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Book of Abstracts

Agroecology, Ecological Agriculture and Environmental Protection

01

Agroekologija, ekološka poljoprivreda i zaštita okoliša

Zbornik sažetaka

Application of kaolin powder for control of olive Fruit fly *Bactrocera oleae* Gmelin (Diptera: Tephritidae)

Abbasi Mozhdehi, Mohammad Reza

Agricultural and natural resource research center of Guilan, Rasht, Iran (mozhdehi.185@gmail.com)

Summary

In Iran the several methods for control of olive fruit fly *Bactrocera oleae* Gmelin (Diptera: Tephritidae) are applied, such as yellow sticky traps. Alone and with sexual pheromones, bottle traps and McPhail traps that contain protein hydrolysate. For this experiment conducted in Roudbar olive research station in 2010, we applied kaolin powder as one of the methods for control and decrease of damage of olive fruit fly. We applied 3 different treatment concentrations containing 5%, 3%, 1.5% of kaolin and water as control. Solutions were sprayed after monitoring with pheromone traps and protein traps. In first stage, after pit hardening of fruits, kaolin was sprayed on trees which coincided with in the beginning of summer. The second and third stage has been done in the end of summer and in the beginning of autumn when we observed maximum sexual activity. Results showed significant difference between treatment concentrations 5% and 3% with 1.5% and control ($p<0.05$). The average number of attacks (total infestation) per olive tree was 3.84± 0.28, 6.96 ± 0.42, 10.1 ± 0.18 and 18.78 ± 0.34 for treatments of 5%, 3%, 1.5% concentrations and water. Due to the low solubility of this material in water, concentration of 5% has been recommended for spraying on trees. Application of kaolin powder is very useful to control of olive fruit fly and will be one of the methods in IPM.

Key words: olive fruit fly, *Bactrocera oleae*, kaolin, control

Evaluation of Temperature and Duration of Sun in point of Ecological Resources in Çankırı, Turkey

Bekir Cengil

Çankırı Karatekin University, Kızılırmak Vocational High School, Çankırı, Turkey (bekircengil@gmail.com)

Summary

Due to rapid population growth in the world to meet the necessary needs of agricultural production, the use of developed technologies is mandatory. However, with increasing energy consumption, this requirement brings with it some environmental problems protecting the natural balance of production is considered a sustainable. In this context, the long-term soil and water resources and climate, natural resources, involving the relationship between agricultural production and the environment should be managed better. Agricultural chemicals used in the production stage and interaction with the atmosphere in the form of land use are a known fact. Protecting the natural balance of production is considered a sustainable; evaluation of energy sources that do not have a negative effect on the environment has a big importance. Solar energy is given damage to the environment compared with to the other fossil fuels is almost negligible. Çankırı, with is position in semi-arid Central Anatolian Region, With a semi-arid climate zones in the Central Anatolia Region Çankırı, has many advantages among the other cities in the cases of temperature and duration of sun. In this study, changes in temperature and duration of sun and extreme conditions were determined based on trend analyses and these data were used and evaluated in scope of alternative energy sources in agricultural production areas.

Key words: Çankırı, temperature, duration of sun, ecological resources

Valorification of treated wastewater by a treatment plant in agriculture

Vasilica Dăescu[1], Maria Cristina Ene[1], Elena Holban[1], György Deák[1], Ioan Veronel Bălănescu[2], Simona Georgiana Tănase[1]

[1]National Institute for Research and Development in Environmental Protection, 294 Splaiul Independenţei, 6th District, 060031, Bucharest, Romania (vasilica_daescu@yahoo.com)
[2] SC ECHIPA HORSE SRL Ploiesti, Romania

Summary

National Institute for Research and Development on Environmental Protection is ongoing, as partner, financing contract no. 37649, which is part of the Sectoral Operational Programme "Increase of Economic Competitiveness" (SOP IEC), the direct beneficiary of the work being “Echipa Horse” society and its ultimate beneficiary is the National Authority for Scientific Research of Romania. The aim of this project is to use treated wastewater for irrigation by plant discharge in agriculture, in order of fertilization of soils, environmental protection and good management of natural resources. It was determined, from experimental research and studies performed by the NIRDEP, the advantages and efficiency of treatment plant, with treatment efficiencies of over 90% for CCOCr, BOD_5, MTS indicators, extractable substances with petroleum ether, total coliform bacteria, fecal coliform bacteria, faecal streptococci. This paper presents the results of tests performed by a team of researchers from NIRDEP on the wastewater input and output of a discharge plant. The interpretation of it is performed in accordance with the legislation in force. The paper also presents dates that were used for wastewater treatment plant exploited in agriculture.

Key words: experimental research, wastewater, treatment plant, agriculture, environmental protection

Use of plant growth promoting rhizobacteria (PGPR) to improve effectiveness of chemical fertilizer on spring wheat and barley in the field condition

Fikrettin Sahin, Metin Turan

Department of Genetics and Bioengineering, Faculty of Engineering and Architechture, Yeditepe University, 34755 Kayisdagi, Istanbul, Turkey (fsahin@yeditepe.edu.tr)

Summary

In 2010, a demonstration field trail was conducted in order to investigate seed inoculation of spring wheat (*Triticum aestivum* spp. *vulgare* var. Kırık) and barley (*Hordeum vulgare* cv. Tokak), with plant growth-promoting rhizobacteria in single and three PGPR strains combinations in comparison to control and mineral fertilizer application in the field condition at Ataturk University Experimental field in Erzurum, Turkey. The treatments included control (no inoculation and fertilizer), Nitrogen (40 kg N ha^{-1}), Nitrogen (80 kg N ha^{-1}), *Bacillus* OSU-142, (5) *Bacillus* M3, *Azospirillum* sp.245, Mixed (OSU-142 + M3 + *Azospirillum* sp.245) and Mixed + 40 kg N ha^{-1} and Mixed + 20 kg N ha^{-1}. Field demonstration results showed that seed inoculation with PGPR strains significantly affected yield, yield components, and quality parameters both in wheat and barley. All treatments significantly increased grain protein, grain and straw N content of wheat and barley plants when compared with control. In terms of seed yield, single application of OSU142, Sp245 or M3 has similar or better yield than 40 kg N application alone. The best results were obtained from mix inoculation (OSU142+M3+Sp245) with 40 kg which was better than even 80 kg N application on both barley and wheat varieties. In conclusion, seed coating with PGPR strains like OSU-142, Sp 245 and mixed inoculation may satisfy nitrogen requirements of wheat and barley under field conditions. Seed coating of PGPR strains can reduce at least 50% of N input in soil without effecting yield.

Key words: PGPR, organic agriculture, seed coating, biofertilizer

Integrated environmental protection using environmental education and training as driving force

Mariana Golumbeanu[1], Simion Nicolaev[1], Fokion K. Vosniakos[2]

[1]NRDIEP-National Institute for Marine Research and Development "Grigore Antipa", 300 Bd. Mamaia Constanta 900581, Romania
[2]Balkan Environmental Association (BENA), Alexander Technological Educational Institute of Thessaloniki, P.O. Box 141, 57400 Sindos, Thessaloniki, Greece
(mariana.golumbeanu@yahoo.com)

Summary

Nowadays the integrated environmental protection and much more the sustainable management of the continuous increasing pollution needs the environmental education and particular the environmental training as a driving force in order to give the opportunity to everybody to contribute in a systematic way to these issues. The component of training is very important and a catalytic key factor for education and public awareness in the frame of the integrated environmental protection. The economical crisis and the social situation in Balkans and particularly in Romania require a new approach to the development of "professional education" (training) in the frame of the sustainable development and the long-life education of the EU. The use of natural resources in sustainable manner and environmental management with appropriate training should become first priority program of the regional development policy. In this direction, the Balkan Environmental Association (B.EN.A.) and the National Institute for Marine Research and Development "Grigore Antipa" through a fruitful collaboration established in 2002 the Training Center on Environmental Professions in Constanta. This Training Center accredited accordingly to the Romanian legislation and is still offering the possibility to the interesting people to increase their level of knowledge on the environmental sciences and ecological management.

Key words: environmental protection, training, environmental management

Selenium concentration in main soil types of Slavonija and Baranja County

Vladimir Ivezić[1], Zdenko Lončarić[1], Bal Ram Singh[2], Åsgeir Rossebø Almås[2]

[1]Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svčića 1d, Osijek, Croatia (vivezic@pfos.hr)
[2]Department of Plant and Environmental Sciences, Norwegian University of Life Sciences, 1432 Ås, Norway

Summary

Selenium (Se) is an essential element for humans and animals but not for plants. Nevertheless, plants are the main source of food and fodder, therefore the ability of plant to take up Se from soil plays an important role in human and animal nutrition. The bioavailability of Se depends on the plant itself as well as on the concentration of Se in soil. The aim of the present study was to investigate Se concentrations in three main soil types of the main agricultural region of Croatia (Osijek-Baranja County). Forty-six soil samples were collected from agricultural and forest soils (Haplic gleysols (n=18), Stagnosols (n=12) and Luvisols (n=16)) and digested by HNO_3 for determination of total Se. Haplic gleysols showed significantly ($p<0.001$) higher average concentrations of total Se (538 µg/kg) from Luvisols (323 µg/kg) and Stagnosols (314 µg/kg). Higher concentrations might be related to soil organic carbon (SOC) and total nitrogen (N) as Haplic gleysols also showed significantly ($p<0.001$) higher percentage of SOC and N from other two soil types. The results of Se concentrations are somewhat higher than the concentrations that can be found in literature regarding Se in soils of Croatia (Požeška kotlina (20-48 µg/kg); Podravina (50-280 µg/kg); Koprivnica (145-333 µg/kg)). Such higher values in the present study could be related to different extraction method. However, these higher concentrations are still relatively low as most soils contain 100 – 2000 µg/kg. In a nutshell, further research in Se bioavailability is necessary in order to better understand Se uptake.

Key words: Osijek-Baranja County, selenium, soil

Utjecaj distibucije gnojidbe dušikom na dinamiku mineralnog dušika u tlu

Krunoslav Karalić[1], Zdenko Lončarić[1], Brigita Popović[1], Rajko Teodorović[2], Meri Engler[1]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (krunoslav.karalic@pfos.hr)*
[2]*HANA d.o.o. Našice, Sokolska 49a, Našice, Hrvatska*

Sažetak

Cilj istraživanja je analitički, na temelju Nmin metode, utvrditi utjecaj distribucije unosa dušičnih gnojiva na dinamiku sadržaja dušika u tlu, te odrediti utjecaj raspoloživosti mineralnog dušika u tlu na komponenete prinosa ozime pšenice. Poljski gnojidbeni pokus uzgoja ozime pšenice postavljen je na dva lokaliteta Lađanska i Donja Motičina. Pokus različite distribucije gnojidbe dušikom dizajniran je prema slučajnom blok rasporedu u tri ponavljanja sa 7 tretmana gnojidbe i rasporedom primjene u osnovnoj gnojidbi i prihrani. Primjenjeni su slijedeći tretmani: kontrola, 80 kg N u prihrani, 80 kg N u osnovnoj gnojidbi i prihrani (40 kg N + 40 kg N), 120 kg N u prihrani, 120 kg N u osnovnoj gnojidbi i prihrani (60 kg N + 60 kg N), 160 kg N u prihrani, 160 kg N u osnovnoj gnojidbi i prihrani (80 kg N + 80 kg N). Ukupno je na svakom lokalitetu primjenjeno dvije prihrane i zasijano je 4 sorte pšenice. Tlo je uzorkovano prije prve i prije druge prihrane. Sadržaj Nmin dušika utvrđen prije prihrane značajno je rastao s povećanjem doze dušika, ali samo na tretmanima koji su uključivali osnovnu gnojidbu. Sukladno mjerenju nakon prve prihrane, aplikacija dušika isključivo u prihrani rezultirala je značajno većim sadržajem mineralnog dušika u tlu u odnosu na tretmane s osnovnom gnojidbom. Povećanje pristupačnosti dušika na lokalitetu Lađanska iznosilo je 22,9 % - 25,3 %, a na lokalitetu Donja Motičina 20,5 % - 21,3 %. Distribucija gnojidbe dušikom u jesen i proljeće rezultirala je većom nadzemnom masom pšenice, dok je unos duška samo prihranom u proljeće rezultirao većim prinosom zrna.

Ključne riječi: dušik, Nmin, osnovna gnojidba, prihrana, pristupačnost

Influence of nitrogen fertilization distribution on mineral nitrogen dynamics in soil

Krunoslav Karalić[1], Zdenko Lončarić[1], Brigita Popović[1], Rajko Teodorović[2], Meri Engler[1]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (krunoslav.karalic@pfos.hr)*
[2]*HANA d.o.o. Našice, Sokolska 49a, Našice, Hrvatska*

Summary

The aim of the research was to analytically determine by Nmin method, impact of nitrogen fertilizers input distribution on nitrogen content dynamics in soil and to determine impact of soil nitrogen availability on winter wheat yield components. Field fertilization experiment of winter wheat growing was conducted on two localities Lađanska and Donja Motičina. Trial with different nitrogen fertilization distribution was set up according to randomized block design with 7 fertilization treatments and distribution in initial fertilization and top dressing. The following treatments were applied: control, 80 kg N in top dressing, 80 kg N in initial fertilization and top dressing (40 kg N + 40 kg N), 120 kg N in top dressing, 120 kg N in initial fertilization and top dressing (60 kg N + 60 kg N), 160 kg N in top dressing, 160 kg N in initial fertilization and top dressing (80 kg N + 80 kg N). Top dressing was applied in two times and four winter wheat cultivars were sown on each locality. Soil was sampled before first and before second top dressing. Nmin nitrogen content measured before top dressing application, raised with fertilization rate increase, but only on treatments including initial fertilization. Application of nitrogen only in top dressing, measured after first top dressing resulted with significantly higher soil mineral nitrogen content compared with treatments including initial fertilization. Incerment of nitrogen availability on Lađanska locality was 22,9 % - 25,3 % and on Donja Motičina locality was 20,5 % - 21,3 %. Nitrogen fertilization distribution throught the autum and the spring resulted with higher aboveground wheat mass, while nitrogen input only by top dressing in the spring resulted with higher grain yield.

Key words: nitrogen, Nmin, initial fertilization, top dressing, availability

The effects of time spraying amino acid on water deficit stress on yield, yield components and some physiological characteristics of grain corn (TWC647)

Pourang Kasraie[1], Mohammad Nasri[1], Mansoureh Khalatbari[1] , Alireza Pazoki[2], Reza Monem[2]

[1]*Department of Agronomy, Varamin-Pishva Branch, Islamic Azad University, Varamin, Iran (kasraie@iauvaramin.ac.ir)*
[2]*Department of Agriculture, Shahr-e-Rey Branch, Islamic Azad University, Tehran, Iran*

Summary

This study investigated the effects of time spraying amino acid on the yield and yield components and some physiological traits in grain corn (*Zea mays* L. var. TWC647) under water deficit. Research was conducted with complete randomized block experimental design with split-plot arrangement with three replications. In this experiment, the main plots consisted of water deficit with 3 levels: cut irrigation in vegetative (A1), cut irrigation in flowering (A2), cut irrigation in grain filling (A3). Subplots were time spraying amino acid in 3 levels: Control-non amino acid (B1), amino acid spraying before water deficit stress (B2), and amino acid spraying after water deficit stress (B3). Results of analysis of variance showed that the interaction effects of water deficit and time spraying amino acid on the characteristics of number of rows per spike, number of grains per row, 1000 grains weight, grain yield, biological yield, harvest index, protein yield, protein percentage and proline were significant at the 5% level. However, there was not significant number of the plants per square meter and number of the spikes per plant of water stressed plants treated with time of amino acid foliar application. In this study, the maximum grain yield (7406.1 kg/ha^{-1}) and number of the plants per square meter, number of spikes per plant, number of rows per spike, number of grains per row, 1000 grains weight, proline , harvest index were obtained from cut irrigation in vegetative with amino acid foliar before water deficit stress. Seed protein percentage increased as the amount of water deficiency. Lowest grain yield was assigned of cut irrigation in flowering with control (none amino acid) with (2258.6 kg/ha^{-1}) had no significant difference with cut irrigation in grain filling with control treatment and the lowest 1000 grains weight (183.4 g) allocated to the same treatment.

Key words: corn, water deficit stress, time spraying amino acid, yield, yield components

Mineralnom gnojidbom obogaćena pšenica kao kvalitetnija hrana

Zdenko Lončarić[1], Maja Manojlović[2], Krunoslav Karalić[1], Brigita Popović[1], Darko Kerovec[1], Vladimir Ivezić[1], Ranko Čabilovski[2], Espen Govasmark[3], Bal Ram Singh[3]

[1]*Poljoprivredni fakultet Sveučilišta Josipa Jurja Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (Zdenko.Loncaric@pfos.hr)*
[2]*Poljoprivredni fakultet Novi Sad, Trg Dositeja Obradovića 8, 21000 Novi Sad, Srbija*
[3]*Norwegian University of Life Sciences (UMB), Ås, Norway*

Sažetak

Cink (Zn) je mikroelement esencijalan za ljude, životinje i više biljke, dok selen (Se) nije neophodan za više biljke. Pošto koncentracija Zn i Se u tlu utječe na koncentracije u biljkama, cilj je ovog istraživanja utvrditi utjecaj gnojidbe Zn i Se na njihovu koncentraciju u zrnu ozime pšenice. Poljski pokus s tri sorte pšenice (Srpanjka i Simonida kao visokoprinosne, te sorta Divana visoke kvalitete) proveden je u Banovcima sa 7 gnojidbenih tretmana: 1. kontrola, 2. Se folijarno, 3. dvostruki Se folijarno, 4. dvostruki Se na površinu tla, 5. Zn-sulfat folijarno, 6. Zn-EDTA folijarno, 7. Zn-sulfat folijarno + dopunska N gnojidba.Nije utvrđen značajan utjecaj gnojidbenih tretmana na prinos pšenice, ali su Srpanjka i Simonida imali veći prinos (prosječno 8,6 i 8,3 t/ha) od Divane (5,4 t/ha). Značajno najniža koncentracija Zn utvrđena je u zrnu Simonide (21 mg/kg), veća u zrnu Srpanjke (24), a najveća u zrnu Divane (35), ali nije utvrđena takva razlika sorti u koncentraciji Se u zrnu (171-180 μg/kg). Istovremeno, koncentracija je Cd bila značajno niža u zrnu Divane (39 μg/kg) nego Srpanjke (50) i Simonide (53), a sve su koncentracije Cd bile vrlo niske, na razini svega 20-26% maksimalno dopuštenih koncentracija u zrnu pšenice (200 μg/kg). Sve su gnojidbe cinkom rezultirale većim koncentracijama Zn nego na kontrolnom tretmanu (20 mg/kg), ali je učinak sulfatnog oblika Zn bio značajno veći (prosječno 40 mg/kg) nego učinak EDTA oblika (27 mg/kg). S druge strane, EDTA oblik rezultirao je 3,5 puta manjim koncentracijama Cd u zrnu u odnosu na kotrolni tretman, a nije utvrđen nikakav utjecaj sulfatnog oblika Zn na koncentraciju Cd. Oba načina aplikacije Se, folijarno i na površinu tla, rezultirali su povećanjem koncentracije Se u zrnu pšenice do 7,8 puta (od 52 do 410 μg/kg u prosjeku), s većim učinkom dvostruke nego jednostruke doze Se. Sorte pšenice značajno su se razlikovale u koncentraciji Zn i Cd.

Ključne riječi: biofortifikacija, cink, selen, kadmij, ozima pšenica

Mineral improved wheat production for healthy food

Zdenko Lončarić[1], Maja Manojlović[2], Krunoslav Karalić[1], Brigita Popović[1], Darko Kerovec[1], Vladimir Ivezić[1], Ranko Čabilovski[2], Espen Govasmark[3], Bal Ram Singh[3]

[1]*Faculty of Agriculture, University of Josip Juraj Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (Zdenko.Loncaric@pfos.hr)*
[2]*Faculty of Agriculture Novi Sad, Trg Dositeja Obradovića 8, 21000 Novi Sad, Serbia*
[3]*Norwegian University of Life Sciences (UMB), Ås, Norway*

Summary

Zinc (Zn) is a trace mineral essential for human, animal and higher plants, but selenium (Se) is not essential for higher plants. Concentration of Zn and Se in soil effect on concentration in plants, and therefore this study was aimed to determine the effect of Zn and Se fertilizer application on their concentration in the wheat grain. The field experiment was conducted on Banovci site with 3 cultivars of winter wheat (Srpanjka and Simonida - high-yielding, and Divana - high-quality) with following 7 fertilization treatments: 1. control, 2. Se foliar, 3. double Se foliar, 4. double Se on the soil surface, 5. Zn sulfate foliar, 6. Zn EDTA foliar, 7. Zn sulfate foliar + additional N. There was no significant effect of any fertilization treatment on grain yield, but Srpanjka and Simonida produced higher yield (8,6 and 8,3 t/ha in average) than Divana (5,4 t/ha). Simonida contained significantly lowest Zn (21 mg/kg), higher was in Srpanjka grain (24), and the highest in Divana (35), but no such cultivar effect was seen on Se concentrations in grain (171-180 µg/kg). At the same time, Cd concentration was significantly lower in Divana cultivar (39 µg/kg) than in grain of Srpanjka (50) and Simonida (53). Nevertheless, all the Cd concentrations were very low, at 20-26% of allowed maximum level in wheat grain (200 µg/kg). All the foliar applications of Zn resulted in higher Zn concentrations in wheat grain than on control treatment (20 mg/kg), but the effect of sulfate was much higher (40 mg/kg in average) than effect of EDTA form (27 mg/kg). On the other hand, EDTA form resulted in 3,5-fold decreasing of Cd concentration comparing to control, and there was no such effect of sulfate form. Both type of Se application, foliar and on the soil surface, increased Se concentrations in wheat grain up to 7,8 times (from 52 to 410 µg/kg in average), with higher effect of doubled than single Se application. The cultivars differ significantly in Zn and Cd concentrations.

Key words: biofortification, zinc, selenium, cadmium, winter wheat

The protective role of zinc and calcium in *Vicia faba* seedlings subjected to cadmium stress

Mahmut Sinan Taspinar

Department of Field Crops, Faculty of Agriculture, Ataturk University 25240 Erzurum, Turkey (taspinar@atauni.edu.tr)

Summary

Along with rapid development of modern industry, environmental contamination by heavy metals has increased drastically. The heavy metal cadmium (Cd^{2+}) is considered to be one of the most dangerous occupational and environmental poisons. The cytotoxic and mutagenic effects of Cd^{2+} have been demonstrated in different plant and animal species. Cd^{2+} was found to inhibit seed germination and root growth, decrease the mitotic index of cells, besides that it produced chlorophyll mutation, chromosomal aberration, important effects on protein metabolism and enzymes in plants. The aim of the present study was to evidence the possible antagonistic effect of Zinc (Zn^{2+}) and Calcium (Ca^{2+}) against cadmium Cd^{2+} -induced DNA damage by using random amplification of polymorphic DNA (RAPD) and metabolic activities in *Vicia faba*. The results showed that all doses of Cd^{2+} (10^{-3} M, 10^{-5} M) caused an increase in polymorphism value and a decrease in genomic template stability (GTS %). In addition, when 10^{-4}-10^{-6} M Ca^{2+}, 10^{-6} M Zn^{2+} were added together with 10^{-3} M, 10^{-4} M, 10^{-5} M of Cd^{2+}, polymorphism value decreased besides GTS, total protein and chlorophyll content increased. Results suggested that Zn^{2+} and Ca^{2+} have an antagonistic effect against Cd^{2+}. The order of the antagonisms of Ca^{2+}, Zn^{2+} against Cd^{2+} toxicity was $Ca^{2+} > Zn^{2+}$. Especially, the degree of antagonistic effect of Zn^{2+} against Cd^{2+} is probably related to its concentration ratio.

Key words: *Vicia faba*, antagonism, DNA damage, cadmium

Observation of population fluctuation of citrus whitefly in lemon trees

Jan M Mari

Department of plant protection, Sindh Agriculture University, Tandojam, Pakistan (janmarree@gmail.com)

Summary

In Pakistan, citrus are grown on an average area of 193.2 thousand hectares with production of 1472.4 thousand tones annually. Several species of insects pests species attack citrus trees among that whitefly, Citrus whiteflies is one of the most important pests of *Citrus* spp., to which it may cause serious damage. Weekly observations intervals were observed through *in situ* plant count as well as water pan traps methods. The *in situ* plant count sampling was also made. Fifty matured branches were observed randomly at weekly intervals during the period March 2009 to September 2010. It is evident from the data that arrival of the whitefly on lemon orchard initiated from 1st March during the time of the study on yellow and green traps with the range of 1.66 and 0.16 per traps respectively. Later, increasing trend in growth was observed of whitefly on pan traps and reached its peak on 24th June. During this period the highest rate of increase went on 76.66, 46.66 and 16.06 for yellow, green and white traps, respectively. Then, capturing abundance started decreasing from 1st July to 26th August. Later on, once again a population on pan traps improved from 1st September to onward. The first population of whitefly in lemon orchard were examined on 1st March and their number increased linearly. A noticeable increase in population levels occurred at the 1st July. A linear regression model for the population fluctuation of whitefly with a slope of line 0.8722X and R-square was 0.96 it indicates that 96% population variation occurred due to date intervals. It decreased and reached its minimum population on 19th August. Linear regression models with a declining curve -1.888X and R-square 0.83. It was estimated from the data that an increasing curve was observed in population from 26th August to onward regression model shows 0.825X and R-square 0.94. It indicated that 94% increase was owing to date intervals. It was concluded that from the results that the seasonal population of the whitefly was highest in month of June through both sampling methods. Data indicate that yellow coloured water pan traps attracted a numerous number of whitefly followed by green and white water pan traps. This basic information will facilitate to growers for pre-cautionary measures for in integrated control programs directed against whitefly on lemon by the use of cultural controls and timed application of selective insecticides.

Key words: lemon, in situ, citrus whitefly, population, fluctuation

Usklađivanje zakona o zaštiti okoliša u poljoprivredi s pravnim aktima Europske Unije

Monika Marković[1], Igor Kralik[1], Jasna Šoštarić[1], Marko Josipović[2], Ana Peruzović[3]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (monika.markovic@pfos.hr)*
[2]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska*
[3]*Diplomant sveučilišnog dodiplomskog studija, Poljoprivredni fakultet Osijek, smjer zootehnika*

Sažetak

Ulaskom u Europsku uniju Republika Hrvatska će provoditi Zajedničku poljoprivrednu politiku (ZPP), koja regulira proizvodnju i prodaju poljoprivredno-prehrambenih proizvoda. Cilj politike je osigurati kvalitetu proizvoda uz prihvatljive cijene, pridonijeti zdravstvenoj ispravnosti proizvoda, očuvati ruralno nasljeđe, te poljoprivrednicima osigurati stabilan dohodak. Kao buduća članica Europske unije, Republika Hrvatska bi trebala uskladiti svoje zakonodavstvo, pravila i procedure sa zakonodavstvom sadržanim u tzv. "acquis communautaire" (pravna stečevina). Jedan od uvjeta je bila i prilagodba poljoprivredne proizvodnje pravnim aktima i zakonima EU (poglavlje 11 – Poljoprivreda i ruralni razvitak) kao i briga o očuvanju okoliša zajedničkom politikom (poglavlje 27 – Okoliš). Cilj ovog rada jest proučiti problematiku s kojom se susreću poljoprivredni proizvođači, kao i vlasnici manjih obiteljskih poljoprivrednih gospodarstava na području Splitsko-dalmatinske županije, prilikom prilagodbe svoje proizvodnje ili poljoprivrednog gospodarstva zakonima Europske unije, a s ciljem ostvarivanja prava na izravna plaćanja, te korištenja sredstava iz fondova EU. Istraživanje je provedeno u obliku ankete, izravnom metodom na 137 ispitanika. Rezultati istraživanja govore o slaboj obaviještenosti i upoznatosti ispitanika sa zakonima EU te o potrebi daljnjeg educiranja i obaviještavanja poljoprivrednih proizvođača u pogledu prilagodbe proizvodnje i ostvarivanja prava na poticaje.

Ključne riječi: zakoni EU, ZPP, prilagodba poljoprivredne proizvodnje

Adjustment of Croatian Environmental Protection Law to the Europian Union Agricultural Policy

Monika Marković[1], Igor Kralik[1], Jasna Šoštarić[1], Marko Josipović[2], Ana Peruzović[3]

[1]*Faculty of Agriculture, Josip Juraj Strossmayer University of Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (monika.markovic@pfos.hr)*
[2]*Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia*
[3]*Graduate student of the University study in Zootechnics, Faculty of Agriculture in Osijek*

Summary

Upon accession to the European Union, Croatia shall implement the Common Agricultural Policy (CAP), which regulates production and sale of agricultural and food products. The Policy objective is to assure quality of products at reasonable prices, to contribute to safety of products, to preserve rural heritage, and to provide stable income for farmers. As a future member country of the European Union, Croatia should adjust its legislation, laws and procedures with the legislation provided in the *acquis communautaire* (Community acquis). One of its conditions is adjustment of agricultural production to legal acts and regulations of the EU (Chapter 11 - Agriculture and Rural Development), as well as obligation for environment protection within common policy (Chapter 27 - Environment). The aim of this paper was to elaborate the problems faced by farmers and owners of small family farms in the area of Split-Dalmatia County, within the process of adjusting their production and agricultural farms to the EU laws, all with the aim to claim their rights for direct payments and the use of EU funds. The study was conducted as a survey, by a direct method on 137 examinees. The results showed that examinees were less informed and familiar with the EU laws. There is a need to further education and informing of agricultural producers to adjustment processes in agriculture and their rights for subsidies.

Key words: EU laws, CAP, adjustment of agricultural production

Rigosoli otoka Raba

Boško Miloš[1], Aleksandra Bensa[2]

[1]*Institut za jadranske kulture i melioraciju krša, Put Duilova 11, Split, Hrvatska (bosko@krs.hr)*
[2]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska*

Sažetak

U radu su analizirana svojstva antropogenih tala otoka Raba ukupne površine 543 ha, izvršena je njihova klasifikacija i utvrđen prostorni raspored u svrhu vrednovanja, planiranja korištenja i zaštite tla. Promjene prirodnih tala nastale krčenjem, dubokom obradom, ravnanjem i terasiranjem, gnojidbom i izmjenom vodnoga režima su prepoznatljive i stoga su tla klasificirana kao rigosoli. U strukturi korištenja dominiraju pašnjaci, zatim tradicionalne mediteranske kulture vinogradi, maslinici i voćnjaci, te oranice i vrtovi. Istraživanja su pokazala da antropogeni procesi često ne uzrokuju dramatične morfološke promjene, ali modificiraju neka kemijska i fizikalna svojstva značajna za gospodarenje tlom. Temeljne značajke i varijabilnost tala definirani su raznovrsnošću matične podloge (eocenski sedimenti – fliš i kvartarni nanosi: šljunkoviti deluvij i breče, te eolski pijesak) i geomorfološko-hidrološkim prilikama, te snažnim i dugotrajnim utjecajem čovjeka. Kao kriterij za klasifikaciju rigosola koristili smo svojstva bitna za njihovo korištenje: dubinu, teksturu i dreniranost tla, karbonatnost, te sadržaj humusa i hranjiva. Prikaz tala dat je temeljem terenskih pedokartografskih i laboratorijskih analiza 78 uzoraka tla uzetih iz 33 pedološka profila. Izrađena je pedološka karta M=1:25 K. U zaključku su date preporuke za unapređenje korištenja poljoprivrednog tla.

Ključne riječi: rigosoli, tlo, klasifikacija, Rab

Rigosols of the island of Rab

Boško Miloš[1], Aleksandra Bensa[2]

[1]*Institute for adriatic crops and karst reclamation, Put Duilova 11, Split, Croatia (bosko@krs.hr)*
[2]*Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia*

Summary

The paper analyzes the characteristics of anthropogenic soils of the island of Rab, the total area of 543 ha, classification and spatial distribution was carried out for the purposes of valuation, planning, use and protection of soil. Changes in natural soils caused by clearing, deep ploughing, leveling and terracing, fertilization and water regime changing are recognizable and therefore are classified as the Rigosols. The dominant types of the land use are pastures, then the traditional Mediterranean food crops, vineyards, olive groves and orchards, and ploughlands and gardens. Studies have shown that anthropogenic processes often do not cause dramatic morphological changes, but modify the some chemical and physical properties relevant to soil management. Essential characteristics and variability of soils are defined by diversity of parent material (Eocene sediments - Flysch and quaternary deposites: gravelly colluvium and breccias, aeolian sand) and geomorphological-hydrological conditions and strong and long-lasting human impact. As a criterion for the classification of Rigosols we used soil properties relevant to their use: depth, texture and soil drainage, content of carbonate, humus and nutrients. The results were based on field investigation and laboratory analyzes of 78 samples taken from 33 soil profiles. The Soil Map in the scale M= 1:25 K was made. In the conclusion, suggestions for improved use of agricultural soil were given.

Key words: Rigosols, soil, classification, Rab

Organic farming in India: Challenges under a changing climate

Shadananan Nair

Nansen Environmental Research Centre (India), A6, Oxford Business Centre, Ravipuram, Kochi-682016, Kerala, India (nair59@yahoo.com)

Summary

Excessive use of fertilizers and chemicals in agriculture has become a serious environmental issue in India. The green revolution that helped India to overcome food crisis led to large-scale degradation of land and water resources. India is in the path of intense agricultural development to feed the fast rising population. Promotion of organic farming can contribute to the attempts in controlling the rising temperature. India has cultivable drylands where organic farming can be newly introduced. Organic products from India have a good market outside. However, the small and marginal farmers face a number of challenges including the availability of ideal land, finance, proper insurance, good market and competition with the large firms. Organic farming is important as problems related to climate change are linked to fossil fertilisers. Because of poor land management practices, the soils of India under different climate zones have lost a significant amount of Carbon which can be solved through the improvements in farming systems and use of organic material. India was too late to develop an agricultural policy and climate policy. Even the guidelines of existing environment policies are not properly implemented because of various socio-economic, political and administrative reasons. This paper highlights the importance of organic farming in India under a changing climate and environment and rising population. An assessment of the climate change on different zones and current scenario of organic farming and a review of existing policies and management practices have been made. There is a tendency of increasing seasonality of rainfall that reduces groundwater recharge in major parts of the country. Long gap in rainfall and loss in soil moisture due to rising temperature are challenges to farming. Measures to recharge groundwater during active monsoon period and extension of irrigation facilities are urgently required. Agriculture policy should be revised to encourage cooperative farming and to prove linkages between market and farmers. There should be incentives to farmers and proper insurance to overcome failure in production due to adverse climate. India has the potential to develop organic agriculture. At present only 0.03% of the cultivated area is under organic farming. Since the soil in the vast area under agriculture is already filled with chemicals and fertilizers, it is better to extend organic farming into the cultivable wastelands. Small farmers in India can benefit from the organic farming that may help eradicating poverty. Low investment, less dependence on money lenders and opportunity to utilise the abundance of traditional knowledge are attractions for the poor farming communities of rural India. Developments in agriculture will enable the country to face the possible food crisis associated with fast rising population.

Key words: organic agriculture, degradation, India, climate change, policy

Effect of irrigation by domestic wastewater on quantity and quality characteristics of safflower (*Carthamus tinctorius* L.), alfalfa (*Medicago sativa* L.) and rose (*Rosa hybrida* L.) under lysimeter conditions

Mohammad Nasri[1], Mansoureh Khalatbari[1], Alireza Pazoki[2]

[1]*Department of Agriculture, Varamin Branch, Islamic Azad University, Varamin, Iran (dr.nasri@iauvaramin.ac.ir)*
[2]*Department of Agriculture, Shahr-e-Rey Branch, Islamic Azad University, Tehran, Iran*

Summary

In order to determine the effect of irrigation by domestic wastewater on quantity and quality characteristics of safflower (*Carthamus tinctorius* L.), alfalfa (*Medicago sativa* L.) and rose (*Rosa hybrida* L.) under lysimeter conditions, this experiment was carried out in Iran at Varamin. In experimental field were 15 lysimeters, on which were cultivated safflower (*Carthamus tinctorius* L.) in 1 to 5 lysimeters and irrigated by domestic wastewater and primary drainage water were accumulated. On the 6 to 9 lysimeters were cultivated alfalfa (*Medicago sativa* L.) and irrigated by primary drainage water and then, secondary drainage water were accumulated. On 10, 11 and 12 lysimeters were cultivated rose (*Rosa hybrida* L.) and irrigated by secondary drainage water. In order to compare plants characteristics, in 13, 14 and 15 lysimeters were cultivated safflower (*Carthamus tinctorius* L.), alfalfa (*Medicago sativa* L.) and rose (*Rosa hybrida* L.) and irrigated by fresh water. The results showed that plant height, Boll number, seed number in Boll, seed yield and biological yield in Safflower increased with domestic wastewater in ratio to fresh water. Protein percentage reached from 17.9 to 19.2 percent but oil percentage reduced from 28.4 to 27.3 percent. The use of primary drainage water in alfa alfa increased dry weight yield, Protein percentage (from 15.8 to 17.4 percent) and plant height. As finally stem number and length after harvesting of Rosa increased with secondary drainage water. Quantity and quality characteristics of safflower, alfalfa and rose were improved under irrigation by secondary drainage water in comparison to irrigation by fresh water. The applied effluent contained higher levels of Na, Cl, $HCO_{3,}^{-1}$ P, K, NH_4^{+1}, NO_3^{-1}, Ca+Mg, B, Mn, and Fe than the local potable water used as a control and reduced in primary and secondary drainage water, that were characterized by higher values of electrical conductivity (EC), pH, and sodium absorption ratio (SAR).

Key words: Domestic wastewater, safflower (*Carthamus ti nctorius* L.), alfalfa (*Medicago sativa* L.), rose (*Rosa hybrida* L.).

Consumer Perspective of Organic Food

Nihan Özgüveni

Faculty of Economic and Administrative Sciences, Dokuz Eylul University, Department of Business Administration, İzmir, Turkey (nihan.ozguven@deu.edu.tr)

Summary

Organically produced food has shown remarkable industry growth. Growing interest in organic agriculture has prompted numerous studies that compare various aspects of organic and conventionally-produced food. Even with strict adherence to the production practices and increasing availability, the majority of consumers are still not aware of organically produced alternatives. Consumer concern over the quality and safety of conventional food has intensified in recent years, and primarily drive the increasing demand for organically grown food. Organic fruits and vegetables can be expected to contain fewer agrochemical residues than conventionally grown alternatives. Organic fruits and vegetables can be expected to contain fewer agrochemical residues than conventionally grown alternatives; yet, the significance of this difference is questionable, inasmuch as actual levels of contamination in both types of food are generally well below acceptable limits. Organic food comes from organic farms, which are small plots of land that are farmed by families or groups of people. Organic food is grown, cultivated and harvested in the purest most natural state without over processing. This report provides a comprehensive evaluation of organic food. And it presents consumer perception and knowledge of organic food. However it evaluates organic food preferences in the light of food attributes, going beyond the current treatment with predictions limited largely to socioeconomic. In this study, a review of the literature has been examined. Finally the study aims to provide a critical review of the literature on the consumer perspective on organic food. In the result, organic market in the world is developing very slowly. In conclusion, organic food consumers choose the lifestyle because they are environmentally conscious.

Key words: organic foods, consumer, agriculture

Assessment of surface runoff and soil losses over snow covered soils under artificial rainfall

Sultan Gunes, Taskin Oztas

Ataturk University, Faculty of Agriculture, Department of Soil Science and Plant Nutrients, 25240 Erzurum, Turkey (toztas@atauni.edu.tr)

Summary

It is well known that sudden snow melting in early spring and especially spring-rainfalls on snow-cowered soils cause excessive soil and water losses. The objective of this study was to determine surface runoff and soil losses from snow covered soils under different rainfall intensity. Texturally different three soil samples (loam (L), sandy loam (SL) and clay (C)) were collected from the Experimental Research Station of Ataturk University in Erzurum in where freezing-thawing processes are commonly seen. Soil samples passed through 4.76 mm sieve were put into 30x30x10 cm trays and 5 cm snow layers were added on these samples and freezed at -4^0C. Following thawing, consecutive artificial rainfalls with different intensities (1.0; 2.5 and 5.0 cm h^{-1}) were applied with 15 and 30 minutes on samples located at 9% slope gradient using rainfall simulator under laboratory conditions. Surface runoff and sediment yield were collected within a conserved area and the results were compared. The results indicated that the amounts of runoff and soil losses were greatly affected by soil properties, rainfall intensity and time. The maximum amounts of soil losses were obtained from the highest rainfall intensity (5.0 cm h^{-1}) with 30 minutes rainfall and soil with sandy-loam texture. The highest surface runoff at the same rainfall intensity was obtained from C-textured soil samples. The erosion rates estimated for the highest rainfall intensity with 30 minutes period were 66 tons ha^{-1} for SL-textured soil, 55 tons ha^{-1} for L-textured soil and 48 tons ha^{-1} for C-textured soil. On the other hand, the amounts of surface runoff were the highest for C-textured soil and the lowest for SL-textured soil. The results of this study clearly indicated that the amounts of surface runoff and soil losses were affected by soil properties, rainfall characteristics and rainfall period.

Key words: surface runoff, soil loss, erosion, rainfall simulator

Mapping critical levels for ozone in relation with ecosystems protection in Romania

Alexandru Petrescu, Deák György, Georgiana Tănase, Bogdan Uriţescu

National Institute for Research and Development in Environmental Protection, 294 Splaiul Independentei, 6th District, Bucharest, Romania (danalpin2002@yahoo.com)

Summary

The AOT40 exposure index developed within the context of UN-ECE as a critical level is a tool commonly used in Europe to assess the geographical areas where ecosystems (crops, forests and semi-natural vegetation) face a potential risk due to high ambient ozone concentrations. Using the ambient ozone data recorded in 2007-2009 within an irregular monitoring network covering Romania (32 rural, suburban and background urban stations) we calculated the AOT40 values separately for forests, crops and semi-natural vegetation. The interpolation method used was the IDW modified, with respect to the influence of altitude change on ozone concentrations and the representativity of the data registered at different kinds of stations. Ecosystems were identified in Corine LandCover 2006 dataset for Romania. For mapping AOT40 interpolated data, ArcGIS Desktop was used. About 94% of Romanian territory exceeds the critical levels for forests (AOT40 - 5 ppm.h April-September daylight hours) and about 92% of Romanian territory exceeds the critical levels for crops and semi-natural vegetation (AOT40 - 3 ppm.h May-July daylight hours). After processing the data we noticed that there are large uncovered areas of national territory. Finally, we suggest adding 6 new ozone rural monitoring stations in order to complete the Romanian monitoring network.

Key words: ozone, AOT40, ecosystems, monitoring network

Utjecaj porijekla komposta za proizvodnju gljiva na sadržaj teških metala u plodu šampinjona (*Agaricus bisporus*)

Brigita Popović[1], Nataša Romanjek-Fajdetić[2], Nada Parađiković[1], Zdenko Lončarić[1], Krunoslav Karalić[1], Darko Kerovec[1], Meri Engler[1]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (brigita.popovic@pfos.hr)*
[2]*Veleučilište u Slavonskom Brodu, Dr. Mile Budaka 1, Slavonski Brod, Hrvatska*

Sažetak

Cilj ovog rada bio je utvrditi sadržaj teških metala (Zn, Fe, Pb i Cd) u plodu šampinjona s obzirom na upotrebu dvaju različitih komposta za proizvodnju gljiva. Pokus je postavljen u četiri ponavljanja po dizajnu slučajnog blok rasporeda na obiteljskom gospodarstvu Romanjek u Slavonskom Brodu, a korišteni su komposti Bio fungi Kft iz Mađarske i CNC Grondstoffen BV iz Nizozemske. Sadržaj teških metala u suhoj tvari šampinjona određen je induktivno spregnutom plazmom (ICP OES) nakon razaranja mikrovalnom tehnikom i kretao se u nizu Fe> Zn> Pb> Cd neovisno o porijeku komposta. Statistički značajna razlika između sadržaja teških metala u plodu šampinjona ovisno o porijeku komposta utvrđena je jedino za Cd CNC Grondstoffen B.V. 0,134 mg/kg st, Bio fungi Kft 0,017 mg/kg st,) dok za ostale teške metale nije utvrđena statistički značajna razlika. Sve dobivene vrijednosti bile su ispod granica propisanih Europskom regulativom o sadržaju teških metala. Dobiveni rezultati ukazuju na pogodnost oba supstrata za uzgoj šampinjona, te da s aspekta akumulacije teških metala u plodu šampinjona, odabir supstrata nije limitirajući faktor.

Ključne riječi: šampinjoni, teški metali, Bio fungi Kft kompost, CNC Grondstoffen B.V kompost

Influence of mushroom champignon production compost origin on heavy metal content in champignon fruits (*Agaricus bisporus*)

Brigita Popović[1], Nataša Romanjek-Fajdetić[2], Nada Parađiković[1], Zdenko Lončarić[1], Krunoslav Karalić[1], Darko Kerovec[1], Meri Engler[1]

[1]*Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (brigita.popovic@pfos.hr)*
[2]*University of applied sciences in Slavonski Brod, Dr. Mile Budaka 1, Slavonski Brod, Croatia*

Summary

The aim of this study was to determine the content of heavy metals (Zn, Fe, Pb and Cd) in the champignon fruit considering the use of two different composts for mushroom production. The experiment was conducted in four replications on the family farm Romanjek in Slavonski Brod, and Bio fungi Kft composts from Hungary and CNC Grondstoffen BV from the Netherlands were used. The content of heavy metals in the champignon fruit (dry matter) determined by inductively coupled plasma (ICP OS) after microwave digestion technique ranged in a series of Fe> Zn> Pb> Cd regardless of compost origin. Statistically significant difference between the content of heavy metals in the champignon fruit was found only for Cd (CNC Grondstoffen BV 0.134 mg / kg DM, Bio fungi Kft composts 0.017 mg / kg DM,) while for other heavy metals did not show statistically significant difference. All determined heavy metals content were below the treshold values established by the Commission of the European Communities. These results indicate the suitability of both growing champignon substrates, and in terms of heavy metals accumulation in the champignon fruit, substrate is not a limiting factor.

Key words: champignon fruits, heavy metals, Bio fungi Kft compost, CNC Grondstoffen BV compost

Manjak vode u tlima istočne Hrvatske

Domagoj Rastija[1], Miroslav Dadić[1], Nenad Heček[2], Vladimir Zebec[1], Zoran Semialjac[1]

[1]Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (domagoj.rastija@pfos.hr)
[2]Elektroprojekt d.d., Alexandera von Humboldta 4, Zagreb,Hrvatska

Sažetak

Cilj ovog rada je bio utvrditi manjak vode u tlu u agroekološkim uvjetima istočne Hrvatske za područje Donjeg Miholjca. Pedološka i hidropedološka terenska istraživanja provedena su tijekom proljeća, ljeta i jeseni 2011. godine na površini od 1381 ha, prilikom čega je utvrđena zastupljenost tipova tala te su određene osnovne hidropedološke konstante. Mjesečne vrijednosti nedostatka vode u tlu izračunate su za najzastupljenije poljoprivredne kulture u sušnoj i prosječnoj godini. Ulazni podaci za proračun su bile hidropedološke konstante tala istraživanog područja, podaci o srednjim mjesečnim oborinama, koeficijenti usjeva k_c, te prosječne mjesečne referentne vrijednosti evapotranspiracije za razdoblje 1976.-2010. Prosječna godišnja količina oborina za područje Donjeg Miholjca iznosi 725,5 mm, a godišnja količina oborina u prosječno sušnoj godini iznosi 411,7 mm. Manjak vode u tlu u vegetacijskom razdoblju u prosječnoj godini kreće se od 16 mm kod pšenice do 155 mm kod šećerne repe. U sušnoj godini pri 75% vjerojatnosti pojave oborina najveći nedostatak vode u tlu također je utvrđen za usjev šećerne repe (268 mm), a najmanji kod pšenice (54 mm).

Ključne riječi: oborine, evapotranspiracija, tlo, manjak vode

Soil water deficit in east Croatia

Domagoj Rastija[1], Miroslav Dadić[1], Nenad Heček[2], Vladimir Zebec[1], Zoran Semialjac[1]

[1]Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (domagoj.rastija@pfos.hr)
[2]Elektroprojekt d.d., Alexandera von Humboldta 4, Zagreb,Hrvatska

Summary

The aim of this study was to determine soil water deficit in agroecological conditions of east Croatia, Donji Miholjac area. Pedological and hydropedological field researches were carried out from spring to autmn 2011. Distribution of soil types and soil moisture constants were determined in the research area of 1381 ha. Soil water deficits were calculated for most common crops during vegetation of average and dry year (dependable rainfall at 75 percent probability). The input data for calculation soil water deficit were soil moisture constants, crop coefficients k_c, average monthly precipitations and reference evapotranspiration for period 1976-2010. The total amounts of precipitation for meteorological station Donji Miholjac in average year is 725.5 mm, while for average dry year is 411.7 mm. The lowest soil water deficit during vegetation period of average year (16 mm) was obtained for wheat, while the highest one for sugar beet (155 mm). In the average dry year (dependable rainfall at 75 percent probability) also the lowest and the highest values were obtained for wheat (54 mm) and sugar beet (268 mm).

Key words: rainfall, evapotranspiration, soil, water deficit

Utjecaj kadmija na distribuciju molibdena u ozimoj pšenici

Andrijana Rebekić, Zdenko Lončarić

Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (andrijana.rebekic@pfos.hr)

Sažetak

Cilj rada je ispitati utjecaj kontaminacija tla Cd na usvajanje i distribuciju Mo u ozimoj pšenici. Pokus je postavljen u posude po planu potpuno slučajnog blok sustava s deset sorata ozime pšenice i tri razine kontaminacije tla Cd (0, 2 i 5 mg Cd kg^{-1} tla) u četiri ponavljanja. Uzorkovanje je provedeno u fazi cvatnje (stabljika, listovi, list zastavičar i klas) i u punoj zriobi (slama, listovi, pljevice i zrno). Statistička analiza napravljena je u programu SAS 9.3. U fazi cvatnje najviša koncentracija Mo utvrđena je u stabljici na svim razinama kontaminacije tla, dok je najniža koncentracija utvrđena u listovima pri kontaminaciji s 0 i 2, te u listu zastavičaru pri 5 mg Cd kg^{-1} tla. U zriobi najviša koncentracija Mo utvrđena je u zrnu, a najniža u pljevicama pri svim razinama kontaminacije tla. Rezultati Kruskal-Wallis ANOVE ukazuju na značajne razlike u prosječnim vrijednostima rangova između razina kontaminacije tla samo za list zastavičar ($P = 0,001$) i klas ($P = 0,012$). U cvatnji polovina ukupno usvojenog Mo (53, 43 i 52% na 0, 2 i 5 mg Cd kg^{-1} tla) akumulirana je u stabljici, dok je u punoj zriobi najviše Mo akumulirano u zrnu (62, 66 i 69% od ukupno usvojene količine na 0, 2 i 5 mg Cd kg^{-1} tla). Ispitivane sorte pšenice razlikuju se po koncentraciji i sadržaju Mo u listu zastavičaru i klasu na svim razinama kontaminacije tla, dok za koncentraciju i sadržaj Mo u zrnu nisu utvrđene razlike. Prema tome ne može se zaključiti da Cd utječe na akumulaciju Mo u zrno pšenice.

Ključne riječi: molibden, kadmij, ozima pšenica, usvajanje, distribucija

Cadmium influence on molybdenum distribution in winter wheat

Andrijana Rebekić, Zdenko Lončarić

Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (andrijana.rebekic@pfos.hr)

Summary

The aim of this paper was to determine how soil Cd contamination influences on uptake and distribution of Mo in winter wheat. Pot experiment was set up as completely randomized block design with three levels of soil Cd contamination (0, 2 and 5 mg Cd kg^{-1} soil), ten winter wheat genotypes and four replicates. Samples were taken in flowering stage (stem, leaves, flag leaf and spike) and in full maturity (straw, leaves, glumes and grain). Statistical analysis was done in SAS 9.3.In flowering stage the highest average Mo concentration was measured in stem at all levels of contamination while lowest Mo concentration was in leaves at 0 and 2 and in flag leaf at 5 mg Cd kg^{-1}. In full maturity the highest Mo concentration was found in grain and lowest in glumes at all levels of soil contamination. Kruskal-Wallis ANOVA obtained significant differences in mean scores of Mo concentration between levels of soil contamination only for flag leaf ($P = 0.001$) and spike ($P = 0.012$). About half of total plant Mo (53, 43 and 52% at 0, 2 and 5 mg Cd kg^{-1} soil respectively) was stored in stem in flowering stage. In full maturity the biggest storage of Mo was in grain (62, 66 and 69% of total Mo at 0, 2 and 5 mg Cd kg^{-1} soil respectively). Genotypes differ significantly in Mo concentration and content in flag leaf and spike. Genotypic difference in Mo grain concentration and content failed to give sufficient evidence, so we cannot conclude that soil Cd contamination influences accumulation of Mo in grain.

Key words: molybdenum, cadmium, winter wheat, uptake, distribution

Višegodišnje praćenje utjecaja klimatskih promjena na brojnost populacija skladišnih štetnika

Vlatka Rozman, Anita Liška

Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (vrozman@pfos.hr)

Sažetak

Posljedice klimatskih promjena sve više se uočavaju kako tijekom vegetacije i uzgoja žitarica i uljarica, tako i tijekom njihova skladištenja. Povišene ljetne temperature zraka i na našem području direktno uvjetuju pomicanje rokova žetve, te porast temperature zrnene mase. S jedne strane, smanjuju su troškovi sušenja i dosušivanja, dok s druge strane, povećava se potreba za ulaganjem u sisteme umjetnog hlađenja zrna. Ovako topla uskladištena zrnena masa lako je podložna intenziviranju negativnih fizioloških procesa, te predstavlja idealan medij za razvoj skladišnih štetnika, što direktno uvjetuje veće troškove u zaštiti uskladištenih proizvoda. Cilj ovog rada je prikazati rezultate faunističkih pregleda uzoraka pšenice, kukuruza, ječma, soje i suncokreta iz skladišnih objekata s područja Slavonije i Baranje na prisutnost štetnika u ovisnosti o klimatskom promjenama. Ukupno je analizirano 234 uzorka pšenice, 167 uzoraka kukuruza, 90 uzoraka ječma, 90 uzoraka soje i 104 uzorka suncokreta. U pšenici dominiraju prašne uši - *Liposcelis* spp. (37,92%), a iz reda Coleoptera hrđasti brašnar – *Cryptolestes ferrugineus* (Steph.) (23,11%). U ječmu su najzastupljenije prašne uši - *Liposcelis* spp. (48,21%) te grinje - Acarina (39,83%)., a iz reda Coleoptera, rižin žižak - *Sitophilus oryzae* (L.) (10,48%). U kukuruzu dominira hrđasti brašnar – *C. ferrugineus* (Steph.) (25,8%) te kukuruzni žižak - *Sitophilus zeamays* (Motsch.) (23,22%). U soji su determinirani bakrenasti moljac - *Plodia interpunctella* (Hübn.) (44,44%) i rižin žižak - *S. oryzae* (L.) (33,33%), dok su najzastupljenije vrste u suncokretu kestenjasti brašnar – *Tribolium castaneum* (Herbst) (29,51%) te surinamski brašnar – *Oryzaephilus surinamensis* (L.) (22,43%). Determinirane vrste skaldišnih štetnika ubrajaju se u najznačajnije gospodarske štetnike uskladištenih poljoprivrednih proizvoda, te predstavljaju glavne uzročnike gubitaka kakvoće i količine uskladištenih žitarica i uljarica. O tome, koliko budemo bili stručni i spremni, te voljni uložiti i investirati u nove načine sigurnijeg skladištenja, ovisit će i uspješnost čuvanja i kvaliteta hrane.

Ključne riječi: skladišni štetnici, klimatske promjene, žitarice, uljarice

Long time recording influence of climate change on stored pests populations

Vlatka Rozman, Anita Liška

Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (vrozman@pfos.hr)

Summary

The effects of climatic changes have been progressively pronounced during the period of vegetation, production and crop storage. Increased summer temperatures in our area could be result of global warming that directly delay the time of harvest, and increase grain temperature. Although the expenses of drying and re-drying become lower, there is an increasing awareness for investment in the systems for artificially-cooled grain. Such warm stored grain is easily exposed to intensifying negative physiological processes in grain, and become an ideal medium for development of stored pests, which directly causes higher expenses in stored product protection. The aim of this paper is to present the faunistic review of wheat, corn, barley, soybeans and sunflowers samples from storages in Slavonia and Baranja, to the presence of pests, depending on climate change. We analyzed 234 samples of wheat, 167 samples of corn, 90 barley samples, 90 samples of soybean and sunflower 104 samples. In wheat, the highest population was of *Liposcelis* spp. (37.92%) and from the order Coleoptera, rusty grain beetle – *Cryptolestes ferrugineus* (Steph.) (23.11%). In barley *Liposcelis* spp. dominated (48.21%) and also mites Acarina (39.83%) were present. From the order Colepotera, the most represented species in barley was rice weevil - *Sitophilus oryzae* (L.) (10.48%). In corn the most abounded species was also rusty grain beetle – *Cryptolestes ferrugineus* (Steph.) (25.8%) followed by maize weevil - *Sytophilus zeamays* (Motsch.) (23.22%). In soybean most often were found Indian meal moth - *Plodia interpunctella* (Hübn.) (44.44%) and rice weevil – *Sytophilus oryzae* (L.) (33.33%). The highest population in sunflower had red flour beetle – *Tribolium castaneum* (Hrebst) (29.51%) and saw-toothed grain beetle – *Oryzaephilus surinamensis* (L.) (22.43%). Determined species of storage pests are among the most important economic pests of stored agricultural products, these are the main causes of loss of quality and quantity of stored cereals and oilseeds. Efficiency of food preservation and maintenance of the quality depend on our professional attitude and readiness, as well as on our will to invest in new modes of safer storing.

Key words: stored pests, climate change, cereals, oilseeds

Alelopatski utjecaj oštrodlakavog šćira (*Amaranthus retroflexus* L.) na klijavost sjemena uljne bundeve

Ivan Serezlija[1,2], Renata Baličević[1], Marija Ravlić[1]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (rbalicevic@pfos.hr)*
[2]*Student diplomskoga studija*

Sažetak

Pokus je proveden tijekom 2012. godine kako bi se utvrdio alelopatski utjecaj vodenih ekstrakata običnog šćira (*Amaranthus retroflexus* L.) na klijavost sjemena uljne bundeve (*Cucurbita pepo* var. *oleifera* Pietsch). U laboratoriju u petrijevim zdjelicama ispitani su vodeni ekstrakti pripremljeni od svježe mase korijena, stabljike i listova vrste *A. retroflexus* u koncentracijama od 0, 5, 10, 15 i 20%. U prosjeku, ekstrakti iz svih biljnih dijelova značajno su smanjili klijavost sjemena uljne bundeve. Ekstrakt lista imao je najveći inhibitorni učinak i smanjio klijavost za 85,3%, a ekstrakti stabljike i korijena za 23,3% i 27,6%. Porastom koncentracije ekstrakta korijena i lista klijavost se smanjivala, pa su najveći inhibitorni učinak pokazale koncentracije od 15 i 20%. S druge strane, klijavost sjemena u tretmanima s ekstraktom stabljike nije ovisila o porastu koncentracije. Najniža klijavost sjemena uljne bundeve zabilježena je pri koncentraciji od 15%, a najviša pri 20%.

Ključne riječi: alelopatija, *Amaranthus retroflexus*, vodeni ekstrakti, uljna bundeva

Allelopathic effect of redroot pigweed (*Amaranthus retroflexus* L.) on germination of oil pumpkin seeds

Ivan Serezlija[1,2], Renata Baličević[1], Marija Ravlić[1]

[1]*Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (rbalicevic@pfos.hr)*
[2]*Student, Graduate study*

Summary

The experiment was conducted during 2012 to determine the allelopatic effect of water extracts from redroot pigweed (*Amaranthus retroflexus* L.) on germination of oil pumpkin (*Cucurbita pepo* var. *oleifera* Pietsch) seeds. Water extracts from fresh roots, stems and leaves of *A. retroflexus* at 0, 5, 10, 15 and 20% concentrations were examined under laboratory conditions using Petri dishes. On average, extracts from all plant parts significantly decreased seed germination of oil pumpkin. Leaf extract had the highest inhibitory effect and reduced germination for 85.3%, while stem and leaf extracts reduced germination for 23.3% and 27.6%. The increasing concentration of root and leaf extract decreased seed germination, and highest inhibitory effect was recorded with 15 and 20% concentrations. On the other hand, seed germination in treatments with stem extract was not concentration dependent. The lowest germination of oil pumpkin seeds was recorded at 15% and the highest at 20% concentration.

Key words: allelopathy, *Amaranthus retroflexus*, water extracts, oil pumpkin

Bioremediation of wastewater and irrigation water by *Lactacoccus spp. and Enterococcus spp.*

Sinem Taşçı, Gonca Altın, Metin Turan, Fikrettin Şahin

Department of Genetics and Bioengineering, Yeditepe University, Kayışdağı, Istanbul,Turkey (gonca2006@yahoo.com)

Summary

The use of wastewater or low quality water for irrigation is increasingly being considered as technical solution to minimize environment degradation and sustainability. Due to extensive industrialization, increasing population density and a highly urbanized society the world is facing problems related to management of wastewater. Nowadays, there are a lot of wastewater treatment technologies, but bioremediation is an invaluable tool box for wider application in the realm of environmental protection. Bioremediation approach is currently applied to contain contaminants in soil, groundwater, surface water, and sediments including air. These technologies have become attractive alternatives to conventional cleanup technologies due to relatively low capital costs and their inherently aesthetic nature. It can be defined as any process that uses microorganisms or their enzymes to return the environment altered by contaminants to its original condition. The objective of this study was to investigate the efficiency of *Lactococcus spp.* and *Enterococcus spp*. Species on municipal wastewater and low quality irrigation water remediation. The studies were performed with raw samples of municipal wastewater taken from raw wastewater discharge location in Istanbul and diluted samples (1:5, 1:25, 1:50, and 1:100) were used in tis study and simulate different quality irrigation water (0, 3, 6, 9, 12 Sodium Adsorption Ratio (SAR) and 0, 4, 8, 12 dS/m electrical conductivity (EC)) using Na, Ca and Mg salt was also used. The results of this study show that both *Lactococcus spp.* and *Enterococcus spp*. species can effectively be used in the removal of heavy metal and Na from the municipal waste water and low quality of irrigation water.

Key words: bioremediation, wastewater, microorganisms

Biodiversity protection within farming under Czech and European law

Jana Tkáčiková

Law Faculty of Masaryk University, Veveří 70, 611 80, Brno, Czech Republic (jana.tkacikova@email.cz)

Summary

The paper firstly introduces the system of current legal instruments in the CAP reflecting the biodiversity protection requirement within farming, together with a link to their further development with regard to the reform of the CAP after 2013. Furthermore, the attention is focused on selected instruments and their functioning in the practice in the Czech Republic. Specifically, it is discussed the application of the Habitats and Birds Directives, principal instrument of EU nature and biodiversity policy and the legal basis for Natura 2000 network.Protection of biodiversity and farming are the two vessels. There have been adopted the range of legal instruments within the EU Common Agricultural Policy (CAP) that are aimed at sustainable agriculture and to support biodiversity conservation. These instruments take the form of both the classical administrative ones with coercive character, typically an obligation to act (or not to act) under the threat of administrative sanctions and economical legal instruments with incentive character such as financial payments connected with the existence of certain restrictions due to environmental protection or implementation activities beyond statutory obligations in favour of environment protection.Rules for farming in Natura 2000 network in the Czech Republic include both types of instruments and they are unexpendable tool for biodiversity protection but due to shortages their application have to be support with other appropriate means.

Key words: CAP, Biodiversity, farming

Važnost šumara Adolfa Danhelovskog za ekološku prihvatljivost gospodarenja šumama u Slavoniji

Alka Turalija, Vlatko Galić

Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (aturalija@pfos.hr)

Sažetak

Malo je pisanih dokumenata koji precizno opisuju slavonske krajobraze u 19. st., te su malobrojni autori koji su bilježili mijene u prostoru i gospodarstvu od velike važnosti za uvid u tadašnje stanje i u ekološku prihvatljivost uzgoja šumskih biljnih vrsta, planiranje njihove sukcesivne eksploatacije, te obnovu šumskog fonda.Jedno od najvećih imanja hrvatskog plemstva u 19. st. koje se primarno bavilo uzgojem šuma bilo je imanje valpovačkog vlastelina Gustava von Prandaua, koje je detaljno opisao nadšumar imanja Adolf Danhelovsky u svom djelu Die Dömanen Valpo und Dolnji-Miholjac in Slavonien. Ovaj je rad jednim dijelom posvećen i tom vrlo značajnom šumaru. Znanstveni pristup Adolfa Danhelovskog gospodarenju šumama i organizaciji poslovanja vlastelinstva, ono je što je omogućilo narednim generacijama detaljan uvid u način gospodarenja šumama u 19. st., te što je samu šumu dugi niz godina održavalo zdravom biocenozom. Danhelovsky je osim što je bio vrstan šumar, bio izvrsno upućen u znanja iz klimatologije, fizike te ekonomije, što njegove radove čini još vrjednijima, te ih u stručnom kontekstu čini i danas razumljivim.

Ključne riječi: Danhelovsky, šuma, ekologija, Slavonija

Importance of a forester Adolf Danhelovsky in ecological forest management in Slavonia

Alka Turalija, Vlatko Galić

Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (aturalija@pfos.hr)

Summary

There are only few written documents that accurately describe Slavonian landscape in the 19th century, and only a few authors who have noted the changes in the landscape and economy. Those documents are of great importance for clear insight into the state of the environmen and acceptability of growing forest plant species, planning their successive exploitation, and restoration of forests in 19th century.One of the largest estates of the Croatian nobility in the 19th century, which was primarily engaged in growing forests was held by Valpovo Baron Gustav von Prandau. Baron's forestry superintendent Adolf Danhelovsky wrote in his book *Die Dömanen Valpo und Dolnji-Miholjac in Slavonien* a detail insight of the estate. This work is partially dedicated to this very important forester. Adolf Danhelovsky's scientific approach to forest management and organization of the estate is what has allowed future generations a detailed view of forest management in the 19 century, as well as the wooded area for many years maintained a healthy biocoenosis. Except that Danhelovsky was a very skilled woodsman, he was also well versed in the knowledge of climatology, physics, and economics, which makes his work even more valuable, and so in the professional context, even nowadays understandable.

Key words: Danhelovsky, forest, ecology, Slavonia

Nitrates Directive - Czech experience with its implementation and application

Petr Vaculík

Central Institute for Supervising and Testing in Agriculture, Hroznová 2, Brno, 656 06, Czech Republic (petr.vaculik@ukzuz.cz)

Summary

The focus of the paper is on more than ten year history of Council Directive 676/1991 (known as a Nitrates Directive). The directive addresses the protection of waters against pollution caused by nitrates from agricultural sources. It is one of the main tools of sustainable agriculture within the Czech environment with taking into account the experience of neighbouring countries. The main part of this paper devotes to environmental problems which have occurred during its implementation, including the economic aspects. Despite the initial improvement of the environment which occurred after the implementation this Directive to Czech legal systems the situation is nowadays getting worse. The main reason seems to be the initiative of gaining higher yields by increasing fertilizer application, which in comparison to other European countries has been significantly higher. This has resulted, in comparison to the previous years, to degradation of soil quality, quality of water sources as well as biodiversity.In addition to environmental aspects, nitrate directive contains also an economic aspect i.e. financial charge of a farmer as well as a state. This contribution will also deal with this correlation which seems to be problem not only in Czech Republic.

Key words: Nitrate Directive, water pollution, fertilisers

Utjecaj gnojidbe i kalcizacije na prinos ozime pšenice

Vladimir Zebec, Zdenko Lončarić, Zoran Semialjac, Domagoj Rastija

Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (vzebec@pfos.hr)

Sažetak

Cilj rada je utvrditi rezidualni utjecaj kalcizacije deset godina nakon primjene i mineralne gnojidbe na kemijska svojstva tla te prinos zrna i agronomska svojstva ozime pšenice. Poljski pokus je postavljen na lesiviranom pseudoglejnom tlu, jako kisele reakcije (pH_{KCl} 4,28) i niske razine pristupačnosti fosfora i kalija, po slučajnim bloknim rasporedom u tri ponavljanja na lokalitetu Zelčin (45°36'45.48"N, 18°22'4.74" E) u istočnoj Hrvatskoj. Tretmani u pokusu su: 1. kontrola, 2. kalcizacija (10 t ha^{-1}karbokalka), 3. mineralna gnojidba (160 kg N ha^{-1}, 150 kg P_2O_5 ha^{-1}, 200 kg K_2O ha^{-1}) 4. kalcizacija i mineralna gnojidba, 5. kalcizacija i pojačana mineralna gnojidba (240 kg N ha^{-1}, 300 kg P_2O_5 ha^{-1}, 300 kg K_2O ha^{-1}). Prinos zrna određen je s površine od 2 m^2, a svojstva pšenice na prosječnom uzorku od 20 biljaka po parcelici. Najviši pH tla je utvrđen na tretmanu kalcizacije, ali tlo pripada kategoriji kiselih tala što ukazuje na smanjenje utjecaja kalcizacije i potrebu ponovne primjene vapnenih materijala. Najniži prinosi utvrđeni su na kontroli i tretmanu kalcizacije (1,65 i 1,73 t ha^{-1}), dok se na tretmanima koji su uključivali mineralnu gnojidbu prinos kretao u rasponu od 6,34 do 7,51 t ha^{-1}. Statistički značajno viši prinosi (u prosjeku za više od 4 t ha^{-1}) na svim gnojidbenim tretmanima posljedica su primjene mineralnih gnojiva u odnosu na kontrolu i tretman kalcizacije na kojima nije aplicirano mineralno gnojivo 10 godina. Vrijednosti duljine stabljike, duljine klasa, broja klasića u klasu i naročito broja zrna po klasu, također su bile veće na gnojidbenim tretmanima.

Ključne riječi: kalcizacija, mineralna gnojidba, pšenica, prinos

Effect of fertilization and liming on winter wheat yield

Vladimir Zebec, Zdenko Lončarić, Zoran Semialjac, Domagoj Rastija

Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (vzebec@pfos.hr)

Summary

The aim of this paper was to evaluate the residual impact of liming ten years after application as well as impact of mineral fertilization on soil chemical properties and winter wheat grain yield and agronomic traits. Field trial was set up on a dystric luvisol with with very low pH (4.28) and low nutrients availability, in a randomized block design in three replicates in Zelčin (45°36'45.48"N, 18°22'4.74" E) in the eastern Croatia. The treatmants were: 1. control, 2. liming (10 t ha^{-1}carbocalc), 3. mineral fertilization (160 kg N ha^{-1}, 150 kg P_2O_5 ha^{-1}, 200 kg K_2O ha^{-1}), 4. liming and mineral fertilization, 5. liming and double mineral fertilization (240 kg N ha^{-1}, 300 kg P_2O_5 ha^{-1}, 300 kg K_2O ha^{-1}). Area of 2 m^2 was harvested for grain yield determination, and average sample of 20 plants per plot was taken for agronomic properties evaluation. The highest pH was on the liming treatment, but this soil stil was acid, indicating a reduction of liming impact and the need for re-application of lime materials. The lowest wheat yield was on the control and liming treatments (1.65 and 1.73 t ha^{-1}, respectively), while in the treatments involving mineral fertilization yields ranged from 6.34 to 7.51 t ha^{-1}. Statistically higher yields (in average for 4 t ha^{-1}) on all fertilizer treatments are consequence of mineral fertilization application versus control and liming where were no fertilization in the last ten years. Length of stem and ear, spikelets number per ear and especially number of grain per ear, also were higher on fertilization treatments

Key words: liming, mineral fertilization, wheat, yield

Book of Abstracts

Agricultural Economics and Rural Sociology

02

Agroekonomika i ruralna sociologija

Zbornik sažetaka

Analiza mišljenja studenata o etici u akademskom društvu

Romana Caput-Jogunica, Sanja Ćurković

Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska

Sažetak

Visokoobrazovne ustanove trebale bi slijediti etička načela osobito u dijelu u kojem je svim osobama zajamčen razvoj u skladu s njihovim sposobnostima i slobodama ne ograničavajući slobodu drugih: „Čovjek za sebe treba naći mjesto pod suncem, ali ne treba druge gurnuti u sjenu“ (V. von Gogh). Da bismo utvrdili ulogu akademske zajednice u postizanju etičkih standarda, analizirana su mišljenja studenata Agronomskog fakulteta o primjeni i ulozi etike u akademskoj zajednici. U pilot istraživanju je sudjelovalo 30 studenata prve i druge godine studija. Studenti ističu kako svaka igra ima svoja pravila, a da je pravila igre potrebno donijeti uvijek prije početka igre jer mijenjanjem pravila za vrijeme igre potiče se nesigurnost, napetost, stres, nemir što je osobito bilo zastupljeno prvih godina uvođenja Bolonjskog procesa. Analiza mišljenja studenata u prvi plan ističe obitelj kao mjesto gdje pojedinac usvaja moralne vrijednosti koje se uče u ranom djetinjstvu (empatija, savjest, altruizam i moralno odlučivanje), potom obrazovanje i društvo u kojem živi. Studenti ističu problem degradacije morala u širem društvu, što se odražava i na individualni odnos prema radu.Što akademska zajednica može učiniti? Zaključujemo da je unapređenje moralnog ponašanja nezaobilazno i nužno u akademskom društvu kojemu prijeti da postane surovo društvo u kojem se samo trči za uspjehom.

Ključne riječi: etika, mišljenje studenata, uloga akademske zajednice

Analysis of students' opinion about ethics in academic society

Romana Caput-Jogunica, Sanja Ćurković

Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia

Summary

The scientific education institutions should protect and promote rights and freedoms, ensure the fair and equal treatment of every member of the academic community and encourage ethical behaviour of all the members of the community. „All members of the academic society must find their own place below the sun, without pushing the others under the shadow" (the Gogh quotation). The question is what can be done specifically by the universities in order to help students to achieve ethical behaviour? The aim of this paper is to present the opinions of the university students from the Faculty of Agriculture University of Zagreb about representation of moral norms in academic society. The study sample included 30 students between 18-20 years old, who were on the first or second year of study. Every game has the rules which are well-known before the beginning of the game. When the Bologna Treaty applied in the University, these rules changed a lot during the following academic years and that has caused insecurity, tension, stress, etc. to a great number of students.According to the student' opinions family is the basis for all kinds of development: moral, financial contribution, trust and hope for the future, afterwards education and society. Students have emphasized degradation of moral value in the society which is reflected on individual ratio towards labour. With regard to students' opinions and actual situation we can conclude that improvement of moral behaviour is inevitable and necessary in the academic society which threatens to become a rough society where everybody runs after success.

Key words: ethics, students' opinion, role of academic society

Model izračuna ekonomske isplativosti aplikacije stajskog gnojiva

Ružica Lončarić[1], Drago Rebić[2], Zdenko Lončarić[1]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (rloncaric@pfos.hr)*
[2]*Novi agrar d.o.o., Đakovština 3, Osijek, Hrvatska*

Sažetak

Gnojidba stajskim gnojivom uobičajena je agrotehnička mjera u cilju povećanja plodnosti tla. Međutim, ova mjera često uključuje nedovoljno analizirane dodatne troškove poljoprivredne proizvodnje. Cilj izrade kompjutorskog modela je utvrditi isplativost upotrebe krutog stajskog gnojiva s različitih aspekata: vrsta gnojiva, udaljenost parcele od ekonomskog dvorišta, koncentracija dušika i drugih hraniva u gnojivu, tržišna cijena stajskog gnojiva, te troškovi rada mehanizacije (traktor, prikolica, utovarivač, plug).Cijene stajskih gnojiva često se određuju, a gnojidbe provode bez točne informacije o koncentracijama hraniva. Ukoliko porast koncentracije dušika (npr. 0,3-2,0%) prati i porast cijene gnojiva (npr. 50-200 kn t^{-1}), tada cijena aplikacije potrebne količine (ekvivalent 170 kg N ha^{-1}) najskupljeg i najkoncentriranijeg gnojiva opada 2,1 puta. Međutim, i kada bi cijena gnojiva bila ista za goveđi stajski gnoj s koncentracijama 0,3-0,7% N (očekivan raspon koncentracija ovisno o udjelu stelje i načinu čuvanja), troškovi ekvivalentne gnojidbe uz 07,% N bili bi na razini svega 47% troškova uz koncentraciju 0,3%. Nadalje, očekivano, porast troškova aplikacije povećan je udaljavanjem mjesta aplikacije od ekonomskog dvorišta, a koncentracija hraniva i ovdje je vrlo značajan činitelj. Tako je krivulja porasta troškova povećavanjem udaljenosti s 0,5 do 10 km puno strmija uz 0,5% N u gnojivu (koeficijent nagiba oko 11), nego uz 1,5% N (koeficijent nagiba oko 3, ovisno o korištenoj mehanizaciji). Troškovi mehanizacije smanjuju se proporcionalno volumenu prikolice, te su uporabom prikolice od 5,5 t umjesto prikolice od 3 t smanjuju 42% pri aplikaciji na udaljenosti 1 km, 51% na 3 km, a 61% na 7 km. Značaj optimalnog plana organske gnojidbe ilustrira primjer gospodarstva s dva stajska gnojiva različitih koncentracija N (0,3% i 0,7%) koje trebao odvesti i aplicirati na površine približno jednake plodnosti udaljene 1 i 6 km od ekonomskog dvorišta. Optimalan plan podrazumjeva gnojivo s 0,7% N aplicirati na udaljeniju parcelu jer bi u suprotnom slučaju troškovi mehanizacije bili 24% veći. Doprinos modela sustavu potpore odlučivanja menadžmentu stajskog gnojiva sastoji se u preciznom izračunu isplativosti upotrebe stajskog gnojiva što može utjecati na smanjenje troškova proizvodnje.

Ključne riječi: model, stajsko gnojivo, isplativost, troškovi, varijable

Calculation model: economic effectiveness of stock manure application

Ružica Lončarić[1], Drago Rebić[2], Zdenko Lončarić[1]

[1]*Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (rloncaric@pfos.hr)*
[2]*Novi agrar d.o.o., Đakovština 3, Osijek, Croatia*

Summary

Fertilizing with stock manure is a common agro-technical measure in order to increase soil fertility. However, this measure often includes inadequately analyzed additional costs of agricultural production. The aim of developing a computer model was to determine the cost-effectiveness of using solid stock manure from various aspects: the type of fertilizer, plot distance, the concentration of nitrogen and other nutrients in the manure, the market price of manure, and machinery costs (tractor, trailer, loader and plow).The manure prices often are determined and fertilization is performed without accurate information on concentrations of nutrients. If the increase in nitrogen concentration (eg, 0.3 to 2.0%), is followed by an increasing of fertilizer prices (eg 50-200 HRK t^{-1}), then the price of required amount (equivalent to 170 kg N ha^{-1}) of the most expensive and the most concentrated fertilizer decreased 2.1 times. However, if the price of fertilizer was the same for manure with concentrations from 0.3 to 0.7% N (expected range of concentrations depending on the proportion of litter and storage methods), the cost of equivalent fertilization of 0,7% N would be at all 47% of the costs by concentration of 0.3%. Furthermore, expectedly, the increase of application costs is higher by distancing from economic yard and, again, the nutrients concentration is a very significant factor. Thus, the curve of increasing costs by distancing from 0.5 to 10 km is much steeper with the 0.5% N in manure (slope coefficient about 11), but with 1.5% N slope coefficient is about 3, depending on used machines. The machinery cost are decreasing proportionally to the trailer volume, and by using a trailer of 5.5 t instead of 3 t, the costs are decreased by 42% (application at the distance of 1 km), 51% at 3 km, and 61% at 7 km. The importance of optimal organic fertilization plan illustrates an example of farm with two manures of different concentrations of N (0.3% and 0.7%), which should be delivered and applied to the plots approximately equal fertility, distanced 1 and 6 km from the yard. Optimal plan implies application of 0.7% N to the more distanced plots because in the opposite case the costs of machinery were 24% higher. The contribution of the model to the decision support system in stock manure management is to precisely calculate profitability of manure use, which can affect the reduction of production costs.

Key words: model, stock manure, effectiveness, costs, variables

Uloga i utjecaj Međunarodnog saveza zadruga u razvoju zadrugarstva

Aleksandar Nedanov[1], Stipe Volarević[2], Tihana Ljubaj[1]

[1]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska (anedanov@agr.hr)*
[2] *Student diplomskoga studija Agrobiznis i ruralni razvitak, Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska*

Sažetak

Međunarodni savez zadruga (ICA) jedna je od najvećih organizacija koja danas „vodi brigu“ o približno jednoj milijardi ljudi rasprostranjenih diljem svijeta. Kao nezavisna i ne vladina organizacija snažno utječe na promicanje ekonomske konkurentnosti i održivosti zadružnog identiteta više od jednog stoljeća. Osnovana s ciljem povećanja globalnog utjecaja, promoviranja zadruga i zadružnog pokreta kao specifičnog poslovnog modela s jasno definiranim načelima koja i danas vrijede.Putem deskriptivne analize i analize sadržaja sekundarnih izvora utvrditi će se ciljevi i mjere ICA-e, prikazati i obrazložiti budući planovi (projekti), te predvidjeti mjere daljnjem razvoju. Rezultati ukazuju kako zadružno strateško povezivanje u podizanju stupnja konkurentnosti i uzajamne integracije osigurava uvjete za rast i napredak, brine o suvremenim trendovima razvoja i uspostavlja komunikaciju između članova/ica diljem svijeta. Najinteresantniji podaci dolaze iz najrazvijenijih zemalja svijeta. U Japanu zadružni sektor okuplja 91% poljoprivrednika i ostvaruje promet od $90 milijardi. U SAD-u danas približno 30.000 zadruga otvara preko 2 milijuna radnih mjesta. Prikazom svjetskih zadružnih trendova, njihovih mogućnosti, prepreka i mjera budućih djelovanja daje se jasna slika kako zadruge nisu imune na financijske poteškoće, ali njihova fleksibilnost na tržišne promjene i unutarnje povjerenje prikazuju ih ekonomski trajnim oblikom poslovanja, koji omogućuje prosperitet i napredak već 150 godina.

Ključne riječi: Međunarodni savez zadruga (ICA), zadružni pokret, globalni razvoj

The role and influence of the International Cooperative Alliance in cooperatives development

Aleksandar Nedanov[1], Stipe Volarević[2], Tihana Ljubaj[1]

[1]*Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia (anedanov@agr.hr)*
[2]*Gradauate studies, MS Agribusiness and Rural Development, Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia*

Summary

The International Cooperative Alliance (ICA) one of the largest organizations that "take care" about approximately one billion people widespread around the word. As an autonomous and non-governmental organization has a strong impact in promotion of competitiveness and sustainability of cooperative identity for more than one century. The ICA was founded, with the purpose of increasing its global influence, promotion of cooperatives and cooperative movement as a specific business model with clearly defined principles which are still valid.The aim of this paper is through descriptive analysis and content analysis of secondary sources to establish objectives and measures, as well as to review and explain future plans (projects) and to predict measures to further development of cooperatives. The analysis results indicate how cooperative strategic alliance in raising the level of competitiveness and mutual integration can provide the conditions for growth and progress; take care about modern development trends; and provide communication between members around the world. The most interesting information comes from the most developed countries. In Japan, cooperative sector gather 91% of all farmers and gain the turnover of $90 billion. Today, in the U.S.A. approximately 30,000 cooperatives create over 2 million jobs.The paper show cooperative world trends, their opportunities, barriers and measures in further action and give us a clear image how cooperative are not immune to financial difficulties, but internal confidence and their flexibility to the market changes made them as a permanent business model which allows the prosperity and progress already for 150 years.

Key words: International Cooperative Alliance (ICA), cooperative movement, global development

Multifunkcionalni razvoj: aktivnosti ruralnih politika 2014.-2020.

Ilija Nedić[1], Krunoslav Zmaić[2], Marko Arežina[2]

[1] *Tvornica šećera Osijek d.d., Frankopanska 99., Osijek, Hrvatska*
[2] *Poljoprivredni fakultet u Osijeku, Kralja Petra Svačića 1 d., Osijek, Hrvatska (kzmaic@pfos.hr)*

Sažetak

Ekološka kriza kao osnovno obilježje suvremene civilizacije, dovodi u pitanje zadovoljavanje mnogobrojnih ljudskih potreba, daljnji razvoj, pa čak i opstanak. Ruralna politika i multifunkcionalni razvoj predstavljaju osnovu za rješavanje nekih od najvećih izazova s kojima se suočava čovječanstvo u ovom stoljeću. Duboke promjene načina na koji se u Europi zemljišni resursi koriste i upravljaju proizlaze iz bioraznolikosti, ublažavanja i prilagodbe klimatskim promjenama, te održavanje čistih vodnih resursa čine samo neka od izazova u očuvanju okoliša. Europski poljoprivredni fond za ruralni razvoj od 2014. do 2020. godine nije podijeljen u tri područja, kao i tijekom prethodnog 2007.-2013. proračunskog razdoblja, nego je sa šest prioriteta vezan za strategiju EU 2020. Pet prvih prioriteta odnose se na brigu o poljoprivredi, a to uključuje prijenos znanja i inovacija, poboljšanje konkurentnosti, promicanje upravljanja hranidbenim lancem, poboljšanje ekosustava vezanih za poljoprivredu i šumarstvo, odnosno na veću učinkovitost resursa u poljoprivredi i prelazak na nisku razinu ugljika. Ruralni razvoj u smislu korištenja fonda za promicanje društvene uključenosti, smanjenje siromaštva i gospodarski razvoj u ruralnim područjima je podijeljen u tri osi: diverzifikacija i stvaranje malih poduzeća i radnih mjesta, promicanje lokalnog razvoja u ruralnim područjima i poboljšanje pristupa novim informacijskim i komunikacijskim tehnologijama. U radu se, između ostalog, ukazuje kako opće prihvaćeni model multifunkcionalnog razvoja ima za cilj ne samo zaštitu okoliša, već i poboljšanje kvalitete života jer se zalaže za zadovoljavanje potreba sadašnjih i budućih generacija. Stoga, cilj ovog rada je utvrditi prioritete i aktivnosti ruralne politike za učinkovitiji razvoj lokalnih zajednica.

Ključne riječi: ruralne politike, multifunkcionalni razvoj, prioriteti, konkurentost

Multifunctional development: activities of rural development policies

Ilija Nedić[1], Krunoslav Zmaić[2], Marko Arežina[2]

[1] *Sugar factory Osijek d.d., Frankopanska 99., Osijek, Croatia*
[2] *Faculty of Agriculture, Kralja Petra Svačića 1d, Osijek, Croatia (*kzmaic@pfos.hr*)*

Summary

Environment crises as the base characteristic of modern civilization, consider satisfaction of many people needs, further development, and even survival. Rural policy and multifunctional development presents base solution for some great challenges confront to humanity in this century. Deep changes in managing land resources in Europe are derived from biodiversity, moderate and adjustment of climate change and maintaining water resources are just some of challenges in environment preservation. European Agricultural Fund for Rural Development from 2014 to 2020 was not divided into three areas, as well as in previous budget period from 2007 to 2013, but now it is divided on six priorities connected to EU 2020 strategy. The first five priorities are reflected on agriculture, includes transfer knowledge and innovation, competitiveness improvement, managing food change, improve ecosystem related to agriculture and forestry, and finally the greater efficiency of agricultural resources applying low level of carbon. Rural development fund is used for social inclusion promotion, poverty reduction and economic development in rural areas and it is divided in three axes: diversification and creation of small businesses and jobs, local development encouragement in rural areas and improve access to new information and communication technologies. This paper among other things shows how generally accepted model of multifunctional development has, for aim not only to protect the environment but also to improve the quality of life because it is dedicated to satisfaction needs of present and future generations. Therefore, the aim of this paper is to define priorities and activities of rural policies for effective development of local communities.

Key words: rural policy, multifunctional development, priorities, competitiveness

Studenti u kreiranju ekološke koalicije osječkog sveučilišta

Snježana Tolić[1], Dora Šahini[2], Sandra Zelić[2], Ana Zelić[2]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (stolic@pfos.hr)*
[2]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska, studentica agroekonomskog smjera*

Sažetak

U vremenu globalizacije sve se češće javlja potreba za definiranjem trajnih društvenih vrijednosti koje osiguravaju zdrav i dugoročno održiv društveni razvoj. U njih spadaju i prehrambene navike, a time i sustavi proizvodnje, distribucije i potrošnje hrane. Ekološki osviješten potrošač u potrazi je za „sigurnim" proizvođačem u svojem lokalnom okruženju, a sve u želji da koristeći pravo na vlastiti izbor, umanji moguće štetne utjecaje na svoje zdravlje i okoliš. Upravo ovakvi sustavi su nedovoljno razvijeni u Hrvatskoj. Iskustva razvijenih pokazuju da se u ekološki osviještenim društvima intenzivno razvijaju različiti oblici reciklažnog gospodarenja koji otvaraju nova radna mjesta u poljoprivredi i drugim gospodarskim sektorima. Svijesni ovakve situacije, studenti Poljoprivrednog fakulteta u Osijeku osnovali su studentsku udrugu „Eko klub studenata Poljoprivrednog fakulteta u Osijeku". Ova mlada udruga pokrenula je niz aktivnosti za podizanje ekološke svijesti među studentima i razvila ideju osnivanja sveučilišne eko koalicije s jedinstvenom misijom podizanja ekološke svijesti na osječkom Sveučilištu i šire.Za potrebe ovog rada anketnim istraživanjem ispitana je razina ekološke svijesti među studetima i znanstvenicima osječkog sveučilišta. Temeljem rezultata istraživanja artikulirane su smjernice i preporuke studentima i znanstvenicima za osnivanje i uspješan rad sveučilišne eko koalicije, kao i vidljivije načine njihove javne promocije.

Ključne riječi: ekološka svijest, suradnja, studenti, znanstvenici, sveučilište

Students in creation of eco alliance of Osijek University

Snježana Tolić[1], Dora Šahini[2], Sandra Zelić[2], Ana Zelić[2]

[1]Faculty of agriculture in Osijek, University of J.J. Strossmayera in Osijeku, Kralja Petra Svačića 1d, Osijek, Croatia (stolic@pfos.hr)
[2] Faculty of agriculture in Osijek, University of J.J. Strossmayera in Osijeku, Kralja Petra Svačića 1d, Osijek, Croatia, student of Agroeconomics course

Summary

In the time of globalization, there is a need for the definition of lasting social values which ensure a well and long term sustainable social development. These include dietary habits, and thus also food production, distribution and consumption systems. Ecologically conscious consumer is looking for "safe" producers in their local communities, and all in order to use the right on personal choice, to minimize potential destructive effects for their health and environment. Precisely, such systems are not sufficiently developed in Croatia. Experiences of developed countries show that ecological aware societies intensively develop various forms of recycle management which creates new jobs in agriculture and in other sectors of the economy.Aware of this situation, students of the Faculty of Agriculture in Osijek founded students' association "Eco club of students of Faculty of agriculture". This young association has launched a series of activities to raise ecological awareness among students and developed the idea of establishing university eco coalition with a unique mission to raise environmental awareness on Osijek University.For this research, level of ecological awareness among students and scientists of Osijek University is investigated. Based on the results of research, guidelines and recommendations to students and scientists are articulated for more successful operation of the university eco coalition and more transparent ways to general public promotion.

Key words: ecological awareness, alliance, students, scientists, university

Book of Abstracts

Genetics, Plant Breeding and Seed Production

03

Genetika, oplemenjivanje bilja i sjemenarstvo

Zbornik sažetaka

Komparativna analiza SSR polimorfizma germplazme ozimoga i jarog ječma

Ivan Abičić[1], Alojzije Lalić[1], Silvio Šimon[2], Ivan Pejić[2], Gordana Šimić[1]

[1]*Poljoprivredni institut Osijek,Južno predgrađe 17, Osijek, Hrvatska (ivan.abicic@poljinos.hr)*
[2]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska*

Sažetak

U ovom istraživanju su korišteni specifični SSR markeri (Bmac209, GMS21 i Bmac67) na setu od 126 kultivara ječma (78 ozimih i 48 jarih). Spomenuti markeri su potvrđeni u prethodno publiciranim radovima kao molekularni markeri koji upućuju na određene kromosomske regije odgovorne za svojstvo povećanja uroda zrna. Koncept ovoga istraživanja je metodološki kombinirati opću studiju varijabilnosti uz testiranje grupa kultivara preko promatranog svojstva. Fokus je usmjeren na pronalazak poveznica između formiranih grupa (obzirom na genotip) i rezultata poljskih pokusa za svojstvo uroda zrna. Poljski pokus je bio postavljen u periodu od dvije godine (2010. do 2012.) na lokaciji Osijek promatranjem svojstva uroda zrna. Rezultati molekularne analize prikazuju UPGMA dendrograme kod kojih je vidljiva očita razlika ili grupiranje na ozime i jare kultivare, a u sljedećim dendrogramima je uočeno formiranje podgrupa obzirom na promatrano svojstvo nakon uključivanja samo specifičnih (gore navedenih) markera. Ukupno je detektirano šest podgrupa kod ozimih i četiri podgrupe kod jarih kultivara. Visokorodne podgrupe na odabranom podsetu relevantnih kultivara u proizvodnom smislu (9 ozimih i 9 jarih) su: ozimi t. – grupa I i V, jari t. – grupa I. Svi dobiveni dendrogrami potvrdili su odnose među prosjecima uroda zrna odabranoga podseta kultivara što potvrđuje dobru sposobnost odabranih markera pri detekciji visokorodnih genotipova što ubuduće može poslužiti za provjeru potomstva u predselekciji.

Ključne riječi: molekularni markeri, UPGMA, urod, grupiranje

Comparative SSR polymorphism analysis of winter and spring barley germplasm

Ivan Abičić[1], Alojzije Lalić[1], Silvio Šimon[2], Ivan Pejić[2], Gordana Šimić[1]

[1]*Agricultural Institute Osijek, Juzno predgrađe 17, Osijek, Croatia (ivan.abicic@poljinos.hr)*
[2]*Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia*

Summary

In this research we used specific SSR markers (Bmac209, GMS21 and Bmac67) on a set of 126 barley cultivars (78 winter type and 48 spring type). Markers mentioned here have been previously confirmed through a number of publications as markers which point to certain chromosomal regions responsible for trait of high grain yield. Overall approach was to methodologically combine general variability survey with group testing of cultivars to a specific trait. Expectations were focused on finding an analogy between formed groups (genotype wise) and field results considering the same trait (grain yield). Two years (2010-2012) of field trials on the location of Osijek were set up in order to observe grain yield variations among cultivars. Results of molecular analysis showed UPGMA dendrograms with clear distinction considering general variability (winter vs. spring varieties) and also within the major group (sub-grouping with reference to observed trait). A total of six sub-groups were detected among winter and four among spring types. High yielding groups among the chosen subset of relevant barley varieties in 9 winter and 9 spring types are: winter t. – group I and V, spring t. – group I. All of the calculated dendrograms are congruent to grain yield means of a chosen subset which confirms the overall marker ability to detect high yielding genotypes which can be used as a pre-breeding method in progeny check-up.

Key words: molecular markers, UPGMA, yield, grouping

Genetic relationships among wild and cultivated blackberries (*Rubus caucasicus* L.) based on amplified fragment length polymorphism markers

Guleray Agar

Department of Biology, Faculty of Science, Ataturk University 25240 Erzurum, Turkey (agar252001@yahoo.com)

Summary

Rubus is accepted as one of the most diverse genera in plant kingdom comprises over 400 species and subdivided into 12 subgenera. However, only a few subgenera of *Rubus* such as raspberries, blackberries, arctic fruits and flowering raspberries have been domesticated and utilized in breeding programs. Turkey is one of the natural habitat centers of the *Rubus* genus and nearly all *Rubus* plants are widely distributed globally as wild in Turkey. The blackberries, as well as various other *Rubus* species with mounding or rambling growth habits, are often called brambles. Little information is available on the genetic diversity of wild-grown blackberries. The objective of this study was to determine the genetic relationships among nine promising (high-yield capacity, free of pest and diseases, better fruit traits) wild blackberry (*Rubus caucasicus* L.) selections and the well-known cultivar, "Chester" by using amplified fragment length polymorphism (AFLP) markers. Genotypes were evaluated with three selective primer-enzyme combinations, producing a total of 223 AFLP fragments with 53% polymorphism ratio. Clustering of genotypes using unweighted pair-group method of arithmetic average (UPGMA) cluster analysis clearly separated groups of wild blackberry genotypes while the variety "Chester" was clustered independently. Wild selections represented a distinct germplasm source on the basis of the estimated genetic distance among them. Genetic diversity data from this study will be helpful in using and exploiting the wild genetic material for breeding purposes as well as for further research.

Key words: *Rubus*, genetic diversity, wild material, AFLP, genetic relationships.

Utjecaj egzogene primjene askorbinske kiseline na rani rast crvene djeteline izložene vodnom stresu

Dejan Agić[1], Sonja Grljušić[2], Gordana Bukvić[1], Drago Bešlo[1], Željka Greger[1], Natalija Steiner[1]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (dagic@pfos.hr)*
[2]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska*

Sažetak

Askorbinska kiselina (ASC) je molekula uključena u mnoge stanične procese. Kao antioksidant koji neutralizira slobodne kisikove radikale ASC je važan čimbenik biljke u borbi protiv abiotičkog stresa. Cilj rada bio je istražiti utjecaj egzogene primjene ASC na rani rast različitih genotipova crvene djeteline izložene vodnom stresu induciranim polietilen glikolom 6000 (PEG 6000) te procijeniti može li egzogena primjena ASC pozitivno utjecati na svladavanje negativnog učinka vodnog stresa. Sjeme devet genotipova crvene djeteline (eksperimentalne populacije: TPEXP1, TPEXP2, TPEXP3 i TPEXP4; domaći kultivari: Croatia i Nada te uvozni kultivari: Viola, Rajah i Diana) podvrgnuto je sljedećim tretmanima: 1. nabubreno u destiliranoj vodi i naklijavano na podlozi navlaženoj destiliranom vodom; 2. nabubreno u destiliranoj vodi, te naklijavano na podlozi s 15% PEG 6000; 3. nabubreno u 0,56 mM ASC, te naklijavano na podlozi s 15% PEG 6000; 4. naklijavano na podlozi s 15% PEG 6000 i 0,56 mM ASC; 5. naklijavano na podlozi s 15% PEG 6000 prvih 48 sati, a potom na podlozi s 15% PEG 6000 i 0,56 mM ASC. Nakon 96 sati naklijavanja utvrđen je postotak klijavosti i izmjerena je dužina korjenčića. Utjecaj genotipa bio je značajan ($p=0,01$) za postotak klijavosti i dužinu korjenčića. Utjecaj tretmana te interakcija genotipa i tretmana bili su značajni ($p=0,01$) za dužinu korjenčića. Pozitivan utjecaj egzogene primjene ASC na svladavanje negativnog učinka vodnog stresa bio je u prosjeku najviši za tretman 5.

Ključne riječi: vodni stres, askorbinska kiselina, crvena djetelina, genotip, rani rast

Effect of exogenously applied ascorbic acid on early growth of red clover under water stress

Dejan Agić[1], Sonja Grljušić[2], Gordana Bukvić[1], Drago Bešlo[1], Željka Greger[1], Natalija Steiner[1]

[1]*Faculty of Agriculture, University of J.J. Strossmayer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (dagic@pfos.hr)*
[2]*Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia*

Summary

Ascorbic acid (ASC) is a molecule involved in many cell processes. As an antioxidant that neutralizes free oxygen radicals, ASC is an important factor in plant defence against abiotic stresses. The aim of the study was to investigate the effects of exogenously applied ASC on early growth of different red clover genotypes under water stress induced by polyethylene glycol 6000 (PEG 6000), and to evaluate can the exogenously applied ASC alleviate the negative effects of water stress. Seeds of nine red clover genotypes (experimental populations: TPEXP1, TPEXP2, TPEXP3 and TPEXP4; domestic cultivars: Croatia and Nada, and foreign cultivars: Viola, Rajah and Diana) were under following treatments: 1. imbibed in distilled water and germinated on media moisturised by distilled water; 2. imbibed in distilled water and germinated on media with 15% PEG 6000; 3. imbibed in 0.56 mM ASC, and germinated on media with 15% PEG 6000; 4. germinated on media with 15% PEG 6000 and 0.56 mM ASC; 5. germinated on media with 15% PEG 6000 for the first 48 hours and then on media with 15% PEG 6000 and 0.56 mM ASC. Percentage of germination was estimated and radicle length was measured after 96 hours of germination. Effect of genotype was significant ($p=0.01$) for the germination percentage and radicle length. The effects of treatments and genotype x treatment interaction were significant ($p=0.01$) for the radicle length. Alleviation of the negative water stress effects through exogenously applied ASC was highest for the treatment 5.

Key words: water stress, ascorbic acid, red clover, genotype, early growth

Kontrola kvalitete tretiranja sjemena kukuruza insekticidima Heubach testom

Ivica Beraković[1], Sanja Špoljarić-Marković[2], Ksenija Duka[2], Marijana Böhm[2], Luka Andrić[1]

[1]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (ivica.berakovic@poljinos.hr)*
[2]*HCPHS-Zavod za sjemenarstvo i rasadničarstvo, Usorska 19, Brijest-Osijek, Hrvatska*

Sažetak

Štetnici kukuruza posljednjih godina uzrokuju velike štete na usjevima kukuruza. Stoga sjeme kukuruza treba biti tretirano odgovarajućim insekticidima. Da bi se postigli zadovoljavajući rezultati u suzbijanju štetnika sjeme mora biti kvalitetno tretirano. Na kvalitetu tretiranja sjemena utječu i faktori kao što su: kvaliteta dorađenog sjemenskog materijala, karakteristike preparata za tretiranje, receptura za tretiranje, oprema za tretiranje sjemena i ljudski faktor. Dobrim tretiranjem sjemena u isto vrijeme vodimo brigu i o okolišu i koncentraciji otpalih čestica insekticida. Kvaliteta tretiranja sjemena analizirana je Heubach testom u laboratoriju Zavoda za sjemenarstvo i rasadničarstvo. Heubach testom se mjeri količina otpalih čestica što je parametar za određivanje kvalitete tretiranja sjemena.Tijekom 2012. godine izvršena su ispitivanja na 30 partija sjemena hibrida kukuruza Poljoprivrednog instituta Osijek. Sjeme kukuruza bilo je tretirano insekticidima u dva tretmana, imidakloprid i klotianidin, prema recepturi proizvođača. Prosječna vrijednost otpalih čestica iznosila je 0,32 g/100.000 zrna. Kod imidakloprida prosječna vrijednost otpalih čestica iznosila je 0,23 g/100.000 zrna, dok je kod klotianidina prosječna vrijednost otpalih čestica iznosila 0,4 g/100.000 zrna. Najveća količina otpalih čestica insekticida iznosila je 0,89 g/100.000 zrna, dok je najmanja vrijednost otpalih čestica iznosila 0,07 g/100.000 zrna. Poštivajući preporuke proizvođača insekticida te primjenom pravilne metodologije ostvareni rezultati tretiranja sjemena u 2012. godini bili su iznimne kvalitete. Dobiveni rezultati pokazuju da je količina otpalih čestica mnogo manja od gornje dopuštene granice koja iznosi 1g/100.000 zrna sjemena. Na temelju ostvarenih rezultata s Heubach testom možemo utvrditi da pravilna primjena i adekvatna metodologija u tretiranju sjemena insekticidom smanjuje količinu otpalih čestica, a time i mogućnost onečišćenja okoliša i nepoželjnog utjecaja na okoliš.

Ključne riječi: Heubach test, tretiranje sjemena, kukuruz, insekticid

Quality control of corn seed insecticide treatment with Heubach test

Ivica Beraković[1], Sanja Špoljarić-Marković[2], Ksenija Duka[2], Marijana Böhm[2], Luka Andrić[1]

[1]*Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia (ivica.berakovic@poljinos.hr)*
[2]*HCPHS-Institute for Seed and Seadlings, Usorska 19, Brijest-Osijek, Croatia*

Summary

In recent years corn pests caused great damage to the maize crops. Therefore, the corn seed should be treated with appropriate insecticides. To achieve the best results in pests control the seed must be properly treated. Many factors influence the quality of treated seed such as: quality of seed material, the characteristics of the preparation, formulation of insecticide, equipment for seed treatment and human factor. With appropriate seed treatment at the same time we take care of the environment and concentration of fallen particles of insecticides. Quality of seed treatment was investigated using Heubach test in the laboratory of Institute for Seed and Seedlings. During the 2012, 30 hybrid corn seed parties of Agricultural Institute Osijek were analysed. Corn seeds were treated with insecticides in two treatments, imidacloprid and clothianid, as prescribed by the manufacturers.The average value of the fallen particles was 0.32 g/ 100.000 grain. The average value of imidacloprid fallen particles was 0.23 g/ 100.000 grains, while the average value of clothianidin fallen particles was 0.4 g/ 100.000 grain. The greatest amount of fallen particles of insecticide was 0.9 g/100.000 grains, while the lowest value was 0.07 g/100.000 grain. Following the recommendations of insecticide manufacturers and using appropriate methodology resulted in seed treatment of exceptional quality in 2012. The obtained results showed that the amount of fallen particles was much smaller than the upper permitted limit of 1g/100.000 grain seed. On the base of the achieved results with the Heubach test we can state that the proper application and adequate methodology in the insecticide seed treatment reduces the amount of fallen particles and thus the possibility of environmental pollution and undesirable environmental impacts.

Key words: Heubach test, seed treatment, corn, insecticide

Genotipska varijabilnost koncentracije deset elemenata u korijenu kukuruza

Andrija Brkić[1], Ivan Brkić[1], Marija Ivezić[2], Emilija Raspudić[2], Domagoj Šimić[1]

[1]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (andrija.brkic@poljinos.hr)*
[2]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska*

Sažetak

U sklopu programa oplemenjivanja kukuruza na prirodnu otpornost protiv kukuruzne zlatice, iskopani korijeni biljaka nakon ocjenjivanja su korišteni za kemijsku analizu koncentracije 10 elemenata (bor - B, kadmij - Cd, bakar - Cu, željezo - Fe, kalij - K, magnezij - Mg, mangan - Mn, fosfor - P, stroncij - Sr i cink - Zn) pomoću induktivno spregnute plazme – optičke emisijske spektroskopije (ICP-OES). Cilj je bio procijeniti genotipsku varijabilnost koncentracije elemenata u korijenu 127 genotipova kukuruza, kao i odnose koncentracije elemenata i svojstava prirodne otpornosti na kukuruznu zlaticu. Analiza varijance je pokazala visokosignifikantnu varijabilnost genotipova za koncentraciju svih 10 elemenata. Najmanju ponovljivost je imao mangan (37,4 %), a najveću fosfor (70,5 %). Najveći korelacijski koeficijent procijenjen je između oštećenja korijena nastalog zbog kukuruzne zlatice i bora (-0,41), te između porasta sekundarnog korijena i željeza (-0,46), mangana (-0,44) i cinka (-0,41). Veličina korijena je bila znatno slabije povezana s koncentracijama elemenata u korijenu. Općenito, povezanost između svojstava prirodne otpornosti protiv kukuruzne zlatice i koncentracija elemenata u korijenu je bila slaba. Stoga ionomska analiza korijena se ne čini svrsishodnom za preliminarnu procjenu otpornosti genotipova kukuruza protiv kukuruzne zlatice.

Ključne riječi: kukuruzna zlatica, prirodna otpornost, varijabilnost, korelacija, elementi

Genotypic variability for concentrations of ten elements in maize roots

Andrija Brkić[1], Ivan Brkić[1], Marija Ivezić[2], Emilija Raspudić[2], Domagoj Šimić[1]

[1]*Agricultural institute Osijek, Južno predgrađe 17, Osijek, Croatia (andrija.brkic@poljinos.hr)*
[2]*Faculty of Agriculture, University of J.J. Strossmayer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia*

Summary

As a part of a western corn rootworm (WCR) resistance breeding program, chemical analysis was performed on evaluated plants. Concentrations of 10 elements (boron - B, cadmium - Cd, copper - Cu, iron - Fe, potassium - K, magnesium - Mg, manganese - Mn, phosphorus - P, strontium - Sr and zinc - Zn) are assessed using inductively coupled plasma – optical emission spectroscopy (ICP-OES). Research goal was to assess genotypic variability for concentrations of ten elements in roots of 127 maize genotypes, as well as correlations between concentration of elements and WCR native resistance traits. ANOVA showed highly significant variability of genotypes for concentration of all ten elements. Manganese showed lowest repeatability (37.4 %), and phosphorus showed highest repeatability (70.5 %). Highest correlation coefficient was between root injury and boron (-0.41), and between root regrowth and iron (-0.46), manganese (-0.44) and zinc (-0.41). Correlation between root size and root element concentrations was low, as well as correlation between WCR native resistance traits and root element concentrations in general. Therefore ionomic analysis of roots does not seem like a good rationale for preliminary assessment of maize genotypes for WCR resistance.

Key words: western corn rootworm, native resistance, variability, correlation, elements

Adaptabilnost novije domaće germplazme kukuruza na stres uvjetovan sušom

Josip Brkić, Antun Jambrović, Domagoj Šimić, Zvonimir Zdunić, Tatjana Ledenčan, Andrija Brkić, Maja Kovačević, Mirna Volenik, Ivan Brkić

Poljoprivredni institut Osijek, Južno predgrađe 17, 31000 Osijek, Hrvatska (josip.brkic@poljinos.hr)

Sažetak

Adaptabilnost predstavlja sposobnost kultivara (hibrida) da ostvari stabilan i visok prinos u različitim uvjetima okoline. Hibridi kukuruza razlikuju se po svojoj adaptabilnosti (prilagođenosti) uvjetima okoline, pa se može govoriti o generalnoj ili širokoj adaptabilnosti i uskoj adaptabilnosti. Hibridi široke adaptabilnosti daju stabilne prinose u velikom arealu različitih uvjeta okoline, ali na nižoj razini, dok hibridi uske adaptabilnosti daju visoke prinose u povoljnim uvjetima, a niske prinose u nepovoljnim uvjetima okoline. Stres uvjetovan sušom može uvelike dovesti do smanjenja prinosa hibrida kukuruza, ovisno u kojem razvojnom stadiju je došlo do stresa te od intenziteta i trajanja suše. U 2012. godini postavljeno je pet mikropokusa s ciljem testiranja novijih OS hibrida kukuruza na važna gospodarska svojstva (prinos). Testirani su hibridi FAO grupa 400 do 600 na četiri lokaliteta (Osijek, Feričanci, Rugvica, Šašinovec). Pokusi su postavljeni u četiri ponavljanja po 32 člana, uključujući standarde PR37M34, PR35P12 i PR34N43. Pokus na lokalitetu Feričanci je propao uslijed nepovoljnih uvjeta okoline. Rezultati pokazuju da su hibridi FAO grupa 400 i 500 na svim lokalitetima postigli u prosjeku veće prinose u odnosu na FAO grupu 600. Na lokalitetu Osijek, po svim FAO grupama, ostvareni su značajno manji prinosi hibrida u odnosu na druge lokalitete. Može se zaključiti da je uslijed stresa uvjetovanog sušom i vrlo visokih temperatura zraka u vrijeme polinacije prinos kukuruza u prosjeku manji za 2,5 do 3 t/ha na lokalitetu Osijek, što ukazuje na daljnju potrebu stvaranja hibrida tolerantnih na sušu.

Ključne riječi: adaptabilnost, kukuruz, hibridi, prinos, suša

Adaptability of new domestic maize germplasm to drought stress

Josip Brkić, Antun Jambrović, Domagoj Šimić, Zvonimir Zdunić, Tatjana Ledenčan, Andrija Brkić, Maja Kovačević, Mirna Volenik, Ivan Brkić

Agricultural Institute Osijek, Južno predgrađe 17, 31000 Osijek, Croatia (josip.brkic@poljinos.hr)

Summary

Adaptability of a cultivar (hybrid) represents its capability for stable and high yield in various environments. Maize hybrids vary from hybrids with general (wide) adaptability to hybrids with narrow adaptability. Hybrids with wide adaptability gain stable but lower scale yields in great areal of various environmental conditions, while hybrids with narrow adaptability gain high yields in favourable conditions and low yields in unfavourable conditions. Drought stress can significantly reduce maize hybrid yield, and its influence depends on developmental stage of the plant, as well as on drought intensity and duration. In 2012 five microtrials were set in order to test new OS maize hybrids for important traits (yield). New hybrids, FAO 400 to FAO 600, were tested on 4 locations (Osijek, Feričanci, Rugvica, Šašinovec), with four replicates and 32 treatments each, including standards PR37M34, PR35P12 and PR34N43. Trial in Feričanci failed due to poor environmental conditions. According to results, hybrids from FAO 400 and 500 showed higher yield than hybrids from FAO 600 at all locations. Significantly lower yields of all hybrids at all locations were acquired in Osijek. General conclusion – due to drought stress and very high temperatures during pollination time, hybrid yield at Osijek location is 2.5 to 3 t/ha lower, which implies the need for breeding drought tolerant maize.

Key words: adaptability, maize, hybrids, yield, drought

Stabilnost agronomskih svojstava hrvatskih kultivara duhana tipa virdžinija

Ankica Budimir[1], Hrvoje Šarčević[2], Snježana Bolarić[2], Jerko Gunjača[2], Miroslav Bukan[2], Mirko Boić[1], Vinko Kozumplik[2]

[1]*Hrvatski Duhani d.d. Virovitica, Osječka 2, 33000 Virovitica, Hrvatska (ana.budimir@hrvatskiduhani.hr)*
[2]*Sveučilište u Zagrebu, Agronomski fakultet, Svetošimunska 25, 10000 Zagreb, Hrvatska*

Sažetak

Cilj istraživanja bio je usporediti stabilnost uroda, cijene i vrijednosti te nekih morfoloških svojstava hrvatskih kultivara duhana tipa virdžinija, koji su priznati i prošireni u proizvodnji u periodu od 1973 do 2007. godine. U pokusima postavljenim po shemi slučajnog bloknog rasporeda proučavano je devet domaćih kultivara (H10, H31, DH10, VaDK, DH17, DH27, DH33, DH27 i DH36) virdžinijskog duhana usporedo sa američkim kultivarom NC55 na lokacijama Kutjevo, Virovitica i Ivanovci u periodu od 2005.-2007. godine. Stabilnost istraživanih svojstava analizirana je izračunom varijance stabilnosti prema Shukli. Najstabilniji u prinosu, uz američki kultivar NC55, pokazali su se noviji domaći kultivari DH12 i DH36, dok je najmanja stabilnost prinosa procijenjena kod najstarijeg domaćeg kultivara H10. Najstabilniji u cijeni su bili noviji kultivari DH12 i DH33, te stariji kultivari DH10 i H31, dok su veliku stabilnost u svojstvu ukupne vrijednosti uz američki kultivar NC55 pokazali noviji domaći kultivar DH12 i stariji kultivar DH10. Za broj dana do cvatnje, broj listova po biljci te duljinu, širinu i površinu 9. lista najveću stabilnost pokazali su kultivari novijeg doba: DH27, DH17, DH36, DH12 i DH33, dok su za svojstva visine biljke i omjera širine i duljine 9. lista najveću stabilnost pokazali stariji kultivari H10 i VaDK.

Ključne riječi: duhan, agronomska i morfološka svojstva, stabilnost

Stability of agronomic traits of Croatian flue-cured tobacco cultivars

Ankica Budimir[1], Hrvoje Šarčević[2], Snježana Bolarić[2], Jerko Gunjača[2], Miroslav Bukan[2,] Mirko Boić[1], Vinko Kozumplik[2]

[1]*Croatian tobaccos d.d. Virovitica, Osječka 2, 33 000 Virovitica, Croatia (ana.budimir@hrvatskiduhani.hr)*
[2]*Universityof Zagreb, Faculty of Agriculture, Svetošimunska 25,10000 Zagreb, Croatia*

Summary

The objective of this study was to compare the stability of yield, price, value and some other morphological traits of Croatian flue-cured tobacco cultivars released and expanded in production from 1973 to 2007. In an experiment, set up as randomized complete block design, nine Croatian (H10, H31, DH10, VaDK, DH17, DH27, DH33, DH27 and DH36) and one U.S. (NC55) flue-cured tobacco cultivar were studied at three locations, Kutjevo, Virovitica and Ivanovci, for three years, 2005-2007.The stability of the studied traits was analysed using the Shukla's stability variance. The highest yield stability was observed for domestic cultivars DH12 and DH36, and for the U.S. cultivar NC55. The oldest Croatian cultivar H10, released in 1973, had the lowest yield stability. The highest stability of price was observed for the newer cultivars DH12 and DH33, and for the older cultivars DH10 and H31. The high stability of value was, besides for NC55, observed for domestic cultivars DH12 and DH10. For the number of days to flowering, number of leaves per plant and 9th leaf width, length, and area the highest stability was observed for recently released Croatian cultivars DH27, DH17, DH36, DH12, and DH33, while the older cultivars H10 and VaDK exhibited the highest stability of plant height and the ratio of the 9th leaf length and width.

Key words: tobacco, agronomic and morphological traits, stability

ASI i prinos zrna inbred linija kukuruza u stresnim okolinama

Ivica Buhiniček[1], Mirko Jukić[1], Jerko Gunjača[2], Hrvoje Šarčević[2], Miroslav Bukan[2], Branko Palaveršić[1], Zdravko Kozić[1], Antun Vragolović[1], Ivan Pejić[2]

[1]Bc Institut za oplemenjivanje i proizvodnju bilja d.d. Zagreb, Rugvica, Dugoselska 7, 10370 Dugo Selo, Hrvatska (ibuhinicek@bc-institut.hr)
[2]Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, 10 000 Zagreb, Hrvatska

Sažetak

Proizvodnja kukuruza sve više je izložena različitim stresnim uvjetima. Interval prašenje-svilanje (ASI) važan je pokazatelj osjetljivosti genotipova (hibrida i inbred linija) na stres uzrokovan sušom i nedostatkom N-a. Ispitali smo 20 inbred linija kukuruza umjerenog pojasa u stresnim i nestresnim okolinama s ciljem procjene: 1) intervala prašenje – svilanje (ASI) i 2) prinosa zrna. Inbred linije su ocijenjene u okolinama s umjerenom sušom, s niskim sadržajem dušika (N) i okolini bez ciljanog stresa (normalnoj) u 2007. godini. Suša i stres uslijed niskog sadržaja dušika opravdano su povećali ASI. Prosječni ASI inbred linija kukuruza kretao se od 5,93 dana u uvjetima stresa izazvanog umjerenom sušom do 2,89 dana u normalnoj okolini. Suša i stres uslijed niskoga sadržaja dušika također su opravdano smanjili prinos zrna inbred linija kukuruza. Prosječni prinos zrna inbred linija kretao se od 1,43 t ha^{-1} u uvjetima stresa izazvanog umjerenom sušom do 4 t ha^{-1} u normalnoj okolini. Korelacije između ASI i prinosa zrna inbred linija kukuruza nije bilo u sušnoj okolini (r = 0,06), a u ostale dvije okoline je bila negativna (-0,51 u normalnoj okolini i -0,59 u okolini s niskim sadržajem dušika).

Ključne riječi: inbred linije kukuruza, ASI, prinos zrna, suša i dušik

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ASI and grain yield of maize inbred lines in stress environments

Ivica Buhiniček[1], Mirko Jukić[1], Jerko Gunjača[2], Hrvoje Šarčević[2], Miroslav Bukan[2], Branko Palaveršić[1], Zdravko Kozić[1], Antun Vragolović[1], Ivan Pejić[2]

[1]*The Zagreb Bc Institute for Breeding and Production of Field Crops, Rugvica, Dugoselska 7, 10370 Dugo Selo, Croatia (ibuhinicek@bc-institut.hr)*
[2]*University of Zagreb, Faculty of Agriculture, Svetošimunska 25, 10 000 Zagreb, Croatia*

Summary

Maize production is increasingly exposed to different stress conditions. The anthesis-silking interval (ASI) is an important indicator of genotypes (hybrids and inbred lines) susceptibility to stress caused by drought and low N conditions. We evaluated 20 temperate maize inbred lines under stress and non-stress conditions to estimate: 1) anthesis-silking interval (ASI), and 2) grain yield (GY). The inbred lines were evaluated in intermediate drought stress, low nitrogen (N) stress, and nonstress (normal) environments in 2007. Drought and low N stress significantly increased ASI. Mean ASI for inbred lines ranged from 5.93 days under intermediate drought stress to 2.89 days in normal environment. Drought and low N stress also significantly decreased inbreds grain yield. Mean grain yield for inbreds ranged from 1.43 t ha^{-1} under intermediate drought stress to 4 t ha^{-1} in normal environment. There was no correlation between GY and ASI of inbred lines in dry environment (r = 0.06). In other two environments correlation was negative (-0.51 in normal and -0.59 in low nitrogen environment).

Key words: maize inbred lines, ASI, grain yield, drought and nitrogen

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Promjena genetske strukture M3S populacije kukuruza nakon četiri ciklusa rekurentne selekcije

Miroslav Bukan[1], Hrvoje Šarčević[1], Ana Sabljo[2], Ramsey S. Lewis[3], Vinko Kozumplik[1]

[1]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska (mbukan@agr.hr)*
[2]*Agronomski i prehranbeno tehnološki fakultet Sveučilišta u Mostaru, Biskupa Čule b.b., Mostar, Bosna i Hercegovina*
[3]*Department of Crop Science, North Carolina State University, Raleigh, USA*

Sažetak

Maksimir 3 Sintetik (M3S) populacija kukuruza prošla je četiri ciklusa rekurentne selekcije. Glavna svojstva pod selekcijom bila su povećanje prinosa i otpornost na bolesti, nakon prva tri, te poboljšanje učinkovitosti korištenja dušika u četvrtom ciklusu selekcije. Razlike u genetskoj strukturi sedam M3S ciklus populacija (C0, C1, C2, C3S1, C3FS, C4N0 i C4N150) proučavane su pomoću 38 SSR markera. Nakon četvrtog ciklusa selekcije nije zapažena signifikantna promjena niti ukupnog niti prosječnoga broja SSR alela po lokusu. Uočeno je povećanje broja alela sa malom (<0.10) i sa velikom (>0.90) frekvencijom. Također nije uočeno signifikantno smanjenje očekivane heterozigotnosti (H_e). Devet SSR lokusa u C0 i C1, pet u C2, 11 u C3S1, tri u C3FS, devet u C4N0 i pet u C4N150 populaciji odstupalo je od Hardy-Weinbergove ravnoteže. Većinu istih lokusa karakterizira višak homozigota koji je vjerojatno posljedica asortativnog razmnožavanja. Tri para alela bila su u signifikantnoj neravnoteži gametne faze C0, 16 u C1, četiri u C2, jedan u C3S1, sedam u C3FS, pet u C4N0 i šest u C4N150 populaciji. Većina SSR lokusa u neravnoteži gametne faze je prema Waplesovom testu bilo selekcijski neneutralno. Analiza molekularne varijance pokazala je 94,5% genetske varijabilnosti unutar i 5,5% između ciklus populacija. M3S populacija čini se pogodnim genetskim materijalom za nastavak programa rekurentne selekcije.

Ključne riječi: kukuruz, rekurentna selekcija, SSR markeri

Change of genetic structure of the M3S maize population after four cycles of recurrent selection

Miroslav Bukan[1], Hrvoje Šarčević[1], Ana Sabljo[2], Ramsey S. Lewis[3], Vinko Kozumplik[1]

[1]*Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia (mbukan@agr.hr)*
[2]*Faculty of Agriculture and Food Technology, University of Mostar, Biskupa Cule b.b., Mostar, Bosnia and Herzegovina*
[3]*Department of Crop Science, North Carolina State University, Raleigh, USA*

Summary

Maksimir 3 Synthetic (M3S) maize population was subjected to four cycles of recurrent selection. Main traits under selection were improvement of grain yield and disease resistance, after the first three, and improvement of nitrogen use efficiency in the fourth selection cycle. The genetic structure of the seven (C0, C1, C2, C3S1, C3FS, C4N0 and C4N150) M3S cycle populations was compared using 38 SSR markers. Seven cycle populations did not differ neither in the total number of alleles, nor in the mean allele number per locus. Increase in number of alleles with small (<0.10) and with high (>0.90) frequencies was observed. Decrease of observed heterozygosity (H_e) was not observed. Eleven SSR loci in the C3S1, nine in C0, C1, and C4N0, five in C2 and C4N150 and, three in the C3FS population were in significant Hardy-Weinberg disequilibrium. Majority of those loci exhibited an excess of homozygotes, what seems to be a result of assortative mating. Three pairs of alleles were in significant linkage disequilibrium (LD) in C0, 16 in C1, four in C2, one in C3S1, seven in C3FS, five in C4N0 and six in C4N150 population. The majority of SSR loci in significant LD were also selectively nonneutral according to a Waple's test of selective neutrality. Analysis of molecular variance revealed 94.5% of genetic variability within and 5.5% among the cycle populations. M3S population seems to be a favourable genetic material for further improvement via recurrent selection

Key words: maize, recurrent selection, SSR markers

Analiza izoflavona u jednogodišnjim mahunarkama

Tihomir Čupić, Rezica Sudar, Marijana Tucak, Svetislav Popović, Luka Andrić

Poljoprivredni insitut Osijeku, Južno predgrađe 17, 31000 Osijek, Hrvatska (tihomir.cupic@poljinos.hr)

Sažetak

Jednogodišnje mahunarke (*Fabaceae*) su jedan od značajnijih izvora izoflavona, od kojih su najzastupljeniji: daidzein, glicitein, genistein i formononetin. Istraživani biokemijski spojevi su korisni zbog preventivnog utjecaja i ublažavanja kardiovaskularnih bolesti, tumora, osteoporoze i regulacije hormona prvenstveno kod tegoba u menopauzi. Cilj rad je utvrditi udio i zastupljenost pojedinih izoflavona u zrnu različitih vrsta jednogodišnjih mahunarki prikupljenih na području Republike Hrvatske. Analizirano je sedam vrsta jednogodišnjih mahunarki (*Cicer arietinum, Lathyrus sativus, Lens culinatus, Lupinus albus, Phaseolus vulgaris, Vicia faba i Vignia* spp.). Uzorci zrna jednogodišnjih mahunarki su samljeveni i ekstrahirani etanolom, a hidroliza glukozida je provedena kloridnom kiselinom. Izoflavoni su identificirani HPLC sustavom prema vremenu zadržavanja u usporedbi sa standardima i kvantificirani postupkom internog standarda (*β*-naftol) pomoću površine pika. Udio ukupnih izoflavona varirao je od 11,47 do 141,01 mg/100g ST, a u prosjeku najzastupljeniji su u vrsti *Ph. vulgaris* s 85,9 mg/100g ST, dok su najveća variranja utvrđena unutar vrste *L. sativus.* U zrnu je dominirao izoflavon daidzein s prosječnim udjelom 40,74 mg/100g ST, dok su zrna ispitivanih primki imala najmanji udio gliciteina (u prosjeku 2,65 mg/100g ST). Primka graha Gradištanac imala je najveće udjele izoflavona gliciteina i formonetina (5,73 i 17,88 mg/100g ST), dok je lokalna populacija *V. faba* iz Pakova sela imala najveći udio genisteina /67,96 mg/100g ST), a *L. sativus* S1 najveći udio daidzeina (123,61 mg/100g ST). Utvrđena su variranja u udjelima izoflavona između primki unutar vrsta. Prisutnost formonetina i daizeina utvrđeno je u svim uzorcima zrna ispitivanih primki, dok glicitein i genistein nisu bili detektirani u uzorcima pojedinih primki.

Ključne riječi: izoflavoni, jednogodišnje mahunarke, zrna

Analysis of isoflavones in annual legumes

Tihomir Čupić, Rezica Sudar, Marijana Tucak, Svetislav Popović, Luka Andrić

Agricultural Institute Osijek, Južno predgrađe 17, 31000 Osijek, Croatia (tihomir.cupic@poljinos.hr)

Summary

The annual legumes (*Fabaceae*) are one of the most significant sources of isoflavones of wich daidzein, glycitein, genistein and formononetin are the most common. The investigated biochemical compounds are useful for prevention and mitigation of the effects of cardiovascular diseases, cancer, osteoporosis, but primarily for hormone regulation in menopause. The goal of this paper was to determine the content and structure of individual isoflavones in different annual legume species collected in the Republic of Croatia. Seven annual legume species (*Cicer arietinum, Lathyrus sativus, Lens culinatus, Lupinus albus, Phaseolus vulgaris, Vicia faba and Vignia* spp.) were analysed. The samples of annual legume grains were ground and extracted with ethanol. The glycoside hydrolysis was performed with hydrochloric acid. Isoflavones were identified with the HPLC system, according to retention time which was compared with standards and quantified by the internal standard method (*β*-naphthyl) using peak area. The content of total isoflavones ranged from 11.47 to 141.01 mg/100g DM, and the *Ph. vulgaris* species had the highest content with 85.9 mg/100g DM, while the greatest variation found within a species was in *L. sativus*. The most dominant isoflavone was daidzein with an average content of 40.74 mg/100g DM, while glicitein had the lowest content (on average 2.65 mg/100g DM) in examined grains of accessions. The accession Gradištanac (bean) had the highest content of glicitein and formonetin isoflavones (5.73 and 17.88 mg/100g DM), while the landrace *V. faba* from Pakovo selo had the highest content of genistein 67.96 mg/100g DM and *L. sativus* S1 had the largest content of daidzein (123.61 mg/100g DM). Variations of isoflavone content were determined between accessions within species. The presence of formonetin and daizein was discovered in all examined grain accessions while glicitein and genistein weren't detected in individual accessions.

Key words: Isoflavones, annual legumes, grains

Integracija hrvatskoga sjemenarstva u EU industriju sjemena

Ivan Đurkić

HCPHS, Zavod za sjemenarstvo i rasadničarstvo, Usorsska 19, 31000 Osijek, Hrvatska (ivan.djurkic@hcphs.hr)

Sažetak

Punopravno članstvo RH u EU donijeti će velike promjene u društvenom i gospodarskom životu RH. Promjene će se osjetiti i u hrvatskom sjemenarstvu i rasadničarstvu unatoč činjenici da je hrvatsko zakonodavstvo u ovom segmentu usklađeno sa EU zakonodavstvom, EU direktivama. Znanstvena, stručna i tehnološka razina hrvatskog sjemenarstva je na razini europskog. Povijesni razvoj je tekao gotovo istovremenu u Hrvatskoj kao i u zemljama Europske zajednice. Kapaciteti za proizvodnju, doradu i skladištenje sjemena su dostatni za vlastite potrebe i sadašnju razinu izvoza. Tržište sjemena razvijalo se kontinuirano i može se reći da je pokrivenost proizvodnih područja sa deklariranim sjemenom potpuna. Stoga imamo gotovo stopostotnu uporabu deklariranog sjemena unatoč što je zakonskim propisima omogućena i uporaba nedeklariranog sjemena. Ovoj činjenici je doprinijela i dobra cjenovna politika koju su vodile poslovni subjekti u sektoru sjemenarstva a podržavala nadležna tijela. Ulaskom u Europsku zajednicu zaoštriti će se u većoj mjeri tržišni odnosi; poljoprivredni proizvodi / reprodukcijski materijal. Mogu se očekivati promjene u stavu poljoprivrednih proizvođača prema upotrebi deklariranog sjemena i postupno uvođenje u proizvodnju nedeklarirano sjeme, tzv. „farmerovo sjeme“. Ovome procesu mogu pogodovati i očekivane promjene EU regulative u sektoru sjemenarstva. Da se upotreba nedeklariranog sjemena ne bi loše odrazila na razinu i kakvoću poljoprivrednih proizvoda nužno je potrebno, po uzoru na rješenja koja su uvele neke zemlje članice Europske unije, regulirati i kod nas. Reguliranje kategorije sjemena„ farmerovo sjeme“ nužno je iz razloga zdravstvenog stanja usjeva koji se navedenom kategorijom sjemena zasijavaju i reguliranja autorskih prava pravne osobe koja je vlasnik sorata.Ulaskom Hrvatske u EU hrvatska poljoprivreda trebati će se prilagoditi različitim modelima poljoprivredne proizvodnje. Doći će do slobodnog prometa roba i usluga unutar zemalja članica EU, primjenjivati će se EU propisi i standardi kao i EU sortna lista.Zajednička poljoprivredna politika EU dodatno stimulira integriranu i ekološku proizvodnju i može se očekivati da će to dovesti do promjena i kod hrvatskih poljoprivrednika. Kako oba navedena modela imaju posebne zahtjeve i u pogledu upotrebe sjemena za očekivati je da će to dovesti do određenih promjena i u hrvatskom sjemenarstvu.Hrvatska industrija sjemena trebati će izvršiti prilagodbu načinima prakticiranja upotrebe različitih kategorija sjemena po uzoru kako su to učinile zemlje članice EU. U procesu prilagodbe biti će nužna suradnja svih subjekata koji su nadležni za učinkovitu poljoprivredu tržišno orijentiranu.

Ključne riječi: sjeme, proizvodnja sjemena, farmerovo sjeme, zakonska regulativa, tržište

Integration of the Croatian Seed Sector into the EU Seed Industry

Ivan Đurkić

HCPHS-Institute for Seed and Seadlings, Usorska 19, Brijest-Osijek, Croatia (ivan.djurkic@hcphs.hr)

Summary

Full membership of the EU will bring major changes in the social and economic life of the Croatian Republic. The changes will be felt in the Croatian seed production and plant propagation despite the fact that the Croatian legislation in this area was in line with EU legislation and EU directives.Scientific, technical and technological levels of the Croatian seed sector are at European level. Historical development has progressed almost simultaneously in Croatia and the European Union. Capacities for the production, processing and storage of seed are sufficient for country needs and current level of exports. The seed market developed continuously and it could be said that the coverage of the production areas with declared seed is complete. Therefore, we have almost full use of the declared seed, despite that the legislation enables for the use of undeclared seeds. Good prices and adequate businesses policies in the seed sector and the support of the national authorities contributed to this fact.The entry into the European Community will largely sharpen the market relations between agricultural products and propagation material. Changes are expected in the attitude of farmers towards the use of declared seed and the gradual introduction of undeclared seeds, so-called "Farmer's seed" in the crop production. This process could benefit from the anticipated changes in EU regulations of the seed sector.In order to avoid negative effect of the use of unlabelled seeds on the quantity and quality of agricultural products, it is necessary, based on the solutions that are imposed by some European Union member states, to be applied in our country. The regulation of the "Farmer's seed" category is necessary in order to ensure the health of crops grown from this seed category and to regulate the royalties to the varieties owners.By joining the EU, Croatian agriculture needs to be adapted to different models of agricultural production. There will be free movement of goods and services among the EU member states, EU regulations and standards as well as the EU list of varieties will be applied.The Common Agricultural Policy of the EU further stimulates integrated and organic agricultural production and it could be expected that this would change the Croatian farmers. As both of these models have special requirements in terms of use of seeds, it is expected that this would lead to some changes in the Croatian seed sector.Croatian seed industry will need to adapt the use of different seed categories the way as it is practiced in the EU member states. In the process of adaptation it will be necessary the cooperation of all entities that are responsible for the efficient market-oriented agriculture.

Key words: seed, seed production, farmer's seed, legislation, market

Sorte pšenice Poljoprivrednog instituta Osijek

Georg Drezner, Krešimir Dvojković, Daniela Horvat, Valentina Španić, Dario Novoselović

Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (georg.drezner@poljinos.hr)

Sažetak

Sorte pšenice Poljoprivrednog instituta Osijek (OS-sorte) u proteklih 20 godina sijane su na 50-60% pšeničnih površina u Republici Hrvatskoj. Posljednjih nekoliko godina sve više se siju i u inozemstvu (BiH, Kosovo, Slovenija, Rumunjska, Turska, Makedonija). Djelomičan odgovor na pitanje što je utjecalo na takav udio OS-sorata u strukturi sjetve razmotren je kroz dinamiku priznavanja OS-sorata. Od 1968. godine Poljoprivrednom institutu Osijek priznato je 116 sorti ozime pšenice u Republici Hrvatskoj (i bivšoj SFRJ), te 44 sorte u inozemstvu. Broj priznatih sorti u Republici Hrvatskoj praćen je kroz razdoblja: 1968/70., dvije sorte; 1971/80., tri sorte; 1981/90., 21 sorta; 1991/00., 34 sorte; 2001/10., 51 sorta i 2011. godine četiri sorte. U inozemstvu se broj priznatih sorti kretao: 1981/90., četiri sorte; 1991/00., četiri sorte; 2001/10., 23 sorte i 2011/12., 13 sorti. Sve sorte su nastale pedigree metodom selekcije. Najčešći roditelji u do sada priznatim sortama su Srpanjka, Slavonija, Osk 4.216-2-76, Žitarka i Zg 2877-74. U oplemenjivačkom programu usmjerenom ka stvaranju rodnijih, kvalitetnijih i stabilnijih sorata pšenice održava se visoka razina genetske varijabilnosti visokih prosječnih vrijednosti za svojstva od interesa. Preko 95% OS-sorti je u A ili B farinografskoj kvalitetnoj grupi. Pretežito su krušne sorte, ali ima i poboljšivača, te pogodnih za konditorsku industriju.

Ključne riječi: pšenica, priznate sorte, kombinacije križanja, roditelji

Wheat varieties of the Agricultural Institute Osijek

Georg Drezner, Krešimir Dvojković, Daniela Horvat, Valentina Španić, Dario Novoselović

Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia (georg.drezner@poljinos.hr)

Summary

Wheat varieties of the Agricultural Institute Osijek (OS-varieties) in last 20 years have been sown on 50-60% of wheat areas in Republic of Croatia. In last few years they have been sowing increasingly abroad (BiH, Kosovo, Slovenia, Romania, Turkey, Macedonia). Partial answer on question what influenced this portion of OS-varieties in sowing structure was considered through recognition dynamics of OS-varieties. Since 1968 to the Agricultural Institute Osijek have been recognized 116 winter wheat varieties in Republic of Croatia (and former SFRJ) and 44 varieties abroad. Number of recognized varieties in Republic of Croatia was followed through periods: 1968/70, two varieties; 1971/80, three varieties; 1981/90, 21 varieties; 1991/00, 34 varieties; 2001/10, 51 varieties and in 2011 four varieties. Number of recognized varieties abroad was: 1981/90, four varieties; 1991/00, four varieties; 2001/10, 23 varieties and 2011/12, 13 varieties. All varieties were created by pedigree selection method. The most often parents of recognized varieties up to now are Srpanjka, Slavonija, Osk.4.216-2-76, Žitarka and Zg 2877-74. In breeding program focused to creation of wheat varieties with increased yield, quality and stability, high level of genetic variability of high average values of traits of interest have been maintaining. Over 95% of OS-varieties are in A or B pharinographic quality group. Predominantly they are bread varieties, some of them are improvers and some are suitable for confectionery industry.

Key words: wheat, recognized varieties, crossing combinations, parents

Determination of genetic diversity among wild grown apricots from Sakit valley in Turkey using SRAP markers

Sezai Ercisli

Department of Horticulture, Faculty of Agriculture, Ataturk University 25240 Erzurum, Turkey (sercisli@gmail.com)

Summary

Wild grown apricots (*Prunus armeniaca* L.) are an economically important fruit crop in particular for local peoples living in rural areas in Turkey. This is a multi-purpose fruit tree and besides its fresh edible fruits, is used in diverse ways because they have distinct taste and aroma. Edible fruits of wild apricots has been using from the past till now as dry fruit, process into jam, marmalade, fruit juice etc. in Turkey. Traditional uses and drying of apricot fruits have been found to be of great significance in the socio-economy of local people of these areas. The bitter seeds of wild grown apricots are valuable material for pharmacology to treat cancer. In Turkey, all apricot cultivars are grafted on seedlings obtained from wild apricot seeds. More recently in particular wild grown apricot fruits have been gaining more importance particularly in fruit juice industry in Turkey and there were growing interest to its juices because of its better sugar/acidity balance than cultivated apricots. Sequence-related amplified polymorphism (SRAP) marker was employed first time to analyse genetic diversity of 57 seed propagated early-maturated wild grown apricot genotypes sampled from different parts of Sakit valley in Mediterranean Region of Turkey. Of the total 19 primer combinations investigated, 16 could amplify clearly and consistently. They produced a total of 87 fragments, of which 56 (64.3%) were polymorphic bands. All bands obtained from Me3-Em2, Me2-Em10 and Me2-Em6 primers were polymorphic. The cluster analysis revealed that the 57 genotypes were grouped into three major clusters. The similarity ratio among genotypes was between 0.73 and 0.94. There were no identical genotypes. The study revealed that SRAP marker system was useful in identification and genetic diversity analysis of wild grown apricots.

Key words: SRAP, apricot, biodiversity, molecular classification

Pad vitalnosti biljaka kukuruza tretiranih s rastućim koncentracijama kadmija u tlu

Mario Franić[1], Zdenko Lončarić[2], Hrvoje Lepeduš[1], Vlatka Jurković[1], Krunoslav Karalić[2], Brigita Popović[2], Domagoj Šimić[1]

[1]*Poljoprivredniinstitut Osijek, Južno predgrađe 17, Osijek, Hrvatska (mario.franic@poljinos.hr)*
[2]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska*

Sažetak

Kadmij je vrlo toksičan za biljke, topiv je u vodi i stoga se brzo apsorbira u tkiva. Oštećuje fotosintetski aparat i uzrokuje smanjenje količine klorofila. Istraživanja su pokazala da je fluorescencija klorofila *a* vrlo osjetljiva metoda za utvrđivanje fiziološkog statusa biljaka u nizu situacija. Indeks učinkovitosti (PI_{ABS}), izračunat OJIP-testom, kvantificira glavne fotokemijske procese fotosustava II (PSII) i u biti je pokazatelj vitalnosti biljke. Cilj ovog istraživanja bio je analizirati indekse učinkovitosti šest genotipova kukuruza kako bi se utvrdio utjecaj povećanja koncentracije kadmija u tlu na njihovu vitalnost. Sjeme (32 sjemenke po genotipu i četiri sjemenke po loncu) je posađeno u lonce s rastućim koncentracijama kadmija (dodan kao otopina $CdCl_2$) u tlu: kontrola, 0,5, 1, 5 i oko 10 mg/kg tla. Analizirani su parametri OJIP-testa ABS/RC, TR/RC, ET/RC, DI/RC, PI_{ABS}. Naši rezultati su pokazali vidljiv pad PI_{ABS} sa povećanjem koncentracije kadmija u tlu sa velikim, ali konzistentnim razlikama između šest genotipova. Linija B73 je imala najviše PI_{ABS} vrijednosti u svim tretmanima, dok su hibridi, posebno OS602, imali najniže vrijednosti. Na temelju analize pet OJIP-test parametara čini se da je pad vitalnosti biljaka uzrokovan smanjenjem elektron transporta i povećanjem disipacije u fotosintetskom aparatu.

Ključne riječi: kukuruz, kadmij, stres, fluorescencija klorofila, OJIP-test

Decrease of vitality in maize plants challenged by increasing cadmium concentrations in soil

Mario Franić[1], Zdenko Lončarić[2], Hrvoje Lepeduš[1], Vlatka Jurković[1], Krunoslav Karalić[2], Brigita Popović[2], Domagoj Šimić[1]

[1]*Agricultural institute Osijek, Južno predgrađe 17, Osijek, Croatia (mario.franic@poljinos.hr)*
[2]*Faculty of agriculture, University of J.J. Strossmayer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia*

Summary

Cadmium is highly toxic to plants, water soluble and consequently promptly absorbed by tissues. It damages the photosynthetic apparatus and causes a decrease in chlorophyll content. Studies have shown that chlorophyll *a* fluorescence is a very sensitive method for determining physiological status of plants in a range of situations. Performance index (PI_{ABS}), provided by the OJIP-test, quantifies the main processes in photosystem II (PSII) photochemistry and is essentially the indicator of plant vitality. The aim of this study was to analyse performance indexes of six maize genotypes in order to determine the effects of increasing cadmium concentrations in soil on their vitality. Seeds (32 seeds per genotype and four seeds per pot) were planted in pots with increasing cadmium (applied as $CdCl_2$ solution) concentrations in soil: control, 0.5, 1, 5, and approximately 10 mg/kg of soil. OJIP-test parameters (ABS/RC, TR/RC, ET/RC, DI/RC, PI_{ABS}) were analysed. Our results revealed an apparent decline in PI_{ABS} along with increasing cadmium concentrations in soil, whereas large differences among six genotypes were consistent. B73 line had the highest PI_{ABS} values throughout the treatments while hybrids, especially OS602, had the lowest values. Based on the analysis of five OJIP-test parameters it seems that the decrease in plant vitality is due to decreased electron transport and increased dissipation in the photosynthetic apparatus.

Key words: maize, cadmium, stress, chlorophyll fluorescence, OJIP-test

Procjena genetskih parametara stranooplodnih populacija – primjer crvene djeteline

Sonja Grljušić[1], Gordana Bukvić[2], Dejan Agić[2], Snježana Bolarić[3], Dario Novoselović[1]

[1]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (sonja.grljusic@poljinos.hr)*
[2]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska*
[3]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska*

Sažetak

Procjena parametara koji se koriste za opis genetske strukture raspoloživih populacija važan je preduvjet učinkovite selekcije svakoga oplemenjivačkog programa. Procjene se obavljaju različitim tehnikama i metodama čiji izbor ovisi o tipu genetskog srodstva, koje se analizira te primijenjenom eksperimentalnom dizajnu. U ovom radu dan je kratak pregled direktnih metoda koje koriste koncept kovarijance između srodnika te dijele genetsku varijancu na aditivnu, dominantnu i epistatičnu komponentu, kao i metoda najveće vjerodostojnosti koje koriste princip procjene svih mogućih setova vrijednosti parametara za definiranje modela u kojem su procijenjene vrijednosti parametara maksimalno vjerojatne za podatke opažanja. Prikazani su primjeri procjena genetskih parametara različitih populacija više stranooplodnih vrsta. Poseban osvrt dan je procjeni genetskih parametara oplemenjivačkih populacija crvene djeteline kreiranih na Poljoprivrednom institutu Osijek sa svrhom opisa detalja procjene parametara u praksi.

Ključne riječi: genetski parametri, metode procjene, crvena djetelina

Estimation of genetic parameters in cross fertilized populations – a case of red clover

Sonja Grljusić[1], Gordana Bukvić[2], Dejan Agić[2], Snježana Bolarić[3], Dario Novoselović[1]

[1]*Agricultural Institute Osijek, Juzno predgrađe 17, Osijek, Croatia (sonja.grljusic@poljinos.hr)*
[2]*Faculty of Agriculture, University of J.J. Strossmayer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia*
[3]*Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia*

Summary

Estimation of parameters used to describe genetic structure of available populations is an important prerequisite for efficient selection in any breeding program. Estimates are done by variety of techniques and methods which choice depends on the type of genetic relationships involved and experimental design applied. This paper gives a short review of direct methods based on concept of covariance between relatives and used to partition the genetic variance into the additive, dominant and epistatic components, and a methods of maximum likelihood based on principle of estimation of all possible sets of parameter values for a specified model under which the estimated parameter values have the maximum likelihood of obtaining the observed data. Examples of estimation of genetic parameters in different populations of several cross fertilized species are illustrated. A special attention is given to the estimation of genetic parameters in the breeding populations of red clover created at the Agricultural Institute Osijek in order to illustrate details of the parameter estimations in practice.

Key words: genetic parameters, methods of estimation, red clover

Utjecaj zaraze *Fusarium culmorumom* na kakvoću bjelančevina i pecivna svojstva pšenice (*Triticum aestivum L.)*

Daniela Horvat[1], Georg Drezner[1], Valentina Španić[1], Krešimir Dvojković[1], Rezica Sudar[1], Ante Nevistić[2]

[1]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (daniela.horvat@poljinos.hr)*
[2]*Inspecto d.o.o., Martina Divalta 193, Osijek, Hrvatska*

Sažetak

Fuzarijska palež klasa je s ekonomskog aspekta jedna od najštetnijih gljivičnih bolesti pšenice. Mikotoksini producirani *Fusarium* vrstama predstavljaju zdravstveni rizik za ljude i životinje. U radu je analizirano 14 kultivara pšenice različite pecivne kakvoće i otpornosti na *Fusarium* vrste. Uzorci pšenice su prikupljeni na Poljoprivrednom institutu Osijek tijekom 2008./2009. i 2009./2010. Istraživanje je provedeno s ciljem utvrđivanja jačine utjecaja umjetne zaraze *Fusarium culmorumom* na kakvoću rezervnih bjelančevina i pecivna svojstva pšenice. U radu su analizirani parametri kakvoće zrna, brašna i tijesta. Provedeno je probno pečenje kruha i analizirana je količina deoksinivalenola (DON) u brašnu. RP-HPLC metodom su analizirane rezervne bjelančevine pšenice. Umjetna zaraza *Fusariumom* nije statistički značajno utjecala na količinu ukupnih bjelančevina i vlažnog glutena. *Fusarium* zaraza imala je štetan utjecaj na konzistenciju i otpor tijesta na rastezanje kao i na izgled i oblik kruha. Stupanj utjecaja *Fusariuma* na svojstva kakvoće pšenice je značajno uvjetovan sortom. U umjetno zaraženim uzorcima je količina albumina i globulina, ukupnih glutenina i njihovih HMW and LMW podjedinica značajno smanjena, dok se količine ukupnih, α- i γ- glijadina nije značajno mijenjala.

Ključne riječi: pšenica, *Fusarium culmorum,* rezervne bjelančevine, pecivna svojstva

Effects of *Fusarium culmorum* infection on protein quality and baking properties of wheat (*Triticum aestivum L.)*

Daniela Horvat[1], Georg Drezner[1], Valentina Španić[1], Krešimir Dvojković[1], Rezica Sudar[1], Ante Nevistić[2]

[1]*Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia (daniela.horvat@poljinos.hr)*
[2]*Inspecto d.o.o., Martina Divalta 193, Osijek, Croatia*

Summary

Fusarium head blight (FHB) is economically one of the most serious fungal diseases of wheat. The *Fusarium mycotoxins* represent a potential risk to human and animal health. 14 wheat cultivars differing in breadmaking quality and their resistances to *Fusarium* disease were collected from experimental field of the Agricultural Institute Osijek during two vegetation seasons (2008/2009 and 2009/2010). This study was undertaken to determine the extent to which *Fusarium* infection influences the storage proteins and consequently the baking performance of wheat. Grains, flour and dough rheological properties of wheat, baking tests, RP-HPLC analyses of storage proteins and deoxynivalenol (DON) content determination were performed. The artificial *Fusarium* infection did not statistically significant influence on total protein and wet gluten content. *Fusarium* infection had detrimental effect on dough consistency and resistance to extension as well on bread appearance and shape. The extent of the effects appeared to be cultivar specific. The content of albumins and globulins, total glutenins and its main subunits HMW and LMW in the artificially infected samples was a significant reduced, while content of total and α- and γ- gliadins were not changed under *Fusarium* infection.

Key words: wheat, *Fusarium culmorum,* storage proteins, baking properties

Različit intenzitet otpuštanja vlage u različitim FAO grupama kukuruza u 2012. godini

Antun Jambrović, Domagoj Šimić, Ivan Brkić, Zvonimir Zdunić, Josip Brkić, Andrija Brkić

Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (antun.jambrovic@poljinos.hr)

Sažetak

Kukuruz se u Hrvatskoj sije na 300-350.000 ha. U 2012. godini posijano je svega 290-300.000 ha. Tradicionalno je da se kukuruz sije za podmirenje vlastitoga stočnog fonda, a u većini ratarski orijentiranoj proizvodnji pojavljuju se tržišni viškovi kukuruza. U tom slučaju, ranije otpuštanje vlage u zriobi znači i raniju berbu, manje troškove sušenja i veći prihod sa jedinice površine. Pokus je bio postavljen po slučajnom bloknom rasporedu u Osijeku, u 3 ponavljanja. U pokusu je bilo posijano 18 hibrida Poljoprivrednog instituta Osijek, od FAO grupe 300 do FAO grupe 700. Sjetva pokusa bila je 15. travnja, a prva berba 31. kolovoza 2012., odnosno nakon 130 dana. Sljedeće dvije berbe bile su u vremenskom razmaku od 10 dana, zaključno sa 19.09. 2012. godine. U hibrida FAO 300 vlaga od 14% postignuta je već u prvoj, odnosno drugoj berbi. U FAO 400 je bila slična situacija, a pad vlage u prosjeku je bio od 0,20 do 0,30% po danu, s tim da je glavnina vlage otpuštena između prve i druge berbe, a nakon toga se vlaga ustalila i padala vrlo sporo. U FAO 500, početne vlage bile su znatno više nego u FAO 400, a pad vlage bio je od 0,20 do 0,49% po danu, sa istom tendencijom kao i u FAO 400 – najveći je pad vlage između prve i druge berbe. U FAO 600, početne vlage bile su još više, a pad vlage zrna po danu bio je od 0,28 do 0,53%. Nakon treće berbe vlage zrna u ovoj FAO grupi bile su vrlo blizu skladišnim vlagama od 14%. Više kao zanimljivost, u ovaj pokus stavljen je i vrlo kasni hibrid FAO grupe 780 – Kirmizi, koji je namijenjen tržištu Turske i koji je objektivno prekasan za Hrvatsku. Kod njega je početna vlaga bila vrlo visoka, a i pad vlažnosti zrna po danu bio je najveći u pokusu – 0,76%.

Ključne riječi: FAO grupe, hibridi, kukuruz, otpuštanje vlage, prinos zrna

Different drydown intensity in various maize FAO groups in 2012

Antun Jambrović, Domagoj Šimić, Ivan Brkić, Zvonimir Zdunić, Josip Brkić, Andrija Brkić

Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia (antun.jambrovic@poljinos.hr)

Summary

Maize is grown on about 350,000 ha in Croatia. In 2012, that was less than 300,000 ha. Traditionally, maize is used for feed in domestic production with some surpluses. In this case, a faster drydown means an earlier harvest, less costs of drying and greater revenue. Our experiment was set as randomized complete block design planted in Osijek in three replications including 18 maize hybrids of the Agricultural institute Osijek from FAO 300 to FAO 700. Planting was on April 15, while the first harvest was on August 31, 2012, - 130 days later. Other two consecutive harvests were within 10 days interval ending on September 19. Moisture of 14% in hybrids of FAO 300 was achieved in the first or the second harvest. The same was true for the hybrids of FAO 400 with a drydown of 0.20-0.30% per day in the first two harvests, and drydown was very slow afterwards. In FAO 500 group at the beginning, water contents were considerably higher than those in FAO 400 and drydown was 0.20-0.49% per day having similar trend as in FAO 400: the fastest drydown was between the first two harvests. In FAO 600, initial moistures were higher and drydown was 0.28-0.53% per day. After the third harvest, moisture in the FAO 600 group was close to 14%. Interestingly, the very late hybrid named Kirmizi of FAO group 780 from the Turkish market was also included in the experiment. The initial moisture was very high in this hybrid, and its drydown was the fastest with 0.76% per day.

Key words: FAO groups, hybrids, maize, drydown, grain yield

Utjecaj genotipa i okoline na fotosintetsku učinkovitost soje

Ana Josipović, Marija Viljevac, Aleksandra Sudarić, Antonela Markulj, Ivica Liović, Josip Kovačević

Poljoprivredni institut Osijek, Južno predgrađe 17, 31 103, Osijek, Hrvatska (ana.josipovic@poljinos.hr)

Sažetak

Cilj istraživanja bio je utvrditi razlike u fotosintetskoj učinkovitosti između 15 genotipova soje (G) u uvjetima suše na dvije vrste tla (Osijek i Okučani) različitoga kemijskog i mehaničkog sastava. Pokus je postavljen u vegetacijskim posudama u tri varijante (V) i tri ponavljanja. Kontrolna varijanta (V1 - Osijek) održavana je na 80% poljskog vodnog kapaciteta (PVK) dok su varijante pokusa (V2 - Osijek) i (V3 - Okučani) bile zasušene na 60% PVK prije mjerenja fotosintetske učinkovitosti u fazi punog razvoja mahune (R4). Najveću prosječnu vrijednost indeksa fotosintetske učinkovitosti (PI_{abs}) pokazao je kultivar K14 (4,219) dok je najmanju vrijednost imao K8 (2,429). U varijantama pokusa, V1 je pokazao veće vrijednosti PI_{abs} u odnosu na V2 i V3 koji su bili pod utjecajem stresa uzrokovanog sušom. Analizom varijance dobivene su statistički značajne razlike između genotipova, varijanti, grupa zriobe te interakcije GxV. Usporedbom kultivara po grupama zriobe vrlo rani kultivari (00) su pokazali veću fotosintetsku učinkovitost od ranih (0) i srednje ranih (I) kultivara soje. Dobiveni rezultati ukazuju na mogućnost korištenja indeksa fotosintetske učinkovitosti kao mjerila u izdvajanju genotipova soje otpornijih na sušu.

Ključne riječi: fotosintetska učinkovitost, genotip, soja, suša

Effect of genotype and environment on the photosynthetic efficiency of soybean

Ana Josipović, Marija Viljevac, Aleksandra Sudarić, Antonela Markulj, Ivica Liović, Josip Kovačević

Agricultural Institute Osijek, Južno predgrađe 17, 31 000, Osijek, Croatia (ana.josipovic@poljinos.hr)

Summary

The aim of this study was to determine the differences in photosynthetic efficiency between 15 soybean genotypes (G) in drought conditions in two soil types (Osijek and Okučani) with different chemical and mechanical composition. The experiment was set up in vegetation pots in three variants (V) and three replications. Control variant (V1 - Osijek) was maintained on 80% of the field water capacity (FWC) while variants (V2 - Osijek) and (V3 - Okučani) were dried out on 60% of FWC before measuring photosynthetic efficiency at full pod development (R4). The highest average value of the index of photosynthetic efficiency (PI_{abs}) showed cultivar K14 (4.219), while the lowest value had K8 (2.429). The variants, V1 showed higher values PI_{abs} compared to V2 and V3 who were under the influence of stress caused by drought. Analysis of variance provided statistically significant differences between genotypes, variants, maturity groups and interaction GxV. Comparing cultivars maturity groups, very early cultivars (00) showed greater photosynthetic efficiency then the early (0) and medium early (I) cultivars of soybean. These results suggest the possibility of using the index of photosynthetic efficiency as a criterion in separating soybean genotypes resistant to drought.

Key words: photosynthetic efficiency, genotype, soybean, drought

Utjecaj različitih čimbenika na klijavost sjemena kukuruza tijekom skladištenja

Tihomir Jozinović[1], Ivan Živković[1], Kristijan Puškarić[1], Hrvoje Šarčević[2]

[1]Bc Institut d.d. Zagreb, Dugoselska 7, Rugvica, 10370 Dugo Selo, Hrvatska (tihomir.jozinovic@bc-institut.hr)
[2] Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, 10000 Zagreb, Hrvatska

Sažetak

Cilj ovog istraživanja je bio usporediti razne čimbenike koji utječu na kvalitetu sjemena tijekom i nakon određenog razdoblja skladištenja. Sjeme je razdvojeno na četiri frakcije: srednje okruglo, srednje plosnato, veliko okruglo i veliko plosnato, tretirano sa preporučenim koncentracijama fludioxonil + methalaxyl (F), fludioxonyl + methalaxyl + imidacloprid (FI), imidacloprid (I) te kontrolna varijanta bez tretmana (K). Sjeme je uskladišteno u dva različita tipa skladišta: klima komora (prosjek temperature 10º C, i 55 % vlage) i konvencionalno skladište (ambijentalna temperatura i vlaga). Svakih 6 mjeseci uzroci su isptivani na standardnu klijavost, četvrti i sedmi dan tijekom 30 mjeseci. Analiza varijance (ANOVA) pokazala je signifikantan učinak načina skladištenja, tretmana i frakcije na klijavost nakon četiri i sedam dana u svim razdobljima ispitivanja. Dvostruke interakcije su bile signifikantne samo za klijavost nakon četiri dana za skladište x tretman, tretman x frakcija i skladište x frakcija, dok interakcija skladište x tretman x frakcija nije bila signifikantna ni nakon četiri, niti nakon sedam dana klijanja. Uzorci iz klima komore imali su veće vrijednosti klijavosti nego oni iz konvencionalnoga skladišta. U konvencionalnom skladištu vrijednosti klijavosti su bile znatno niže nakon 30 mjeseci. Sve okrugle frakcije su imale nižu klijavost nego plosnate za sve tretmane. Najniže klijavosti su utvrđene kod tretmana FI, a kontrolni tretman je zadržao najveće vrijednosti.

Ključne riječi: kukuruz, sjeme, način skladištenja, frakcija, klijavost

Impact of different factors on germinability of corn seed during storage

Tihomir Jozinović[1], Ivan Živković[1], Kristijan Puškarić[1], Hrvoje Šarčević[2]

[1]*The Zagreb Bc Institute for Breeding and Production of Field Crops, Dugoselska 7, Rugvica, 10370 Dugo Selo, Croatia (tihomir.jozinovic@bc-institut.hr)*
[2]*University of Zagreb, Faculty of Agriculture, Svetošimunska 25, 10000 Zagreb, Croatia*

Summary

The objective of this study was to compare different factors which influence seed quality during and after some period of storage. Seeds were divided in four fractions: middle round, middle flat, large round and large flat, and treated with recommended rates of fludioxonil+methalaxyl (F), fludioxonyl+methalaxyl+imidacloprid (FI), imidacloprid (I), and control sample without any treatment (K). The seeds were placed in two different storage conditions: climate chamber (temperature average 10ºC, 55% moisture) and conventional storage (ambient temperature and moisture). Every 6 months samples were evaluated for standard germination percentage 4^{th} and 7^{th} day during the period of 30 months. ANOVA revealed a significant effect of way of storage, treatment and fraction on germinability after 4 and 7 days in all evaluation periods. Double interactions were significant only on 4^{th} day for storage x treatment, treatment x fraction, and storage x fraction, while interaction storage x treatment x fraction was not significant neither on 4^{th} nor on 7^{th} day. Samples stored in climate chamber had higher germinability values than in conventional storage. In conventional storage germinability values were considerably lower after 30 months. All round fractions had lower germinability than flat fractions for all treatments. The lowest germinability values were found in FI treatment, while K treatment maintained highest values.

Key words: corn, seed, way of storage, fraction, germinability

Heritabilnost svojstava kvalitete ozime pšenice kod dviju razina gnojidbe s dušikom

Katarina Jukić[1], Ivica Ikić[1], Rade Mlinar[1], Marko Maričević[1], Ana Lovrić[2], Marija Pecina[2], Jerko Gunjača[2], Hrvoje Šarčević[2]

[1]Bc Institut za oplemenjivanje i proizvodnju bilja d.d. Zagreb, Dugoselska 7, Rugvica, 10370 Dugo Selo, Hrvatska (kjukic@bc-institut.hr)
[2]Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, 10000 Zagreb, Hrvatska

Sažetak

Utvrđivanje pekarske kakvoće pšenice (*Triticum aestivum* L.) važno je za oplemenjivanje kao i za potrebe prehrambene industrije. Pekarska kakvoća u pšenice je pod utjecajem genotipa, okoline i njihove interakcije. Među okolinskim čimbenicima dušik (N) zauzima posebno mjesto i poznato je da različite razine dušične gnojidbe uzrokuju promjene količine i sastava proteina u brašnu. Cilj rada je bio procijeniti utjecaj dviju razina N gnojidbe na srednju vrijednost i heritabilnost pokazatelja pekarske kakvoće pšenice U istraživanje je bilo uključeno 19 kultivara ozime pšenice, koji su uzgajani u osam okolina pri 80 kg N/ha (N_{80}) i 180 kg N/ha (N_{180}). Za ocjenu pekarske kakvoće analizirani su indirektini pokazatelji kakvoće: sadržaj proteina (P), sadržaj vlažnog glutena (WG), gluten indeks (GI), sedimentacija prema Zeleny-ju (SED) i padajući broj po Hagbergu (FN). Heritabilnost proučavanih svojstava procijenjena je iz komponenti varijance izračunatih na temelju očekivanih srednjih kvadrata iz kombinirane analize varijance (ANOVA), provedene posebno za svaku razinu dušične gnojidbe. Za P, SED, WG i FN su utvrđene veće vrijednosti pri N_{180} dok je za GI utvrđena veća vrijednost pri N_{80}. Heritabilnost za sva ispitivana svojstva osim za FN bila je veća pri N_{180}. Kombinirana ANOVA kroz N gnojidbe pokazala je postojanje signifikantne interakcije kultivara i N gnojidbe za sva ispitivana svojstva ukazujući na specifičnu prilagođenost kultivara višoj odnosno nižoj N gnojidbi.

Ključne riječi: ozima pšenica, pekarska kakvoća, gnojidba, dušik, heritabilnost

Heritability of quality properties in winter wheat under two nitrogen fertilization levels

Katarina Jukić[1], Ivica Ikić[1], Rade Mlinar[1], Marko Maričević[1], Ana Lovrić[2], Marija Pecina[2], Jerko Gunjača[2], Hrvoje Šarčević[2]

[1] *The Zagreb Bc Institute for Breeding and Production of Field Crops, Dugoselska 7, Rugvica, 10370 Dugo Selo, Croatia (kjukic@bc-institut.hr)*
[2]*University of Zagreb, Faculty of Agriculture, Svetošimunska 25, 10 000 Zagreb, Croatia*

Summary

Determining bread making quality of wheat (*Triticum aestivum* L.) is important for breeding and for the food industry. Bread making quality of wheat is affected by genotype, environment and their interaction. Among environmental factors nitrogen (N) holds a special place and it is known that different levels of nitrogen fertilization cause changes in quantity and composition of proteins in the flour. The aim of this study was to estimate impact of two levels of N fertilization on the mean value and heritability of parameters of bread making quality of wheat. The study included 19 cultivars of winter wheat, which were grown in eight environments at 80 kg N/ha (N_{80}) and 180 kg N/ha (N_{180}). For evaluation of bread making quality indirect parameters of quality were analyzed: protein content (P), wet gluten content (WG), gluten index (GI), the Zeleny sedimentation value (SED) and falling number by Hagberg (FN). Heritability of traits was estimated from components of variance calculated on the basis of expected mean squares from the combined analysis of variance (ANOVA) conducted separately for each level of nitrogen fertilization. For P, SED, WG and FN higher values were found at N_{180} while for the GI higher values were found at N_{80}. Heritability was higher at N_{180} for all traits except for the FN. Combined ANOVA through N fertilization showed a significant interaction of cultivar and N fertilization for all properties indicating the specific adaptability of cultivars to higher or lower N fertilization.

Keywords: winter wheat, bread making quality, fertilization, nitrogen, heritability

Testiranje novih inbred linija kukuruza na prinos i otpornost prema fuzarijskoj truleži stabljike

Mirko Jukić, Branko Palaveršić, Ivan Živković, Ivica Buhiniček, Marija Kostenjak, Antun Vragolović, Zdravko Kozić

Bc Institut za oplemenjivanje i proizvodnju bilja d.d. Zagreb, Rugvica, Dugoselska 7, 10370 Dugo Selo, Hrvatska (mjukic@bc-institut.hr)

Sažetak

Stvaranje novih inbred linija i hibrida kukuruza sa visokim i stabilnim prinosima zrna, te visokim stupnjem otpornosti prema najvažnijim bolestima i tolerantnosti prema stresnim uvjetima proizvodnje cilj je svakog oplemenjivača odnosno modernog oplemenjivačkoga programa. Cilj ovog istraživanja je ispitati nove inbred linije kukuruza razvijenih iz linije Bc 279 na prinos zrna, otpornost prema fuzarijskoj truleži stabljike i tolerantnost na sušne uvjete preko sekundarnoga svojstva, intervala između prašenja i svilanja (ASI). Pokusi su postavljeni u Rugvici tijekom 2012. godine u kojima je testirano šest novih linija te originalna linija Bc 279 kao standard u kombinaciji s dva testera. Linija L2 je u kombinaciji s testerom T1 bila najprinosnija (9,91 t/ha), dok je u kombinaciji s testerom T2 zauzela 3. mjesto (9,82 t/ha). Najotpornija prema fuzarijskoj truleži stabljike pokazala se linija L5 kod koje je u kombinacijama s oba testera zabilježen najmanji prosječni broj trulih biljaka. U svojstva ASI kao najbolja pokazala se linija L3, koja je u kombinacijama s oba tetstera zabilježila najmanju vrijednost. Koeficijent korelacije između svojstva ASI i prinosa zrna iznosio je -0,55*. Na temelju dobivenih rezultata možemo zaključiti da smo u novim ciklusima selekcije razvili linije većeg potencijala rodnosti, s većim stupnjem otpornosti prema truleži stabljike i tolerantnosti prema stresnim uvjetima suše.

Ključne riječi: kukuruz, oplemenjivanje, prinos, otpornost, ASI

Testing of new maize inbred lines for yield and Fusarium stalk rot resistance

Mirko Jukić, Branko Palaveršić, Ivan Živković, Ivica Buhiniček, Marija Kostenjak, Antun Vragolović, Zdravko Kozić

The Zagreb Bc Institute for Breeding and Production of Field Crops, Rugvica, Dugoselska 7, 10370 Dugo Selo, Croatia (mjukic@bc-institut.hr)

Summary

Development of new maize inbred lines and hybrids with high and stabile grain yield, high degree of resistance to main maize diseases and certain tolerance to stress conditions is the main goal of any maize breeder and maize breeding programme. The aim of this study was to evaluate new inbred lines developed from the original inbred line Bc 279 for grain yield (GY), resistance to Fusarium stalk rot and tolerance to drought stress through secondary trait anthesis-silking interval (ASI). Inbred line Bc 279 as standard line and six newly developed lines were used in the research in combinations with two testers in Rugvica in 2012.The best yields were produced by inbred L2 in combination with the tester T1 (9.91 t/ha) while the same line, L2, in combination with tester T2 ranked third (9.82 t/ha). The most resistant line to Fusarium stalk rot was inbred line L5 in combinations with both testers. For ASI the best line was L3 in combinations with both testers. Correlation coefficient between ASI and GY was -0.55*. Based on obtained results we can conclude that new cycles of selection resulted in higher yielding inbreds with higher degree of resistance to Fusarium stalk rot and tolerance to drought stress conditions.

Key words: maize, breeding, grain yield, resistance, ASI

Genetska analiza parametara fluorescencije klorofila *a* u kukuruza uzgojenog u različitim sklopovima

Vlatka Jurković[1], Mario Franić[1], Hrvoje Lepeduš[1], Maja Kovačević[1], Antun Jambrović[1], Vera Cesar[2], Domagoj Šimić[1]

[1]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (domagoj.simic@poljinos.hr)*
[2]*Odjel za biologiju Sveučilišta J.J. Strossmayera u Osijeku, Cara Hadrijana 8A, Osijek, Hrvatska*

Sažetak

Kukuruz je najosjetljiviji na promjenu sklopa u odnosu na ostale ratarske kulture te gušći sklop može izazvati stres. Učinkovitost fotosinteze usjeva se može povezati s otpornošću na stres mjerenjem fluorescencije klorofila *a*. Na selekcijskom polju Poljoprivrednoga instituta Osijek tijekom svilanja, mjerena je učinkovitost fotosinteze analizatorom Handy PEA, 245 međukrižanih rekombinantnih inbred linija IBM (Intermated B73 x Mo17). Mapirajuće populacije kukuruza u dvije okoline koje se razlikuju po gustoći sjetve. Ciljevi ovog rada bili su analizirati genetsku varijabilnost i detektirati potencijalne lokuse kvantitativnih svojstava (QTL) za parametre fluorescencije radi razjašnjavanja genetičke povezanosti između fotosinteze i gustoće sklopa u kukuruza. Rezultati su pokazali da postoji značajna razlika fotosintetske učinkovitosti između različitih IBM linija unutar pojedinog sklopa, ali ne i značajna razlika između sklopova. Tako je srednja vrijednost PI_{ABS} parametra fotosintetske učinkovitosti u normalnom sklopu IBM populacije bila 2,171, a u gustom sklopu 2,223. Rezultati QTL analize, kao i daljnja istraživanja test križanaca IBM populacije dat će potpuniju sliku o genetskom odnosu gustoće sjetve, stresa i fotosintetske učinkovitosti.

Ključne riječi: fluorescencija klorofila *a*, kukuruz, QTL, gustoća sklopa

Genetic analysis of chlorophyll *a* fluorescence parameters in maize grown in different plant densities

Vlatka Jurković[1], Mario Franić[1], Hrvoje Lepeduš[1], Maja Kovačević[1], Antun Jambrović[1], Vera Cesar[2], Domagoj Šimić[1]

[1]*Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia (domagoj.simic@poljinos.hr)*
[2]*Department of Biology, University of J.J. Strossmayer in Osijek, Cara Hadrijana 8A, Osijek, Croatia*

Summary

Maize is most sensitive to changes in the plant densities relative to other crops, and higher plant densities can cause stress. Photosynthetic efficiency of crops may be associated with resistance to stress by measuring the fluorescence of chlorophyll *a*. Efficiency of photosynthesis was measured in nursery of the Agricultural Institute Osijek during silking with Handy PEA analyzer on 245 intermated recombinant inbred lines of IBM (Intermated B73 x Mo17) mapping population of maize in two environments that vary in plant density. The objectives of this study were to analyze the genetic variability and detect putative quantitative trait locus (QTL) for fluorescence parameters in order to clarify the genetic relationship between photosynthesis and plant density in maize. The results showed that there were significant differences in photosynthetic efficiency among different IBM lines within a same density, but no significant difference between the densities. Thus, the mean value of the photosynthetic efficiency parameter PI_{ABS} in the normal plant density of IBM population was 2.171, and in the higher plant density 2.223. Results of QTL analysis as well as further research of IBM population test crosses will give a more complete picture of the genetic relationship between plant density, stress and photosynthetic efficiency.

Key words: chlorophyll *a* fluorescence, maize, QTL, plant density

Varijabilnost svojstava domaćih populacija raštike

Zrinka Knezović, Elma Sefo, Zdravko Matotan, Ana Sabljo

Agronomski i prehrambeno-tehnološki fakultet Sveučilišta u Mostaru, Biskupa Čule bb, BiH (zrinka.knezovic@sve-mo.ba)

Sažetak

Nakon identifikacije i sakupljanja sjemena lokalnih populacija raštike s klimatski i edafski različitih ruralnih područja jugozapadnoga dijela Hercegovine, proveden je poljski pokus na dvije lokacije sa 17 populacija raštike (*Brassica oleraceae L. var. acephala*). Na području Bosne i Hercegovine selekcija raštike do sada nije provedena. Iz prirodne populacije prilagođene manje intenzivnim uvjetima obavljena je selekcija i umnožavanje izdvojenih genotipova, kao mogući materijal za oplemenjivanje na poboljšanje osobina. Cilj rada bio je usporediti varijabilnost svojstava populacija raštike prikupljenih s više lokacija i uzgojenih na dvije lokacije u Hercegovini. Analizirana su sljedeća svojstva: visina biljke u tehnološkoj zrelosti, visina biljke u punoj cvatnji, broj internodija u tehnološkoj zrelosti, broj internodija u punoj cvatnji, dužina peteljke, promjer plojke, dužina plojke, ukupni prinos listova i ukupni broj listova. Između populacija je uočeno variranje u širokom rasponu. Najveća varijabilnost na obje lokacije zabilježena je za svojstvo broja internodija u tehnološkoj zrelosti, a najmanju za ukupni broj listova. Populacije bi u budućnosti mogle poslužiti kao kvalitetni izvori genetske varijabilnosti te pogodan materijal za oplemenjivački rad i prilagodbu lokalnim proizvodnim uvjetima, kao i za razvoj inbred linija za dobivanje hibrida raštike.

Ključne riječi: varijabilnost, raštika, populacije, morfološka i agronomska svojstva

Variability of domestic populations Kale

Zrinka Knezović, Elma Sefo, Zdravko Matotan, Ana Sabljo

Faculty of Agriculture and food technology, University of Mostar, Biskupa Čule bb , Mostar, Bosnia and Herzegovina (zrinka.knezovic@sve-mo.ba)

Summary

After the identification and collection of local populations kale seeds with different climatic and edaphic areas in the south-western part of Herzegovina, conducted a field experiment on two locations with 17 populations of kale (*Brassica oleraceae* L. var. *acephala*). In Bosnia and Herzegovina, kale selections so far are not been implemented. From natural populations adapted to less intensive conditions selection was performed and multiplication of selected genotypes, as a possible material for plant breeding for improved traits. The aim of this study was to compare the variability properties of kale populations collected from multiple locations and those grown in two locations in Herzegovina. Following traits were measured: the plant height in the technological maturity, plant height in full blossom period, the number of internodes in technological maturity, number of internodes in full bloom, length of leaf blades, diameter folding, folding length, the total yield of leaves, and total number of leaves. A wide range of variation was observed between populations. The greatest variability in both locations had the number of internodes in technological maturity, and the lowest total number of leaves. Population would be able to serve as a rich source of genetic variability, and suitable material for breeding and adaptation to local production conditions and the development of inbred lines to obtain hybrid kale.

Key words: variability kale, populations, morphological and agricultural traits

Učinkovitost korištenja vode različitih kultivara ozimog ječma

Josip Kovačević[1], Maja Kovačević[1], Alojzije Lalić[1], Vera Cesar[2], Marko Josipović[1], Ana Josipović[1], Magdalena Markasović[3], Vlado Kovačević[3]

[1]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (josip.kovacevic@poljinos.hr)*
[2]*Sveučilište J.J. Strossmayera u Osijeku, Odjel za Biologiju, Cara Hadrijana 8A, Osijek, Hrvatska*
[3]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska*

Sažetak

Učinkovitost iskorištenja vode (water use efficiency – WUE) različitih kultivara ozimog ječma jedan je od vrlo dobrih pokazatelja tolerantnosti na sušu, odnosno stabilnosti prinosa zrna i same rodnosti kultivara, naročito u uvjetima suše. Indeks učinkovitosti korištenja vode utvrđen je u pokusima postavljenim u vegetacijskim loncima s osam kultivara ozimog ječma u tri ponavljanja i dvije varijante, gdje je jedna varijanta bila zalijevana na razini dobre opskrbljenosti vodom, a u drugoj varijanti je tri puta izazvan kratkotrajni stres uslijed nedostatka vode i to u fazi punog busanja, pred klasanje i u fazi nalijevanja zrna. Utvrđene su značajne razlike u ukupnoj potrošnji vode kod različitih kultivara ječma i značajne razlike prinosa zrna po vegetacijskom loncu, te je temeljem tih podataka izračunat indeks učinkovitosti iskorištenja vode različitih kultivara ozimog ječma. Indeks učinkovitosti iskorištenja vode kultivara ječma bio je u značajnoj pozitivnoj korelaciji s prinosom zrna istih kultivara ostvarenim u višegodišnjim pokusima na četiri lokacije i dvije norme sjetve. Indeks učinkovitosti korištenja vode u varijanti dobre opskrbljenosti s vodom bio je u korelaciji s prinosom zrna kultivara u pokusima s normom sjetve 300 zrna/ m^2 ($r = 0,78$) i 450 zrna/ m^2 ($r = 0,79$). Indeks učinkovitosti korištenja vode kultivara ječma u stresnoj varijanti bio je u značajnoj pozitivnoj korelaciji s prinosom zrna istih kultivara ($r = 0,81$ za 300 zrna /m^2; $r = 0,84$ za 450 zrna/ m^2).

Ključne riječi: učinkovitost iskorištenja vode, ozimi ječam, kultivar, suša, norma sjetve

Water use efficiency of different winter barley cultivars

Josip Kovačević[1], Maja Kovačević[1], Alojzije Lalić[1], Vera Cesar[2], Marko Josipović[1], Ana Josipović[1], Magdalena Markasović[3], Vlado Kovačević[3]

[1]*Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia (josip.kovacevic@poljinos.hr)*
[2]*Department of Biology, University J.J. Strossmayer in Osijek, Cara Hadrijana 8A, Osijek, Croatia*
[3]*Faculty of Agriculture, University of J.J. Strossmayer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia*

Summary

Water use efficiency (WUE) of different cultivars of winter barley is one of the very good indicators of drought tolerance, grain yield stability and yield of the cultivars, especially in drought conditions. Index of water use efficiency was determined in trials set up in plant pots with eight cultivars of winter barley in three replications and two variants. One variant was well watered, while the second variant has been subjected three times to the short-term stress caused by a lack of water in the stage of full tillering, beginning of heading and grain filling. Determined significant differences in the total consumption of water in different barley cultivars and significant differences in grain yield per pot were used to calculate the index of water use efficiency of winter barley. Index of water use efficiency of barley was significantly positively correlated with yield of the same cultivars, achieved in perennial trials at four locations and two sowing rate. Index of water use efficiency in variants with a good supply of water was correlated with yield of cultivars in experiments with standard sowing rate of 300 seeds/ m^2 ($r = 0.78$) and 450 seeds/ m^2 ($r = 0.79$). Index of water use efficiency of barley in the stressful trial was significantly positively correlated with grain yield of the same cultivars ($r = 0.81$ for 300 seeds/ m^2, $r = 0.84$ for 450 seeds/ m^2).

Key words: water use efficiency, winter barley, cultivar, drought, sowing rate

Učinkovitost iskorištenja vode različitih kultivara ozime pšenice

Josip Kovačević[1], Maja Kovačević[1], Georg Drezner[1], Alojzije Lalić[1], Hrvoje Lepeduš[1], Marko Josipović[1], Ana Josipović[1], Vlado Kovačević[2]

[1]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (josip.kovacevic@poljinos.hr)*
[2]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska*

Sažetak

Učinkovitost iskorištenja vode (water use efficiency – WUE) i pokazatelji fotosintetske učinkovitosti različitih kultivara ozime pšenice mogu biti dobri pokazatelji tolerantnosti na sušu, odnosno stabilnosti prinosa zrna i same rodnosti kultivara, naročito u uvjetima suše. Indeks učinkovitosti korištenja vode utvrđen je u pokusima postavljenim u vegetacijskim loncima sa sedam kultivara ozime pšenice u tri ponavljanja i dvije varijante, gdje je jedna varijanta bila zalijevana na razini dobre opskrbljenosti vodom, a u drugoj varijanti je tri puta izazvan kratkotrajni stres uslijed nedostatka vode i to u fazi punog busanja, pred klasanje i u fazi nalijevanja zrna. Utvrđene su značajne razlike u ukupnoj potrošnji vode kod različitih kultivara pšenice i značajne razlike prinosa zrna po vegetacijskom loncu, te je temeljem tih podataka izračunat indeks učinkovitosti iskorištenja vode različitih kultivara ozime pšenice. Indeks učinkovitosti iskorištenja vode kultivara ozime pšenice bio je u vrlo značajnoj pozitivnoj korelaciji s pokazateljima fotosintetske učinkovitosti i prinosom zrna ostvarenim u vegetacijskim loncima. Korelacijski koeficijenti između učinkovitosti iskorištenja vode kultivara ozime pšenice i prinosa zrna istih kultivara u višegodišnjim poljskim pokusima bili su također pozitivni, ali statistički neopravdani (r = 0,20 do 0,57), kao i korelacijski koeficijenti između indeksa fotosintetske učinkovitosti i prinosa zrna u poljskim pokusima (r = 0,21 do 0,60).

Ključne riječi: učinkovitost iskorištenja vode, fotosintetska učinkovitost, kultivar, pšenica, suša

Water use efficiency of different winter wheat cultivars

Josip Kovačević[1], Maja Kovačević[1], Georg Drezner[1], Alojzije Lalić[1], Hrvoje Lepeduš[1], Marko Josipović[1], Ana Josipović[1], Vlado Kovačević[2]

[1]*Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia (josip.kovacevic@poljinos.hr)*
[2]*Faculty of Agriculture, University of J.J. Strossmayer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia*

Summary

Water use efficiency (WUE) and indicators of photosynthetic efficiency of different cultivars of winter wheat are good indicators of drought tolerance, grain yield stability and yield of the cultivars, especially in drought conditions. Index of water use efficiency was determined in trials in plant pots with seven cultivars of winter wheat in three repetitions and two variants. One variant has been well watered, while the second variant was subjected three times to a short-term stress caused by a lack of water in the stage of full tillering, beginning of heading and grain filling. Determined significant differences in the total consumption of water in different wheat cultivars and significant differences in grain yield per pot were used to calculate the index of water use efficiency of different cultivars of winter wheat. Index of water use efficiency of winter wheat cultivars was in very significant positive correlation with indicators of photosynthetic efficiency and grain yield in the pots. Correlation coefficients between water use efficiency of wheat cultivars and grain yield of the same cultivars in multiyear field trials were also positive, but statistically insignificant (r = 0.20 to 0.57), as well as correlation coefficients between the index of photosynthetic efficiency and grain yield in field trials (r = 0.21 to 0.60).

Key words: water use efficiency, photosynthetic efficiency, cultivar, winter wheat, drought

Genetska varijabilnost dihaploidnih populacija kukuruza

Maja Kovačević[1], Ivan Brkić[1], Sonja Marić[2], Domagoj Šimić[1]

[1]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (maja.kovacevic@poljinos.hr)*
[2]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska*

Sažetak

Upotreba dihaploida u oplemenjivanju kukuruza pokazala se kao vrlo učinkovita metoda za razvoj novih linija zbog niza prednosti u odnosu na klasične metode razvoja inbred linija, no uz prednosti treba voditi računa i o mogućim nedostatcima ove metode. Potrebno je ispitati utječe li proces indukcije haploida na genetsku varijabilnost, odnosno dolazi li do smanjenja genetske varijabilnosti i gubitka poželjnih gena iz populacije upotrebom ove metode. Usporedba dihaploidnih i linija dobivenih klasičnim metodama oplemenjivanja u dosadašnjim istraživanjima nije pokazala značajne razlike između tih linija u pogledu agronomskih i morfoloških svojstava, no malo je istraživanja o razlikama između ovih linija na genetskoj osnovi. S ciljem ispitivanja mogućih razlika korištene su populacije dihaploidnih linija dobivene indukcijom majčinskih haploida *in vivo* u F_1 generaciji. Korišteni su križanaci elitnih linija Poljoprivrednoga instituta Osijek i pripadajuće biljke F_2 generacije, dobivene iz materijala koji je korišten kao početni za indukciju haploida. Učinjena je molekularna analiza pomoću standardnog seta SSR (simple sequence repeat) markera. Za svaki lokus računat je broj alela i očekivana heterozigotnost. Svi markeri su bili podvrgnuti χ^2 testu kako bi se utvrdili markeri s odstupanjem od očekivanog omjera razdvajanja po Mendelu, a smjer distorzija određen je unošenjem frekvencija genotipova svakog markera uzduž genetske mape.

Ključne riječi: dihaploidi, genetska varijabilnost, SSR markeri

Genetic variability of doubled haploid populations of maize

Maja Kovačević[1], Ivan Brkić[1], Sonja Marić[2], Domagoj Šimić[1]

[1]*Agricultural institute Osijek, Južno predgrađe 17, Osijek, Croatia (maja.kovacevic@poljinos.hr)*
[2]*Faculty of Agriculture, University of J.J. Strossmayer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia*

Summary

Use of doubled haploids in maize breeding proved to be very effective method for development of new lines due to a number of advantages in comparison to conventional methods of inbred lines development, but despite all advantages, it is important to take into account the possible disadvantages of this method. It is necessary to determine whether the haploid induction process affects the genetic variability, or whether using this method results in reduction of genetic variability and loss of favourable genes from the population. In previous studies, comparison of doubled haploid lines and lines developed by traditional methods in terms of agronomic and morphological traits showed no significant difference between these two groups of lines, but there is small number of research on the differences between these lines at the genetic level. In order to examine the possible differences, we used populations of doubled haploids developed by *in vivo* induction of maternal haploids in F_1 generation after crossing of elite lines of Agricultural institute Osijek, and corresponding F_2 plants, developed from the same material that was used for haploid induction. Molecular analysis using a standard set of SSR (*simple sequence repeat*) markers was done. Number of alleles and expected heterozygosity was calculated for each locus. All markers were subjected to a χ^2 test to determine markers with a deviation from the expected Mendelian segregation ratio. Direction of distortion was characterized by plotting the genotype frequencies of each marker along the genetic linkage map.

Key words: doubled haploids, genetic variability, SSR markers

Using of rimantadine and acyclovir for the *Potyvirus* elimination in garlic

Martina Kudělková, Eva Ondrušiková, Hana Sasková

Faculty of Horticulture, Mendel University in Brno, Valtická 337, 691 44 Lednice, Czech Republic (martina.kudelkova@mendelu.cz)

Summary

Garlic plants (*Allium sativum* L.) were cultivated *in vitro*. All of them were positive for two *Potyviruses*; *Onion yellow dwarf virus* (OYDV) and *Leek yellow stripe virus* (LYSV). The viruses were eliminated by antivrilas acyclovir (A) and rimantadine hydrochloride (R). Antivirals were used in two concentrations: 10 $mg.l^{-1}$ (A1; R1) and 25 $mg.l^{-1}$ (A2; R2), and then added into medium after autoclaving using a sterile filter. Plants were cultivated for two weeks in the medium with antivirals, after that in a medium without. Every variant contained 14 plants except the A2 variant. Plants were tested by ELISA.The results showed that a bigger success was achieved in the case of the OYDV elimination. Using R2 method total of 100% negative plants was achieved and 91% by the R1 method; 90% of negative plants by the A2 method and 64% by the A1 method, respectively. R2 method was significantly more efficient than others. Contrast the success of the LYSV elimination was 72% by the A2 method, 71% by the R2 method, 50% by the R1 method and 21% by the A1 method only. R2 and A2 methods were significantly more efficient than A1. We concluded using of R2 method was the best for the OYDV elimination and using of A2 and R2 methods were the best for the LYSV elimination.

Key words: rimantadine, acyclovir, *Potyvirus*

In vitro regeneration and genetic fidelity of some *Iridaceae* species

Lăpădătescu Simona[1], Petolescu Cerasela[2], Bălă Maria[2]

[1]*APIA Timişoara, Romania*
[2]*Faculty of Horticulture and Sylviculture, Banat University of Agricultural Sciences and Veterinary Medicine Timişoara, Romania (cerapetolescu@yahoo.com)*

Summary

The objective of this study was to evaluate the regeneration ability of few *Iris germanica* varieties (Michigan, Mission Ridge, Circle Step, and Fat Game) and genetic diversity of the regenerated plants using molecular markers. *In vitro* cultures of *Iris germanica* were established and propagated on MS (Murashige and Skoog, 1962) medium. Concentration of growth regulators used in this study was adopted from Shibli and Ajlouni (2000). Somatic embryogenesis was achieved from callus, which induction was made by subculturing segments from leaf bases. The frequency of the explants with regeneration ability was very low (1%) in the population of all varieties selected for this study. The results obtained are presented as follow: Michigan and Mission Ridge genotype produced 15 regenerants, Circle Step 9 and Fat Game 11 regenerants. The regenerated plantlets were maintained in aseptic conditions for further growth. For DNA extraction young leaves from in vitro growing plants were sampled. Total genomic DNA from 50 regenerants and from mother plants was extracted using Maxwell™ 16 Instrument from Promega. Purified concentrated products were obtained at high quality and high yield. The 10 RAPD primers were screen for detection of the genetic polymorphism among regenerated and mother plants. Only 7 produced reproducible fragments. Number of bands generated by different pairs of primers used was scored. The total number of clear bands obtained from each primer ranged from 4 (Fat Game genotype OPA-12 primer) to 8 (Mission Ridge genotype-OPB-04 primer). Amplified fragments ranged from 350 to 1420 bp in size. For all varieties, RAPD fingerprints of the mother and the regenerated plants were identical. In this study, regeneration ability of all German iris varieties was very low. RAPD analysis did not reveal any type of polymorphism between regenerated and mother plant.

Key Words: *in vitro* culture, German iris, molecular markers, genetic fidelity

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Reakcija inbred linija i hibrida kukuruza šećerca na sušu

Tatjana Ledenčan, Rezica Sudar, Sanja Marković, Slavica Živalj, Domagoj Šimić

Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska
(tatjana.ledencan@poljinos.hr)

Sažetak

Reakcija kukuruza šećerca na sušu ovisi o razvojnom stadiju biljke u kojem je suša nastupila, jačini i trajanju suše. Pojava, jačina i trajanje suše, na našem uzgojnom području, su vrlo nepredvidivi čimbenici što značajno otežava procjenu tolerantnosti genotipova. Tijekom vegetacije u 2012. godini na lokaciji Osijek zabilježen je izrazit vodni i toplotni stres, posebice u fazi cvatnje i nalijevanja zrna. Reakcija na sušu i visoke temperature procijenjena je u 29 inbred linija i 10 hibrida kukuruza šećerca. Pokus sa hibridima posijan je u tri roka sjetve. Svojstva ispitivana u linija su: broj dana između polinacije i svilanja (ASI - anthesis-silking interval) i postotak oplodnje. U hibrida utvrđeni su: broj klipova, postotak oplodnje, dužina i širina klipa te sadržaj šećera i vode u zrnu. Oplodnja je u potpunosti izostala u 15 linija, a najveći postotak oplodnje (do 24,6%) imale su rane linije *shrunken* tipa mutacije endosperma, kod kojih je cvatnja bila tijekom lipnja. Dobivena je slaba negativna korelacija (r=-0,28) između ASI i oplodnje. Hibridi su najviše prosječne vrijednosti promatranih svojstava imali u prvom roku sjetve. U drugom i trećem roku sjetve u svih hibrida smanjen je postotak oplodnje za 35-50% i dužina klipa za 26-44%, a kod hibrida *sugary* tipa mutacije endosperma smanjen je i sadržaj šećera u zrnu za 8,2-18,6%. Dobiveni rezultati ukazuju na vrlo nisku tolerantnost ispitivane germplazme kukuruza šećerca na sušu i visoke temperature u fazi cvatnje.

Ključne riječi: kukuruz šećerac, linije, hibridi, tolerantnost na sušu

Response of sweet corn inbred lines and hybrids to drought

Tatjana Ledenčan, Rezica Sudar, Sanja Marković, Slavica Živalj, Domagoj Šimić

Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia (tatjana.ledencan@poljinos.hr)

Summary

Response of sweet corn to drought depends on the developmental stage of the plant in which drought occurred, the intensity and duration of drought. Occurrence, intensity and duration of drought in our growing area are very unpredictable factors, which makes difficult the screening for drought tolerance. At Osijek location, during 2012 growing season, very strong water and heat stress was recorded, especially at the flowering and grain filling. Response to drought and high temperatures has been estimated in 29 inbred lines and 10 hybrids of sweet corn. Trial with hybrids was set up at three planting dates. Traits examined in inbreds were the anthesis-silking interval (ASI) and the percentage of fertilization. In hybrids, ear number, fertilization rate, ear length and width, grain sugar and moisture content were determined. Fertilization was completely absent in 15 inbreds, and the highest rate of fertilization (up to 24.6%) had early inbreds with *shrunken* endosperm mutation, in which flowering was during June. A weak negative correlation (r = -0.28) between ASI and fertilization was obtained. Hybrids had the highest average value of the examined traits in the first planting date. In the second and third planting date, all hybrids had 35-50% lower percentage of fertilization and 26-44% lower ear length, and the hybrids with *sugary* endosperm mutation also had 8.2-18.6% lower sugar content in the grain. These results indicate that the examined sweet corn germplasm has a very low tolerance to drought and high temperatures in the flowering stage.

Key words: sweet corn, inbreds, hybrids, drought tolerance

Korelacije između svojstava pekarske kakvoće u F_4 cijepajućoj generaciji u pšenice

Ana Lovrić[1], Katarina Jukić[2], Ivica Ikić[2], Marko Maričević[2], Miroslav Bukan[1], Hrvoje Šarčević[1]

[1]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska (alovric@agr.hr)*
[2]*Bc Institut za oplemenjivanje i proizvodnju bilja d.d. Zagreb, Dugoselska 7, 10370 Rugvica, Dugo Selo, Hrvatska*

Sažetak

Suvremeni programi oplemenjivanja pšenice imaju za cilj stvoriti kultivare s visokim genetičkim potencijalom za prinos kao i visokom pekarskom kakvoćom. Cilj rada bio je usporediti vrijednosti indirektnih pokazatelja pekarske kakvoće kao i njihove međusobne fenotipske korelacije u F_4 generaciji kod dvaju biparentalnih križanja: Golubica x Emesse i Verbunkos x Soissons. Po 50 F_4 potomstava po križanju uzgojeno je u Botincu 2010./2011. godini. Analizirani su: sadržaj proteina (P), vlažni gluten (WG), gluten indeks (GI), sedimentacija prema Zeleny-ju (SED) i padajući broj prema Hagbergu (FN). Prosječne vrijednosti svih analiziranih svojstava osim za FN bile su signifikantno veće kod križanja Golubica x Emesse (P=11,1%, WG=27,5%, GI=89,6%, SED=42,1ml) u usporedbi s križanjem Verbunkos x Soissons (P=10,1%, WG=24,1%, GI=84,4%, SED= 29,8ml). Varijacijski koeficijent za sva svojstva osim GI su imali podjednake vrijednosti u oba križanja i bili su najmanji za P, a najveći za SED. Varijacijski koeficijent za GI je bio znatno veći kod križanja Verbunkos x Soissons (21%), nego kod Golubica x Emesse (13%). U oba križanja sve izračunate korelacije su bile signifikantne osim korelacije između FN i ostalih svojstava te GI i SED, samo kod križanja Verbunkos x Soissons. Križanje Golubica x Emesse ima veći potencijal za selekciju na pekarsku kakvoću, zbog većih srednjih vrijednosti pokazatelja pekarske kakvoće te jače korelacije između njih.

Ključne riječi: pšenica, pekarska kakvoća, korelacija

Correlations among bread making quality traits in F_4 segregating generation in wheat

Ana Lovrić[1], Katarina Jukić[2], Ivica Ikić[2], Marko Maričević[2], Miroslav Bukan[1], Hrvoje Šarčević[1]

[1]*Faculty of Agriculture,University of Zagreb, Svetošimunska 25, 10000 Zagreb, Croatia (alovric@agr.hr)*
[2]*The Zagreb Bc Institute for Breeding and Production of Field Crops, Dugoselska 7, 10370 Rugvica, Dugo Selo, Croatia*

Summary

Modern wheat breeding programs aim to create cultivars with high genetic potential for yield and high bread making quality. The aim of this study was to compare the value of indirect bread making quality parameters and their mutual phenotype correlations in F_4 generation of two biparental crosses: Golubica x Emesse and Verbunkos x Soissons. Fifty F_4 progenies per cross were grown at Botinec in 2010/2011. Analyzed parameters were protein content (P), wet gluten content (WG), gluten index (GI), the Zeleny sedimentation value (SED) and the Hagberg falling number (FN). Average values of all analyzed traits except for FN were significantly higher for the cross Golubica x Emesse (P = 11.1%, WG = 27.5%, GI = 89.6%, SED = 42.1 ml) compared to the cross Verbunkos x Soissons (P = 10.1%, WG = 24.1%, GI = 84.4%, SED = 29.8 ml). The coefficients of variation for all traits except GI had equal values for both crosses and were lowest for P, and highest for SED. The coefficient of variation for GI was significantly higher for the cross Verbunkos x Soissons (21%) than for the cross Golubica x Emesse (13%). In both crosses all calculated correlations were significant except the correlation between the FN and other traits, and for GI and SED for the cross Verbunkos x Soissons. The cross Golubica x Emesse had greater potential for selection for improved bread making quality, due to its higher average values for bread making quality parameters and stronger correlations among them.

Key words: wheat, bread making quality, correlation

Genotipske razlike u prinosu i kvaliteti zrna ozime pšenice pri različitim normama sjetve

Marko Maričević[1], Ivica Ikić[1], Rade Mlinar[1], Katarina Jukić[1], Hrvoje Šarčević[2]

[1]Bc Institut za oplemenjivanje i proizvodnju bilja d.d. Zagreb, Dugoselska 7, Rugvica, 10370 Dugo Selo, Hrvatska, (marko.maricevic@bc-institut.hr)
[2]Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska

Sažetak

Pokus s 18 sorata ozime pšenice, pri tri različite norme sjetve, postavljen prema slučajnom bloknom rasporedu u dvije repeticije, sijan je tijekom tri uzastopne godine (2010.-2012.) na lokaciji Rugvica. Norme sjetve iznosile su 350, 550 i 750 klijavih zrna/m². Cilj pokusa je bio istražiti utjecaj norme sjetve na prinos, hektolitarsku masu, masu 1000 zrna i svojstva kvalitete zrna testiranih sorata. Dobiveni rezultati pokazuju da je najveći učinak na sva svojstva imala godina, zatim sorta, a potom norma sjetve. Utjecaj godine i sorte na sva svojstva bio je signifikantan, dok je utjecaj norme sjetve bio signifikantan samo za prinos i masu 1000 zrna. Također je interakcija godina x sorta bila signifikantna za sva svojstva. Interakcija godina x norma sjetve imala je signifikantan učinak na sva svojstva, dok interakcija norma sjetve x sorta imala signifikantan učinak samo na sadržaj bjelančevina i gluten indeks. Prosječan prinos zrna svih sorata u svim godinama bio je najveći pri normi sjetve od 550 klijavih zrna/m², dok je prosječna masa 1000 zrna pri ovoj normi sjetve bila najmanja. Povećanjem norme sjetve na 750 klijavih zrna/m² dolazi do signifikantnog smanjenja prosječnog prinosa u 2010. godini koja je bila povoljna za razvoj biljnih bolesti, dok smanjenjem norme sjetve na 350 klijavih zrna/m² dolazi do signifikantnog smanjenja prinosa u 2011. i 2012. godini, koje su bile nepovoljne za razvoj biljnih bolesti.

Ključne riječi: norma sjetve, ozima pšenica, sorta, prinos, kvaliteta

Genotypic differences in yield and grain quality of winter wheat at different sowing rate

Marko Maričević[1], Ivica Ikić[1], Rade Mlinar[1], Katarina Jukić[1], Hrvoje Šarčević[2]

[1]*The Zagreb Bc Institute for Breeding and Production of Field Crops, Dugoselska 7, Rugvica, 10370 Dugo Selo, Croatia, (marko.maricevic@bc-institut.hr)*
[2]*Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia*

Summary

Experiment with eighteen winter wheat varieties was sown during three consecutive years (2010-2012) in Rugvica at three different sowing rates, following a randomized complete block design with two replications. Sowing rates were 350, 550 and 750 germinated seeds/m². The aim of the experiment was to investigate the influence of sowing rates on yield, test weight, 1000 kernel weight and grain quality of the tested varieties. The obtained results show that the year had the greatest effect on all traits, followed by the variety and the sowing rate. The effect of year and variety on all properties was significant, while the effect of sowing rate was significant only for yield and 1000 grain weight. Also, the year x variety interaction was significant for all traits. Year x sowing rate interaction had a significant effect on all properties, while the variety x sowing rate interaction had no significant effect only on protein content and gluten index. The average yield of all varieties in all years was highest with sowing rate of 550 germinated seeds/m², while the average 1000 grain weight with this sowing rate was lowest. Increasing sowing rate to 750 germinated seeds/m² resulted in significant reduction in the average yield in 2010 that was favourable for development of plant diseases, while reducing sowing rate to 350 germinated seeds/m² caused significantly lower yields in 2011 and 2012 which were unfavourable for development of plant diseases.

Key words: sowing rate, winter wheat, variety, yield, quality

Prinosi novopriznatih hibrida kukuruza FAO grupe 400 u odnosu na prinos standarda

Bojan Marković, Ružica Jurić, Ivan Varnica, Marina Zorić

Hrvatski centar za poljoprivredu hranu i selo, Zavod za sjemenarstvo i rasadničarstvo, Usorska 19 Brijest, 31000 Osijek , Hrvatska (bojan.markovic@hcphs.hr)

Sažetak

Proizvodnja hrane, a naročito proizvodnja ratarskih kultura za sve veće potrebe čovječanstva, pred nas stavlja sve veće zahtjeve. Jedan od zadataka je da se s istih proizvodnih površina proizvodi više. Iako je ovo složen problem, veliki udio u savladavanju ove zadaće pripada izboru sjemena i njegovom genetskom potencijalu i karakteristikama.Priznavanje novih hibrida kukuruza regulirano je Zakonom o sjemenu, sadnom materijalu i priznavanju sorti poljoprivrednog bilja, te Pravilnikom o priznavanju sorti poljoprivrednog bilja i Pravilnikom o postupku utvrđivanja različitosti, ujednačenosti i postojanosti novih biljnih sorti u svrhu dodjeljivanja oplemenjivačkog prava i priznavanja sorti. Trenutno se postupak odvija u dvije uzastopne vegetacije na više lokacija, ovisno o pripadnosti hibrida kukuruza FAO grupi. Ovim pregledom želimo prikazati doprinos selekcije na povećanje prinosa novih hibrida kukuruza u FAO grupi 400 koji su vidljivi iz rezultata poljskih pokusa.Rezultati poljskih pokusa u posljednjih deset godina i devet ciklusa priznavanja novih hibrida nedvojbeno pokazuju da se uvođenjem novih hibrida kukuruza u proizvodnju samo na temelju izbora sjemena može očekivati povećanje prinosa kukuruza po jedinici površine.

Ključne riječi: kukuruz, hibrid, priznavanje, prinos

The yields of newly registered maize hybrids FAO 400 group compared to the standards

Bojan Marković, Ružica Jurić, Ivan Varnica, Marina Zorić

Croatian Centre for Agriculture, Food and Rural Affairs, Institute for Seeds and Seedlings, Usorska 19 Brijest, 31000 Osijek, Croatia (bojan.markovic@hcphs.hr)

Summary

Food production, especially the production of agricultural crops for the increasing needs of mankind have higher demands. One of the tasks is to increase production from the same production area. While this is a complex problem, a large part in overcoming this task belongs to the choice of seeds and its genetic potential and characteristics.Registration of new maize hybrids is regulated by the Act on Seeds, Planting Material and Registration of Varieties of Agricultural Plants, Ordinance on the Registration of Varieties of Agricultural Plants and Ordinance on the Procedure of Determining Distinctness, Uniformity and Stability of New Plant Varieties to Obtain Plant Breeder's Rights and Register Varieties. Currently the process takes place in two consecutive years in several locations, depending on the FAO group. In this review, we want to demonstrate the contribution of plant breeding in increasing of yield of new hybrids from FAO group 400 which are visible from field trials results.The field trials results in the last ten years and nine cycles of registration of new hybrids clearly show that by introduction of new hybrids of maize in production only on the basis of seed selection can increase corn yield.

Key words: maize, hybrid, registration, yield

Fotosintetska učinkovitost i temperatura lista hibrida suncokreta u stresnim uvjetima uzgoja

Antonela Markulj, Miroslav Krizmanić, Josip Kovačević, Marija Viljevac, Ivica Liović, Anto Mijić, Aleksandra Sudarić, Ana Josipović

Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (antonela.markulj@poljinos.hr)

Sažetak

Istraživana je fotosintetska učinkovitost i temperatura lista 13 hibrida suncokreta, mjerena u V6 fazi razvoja biljke. Pokus je postavljen u posudama, po slučajnom bloknom rasporedu, s dva tretmana u tri ponavljanja. U prvom tretmanu (T1), ispitivani hibridi su održavani na 80% poljskoga vodnog kapaciteta (PVK), a u drugom (T2) na 60% PVK. Prosječna vrijednost indeksa fotosintetske učinkovitosti svih hibrida za T1 je bila 1,65, a za T2 1,76. Razlike između tretmana u fotosintetskoj učinkovitosti nisu utvrđene, vjerojatno zbog toga što u toj fazi razvoja suncokreta, zasićenost tla vodom na 60% i 80% PVK nema utjecaj na fotosintezu. U prosjeku oba tretmana, vrijednost indeksa fotosintetske učinkovitosti hibrida iznosila je 1,70. Najnižu vrijednost indeksa fotosintetske učinkovitosti imao je hibrid H3 (1,15), a najvišu hibrid H10 (2,40). Utvrđene su statistički značajne razlike u fotosintetskoj učinkovitosti između hibrida kao rezultat njihove genetske divergentnosti. Razlike u temperaturi lista između tretmana bile su statistički značajne (T1=27,16ºC, T2=33,19ºC). Razlike između hibrida unutar tretmana nisu bile statistički opravdane. U tretmanu koji je bio održavan na 60% PVK, svi hibridi suncokreta reagirali su s povećanjem temperature lista uslijed nedostatka vode, odnosno smanjenja transpiracije. Interakcija između hibrida i tretmana nije bila značajna s obzirom na fotosintetsku učinkovitost i temperaturu lista u početnoj fazi razvoja suncokreta.

Ključne riječi: suncokret, fotosintetska učinkovitost, temperatura lista, stres

Photosynthetic efficiency and leaf temperature of sunflower hybrids in stress conditions

Antonela Markulj, Miroslav Krizmanić, Josip Kovačević, Marija Viljevac, Ivica Liović, Anto Mijić, Aleksandra Sudarić, Ana Josipović

Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia (antonela.markulj@poljinos.hr)

Summary

The photosynthetic efficiency and leaf temperature of 13 hybrids, measured in the V6 stage of plant development was studied. Research was conducted in pots in a randomized block design with two treatments in three replicates. In the first treatment (T1), tested hybrids were maintained at 80% field water capacity (FWC) and at 60% in the second (T2). The average value of the index of photosynthetic efficiency of all hybrids was 1.65 for T1 and 1.76 for T2. Differences between treatments in photosynthetic efficiency were not determined, probably because at this stage of development of sunflower, soil water saturation of 60% and 80% FWC has no effect on photosynthesis. In both treatments, average value of index of photosynthetic efficiency of hybrids was 1.70. Hybrid H3 (1.15) had the lowest value index of photosynthetic efficiency, while hybrid with the highest value was H10 (2.40). There were significant differences in photosynthetic efficiency between hybrids as a result of their genetic diversity. Differences in leaf temperature between treatments were statistically significant (T1=27.16°C, T2=33.19ºC). Differences among hybrids within treatments were not statistically significant. In treatment, which was maintained at 60% FWC, all hybrids reacted with an increase in leaf temperature due to lack of water and reduce transpiration. In the initial stage of development of sunflower, interaction between hybrids and treatment was not significant for the photosynthetic efficiency and leaf temperature.

Key words: sunflower, photosynthetic efficiency, leaf temperature, stress

Najnovija dostignuća u oplemenjivanju ozime pšenice u Bc Institutu d.d. Zagreb

Rade Mlinar, Ivica Ikić, Marko Maričević, Katarina Jukić

Bc Institut za oplemenjivanje i proizvodnju bilja d.d. Zagreb, Dugoselska 7, Rugvica, 10370 Dugo Selo, Hrvatska (bc-botinec@bc-institut.hr)

Sažetak

Proteklih 65 godina u Bc Institutu se neprestano stvaranju nove sorate ozime pšenice povećanoga genetskog potencijala za rodnost i kvalitetu te povećane adaptabilnosti i stabilnosti. Realizacija programa oplemenjivanja ozime pšenice proizlazi iz kombinacijskih križanja odabranih domaćih i stranih genotipova. Od 2012. godine proizvodni sortiment Bc Instituta bogatiji je za dvije nove odlične sorte ozime pšenice imena Bc Darija i Bc Irma. Ove sorte imaju poboljšanu stabilnost, posjeduju otpornost na najvažnije bolesti pšenice i polijeganje. Sorta Bc Darija je bijela golica, izdvojena je iz kombinacijskog križanja sorata Mv Amanda i NS Rana 5. U pokusima Komisije za priznavanje sorata Republike Hrvatske Bc Darija je ostvarila prosječan prinos od 8580 kg/ha te je bila rodnija od standardnih pšenica za 652 kg/ha u odnosu na Žitarku, 613 kg/ha u odnosu na Srpanjku i 1326 kg/ha u odnosu na Divanu. Novopriznata sorta Bc Irma je bijela brkulja, potomstvo je križanja genotipova 4741/95 i 88-381/1. Prema rezultatima Komisije za priznavanje sorata Republike Hrvatske tijekom dvogodišnjeg ispitivanja ostvarila je visoke prinose na svim lokacijama. Prosječan prinos zrna sorte Bc Irma iznosio je 9197 kg/ha, što je za 1269 kg/ha bolje od sorte Žitarka, 1230 kg/ha bolje od Srpanjke i za 1949 kg/ha bolje od Divane. Obje sorte su srednje rane vegetacije, imaju krupno i dobro ispunjeno zrno, farinogramske grupe B1, II (I) kvalitetnog razreda te pripadaju u skupinu visokorodnih krušnih sortata.

Ključne riječi: ozima pšenica, sorta, oplemenjivanje, prinos, kvaliteta

The latest achievements in winter wheat breeding in the Bc Institute Zagreb

Rade Mlinar, Ivica Ikić, Marko Maričević, Katarina Jukić

The Zagreb Bc Institute for Breeding and Production of Field Crop, Dugoselska 7, Rugvica, 10370 Dugo Selo, Croatia (bc-botinec@bc-institut.hr)

Summary

New winter wheat varieties with increased genetic potential for yield and quality, higher adaptability and stability have been developed over the past 65 years in the Bc Institute. Realization of the winter wheat breeding programme is a result of crossing combinations between selected domestic and foreign genotypes. Since 2012 the assortment of Bc Institute is richer in two new excellent winter wheat varieties named Bc Darija and Bc Irma. These varieties have improved stability and are resistant to the most important wheat diseases and lodging. Variety Bc Darija is a white awnless variety, selected from crossing between varieties Mv Amanda and NS Rana 5. In experiments of the Croatian Committee for Registration of Agricultural Crop Varieties Bc Darija achieved an average yield of 8580 kg/ha which was 652 kg/ha more than the control wheat Žitarka, 613 kg/ha more than Srpanjka and 1326 kg/ha more than Divana. The newly recognized variety Bc Irma is a white awned variety, the offspring of crossing between genotypes 4741/95 and 88-381/1. According to the results of the Croatian Committee for Registration of Agricultural Crop Varieties during the two years it achieved high yields at all locations. Mean yields of the variety Bc Irma was 9197 kg/ha, which was 1269 kg/ha higher than Žitarka, 1230 kg/ha higher than Srpanjka and 1949 kg/ha higher than Divana. Both varieties are mid-early in vegetation, have large and well-filled grains, quality group B1, II (I) grade quality and belong to a group of high yielding bread varieties.

Key words: winter wheat, variety, breeding, yield, quality

Izbor testera pri ispitivanju kombinacijske sposobnosti linija kukuruza na otpornost prema lomu stabljike

Branko Palaveršić, Ivan Živković, Ivica Buhiniček, Antun Vragolović, Marija Kostenjak, Mirko Jukić, Zdravko Kozić

Bc Institut za oplemenjivanje i proizvodnju bilja d.d. Zagreb, Rugvica, Dugoselska 7, 10 370 Dugo Selo, Hrvatska (mjukic@bc-institut.hr)

Sažetak

Gospodarska vrijednost samooplodnih linija kukuruza može se ocijeniti samo u hibridnim kombinacijama. Pored prinosa i vlage zrna u berbi, otpornost prema lomu i polijeganju stabljike su najvažnija svojstva. Cilj ovih istraživanja je bio usporediti kombinacijsku sposobnost otpornosti prema lomu stabljike dva seta od 12 srodnih linija kukuruza testiranjem s dva testera. U tu svrhu 2012. godine na lokaciji Rugvica provedena su dva mikropokusa FAO 400 i 500. Stabljike prvog reda svake parcelice zaražene su s *Colletotrichum graminicola*, a drugi red je ostavljen u prirodnim uvjetima. Umjetna zaraza značajno je povećala prosječan postotak trulih biljaka i to s 9,9% na 78,3% (FAO 400) i s 1,8% na 67,4% (FAO 500). Zbog zaraze s antraknozom, kao posljedicom umjetne infekcije, razlike u otpornosti prema lomu stabljike između ispitivanih test križanaca mogle su se jasno utvrditi. U pokusu FAO 400 test križanci s osjetljivim testerom T1 su u prosjeku osjetljiviji, s 50,9% polomljenih stabljika, u odnosu na test križance s testerom T2 s 21,5% loma stabljike. Osjetljiv tester T1 je dao veći raspon u stupnju otpornosti test križanaca. U pokusu FAO 500 u uvjetima umjetne infekcije prosječan lom stabljike povećan je sa 17,7% na 25,1%. U prirodnim uvjetima lom stabljike je bio posljedica napada kukuruznog moljca. U uvjetima umjetne infekcije prosječan lom stabljike kod test križanaca s testerom T2 iznosio je 23,5%, a s testerom T3 26,6%.

Ključne riječi: kukuruz, antraknoza stabljike, lom stabljike

Tester selection in testing combining ability of maize inbred lines for resistance to stalk breakage

Branko Palaveršić, Ivan Živković, Ivica Buhiniček, Antun Vragolović, Marija Kostenjak, Mirko Jukić, Zdravko Kozić

The Zagreb Bc Institute for Breeding and Production of Field Crops, Rugvica, Dugoselska 7, 10370 Dugo Selo, Croatia (mjukic@bc-institut.hr)

Summary

Economic value of maize inbred lines can be evaluated only in hybrid combinations. Apart from yield and grain moisture, resistance to breakage and lodging are the most important traits. The aim of this research was to compare combining ability of two sets of 12 related maize inbred lines for resistance to stalk breakage by testing them with two testers. For that purpose, two small-scale trials, FAO 400 and 500 were conducted in Rugvica in 2012. Stalks from the first row in each plot were inoculated with *Colletotrichum graminicola*, while the second row was left to natural infection. Artificial infection significantly increased average percentage of rotted plants, from 9.9 % to 78.3 % (FAO 400) and from 1.8 % to 67.4 % (FAO 500). Owing to anthracnose infections resulting from artificial inoculation difference in resistance to stalk breakage among the test crosses were easily identified. In FAO 400 trial test crosses with the susceptible tester, T1, were on the average more susceptible with 50.9 % of broken stalks in comparison with test crosses with the tester T2 (21.5 % of stalk breakage). Under natural conditions stalk breakage was a result of corn borer attack. Under conditions of artificial inoculation average stalk breakage in test crosses was 23.5 % and 26.6 % with the tester T2 and T3 respectively.

Key words: maize, stalk anthracnose, stalk breakage

Procjena genetske različitosti hrvatskih sorata pšenice upotrebom SSR i AFLP markera

Sonja Petrović[1], Sonja Marić[1], Tihomir Čupić[2], Georg Drezner[2], Ildikó Karsai[3], Vlado Guberac[1], Milutin Bede[1], Đurđica Ačkar[4], Drago Šubarić[4]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (spetrovic@pfos.hr)*
[2]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska*
[3]*Agricultural Institute, Centre for Agricultural Research, Hungarian Academy of Sciences, Brunzvik u.2, Martonvásár, Hungary*
[4]*Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, Osijek, Hrvatska*

Sažetak

Razvoj i održivost genetske različitosti germplazme ozime pšenice jedan je od osnovnih uvjeta za uspjeh u budućim oplemenjivačkim programima. Odabir divergentnih i genetski različitih roditelja najvažniji je korak u stvaranju novih superiornih sorata. Opasnost od genetske erozije je pogotovo prisutna u manjim oplemenjivačkim programima koji imaju manji ograničenih proizvodnih površina u kojima se selekcija odvija u sličnim uvjetima uzgoja. Upotreba molekularnih markera u procjeni genetske različitosti sorata ozime pšenice je ograničena u hrvatskim oplemenjivačkim programima. Cilj ovoga istraživanja je bio procijeniti genetsku različitost hrvatske sorata ozime pšenice koristeći SSR i AFLP markere. U istraživanje je bilo uključeno 40 sorata ozime pšenice iz hrvatskih i stranih oplemenjivačkih centara. Korišten je set od 26 mikrosatelitnih početnica s kojima se nastojao pokriti genom pšenice sa 42 kromosoma. Prosječna genetska udaljenost iznosila je 0,66. Najveća udaljenost zabilježena je između sorata Zlatna dolina i Lela (d_{ij}=0,98), dok su najsličnije sorte bila Super Žitarka i Barbara s genetskom udaljenosti od d_{ij}=0,21. Pomoću četiri kombinacije AFLP početnica proizvedeno je ukupno 108 polimorfnih fragmenata sa prosjekom od 34 fragmenta po kombinaciji. Prosječno je utvrđeno 27 polimorfnih alela po kombinaciji i prosječnom vrijednosti PIC od 0,34. Specifični AFLP fragmenti uspješno su razlučili tri sorte pšenice: Žitarku, Super Žitarku i Barbaru te se stoga mogu koristiti za njihovu identifikaciju. Grupiranje sorata bilo je u skladu s njihovim podrijetlom i podacima o pedigreu.

Ključne riječi: pšenica, genetska različitost, SSR, AFLP

Assessment of genetic diversity in Croatian winter wheat varieties using SSR and AFLP markers

Sonja Petrović[1], Sonja Marić[1], Tihomir Čupić[2], Georg Drezner[2], Ildikó Karsai[3], Vlado Guberac[1], Milutin Bede[1], Đurđica Ačkar[4], Drago Šubarić[4]

[1]*Faculty of Agriculture, University of J.J. Strossmayer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (spetrovic@pfos.hr)*
[2]*Institute of Agriculture in Osijek, Južno predgrađe 17, Osijek, Croatia*
[3]*Agricultural Institute, Centre for Agricultural Research, Hungarian Academy of Sciences, Brunzvik u.2, Martonvásár, Hungary*
[4]*Faculty of Food and Technology, Franje Kuhača 20, Osijek, Croatia*

Summary

Sustaining and developing of genetic diversity in winter wheat germplasm is one of the main prerequisite for success in future winter wheat breeding programs. Selection of diverse parents is essential for creation of superior new varieties. Danger of genetic erosion specially exists in smaller breeding programs and selection for limited production area with similar growing conditions. Croatian winter wheat breeding has a long tradition but it is relatively small compared to countries with bigger growing areas. Use of molecular markers in evaluating genetic diversity of winter wheat varieties is limited in Croatian breeding programs. Therefore, aim of this study was to evaluate genetic diversity of Croatian winter wheat varieties using SSR and AFLP markers as a powerful tool for assessing genetic diversity. Forty winter wheat varieties, from three Croatian breeding centers and foreign centers were included in the study. A set of 26 microsatellite primers were used, covering three wheat genomes and 42 chromosomes by 0.66 average genetic distance. The largest calculated distance was between the varieties Zlatna Dolina and Lela (d_{ij}=0.98), while most similar varieties were Super Žitarka and Barbara with the distance value of d_{ij}=0.21. Four AFLP marker combinations generated 108 polymorphic bands with average of 34 specific bands per primer combination. On the average 27 polymorphic bands were generated with average PIC value of 0.34. Specific polymorphic bands were discriminant for the three varieties Žitarka, Super Žitarka and Barbara, which, therefore, can be used for their identification. Grouping of varieties was in accordance with their origin (breeding center) and pedigree data.

Key words: wheat, genetic diversity, SSR, AFLP

Distribucija alelnih varijanti germplazme heksaploidne pšenice na lokusima *Xgwm*261 i *Ppd*-D1

Sonja Petrović[1], Sonja Marić[1], Tihomir Čupić[2], Georg Drezner[2], Ildikó Karsai[3], Vlado Guberac[1], Milutin Bede[1], Đurđica Ačkar[4], Drago Šubarić[4]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (spetrovic@pfos.hr)*
[2]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska*
[3]*Agricultural Institute, Centre for Agricultural Research, Hungarian Academy of Sciences, Brunzvik u.2, Martonvásár, Hungary*
[4]*Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, Osijek, Hrvatska*

Sažetak

Velik broj svojstava koje oplemenjivači traže u željenim genotipovima kontrolirana su od strane gena koji utječu na visinu biljke i osjetljivost na fotoperiod. Danas promjena klimatskih prilika u tradicionalnim uvjetima uzgoja uzrokuju visoke temperature i sušu. Korištenje različitih *Rht* (*Reduced Height Gene*) te gena odgovornih za osjetljivost na fotoperiod (*Ppd*) mogu biti od velike pomoći u oplemenjivačkim programima pšenice, posebice u selekciji genotipova otpornih na stres koji će biti prilagođeni različitim okolinama. Mikrosatelit gwm261 je smješten na lokusu *Xgwm*261 koji je 0,6 cM udaljen od *Rht*8 gena na 2DS kromosomu te koji može uključivati i *Ppd*1 gen za neosjetljivost na fotoperiod. Rezultati dobiveni na temelju PCR reakcije pokazuju da u hrvatskoj germplazmi prevladava alel sa 192 parova baza, na lokusu *Xgwm*261 te alel za neosjetljivost na fotoperiod (*Ppd*-D1*a*). Rezultati ovoga istraživanja mogu biti korisni za preciznije vrednovanje i odabir hrvatskih i stranih sorata kao roditelja u križanjima radi stvaranja boljih adaptabilnih sorata.

Ključne riječi: pšenica, alelna varijabilnost, lokus *Xgwm*261, lokus *Ppd*-D1

Distribution of allelic variants of hexaploid wheat germplasm at *Xgwm*261 and *Ppd-D*1 locus

Sonja Petrović[1], Sonja Marić[1], Tihomir Čupić[2], Georg Drezner[2], Ildikó Karsai[3], Vlado Guberac[1], Milutin Bede[1], Đurđica Ačkar[4], Drago Šubarić[4]

[1]*Faculty of Agriculture, University of J.J. Strossmayer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (spetrovic@pfos.hr)*
[2]*Institute of Agriculture in Osijek, Južno predgrađe 17, Osijek, Croatia*
[3]*Agricultural Institute, Centre for Agricultural Research, Hungarian Academy of Sciences, Brunzvik u.2, Martonvásár, Hungary*
[4]*Faculty of Food and Technology, Franje Kuhača 20, Osijek, Croatia*

Summary

Traits like plant height and response to photoperiod are involved in controlling many quality characteristics that breeders look into the desired genotype. Today, climatic changes in traditional wheat growing regions cause day temperature rising and water supply shortening. Exploitation of various semi-dwarfing (*Rht*) and photoperiod response (*Ppd*) genes could help the implementation of wheat breeding programs, especially selection of stabile and stress adaptable varieties targeted for different environments. Microsatellite gwm261 is located on *Xgwm*261 locus, and it is 0.6 cM distant from *Rht*8 gene on 2DS chromosome, which can also include *Ppd*1 gen for insensitivity to photoperiod. PCR screening of Croatian and foreign wheat varieties showed prevalence of 192 bp allele at *Xgwm*261 locus and photoperiod insensitive allele (*Ppd*-D1*a*). The results of this research could be useful for more accurate characterization and selection of Croatian wheat cultivars and foreign ones aiming to cross and create new adaptable varieties.

Key words: wheat, allelic variability, *Xgwm*261 locus, *Ppd*-D1 locus

Cadmium effects on α-tubulin organization in root-meristem cells of tomato

Daniel Pizzaia, Fernando A. Piotto, Ricardo A. Azevedo

Escola Superior de Agricultura "Luiz de Queiroz", Universidade de São Paulo, Avenida Pádua Dias 11, Piracicaba, Brasil (raa@usp.br)

Summary

Soil contamination by cadmium (Cd) may lead to crop yield reductions. Cd contamination has increased in the soil as a consequence of anthropogenic activities. Tomato (*Solanum lycopersicum* L.) is an important crop widely cultivated and an excellent model for plant studies. The effects of Cd on dividing root-tip cells of the tomato cv. MicroTom were investigated with α-tubulin. We analyzed seedlings cultivated under defined conditions (presence or absence of Cd). Using anti-α-tubulin indirect immunofluorescence microscopy, we found four different types of microtubules (MT) structures. These structures appeared to be depended upon the stage of the cell cycle: the interphase array, preprophase band, mitotic spindle and phragmoplast were typical for the control cells. The organization of the MT cytoskeleton had its control mechanism affected by Cd and induced aberrations in interphase and mitotic dividing cells. Cd induced the formation of atypical MT arrays in the cortical cytoplasm of the interphase cells, consisting of MT fragments, wavy MT bundles and ring-like tubulin aggregations. In some cases, MTs disintegrated into shorter fragments or they completely disappeared, indicating MT depolymerization. Cd also induced a disorder of the mitotic spindles and caused errors on chromosome movements characterized by loss, break, bridge, c-metaphase and polyploidization. These mitotic divisions represented only 1.6% of the total cells and the mitotic index is significant using Kruskal-Wallis test ($P<0.05$). We suggest that the most probable action of Cd on tomato cells occurs firstly on MT cytoskeleton which may also be important when Cd toxicity/tolerance is concerned in tomato.

Key words: heavy metal, plant, microtubule, tubulin, chromosome aberration

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Utjecaj oborina na prinos sjemena ozimog stočnog graška u razdoblju od 2004. do 2012. godine

Svetislav Popović, Marijana Tucak, Tihomir Čupić

Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (svetislav.popovic@poljinos.hr)

Sažetak

Ozimi stočni grašak (*Pisum arvense* L.), poznat i kao Austrian winter peas, sve se više sije u Hrvatskoj i njenom okruženju za proizvodnju kvalitetne voluminozne krme. Osnovne značajke ove kulture su: kratka vegetacija, visoki prinosi mase (zelena masa, sijeno, sjenaža) i odlična kakvoća koja se ogleda kroz visoku produkciju bjelančevina. Sjemenska proizvodnja ozimog stočnog graška vrlo je složena, najviše radi same građe biljke i visine stabljike. Visina stabljike na kraju vegetacije iznosi od 1,5 do 2 metra uslijed čega zbog težine mahuna stabljika poliježe što znatno otežava žetvu. U poljoprivrednoj proizvodnji na visinu prinosa djeluje genetski potencijal sijane sorte te okolinski uvjeti tijekom vegetacije, a prije svih količina oborina u vegetacijskom razdoblju. Stoga je učinjena analiza sjemenske proizvodnje ozimog stočnog graška, sorte Osječki zeleni na Poljoprivrednom institutu Osijek te klimatskih prilika za devetogodišnje razdoblje (2004.-2012. godine). Utvrđene su velike oscilacije kako u prinosu, klijavosti i masi 1000 sjemenki tako i u količini oborina tijekom vegetacijskog perioda ozimog graška u analiziranim godinama. Korelacijska analiza po Pearsonu pokazala je nepostojanje povezanosti između prinosa, klijavosti i mase 1000 sjemena te analiziranih parametara i ukupne količine oborina u vegetacijskom periodu, ali niti s količinom oborina po mjesecima, iz čega se može zaključiti da su promatrani parametri pod znatnim utjecajem drugih okolinskih čimbenika.

Ključne riječi: ozimi stočni grašak, sjemenska proizvodnja, oborine

Precipitation influence on the yield of pea seeds in the period 2004-2012

Svetislav Popović, Marijana Tucak, Tihomir Čupić

Agricultural Institute Osijek, Juzno predgrađe 17, Osijek, Croatia (svetislav.popovic@poljinos.hr)

Summary

Forage pea (*Pisum arvense* L.), also known as Austrian winter pea, is increasingly being planted in Croatia and its environment to produce high-quality forage. Main characteristic of the culture are: short vegetation, high yields of mass (green mass, hay, haylage) and excellent quality that is reflected in the high production of protein. Seed production of pea is very complex process, mostly because of the plant structure and plant height. Plant height at the end of the growing season varied between 1.5 to 2 meters due to which lodging can occur because of the weight of the pod, which significantly complicates harvest. In agricultural production the yield is under the influence of plant genetic potential and environmental factors especially of the amount of precipitation during the growing season. Therefore, the analysis of seed pea production of variety Osječki zeleni at the Agricultural Institute Osijek was made, and analyses of climatic conditions for the nine-year period (2004-2012) were made. Analyses showed the large fluctuations in yield, germination and 1000 seed weight and oscillations in the amount of precipitation during the growing period of winter peas in the analyzed years. Pearson correlation analysis showed a lack of relation between yield, germination and 1000 seed weight. There was no correlation observed between tested parameters and the total amount of precipitation during the growing period, and between analyzed parameters and the amount of precipitation per month, from which it can be concluded that the observed parameters were substantially influenced by other environmental factors.

Key words: forage pea, seeds production, precipitation

Rezultati makropokusa hibrida suncokreta od 2002. do 2012. godine

Branimir Šimić, Luka Andrić, Miroslav Krizmanić, Josip Šimenić, Goran Krizmanić, Hrvoje Plavšić

Poljoprivredni institut Osijek, Južno predgrađe 17, 31 000 Osijek, Hrvatska (branimir.simic@poljinos.hr)

Sažetak

U radu su analizirani rezultati makropokusa hibrida suncokreta od 2002.-2012. godine na lokalitetu PIK Vinkovci PC Sopot. U pokusima su bili zastupljeni hibridi poznatih svjetskih kompanija, a broj hibrida u pokusu je bio od 13 do 31. Testiranjem hibrida suncokreta u makropokusima utvrđen je 11-godišnji prosječan sadržaj vode u zrnu (%), urod zrna (dt/ha), sadržaj ulja (%) i urod ulja (kg/ha). Sva navedena svojstva hibrida suncokreta u pokusu su varirala. Sadržaj vode u zrnu bio je najmanji 2012. godine od 5,12%. Prosječan urod zrna bio je 32,37 dt/ha, a varirao je od 11,3 dt/ha 2005. godine do 43,55 dt/ha 2003. godine. Prosječan sadržaj ulja bio je 45,77%, najmanji 42,46% 2005., a najveći 48,17% 2007. godine. Prosječan urod ulja tijekom svih godina istraživanja, neovisno o hibridu, iznosio je 1,39 t/ha. Najmanji urod ulja zabilježen je 2004. (1.206 kg/ha), a najveći 2003. godine (2,030 kg//ha).Na temelju analize rezultata makropokusa od 2002. do 2012. godine na lokalitetu Vinkovci može se zaključiti da su oplemenjivačkim i sjemenarskim radom postignuti značajni rezultati na stvaranju novih hibrida koji imaju povećan genetski potencijal rodnosti i sadržaja ulja. Dobiveni podaci istraživanja ukazuju da na urod zrna i urod ulja hibrida suncokreta značajno utječu vremenske prilike u proizvodnoj godini (količina i raspored oborina te temperature zraka). Na temelju svih navedenih činjenica može se reći da sam izbor hibrida nije presudan čimbenik u proizvodnji suncokreta

Ključne riječi: suncokret, makropokusi, urod zrna, sadržaj ulja, urod ulja

Results of sunflower hybrids in macro-trials since 2002 to 2012 year

Branimir Šimić, Luka Andrić, Miroslav Krizmanić, Josip Šimenić, Goran Krizmanić, Hrvoje Plavšić

Agricultural Institute Osijek, Južno predgrađe 17, 31 000 Osijek, Croatia (branimir.simic@poljinos.hr)

Summary

This paper analyzes the results of macro-trials sunflower hybrids from 2002 to 2012 at location PIK Vinkovci (PC Sopot). In the experiments were presented hybrids from known world companies. Number of hybrids in the trial were from 13 to 31. Testing hybrids in macro trials was determined by 11-year average: grain moisture (%), grain yield (dt/ha), oil content (%) and oil yield (kg/ha). All the mentioned traits of sunflower hybrids in the trial varied. The water content in the grain was the lowest in 2012 (5.12%). Average grain yield was (32.37 dt/ha) and varied (11.3 dt/ha) from 2005 to (43.55 dt/ha) in 2003. The average oil content was (45.77%) and the lowest was (42.46%) in 2005, and the highest (48.17%) in 2007. The average oil yield during all the years of research, regardless of hybrid, was 1.39 t/ha. The lowest oil yield was (1206 kg/ha) in 2004 and the largest (2030 kg/ha) in 2003. Based on the analysis of the macro-trials results (locality Vinkovci) since 2002 till 2012, it may be concluded that the breeding and seed production obtained significant results in the creation of new hybrids that have increased genetic potential for grain yield and oil content.Obtained data suggest that research on grain and oil yield of sunflower hybrids under influence of weather conditions in the production year (the amount and distribution of precipitation and air temperature). Based on all the above results it can be concluded that the choice of hybrids is not the determining factor in the production of sunflower.

Keywords: sunflower, macro-trials, grain yield, oil content, oil yield

Precizno kartiranje lokusa kvantitativnih svojstava za akumulaciju metala u listu IBM populacije kukuruza

Domagoj Šimić, Sonja Grljušić, Tatjana Ledenčan, Tomislav Duvnjak, Zvonimir Zdunić

Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (domagoj.simic@poljinos.hr)

Sažetak

Iako se kukuruz već desetljećima istražuje radi mijenjanja koncentracija metala u različitim tkivima, tek odnedavno ovakvi ciljevi dobivaju na još većem značaju u programima biofortifikacije i fitoremedijacije. U međukrižanoj B73 × Mo17 (IBM) populaciji kukuruza određivali smo koncentracije osam metala u listu ispod klipa kako bi se vrlo precizno kartirali lokusi kvantitativnih svojstava (QTL) pomoću 2161 molekularnih biljega raspoređenih po cijelom genomu. QTL analiza je otkrila devet signifikantnih QTL-ova za koncentraciju kadmija, bakra, željeza, kalija, magnezija i stroncija u dvije okoline. Medijan razlučivosti QTL intervala bio je 5.2 IcM, ili, ekvivalentno, manje od 1 cM na standardnoj karti F_2 populacije, što predstavlja veliki napredak u odnosu na medijan u našem prijašnjem istraživanju (8 cM) kod standardne B84 × Os6-2 biparentalne populacije. U ovom istraživanju nismo detektirali kolokalizirane QTL-ove. QTL kartiranje visoke razlučivosti u IBM populaciji nije potvrdilo detektirane QTL-ove iz istraživanja B84 × Os6-2 populacije, osim samo jednog major QTL-a na kromosomu 2 za akumulaciju kadmija. Naši rezultati omogućuju daljnja preciznija genetička i fizikalna kartiranja za akumulaciju metala kod kukuruza što će u konačnici razložiti QTL-ove do pojedinačnih gena.

Ključne riječi: IBM populacija, kukuruz, list, metali, QTL

Precise QTL mapping of metal accumulation in leaf of the maize IBM population

Domagoj Šimić, Sonja Grljušić, Tatjana Ledenčan, Tomislav Duvnjak, Zvonimir Zdunić

Agricultural institute Osijek, Južno predgrađe 17, Osijek, Croatia (domagoj.simic@poljinos.hr)

Summary

Maize has been investigated for decades for altering metal concentrations in various tissues, but the interest has been recently intensified because of biofortification and phytoremediation programs. We evaluated the intermated B73 × Mo17 maize population (IBM) for concentrations of eight metals in ear-leaf to map quantitative trait loci (QTL) with 2161 molecular markers across the genome. QTL analysis revealed 9 significant QTLs for concentrations of cadmium, copper, iron, potassium, magnesium and strontium combined over two environments. Median resolution for the QTL interval was 5.2 IcM, or less than 1 cM on a regular F2 map, which is a big improvement compared with the prior mapping (8 cM). No QTLs were found to be colocalized. High-resolution QTL mapping in the IBM population did not confirm our earlier QTL results in the population B84 × Os6-2. The only exception is confirmation of the major QTL for cadmium accumulation on chromosome 2. Our results could facilitate further genetic and physical mapping for metal accumulation in maize eventually resolving QTLs down to genes.

Key words: IBM population, leaf, maize, metals, QTL

Malting quality of winter and spring barley varieties

Gordana Šimić, Alojzije Lalić, Daniela Horvat, Josip Kovačević, Ivan Abičić

Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia (gordana.simic@poljinos.hr)

Summary

The aim of this study was to estimate the malting quality of barley varieties of different seasonal type. Field trials included six cultivars grown in locations of Osijek and Nova Gradiška for three successive years. Zlatko, Barun and Vanessa are two-rowed winter type barley varieties and Fran, Matej and Scarlett are spring barley varieties. The results of malt extract content showed significant differences among winter and spring varieties under different growing conditions. In general spring barley varieties had a higher content of malt extract, lower difference between the extract contents produced from fine and coarse grinded malt, lower wort viscosity, higher level of *β*-glucanase reaction and higher friability in comparison to winter varieties. However, the results from locations showed no evidence which would point out the statistically significant difference in terms of extract content, together with malt degradation parameters.

Key words: barley, malting quality, malt extract, wort viscosity

QSSR prediction of HPLC retention time of triacylglycerols in soybean oil obtained by supercritical CO_2 extraction

Rezica Sudar[1], Stela Jokić[2], Senka Vidović[3], Aleksandra Sudarić[1], Zvonimir Zdunić[1], Sanja Podunavac-Kuzmanović[3], Lidija Jevrić[3]

[1]*Agricultural Institute Osijek, Juzno predgrade, 17, 31000 Osijek, Croatia (rezica.sudar@poljinos.hr)*
[2]*Faculty of Food Technology, University of J.J. Strossmayer in Osijek, F. Kuhaca 20, 31000 Osijek, Croatia*
[3]*Faculty of Technology, University of Novi Sad, Bulevar Cara Lazara 1, 21000 Novi Sad, Serbia*

Summary

Soybean oil fractions were obtained by collecting extract at different time intervals during supercritical CO_2 extraction. The influence of pressure (300–500 bar), temperature (40–60 °C), CO_2 flow rate (0.194–14.125 kg/h) and particle size (0.238–1.059 mm) were investigated. The concentration of triacylglycerols in different fractions of soybean oil obtained at different extraction process conditions was determined. Triacylglycerols were analyzed by reversed phase high performance liquid chromatography (HPLC) with refractive index detector and identified by comparing their retention time to standards. Quantitative structure-retention relationship (QSRR) is undoubtedly of great importance in modern chemistry and biochemistry. QSRR analysis is a useful technique, which quantify the relation between the structure of the molecule and the chromatographic retention times of the compounds, allowing the prediction of the retention times. QSRR currently are being applied in many disciplines, such as in drug design and environmental risk assessment. QSRR offers the possibility for screening a large number of chemicals in a short time and with low cost. In view of the above, the objective of this investigation was to establish a new QSRR model for predicting retention times of some triacylglycerols using chemometric linear least squares (LLS) procedure. QSRR study has been carried out for training set of 17 triacylglycerols to correlate and predict the HPLC retention time of studied compounds. Molecular modelling and QSRR analysis were performed to find the quantitative effects of the lipophilicity of the compounds on their retention behaviour. An accurate mathematical model was developed for predicting the HPLC retention time of some triacylglycerols. The validity of the model has been established using Leave-One-Out (LOO) cross validation. The statistical measures such as r^2, r^2_{CV}, and F value of this model were 0.914, 0.885 and 158.98 respectively, revealing the credibility of the model. The established model was used to predict the retention time of the investigated compounds and close agreement between experimental and predicted values was obtained. The low residual values suggest a good predictive ability of the developed QSRR model. It indicates the retention time of series of triacylglycerols can be successfully modelled using lipophilicity descriptor, log$P$.

Key words: QSRR, triacylglycerols, soybean oil, supercritical CO_2 extraction

Primjena molekularnih markera u izboru roditeljske germplazme lucerne

Marijana Tucak[1], Svetislav Popović[1], Tihomir Čupić[1], Vladimir Meglič[2]

[1]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (marijana.tucak@poljinos.hr)*
[2]*Agricultural Institute of Slovenia, SI-Hacquetova 17, Ljubljana, Slovenia*

Sažetak

Cilj istraživanja bio je utvrditi povezanost između genetski različitih/sličnih roditeljskih komponenti lucerne, izabranih na temelju genetske udaljenosti procijenjene RAPD markerima i prinosa biomase te najznačajnijih komponenti prinosa F_1 potomstava. Osam roditeljskih kombinacija (pet pojedinačnih biljaka/kombinacija križanja) kod kojih je utvrđena mala/velika genetska udaljenost ručno je križano u poljskim uvjetima tijekom srpnja 2007. godine. Tijekom dvije uzastopne godine uzgoja (2008. i 2009.) ispitivano je F_1 potomstvo i izabrana roditeljska germplazma lucerne svake kombinacije križanja. Poljski pokus je postavljen po metodi slučajnog bloknog rasporeda u četiri ponavljanja. Na svim pojedinačnim biljaka svakog potomstva/roditelja utvrđen je prinos zelene mase i suhe tvari, visina biljaka te broj stabljika u svakom otkosu obje vegetacijske godine, osim za broj stabljika koji je utvrđivan u drugom otkosu 2009. godine. Rezultati provedenoga istraživanja ukazali su na postojanje pozitivne veze između genetski raznolike germplazme lucerne i prinosa njihova F_1 potomstva. Većina potomstva stvorena križanjem genetski raznolikih roditeljskih komponenti imala je veći prinos i vrijednosti ostalih promatranih svojstava, u odnosu na vrijednosti potomstava dobivenih križanjem genetski sličnih roditelja. Potvrđena je korisnost molekularnih markera u identifikaciji sličnosti/različitosti germplazme lucerne. Postavljanje poljskih pokusa s ciljem identifikacije potencijalnih heterotičnih skupina temeljeno na osnovi saznanja dobivenih primjenom molekularnih markera bit će učinkovitije, produktivnije i ekonomičnije. Rezultati istraživanja na molekularnoj razini značajno će doprinijeti skraćivanju selekcijskog procesa nastanka novih sorti te unaprjeđenju našega oplemenjivačkog programa lucerne.

Ključne riječi: lucerna, genetska udaljenost, izbor roditelja, križanje, potomstvo

Use of molecular markers in parental selection of alfalfa germplasm

Marijana Tucak[1], Svetislav Popović[1], Tihomir Čupić[1], Vladimir Meglič[2]

[1]*Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia (marijana.tucak@poljinos.hr)*
[2]*Agricultural Institute of Slovenia, SI-Hacquetova 17, Ljubljana, Slovenia*

Summary

The aim of this research was to determine the relationships between genetically dissimilar/ similar parental components of alfalfa based on genetic distance estimated by RAPD markers, with yield and yield-related components of F_1 progenies derived from them. Eight combinations of parents (five pairs of individual plants/cross combination) with large and small genetic distances were hand-crossed at the field during July 2007. F_1 progenies and their selected parental alfalfa germplasm of each cross combination were evaluated during two consecutive years (2008 and 2009). Field experiment was designed as a randomised complete block with four replications. Data for yields of green mass and dry matter, plant height and stem number were collected on all individual plants of each progeny/parent in all cuts of both growing seasons, except stem number which was determined only in second cut of 2009. The results of this investigation indicated positive relation between genetic diversity of parental germplasm and yield of their progenies. Most of the progenies created from crosses between genetically divergent parental components had higher yield and yield-related traits than progenies obtained from crosses between genetically similar parents. The results confirmed usefulness of molecular marker application in identification of alfalfa germplasm similarity/dissimilarity. Designing field trials for identification of promising heterotic groups, which was based on molecular markers information tends to be more efficient, more productive, and less costly. The results of research based on the molecular level will significantly contribute to shorten the time of selection process in the creation of new varieties and will improve our alfalfa breeding program.

Key words: alfalfa, genetic distance, parental selection, crosses, progeny

Trogodišnje istraživanje megaokolina za prinos zrna kukuruza u Hrvatskoj i Turskoj

Zvonimir Zdunić[1], Antun Jambrović[1], Tatjana Ledenčan[1], Josip Brkić[1], Andrija Brkić[1], Ülkü Er[2], Ersan Atakul[2], Hamdi Akkurt[2], Ivan Brkić[1], Domagoj Šimić[1]

[1]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (zvonimir.zdunic@poljinos.hr)*
[2]*Tareks A. Ş., Altınova-Ayvalık, Turska*

Sažetak

Trogodišnje istraživanje megaokolina za prinos zrna 22 hibrida kukuruza je provedeno u sklopu znanstvenoga projekta financiranog od strane Ministarstva znanosti obrazovanja i sporta (MZOS), a kao dio dugogodišnje suradnje s firmom Tareks iz Turske. Cilj istraživanja je bio odrediti broj megaokolina – regija koje su po strukturi prinosa različitih hibrida oplemenjivački međusobno slične s ciljem utvrđivanja strategije za daljnji oplemenjivački rad. Pokusi su postavljeni 2010., 2011. i 2012. godine na dvije lokacije u Hrvatskoj i četiri lokacije u Turskoj gdje su odvojeni pokusi posijani u dvije vegetacijske sezone. U statističkoj analizi korištena je multivarijatna „pattern" metoda za utvrđivanje diskontinuiranih uzgojnih regija. Naši rezultati pokazali su da okoline u Hrvatskoj i okoline u drugoj vegetacijskoj sezoni su slične prema strukturi (pattern) prinosa zrna, dok skup okolina iz prve vegetacijske sezone formira drugu grupu. Ovo ukazuje da zapravo postoje dvije megaokoline: prva megaokolina su lokacije u Hrvatskoj i okoline u Turskoj u drugoj sjetvi, a druga megaokolina su okoline u Turskoj posijane u drugoj sjetvi neovisno o godini pokusa i geografskoj poziciji pojedine lokacije. Implikacije ovih rezultata na strategiju oplemenjivanja kukuruza za Hrvatsku i Tursku bit će raspravljene u prezentaciji.

Ključne riječi: Hrvatska, interakcija genotip x okolina, kukuruz, prinos zrna, Turska

Three-year testing of megaenvironments for maize grain yield in Croatia and Turkey

Zvonimir Zdunić[1], Antun Jambrović[1], Tatjana Ledenčan[1], Josip Brkić[1], Andrija Brkić[1], Ülkü Er[2], Ersan Atakul[2], Hamdi Akkurt[2], Ivan Brkić[1], Domagoj Šimić[1]

[1]*Agricultural institute Osijek, Južno predgrađe 17, Osijek,Croatia (zvonimir.zdunic@poljinos.hr)*
[2]*Tareks A. Ş., Altınova-Ayvalık, Turkey*

Summary

Three-year testing of megaenvironments for grain yield of 22 maize hybrids were made possible by a grant of Ministry of Science, Republic of Croatia, as part of long-term cooperation with Tareks Company, Turkey. Objective was to determine number of megaenvironments – regions with similar grain yield patterns of maize hybrids in order to define maize breeding strategy. Trials were set in 2010, 2011 and 2012 at two locations in Croatia and four locations in Turkey where separate trials were planted in two growing seasons per year. Multivariate pattern analysis was applied as a method to identify discontinuous growing megaenvironments. Our results showed that environments in Croatia and environments of second growing season in Turkey had similar grain yield pattern in hybrids, whereas environments of first growing season made second pattern group. It suggests that there are two meganvironments: the first meganvironment consists of locations in Croatia and the second growing season, while the second megaenvironment includes the first goring season in Turkey irrespective to the particular year and geographical positions of locations. Implications of these results to maize breeding strategy for Croatia and Turkey will be discussed.

Key words: Croatia, genotype by environment interactions, maize, grain yield, Turkey

Tuberization and phenotypic tuber characteristics of wild and cultivated *Solanum* genotypes

Dukagjin Zeka[1], Petr Sedlák[1], Vladimíra Sedláková[1], Jaroslava Domkářová[2]

[1]*Department of Genetic and Breeding, Faculty of Agrobiology, Food and Natural Resources, Czech University of Life Sciences in Prague Kamycka 129, Praha 6 - Suchdol, Czech Republic (zeka@af.czu.cz, dukagjinzeka@yahoo.com)*
[2] *Department of Genetics Resources, Potato Research Institute Ltd., Dobrovského 2366, Havlíčkův Brod, Czech Republic*

Summary

The aim of this study was to test tuberization of wild and cultivated *Solanum* species and evaluate characteristics of tubers according to EVIGEZ (Plant Genetic Resources Documentation in the Czech Republic) descriptors in agro-ecological conditions of the Czech Republic. The two-year research included 28 *Solanum* genotypes, five cultivated species and 23 wild species. Genetic material was provided from potato *in vitro* gene bank, part of potato research institute, in Havlíčkův Brod. In the end of 2010, *in vitro* preserved genotypes were brought and assessed in Department of Genetics and Breeding (DGB). The genotypes from test tubes were propagated in the jars 0.1l with standard MS medium (Sigma). Ten plants of each genotype were transferred to the perlite substrate in boxes for adaptation in environmental conditions, than cultivated *ex vitro* in greenhouse. At the end of May seedlings were planted in experimental field. Field experiment was completely randomized with two replications. Harvest was done manually in the beginning of October. Phenotypic evaluation was done according to EVIGEZ descriptor list for following eleven characteristics: shape, flatness, regularity shape, size, regulatory size, type, eye depth, skin type, skin colour, colour distribution and flesh colour. All tested genotypes created tubers, but tubers differed in size and number. Large phenotype diversity between tubers for particular traits was noticed, and according to similarities were done groups for each characteristic. Numbers of groups depending in characteristics varied from three for tuber colour distribution to seven for tuber shape, other characteristics were grouped between these ranges.

Key words: *Solanum*, genotypes, tuberization, characterization, EVIGEZ

Umjetna infekcija zrna s *Fusarium verticillioides* u oplemenjivanju kukuruza na otpornost prema truleži klipa

Ivan Živković[1], Tihomir Jozinović[1], Zdravko Kozić[1], Antun Vragolović[1], Ivica Buhiniček[1], Mirko Jukić[1], Hrvoje Šarčević[2], Branko Palaveršić[1]

[1]Bc Institut za oplemenjivanje i proizvodnju bilja d.d. Zagreb, Rugvica, Dugoselska 7, 10370 Dugo Selo, Hrvatska, (ivanzivkovic@yahoo.com)
[2]Agronomski Fakultet Sveučilišta u Zagrebu, Svetošimunska 25, 10000 Zagreb, Hrvatska

Sažetak

Fusarium verticillioides je jedan od najznačajnijih patogena kukuruza u svijetu. Veliku pozornost zaslužuje kao uzročnik truleži klipa i proizvođač mikotoksina fumonizina. Oplemenjivanje na otpornost je najučinkovitiji način zaštite od ove bolesti. Cilj istraživanja bio je provjera pouzdanosti vlastite tehnike inokulacije zrna sa *F. verticillioides* i pronalaženje izvora otpornosti. Svake godine ispitana je otpornost 25 linija kukuruza. Dobivene su značajne razlike u stupnju otpornosti u rasponu od 1,6 do 4,9 (2011.) i od 1,2 do 5,4 (2012.). Utvrđena je dobra podudarnost ocjena 13 linija kroz dvije godine istraživanja. Prema dvogodišnjim rezultatima linija Bc 80086 je najotpornija s prosječnom ocjenom 1,4 te predstavlja potencijalni izvor otpornosti. Također su otporne i linije Bc 80085 i Bc 281, ispitane samo 2012. U pokusu s hibridima uspoređeno je nekoliko tehnika inokulacije klipa s *F. verticillioides*. Najveći raspon u stupnju otpornosti dala je usvojena tehnika inokulacije iglom (1,5-2,9). Zbog sušnih uvjeta zaraza klipa bila je niska, u prosjeku 1,7 te će se istraživanje nastaviti.

Ključne riječi: kukuruz, *Fusarium verticillioides*, umjetna infekcija, trulež klipa

Artificial inoculation of kernel with *Fusarium verticillioides* in maize breeding for resistance to ear rot

Ivan Živković[1], Tihomir Jozinović[1], Zdravko Kozić[1], Antun Vragolović[1], Ivica Buhiniček[1], Mirko Jukić[1], Hrvoje Šarčević[2], Branko Palaveršić[1]

[1]The Zagreb Bc Institute for Breeding and Production of Field Crops, Rugvica, Dugoselska 7, 10370 Dugo Selo, Croatia (ivanzivkovic@yahoo.com)
[2] Faculty of Agriculture,University of Zagreb, Svetošimunska 25, 10000 Zagreb, Croatia

Summary

Fusarium verticillioides is one of the most important maize pathogens. It deserves great attention as cause of ear rot and fumonisins producer. Maize breeding represents the most efficient way of protection against this disease. Objective of this research was testing of reliability of our own inoculation technique and finding source of resistance. Every year resistance of 25 inbred lines was tested. Significant differences in degree of resistance were found, they ranged from 1.6 to 4.9 (2011) and from 1.2 to 5.4 (2012). Ranges of 13 inbred lines coincided well during two years of research. According to two-year results inbred line Bc 80086 was the most resistant with average range 1.4 and it is considered as possible source of resistance. Bc 80085 and Bc 281 were detected as resistant but they were tested only in 2012. In 2012 trial several Fusarium ear rot inoculation techniques were compared on hybrids. Greatest range in degree of resistance showed needle inoculation technique. Research will be continued because of drought mean rate was low (1.7).

Keywords: maize, *Fusarium verticillioides*, artificial inoculation, Fusarium ear rot

Book of Abstracts

Vegetable Growing, Ornamental, Aromatic and Medicinal Plants

04

Povrćarstvo, ukrasno, aromatično i ljekovito bilje

Zbornik sažetaka

Dinamika plodonošenja i gospodarska svojstva "cherry" rajčice u hidroponskom uzgoju

Božidar Benko[1], Josip Borošić[1], Sanja Fabek[1], Sanja Stubljar[1], Nina Toth[1], Martina Pečar[2]

[1]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska (bbenko@agr.hr)*
[2]*Studentica diplomskog studija Hortikultura-Povrćastvo,Agronomski fakultet Sveučilišta u Zagrebu*

Sažetak

Cilj istraživanja bio je utvrditi dinamiku dozrijevanja i gospodarska svojstva kultivara „cherry“ rajčice u hidroponskom uzgoju. Testirana su četiri kultivara: 'Sakura', 'Principe Borghese', 'Sweet Million' i 'Tiguan', uzgajana na kamenoj vuni i kokosovim vlaknima. Razdoblje berbe trajalo je od 20. lipnja do 8. rujna, a tijekom 18 berbi, ubrani su plodovi s osam cvjetnih grana. Plodove podjednake krupnoće razvili su 'Principe Borghese' i 'Tiguan' (24 g) te 'Sakura' (23 g), dok su plodovi kultivara 'Sweet Million' bili značajno sitniji (11 g). Najveći broj plodova u grozdu imao je 'Sweet Million' (44), dok su ostali kultivari razvili između 15 i 27 plodova u grozdu. Najveći prinos ostvaren je na šestom grozdu kultivara Sakura uzgajanog na kamenoj vuni (2,66 kg/m^2). Najmanji tržni prinos je ostvario 'Principe Borghese' na prvom grozdu biljaka uzgajanih na kamenoj vuni (0,73 kg/m^2). Obzirom na ostvareni po dekadama, najveći prinos u uzgoju na kamenoj vuni ostvario je kultivar 'Sakura' (3,75 kg/m^2) u drugoj dekadi srpnja, dok je u uzgoju na kokosovim vlaknima najveći prinos ostvario 'Tiguan' (4,74 kg/m^2) u trećoj dekadi srpnja. Većina testiranih kultivara je veći tržni prinos ostvarila uzgojem na kokosovim vlaknima ('Sakura' 1,4 %, 'Principe Borghese' 7,6 %, i 'Tiguan' 8,7 %), dok je tržni prinos kultivara Sweet Million bio podjednak na oba supstrata.

Ključne riječi: *Lycopersicon esculentum* Mill. var. *cerasiforme* Alef., supstrat, dinamika dozrijevanja, masa ploda, tržni prinos

Fruiting dynamics and agronomic traits of soilless grown cherry tomatoes

Božidar Benko[1], Josip Borošić[1], Sanja Fabek[1], Sanja Stubljar[1], Nina Toth[1], Martina Pečar[2]

[1]*Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia (bbenko@agr.hr)*
[2]*Student of the MS study Horticulture-Vegetable Growing, Faculty of Agriculture, University of Zagreb*

Summary

The aim of this research was to determine the dynamics of maturation and the agronomic traits of cherry tomato cultivars grown in a soilless culture. Four cultivars were tested: 'Sakura', 'Principe Borghese', 'Sweet Million' and 'Tiguan', grown on rockwool and coconut fibers. Harvest period lasted from June 20 to September 8, and during 18 harvests the fruits from eight clusters were harvested. The fruits of similar weight were developed by cultivars 'Principe Borghese' and 'Tiguan' (24 g) and 'Sakura' (23 g), while the fruits of cultivar 'Sweet Million' were significantly smaller (11 g). The highest fruits number per cluster was recorded for cultivar 'Sweet Million' (44). The other tested cultivars had developed between 15 and 27 fruits per cluster. The highest yield per cluster was achieved by 'Sakura' grown on rockwool (2.66 kg/m^2 at the sixth cluster). The lowest marketable yield was achieved by 'Principe Borghese' at the first cluster of rockwool grown plants (0.73 kg/m^2). The highest yield over a decade was achieved in the second decade of July by 'Sakura' (3.75 kg/m^2) grown on rockwool, and in the third decade of July by 'Tiguan' (4.74 kg/m2) grown on coconut fibers. The most of tested cultivars achieved higher marketable yield on coconut fibers: 'Sakura' 1.4%, 'Principe Borghese' 7.6%, and 'Tiguan' 8.7% higher in comparison with rockwool. The marketable yield of 'Sweet Million' was similar on both substrates.

Key words: *Lycopersicon esculentum* Mill. var. *cerasiforme* Alef., substrate, maturation dynamics, fruit weight, marketable yield

Učinak gnojidbe na komponente prinosa batata (*Ipomoea batatas* L.)

Mara Bogović[1], Bruno Novak[2], Nina Toth[2] , Tajana Slunjski[2], Kornelija Klarić[2]

[1]*Poljoprivredna savjetodavna služba, Anina 11, 42000 Varaždin, Hrvatska (mara.bogovic@savjetodavna.hr)*
[2]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, 10000 Zagreb, Hrvatska*

Sažetak

Batat je višegodišnja tropska vrsta izuzetno velike nutritivne vrijednosti korijena i lista. Zadebljali korijen se najviše koristi kao namirnica u prehrani ljudi, ali i kao sirovina u proizvodnji škroba i alkohola, dok se listovi znatno manje upotrebljavaju u ljudskoj prehrani. Obzirom na povećan interes za proizvodnjom batata uočena je potreba istraživanja utjecaja rastuće gnojidbe na komponente prinosa na aluvijalnom tlu. Osim optimalnih agroekoloških uvjeta za ostvarivanje većeg prinosa korijena batat zahtijeva i povećanu gnojidbu kalijem, naročito na aluvijalnim pjeskovitim tlima koja imaju nisku sposobnost vezivanja kationa. Istraživanje i postavljanje pokusa provedeno ja na Pokusno pokaznom polju u Varaždinu tijekom dvije godine uz postavljenje identičnih dvofaktorijalnih poljskih pokusa po metodi slučajnog bloknog rasporeda u četiri ponavljanja. Prvi faktor je sorta u dvije stepenice (Bat i Boniato), a drugi razina gnojidbe dušikom i kalijem u tri stepenice (N:K 1:1, 1:2,5 i 1:5). Gnojidba je provedena prije strojnog oblikovanja gredica i postavljanja PE filma. Proizvodnja presadnica organizirana je u zaštićenom prostoru Zavoda za povrćarstvo Agronomskog fakulteta u Zagrebu. Sadnja je obavljena sredinom svibnja na sklop od 2 biljke po m^2. Prije vađenja korijena obavljeno je određivanje mase lista po biljci, a nakon vađenja određivanje mase korijena radi utvrđivanja utjecaja gnojidbe na komponente prinosa. Prosječan prinos korijena sorte Bat na kontrolnoj parceli iznosio je 3,25 kg/m^2,na parceli s nižom razinom gnojidbe 3,83 kg/m^2 dok je na parceli s višom višoj razinomi gnojidbe iznosio 4,16 kg/m^2. Prosječan prinos korijena sorte Boniato na kontrolnoj parceli je bio 3,12 kg/m^2, niža razina gnojidbe 3,8 kg/m^2, dok je na višoj razini iznosio 4,25 kg/m^2. Prosječan prinos lista sorte Bat na kontrolnoj parceli je bio 2,88 kg/m^2, niža razina gnojidbe 2,73 kg/m^2, dok je na višoj razini iznosio 2,69 kg/m^2. Prinos lista sorte Boniato na kontrolnoj parceli je bio 4,22 kg/m^2, niža razina gnojidbe 4,26 kg/m^2, dok je na višoj razini iznosio 5,28 kg/m^2. Na osnovu dobivenih rezultata utvrđena je pozitivna korelacija između rastuće gnojidbe kalijem i povećanja prinosa korijena obje sorte, dok je značajno veći prinos lista utvrđen kod sorte Boniato kao sortno svojstvo.

Ključne riječi: batat, gnojidba, prinos, korijen, list

Effect of fertilization on the yield components of sweet potato (*Ipomoea batatas* L.)

Mara Bogović[1], Bruno Novak[2], Nina Toth[2] , Tajana Slunjski[2], Kornelija Klarić[2]

[1]*Poljoprivredna savjetodavna služba, Anina 11, 42000 Varaždin, Hrvatska (mara.bogovic@savjetodavna.hr)*
[2]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, 10000 Zagreb, Hrvatska*

Summary

Sweet potato is a perennial tropical species with an extremely high nutritional value of roots and leaves. The tuberous root is mainly used as food in the nutrition of people, but also as a raw material in the manufacture of starch and alcohol, while the leaves are much less used in the human nutrition. Given the increased interest in the production of sweet potato, the need for research of the effect of increasing fertilization on yield components on alluvial soil was needed. Except the optimum environmental conditions for achieving higher yields of roots, sweet potato requires increased potassium fertilization, particularly on sandy alluvial soils that have a low ability to bind cations. The research and setting up the experiment was conducted on the demonstrational trial field in Varazdin within two years by setting identical two factorial field experiments in randomized complete block design with four repetitions. The first factor is the variety in two stages (Bat and Boniato) while the second is the level of nitrogen and potassium fertilization in three stages (N: K 1:1, 1:2,5 and 1:5). Fertilization was carried out prior to the machine forming beams and setting PE film. Seedling production was organized in a protected area of the Vegetable Crops, University of Zagreb. Planting was done in the middle of May, setting 2 plants on m^2. Before extracting the roots, the mass of leaf per plant was determined, and after extraction the mass of root was determined in order to establish the influence of fertilization on yield components. The average root yield of the Bat sort on the control parcel was 3.25 kg/m^2, the lower level of fertilization was 3.83 kg/m^2, while at the higher level of fertilization it was 4.16 kg/m^2. The average root yield of the Boniato on the control parcel was 3.12 kg/m^2, lower fertilizer level was 3.8 kg/m^2, while at the higher level it amounted up to 4.25 kg/m^2. The average yield of the Bat leaf on the control parcel was 2.88 kg/m^2, the lower fertilizer level was 2.73 kg/m^2, while at the higher level it was 2.69 kg/m^2. Yield leaf of the Boniato sort on the control parcel was 4.22 kg/m^2, lower fertilizer level was 4.26 kg/m^2, and at the higher level 5.28 kg/m^2. The results showed a positive correlation between increasing potassium fertilization and the root yield increase of both cultivars, while a significantly higher yield of leaf was determined in the Boniato sort as a varietal characteristic.

Key words: sweet potato, fertilization, yield, root, leaf

Utjecaj cijepljenja i koncentracije dušika na prinos rajčice i brojnost duhanovog štitastog moljca

Gvozden Dumičić[1], Katja Žanić[1], Branimir Urlić[1], Marisa Škaljac[1], Smiljana Goreta Ban[1], Dean Ban[2]

[1]*Institut za jadranske kulture i melioraciju krša, Put Duilova 11, Split, Hrvatska (gdumicic@krs.hr)*
[2]*Institut za poljoprivredu i turizam, Carla Huguesa 8, Poreč, Hrvatska*

Sažetak

Cilj istraživanja bio je utvrditi utjecaj cijepljenja i koncentracije dušika na prinos rajčice i brojnost štitastog moljca *Bemisia tabaci* u hidroponskom uzgoju. Pokus je postavljen u stakleniku, po principu slučajnog bloknog rasporeda, u četiri ponavljanja, od travnja do kolovoza. Rajčica cv. Belle je uzgajana na vlastitom korijenu (necijepljena) i cijepljena na podlogu Arnold, te posađena u blokove kamene vune. Prihranjivana je s tri koncentracije dušika (75, 140 i 205 mgL^{-1} N). Biljke su infestirane s *B. tabaci*. Kod ranog prinosa (prve tri berbe), najveći broj plodova i prinos po biljci utvrđen je na biljkama tretiranim sa 75 mgL^{-1} N, dok utjecaj podloge nije zabilježen. U ukupnom prinosu, najmanja masa ploda je zabilježena na biljkama tretiranim sa 75 mgL^{-1} N. Premda primijenjeni tretmani (N i podloga) nisu imali utjecaja na broj plodova i prinos, biljke tretirane sa 140 mgL^{-1} N ostvarile su 20 % veći ukupni prinos od ostalih. Brojnost preimaginalnih oblika štetnika (nimfe), izražena brojem jedinki po cm^2, utvrđena je 62 dana nakon infestacije. Najmanja brojnost je utvrđena na cijepljenim i necijepljenim biljkama tretiranim sa 75 mgL^{-1} N a najveća na necijepljenim biljkama tretiranim s 205 mgL^{-1} N. Morfološke karakteristike puparija štetnika bile su najslabije izražene na biljkama tretiranim sa 75 mgL^{-1}. Primjenom koncentracije od 140 mgL^{-1} N osigurava se veći prinos rajčice i manja brojnost štetnika u odnosu na standardnu koncentraciju (205 mgL^{-1} N).

Ključne riječi: *Bemisia tabaci*, *Lycopersicon esculentum* Mill., hidroponski uzgoj, podloga Arnold

The effect of grafting and nitrogen rate on tomato yield and tobaco whitefly populations

Gvozden Dumičić[1], Katja Žanić[1], Branimir Urlić[1], Marisa Škaljac[1], Smiljana Goreta Ban[1], Dean Ban[2]

[1]*Institute for Adriatic Crops and Karst Reclamation, Put Duilova 11, Split, Croatia (gdumicic@krs.hr)*
[2]*Institute for Agriculture and Tourism, Carla Huguesa 8, Poreč, Croatia*

Summary

The aim of the study was to determine the influence of grafting and nitrogen rate on tomato yield and population density of *Bemisia tabaci* under hydroponic cultivation. The greenhouse experiment was conducted according to completely randomized experimental design with four replications, from April to August. Tomato cv. Belle grown with its own root (ungrafted) or grafted onto the rootstock Arnold, was planted into rockwool cubes. The crop was fertigated with three N concentrations (75, 140 and 205 mgL^{-1} N). Infestation with *B. tabaci* was done. At the early yield (first three harvests), the highest number of fruits and the highest yield per plant were recorded on plants grown at 75 mgL^{-1} N, while the rootstock effect was not evidenced. Under the total yield, the lowest fruit weight was recorded on plants at 75 mgL^{-1} N. Although treatments (N and rootstock) did not influence on number of fruits and yield, tomatoes grown at 140 mgL^{-1} N had the 20 % higher yield than others. Density of nymphs, expresses as number of individuals per cm^2, was recorded 62 days after infestation. The lowest density was found on ungrafted or grafted plants at 75 mgL^{-1} N while the highest density was on ungrafted plants at 205 mgL^{-1} N. Morphological characteristics of pupal stage were weakest expressed on plants at 205 mgL^{-1} N. The plant treated with 140 mgL^{-1} N provides higher yield of tomato and lower *B. tabaci* density than standard (205 mgL^{-1} N).

Key words: *Bemisia tabaci*, *Lycopersicon esculentum* Mill., hydroponic cultivation, rootstock Arnold

Utjecaj koncentracije hranjive otopine na rast presadnica raštike

Branimir Urlić[1], Gvozden Dumičić[1], Smiljana Goreta Ban[1], Juan Carlos Díaz-Pérez[2]

[1]*Institut za jadranske kulture i melioraciju krša, Put Duilova 11, 21000 Split, Hrvatska (branimir@krs.hr)*
[2]*Department of Horticulture, University of Georgia, Tifton, USA*

Sažetak

Izazivanje ionskog stresa koristi se u proizvodnji presadnica s ciljem dobivanja kvalitetnih i ujednačenih biljaka. Cilj istraživanja bio je utvrditi utjecaj koncentracije hranjive otopine na rast i razvoj presadnica raštike (*Brassica oleracea var. acephala*). Presadnice lokalne populacije raštike uzgajane su u negrijanom stakleniku u polistirenskim plutajućim pločama s 6 koncentracija hranjive otopine po Sonneveldu, EC-vrijednosti od 1 do 6 $dS \cdot m^{-1}$. Tijekom uzgoja mjereni su porasti biljaka, a 32 dana nakon sjetve (DNS) morfološki parametri i masa biljaka. Koncentracija otopine signifikantno je utjecala na porast biljaka 14., 22. i 32. DNS. Dužina stabljike se razlikovala kod biljaka tretiranih s EC vrijednostima većim od 4 $dS \cdot m^{-1}$, dok kod broja listova i dužine internodija nije bilo razlike među tretmanima. Promjer stabljike, svježa masa biljke i masa listova bili su signifikantno najveći kod biljaka tretiranih s EC 1 i 3 $dS \cdot m^{-1}$. Masa suhih biljaka, listova i stabljika bila je najveća pri Ec 3 $dS \cdot m^{-1}$. Signifikantno najveća lisna površina zabilježena je kod biljaka tretiranih s EC 1 do 3 $dS \cdot m^{-1}$, a najmanja s EC 6 $dS \cdot m^{-1}$. Suha tvar biljaka signifikantno se razlikovala među tretmanima, a rasla je s porastom koncentracije otopine . Veće koncentracije hranjive otopine od EC 3 utječu na smanjivanje parametara rasta, mase biljke i površinu listova dok je postotak suhe tvari veći kod biljaka uzgojenih s većim EC.

Ključne riječi: raštika, hranjiva otopina, staklenik, plutajuće ploče

Influence of nutrient solution concentration on kale seedlings growth

Branimir Urlić[1], Gvozden Dumičić[1], Smiljana Goreta Ban[1], Juan Carlos Díaz-Pérez[2]

[1]*Institut za jadranske kulture i melioraciju krša, Put Duilova 11, 21000 Split, Hrvatska (branimir@krs.hr)*
[2]*Department of Horticulture, University of Georgia, Tifton, USA*

Summary

Ionic stress is used in seedlings production as tool for getting uniform and quality plants. The aim of this research was to determine influence of nutrient solution concentration on kale (Brassica oleracea var. acephala) seedlings growth and development. Seedlings of local kale accessions were grown in unheated greenhouse in polysytren panels floating on Sonneveld nutrient solution with EC values from 1 to 6 dSm^{-1}. During growing plant height was measured and 32 days after sowing (DAS) morphological parameters and plant weights. Solution concentration significanntly affected plants heights at 14., 22. i 32. DAS. Stem lenght was different in plants treated with EC higher than 4 dSm^{-1}, while leaves number and internodium lenght did not show differences between treatments. Stem diameter, plant and leaves fresh weight (FW) was highest at EC 1 and 3 dSm^{-1}. Plants, leaves and stems dry weights was highest at EC 3 dSm^{-1}. Significantly highest leaf area was measured at treatments with EC 1 to 3 [1] and lowest at EC 6 dSm^{-}. Plant dry weight percentage was significantly different between treatments and increased as nutrient solution concentrations increasing. supply. Solution concentrations higher than 3 dSm^{-1} lowered growth parameters, plant weight and leaf area while dry weight pecentage grow at higher EC.

Key words: kale seedlings growth, polysytren panels floating, greenhouse

Kvaliteta sjemena blitve u ovisnosti o sklopu, pinciranju i vegetacijskoj sezoni

Josip Haramija[1], Nada Parađiković[2], Zdravko Matotan[3], Vlado Guberac[2], Tomislav Vinković[2], Dijana Horvat[4]

[1]*Ministarstvo poljoprivrede, Florijanski trg 9, Koprivnica, Hrvatska (josip.haramija@vip.hr)*
[2]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska*
[3]*Podravka d.d. Koprivnica, Ante Starčevića 32, Koprivnica, Hrvatska*
[4] *Visoko gospodarsko učilište u Križevcima, Milislava Demerca 1, Križevci, Hrvatska*

Sažetak

Sjeme blitve je višeklično. Iz jednog klupka mogu se razviti 2 do 3 biljke. U ovom istraživanju bio je cilj utvrditi utjecaj sklopa, pinciranja i vegetacijske sezone na klijavost, energiju klijanja i ukupni broj klica sjemena blitve. Istraživanje je provedeno na različitim sklopovima 25.000, 50.000, 100.000 i 150.000 biljaka ha^{-1}, tijekom tri vegetacijske sezone na blitvi rebrastoj, sorti „srebrnolisna“ u Podravini, Hrvatska. Analizirano je naturalno sjeme blitve primarno očišćeno od primjesa. U ovim istraživanjima prosječna klijavost naturalnog sjemena blitve iznosila je 87,26 %. Utvrđeno je da klijavost sjemena nije bila pod utjecajem sklopa, pinciranja i vegetacijske sezone. Prosječna energija klijanja sjemena blitve iznosila je 79,44 %. Godina istraživanja imala je vrlo značajan utjecaj na energiju klijanja, isto kao i interakcija sklopa i pinciranja. Interakcija sklopa, pinciranja i godine značajno je utjecala na energiju klijanja sjemena blitve. Prosječni ukupni broj klica (od 100 sjemenki) u ovim istraživanjima iznosio je 159,44. Navedeno svojstvo bilo je pod vrlo značajnim utjecajem sklopa i vegetacijske sezone, te pod utjecajem interakcija sklopa i godine, te sklopa, pinciranja i godine. U najgušćem sklopu sjemenske blitve 150.000 biljaka ha^{-1} proizvedeno je sjeme sa značajno najvećim ukupnim brojem klica 163,92. Sklop sjemenske blitve 150.000 biljaka ha^{-1} uz visoku i stabilnu klijavost i energiju klijanja osigurava značajno najveći ukupni broj klica.

Ključne riječi: blitva, *Beta vulgaris ssp. cycla*, sjeme, klijavost, ukupni broj klica

Swiss chard seed quality depending on plant density, decapitation and vegetation season

Josip Haramija[1], Nada Parađiković[2], Zdravko Matotan[3], Vlado Guberac[2], Tomislav Vinković[2], Dijana Horvat[4]

[1]*Ministry of Agriculture,, Florijanski trg 9, Koprivnica, Croatia (josip.haramija@vip.hr)*
[2]*Faculty of Agriculture, Kralja Petra Svačića 1d, Osijek, Croatia*
[3]*Podravka d.d. Koprivnica, Ante Starčevića 32, Koprivnica, Croatia*
[4]*Agricultural College in Križevci, Milislava Demerca 1, Križevci, Croatia*

Summary

A swiss chard seed has many germs so two or three plants can develop from one bunch. The aim of this research was to determine the influence of plant density, decapitation and vegetation season on germination, energy of germination and total number of germs in swiss chard seed. The research was carried out on plant density of 25.000, 50.000, 100.000 and 150.000 plants ha^{-1} during three vegetation seasons on ribbed swiss chard, variety Srebrnolisna, in Podravina, Croatia. Natural swiss chard seed previously cleaned of impurities was analysed. Average germination of natural swiss chard seed was 87.26 %. It was established that seed germination was not affected by plant density decapitation and vegetation season. Average energy of germination swiss chard seed was 79.44 %. The research year had a very significant influence on energy of germination just like the interaction of plant density and decapitation. Average total number of germs (out of 100 seeds) was 159.44. This was greatly affected by plant density and vegetation season as well as by the interaction of plant density and the year and the plant density, decapitation and the year. In the thickest plant density of 150.000 swiss chard plants ha^{-1} the produced seed had the highest total number of germs of 163.92. The plant density of 150.000 swiss chard plants ha^{-1} with high to stable germination and energy of germination ensures significantly the highest total number of germs.

Key words: swiss chard, *Beta vulgaris ssp.cycla*, seed, germination, total number of germs

Kontrola rasta rajčice uzgajane u zaštićenim prostorima u tlu

Ivan Simeunović

Adriaflora d.o.o., Alojzija Stepinca 83, Pakoštane, Hrvatska (ivan.adriaflora@gmail.com)

Sažetak

U radu se analiziraju rezultati promatranja provedenog u zaštićenim prostorima u Hrvatskoj od 2006. do 2012. godine. Hipoteza rada je da se mogućnosti kontrole čimbenika rasta rajčice u uvjetima srednje visoke tehnologije ne iskorištavaju u svom punom potencijalu. Neuravnoteženi rast rajčice jedan je od najčešćih problema kod uzgoja rajčice u zaštićenim prostorima. Pri tome se misli na ravnotežu između rasta vegetativnog i generativnog dijela biljke. Promjene u ravnoteži rasta nastupaju postepeno i vrlo ih je teško primijetiti neposredno bez raznih mjerenja. Pravovremeno zapažanje je neophodno jer se posljedice neuravnoteženog rasta manifestiraju nakon dužeg vremena odnosno prekasno za korekciju. U prvom dijelu članka opisani su čimbenici koji utječu na rast biljaka s posebnim osvrtom na uvjete u zoni ukorijenjavanja, mikroklimi nasada te utjecaj kvalitete i kvantitete svijetla na rast biljaka. Navedene su mogućnosti manipulacije navedenim čimbenicima kod usmjeravanja rasta rajčice u uvjetima srednje visoke tehnologije. U drugom dijelu rada navedeni su simptomi neuravnoteženih biljaka te metode mjerenja dinamike rasta biljaka koje pomažu pri pravovremenom zapažanju trenda rasta biljaka. U radu će se prikazati da su naprednom tehnologijom uzgoja uzgajivači u mogućnosti usmjeravati biljke te u skladu s potrebama postići raniju berbu, veći prinos, kvalitetnije plodove ili neke druge željene karakteristike.

Ključne riječi: rajčica, vegetativni rast, generativni rast, zaštićeni prostori, kontrola rasta

Controlling tomato growth in greenhouse in soil

Ivan Simeunović

Adriaflora d.o.o. Alojzija Stepinca 83, Pakoštane, Croatia (ivan.adriaflora@gmail.com)

Summary

The paper analyses the results of observations conducted in greenhouses in Croatia from 2006 until 2012. Assumption is that the potential for control of growth factors of tomatoes in conditions of medium-high technology is not exploited to its fullest potential. Unbalanced growth of tomatoes is one of the major problems associated with growing tomatoes in greenhouses. This refers to the balance between vegetative and generative growth of the plants. Changes in the balance of growth occur gradually and are very difficult to observe directly without various measurements. Well timed observation is necessary because the effects of unbalanced growth are manifested late in the growth period when it is too late for corrections. The first part of the article describes the factors that affect the growth of plants, with special reference to conditions in the rooting zone, role of micro-climate crops and influence of quality and quantity of light on plant growth. We identify the possibilities of manipulating these factors in order to direct the growth of plants in terms of medium-high technology of tomato grown in greenhouse conditions. The second part of the article describes the symptoms of unbalanced plants and methods of measuring plant growth that help the well timed observation of plant growth trend. This paper will show that with advanced technology of breeding, growers are able to direct the plant and, if needed, achieve earlier harvesting, higher yields, better fruit or some other desired characteristics.

Key words: tomato, vegetative growth, generative growth, greenhouses, controlling growth

Umnožavanje slavonskog ozimog češnjaka *in vitro* metodom

Nada Parađiković[1], Monika Tkalec[1], Tomislav Vinković[1], Svjetlana Zeljković[2], Jasna Kraljičak[1]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (nparadj@pfos.hr)*
[2]*Agronomski fakultet Banja Luka, Bulevar Vojvode Petra Bojovića 1A, 78 000 Banja Luka, Bosna i Hercegovina*

Sažetak

In vitro kultura biljnih stanica, tkiva i organa je posebna grana biotehnologije koja predstavlja skup tehnika za sterilni uzgoj i vegetativno razmnožavanje. U hranljivom mediju definiranog sastava i pod kontroliranim uvjetima sredine. Najveću primjenu metoda kulture tkiva ima u razmnožavanju brojnih biljnih vrsta, posebice onih koje se teško razmnožavaju sjemenom. Prednost vegetativnog razmnožavanja u uvjetima *in vitro* je u tome što razmnožavanje može početi sa vrlo malo biljnog materijala kao početnog eksplatanta, što je veoma bitno u zaštiti ugroženih i rijetkih vrsta. Slavonski ozimi češnjak je stara, autohtona sorta češnjaka s područja Slavonije i Baranje. Danas, zbog uvođenja introduciranih stranih sorti u proizvodnju, nedostatka izvornog sjemena, sve veće komercijalizacije povrtlarske proizvodnje i depopulacije ruralnog prostora, velikom dijelu domaćih sorti češnjaka prijeti da zauvijek budu izgubljene. Razmnožavanje metodom *in vitro* je brz način razmnožavanja kada se od jedne majčinske biljke moguće proizvesti i do nekoliko tisuća sadnica. Ušteda energije je velika jer se sadnice slažu na police te je klimatizirani prostor maksimalno iskorišten. Metodom razmnožavanja *in vitro*, u kratkom vremenskom periodu, dobivaju se kvalitetne i zdrave presadnice. Takvim načinom uzgoja sačuvala bi se autohtona hrvatska sorta ozimog slavonskog češnjaka, vratila na slavonska, baranjska i srijemska polja i u autohtone hrvatske proizvode.

Ključne riječi: slavonski ozimi češnjak, in vitro uzgoj, eksplatant, medij uzgoja

In vitro Regeneration of Winter Slavonian Garlic

Nada Parađiković[1], Monika Tkalec[1], Tomislav Vinković[1], Svjetlana Zeljković[2], Jasna Kraljičak[1]

[1]*Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (nparadj@pfos.hr)*
[2]*Faculty of Agriculture Banja Luka, Bulevar Vojvode Petra Bojovića 1A, 78 000 Banja Luka, Bosnia and Hercegovina*

Summary

In vitro culture of plant cells, tissues and organs is a special branch of plant biotechnology, which is a set of techniques for sterile breeding and vegetative propagation of plants, plant organs, tissues and cells in a defined nutrient medium and under controlled environmental conditions. Largest application of tissue culture methods is in the reproduction of many plant species, especially those that are difficult to reproduce by seeds. Advantages of *in vitro* propagation is that the propagation can start with very little amount of plant material that represents initial explants, which is very important in the protection of endangered and rare species. Slavonian winter garlic is an old, indigenous variety of garlic grown on Slavonia and Baranya fields. Today, unfortunately, due to the introduction of foreign varieties into production, lack of local seed source, the increasing commercialization of vegetable production and the depopulation of rural areas, large part of the local varieties of garlic may be lost forever. Method of *in vitro* propagation provides a rapid propagation and large number of plants as a single mother plant can produce up to several thousand of seedlings. I*n vitro* propagation, in a short period of time, can provide quality and healthy seedlings and thus return the indigenous Croatian variety of winter Slavonian garlic to our Slavonian fields and our authentic Croatian products.

Key words: winter slavonian garlic, *in vitro* propagation, explant, growth medium

Hidoponski uzgoj salate (*Lactuca sativa* L.) korištenjem tehnike hranjivog filma (NFT)

Dragan Žnidarčič[1], Dean Ban[2], Marko Devetak[3], Smiljana Goreta Ban[4]

[1]*Odelek za agronomijo, Biotehniška fakulteta Univerza v Ljubljani, Jamnikarjeva 101, 1000 Ljubljana, Slovenija (dragan.znidarcic@bf.uni-lj.si)*
[2]*Institut za poljoprivredu i turizam, Karla Huguesa 8, 52440 Poreč, Hrvatska*
[3]*Unichem d.o.o., Sinja Gorica 2, 1360 Vrhnika, Slovenija*
[4]*Institut za jadranske kulture i melioraciju krša, Put Duilova 11, 21000 Split, Hrvatska*

Sažetak

Istraživanje provedeno u zaštićenom prostoru laboratorija Biotehničkog fakulteta u Ljubljani, uspoređuje hidroponski uzgoj salate u različitim polistirenskim kontejnetima u tehnici hranjivog filma (NFT). Uspoređivana su dva kultivara salate, 'Marija' i 'Lusiana', te je promatran njihov rast i razvoj u kontejnerima sa 84 odnosno 160 sadnih rupa te kontejnerima sa prorezima, namijenjenima gustoj sjetvi. Masa i dužina nadzemnih dijelova mjerena je pri svakoj rezidbi, a masa i dužina korijenovog sustava, mjerena je isključivo nakon drugog reza. Prosječna masa svježeg nadzemnog dijela oba kultivara, izmjerena pri prvoj rezidbi, najniža je kod biljaka uzgajanih u kontejnerima za gustu sjevu, dok salata uzgajana u druga dva tipa kontejnera, statistički ne pokazuje razliku u rastu. U kontejnerima gustog sklopa, prinos nadzemne mase bio je svega 123,8 g u drugoj rezidbi, te je zabilježena statistički opravdana razlika ($p \leq 0.05$) u interakciji kultivar, gustoća sadnje. Inteakcija kultivara i gustoće sadnje zamijećena je kod kultivara 'Marija' koji postiže prosječnu lisnu masu 281,2 g u kontejnerima od 84 sadne rupe, ujedno najvišu izmjerenu na svim gustoćama sadnje, dok kultivar 'Luisiana' na istoj gustoći sadnje (84) postiže najnižu izmjerenu prosječnu lisnu masu (95,5 g). Nije utvrđena interakcija između kultivara i gustoće sadnje kada se promatra masa korijenovog sustava. Također nije utvrđena statistički opravdana razlika između mase korijenovog sustava kultivara.

Ključne riječi: gustoća sadnje, kultivar, nadzemna masa, masa korijena, salata

Hydroponic lettuce (*Lactuca sativa* L.) production using nutrient film technique (NFT)

Dragan Žnidarčič[1], Dean Ban[2], Marko Devetak[3], Smiljana Goreta Ban[4]

[1]*Department of Agronomy, Biotechnical Faculty, University of Ljubljana Jamnikarjeva 101, 1000 Ljubljana, Slovenia (dragan.znidarcic@bf.uni-lj.si)*
[2]*Institute for Agriculture and Tourism, Carla Huguesa 8, 52 440 Poreč, Croatia*
[3]*Unichem d.o.o., Sinja Gorica 2, 1360 Vrhnika, Slovenia*
[4]*Institute for Adratic Crops and Karst Reclamation, Put Duilova 11, 21000 Split, Croatia*

Summary

The research was conducted in greenhouse of the Biotechnical Faculty, Ljubljana. We performed comparisment of lettuce growing on different plug trays in the NFT hydroponic system. The experiment was based on cultivars 'Marija' and 'Lusiana' and their growth and development was observed on plug trays with 84 cells, 160 cells, and trays with slots suitable for a dense seeding. The measurements of the mass and lengths of the above ground parts of plants were carried out on every cutting, while the mass of roots was weighed solely after the second cutting. On the first cutting, both cultivars weighed the lowest average fresh mass of the above ground parts on trays with slots, whereas lettuce grown on the other types of trays showed no statistically significant differences. On trays designed for dense seeding the yield resulted only in 123.8 g. with the second cutting there appeared statistically significant difference ($p \leq 0.05$) between cultivars and seeding density. The reason for the reciprocal influence between cultivars and seeding density lies in the average mass of leaves of 'Marija' sort with the density of 84 cells, which is the highest (281.2 g) among the trays dealt with, and 'Lusiana' cultivar, which is the lowest (95.5 g) at the same density. There was no reciprocal influence between seeding density and cultivar when root system masses were compared, and consequently there are no statistically significant differences between the two cultivars in root mass.

Key words: seeding density, cultivar, average mass of leaves first, root mass

Percepcija ukrasnog drveća na javnim površinama

Katica Arar, Radica Ćorić

Agronomski i prehrambeno-tehnološki fakultet Sveučilišta u Mostaru, Biskupa Čule bb, Mostar, Bosna i Hercegovina (katica.arar@sve-mo.ba)

Sažetak

Nakon sužavanja izbora vrsta prikladnih za određenu lokaciju događa se da se krajobrazni arhitekti odlučuju za one biljke koje se sviđaju njima, a ne za biljke koje se sviđaju potencijalnim korisnicima prostora. Razlog tomu leži u činjenici da o afinitetima i ukusu korisnika imamo vrlo malo podataka. Kao rezultat toga provedeno je istraživanje o tome koje vrste ukrasnog drveća se ispitivanoj populaciji više sviđaju, a koje manje. Za prikupljanje podataka korištena je metoda ankete koja se ubraja u okvir estetskih dojmova koje smo dobili metodom razvrstavanja. Provedena je u Mostaru na 105 anketiranih osoba slučajnim odabirom. Anketiranim osobama predstavili smo stabla pomoću fotografija u boji. Svaku osobu zamolili smo da 13 stabala rasporedi na sljedeći način: da u prvu skupinu rasporedi tri stabla koje joj se najviše sviđaju, a u drugu skupinu tri stabla koja joj se najmanje sviđaju. Zatim je anketirana osoba iz obje skupine odabrala biljku koja joj se najviše sviđa i biljku koja joj se najmanje sviđa. Pregled rezultata ankete pokazuje da su većina ispitanika kao tri najljepša stabla izabrali: kineski jorgovan, obični koprivić i srebrnastu lipu, a kao tri najmanje lijepa stabla odabrali su: obični čempres, japansku soforu 'Pendula' i hibridnu platanu. Japanska sofora 'Pendula' niti od jednog ispitanika nije bila odabrana u kategoriju najljepšeg stabla, odnosno perzijska očenašica niti od jednog ispitanika nije bila odabrana u kategoriju stabla koje im se najmanje sviđa. Ostale istraživane vrste bile su odabirane u sve ponuđene kategorije.

Ključne riječi: ukrasno drveće, percepcija, Mostar

Perception of ornamental trees on public areas

Katica Arar, Radica Ćorić

Faculty of Agriculture and Food Tehnology, University of Mostar, Biskupa Cule bb, Mostar, Bosnia and Herzegovina (katica.arar@sve-mo.ba)

Summary

After narrowing the choices of a kind suitable for a particular location, happens that landscape architects make choice for plants that like them, not for plants that like potential users of area. The reason for this lies in the fact that the preferences and tastes of customers we have very little information. As a result, a survey was conducted on what types of ornamental trees are studied population prefer and which less. To collect the data, the method of the survey is included in the box aesthetic impressions that we get by classification. It's been conducted in Mostar surveyed 105 people at random. Respondents are presented with tree colour photos. We asked each person to 13 trees distributed as follows: in the first group that schedules three trees that she likes the most, and the second group of three trees that you least like. Then he interviewed people from both groups chose a plant that she likes the most, and a plant that you least like. The result of the survey shows that the majority of respondents as the three most beautiful tree chosen: crape myrtle, European hackberry and silver linden, and as at least three beautiful trees chosen are: Mediterranean cypress, Japanese pagoda tree 'Pendula' and London plane. Japanese pagoda tree 'Pendula' wasn't selected in the category of the most beautiful trees by one of the respondents and Persian lilac or from one of the respondents was selected in the category tree that they like least. Other species were studied were selected in all of the categories.

Key words: ornamental trees, perception, Mostar

Cvjetne gredice kao element tradicijskog seoskog vrta Slavonije i Baranje

Jasna Kraljičak[1], Nada Parađiković[1], Vesna Židovec[2], Monika Tkalec[1]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (jasna.kraljicak@pfos.hr)*
[2]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska*

Sažetak

Autohtoni ambijent seoskih dvorišta Slavonije i Baranje nezamisliv je bez pažljivo kreiranih gredica sa starim sortama ukrasnog bilja (hortenzija-*Hidrangea*, božur-*Peonia officinalis*, ruža-*Rosa*, jorgovan-*Syringa Mill*.), koje čine skladnu cijelinu zajedno sa cvjetnim kompozicijama jednogodišnjih (cinia–*Zinnia elegans*, kokotić–*Delphinium ajacis*, neven–*Callendula officinalis*, dragoljub–*Tropaeolum majus*, slamnati cvijet–*Chelicrisum bracteatum*, zijevalica–*Antrrhinum majus* i dr.) i dvogodišnjih cvjetnih vrsta (potočnica–*Myosotis palustris*, turski karanfil–*Dianthus barbatus*, šeboj–*Cheiranthus cheiri*) te trajnica (srdašca-*Dicentra spectabilis*, kokotić-*Delphinium*, plamenac-*Phlox sp*., zvjezdan-*Aster sp*. i geofita (carski ljiljan–*Lilium candidum*, perunika–*Iris germania*, zumbul–*Hyacinthus orientalis*, dalia–*Dahlia sp*., sunovrat–*Narcissus poeticus*) postavljenih tako da tijekom cijele godine dolazi do izmjene cvatnje, boja i mirisa. Takve cvjetne gredice najčešće se nalaze uz trijemove kuća i predstavljaju prelazni dio iz kuće u dvorište, protežu se pored staza u dvorištu koje su popločane ciglom, uz zidove susjedne kuće, a uokvirene su travnjakom ili omeđene bordurom od šimšira (*Buxus*) ili ogradicom od cigle obojene krečom. Biljke su raspoređene po visini i to u redove, tako da su najniže biljke naprijed, a više otraga. Neke trajnice (muškatli–*Pelargonium sp*., fuksie-*Fuchsia*) tijekom toplog dijela godine nalaze svoje mijesto u gredicama, ali se u jesen vade iz zemlje, stavljaju u posude i unose u kuće, najčešće se smještaju u prozore. Cvjetne gredice sa autohtonim vrstama cvijeća trebale bi postati sastavni dio tradicijskog seoskog vrta Slavonije i Baranje.

Ključne riječi: cvjetne gredice, tradicijski seoski vrt Slavonije i Baranje

Flowerbeds as an element of traditional rural garden of Slavonia and Baranya

Jasna Kraljičak[1], Nada Parađiković[1], Vesna Židovec[2], Monika Tkalec[1]

[1]*Faculty of Agriculture Osijek, University of J.J. Strossmayera in Osijek, Kralja Petra Svačića 1d, 31 000 Osijek, Croatia (jasna.kraljicak@pfos.hr)*
[2]*Faculty of Agriculture Zagreb, University of Zagreb, Svetošimunska 25, Zagreb, Croatia*

Summary

Indigenous ambient of rural backyards of Slavonia and Baranya is unthinkable without carefully designed beds with old varieties of ornamental plants (*Hidrangea, Peonia officinalis, Rosa, Syringa Mill*) that form a harmony with floral compositions of annuals (*Zinnia elegans, Delphinium ajacis, Callendula officinalis, Tropaeolum majus, Chelicrisum bracteatum, Antrrhinum majus*), biennials (*Myosotis palustris, Dianthus barbatus, Cheiranthus cheiri*), perennials (*Dicentra spectabilis, Delphinium, Phlox sp, Aster* sp.) and geophytes (*Lilium candidum, Iris germania, Hyacinthus orientalis, Dahlia sp., Narcissus poeticus*) set so that throughout the year there is a change of flowering, color and odor. These flower beds are usually found along the porches of houses and represent a transitional part of the house into the yard, they are placed along the brick path and the walls of the neighboring houses, framed by a lawn or bordered by a hedge (*Buxus*) or lime colored bricks. Plants are arranged by height and in rows, so that the lowest plants are in front and taller in the back. Some perennials (*Pelargonium* sp., *Fuchsia*) during the warm part of the year find their places in the beds, but in the fall are removed from the ground and placed in a pan so they can be brought in the house, usually placed in the windows. Flowerbeds with indigenous flowers species should become an integral part of traditional rural garden of Slavonia and Baranya.

Key words: flowerbeds, traditional rural garden of Slavonia and Baranya

Morfološka svojstva dvodomne koprive (*Urtica dioica* L.) pod utjecajem tehnologije uzgoja

Sanja Stubljar, Ivanka Žutić, Božidar Benko, Sanja Fabek, Nina Toth

Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska (sstubljar@agr.hr)

Sažetak

Kopriva je ljekovita biljna vrsta, koja je zbog izuzetne hranidbene i zdravstvene vrijednosti posljednjih godina vrlo cijenjena i tražena. Poznato je da se može uzgajati na tri načina (izravna sjetva, uzgoj presadnica i sadnja rizoma), ali optimalna tehnologija još uvijek nije potpuno istražena. U vegetacijskom pokusu provedenom 2012. godine na pokušalištu Zavoda za povrćarstvo Agronomskog fakulteta u Zagrebu tijekom dvije košnje zelene biljne mase, analizirana su morfološka svojstva biljaka uzgojenih izravnom sjetvom i iz presadnica uz dvije razine gnojidbe dušikom (0 i 100 kg N/ha). Ustanovljeno je da način uzgoja značajno utječe na većinu svojstava promatranih u prvoj košnji - biljke uzgojene iz presadnica razvile su veći broj grana/biljci, ali su one iz izravne sjetve na najdužoj grani imale veći broj nodija i listova, kao i veće listove, što je rezultiralo podjednakom masom biljke u oba načina uzgoja. U drugoj je košnji većina morfoloških parametara podjednakih vrijednosti u oba načina uzgoja, ali veće dimenzije listova u biljaka iz izravne sjetve rezultiraju i većom masom biljke. Gnojidba nije utjecala značajno na promatrana morfološka svojstva ni u jednoj košnji. U budućim istraživanjima potrebno je istražiti utjecaj gnojidbe na organski i mineralni sastav koprive pri različitim načinima uzgoja.

Ključne riječi: gnojidba, izravna sjetva, morfološka svojstva, presadnice, rok berbe

Morphological characteristics of stinging nettle (*Urtica dioica* L.) affected by growing technology

Sanja Stubljar, Ivanka Žutić, Božidar Benko, Sanja Fabek, Nina Toth

Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia (sstubljar@agr.hr)

Summary

Stinging nettle is a medicinal plant whose market demand has increased in recent years due to its exceptional nutritional and medicinal value. There are three cultivation techniques for stinging nettle (direct sowing, seedlings and rhizomes planting) but the optimal growing technique is not completely determined. The vegetation trial was conducted during 2012 in Zagreb at the experimental field of the Faculty of Agriculture. Morphological characteristics of nettle plants from direct sowing and seedlings affected by two levels of nitrogen fertilization (0 and 100 kg N/ha) during two cutting treatments were analyzed. It was found that the growing technique significantly influenced on the most observed parameters in the first cutting treatment. Plants from seedlings developed more branches/plant but directly sown plants had larger leaves, more nodes and leaves on the longest branch which resulted in an equal weight in both growing techniques. In the second cutting treatment the most measured parameters were equal in both growing techniques but the higher plant weight was found among plants from direct sowing. The morphological parameters observed in both cuttings were not significantly affected by nitrogen fertilization. In future, it is necessary to research the influence of nitrogen fertilization on organic and mineral content of nettle cultivated by various techniques.

Key words: fertilization, direct sowing, morphological parameters, seedlings, harvest period

Utjecaj uzgojnog supstrata na morfološke karakteristike lobelije (*Lobelia erinus* L.)

Elma Temim, Alisa Hadžiabulić, Semina Hadžiabulić, Alma Leto, Aida Mešukić

Agromediteranski fakultet Univerzitet „Džemal Bijedić“ Mostar, USRC Midhat Hujdur-Hujka, Mostar, Bosna i Hercegovina

Sažetak

Lobelija je veoma popularna jednogodišnja cvjetna kultura. Jedna od njenih karakteristika je dug period cvjetanja, od sredine proljeća do početka jeseni. Koristi se na osunčanim mjestima za sadnju u gredice, rubove, ukrasne posude, balkonske sandučiće i viseće košare. Raste kao grmić, visine od 10 do 25 cm i širine od 10 do 15 cm. Cilj rada je bio utvrditi najpovoljnije karakteristike supstrata za uzgoj lobelije. Korišteni su supstrati: tresetna mješavina, klasični komercijalni supstrat i vrtno tlo. Urađene su kemijske analize sva tri korištena supstrata (pH, sadržaj makro i mikroelemenata). Prema dobivenim rezultatima vidljivo je da lobelija zahtjeva: pH 5.0-6.5, 100-600 mg L^{-1} N, 100-500 mg L^{-1} P i 400-1000 mg L^{-1} K..

Ključne riječi: lobelija (*Lobelia erinus L.*), uzgojni supstrati, morfološke karakteristike, početak cvjetanja, intezitet cvjetanja

Influence of cultivation substrate on morphological characteristics of Lobelia (*Lobelia erinus* L.)

Elma Temim, Alisa Hadžiabulić, Semina Hadžiabulić, Alma Leto, Aida Mešukić

Agromediterranean faculty „Džemal Bijedić" University of Mostar, USRC Midhat Hujdur-Hujka, Mostar, Bosnia and Herzegovina

Summary

Lobelia is very popular annual flower. One of its characteristics is a long period of blossom from mid-spring to early fall. In is used in sunny positions for planting in flower beds, edges, decorative pots, balcony boxes and hanging baskets. It grows as a shrub, a height of 10 to 25 cm and a width of 10 to 15 cm. The aim of this study was to determine the most suitable characteristics of substrate for cultivation of lobelia. The substrates that were used are: a mixture of peat, classic commercial compost and garden soil. The chemical analyses of all three substrates were performed (pH, contents of micro and macro elements). The results indicated that requirements for cultivation of lobelia are: pH 5.0-6.5, 100-600 mg L^{-1} N, 100-500 mg L^{-1} P and 400-1000 mg L^{-1} K.

Key words: cultivation substrates, morphological characteristics, beginning of flowering, intensity of flowering

Effects of nanotechnology liquid fertilizer on plant growth and yield of cucumber (*Cucumis sativus* L.)

Melek Ekinci, Atilla Dursun, Ertan Yildirim, Fazilet Parlakova

Atatürk University, Faculty of Agriculture, Department of Horticulture, 25240 Erzurum, Turkey

Summary

This study was under taken to determine the effects of nanotechnology liquid fertilizer on plant growth and yield of cucumber (*Cucumis sativus* L.). The experiment was carried out in the Department of Horticulture at Ataturk University under unheated greenhouse condition in Erzurum, Turkey, in 2011-2012. The doses of 200, 300 and 400 cc/da Nanonat and Ferbonat fertilizers were used as foliar. The plant leaves were sprayed with Nanonat and Ferbonat suspension (40 ml/per plant) until getting wet at ten days interval for three times during seedling development. Results showed that the effects of the fertilizer treatments significantly affected total yield and yield per plant when comparing with control. As a result, this study showed that the application of liquid fertilizer increased in plant growth and yield of cucumber.

Key words: Nano fertilizer, cucumber, yield

Effects of rhizobacteria on cucumber (*Cucumis sativus* L.) seedling growth and quality

Ertan Yildirim[1], Melek Ekinci[1], Atilla Dursun[1], Kenan Karagöz[2]

[1]*Atatürk University, Faculty of Agriculture, Department of Horticulture, 25240 Erzurum, Turkey*
[2]*Atatürk University, Faculty of Agriculture, Department of Plant Protection, 25240 Erzurum, Turkey*

Summary

This study was conducted to determine the effects of bacterial treatments on seedling growth and quality of cucumber (*Cucumis sativus* L.). *Bacillus pumilis* and *Alcaligenes piechaudii* strains were used as plant growth promoting rhizobacteria (PGPR). The bacterial strains were applied as seed treatment or both seed and foliar treatment. The results of the experiment showed that bacterial applications significantly affected seedling length, stem diameter, number of leaf, cotyledon diameter, leaf area, and leaf fresh weight when compared with control. As a result, it should be suggested that bacteria applications can increase seedling growth and quality of cucumber.

Key words: bacteria, cucumber, seedling, growth, quality

Efficiency of Ca and B humate and humic acid application on pepper (*Capsicum annuum* L.) seedlings growth and quality parameters

Ertan Yildirim[1], Mehmet Rüştü Karaman[2], Alpaslan Gürsoy[3], Adem Güneş[3], Metin Turan[4]

[1]*Department of Horticulture, Faculty of Agriculture, Atatürk University, 25240 Erzurum, Turkey*
[2]*Department of Soil Science and Plant Nutrition, Faculty of Agriculture, Gaziosmanpaşa University, Tokat, Turkey*
[3]*Department of Soil Science and Plant Nutrition, Faculty of Agriculture, Atatürk University, Erzurum, Turkey*
[4]*Department of Genetics and Bioengineering, Faculty of Engineering and Architecture, Yeditepe University, Kayısdagi, Atasehir 34755 Istanbul, Turkey*

Summary

This study was carried out in order to determine effects of calcium (Ca) and boron (B) humate applications on pepper seedling growth under greenhouse condition. A mixture of soil and sand (1:1) was used as a plant growing media including four different concentrations of Ca humate, B humate and humic acid which were applied in following concentrations 0, 500, 1000, and 2000 mg kg^{-1} of Ca humate and humic acid and 0, 50, 100 and 200 mg kg^{-1} of B humate. Pepper seeds cv. Demre were sown into 300 cm^3 of mixture of turf : perlite : vermiculite (2:1:1) in each pot. Recorded data showed that all morphological characters parameters including plant height, number of leaves and stems/plant, fresh weights of leaves/plant as well as yield and its components of pepper seedling showed positive and significant responses with the Ca and B humate and humic acid application compared with control treatments. The highest fresh and dry leaf weight, fresh and dry root weight, stem diameter, root length and shoot length, chlorophyll content were determined at 1000 and 2000 mg kg^{-1} of Ca humate, 2000 mg kg^{-1} of humic acid and 100 mg kg^{-1} of B humate. On the other hand, results showed that macro- and micronutrient content increased with increasing the Ca and B humate as well as humic acid application. Highest N, Ca, P, S, and Mn concentration of seedling were determined at 1000 mg kg^{-1} of Ca humate application, whilst the highest N, P, K, Mg, S, Fe content were obtained at 2000 mg kg^{-1} of humic acid application. Highest concentrations of N, P, K, Mg, S, Fe and Zn in plant were determined at 200 mg $kg^{-1}$of B humate application.

Key words: pepper seedling, Ca humate, B humate, growth

Mutation preventive and antigenotoxic potential of methanol extracts of two natural lichen species, *Rhizoplaca chrysoleuca* and *Rhizoplaca melanophthalma* on corn (*Zea mays* seeds)

Medine Gulluce[1], Guleray Agar[1], Ali Aslan[2], Sedat Bozari[1], Mehmet Karadayi[1], Furkan Orhan[1]

[1]*Department of Biology, Faculty of Science, Ataturk University 25240 Erzurum, Turkey (mgulluce@hotmail.com)*
[2]*Department of Biology, Kazim Karabekir Education Faculty, Ataturk University 25240 Erzurum, Turkey*

Summary

Lichens, which grow on rocky coasts, soil and plant cover exist from an association with a heterotrophic mycobiont as a fungus and an autotrophic photobiont as an alga or a cyanobacterium. These mutualistic symbionts have variously characteristic properties different from their basic component. These properties enable lichens to be used in various areas. For example, some of them are used in the perfume and dye industry and they are also used for the removal of toxic metals from different substances like water, air etc. We aimed to determine the mutagenic, antimutagenic and antigenotoxic effects of *Rhizoplaca chrysoleuca* and *Rhizoplaca melanophthalma*'s methanol extracts on the known mutagens against two different organisms using mitotic index (MI) and Ames-Salmonella assay systems. For the MI assay the genotoxic dose of NaN_3 was defined on *Zea mays* seeds and different dose of the lichen extract used as anti-mutagen (5, 10, 20, 40 mu g/plate). Observed data showed that methanol extracts prevent the cytotoxic effect of NaN_3 partially. In addition, the antimutagenic activities of the methanol extracts were investigated against 9-AA in TA1537 and NaN_3 in TA1535 strains of *Salmonella typhimurium*. Extracts show antimutagenic effect against 9-AA-induced mutation in TA1537 strain at all tested concentrations. The inhibition rates ranged from 70.73 to 85.71% (*R. chrysoleuca*, 0.5 mu g/plate - 5 mu g/plate). The results show that these natural compounds have an ability to reduce or prevent the effects of these mutagenic substances.

Key words: lichen, zea mays, seed treatment, antimutagenic

Influence of processing method on total phenolic and total flavonoid content of marjoram and summer savory

Jindřiška Vábková, Jarmila Neugebauerová

Department of Vegetable Science and Floriculture, Faculty of Horticulture, Mendel University in Brno, Valtická 337, Lednice, Czech Republic (jindriska.vabkova@mendelu.cz)

Summary

The aim of this study was evaluation of changes in total phenolic (TPC) and total flavonoid (TFC) content in marjoram (*Majorana hortensis*) and summer savory (*Satureja hortensis*) in dependence on processing. The aerial part of these herbs was harvested three times. The TPC and TFC were evaluated in fresh as well as dried and frozen herbs. TPC was determined by the photometric method using the Folin – Ciocalteu reagent. TFC was measured using a modified colorimetric method using $NaNO_2$ and $AlCl_3$ formula. In this study the amount of TPC in marjoram ranged from 6.12 to 6.74 g Gallic acid equivalents (GAE).$100g^{-1}$ dried weight (dw) in fresh herb, from 3.41 to 4.56 g GAE.$100g^{-1}$dw in frozen herb and from 4.58 to 5.12 g GAE.$100g^{-1}$dw in dried herb. Summer savory contained from 4.16 to 6.44 g GAE.$100g^{-1}$dw in fresh herb, from 2.58 to 3.58 g GAE.$100g^{-1}$dw in frozen herb and from 2.70 to 4.80 g GAE.$100g^{-1}$dw in dried herb.In the case of TFC there were in marjoram measured amounts in the range from 3137 to 3717 mg catechin equivalents (CE).$100g^{-1}$ of (dw) at fresh stage, from 1901 to 2863 mg CE.$100g^{-1}$ dw at frozen stage and from 3228 to 3773 mg CE.$100g^{-1}$ dw at dried stage. Summer savory contained amounts in the range from 2359 to 4103 mg CE.$100g^{-1}$ dw in fresh herb, from 1746 to 2495 mg CE.$100g^{-1}$ dw in frozen herb and from 1766 to 3649 CE.$100g^{-1}$ dw in dried herb.By most harvest terms contained both herbs the highest level of TPC in fresh stage and the lowest in frozen stage. Frozen summer savory and marjoram contained significantly lower TFC than fresh and dried. Drying seems to be better processing method than freezing in the case of flavonoids and phenolics preservation.

Key words: marjoram, summer savory, total phenolic content, total flavonoid content, processing

Production of plant secondary metabolites caused by exogenous application of phytohormonal substances on Weigela x hybrida in containers

Martin Jonáš, Petr Salaš, Jiří Sochor

Faculty of Horticulture, Mendel University in Brno, Valtická 337, Lednice, Czech Republic

Summary

Experiment was established in order to eliminate the effect of stress factors acting on woody plants cultivated in containers. In the experiment was evaluated effect of exogenouse application of phytohormonal substances. There were used phytohormones affecting the impact of stress on plants. Abscisic acid , 24- epibrassinolid, kinetin and spermine were applied by spraying the leafs. In nursery production, we can expected occurrence of stress factors acting on plants in containers. Environmental stress leads to morphological, biochemical, physiological and molecular changes in plants. Phytohormonal substances play a key role in resistance of plants to environmental stress. The experiment was focused on determine of content of salicylic acid and amino acids in treated variants in compare with nontreated variant. There were found diferences between treated and nontreated variants in production of secondary metabolites.

Key words: phytohormones, abscisic acid, weigela x hybrida, environmental stress

Effects of *Azotobacter* on growth and total phenolic content of garden thyme (*Thymus vulgaris*)

Sonia Naseri, Shahram Sharafzadeh, Kourosh Ordookhani

Department of Agriculture, Firoozabad Branch, Islamic Azad University, Firoozabad, Iran (shahramsharafzadeh@hotmail.com)

Summary

Garden thyme, a member of Lamiaceae family, has a very important role in phytotherapy. The growth of plant from a particular species of thyme could be markedly affected by environmental and agronomical factors. Application of biofertilizers can improve environmental conditions and human health. *Azotobacter* is one of the plant growth promoting rhizobacteria (PGPR). This study focused on the effects of different strains of *Azotobacter* on the growth of garden thyme. The treatments were different strains of *Azotobacter* (strains 5, 9, 12, 30) and comparing them to control (without using bacteria). Experiment was carried out using a completely randomized design (CRD) with three replications. All strains altered plant height, shoot fresh and dry weights and root fresh and dry weights. Total phenolic content was maximum (6.40 mg GAE/g dw) when strain 5 was used. PGPR improve nutrition uptake and induce production of growth regulators.

Keywords: total phenolic content, PGPR, biofertilizer, *Azotobacter*.

The determination of Ordu University campus flora

Metin Deveci[1] , Tuğba Bayrak Özbucak[2], Gürkan Demirkol[1]

[1]*Faculty of Agriculture, Department of Field Crops , University of Ordu, Ordu, Turkey (devecimetin@hotmail.com)*
[2]*Faculty of Science, Department of Biology, University of Ordu, Ordu, Turkey*

Summary

This research was conducted in the period 2005-2010 in order to investigate the flora of the Ordu University Campus. Ordu is phytogeographically located in Euro-Siberian floristic region. At the end of study, species, subspecies and variety level of 223 taxa belong to 58 families and 167 genera had been determined. Distribution of the taxa according to phytogeographical regions is as follows: 25,11% Euro-Siberian, 2,42% Mediterranean, 0,45% Iran- Turan and the ratio of the type which is unknown region and pluri regionals is 72,20%. The largest five families are *Poaceae* (15,25%), *Fabaceae* (12,11%), *Asteraceae* (11,70%), *Lamiaceae* (5,83%) and *Apiaceae* (4,90%). The life forms of taxa were determined according to Raunkier. 25,11% of taxa are annual, 7,60 % are biannual, and 67,30% are perennial. The results show that five taxa are endemics.

Key words: Flora, Ordu University, Campus, Turkey

Book of Abstracts

Field
crop
production

05

Ratarstvo

Zbornik sažetaka

The effect of defoliation on the yield and quality of sugar beet

Zohre Babaei[1], Mehdi Rezaee[1], Rahim Mohammadian[2], Hamid Noshad[2]

[1]*Department of Agronomy, Faculty of Agriculture, Islamic Azad University, Karaj Branch, Iran (mehdi.rezaee@kiau.ac.ir)*
[2]*Department of Sugarbeet Research. Seed and Plant Institute, Karaj, Iran*

Summary

This study was conducted to determine the effects of defoliation on the yield and quality of sugar beet grown in Karaj using *Rasool* variety. Sugar beet (*Beta Vulgaris* L.) planted at different dates (April 20 and May 20, 2012) were subjected to a single defoliation of 25, 50, 50, 75 and 100 % on four dates July10, August 5, September1 and September 25, 2012. A Factorial split plot experiment based on a randomized complete block design with four replications was carried out. The dates of defoliation were significant on percent of sugar content. The percent of sugar content of four dates of defoliation, July 10, August 5, September1 and September 25 were 21/43, 20/88, 17/43 and 15/01, respectively. There was minimum sugar content (14/06 percent) in the sugar beets from 100% defoliation in September 25. The sugar beet root yield and sugar content were reduced by defoliation significantly. One hundred percent defoliation reduced yield and sugar content 25% and 30%, respectively in compared to Non-defoliated sugar beet. The interaction of planting date, defoliation percent and defoliation date was significant on root yield. The maximum of yield root (48/73 ton/ha) was obtained from early planted sugar beets with 25 % defoliation on July 10.

Key words: Sugarbeet, Beta vulgaris L, Defoliation, Root yield, Sugar content

Potato spindle tuber viroid continues to be a potential epidemic agent in the world

Tatyana B. Kastalyeva[1], Natalya V. Girsova[1], Karina A. Mozhaeva[1], Ing Ming Lee[2], Robert A. Owens[2]

[1]*Russian Research Institute of Phytopathology (VNIIF), Bolshie Vyaziomy, Moscow Region 143050, Russia (kastalyeva@vniif.ru)*
[2]*Molecular Plant Pathology Laboratory (USDA/ARS), Beltsville, MD 20705, USA*

Summary

In the past, *Potato spindle tuber viroid* (PSTVd) has been identified in potatoes from various countries in Europe, North and South America, Asia, Australia and New Zealand. PSTVd has also been the cause of severe disease epidemics in potato in Russia. Since 2006, we have identified 45 individual sequence variants of PSTVd. A majority of these represented potato isolates collected in different regions of Russia. Several other isolates were found in potatoes from Ukraine, one was received from Georgia, and three other sequence variants of PSTVd were isolated from samples of tomato leaves collected in Armenia. Russian isolates included all types of PSTVd strains (mild, intermediate and severe), but two variants were most common. The first type is identical to a mild strain described first in Germany (GenBank Acc.# M14814), and the second seems to be an endemic Russian isolate with substitution of adenine for cytosine between positions 118 and 123. This mutation, previously observed only in Russian and Ukrainian isolates of PSTVd, has also been found in two Indian isolates (GenBank Acc.# HQ639697 and HQ639701). Globalization facilitates the spread of PSTVd throughout the world. Thus, PSTVd isolates from such distant countries as India and Poland are very similar in their sequences (GenBank Acc.# HQ639699 and X76846, respectively). The same is true for PSTVd isolates from the Netherlands (GenBank Acc.# AY372394) and Iran (GenBank Acc.# DQ308555).

Key words: Potato spindle tuber viroid, sequence identification, Russia

Study of two cropyears in different crop production models with different genotypes of corn hybrids.

Károly Máriás, Péter Pepó

University of Debrecen, Centre for Agricultural and Applied Economic Sciences Faculty of Agricultural and Food Sciences and Environmental Management 4032 Debrecen, Böszörményi Str. 138, Hungary

Summary

The experiment was carried out 6 km from Debrecen, on a homogeneous field on brown forest soil, between 2011 and 2012. Four-four corn hybrids were tested in the trial (*DKC 4795; KWS Kornelius; NK Cobalt; PR37 N01*) at three different sowing times (early; average; late). At each sowing time, three different plant densities were applied (modest; average; high). The agrotechnics applied in the experiment satisfied the requirements of modern corn cultivation. In the experiment the dry year of 2011 was followed by an extremely droughty year of 2012. In the study of 2011, the best yield result was achieved with the early sowing time out of the three examined sowing times (11315 kg ha^{-1}), which was significantly different from that of the average sowing time (10690 kg ha^{-1}), however, there was no statistically justifiable difference between the yield results of the early and the late sowing times. There was a significant difference also between the average and late sowing time. In 2012 significant difference is visible at the average sowing time.

Key words: corn, yield, sowing time, plant density

Svojstva ekstrudata proizvedenih od pšenične krupice

Đurđica Ačkar[1], Drago Šubarić[1], Antun Jozinović[1], Jurislav Babić[1], Vlado Guberac[2], Sonja Marić[2], Ružica Vračević[1]

[1]*Prehrambeno-tehnološki fakultet Osijek, Sveučilište Josipa Jurja Strossmayera u Osijeku, Franje Kuhača 20, Osijek, Hrvatska (ajozinovic@ptfos.hr)*
[2]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska*

Sažetak

Cilj ovog rada bio je odrediti svojstva ekstrudata proizvedenih od pšenične krupice vlažnosti 15% i 20%. Krupica je ekstrudirana u ekstruderu Do-Coder, Brabender 19/20 DN, GmbH, Duisburg, Njemačka pri temperaturnom profilu 135/170 °C uz primjenu puža konfiguracije 4:1 i sapnice promjera 4 mm, a ekstrudatima su određena sljedeća svojstva: promjer ekstrudata, ekspanzijski omjer, tekstura i viskoznost. Dobiveni rezultati pokazali su da je dijametar ekstrudata, a time i ekspanzija bila značajnija kod pšenične krupice ekstrudirane pri većem sadržaju vlage. Nasipna masa bila je nešto veća kod uzoraka ekstrudiranih pri nižem sadržaju vlage. Veću tvrdoću imali su uzorci ekstrudirani pri višoj vlažnosti, dok na lomljivost ekstrudata vlažnost nije utjecala. Moć upijanja pšenične krupice povećala se nakon provedenog procesa ekstruzije, pri čemu je do značajnijeg povećanja moći upijanja došlo kod pšenične krupice ekstrudirane pri većem sadržaju vlage. Ekstruzija je rezultirala povišenjem vrijednosti *viskoznosti vrha* (koja označava maksimalnu viskoznost nakon želatinizacije škroba) i vrijednosti *kidanja*, posebno kod ekstrudirane pšenične krupice pri vlažnosti 20%. Najbolju stabilnost pri visokim temperaturama imala je neekstrudirana pšenična krupica koja je imala najnižu vrijednost kidanja, a najmanje skloni retrogradaciji su uzorci ekstrudirani pri 20% vlage, s najnižom *„setback" vrijednošću.*

Ključne riječi: vlažnostpšenične krupice, ekstrudat, svojstva

Properties of extrudatesproduced from semolina

Đurđica Ačkar[1], Drago Šubarić[1], Antun Jozinović[1], Jurislav Babić[1], Vlado Guberac[2], Sonja Marić[2], Ružica Vračević[1]

[1]Faculty of FoodTechnology Osijek, Universityof Josip Juraj Strossmayer in Osijek, Franje Kuhača 20, Osijek, Croatia (ajozinovic@ptfos.hr)
[2]Faculty ofAgriculture, University of J.J. Strossamyerin Osijek, Kralja Petra Svačića 1d, Osijek, Croatia

Summary

The aim of this research was to determine properties of extrudates produced from semolina with moisture set to 15% and 20%. Semolina was extruded in extruder Do-Coder, Brabender 19/20 DN; GmbH, Duisburg, Germany at temperature profile 135/170 °C, with screw 4:1 and 4 mm die, and extrudate diameter, expansion ratio, texture and viscosity were determined. The obtained results showed that extrudate diameter and expansion increased proportionally to semolina moisture, as well as hardness of extrudates, whereas fracturability wasn't influenced by moisture content. Water absorption index of semolina increased after extrusion proportionally to moisture content of raw semolina. In addition, extrusion resulted in increase of peak viscosity and breakdown, with more pronounced effect on semolina with 20% moisture. Raw semolina was most stable during shearing at high temperatures expressed as breakdown value, whereas samples extruded at 20% moisture were least prone to retrogradation, which was expressed as "setback".

Key words: wheat, semolina, extrusion, viscosity, texture

The effect of defoliation on the yield and quality of sugar beet

Zohre Babaei[1], Mehdi Rezaee[1], Rahim Mohammadian[2], Hamid Noshad[2]

[1]*Department of Agronomy, Faculty of Agriculture, Islamic Azad University, Karaj Branch, Iran (mehdi.rezaee@kiau.ac.ir)*
[2]*Department of Sugarbeet Research. Seed and Plant Institute, Karaj, Iran.*

Summary

This study was conducted to determine the effects of defoliation on the yield and quality of sugar beet grown in Karaj using *Rasool* variety. Sugar beet (*Beta vulgaris* L.) planted at different dates (April 20 and May 20, 2012) were subjected to a single defoliation of 25, 50, 50, 75 and 100 % on four dates July10, August 5, September1 and September 25, 2012. A Factorial split plot experiment based on a randomized complete block design with four replications was carried out. The dates of defoliation were significant on percent of sugar content. The percent of sugar content of four dates of defoliation, July 10, August 5, September1 and September 25 were 21/43, 20/88, 17/43 and 15/01, respectively. There was minimum sugar content (14/06 percent) in the sugar beets from 100% defoliation in September 25. The sugar beet root yield and sugar content were reduced by defoliation significantly. One hundred percent defoliation reduced yield and sugar content 25% and 30%, respectively in compared to Non-defoliated sugar beet. The interaction of planting date, defoliation percent and defoliation date was significant on root yield. The maximum of yield root (48/73 ton/ha) was obtained from early planted sugar beets with 25 % defoliation on July 10.

Key words: Sugarbeet, *Beta vulgaris* L., Defoliation, Root yield, Sugar content

Colorado beetle (*Leptinotarsa decemlineata*) occurence and harmfulness in Poland in last ten years against climate change

Andrzej Bandyk, Felicyta Walczak

Department of Pests Methods Forecasting and Plant Protection Economy, Institute of Plant Protection – National Research Institute W. Węgorka 20, 60-318 Poznań, Poland, (A.Tratwal@iorpib.poznan.pl)

Summary

Colorado beetle (*Leptinotarsa decemlineata* Say) every year can cause significant looses in potato yield in Poland. Adult Colorado beetles are oval in shape and about 1 cm long. They have a yellow-orange area behind the head and yellowish white wing covers (elytra) with 10 narrow black stripes. Females lay clusters of bright yellowish orange oval eggs on the underside of leaves. When young larvae first hatch, they are brick red with black heads. Older larvae are pink to salmon colored with black heads. Both adults and larvae feed on foliage and may skeletonize the crop. Colorado potato beetle is the most important insect defoliator of potatoes in Poland. In Poland the harmfulness and occurrence of the agriculture plants agrophages, including Colorado beetle, has been monitored from 1950. Pest/diseases monitoring is provided by Plant Protection and Seed Health Inspection Service in collaboration with the Institute of Plant Protection - NRI, Poznań, Poland. In the last decade, the harmfulness of the colorado beetle was less than the average of several years, which is 21.9% of damaged potato plants. Lower intensity can be a consequence of unfavorable meteorological conditions for the development of the pest. Nevertheless, in some areas of the country, particularly in the north-eastern and central, a greater severity of Colorado potato beetle in recent years was observed. Such information is the base of the evaluation the tendency of pest spread as well as their economic value.

Key words: Colorado beetle, occurrence and harmfulness, pest monitoring

Evaluation of characteristics of exotic chickpea varieties

Abbas Biabani[1], Akram Moradi[2], Mosarreza Vafaie-Tabar[3]

[1] *Department of Crop Production, Gonbadkavoos University, Iran (abs346@yahoo.com)*
[2] *Department of Crop Production, Faculty of Agricultural and Natural Resource, Gonbadkavoos University, Iran*
[3]*Agricultural Research Institute, Varamin, Iran*

Summary

In order to study the chickpea (*Cicer arietinum*) characteristics from different countries, a green house experimental was carried out at Gonbadkavoos University in 2012. Randomized complete design with four replications was used to study ten chickpea cultivars (*ILC 1278*-Afghanistan, *K-1058*-Afghanestan, *PI 193485 92i SD*-Ethiopia, *IL 235*-Iraq, *RPIP 12-096-00799*-Mexico, *RPIP 12-113-00946*-Pakistan, *K-646*-Pakistan, *K-343*-Pakistan, *ILC 263*-Turkey, *UC-5*-USA, *PESAK*-Yugoslavia and *Hashem*- Iran). Some phonological (days after planting to emergence=DAPE, Emergence to flowering=DEF and emergence to harvest=DEH), morphological (height and branch number per plant) characteristics, yield and yield components were evaluated.The results showed that cultivars had significant differences in term of all characteristics except for seed number per pod. There were significant differences among average values of most characteristics of varieties.The highest and lowest seed yield per plant observed in *K–343* (Pakistan-5.4 gr.) and *RPIP–12–113–00946* (Pakistan–2.5 gr.), respectively. The maximum and minimum seed number per plant obtained from *K-646* (16.86–Pakistan) and RPIP–12–096–00799 (5–Mexico), respectively.

Key words: Chickpea, characteristics, pod, emergence, phonological.

The usefuless and effectiveness of advisory service for cutworm (*Agrotis* spp.) control in Wielkopolska and Dolnośląskie region.

Magdalena Jakubowska, Felicyta Walczak

Institute of Plant Protection – National Research Institute, W. Węgorka 20, 61-608 Poznań, Poland (M.Jakubowska@iorpib.poznan.pl)

Summary

Cutworms, particularly *Agrotis segetum* (Schiff.) and *A. exclamationis* (L.) are becoming a problem in crop production causing economically severe damage on sugar beets and potatoes. Since pesticide application for direct control in Poland is not allowed, reliable methods for quantifying cutworms infestation levels and forecasting damage are urgently needed for any control strategy. In the study (2008–2012) the chemical control was set on the basis of signaling between 31st and 37th day from the date of mass flight of moths. The date of chemical treatments was determined with the aid of phenological criteria, such as sum of heat in the range from 497.8ºC to 567.7ºC and the sum of effective temperature from 130.6ºC to 250.4ºC. The best effects of chemical treatments were obtained when the cutworms reached the L_2 stage and the plants were in the phase of the rosette growth. A slight delay in the treatment performance by a few days due to unfavorable weather condition is possible. However, the treatment must be performed not later than within 5-6 days following the appointed date, as the developing cutworm caterpillars burrow in the soil as soon as they reach the complete L_3 stage and they are covered from the pest control preparations. The results (phenological method) can be used for adjusting the currently used monitoring methods in respect of short-term and long-term forecasting of cutworms and for optimizing chemical control of pest species.

Key words: *Agrotis* spp., cutworm, advisory system, monitoring, sugar beet, effective temperature sums, IPM

Effect of agrotechnological factors on the physiological properties and yield of maize

Lajos Gabor Karancsi

Institute of Crop Science, Faculty of Agricultural and Food Sciences and Environmental Management, Centre for Agricultural and Applied Economic Sciences, University of Debrecen, H-4032 Debrecen Böszörményi str. 138., Hungary (karancsi@agr.unideb.hu)

Summary

The research was set up on chernozem soil at the Látókép AGTC KIT research area of the University of Debrecen, Hungary. Effects of increased doses of fertilizers on crop yield and photosynthetic activity were studied in seven different corn species in 2012 (*SC 3850, NX47279, SE 4410, SE 5000, P37N01, P9494, PR37M01).* Based on the results, we found that yields ranged between 10 012 kg ha^{-1} and 14 972 kg ha^{-1}. The poorest yields were produced by hybrid *PR37M81* while *NX47279* turned out to be the strongest one. Not every fertilizer treatment showed significant differences between yields. Without exception, N_{90} + PK treatments resulted in the highest yields. Highest SPAD values were measured during the grain filling period and tasseling. Results of SPAD measurements ranged between 49 and 67.5 in these two phases. Highest values were measured when using the combinations of N_{60} + PK and N_{120} + PK fertilizers.

Key words: maize hybrid, fertilization, yield, physiological properties

Potato spindle tuber viroid continues to be a potential epidemic agent in the world

Tatyana B. Kastalyeva[1], Natalya V. Girsova[1], Karina A. Mozhaeva[1], Ing Ming Lee[2], Robert A. Owens[2]

[1]*Russian Research Institute of Phytopathology (VNIIF), Bolshie Vyaziomy, Moscow Region 143050, Russia (kastalyeva@vniif.ru)*
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Summary

In the past, *Potato spindle tuber viroid* (PSTVd) has been identified in potatoes from various countries in Europe, North and South America, Asia, Australia and New Zealand. PSTVd has also been the cause of severe disease epidemics in potato in Russia. Since 2006, we have identified 45 individual sequence variants of PSTVd. A majority of these represented potato isolates collected in different regions of Russia. Several other isolates were found in potatoes from Ukraine, one was received from Georgia, and three other sequence variants of PSTVd were isolated from samples of tomato leaves collected in Armenia. Russian isolates included all types of PSTVd strains (mild, intermediate and severe), but two variants were most common. The first type is identical to a mild strain described first in Germany (GenBank Acc.# M14814), and the second seems to be an endemic Russian isolate with substitution of adenine for cytosine between positions 118 and 123. This mutation, previously observed only in Russian and Ukrainian isolates of PSTVd, has also been found in two Indian isolates (GenBank Acc.# HQ639697 and HQ639701). Globalization facilitates the spread of PSTVd throughout the world. Thus, PSTVd isolates from such distant countries as India and Poland are very similar in their sequences (GenBank Acc.# HQ639699 and X76846, respectively). The same is true for PSTVd isolates from the Netherlands (GenBank Acc.# AY372394) and Iran (GenBank Acc.# DQ308555).

Key words: Potato spindle tuber viroid, sequence identification, Russia

Bc hibridi kukuruza u proizvodnim pokusima u ekstremno sušnoj 2012. godini

Đuro Lukić, Kristijan Puškarić, Tihomir Jozinović, Robert Rojc, Robert Matasović, Ljiljana Turek, Zoran Kurtović

Bc Institut za oplemenjivanje i proizvodnju bilja d.d. Zagreb, Rugvica, Dugoselska 7, 10370 Dugo Selo, Hrvatska (lukic@bc-institut.hr)

Sažetak

Pokusi su postavljeni na raznim lokacijama u različitim agroekološkim uvjetima na području Hrvatske. Za vrijeme sjetve tlo je bilo umjereno vlažno. Priprema tla i sjetva obavljene su u idealnim uvjetima. U nicanju i za vrijeme ranog porasta kukuruza uvjeti su također još uvijek bili povoljni, pa su uglavnom ostvareni preporučeni sklopovi. Razvoj kukuruza sve do cvatnje obećavao je rekordne prinose. Pred cvatnju i u cvatnji, u srpnju, nastupa razdoblje od tri tjedna bez oborina, te visoke dnevne temperature i tople noći bez rose.Sušno razdoblje se nastavlja i tijekom kolovoza. Ovakve vremenske prilike su u konačnici rezultirale skraćenjem vegetacije i bržim otpuštanjem vode iz zrna nakon fiziološke zriobe, pa je uslijed toga berba obavljena u rekordno ranom roku, već koncem kolovoza. Ekstremna suša ipak nije pogodila jednako sve dijelove Hrvatske. Primjer je lokacija Farkaševac, gdje su ostvareni iznadprosječni urodi (10.9 t/ha). Standardni hibridi *Bc 582* (12.9 t/ha), *Bc 532* (12.7 t/ha), *Bc 572* (11.3 t/ha) i *Klipan* (11.2 t/ha) su dali očekivano najbolje rezultate. Novi hibridi kukuruza *Bc 306* i *Bc 344*, koji su ispitivani na manjem broju lokacija, dali su odličan urod (Farkaševac, Novo Virje), te pokazali da su odlično prilagođeni ekstremno sušnim uvjetima.

Ključne riječi:proizvodni pokusi, kukuruz, hibridi, suša, urod

Bc maize hybrids in performance trials in extremely dry season 2012

Đuro Lukić, Kristijan Puškarić, Tihomir Jozinović, Robert Rojc, Robert Matasović, Ljiljana Turek, Zoran Kurtović

Bc Institute for Breeding and Production of Field Crops Zagreb, Rugvica, Dugoselska 7, 10370 DugoSelo, Croatia (lukic@bc-institut.hr)

Summary

Trials were set up at various locations and different environmental conditions throughout Croatia. During planting the soil was moderately moist. Soil preparation and planting were performed under ideal conditions. During emergence and early growth conditions were also still favourable due to which the recommended stand was generally achieved. Maize development until flowering promissed record yields. Before and during flowering, in July, a three-week period without rain began, with high daytime temperatures and warm nights without dew. Dry spell continued in August. Such weather conditions eventually resulted in shortened vegetation and faster kernel dry-down after physiological maturiy. Consequently, harvesting was completed at a record time in late August. Extreme drought though did not affect all parts of Croatia equally. For example, at location Fakaševac, above-average yields (10.9 t/ha) were achieved. Standard hybrids Bc 582 (12.9 t/ha), Bc 532 (12.7 T/ha), Bc 572 (11.3 t/ha) and Klipan (11.2 t/ha) produced the best results as expected. New maize hybrids, Bc 306 and Bc 344, which were tested on a limited number of locations produced excellent yields (Farkaševac, Novo Virje) and proved that they were excellently adapted to extremely dry conditions.

Kew words: performance trials, maize, hybrids, drought, yield

Preliminary findings on the productivity of some Slovenian Karst pastures

Stefano Macolino, Cristina Pornaro, Umberto Ziliotto

Department of Agronomy Food Natural Resources Animals and Environment, University of Padova, viale dell'Università 16, AGRIPOLIS, 35020 Legnaro, Padova, Italy (stefano.macolino@unipd.it)

Summary

In order to preserve natural and cultural heritage of the Karst Edge, the project "Network for the protection of biodiversity and landscape" (BioDiNet), has been started in 2011. Among the project activities scheduled, there was the study of the productivity of Karst pastures for defining grazing management guidelines. The preliminary findings of this study, conducted in the Slovenian (Rakitovec and Zazid, Koper) and the Italian (Polazzo, Gorizia) Karst from April to October 2012, are here reported.In each location were determined: 1. the evolution of herbage production (t ha^{-1} dray matter [DM]) during the growing season from April to July 2. the evolution of herbage production during the autumn regrowth (September-October) after the growth interruption in the summer The herbage production of Karst pastures is mainly obtained during spring, and it did not vary significantly from April to July with values that ranged from 0.6 to 1.2 t ha^{-1} DM. During the regrowth, the production was on the average of 0.1-0.2 t ha^{-1} DM. The pastures that was examined are able to support only a livestock unit not exceeding 0.35 UL ha^{-1}. As for the abandoned pastures, the maximum daily production was obtained in 2-3 weeks in April.The herbage production of Karst pastures can support only a moderate level of grazing. A high grazing intensity in these areas may result in a severe pasture damage. The intensity of grazing would be an important factor for future decisions.

Key words:?

Cyclic hydroxamic acid content of maize hybrids measured by HPLC-method

László Nagy, Géza László Nagy, Peter Makleit

Department of Agricultural Botany and Crop Physiology, Institute of Plant Sciences, Centre for Agricultural Sciences and Engineering, University of Debrecen, H-4032, Debrecen, Böszörményiút 138., Hungary (pmakleit@agr.unideb.hu)

Summary

In this research work the cyclic hydroxamic acid (cHx) content of roots of five different maize hybrids in the early stages of development were measured by using HPLC-method. As cHx-s play an important role in the protection against western corn rootworm (*Diabrotica virgifera virgifera* LeConte), the knowledge of the amount of these chemicals in the roots is a valuable imformation. Significant differencies were measured amongst the examined varieties in the amount of cHx-s. The cHx-content was the highest in the roots of the youngest plants and decreased with ageing. There were differencies amongst hybrids in the rate of decrease too. The selection of hybrids with higher cHx-content which have higher self-protecting ability helps to reduce the costs of plant protection and the risks of environmental pollution.

Key words: cyclic hydroxamic acids, maize hybrids

Study of two cropyears in different crop production models with different genotypes of corn hybrids.

Károly Máriás, Péter Pepó

University of Debrecen, Centre for Agricultural and Applied Economic Sciences Faculty of Agricultural and Food Sciences and Environmental Management 4032 Debrecen, Böszörményi Str. 138, Hungary

Summary

The experiment was carried out 6 km from Debrecen, on a homogeneous field on brown forest soil, between 2011 and 2012. Four-four corn hybrids were tested in the trial (*DKC 4795; KWS Kornelius; NK Cobalt; PR37 N01*) at three different sowing times (early; average; late). At each sowing time, three different plant densities were applied (modest; average; high). The agrotechnics applied in the experiment satisfied the requirements of modern corn cultivation. In the experiment the dry year of 2011 was followed by an extremely droughty year of 2012. In the study of 2011, the best yield result was achieved with the early sowing time out of the three examined sowing times (11315 kg ha^{-1}), which was significantly different from that of the average sowing time (10690 kg ha^{-1}), however, there was no statistically justifiable difference between the yield results of the early and the late sowing times. There was a significant difference also between the average and late sowing time. In 2012 significant difference is visible at the average sowing time.

Key words: corn, yield, sowing time, plant density

Effect of the agrotechnological factors on the yield and physiological properties of the sunflower

Adrienn Novák

Institute of Crop Science, Faculty of Agricultural and Food Sciences and Environmental Management, Centre for Agricultural and Applied Economic Sciences, University of Debrecen, H-4032 Debrecen, Hungary (novak@agr.unideb.hu)

Summary

The field research was carried out on chernozem soil at the Látókép AGTC KIT research area of the University of Debrecen. In 2012, effects of plant density and fungicides on growth and yield were examined in three different genotypes of hybrid sunflowers (*P64LC09, Paraiso 1000* and *ES Tectonic*). We applied two variations of plant density measures (35 000 plants ha^{-1} and 55 000 plants ha^{-1}) and two different treatment levels of fungicides (control = no fungicides applied, double fungicide protection). The leaf area index (LAI) ranged between 3.7 AND 5.4 m^2/m^2 during the research and the highest values of LAI were measured in the beginning of July. *Paraiso 1000* had the largest LAI amongst the examined hybrids. In the year of 2012, crop yield varied between 1 826 and 3 602 kg ha^{-1}. Optimum plant density was 55 000 plants ha^{-1} in both the cases of control and double protected plants. According to our examination, fungicide treatments enhanced yields. This result is also underpinned by the fact that yields in the control stand were lower than those of the double protected ones.

Key words: sunflower genotype, sowing date, fungicide treatment, physiological properties, yield,

Determination of quality parameters with yield and yield components of maize hybrids of different FAO maturity groups

Fatih Oner[1], İsmail Sezer[2], Ali Gulumser[2]

[1]*Faculty of Agriculture, Department of Field Crops , University of Ordu, Ordu, Turkey (fatihoner38@gmail.com)*
[2]*Faculty of Agriculture, Department of Field Crops,University of Ondokuz Mayis, Samsun, Turkey*

Summary

This study was set up at three locations (Samsun, Adapazari and Adana) in Turkey in 2008. Randomised block design with three replications was used. At each location 24 hybrids were tested from each of four maturity groups (FAO 400, FAO 600, FAO 650 and FAO 700). Measurements were made of the yield average (kg/da) and the yield components (kernel/cob ratio, plant height, cob height, moisture) were. The protein, oil and starch content of the kernels was determined. In each maturity group the highest yield averages were associated with the greatest average starch content, except for the FAO 400 group in Adana. The variety caused greater differences in protein content than the location. The highest oil content were found in the FAO 650 and FAO 700 groups, but the highest starch content were found FAO 600, FAO 650 and FAO700.

Key words: Maize, FAO maturity group, yield component, protein, oil, starch

Genetic variation of Turkish maize varieties and their accessions for morphological and agronomical traits

Fatih Oner[1], Ahmet Okumus[2], Selcuk Bali[3]

[1]*Faculty of Agriculture, Field Crops Department, University of Ordu, Ordu, Turkey (fatihoner38@gmail.com)*
[2]*Faculty of Agriculture, Department of Biotechnology, University of Ondokuz Mayis, Samsun, Turkey*
[3]*Vocational School of Social Sciences, University of Ordu, Ordu, Turkey*

Summary

Turkish maize accessions collected from north of Turkey were investigated for genetic variation in three maize varieties (flint, pop, dent) including 79 accessions using 8 agronomic and morphologic traits by ANOVA and multivariate discriminant function analysis. Varieties and accessions were significantly varied for variance components which were made up high variance due to accessions. Positive correlations were found between agronomic and morphologic traits. Multivariate discriminant function analysis with 8 traits revealed that first two multivariate correlation covered 86,6 % and second, 69 % of total variation among accessions and the first multivariate discriminant function had high eigen value with 76,8 % of total variance between varieties belonged to flint and pop maize accessions while the second multivariate variable belonged to flint and dent maize accessions. These multivariate variables correctly classify three maize varieties maintaining maize accessions for their variety characteristics with agronomic and morphological traits.

Key-words: agronomic traits, multivariate discriminant function analysis, Turkish maize accessions

Effects of sewage sludge on the yield of plants in the rotation system of wheat-white head cabbage-tomato

Mehmet Arif Özyazıcı, Mehmet Aydoğan

Black Sea AgriculturalResearch Institute, Samsun, Turkey

Summary

This research was carried to determine the effects of sewage sludge applications on the yield and yield components of plants under crop rotation system. The field experiments were conducted in the Bafra Plain, located in the north region of Turkey. In this research, the "wheat-white head cabbage-tomato" crop rotation system has been examined and the same crop rotation has been repeated in two separate years and field trials have been established. Seven treatments were compared: a control without application of sludge nor nitrogen fertilization, a treatment without sludge, but nitrogen and phosphorus fertilization, applied at before sowing of wheat and five treatments where, respectively 10, 20, 30, 40 and 50 tons sludge ha^{-1}. The experimental design was a randomized complete block with three replications. The results showed that all the yield components of wheat and yield of white head cabbage and tomato increased significantly with increasing rates of sewage sludge as compared to control. As results, 20 t ha^{-1} of sewage sludge application could be recommended the suitable dose for the rotation of wheat-white head cabbage-tomato in soil and climatic conditions of Bafra Plain.

Key Words: Sewage sludge, tomato, wheat, white head cabbage

Utjecaj gustoće sklopa i prihrane dušikom na agronomska svojstva pira (*Triticum spelta* L.)

Ana Pospišil, Milan Pospišil, Davor Farkaš

Sveučilište u Zagrebu, Agronomski fakultet, Svetošimunska cesta 25, Zagreb, Hrvatska

Sažetak

Pir (*Triticum spelta* L.) ponovo se počinje uzgajati u Republici Hrvatskoj te uzgoj ove žitarice doprinosi povećanju bioraznolikosti. Na pokušalištu Agronomskog fakulteta u Zagrebu provedena su tijekom 2010./2011. i 2011./2012. godine istraživanja s ciljem utvrđivanja utjecaja gustoće sjetve i prihrane dušikom na agronomska svojstva pira u agroekološkim uvjetima sjeverozapadne Hrvatske. U istraživanju su bile dvije sorte pira: *Nirvana* i *Ostro*, tri gustoće sjetve (200, 300 i 400 klijavih zrna/m^2) te prihrana dušikom. Prihrana dušikom obavljena je na početku i kraju busanja sa po 25 kg/ha dušika. U obje godine istraživanja sorta *Nirvana* ostvarila je značajno veći prinos neoljuštenog zrna u odnosu na sortu *Ostro*. U 2010./2011. ostvareni prinos neoljuštenog zrna pira bio je 4,99 odnosno 4,62 t/ha, a u 2011./2012. 6,85 odnosno 6,16 t/ha. Sorta *Ostro* ostvarila je značajno veću masu 1000 zrna te veći sadržaj proteina u zrnu. Gustoća sklopa nije imala utjecaja na istraživane parametre osim na broj klasova po m^2 te je kod najveće gustoće sklopa ostvaren i značajno najveći broj klasova. Prihrana dušikom pozitivno je utjecala na prinos neoljuštenog zrna pira, broj klasova po m^2 i masu 1000 zrna. Prihrana dušikom nije imala utjecaja na udio oljuštenih zrna u ukupnoj masi i sadržaj proteina u zrnu pira.

Ključne riječi: pir, sorta, gustoća sjetve, prihrana, agronomska svojstva

Influence of seeding rate and topdressing on agronomic traits of spelt (*Triticum spelta* L.)

Ana Pospišil, Milan Pospišil, Davor Farkaš

University of Zagreb, Faculty of Agriculture, Svetošimunska cesta 25, Zagreb, Croatia

Summary

Spelt (*Triticum spelta* L.) is grown again in the Republic of Croatia and its cultivation contributes to increased biodiversity. Therefore, in order to determine the possibility of growing this crop in the agroecological conditions of the northwest Croatia studies were carried out at the Faculty of Agriculture in Zagreb during the growing seasons 2010/2011 and 2011/2012. The aim of the research was to determine the influence of seeding rate and topdressing on the agronomic traits of spelt. The trials included two spelt varieties: Nirvana and Ostro, three seeding rates (200, 300 and 400 germinated seeds m^{-2}) and topdressing with 50 kg N ha^{-1} equally distributed and applied at the beginning and at the end of tillering. In both years the variety Nirvana achieved a significantly higher yield than the variety Ostro. In 2010/2011 hulled grain yield was 4.99 and 4.62 t ha^{-1}, respectively and in 2011/2012 6.85 and 6.16 t ha^{-1}, respectively. The variety Ostro achieved significantly higher 1000 grain weight and higher protein content. Seeding rates had no effect on the studied parameters except for the number of ear. The highest densities achieved significantly the highest ear number per m^{-2}. Topdressing had a positive impact on the yield of hulled grain, ear number per m^{-2} and 1000 grain weight. Topdressing had no influence on the dehulled grain content and protein content in spelt grain.

Key words: spelt, variety, seeding rate, topdressing, agronomic traits

An Important Question: How to Manage Agricultural Wastes?

Mahtab Pouratashi

Faculty of Agricultural Economics and Development, University of Tehran, Iran (m_pouratashi@yahoo.com)

Summary

With population growth, agriculture will need to produce enough supply of food to feed an expected more than eight milliard people by 2030 and this additional production must be achieved with productivity of production factors and decrease of agricultural waste. Since decrease of agricultural wastes is an important way for agricultural sustainability, there is the need to understand factors influencing agricultural waste and to reduce them. This study aims to answer to an important question, which is how to manage agricultural wastes. This article is a meta-analysis study and has done with reviewing and analyzing various researches in different countries. The findings revealed that post harvesting problem, pre-harvesting- natural problem, infrastructure and harvesting problem were the four factors affected agricultural waste. The best method for waste management was reducing of waste. Some factor that reduces agricultural waste was choice of best kind, light intensity, irrigation, feeding management, gathering time, storekeeping technology, package technology, use of biotechnology, and use of nuclear power. According to the findings, there were significant differences between the agricultural losses of farmers who participated in educational courses and who didn't participated. In this regard, extension knows waste management as nations' action and use different methods to deliver knowledge to clients. Therefore, extension needs to use appropriate methods for reach to this purpose.

Key words: waste, waste management, agriculture, irrigation, sustainable development

Učinkovitost kemijskog tretiranja protiv kukuruznog moljca u sjemenskom kukuruzu

Emilija Raspudić[1], Ankica Sarajlić[1], Marija Ivezić[1], Ivana Majić[1], Mirjana Brmež[1], Andrej Gumze[2]

[1]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (ankica.sarajlic@pfos.hr)*
[2]*Pioneer Hi-Bred Production d.o.o. (a DuPoint company), Austria*

Sažetak

Primarni cilj pokusa bio je odrediti točno vrijeme suzbijanja ličinki kukuruznog moljca *Ostrinia nubilalis* Hübner i učinkovitost kemijskih sredstva (Zagor i Chromogor + S) protiv tog štetnika. Pokus je postavljen u 2010. i 2011. godini na Ovčari (istočna Hrvatska) u sjemenskom kukuruzu. U pokus su uključena dva hibrida FAO grupe 400: *PR37NO1* i *PR37F73*. Tijekom vegetacije pratila se biologija štetnika kako bi se odredio optimalan rok primjene insekticida, a pred kraje vegetacije napravljena je disekcija stabljike kukuruza gdje su zabilježeni prinos zrna kukuruza, dužina oštećenja stabljike, broj ličinki u stabljici i klipu. Statističkom obradom podataka utvrđeno je da su godina, tretman i hibrid značajno utjecali na pojavu ovog štetnika. Utvrđena je statistički značajna jaka korelacija između dužine oštećenja stabljike kukuruza i broja ličinki u stabljici.

Ključne riječi: kukuruzni moljac, tretman, insekticid, hibrid, vrijeme suzbijanja

Efficiency of chemical treatment against the European corn borer in seed corn

Emilija Raspudić[1], Ankica Sarajlić[1], Marija Ivezić[1], Ivana Majić[1], Mirjana Brmež[1], Andrej Gumze[2]

[1]*Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (ankica.sarajlic@pfos.hr)*
[2]*Pioneer Hi-Bred Production d.o.o. (a DuPoint company), Austria*

Summary

The primary target of this experiment was to determine the exact time of spraying European corn borer larvae, *Ostrinia nubilalis* Hübner and effectiveness of chemical insecticides (Zagor and Chromogor + S) against this pest. The experiment was set up in 2010. and 2011. on Ovčara (eastern Croatia) in seed corn. At this trial it was included two hybrids FAO 400: PR37NO1 and PR37F73. During the growing season we monitored the biology of pests in order to determine the optimal time of insecticide application, and before the end of the vegetation we made dissection of corn stalks where we recorded grain yield, length of stem damage, number of larvae in the stalk and cob. Statistical analysis shows that year, a hybrid and treatment significantly influenced the incidence of this pest. There was a statistically significant strong correlation between the length of damaged corn stalks and the number of larvae in the stalk.

Key words: European corn borer, treatment, insecticide, hybrid, time of spraying

Effect of CIPC on the shelf life and quality characteristics of potatoes

Mehdi Rezaee, Bita Rahimibadr

Department of Agronomy, Faculty of Agriculture, Karaj Branch, Islamic Azad University, Iran (mehdi.rezaee@kiau.ac.ir)

Summary

The effects of CIPC (isopropyl N-(3-chlorophenyl) carbamate) treatment (0, 0.5 and 1.0 gr/kg) on potato tubers after harvest were studied during 5 months of storage under ambient conditions at temperature (3.5- 32.5˚C) and relative humidity(26-85%) using Marfona variety tubers. A factorial experiment was done, based on a Randomized Complete Block Design with four replications. The dose 1gr/kg of CIPC completely inhibited sprouting while non-treatment tubers and 0.5 treatment tubers sprouted extensively and were not suitable for any use as maximum sprouting has occurred in control (56.4%) followed by 0.5gr/kg treated tubers (13.8%). This study indicated the using of CIPC significantly affected sprouting, weight loss, specific gravity, sugars and ascorbic acid of tubers. Reduction sugars content significantly increased by lower dose of CIPC while non-reducing sugar did not decrease by higher dose of CIPC. The contents of ascorbic acid were not decreased by CIPC treatment significantly. Maximum percent decrease in weight (48.25%), starch (16%) and specific gravity (6%) were recorded for control while minimum percent decrease in weight (23.40%), starch (5.0%) and specific gravity (1.2%) were noted for 1gr/kg CIPC treated tubers. The 1gr/kg CIPC treatment seems to be better for the extension of shelf life of potatoes.

Keywords*:* Storage, Potato, γ-radiation,Sprouting, Shelf Life

Agronomic characteristics in some barley (*Hordeum sativum* L.) cultivars

Imer Rusinovci, Sali Aliu, Salih Salihu, Shukri Fetahu and Ilmije Vllasaku

University of Prishtina, Faculty of Agriculture, Department of Crop Science, Prishtina, Kosova (irusinovci@hotmail.com; imer.rusinovci@uni-pr.edu).

Summary

The experiment was establish in agroecological conditions in Skopje with objective to evaluate and investigate the three (3) barley cultivars as follows; *Egej*, *Hit* and *Barun*. The design of experiment was randomly with four replicates. In these study are investigate different traits include; weight of 1000 seeds, hectolitric weght (HW), yield per cultivars (YC) and protein content (PC). The total average values for 1000 seed weight was 56.08 g, while with higher values was characterized cultivar *Barun* on value 57.0 g. With lower vlaues was determined at cultivar Hit (55.25 g). The differences beteween them were +1.75 g per plant , non significant differences. On higher average values of HW was determined at cultivar *Hit* (67.2 kg), on lower values was cultivar *Barun* (64.80 kg). The differences between cultivars were significantly higher for level of probability LSD*p* =0.05. The average yield at all cultivars which was include in our study was 3.81 t/ha, the cultivar *Barun* was on higher average yiled (4.65 t/ha), but the cultivar *Hit* was realised lower yiled (3.07 t/ha). The differences between cultivars were +1.58 t/ha, significanlty higher on level of probability 0.05. The PC is one crucial element for quality of beer industry.in our study the higher value of PC was cultivar Egej (12.75%), while on better values was characterized *Barun* (11.0%). The differences between cultivars was +1.75%, significantly at level of probability 0.05.

Key words: Barley, cultivars, yield, protein content.

Utjecaj organskog biostimulatora Amalgerol premium na svojstva pšenice i šećerne repe

Ružica Šimunić[1], Siniša Krnjaić[2], Davor Batas[3], Krešimir Ciprić[4], Krunoslav Rob[5]

[1]*Belje d.d. PC Kooperacija, Industrijska zona 1,31326, Darda, Hrvatska (ruzica.simunic@belje.hr)*
[2]*PZ Naše selo , Borisa Kidriča 59/A, 31 324, Jagodnjak, Hrvatska*
[3]*Cheminova A/S Predstavništvo u RH, Frana Alfirevića 19, Zagreb, Hrvatska*
[4]*Sjemenarna d.o.o., Slavonska avenija 26/1, Zagreb, Hrvatska*
[5]*Vodno gospodarstvo, Sv. Ivana Krstitelja 115, 31326, Darda, Hrvatska*

Sažetak

Cilj pokusa je bio utvrditi utjecaj organskog biostimulatora i poboljšivača Amalgerol Premium na svojstva pšenice i šećerne repe u 2012. godini sa 124 l manje oborina od prosjeka a višom prosječnom temperaturom zraka za 2 ^{o}C i sa 42 dana maksimalnom temperaturom zraka višom od 30°C u vegetacijskom periodu. Isipitvanje primjene folijarne gnojidbe obavljeno je na proizvodnih površina PZ Naše Selo Jagodnjak, pšenice na 2 ha a šećerne repe na 6 ha. Na osnovu kemijske analize tla za pšenicu obavljena je gnojidba s 132,6 kg N /ha, 60 kg/ha P_2O_5 i 90 kg/ha K_2O i folijarno Amalgerol u dozi od 3 l/ha i Folyx 1 l/ha u fazi vlatanja, a za šećernu repu s 76 kg N /ha, 110 kg/ha P_2O_5 i 120 kg/ha K_2O i folijarno Amalgerol u dozi od 5 l/ha i Bormax 3 l/ha u vrijeme zatvaranja redova. U kontrolnoj varijanti nije obavljena folijarna prihrana. Amalgerol sadrži biljne ekstrakte i biljna ulja, esencijalna ulja, te ekstrakte algi; Folyx sadrži - 330 g/l Mn, 200 g/l Zn i 50 g/l Cu, a Bormax sadrži 150 g/l bora.). Primjenom Amalerol premium prinos pšenice se povećao 1,61%, sadržaj vlage za1,30 %, a hektolitarska masa za 1,92 %. Primjenom Amalgerola premium prinos šećerne repe bio je veći za 16,47 %, broj repa na ispitivanoj površini je bio viši za 8,16 %, BPŠ veći za 11,62%, a TPŠ za 8,53%.

Ključne riječi: Amalgerol Premium, biostimulator, gnojidba, pšenica, šećerna repa

Quantitative indicators of wheat and sugar beet by apply Amalgerol premium

Ružica Šimunić[1], Siniša Krnjaić[2], Davor Batas[3], Krešimir Ciprić[4], Krunoslav Rob[5]

[1]*Belje PC Kooperacija, Industrijska zona 1,31326 Darda, Croatia (ruzica.simunic@belje.hr)*
[2]*PZ Naše selo, Borisa Kidriča 59/A,31 324,, Jagodnjak, Croatia*
[3]*Cheminova representation in the Republic og Croatia, Frana Alfirevića 19,Zagreb, Croatia*
[4]*Sjemenarna d.o.o., Slavonska avenija 26/1, Zagreb, Croatia*
[5]*Vodno gospodarstvo, Sv. Ivana Krstitelja 115, 31326, Darda, Croatia*

Summary:

The goal of the trial was to establish qualitative and quantitative indicators of wheat and sugar beet due to application of organic biostimulator and soil conditioner Amalgerol Premium in the year 2012. In that year 124 liters of the less precipitation than the average and the higher average air temperature for two degrees and with 42 days with maximum air temperature higher than 30°C in the vegetation period.The testing of the application of foliar fertilisation was conducted on the agricultural production area of PZ Naše Selo Jagodnjak, wheat on 2 ha and sugar beet on 6 ha.On basis of the soil chemical analysis for wheat it was applied 132,6 kg/ha of nitrogen (N), 60 kg/ha of phosphorus pentoxide (P_2O_5) and 90 kg/ha of potassium oxide (K_2O) in the soil and foliar Amalgerol in dose of 3 l/ha and Folyx 1 l/ha in the stage of steam elongation. For sugarbeet it was used 76 kg/ha of Nitrogen (N), 110 kg/ha of phosphorus pentoxide (P_2O_5) and 120 kg/ha potassium oxide (K_2O) in the soil and foliar application with 5 l/ha of Amalgerol and 3 l/ha of Bormax. On the control no foliar fertilization was not used.(Amalgerol Premium contains plant oils and essential oils, plant extracts and seaweed exctracts. Bormax contains 150 g/l of Boron (B). Folyx contains 330 g/l Manganese (Mn), 200 g/l Zinc (Zn) and 50 g/l copper (Cu).)Due to use of Amalgerol on wheat the yield was higher for 1,61 %, moisture for 1,30 %, andhectoliter mass for 1,92 %. Due to use of Amalgerol on sugarbeet the yield was higher for 16,47 %, number of beets was on the trial field higher for 8,16%, the biological yield of sugar was higher for 11,62% and technological yield of sugar was higher for 8,53%

Key words: Amalgerol Premium, biostimulator, fertilisation, wheat, sugarbeet.

Crop rotaion and fertilizer effects for maize yield on chernozem soil in a long-term experiment

Gergely Szilágyi

Faculty of Agricultural and Food Sciences and Environmental Management, Centre for Agricultural and Applied Economic Sciences, University of Debrecen, H-4032 Debrecen Böszörményi str. 138, Hungary (szilagyi.gergely@agr.unideb.hu)

Summary

Maize is the most widely grown grain crop in Hungary, in 2010 the harvested area was 1,06 million ha (FAO, 2010). In maize production the most important facts are improve the annual yield productivity and yield stability. Yield are determined basically by crop rotation and fertilizers quantity, but also cropyear have significant influence. We have studied crop rotation and fertilizer effects for yield on chernozem soil in a long-term experiment (2007, 2008, 2010 cropyear). We had different results in yield due to the crop rotation and fertilizer levels. The effect of crop rotation in average of the years was significant. The biculture gave the highest avarage of yields in longterm experiment (10115 kg ha^{-1}), the second was triculture (9622 kg ha^{-1}) or rather the third was monoculture (7699 kg ha^{-1}). We have measured the effects of nutrition in the surplus yield on the average of the year. Our study showed that the maximum effects of fertilizers was the highest in monoculture with 2052 kg ha^{-1} surplus production, then triculture with 1208 kg ha^{-1} production respectively in the biculture given 1166 kg ha^{-1} surplus yield.

Key words: maize, crop rotation, fertilizers effect

Morphological characteristics and seed yield of East Anatolian local forage pea (*Pisum sativum* ssp. *arvense* L.) ecotypes

Mustafa Tan, Ali Koc, Zeynep Dumlu Gul

Atatürk University Faculty of Agriculture Department of Field Crop, Erzurum, Turkey (mustan@atauni.edu.tr)

Summary

Local forage pea ecotypes, (*Pisum sativum* sp. *arvense* L.) have been cultivated by farmers in the Northern part of the Eastern Anatolia region of Turkey for years and there has not been any breeding regarding these materials up to now. Thus, the material shows great variation with respect to morphological and agronomical characters compared to commercial forage pea cultivars. The objectives of this study was to evaluate yield and some traits of promised local pea ecotypes which was selected previous year's screening study material collected from 61 different location in the northern part of the Eastern Anatolia in 2007. All seed materials were sown with randomized complete blocks design with three replicates in Atatürk University Faculty of Agriculture Experimental Station in 2009 and 2010. There were considerable variations with respect to investigated characters among the ecotypes and also significant interactions over the years. According to two years results, investigated properties were varied from 83.5 to 126.5 cm for plant height, 102 to 116.5 days for days to harvest, 10.4 to 15.5 for pod number per plant, 3.5 to 5.6 for seed number per pod, 3.0 to 4.4 for lodging score, 67.3 to 227.4 g for 1000 kernel weight, 3.37 to 4.57 t ha^{-1} for straw yield, 1.50 to 2.21 t ha^{-1} for seed yield and 27.5 to 35.9 % for harvest index. As a result, *Avcilar* and *Ortakent* ecotypes were considered to be tested in location experiment for new variety development because these ecotypes performed more stable results across the years and higher yield performance.

Key Words: Forage pea, ecotypes, seed yield, plant traits

Usefulness of decision support systems in winter barley control against powdery mildew (Blumeria graminis f. sp. hordei)

Anna Tratwal

Department of Pests Methods Forecasting and Plant Protection Economy Institute of Plant Protection – National Research Institute 60-318 Poznań, Poland (A.Tratwal@iorpib.poznan.pl)

Summary

One of the crucial elements of integrated plant control are different decision support systems (DSS). The main aim of DSS is clear indicating optimal time of chemical treatment. Different programs of DSS allow reducing a number of chemical treatments while an efficacy of the treatment is satisfactory. The assumptions of DSS provide consumers and environment protection and improve the level of plants control. The DSS program has to answer to basic questions: - when the chemical treatment should be done?, - is the treatment economically well-founded?, - which chemical product should be used? Some DSS require automatically submitted meteorological data day by day, directly from the meteorological station to the computer. The DSS NegFry for signaling late blight (*Phytophthora infestans*) can an example. There are also DSS programs mainly operating on the base of mathematical models (without day by day meteorological data automatically submitted to the computer), namely Epipre, MetPole, Kentucky Decision Guide, PC- Plant Protection. Programs for control main disease occurring on cereals. The aim of the research was usefulness and effectiveness of three DSS programs (Epipre, MetPole, Kentucky Decision Guide) on winter barley plantations in Wielkopolska region.

Key words: winter barley, powdery mildew, sustainable agriculture, DSS

Effect of the ecological and the agrotechnological factors on the growth and the yield of the winter wheat

Enikő Vári

Institute of Crop Science, Faculty of Agricultural and Food Sciences and Environmental Management, Centre for Agricultural and Applied Economic Sciences, University of Debrecen, H-4032 Debrecen, Böszörményi street 138 (varie@agr.unideb.hu)

Summary

The effects of crop rotation, crop year and nutrien supply, as well as were studied on the growth and the yields of winter wheat variety GK Csillag during the 2010/2011 and 2011/2012 crop years. The experiments were conducted in triculture (pea – wheat – corn) and biculture (wheat – corn), at three nutrition levels. N fertilization has an outstanding role in the changes in leaf area index, leaf area duration and yield of winter wheat. According to our results, the interaction effect of leaf area index, leaf area duration and fertilization resulted in the maximum yield in biculture and triculture. The weather of the 2010/2011 vegetation period positively affected the growth of winter wheat stands. Based on fertilization, yields varied between 2 046 and 7 742 kg ha-^{1} in bicultural and 6 570 and 9 830 kg ha-1 in tricultural wheat stands. The year of 2011/2012 has been characterized by extreme weather conditions considering the vegetative and generative growth stages and the yield of winter wheat. Yields amounted between 2 439 and 8 109 kg ha^{-1} in biculture and 5 015 and 8 203 kg ha $^{-1}$ in triculture stands depending on fertilization.

Key words: winter wheat, Leaf Area Index, yield

Bean (*Phaseolus vulgaris* L.) nitrogen fixation of inoculation in plant and soil and plant stem above effects organ

Nuri Yilmaz, Mehtap Akkurt

Faculty of Agriculture, Field Crops Department, University of Ordu, Turkey (y_nuri@hotmail.com)

Summary

In this study, the inoculation of bean plants and plant roots and soil nitrogen over fixation organs were investigated. according to trial randomized plots factorial experimenatal design and as five different beans (*Göynük, Nazıkız, Balkız, Gina, Judia*), two bacteria vaccination (vaccinated and unvaccinated), two sterilization conditions (sterilized and unsterilized), and a 3 repetitive. In the experiment, nodule number, nodule weight, the soil above % N content, root in the % N content, nodule % N content, characters such as investigated. According to research, varieties, number of nodules per plant and nodule weight per plant increased to a statistically significant effect. The other hand, shoot% N rate, root and nodule % N, % N rate effect on the rate of the patients were not important. Inoculation of the dry weight of roots that go into effect as statistically significant, the effect of other important observations, not out. Sterilization of soil conditions, nodule weight was up a statistically significant effect in this case, the effects of other important observations have not quit.

Key words: bean, bacteria, nitrojen fixation

Agronomic characteristics in some barley (*Hordeum sativum* L.) cultivars

Imer Rusinovci, Sali Aliu, Salih Salihu, Shukri Fetahu and Ilmije Vllasaku

University of Prishtina, Faculty of Agriculture, Department of Crop Science, Prishtina, Kosova (irusinovci@hotmail.com; imer.rusinovci@uni-pr.edu)

Summary

The experiment was establish in agroecological conditions in Skopje with objective to evaluate and investigate the three (3) barley cultivars as follows; *Egej*, *Hit* and *Barun*. The design of experiment was randomly with four replicates. In these study are investigate different traits include; weight of 1000 seeds, hectolitric weght (HW), yield per cultivars (YC) and protein content (PC). The total average values for 1000 seed weight was 56.08 g, while with higher values was characterized cultivar *Barun* on value 57.0 g. With lower vlaues was determined at cultivar Hit (55.25 g). The differences beteween them were +1.75 g per plant , non significant differences. On higher average values of HW was determined at cultivar *Hit* (67.2 kg), on lower values was cultivar *Barun* (64.80 kg). The differences between cultivars were significantly higher for level of probability LSD*p* =0.05. The average yield at all cultivars which was include in our study was 3.81 t/ha, the cultivar *Barun* was on higher average yiled (4.65 t/ha), but the cultivar *Hit* was realised lower yiled (3.07 t/ha). The differences between cultivars were +1.58 t/ha, significanlty higher on level of probability 0.05. The PC is one crucial element for quality of beer industry.in our study the higher value of PC was cultivar Egej (12.75%), while on better values was characterized *Barun* (11.0%). The differences between cultivars was +1.75%, significantly at level of probability 0.05.

Key words: Barley, cultivars, yield, protein content

Morphological characteristics and seed yield of East Anatolian local forage pea (*Pisum sativum* ssp. *arvense* L.) ecotypes

Mustafa Tan, Ali Koc, Zeynep Dumlu Gul

Atatürk University Faculty of Agriculture Department of Field Crop, Erzurum, Turkey (mustan@atauni.edu.tr)

Summary

Local forage pea ecotypes, (*Pisum sativum* sp. *arvense* L.) have been cultivated by farmers in the Northern part of the Eastern Anatolia region of Turkey for years and there has not been any breeding regarding these materials up to now. Thus, the material shows great variation with respect to morphological and agronomical characters compared to commercial forage pea cultivars. The objectives of this study was to evaluate yield and some traits of promised local pea ecotypes which was selected previous year's screening study material collected from 61 different location in the northern part of the Eastern Anatolia in 2007. All seed materials were sown with randomized complete blocks design with three replicates in Atatürk University Faculty of Agriculture Experimental Station in 2009 and 2010. There were considerable variations with respect to investigated characters among the ecotypes and also significant interactions over the years. According to two years results, investigated properties were varied from 83.5 to 126.5 cm for plant height, 102 to 116.5 days for days to harvest, 10.4 to 15.5 for pod number per plant, 3.5 to 5.6 for seed number per pod, 3.0 to 4.4 for lodging score, 67.3 to 227.4 g for 1000 kernel weight, 3.37 to 4.57 t ha^{-1} for straw yield, 1.50 to 2.21 t ha^{-1} for seed yield and 27.5 to 35.9 % for harvest index. As a result, *Avcilar* and *Ortakent* ecotypes were considered to be tested in location experiment for new variety development because these ecotypes performed more stable results across the years and higher yield performance.

Key words: forage pea, ecotypes, seed yield, plant traits

Book of Abstracts

Fisheries, Game Management and Beekeeping

06

Ribarstvo, lovstvo i pčelarstvo

Zbornik sažetaka

Povijest i uloga časopisa „Croatian Journal of Fisheries (Ribarstvo)“ u znanosti i razvoju ribarstvene struke – prigodom 75. obljetnice izlaženja

Marina Piria

Sveučilište u Zagrebu, Agronomski fakultet, Zavod za ribarstvo, pčelarstvo, lovstvo i specijalnu zoologiju, Svetošimunska 25, Zagreb, Hrvatska (mpiria@agr.hr)

Sažetak

Povijest časopisa započinje 1938. godine. Tijekom 75 godina izlaženja, nekoliko puta mijenja ime: „Ribarstvo“ (1938.-1940.); „Ribarstvo Jugoslavije“ (1946.-1991.); „Ribarstvo“ (1991.-2011.). Od 2011. godine izlazi pod imenom: „Croatian Journal of Fisheries“, a dobiva i pripadajući e-ISSN broj. U prvim brojevima časopisa članci su bili usmjereni na struku i rješavanje problema u slatkovodnom ribarstvu. Kasnije se sadržaj proširuje na otvorene vode, zakonodavstvo i športski ribolov. Tek od 1960. godine časopis sadržava prvenstveno znanstvene i stručne radove, dok su praktični problemi u ribarstvu izdvojeni u posebnu rubriku. U to vrijeme dolazi do procvata ribarstva, kao i znanstvenih te stručnih istraživanja. Časopis od 1990 godine postaje pravi znanstveni časopis koji obrađuje različite teme iz područja slatkovodnog i morskog ribarstva, ihtiologije, akvakulture, ekologije, patologije, hranidbe i sličnih ribarskih tema. Radovi se objavljuju na hrvatskom i engleskom jeziku uz sve veći udio stranih autora. Danas je postao moderan znanstveni časopis koji postaje prepoznatljiv u svijetu i indeksiran u sve većem broju baza podataka. Znanstvenicima iz cijelog svijeta služi za objavljivanje najnovijih dostignuća iz područja ribarstva i tako omogućuje brz protok informacija i razvoj ribarstvene struke. Ciljevi časopisa usmjereni su na podizanje kvalitete objavljenih znanstvenih publikacija te pridruživanje A1 bazama podataka.

Ključne riječi: časopis, Ribarstvo, Croatian Journal of Fisheries, znanost

History and role of the journal “Croatian Journal of Fisheries (Ribarstvo)" in research and development of fisheries profession – on the occasion of the 75th anniversary of the issuance

Marina Piria

University of Zagreb, Faculty of Agriculture, Department of Fisheries, Beekeeping, Game Management and Special Zoology, Svetošimunska 25, Zagreb, Croatia (mpiria@agr.hr)

Summary

The history of the journal started in year 1938. During the 75 years of the issuance, it changed the name several times: „Ribarstvo“ (1938-1940); „Ribarstvo Jugoslavije“ (1946-1991); „Ribarstvo“ (1991-2011). From year 2011 it is published under the name „Croatian Journal of Fisheries“, and it obtained e-ISSN number. The articles in the first issues of the journal have been focused on the fishing profession and solving the problems in freshwater aquaculture. Later, its articles have been extended to open water fishing, legislation and sport fishing issues. Since year 1960, the journal contains primarily scientific and professional papers, while the practical problems in the fishery have been included into a special section. This was a period of great progress in fisheries, as well as in the scientific and professional researches. Since year 1990, the journal becomes a scientific journal comprising diverse topics in the field of freshwater and marine fisheries, ichthyology, aquaculture, ecology, pathology, nutrition and similar fishing subjects. Papers are published in Croatian and English, with an increasing proportion of foreign authors. Today it is a modern scientific journal which is being more recognizable worldwide, and indexed in an increasing number of scientific databases. For the scientists around the world it provides possibility to present the latest achievements in the domain of fisheries, which allows rapid information flow and development of fisheries profession. The objectives of the journal are focused on the improvement of the published scientific contributions and to achieve classification into A1 category of scientific databases.

Key words: journal, Ribarstvo, Croatian Journal of Fisheries, science

Ulov, prilov i odbačeni dio u komercijalnom ribolovu migavicom na istočnoj jadranskoj obali

Sanja Matić-Skoko, Jakov Dulčić, Robert Grgičević, Armin Pallaoro, Miro Kraljević, Pero Tutman, Branko Dragičević, Nika Stagličić

Institut za oceanografiju i ribarstvo, Šetalište Ivana Meštrovića 63, Split, Hrvatska (sanja@izor.hr)

Sažetak

Iako je migavica danas manje zastupljena na istočnoj obali Jadrana, još uvijek ima značajnu socijalnu i ekonomsku važnost u priobalnom ribolovu. Monitoringom je obuhvaćeno 14 postaja i 112 potega tijekom listopada, studenog i prosinca 2011. godine. U ukupno ostvarenom ulovu utvrđeno je 58 vrsta riba i 4 vrste glavonožaca. Dominantne vrste u lovinama su: *Spicara smaris* (52,5 %), *Atherina boyeri* (27,2 %) i *Boops boops* (3,7 %). Od ostalih morskih organizama, značajno je zastupljena tek *Loligo vulgaris*. Kvantitativno, lovine su kolebale od 3,1 kg do 54,8 kg. U odbačenom dijelu je utvrđeno ukupno 44 vrste riba i 2 vrste glavonožaca, s dominacijom *Spicara smaris* (27,0%) i *Boops boops* (9,6 %). Odbačeni ulov je kolebao od 0,02 kg do 4,7 kg. U komercijalnom ulovu je zadržano ukupno 37 vrsta riba i 4 vrste glavonožaca. Komercijalne lovine su kolebale od 2,7 kg do 53,5 kg. Iako u migavici maseni postotak učešća *Spicara smaris* u lovinama ne bi smio biti manji od 80 %, analizom komercijalnih lovina s istraživanog područja, njen ulov je iznosio tek 49 %. Postotak nedoraslih riba u migavici doseže do 35 %, zbog čega se migavica smatra štetnim ribolovnim alatom. Prilov migavice čini i do 70 vrsta riba. Zbog neispunjavanja namjene i štetnosti alata potrebno je točno definirati maksimalnu dužinu i visinu mreže i maksimalnu dužinu konopa koji se smiju koristiti. Također je važno zapriječiti povećanje ribolovnog napora te prostorno i vremenski ograničiti ribolov migavicom u skladu s propisima Europske unije.

Ključne riječi: ulov, prilov, odbačeni dio, migavica, Jadran

Catch, by-cath and discard of the commercial boat seine fisheries in the eastern Adriatic Sea

Sanja Matić-Skoko, Jakov Dulčić, Robert Grgičević, Armin Pallaoro, Miro Kraljević, Pero Tutman, Branko Dragičević, Nika Stagličić

Institute for Oceanography and Fisheries, Šetalište Ivana Meštrovića 63, Split, Croatia (sanja@izor.hr)

Summary

The boat seine fishery is less common in the eastern Adriatic today, but still has considerable social and economic importance on an artisanal fishery. Monitoring comprised 14 stations and 112 hauls during October, November and December 2011. The total catch was composed of 58 fish species and 4 cephalopods. The dominant were *Spicara smaris* (52.5%), *Atherina boyeri* (27.2%) and *Boops boops* (3.7%). Among the other marine organisms, only *Loligo vulgaris* was represented significantly. Catches varied from 3.1 kg to 54.8 kg. A total of 44 fish species and 2 two cephalopods represented the discard, with dominance of *Spicara smaris* (27.0%) and *Boops boops* (9.6%). Discard fluctuated from 0.02 kg to 4.7 kg. A total of 37 fish species and 4 cephalopods were retained in the commercial landings. Landings have fluctuated from 2.7 kg to 53.5 kg. Although the percentage of *Spicara smaris* in the boat seine catches should not be less than 80%, the analysis of landings showed the catch of *Spicara smaris* reaches only 49%. The percentage of caught juveniles is almost 35%, which is why boat seine is considered as harmful fishing gear. By-catch of boat seine makes up to 70 fish species. Due to the failure of purpose and noxiousness of boat seine, it is necessary to accurately define the maximum length and height of the net, and the maximum length of rope that can be used. It also important to prevent the further raising of the fishing effort, and restrict boat seine fisheries in spatially and temporarily terms, according to European Union legislation.

Key words: catch, by-catch, discard, boat seine, Adriatic Sea

Informacijska podrška poslovnim procesima u ribnjačarstvu

Ivan Matejašić[1], Dražen Pekić[1], Ivica Zupčić[2], Željko Đanić[2], Anđelko Opačak[3], Dinko Jelkić[3]

[1]"Spin Informatika" d.o.o., Županijska 15, Osijek, Hrvatska (ivan@spin.hr, drazen@spin.hr)
[2]Poljoprivredno poduzeće „Orahovica" d.d., Stjepana Mlakara 5, Orahovica, Hrvatska
[3]Sveučilište Josipa Jurja Strossmayera u Osijeku, Poljoprivredni fakultet, Zavod za lovstvo, ribarstvo i pčelarstvo, Kralja Petra Svačića 1d, Osijek, Hrvatska

Sažetak

Informacijski sustav u proizvodnji slatkovodne ribe u šaranskim ribnjacima razvijen je i integriran u Jupiter Software. Sustav obuhvaća module za poslovnu inteligenciju, financijsko knjigovodstvo, robno materijalno poslovanje sa skladišnim poslovanjem, upravljanje ljudskim resursima, prodaju, nabavu i marketing. Za obradu podataka korištena je najsuvremenija IT tehnologija koja pruža visoku pouzdanost i stalni, neometani pristup sustavu. Razvoj informacijskog sustava za podršku poslovnim procesima u ribnjačarstvu omogućuje: optimiziranje parametara važnih u procesima hranidbe riba; praćenje sljedivosti genskog materijala (matica i potomstva); integriranje u sustav automatiziranih sustava hranjenja riba i za očitanje parametara vode; daje podatke i metodologiju za dinamički izračun cijene koštanja i profitabilnosti proizvodnje po višestrukim kriterijima. Informacijski sustav je razvijan i implementiran na Poljoprivrednom poduzeću „Orahovica" koji obuhvaća tri ribnjaka: Grudnjak (1050 ha), Donji Miholjac (975 ha) i Podunavlje (550 ha), na ukupnoj površini od 2.575 ha i trenutne ihtiomase od cca 2.000 tona ribe. Sustav je funkciji od svibnja 2012. godine. Očekivani učinci razvoja informacijskog sustava u ribnjačarstvu su: realistična metodologija izračuna cijene koštanja pojedinog proizvoda (kg ribe); optimiziranje procesa uzgoja i hranidbe riba, te poboljšana integracija proizvodnje ribe u druge funkcije poduzeća.

Ključne riječi: ribnjačarstvo, informacijski sustav, proizvodnja, cijena, profitabilnost

Information support to business processes in fish farming

Ivan Matejašić[1], Dražen Pekić[1], Ivica Zupčić[2], Željko Đanić[2], Anđelko Opačak[3], Dinko Jelkić[3]

[1]"Spin Informatika" d.o.o., Županijska 15, Osijek, Croatia (ivan@spin.hr, drazen@spin.hr)
[2]Agricultural Company „Orahovica", Stjepana Mlakara 5, Orahovica, Croatia
[3]University Josip Juraj Strossmayer in Osijek, Faculty of Agriculture, Department of Wildlife, Fishery and Beekeeping, Kralja Petra Svačića 1d, Osijek, Croatia

Summary

The information system for freshwater fish production on carp fish farms was developed and integrated with Jupiter Software. The system includes modules for business intelligence, financial and material accountancy accounting with warehouse operation, human resources management, sales, procurement and marketing. State-of-the-art IT technology was applied for data processing that enables high reliability and continuous and undisturbed access to the system. Development of an information system for operational business in fish farming can provide: optimization of parameters important in fish feeding procedures; monitoring and traceability of genetic material (breeder and offspring); integration of automatic systems for fish feeding and reading of water parameters in the system; obtaining data and methodology for dynamic cost price calculation and production profitability according to multiple criteria. The information system was developed and implemented at Agricultural Company "Orahovica" which comprise three fish farms: Grudnjak (1,050 ha), Donji Miholjac (975 ha) and Podunavlje (550 ha), on total surface of 2,575 ha and actual ichthyomass of ca. 2,000 tons of fish. The system has been operational since May 2012. Expected benefits of developing the information system in fish farming are: a realistic methodology of cost price calculation for particular product (kg of fish); optimization of fish rearing and feeding processes, and improved integration of fish production into other functions of the company.

Key words: fish farming, information system, production, cost price, profitability

Istraživanje ihtiofaune i stavova ribiča na ribolovnim vodama pod upravljanjem Kluba športskih ribolovaca „Korana“, Karlovac

Goran Jakšić[1], Marina Piria[2], Tea Tomljanović[2], Rozelindra Čož Rakovac[3], Tomislav Treer[2]

[1]*Grad Karlovac, Banjevčićeva 9, Karlovac, Hrvatska (goran.jaksic@karlovac.hr)*
[2]*Sveučilište u Zagrebu, Agronomski fakultet, Zavod za ribarstvo, pčelarstvo, lovstvo i specijalnu zoologiju, Svetošimunska 25, Zagreb, Hrvatska (mpiria@agr.hr)*
[3]*Institut Ruđer Bošković, Laboratorij za ihtiopatologiju-biološke materijale, Bijenička 54, Zagreb, Hrvatska*

Sažetak

Analizirani su sastav i stanje zajednice riba u ribolovnim vodama kojima upravlja Klub športskih ribolovaca „Korana" iz Karlovca. Prikupljeni su podaci o ulovu ribiča u razdoblju od 2007. do 2011. godine, kao i stavovi ribiča o ulovi i pusti načinu ribolova i budućnosti ove tehnike u Hrvatskoj. Ihtiocenozu čini 14 vrsta riba svrstanih u pet porodica. Procijenjeni ulov po jedinici ribolovnog napora (CPUE) bio je najveći (12,91 kg/ribič) u 2007., a najmanji (9,78 kg/ribič) u 2011. godini, što je 3,58 puta manje od dozvoljene količine godišnjeg ulova po ribiču i pokazuje da ihtiofond nije prelovljen. Procijenjeni koeficijent varijabilnosti (CV) iznosi 9,37 % za soma (*Silurus glanis*) i 11,28 % za šarana (*Cyprinus carpio*) što pokazuje stalni ulov tijekom godina. Iznimno visoki koeficijent varijabilnosti od 165, 91 % utvrđen je za jeza (*Leuciscus idus*). Prosječni godišnji broj ribiča je 898, dok je prosječni godišnji ulov ribe 9.636 kg. Najčešće ulovljene vrste su: šaran (*Cyprinus carpio*); som (*Silurus glanis*); štuka (*Esox lucius*); bijeli amur (*Ctenopharyngodon idella*) i plotica (*Rutilus virgo*). Među 100 rekreacijskih ribiča, članova kluba, provedena je anketa korištenjem 11 pitanja. Istraženi su stavovi koji se odnose na ulovi i pusti način ribolova. Rezultati ankete pokazuju da 87 % ribiča misli kako je puštena riba dobrobit za riblji fond, dok ih 88 % smatra da nije potrebno uzeti svu ribu kako bi se imao uspješan ribolov. Također, 62 % ribiča je mišljenja da će tijekom vremena porasti broj ribiča koji koriste ulovi i pusti način ribolova.

Ključne riječi: riba, zajednica, ribolov, ulov, Karlovac

Survey of ichthyocoenosis and fishermen attitudes at fishing waters managed by the Sport Fisherman Association „Korana“, Karlovac

Goran Jakšić[1], Marina Piria[2], Tea Tomljanović[2], Rozelindra Čož Rakovac[3], Tomislav Treer[2]

[1]City of Karlovac, Banjevčićeva 9, Karlovac, Croatia (goran.jaksic@karlovac.hr)
[2]University of Zagreb, Faculty of Agriculture, Deparment of Fisheries, Beekeeping, Game Management and Special Zoology, Svetošimunska 25, Zagreb, Croatia (mpiria@agr.hr)
[3]Ruđer Bošković Institute, Laboratory for Ichthyopathology-Biological Materials, Bijenička 54, Zagreb, Croatia

Summary

Composition and condition of ichthyocoenosis in the fishing waters managed by the Sport Fishermen Association „Korana“ from the city of Karlovac, has been analyzed. Data on fishermen catch in the period 2007-2011 were collected, as well as fishermen opinions about catch and release fishing and perspective of this technique in Croatia. The ichthyocoenosis consists of 14 fish species classified into five families. Estimated catch per unit effort (CPUE) was the highest (12.91 kg per fishermen) in 2007, and lowest (9.78 kg per fishermen) in 2011, that is 3.58 time lower than allowed annual quantity of catch per fishermen, indicating that there is no overexploitation. Variability coefficient is estimated to 9.37% for a European catfish (*Silurus glanis*) and 11.28% for a carp (*Cyprinus carpio*), that indicates steady catch throughout the years. Extermely high variability coefficient of 165.91% was obtained for an ide (*Leuciscus idus).* Average number of fishermen is 898, while the average annual fish catch is 9,636 kg. The most frequently caught fish species are carp (*Cyprinus carpio*), catfish (*Silurus glanis*), pike (*Esox lucius*), grass carp (*Ctenopharyngodon idella*) and Danube roach (*Rutilus virgo*). The survey has been conducted among 100 recreational fishermen, members of the Club, using a questionnaire with 11 questions. The main topic was attitudes related to catch and release fishing technique. The results of the survey showed that 87% of fishermen have an opinion that fish release is beneficial for the fish stock, and 88% have an opinion that it is not necessary to take all the fish for having a successful fishing. Also, an opinion of 62% of fishermen is that number of fisherman practicing catch and release would increase during the course of time.

Key words: fish, community, fishing, catch, Karlovac

Posljedice povišene koncentracije nitrita u recirkulacijskom sustavu na oplođenu ikru i ličinke šarana (*Cyprinus carpio carpio* Linnaeus, 1758)

Anđelko Opačak[1], Dinko Jelkić[1], Ksenija Vukman[2], Jasna Radaković[2]

[1]*Sveučilište Josipa Jurja Strossmayera u Osijeku, Poljoprivredni fakultet, Zavod za lovstvo, ribarstvo i pčelarstvo, Kralja Petra Svačića 1d, Osijek, Hrvatska (aopacak@pfos.hr)*
[2]*Poljoprivredno poduzeće „Orahovica" d. d., Stjepana Mlakara 5, Orahovica, Hrvatska*

Sažetak

Kvaliteta vode je važan preduvjet za uspješan uzgoj i zdravlje riba u recirkulacijskom sustavu. Povišena koncentracija nitrita u vodi je potencijalni problem jer uzrokuje kemijski stres za oplođenu ikru i tek izvaljene predličinke i ličinke šarana. Nitrit nastaje oksidacijom amonijaka do nitrata pomoću nitrifikacijskih bakterija, a poznata je njegova toksičnost po ribe. U recirkulacijskom sustavu proces nitrifikacije odvija se u biološkom filteru. Utvrđivanje NO_2 –N (mg/L) obavljeno je multiparametarskožim fotometrom HI83200. Dopuštene koncentracije NO_2^- za šarana iznose do 0,05 mg/L. Povećane koncentracije nitrita u recirkulacijskom sustavu mjerene su odmah nakon početka rada biološkog filtera, zbog neravnoteže u procesu nitrifikacije. Ukupno je u funkciji mrijestilišta bilo 14 Zuger aparata s 9 kg ikre u inkubaciji. pH vrijednost vode bila je u rasponu od 7,8 do 9,2. Najviša utvrđena koncentracija nitrita u recirkulacijskom sustavu iznosila je 0,460 mg/L ($N\text{-}NO2^-$) pri temperaturi vode od 22 C. Inkubacija oplođene ikre šarana trajale je 79 sati ili 19 sati sporije od uobičajenih 60 sati. Povišene vrijednosti nitrita u vodi uzrokovale su smrtnost od 37% kod predličinki i ličinki u Zuger aparatima. Utvrđene su i brojne tjelesne deformacije kod 22 od 100 preživjelih ličinki šarana. U konkurenciji s kloridima, nitriti ulaze u ribu preko škržnog epitela i akumuliraju se dok ne dosegnu vrlo visoke koncentracije u tjelesnim tekućinama. Povišene koncentracije nitrita uzrokuju brojne fiziološke poremećaje (endokrine, respiratorne, kardiovaskularne), a uzrokujući oksidaciju hemoglobina do methemoglobina usporavaju i prijenos kisika u krvi.

Ključne riječi: nitriti, šaran, ikra, ličinke, recirkulacijski sustav

Effects of increased nitrites concentration in recirculating system on fertilized eggs and larvae of the Common carp (*Cyprinus carpio carpio* Linnaeus, 1758)

Anđelko Opačak[1], Dinko Jelkić[1], Ksenija Vukman[2], Jasna Radaković[2]

[1]*University Josip Juraj Strossmayer in Osijek, Faculty of Agriculture, Department of Wildlife, Fishery and Beekeeping, Kralja Petra Svačića 1d, Osijek, Croatia (aopacak@pfos.hr)*
[2]*Agricultural Company „Orahovica", Stjepana Mlakara 5, Orahovica, Croatia*

Summary

Water quality is an important precondition for a successful rearing and health of the fish in recirculating system. Increased nitrite concentration in water is a potential problem that cause chemical stress for fertilized eggs and newly hatched larvae and fry. Nitrite is formed by oxidation of ammonia into nitrates under the activity of nitrifying bacteria, and its toxicity for fish is well known. In recirculating system, nitrification process develops in the biological filter. Concentration of NO_2 – N (mg/L) was measured using HI 83200 multiparameter photometer. Allowable concentration of NO_2^- for carp is up to 0.05 mg/L. Increased nitrite concentrations in recirculating system were measured right after the activation of biological filter, due to imbalance in the nitrification process. A total of 14 Zuger Jars were used as spawning grounds, with 9 kg of fertilized eggs in incubation. The pH value of ranged from 7.8 to 9.2. The highest recorded nitrite concentration ($N\text{-}NO_2^-$) in recirculating system is 0.460 mg/L at water temperature of 22 °C. Incubation of fertilized carp eggs lasted 79 hours, which is by 19 hours slower than usual 60 hours. The increased nitrite levels in water caused mortality of 37% in newly hatched larvae to three day old larvae in Zuger Jars. Numerous body deformations in 22 of 100 survived carp larvae were determined. In competition with chlorides, nitrites enter the fish through the gill epithelium and are being accumulated until reaching the very high concentrations in body fluids. Increased nitrite concentrations causes many physiological disorders (endocrine, respiratory, cardiovascular), and slow down oxygen transport in blood as a result of hemoglobin oxidation to methemoglobin

Key words: nitrites, carp, egg, larvae, recirculating system

Utjecaj načina gospodarenja na raznolikost ihtiofaune u vodama stajaćicama ribolovnog područja Drava – Dunav

Dinko Jelkić[1], Anđelko Opačak[1], Siniša Ozimec[1], Senka Blažetić[2]

[1]*Sveučilište Josipa Jurja Strossmayera u Osijeku, Poljoprivredni fakultet, Zavod za lovstvo, ribarstvo i pčelarstvo, Kralja Petra Svačića 1d, Osijek, Hrvatska (djelkic@pfos.hr)*
[2]*Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za biologiju, Cara Hadrijana 8a, Osijek, Hrvatska*

Sažetak

Ribolovno područje Drava-Dunav obuhvaća prostor šest županija Republike Hrvatske gdje ribolovnim vodama gospodare 34 ovlaštenika ribolovnog prava. Ihtiofaunu čini ukupno 57 vrta riba. Među njima su i jesetarske vrste: sim (*Acipenser nudiventris*), pastruga (*Acipenser stellatus*), dunavska jesetra (*Acipenser gueldenstaedtii*) i moruna (*Huso huso*), koje su praktički nestale iz nakon izgradnje brane Đerdap. Rijeke Drava i Dunav imaju najveći prirodni utjecaj na sastav ihtiofaune voda stajaćica, a potom i načina gospodarenja. Ihtiološka istraživanja provedena su od 2010. do 2012. godine, na deset ribolovnih voda: Erdutski dunavac, Stara Drava kod Podravskih Podgajaca, Stara Drava kod Bilja, Stara Drava Repnjak, Jegeniš, Javorica, Bajer Vinkovci, Grabovo, Ribnjak Golinci i Topoljski dunavac. Inventarsko uzorkovanje urađeno je ribarskim mrežama različite veličine oka (6-12 cm), standardnom mrežom za uzorkovanje te elektroagregatom (AGH, EL65 II). Ulovljeno je 10-15 vrsta riba. Najniži Shannon-Wienerov indeks (1,474) utvrđen je u Ribnjaku Golinci, a najviši (1,837) u Erdutskom dunavcu. Za rijeku Dunav ovaj indeks iznosio je 2,283 u 2011. i 2,567 u 2012. godini, a za rijeku Dravu 2,690 u 2011. i 2,595 u 2012. godini. Dosadašnji način poribljavanja s ribljim vrstama dostupnima na tržištu značajno utječe na raznolikost ihtiofaune voda stajaćica. U svrhu očuvanja raznolikosti ihtiofaune predložene su promjene u načinu poribljavanja. Za ciprinidne vode je najpogodnije koristiti sljedeće vrste i omjere: šaran (*Cyprinus carpio carpio*) 20-30 %; linjak (*Tinca tinca*) 8-16 %; karas (*Carassius carassius*) 5-10 %; klen (*Squalius cephalus*) 3-8 %; amur (*Ctenopharyngodon idella*) 3-5 %; tolstolobik (*Hypophthalmichthys nobilis*, *H. molitrix*) 0,5-1 %; smuđ (*Sander lucioperca*) 3-5 %; grgeč (*Perca fluviatilis*) 3-8 %, štuka (*Esox lucius*) 2-3 %; som (*Silurus glanis*) 1-2 %; kao i: crvenperka (*Scardinius erythrophthalmus*), bodorka (*Rutilus rutilus*), uklija (*Alburnus alburnus*), krupatica (*Blicca bjoerkna*) i plotica (*Rutilus virgo*) 30-40 %.

Ključne riječi: raznolikost, Shannon-Wiener indeks, ribolov, voda stajaćica

The effect of management practice on ichthyofaunal diversity in still water bodies in the Drava – Danube fishing area

Dinko Jelkić[1], Anđelko Opačak[1], Siniša Ozimec[1], Senka Blažetić[2]

[1]*University Josip Juraj Strossmayer in Osijek, Faculty of Agriculture, Department of Wildlife, Fishery and Beekeeping, Kralja Petra Svačića 1d, Osijek, Croatia (djelkic@pfos.hr)*
[2]*University of Josip Juraj Strossmayer in Osijek, Department of Biology, Cara Hadrijana 8a, Osijek, Croatia*

Summary

The Drava – Danube fishing area encompasses an area of six counties in Croatia where fishing waters are managed by 34 authorized fishing right holders. Ichthyofauna consists of 57 fish species, including sturgeon species: fringebarbel sturgeon (*Acipenser nudiventris*), starry sturgeon (*Acipenser stellatus*), danube sturgeon (*Acipenser gueldenstaedtii*) and beluga sturgeon (*Huso huso*), which are almost completely disappeared after completion or Iron Gate dam. The Drava and the Danube rivers have the strongest natural impact on species composition of ichthyofauna in stagnant waters, but the practice in fishery management also has a great impact. Ichthyological survey was carried out in period 2010 – 2012 on ten slowly flowing and standing water bodies: Erdutski dunavac, Stara Drava near Podravski Podgajci, Stara Drava near Bilje, Stara Drava Repnjak, Jegeniš, Javorica, Bajer Vinkovci, Grabovo, Golinci fishpond and Topoljski dunavac. Inventory sampling was done by using fishing nets with different mesh size (6-12 cm), standard sampling fishing net and by using electrofisher (AGH, EL65 II). The number of caught species varied from 10 to 15. The lowest value of Shannon-Wiener index of biodiversity (1.474) was determined in the Golinci fishpond, and highest (1.837) in Erdutski dunavac. Values determined for the rivers were: in the Danube River 2.283 in 2011 and 2.567 in 2012, in the Drava River 2.690 for 2011 and 2.595 in 2012. Former practice of hatchery enhancement by fish species available for purchasing has a significant impact on ichthyofaunal diversity in the stagnant water bodies. Changes in practice of hatchery enhancement are suggested in order to preserve ichthyofaunal diversity. The most applicable is to use following species and percentages: common carp (*Cyprinus carpio carpio*) 20-30%, tench (*Tinca tinca*) 8-16%, crucian carp (*Carassius carassius*) 5-10%, chub (*Squalius cephalus*) 3-8%, grass carp (*Ctenopharyngodon idella*) 3-5%, bighead carp (*Hypophthalmichthys nobilis*) or silver carp (*H. molitrix*) 0,5-1%, pike-perch (*Sander lucioperca*) 3-5%, perch (*Perca fluviatilis*) 3-8%, pike (*Esox lucius*) 2-3%, catfish (*Silurus glanis*) 1-2%, and the rest of 30-40% with rudd (*Scardinius erythrophthalmus*), roach (*Rutilus rutilus*), bleak (*Alburnus alburnus*), white bream (*Blicca bjoerkna*) and danubian roach (*Rutilus virgo*).

Key words: diversity, Shannon-Wiener index, fishery, still water

Biokemijski profili krvi u razlučivanju dviju populacija cipala (rod *Mugil* Linnaeus, 1758) iz Jadranskog i Tirenskog mora

Rozelindra Čož-Rakovac[1], Francesco Fazio[3], Tomislav Šmuc[2], Natalija Topić Popović[1], Ivančica Strunjak-Perović[1], Roberta Sauerborn Klobučar[1], Giuseppe Piccione[3], Caterina Faggio[4],

[1]*Institut Ruđer Bošković, Laboratorij za ihtiopatologiju-biološke materijale, Zagreb, Hrvatska (rrakovac@irb.hr)*
[2]*Institut Ruđer Bošković, Grupa za računalnu biologiju i bioinformatiku, Zavod za elektroniku, Zagreb, Hrvatska*
[3]*University of Messina, Polo Universitario Annunziata, Faculty of Veterinary Medicine, Department of Experimental Science and Applied Biotechnology, Messina, Italy*
[4]*University of Messina, Faculty of Science MM.FF.NN., Department of Life Science „M. Malpihgi",S. Agata-Messina, Italy*

Sažetak

U prikazanom istraživanju praćeni su i uspoređeni biokemijski profili krvi dviju populacija cipala (rod *Mugil)* iz Jadranskog i Tirenskog mora, koje su živjele u različitim biotskim i abiotskim uvjetima. Primjerci za analizu ulovljeni su na lokacijama u moru na kojima nije bilo nikakve akvakulturne djelatnosti. U dvije istraživane grupe cipala, iz Jadranskog mora (AM) i Tirenskog mora (TM), praćeni su enzimi krvne plazme: aspartat i alanin aminotransferaze (AST, ALT) i metaboliti: trigliceridi (TRIG); kolesterol (CHOL); glukoza (GLU) i totalni proteini (TP). Utvrđena je signifikantna razlika između biokemijskih parametara dviju istraživanih grupa, te se tako može zaključiti da su se biokemijski parametri pokazali kao dobar indikator životnih uvjeta u različitim staništima. Radi utvrđivanja različitosti biokemijskih profila krvi s obzirom na životne uvjete u različitim staništima, podatci su obrađeni klasičnom statističkom metodom. Metoda strojnog učenja primijenjena je da generira klasifikacijski model i da istraži važnost, jačinu, međusobnu interakciju ili ovisnost pojedinih istraživanih biokemijskih parametra u modelu, kao i da istraži pouzdanost pojedinih parametara unutar grupa.

Ključne riječi: Jadransko more, Tirensko more, cipal, krv, metoda strojnog učenja

Blood biochemical approach in differentiation of Adriatic and Tyrrhenian mullet populations (Genus *Mugil* Linnaeus, 1758)

Rozelindra Čož-Rakovac[1], Francesco Fazio[3], Tomislav Šmuc[2], Natalija Topić Popović[1], Ivančica Strunjak-Perović[1], Roberta Sauerborn Klobučar[1], Giuseppe Piccione[3], Caterina Faggio[4],

[1]*Ruđer Bošković Institute, Laboratory of Ichthopathology-Biological Materials, Zagreb, Croatia (rrakovac@irb.hr)*
[2]*Rudjer Boskovic Institute, Computational Biology and Bioinformatics Group, Division of Electronics, Zagreb, Croatia*
[3]*University of Messina, Polo Universitario Annunziata, Faculty of Veterinary Medicine, Department of Experimental Science and Applied Biotechnology, Messina, Italy*
[4]*University of Messina, Faculty of Science MM.FF.NN., Department of Life Science „M. Malpihgi", S. Agata-Messina, Italy*

Summary

A comparative study of blood chemistry profile was conducted on two mullet (genus *Mugil*) populations from the Adriatic and Tyrrhenian Sea, which lived under different abiotic and biotic conditions. Specimens for the analysis have been caught on locations without any aquaculture activities. In both of analyzed groups, from the Adriatic (AM) and Tyrrhenian Sea (TM), the following parameters were monitored: blood plasma enzymes - aspartate and alanin aminotransferase (AST, ALT) and metabolites - triglycerides (TRIG); cholesterol (CHOL); glucose (GLU) and total proteins (TP). Significant difference was determined between biochemical parameters of two analyzed groups. Measured blood chemistry parameters were proved as good indicators of living conditions in different habitats. Classical statistical approaches were used for determination of dissimilarity in blood chemistry in relation to living conditions in different habitats. Machine learning technique was applied to generate classification model, and to find the importance, strength, mutual interactions or dependencies in analyzed blood chemistry parameters in the model, as well as to investigate reliability of particular parameters within the groups.

Keywords: Adriatic Sea, Tyrrhenian Sea, mullet, blood, machine learning technique

Učinak antimikrobnih pripravaka na P450 enzime u riba

Natalija Topić Popović, Ivančica Strunjak-Perović, Rozelindra Čož-Rakovac, Roberta Sauerborn Klobučar, Margita Jadan, Josip Barišić

Institut Ruđer Bošković, Laboratorij za ihtiopatologiju-biološke materijale, Zagreb, Hrvatska (ntopic@irb.hr)

Sažetak

P450 enzimi riba metaboliziraju brojne lijekove i antimikrobne pripravke, što ih čini ključnima za detoksikaciju i tvorbu toksičnih metabolita. Stoga je nužno bolje razumijevanje uloge svakog citokroma P450 u metabolizmu lijekova i toksičnosti potenciranoj lijekovima. Trenutno se većina istraživanja P450 sustava u riba obavlja na okolišnim čimbenicima koji utječu na indukciju P450 enzima. Manje se zna o ulozi P450 sustava u metaboliziranju lijekova koji se primjenjuju u akvakulturi. Unatoč strogim propisima, ribe osim ljekovitom hranom, antimikrobnim lijekovima mogu biti izložene i putem vodenog okoliša. Voda ispuštana iz sustava za pročišćavanje otpadnih voda identificirana je kao njihov primarni izvor. Razlike u odgovoru CYP enzima koje različite vrste riba pokazuju pri tretiranju antimikrobnim lijekovima mogu imati utjecaja pri uporabi tih pripravaka u uzgajanih vrsta. Takvi raznoliki učinci antimikrobnih pripravaka upućuju na potrebu pažljive uporabe testova razvijenih za procjenu odgovora na lijekove u sisavaca. Isto tako, uporaba protutijela sisavaca za CYP enzime u riba ima vrijednost ukoliko se koristi uz oprez. Na ribama su istraženi supstrati razvijeni za uporabu u sustavima sisavaca, te su se pokazali korisnima za CYP-posredovanu funkcionalnu usporedbu između vrsta riba i sisavaca. Usklađeni protokoli za proučavanje utjecaja lijekova na riblje P450 enzime olakšat će takve studije, dok su za buduća istraživanja na ribama nužni standardi.

Ključne riječi: citokrom P450 enzimi, ribe, biotransformacija, antimikrobno liječenje

Effects of antimicrobial drugs upon P450 enzymes in fish

Natalija Topić Popović, Ivančica Strunjak-Perović, Rozelindra Čož-Rakovac, Roberta Sauerborn Klobučar, Margita Jadan, Josip Barišić

Ruđer Bošković Institute, Laboratory for Ichtyopathology-Biological Materials, Zagreb, Croatia (ntopic@irb.hr)

Summary

Numerous pharmaceuticals are metabolized by P450 enzymes in fish, which makes them of critical importance both for detoxification and formation of toxic metabolites. Therefore, a better understanding of the role of each cytochrome P450 in drug metabolism and drug-induced toxicity is vital. At this time, however, most research on the P450 system in fish has been done on environmental factors that influence P450 induction. Much less is known about metabolism of aquaculture antibiotics by the cytochrome P450 system. Despite strict regulations, except *via* medicated feed, fish may get exposed to antimicrobial drugs *via* aquatic environment. Discharge from sewage treatment plants has been identified as their primary source. The differences in responses of CYP enzymes in different fish species to antimicrobial treatment may have relevance for the use of antimicrobials in aquaculture. The variable effects in the response among different fish species to antimicrobial drugs is a valid reason to critically use assays developed for mammals for evaluating drug response in various fishes. Also, the use of antibodies to CYP enzymes across phyla can be of value if caution is exercised in the interpretation. Substrates developed for use in mammalian systems have been assayed in fish, and are useful for CYP-mediated functional comparison between mammalian and fish species. Standardized protocols for drug impact on fish P450 will facilitate those studies and standards will be necessary for the future application on fishes.

Key words: cytochrome P450 enzymes, fish, biotransformation, antimicrobial therapy

The effect of the purging time on the dose and fillet yield of barramundi and hybrid striped bass

Péter Juhász[1], Milán Fehér[1], Péter Bársony[1], Éva Csorvási[1], István Szűcs[2], László Stündl[1]

[1]*University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Centre for Agricultural and Applied Economic Sciences, 138. Böszörményi Street, Debrecen, Hungary (juhaszp@agr.unideb.hu)*
[2]*University of Debrecen, Faculty of Applied Economics and Rural Development, Centre for Agricultural and Applied Economic Sciences, 138. Böszörményi Street, Debrecen, Hungary*

Summary

A significant breakthrough of the Hungarian fish production may originate in the production of precious warmwater fish species, such as the barramundi (*Lates calcarifer*) and the hybrid striped bass, which is a cross between striped bass (*Morone saxatilis*) and white bass (*Morone chrysops*). These fishes are being more popular worldwide due to their excellent flesh and rapid growth, thus having a significant export potential. We have tried to find out in the experiment how the length of purging influenced the slaughter weight, the dose fish yield and the fillet yield. The experiment was conducted in 5 treatment groups in duplicate, with periods of purging: 0, 2, 4, 6, 8 days. The loss of the slaughter weight in the 8 days period was nearly 4% in barramundi, while it was 8 % in hybrid striped bass. Depending on the purging time, in barramundi the dose fish yield was between 79,0%±1,106 and 82,9%±0,391, and the fillet yield ranged between 52,7%±0,878 to 56,0%±0,581. In hybrid striped bass these parameters were between 79,3%±1,283 and 80,0%±1,229, as well as 51,8%±1,382 and 54,5%±1,603, respectively. It can be concluded that, in case of the 8-days purging time, the dose fish yield was near the same in the examined two fish species, and the fillet yield of the barramundi has proved to be more effective than of the hybrid striped bass.

Key words: barramundi, hybrid striped bass, purging, fillet yield

The Mediterranean mussel (*Mytilus galloprovincialis* Lamarck, 1819) - marine living resource from the Black Sea with ecological and economical importance

Daniela Mariana Roşioru, Tania Zaharia

National Institute for Marine Research and Development "Grigore Antipa", Blvd. Mamaia nr. 300, Constanţa,Romania (drosioru@alpha.rmri.ro)

Summary

The exploitation of the marine living resources started since 1987 in the National Institute for Marine Research and Development "Grigore Antipa", Constanţa, Romania (NIMRD). Over time it become one of the objects and directions for biotechnology research with economical utilization. The ecological and economical importance of the marine bivalve, the Mediterranean mussel (*Mytilus galloprovincialis*) in the Black Sea is presented, based on data obtained during the research carried out in NIMRD. The aim of this contribution is to emphasise the role of this species in the marine ecosystem and economy in the way of the sustainable development and exploitation.

Key words: *Mytilus galloprovincialis*, ecological, economical, importance, Black Sea

Population structure of the Genus *Trachinus* Linnaues, 1758 in Southern and Central part of the Adriatic Sea

Daria Skaramuca[1], Damjan Franjević[2], Pero Tutman[3], Sanja Matić-Skoko[3], Petra Korlević[4], Domagoj Đikić[2], Zdenko Franić[5], Boško Skaramuca[1]

[1]*University of Dubrovnik, Department of Aquaculture, Ćira Carića 4, Dubrovnik, Croatia*
[2]*University of Zagreb, Faculty of Science, Division of Biology, Zagreb, Croatia (damianf@zg.biol.pmf.hr)*
[3]*Institute of Oceanography and Fisheries, Šetalište Ivana Meštrovića 63, Split, Croatia*
[4]*Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany*
[5]*Institute of Medical Researches and Occupational Health,Ksaverska cesta 2, Zagreb, Croatia*

Summary

Trachinidae family (weevers) comprises two genera: *Trachinus* and *Echiichthys*. Weevers ("spiders" in Croatian) are known for their venomous spines on the gill covers and first few dorsal fins. All species live in sandy or sandy-muddy habitat buried in the ground of benthic, coastal or open ocean area. In the Adriatic Sea, four species are present: *Trachinus draco, Trachinus radiatus, Trachinus araneus* and *Echiichthys vipera.* Due to large morphological diversity among species of genus *Trachinus,* it is not easy to identify them unambiguously, based only on biometric traits. The goal of the presented research was to determine population structure of species of the genus *Trachinus* from Southern and Central part of Adriatic Sea, based on three different mitochondrial phylogenetic markers. In total, 87 samples of the species *Trachinus draco, Trachinus radiatus* and *Echyiichthys vipera* were analyzed. Upon DNA extraction and PCR amplification data for analyses was obtained by standard Sanger sequencing of following markers: COI, 12S rDNA and 16S rDNA. Results of phylogenetic analyses performed on all gene markers showed the same identification pattern of population structure. Therefore, research proved that used genetic markers, and applied methods of molecular phylogenetics reconstruction are excellent tool for resolving population structure quandary inside the genus *Trachinus*. It is necessary to carry out further detailed morphological and meristic studies in order to determine the differences recorded by means of molecular phylogenetic analyses.

Key words: Trachinus, COI, 12S rDNA, 16S rDNA, phylogenetics analysis

Fizikalno-kemijska obilježja vode u donjem toku rijeke Neretve (Bosna i Hecegovina) s aspekta pogodnosti za život autohtonih riba

Anita Ivanković, Predrag Ivanković

Sveučilište u Mostaru, Agronomski i prehrambeno-tehnološki fakultet, Biskupa Čule bb, Mostar, Bosna i Hercegovina (anita.zelenika@tel.net.ba)

Sažetak

Delta rijeke Neretve jedinstveno je mediteransko vlažno područje koje na 20.000 ha sadržava nekoliko vrijednih, zaštićenih dijelova u kategorijama botaničkih, ihtioloških i ornitoloških rezervata. Istraživanja su provedena na ušću rijeke Bregave u Neretvu, Deranskom jezeru u Parku prirode „Hutovo blato" i rijeci Krupi. Područje Hutova blata nalazi se u slivu rijeke Krupe koja s lijeve strane utječe u Neretvu. Fizikalno-kemijska svojstva vode mjerena su u razdoblju od svibnja 2006. do listopada 2007. godine. Mjereni su sljedeći parametri: temperatura vode, suspendirana tvar, ispareni ostatak, kemijska potrošnja kisika, otopljeni i zasićeni kisik, biološka potrošnja kisika, KMnO4, amonijak, nitriti, nitrati, ukupni dušik i fosfor, sulfati, kloridi, pH, ukupne soli, sadržaj Ca^{2+} i Mg^{2+}. Istraživane vode bogate su otopljenim kisikom te imaju niski sadržaj dušika i fosfora, uz pH vrijednost od 7,2 do 7,8. Najbrojnije vrste riba koje obitavaju u istraživanom području jesu: strugač, *Squalius svallize*; podustva, *Chondrostoma knerii*; klen, *Squalius cephalus*; patuljasti somić, *Ameiurus nebulosus*; linjak, *Tinca tinca*; babuška, *Carassius auratus gibelio*; šaran, *Cyprinus carpio*; peškelj, *Scardinius erytrophtalamus scardofa*; masnica, *Rutilus basak*; sunčanica, *Lepomis gibosus*; jegulja, *Anguilla anguilla*; dužičasta pastrva, *Oncorhynchus mykiss* i obična pastrva, *Salmo trutta*. Za vrijeme istraživanja utvrđena je i nazočnost neretvanskog zubatka, *Salmo dentex*.

Ključne riječi: voda, Neretva, autohtone ribe

Physico-chemical characteristics of water in the lower course of the Neretva River (Bosnia and Herzegovina) in terms of benefits to the life of indigenous fish

Anita Ivanković, Predrag Ivanković

University of Mostar, Faculty of Agriculture and Food Technology, Biskupa Čule bb, Mostar, Bosnia and Herzegovina (anita.zelenika@tel.net.ba)

Summary

The Neretva River Delta is a unique Mediterranean wetland area which at surface of 20,000 ha comprises several protected parts in category of botanic, ornithological and ichthiyological reserve. Research was conducted at the mouth of the Bregava River in the Neretva River, Deransko Lake in the Nature Park "Hutovo Blato" and in the Krupa River. Area of the Hutovo Blato is located in the basin of the river Krupa, which from the left side flows into the Neretva River. Physico-chemical properties of the water were measured in the period from May 2006 to October 2007. The following parameters has been measured: water temperature, suspended matter, evaporated rest, chemical oxygen demand, dissolved and saturated oxygen, biological oxygen demand, $KMnO_4$, ammonia, nitrite, nitrate, total nitrogen and phosphorus, sulfates, chlorides, pH, total salt, and Ca^{2+} and Mg^{2+} content. Analyzed waters are rich in dissolved oxygen and have low content of nitrogen and phosphorus, with pH value of 7.2 to 7.8. The most abundant species of fish which lives in the study areas were: *Squalius svallize*, *Chondrostoma knerii*, *Squalius cephalus*, *Ameiurus nebulosus*, *Tinca tinca*, *Carassius auratus gibelio*, *Cyprinus carpio*, *Scardinius erytrophtalamus scardofa*, *Rutilus basak*, *Lepomis gibosus*, *Anguilla anguilla*, *Oncorhynchus mykiss* and *Salmo trutta*. During the research, the presence of Neretvan toothtrout, *Salmo dentex*, was recorded.

Key words: water, Neretva River, indigenous fish

Struktura populacije endemskog strugača (*Squalius svallize* Heckel & Kner, 1858) iz vodotoka neretvanskog slijeva

Predrag Ivanković[1], Tomislav Treer[2], Marina Piria[2], Zrinka Knezović [1]

[1]*Sveučilište u Mostaru, Agronomski i prehrambeno-tehnološki fakultet, Biskupa Čule bb, Mostar, Bosna i Hercegovina (predragivankovic@net.hr)*
[2]*Sveučilište u Zagrebu, Agronomski fakultet, Zavod za ribarstvo, pčelarstvo, lovstvo i specijalnu zoologiju, Svetošimunska 25, Zagreb, Hrvatska*

Sažetak

Neretvanski strugač (*Squalius svallize*) je endemska vrsta koja naseljava vodotoke Jadranskog slijeva u Bosni i Hercegovini te Hrvatskoj, i to isključivo u rijekama: Neretvi, Trebišnjici i Ljutoj. Strukuktura populacije istraživana je na 60 jedinki ulovljenih pomoću mreža prostirica na tri lokacije: Deransko jezero, rijeka Krupa, rijeka Bregava. Cilj istraživanje je utvrditi dužinsku i masenu strukturu populacije strugača po lokacijama, te odnos između duljine probavila i totalne duljine tijela. Rezultati su prikazani u obliku histograma frekvencija, duljinskih i masenih struktura po lokacijama, te regresijskog odnosa između ukupne duljine tijela i duljine probavila. Dominirale su jedinke s totalnom tjelesnom duljinom 19-20 cm, a maksimalna totalna duljina iznosila je 28 cm. Maksimalna zabilježena masa iznosila je 269,30 g, a prema histogramu frekvencija mase tijela, prevladava maseni razred 60-90 g. Utvrđen je pozitivan alometrijski rast s visokom b-vrijednošću od 3,47. Koeficijent korelacije ($r=0,83^{**}$) govori o pozitivnoj povezanosti između totalne duljine tijela i duljine probavila. Ovim istraživanjem dati su novi rezultati o strukturi poulacije endemskog strugača u vodotocima neretvanskog slijeva.

Ključne riječi: strugač, populacija, duljina, tijelo, Neretva

Population structure of the endemic Neretva chub (*Squalius svallize* Heckel & Kner, 1858) from the watercourses in the Neretva River basin

Predrag Ivanković[1], Tomislav Treer[2], Marina Piria[2], Zrinka Knezović [1]

[1]*University of Mostar, Faculty of Agriculture and Food Technology, Biskupa Čule bb, Mostar, Bosnia and Herzegovina (predragivankovic@net.hr)*
[2]*University of Zagreb, Faculty of Agriculture, Department of Fisheries, Beekeeping, Game Management and Special Zoology, Svetošimunska 25, Zagreb, Croatia*

Summary

The Neretva chub (*Squalius svallize*) is an endemic species, which lives in the watercourses of the Adriatic basin in Bosnia and Herzegovina and Croatia, only in the rivers: Neretva, Trebišnjica and Ljuta. Population structure was studied on 60 individuals caught by gill nets at three sites: Deransko Lake, the Krupa River and the Bregava River. The aim was to determine the population structure according to length and mass at study sites, and relationship between the length of gut and total body length. The results are presented in the form of frequency histograms, linear and mass structure according to locations, and the regression relationship between total body length and length of gut. Individuals with total body length of 19-20 cm are dominating, with maximum total length of 28 cm. The maximum recorded weight was 269.30 g. The frequency histogram of body mass showed that weight class 60-90 g dominates, too. Positive allometric growth with high b-value of 3.47 was determined. Coefficient of correlation (r = 0.83 **) indicates positive relation between total body length and length of gut. This research provided new results on structure of population of the endemic Neretva chub.

Key words: Neretva chub, population, length, body, Neretva

Slučajavi napada divljači u Hrvatskoj u razdoblju 1999.-2011. godine

Ivan Krupec[1], Petar Škavić[2], Ivica Budor[1], Nikica Šprem[3]

[1]*Hrvatski lovački savez, Nazorova 63, Zagreb, Hrvatska*
[2] *Sveučilište u Zagrebu, Medicinski fakultet, Šalata 3, Zagreb, Hrvatska (petar.skavic@zg.t-com.hr)*
[3]*Sveučilište u Zagrebu, Agronomski fakultet, Zavod za ribarstvo, pčelarstvo, lovstvo i specijalnu zoologiju, Svetošimunska 25, Zagreb, Hrvatska*

Sažetak

Prikazani su rezultati dobiveni na uzorku od sedam napada divljači na čovjeka tijekom 13-godišnjeg razdoblja, od 1999. do 2011. godine. Istraživanjem je obuhvaćeno ukupno područje Republike Hrvatske. Sve žrtve napada divljači bili su muškarci, lovci, u dobi od 26 do 69 godina, prosječno 51 godina. Ugrizne rane zadobilo je šest osoba, a jedna osoba je zadobila ogrebotine. Prema sezonskoj pojavnosti, napadi su bili najučestaliji u zimsko doba kada je lovna sezona na vrhuncu. Prema dobu dana, većina napada dogodila se u jutarnjim satima. Najčešća vrsta divljači koja je sudjelovala u napadima bila je divlja svinja, sa zabilježenih pet slučajeva (71,4 %), dok su sa po jednim slučajem (14,3 % svaki) sudjelovale srna obična i smeđi medvjed. Sve žrtve napada oporavile su se u potpunosti i bez značajnijih komplikacija.

Ključne riječi: napad, divljač, lov, divlja svinja, Hrvatska

Cases of game animals attack in Croatia during the period 1999-2011

Ivan Krupec[1], Petar Škavić[2], Ivica Budor[1], Nikica Šprem[3]

[1]*Croatian Hunting Association, Nazorova 63, Zagreb, Croatia*
[2]*University of Zagreb, School of Medicine, Šalata 3, zagreb, Croatia (petar.skavic@zg.t-com.hr)*
[3]*University of Zagreb, Faculty of Agriculture, Department of Fisheries, Beekeeping, Game Management and Special Zoology, Svetošimunska 25, Zagreb, Croatia*

Summary

Results obtained on sample of seven game animals attack on human over 13-year period, from 1999 to 2011, are presented. The study comprised an overall state area of the Republic of Croatia. All of the victims were male, hunters, aged from 26 to 69, with 51 in average. Six persons sustained a bite wounds from the animal, and one was rammed. Regarding the seasonal incidence, attacks were the most frequent during the winter time, when the hunting season achieved its peak. Majority of the attacks happened in the morning hours. The most often wild game which has been included in attacks was wild boar, with recorded five cases (71.4%), while roe deer and brown bear were included by one case, or 14.3% each. All victims recovered completely and without significant complications.

Key words: attack, game, hunting, wild boar, Croatia

Status populacije čaglja (C*anis aureus* L.) u istočnoj Hrvatskoj

Ivica Bošković[1], Tihomir Florijančić[1], Marcela Šperanda[1], Nikica Šprem[2], Siniša Ozimec[1], Dražen Degmečić[3]

[1]*Sveučilište Josipa Jurja Strossmayera u Osijeku, Poljoprivredni fakultet, Zavod za lovstvo, ribarstvo i pčelarstvo, Kralja Petra Svačića 1d, Osijek, Hrvatska (bivica@pfos.hr)*
[2]*Sveučilište u Zagrebu, Agronomski fakultet, Zavod za ribarstvo, pčelarstvo, lovstvo i specijalnu zoologiju, Svetošimunska 25, Zagreb, Hrvatska*
[3]*Hrvatske šume Zagreb, Uprava šuma - Podružnica Osijek, Š. Petefija 35, Bilje, Hrvatska*

Sažetak

Čagalj (*Canis aureus*) je stalno boravio na području jugoistočne i središnje Europe do početka 20. stoljeća. Zadnji primjerci u istočnoj Hrvatskoj odstrijeljeni su 1903. u okolici Valpova i 1908. godine u okolici Županje. Stotinjak godina poslije, vrsta doživljava biološku ekspanziju i širi se na područja s kojih je ranije nestala. Još 1987. godine čagalj je odstrijeljen pokraj Ivankova; 1998. u Račinovcima, 1999. u Gunji i od tada je stalno prisutna divljač u istočnoj Hrvatskoj. Obitava u šikarama i močvarnim terenima u poplavnim dolinama rijeka Save, Drave i Dunava. Prema Središnjoj lovnoj evidenciji, u lovnoj 2009./2010. godini, matični fond čaglja u Republici Hrvatskoj iznosio je 1.227 jedinki, a odstrijeljene su 884 jedinke. U lovištima pet županija istočne Hrvatske, matični fond iznosio je 260 jedinki, a odstrijeljeno je 206. Prema udjelu, najviše ih je odstrijeljeno u Brodsko-posavskoj županiji (40 %), u Osječko-baranjskoj 30 % i 26 % u Vukovarsko-srijemskoj županiji. Aktualni podaci su nesigurni, prvenstveno zbog neusklađenosti lovnog zakonodavstva i provedbenih dokumenta lovnog gospodarenja. Procijenjeni odstrjel iznosi 800-1.000 jedinki čaglja u lovnoj 2009./2010. godini. Rezultati urađene genetske studije na jedinkama iz istočne Hrvatske i Srbije potvrdili su da je populacija čagljeva u istočnoj Hrvatskoj genetski vrlo slična s populacijom u Srbiji. Brojnost čaglja potrebno je trajno nadzirati, jer u nedostatku mesnog otpada i glodavaca čagalj može pribjeći predacijskom lovu, prije svega pomlatka krupne divljači.

Ključne riječi: čagalj, *Canis aureus*, populacija, istočna Hrvatska

Status of the golden jackal (C*anis aureus* L.) population in the Eastern Croatia

Ivica Bošković[1], Tihomir Florijančić[1], Marcela Šperanda[1], Nikica Šprem[2], Siniša Ozimec[1], Dražen Degmečić[3]

[1]*University Josip Juraj Strossmayer in Osijek, Faculty of Agriculture, Department of Wildlife, Fishery and Beekeeping, Kralja Petra Svačića 1d, Osijek, Croatia (bivica@pfos.hr)*
[2]*University of Zagreb, Faculty of Agriculture, Department of Fisheries, Beekeeping, Game Management and Special Zoology, Svetošimunska 25, Zagreb, Croatia*
[3]*Croatian Forests Ltd., Forest Administration Osijek, Š. Petefija 35, Bilje, Croatia*

Summary

Golden jackal (*Canis aureus*) permanently resided in the Southeast and Central Europe until the beginning of the 20th century. Last specimens in the Eastern Croatia were culled in 1903 near Valpovo, and in 1908 near Županja. A hundred years after, a biological expansion of this species occurred and it spreads into areas from which had previously disappeared. Yet in 1987, golden jackal was culled near Ivankovo; in Račinovci in 1998, in Gunja in 1999, and since then it is permanent game species in the Eastern Croatia. Golden jackal occupied thickets and wetlands along the flooded valleys of the rivers: the Sava, the Drava and the Danube. According to Central Hunting Registry, in hunting year 2009/2010, a domicile stock in the Republic of Croatia was 1,227 individuals, and cull rate was 884 individuals. In the hunting grounds settled within five counties of the Eastern Croatia, domicile stock was 260, and cull rate of 206 individuals. In the percentage distribution, the highest cull rate (40%) was recoreded in Brodsko-Posavska County, followed by Osječko-Baranjska (30%) and Vukovarsko-Srijemska (26%) Counties. Actual data on numbers are uncertain, primarily due to divergence between hunting legislation and implementing documents for hunting management. Cull rate for golden jackal is estimated from 800 to 1,000 individuals in the hunting year 2009/2010. Results of the undertaken genetic study on individuals from the Eastern Croatia and Serbia confirmed that golden jackal's population in the Eastern Croatia is genetically very similar with population in Serbia. The population size of golden jackal needs to be kept under permanent control, because in case of shortage in meat waste and rodents, golden jackal can easily move on the predation by hunting primarily young of big game animals.

Key words: golden jackal, *Canis aureus*, population, eastern Croatia

Kvalitativna analiza prehrane sivog vuka (*Canis lupus* L.) na području Sisačko-moslavačke županije

Vedran Slijepčević[1], Branislav Koljaja[2], Krunoslav Pintur[1]

[1]*Veleučilište u Karlovcu, Trg J.J. Strossmayera 9, Karlovac, Hrvatska (vedran.slijepcevic@vuka.hr)*
[2]*Đure Pukeca 8, Petrinja, Hrvatska*

Sažetak

Cilj istraživanja koje je provedeno analizom uzoraka (N=49) pronađenog izmeta bile su prehrambene navike sivog vuka *(Canis lupus*). Uzorci su prikupljani u razdoblju od 19. listopada 2011. do 10. ožujka 2012. godine, a istraživano je područje Zrinske gore i Kotar šume u Sisačko-moslavačkoj županiji. Uzorci su prikupljani praćenjem tragova u snijegu, dojavom lovaca s terena (bilo da je opažen sivi vuk ili je primijećen izmet) te terenskim radom u suradnji s lokalnim stanovništvom i lovoovlaštenicima na području njihova lovišta. Makroskopskim i mikroskopskim pregledom sadržaja izmeta određena je učestalost pojavljivanja pojedinih biljnih i životinjskih vrsta u uzorcima, te udio učestalosti pojedinih vrsta koje su plijen sivog vuka. Utvrđena je prisutnost dlake divlje svinje u 100 % uzoraka, srne u 33 % i ovce u 2 % uzoraka. Ovi rezultati su zanimljivi jer u drugim dijelovima Hrvatske, pa i svijeta, vukovi obično rjeđe love divlju svinju. Zbog nedostatka jelena običnog, vukovi su za prehranu očigledno odabrali najbrojniju vrstu krupnog plijena. Pronađen je i sadržaj biljnog podrijetla; trava pirika (*Agropyron repens*) u 8 % uzoraka, višnja (*Prunus cerasus*) u 4 %, šljiva (*Prunus domestica*) u 2 % te hrast lužnjak (*Quercus robur*) u 2 % uzoraka. Poznato je kako vukovi namjerno konzumiraju travu piriku, dok su ostale biljke konzumirali slučajno iz okoliša ili ingestijom iz probavnog sustava plijena.

Ključne riječi: prehrana, vuk, izmet, Sisačko-moslavačka županija

Qualitative analysis of grey wolf (*Canis lupus* L.) diet in the area of Sisačko-Moslavačka County

Vedran Slijepčević[1], Branislav Koljaja[2], Krunoslav Pintur[1]

[1]*University of Applied Sciences in Karlovac, Trg J.J. Strossmayera 9, Karlovac, Croatia (vedran.slijepcevic@vuka.hr)*
[2]*Đure Pukeca 8, Petrinja, Croatia*

Summary

The objective of the research done by analyzing samples (N=49) of faeces was the feeding habits of the grey wolf (*Canis lupus*). Samples were collected in the period from 19 October 2011 to 10 March 2012, in the research area comprising Zrinska gora and Kotar šuma in Sisačko-Moslavačka County. Samples were collected by snow tracking and acting upon calls from hunters on the field (related either to observation of wolf or its faeces), and doing fieldwork in cooperation with local residents and hunting leaseholders in their hunting grounds. Occurrence frequency of certain plant and animal species in samples, as well as occurrence of species that are wolf's prey was investigated both macroscopically and microscopically. The results showed that hair of wild boar was found in 100% of samples, followed by roe deer in 33 % of samples and domestic sheep in 2% of samples. These results are interesting because in other parts of Croatia, and elsewhere in the world, wolves generally avoid predation on wild boar. Due to absence of red deer, wolves have obviously selected the most abundant large prey species. Plant matter was also identified, for example creeping twitch (*Agropyron repens*) in 8% of samples, cherry (*Prunus cerasus*) in 4%, plum (*Prunus domestica*) in 2% and oak (*Quercus robur*) in 2% of samples. It is known that wolves consumed creeping twitch purposely, while the rest of plants they consumed accidentaly from the environment or by ingestion from the digestive system of the prey.

Key words: diet, wolf, faeces, Sisačko-Moslavačka County

Usporedna analiza lovišta kojima gospodari Javno poduzeće „Vojvodinašume“

Dragan P. Gačić, Milorad Danilović

Univerzitet u Beogradu, Šumarski fakultet, Kneza Višeslava 1, Beograd, Srbija (dragan.gacic@sfb.bg.ac.rs)

Sažetak

Cilj rada je analizirati trenutno stanje lovišta i populacija krupne divljači kojima gospodari Javno poduzeće za gospodarenje šumama „Vojvodinašume“ iz Novog Sada. U radu su prikazani službeni podaci iz godišnjih planskih dokumenata za lovnu 2012./2013. godinu o procijenjenoj brojnosti i strukturi (spolnoj i dobnoj) populacija jelena običnog i divlje svinje, te odstrjelu i trofejnoj strukturi. U Vojvodini je, sukladno Zakonu o divljači i lovstvu iz 2010., ustanovljeno ukupno 147 lovišta: 18 lovišta posebne namjene, 13 lovišta na ribnjacima, 115 otvorenih i jedno privatno lovište. Javno poduzeće „Vojvodinašume“ gospodari sa 17 lovišta posebne namjene (površine s većinskim udjelom državnih šuma), koja se prostiru na 109.824 ha površine i čine 5,1% ukupne površine lovišta u Vojvodini. Od toga je 25.500 ha u ograđenim lovištima (Kozara i Apatinski rit) ili ograđenim dijelovima lovišta (Subotičke šume, Plavna, Karakuša, Kućine, Deliblatska peščara, Kamarište i Ristovača). U odnosu na potencijal šuma od približno 130.000 ha kojima gospodari Javno poduzeće „Vojvodinašume“, trenutno stanje u najvećem broju lovišta nije zadovoljavajuće, naročito kod onih u slobodnoj prirodi, tzv. otvorena lovišta. Proljetna brojnost jelena običnog iznosi oko 3.170 jedinki (u slobodnoj prirodi je 24 %), a divlje svinje oko 4.040 jedinki (u slobodnoj prirodi je 30 %). Trenutno stanje populacija ovih dviju glavnih vrsta krupne divljači odlikuje smanjena vitalnost, nedovoljna brojnost ili (rjeđe) veća brojnost od optimalne, zatim nepovoljna struktura (spolna, dobna, genetska) i slaba trofejna vrijednost.

Ključne riječi: lovište, Vojvodina, jelen obični, divlja svinja,

Comparative analysis of hunting grounds managed by "Vojvodinašume" Public Enterprise

Dragan P. Gačić, Milorad Danilović

Faculty of Forestry, University of Belgrade, Kneza Višeslava 1, Belgrade, Serbia (dragan.gacic@sfb.bg.ac.rs)

Summary

The present state of hunting grounds and populations of big game managed by "Vojvodinašume" Public Enterprise for managing forests, from Novi Sad was analysed. The official data collected from the annual planning documents for hunting year 2012/2013, dealing with estimated density and structure (sex and age) of red deer and wild boar populations, as well as culling rate and trophy structure, are presented. In the region of Vojvodina, according to Act on Game and Hunting from 2010, there are total of 147 hunting grounds: 18 specific purposes hunting grounds, 13 hunting grounds established at fisponds, 115 open hunting grounds and one private hunting ground. Public Enterprise "Vojvodinašume"managing with 17 specific purposes hunting grounds (areas with major share of state owned forests), which occupies area of 109,824 ha, making 5.1 % of total hunting grounds area in Vojvodina. Out of this, there is 25,500 ha within fenced hunting grounds (Kozara and Apatinski Rit) or partialy fenced (Subotičke Šume, Plavna, Karakuša, Kućine, Deliblatska Peščara, Kamarište and Ristovača). Related to potential of nearly 130,000 ha in the forests managed by Public Enterprise "Vojvodinašume", the present state in the largest number of hunting grounds in unsatisfactory, especially at those in the wild or so called open hunting grounds. Spring density of red deer amounts to about 3,170 individuals (24% in the wild), and wild boar about 4,040 individuals (30% in the wild). Presently, the populations of these two main big game species are characterised by reduced vitality, insufficient abundance or (rarely) density over an optimal, unfavourable structure (sex, age and genetic), and low trophy worthiness.

Key words: hunting ground, Vojvodina, red deer, wild boar

Usporedba uspješnosti lovnog gospodarenja između lovačkih udruga u Republici Hrvatskoj i Republici Sloveniji

Mirjana Ivasić, Goran Godina, Ratko Branković, Nenad Nekvapil

Strukovna udruga stručnih osoba za provedbu lovnogospodarskih osnova, programa uzgoja divljači i programa zaštite divljači na površinama izvan lovišta, I. Kršnjavoga 2, Karlovac, Hrvatska (mirjana.lov@gmail.com; suso.lov@gmail.com)

Sažetak

Prikazani su rezultati usporedbe uspješnosti lovnog gospodarenja između lovačkih udruga u Hrvatskoj i Sloveniji. Broj ustanovljenih lovišta u Hrvatskoj iznosi 1.074 na površini od 5,468.037 ha, odnosno 424 lovišta na 1,935.969 ha u Sloveniji. Utvrđeno je da su površine lovišta u Hrvatskoj za 2,48 puta veće od lovišta u Sloveniji. Kao ovlaštenici prava lova u obje zemlje prevladavaju lovačke udruge koje gospodare sa 78,9 % lovišta u Hrvatskoj i 85,3 % lovišta u Sloveniji. U lovnoj 2010./2011. godini po jedinici površine odstrijeljeno je: jelenske divljači 0,05 u Hrvatskoj i 0,13 u Sloveniji; srneće divljači 0,21 u Hrvatskoj i 1,62 u Sloveniji; svinje divlje 0,34 u Hrvatskoj i 0,35 u Sloveniji. Izračunati odstrjel jelenske i srneće divljači po jedinici površine veći je u Sloveniji, dok je odstrjel svinje divlje približno jednak. Bolja uspješnost lovstva u Sloveniji, iskazana brojem odstrjela divljači po jedinici površine lovišta, ostvarena je i primjenom jedinstvenih planova lovnog gospodarenja koji obuhvaćaju više lovišta. Stručne poslove lovnog gospodarenja u Sloveniji planiraju i utvrđuju stručna tijela nacionalnog lovačkog saveza. U Hrvatskoj podatke o odstrjelu divljači vodi Ministarstvo poljoprivredu u obliku Središnje lovne evidencije. Usporedba pokazuje da je, uz intenzivniju stručniju i znanstvenu djelatnost, te potrebne normativne izmjene u sektoru lovstva, moguće poboljšati uspješnost lovnog gospodarenja u Hrvatskoj.

Ključne riječi: lovno gospodarenje, lovište, divljač, Hrvatska, Slovenija

Comparison of the successfulness in hunting management between hunting societies in the Republic of Croatia and Republic of Slovenia

Mirjana Ivasić, Goran Godina, Ratko Branković, Nenad Nekvapil

Professional Society of Experts for Implementation of the Hunting Management Programmes, the Game Breeding Programmes and Programmes for Game Protection on Surfaces Outside the Hunting Ground, I. Kršnjavoga 2, Karlovac, Croatia (mirjana.lov@gmail.com; suso.lov@gmail.com)

Summary

Results of the comparison of the successfulness in hunting management between hunting societies in Croatia and Slovenia, are described. Number of the established hunting grounds in Croatia is 1,074 on total area of 5.468,037 ha, and 424 in Slovenia on total area of 1.935,969 ha. It was determined that hunting surfaceas in Croatia are 2.48 time larger than in Slovenia. Hunting societies in Croatia managing with 78.9%, and in Slovenia with 85.3% of the hunting grounds. In the hunting year 2010/2011, the culling rates per unit area were as it follows: red deer 0.05 in Croatia and 0.13 in Slovenia; roe deer 0.21 in Croatia and 1.62 in Slovenia; wild boar 0.34 in Croatia and 0.35 in Slovenia. Calculated values for red deer and roe deer are higher in Slovenia, while the value for wild boar is almost equal for Croatia and Slovenia. Higher level of success in hunting management in Slovenia, given as number of culled game per unit area, has been achieved by the implementation of the integral Plans of the hunting management for a number of hunting grounds. Professional activites related to hunting management in Slovenia are being settled and planned by the professional bodies within the national hunting association. In Croatia, records on culling rates are kept by the Ministry of the Agriculture in the form of Central Hunting Registry. Comparison pointed out that, with more intensive professional and scientific activity, as well as necessary changes in legislation in the hunting sector, it is possible to improve the level of success of the hunting management in Croatia.

Key words: hunting management, hunting ground, game, Croatia, Slovenia

Preliminarna istraživanja područja aktivnosti zeca običnog (*Lepus europaeus* Pall.) u suburbanim područjima

Krunoslav Pintur[1], Vedran Slijepčević[1], Stjepan Keleković[2], Nina Popović[1]

[1]*Veleučilište u Karlovcu, Trg J.J. Strossmayera 9, Karlovac, Hrvatska (krunoslav.pintur@vuka.hr)*
[2]*A.G.Matoša 2, Rakitje - Bestovje, Hrvatska*

Sažetak

Cilj provedenog istraživanja bio je pomoću radiotelemetrije utvrditi veličine područja aktivnosti zeca običnog (*Lepus europeus*) u suburbanim područjima. Istraživanje je provedeno tijekom 2009. i 2010. godine u bližoj okolici grada Zagreba. Zečevi su uhvaćeni pomoću mreža na istraživačkoj plohi veličine cca 50 ha, omeđenoj sa svih strana naseljima i prometnicama. Nakon hvatanja, jedinke su obilježene VHF ogrlicama te su praćene i locirane pomoću prijemnika i antene. Nakon obilježavanja, zečevi su ponovno ispušteni na istu plohu. Lociranje zečeva izvršeno je metodom triangulacije, nakon čega su utvrđene pozicije obrađene u programu Locate III i Quantum GIS 1.5.0. Ukupno su obilježena 4 zeca: 2 mužjaka i 2 ženke. Uslijed ugibanja jedne jedinke te prestanka rada jednog odašiljača, analiza i procjena veličine područja aktivnosti provedena je samo za dvije jedinke. Adultna ženka praćena je 11,5 mjeseci pri čemu je utvrđena veličina područja aktivnosti te jedinke iznosila 11.,67 ha. Juvenilni mužjak praćen je 10 mjeseci, a utvrđena veličina područja aktivnosti iznosila je 7,5 ha. Preklapanje područja aktivnosti praćenih jedinki iznosilo je 2,43 ha. Zečevi koji su praćeni nisu napuštali istraživanu plohu, niti su iskorištavali njezinu cijelu površinu kao područje aktivnosti. Utvrđeno preklapanje područja aktivnosti je uobičajeno, kao i manje područje kretanja juvenilnih jedinki.

Ključne riječi: zec obični, područje, aktivnost, VHF ogrlica, triangulacija

Preliminary research of home range sizes of the European hare (*Lepus europaeus* Pall.) in suburban areas

Krunoslav Pintur[1], Vedran Slijepčević[1], Stjepan Keleković[2], Nina Popović[1]

[1]*University of Applied Sciences in Karlovac, Trg J.J. Strossmayera 9, Karlovac, Croatia (krunoslav.pintur@vuka.hr)*
[2]*A.G. Matoša 2, Rakitje - Bestovje, Croatia*

Summary

The aim of the conducted research was to determine home range sizes of radio-tracked European hares (*Lepus europeus*) in suburban areas. The research was conducted during 2009 and 2010 in the closer outskirts of the city of Zagreb. Hares were caught using nets on approximately 50 ha experimental plot, bounded with settlements and roads. Caught hares were equipped with radio collars and then tracked and located with receiver and antenna. After the marking, hares were released again at the site of their capture. Radio locations were gained by triangulation and range analysis was carried out using Locate III and Quantum GIS 1.5.0. In total, 4 hares were marked: 2 males and 2 females. Owing to death and transmitter failures, only two hares were used in the analysis. Adult female was radio-tracked during 11.5 months and its home range size of 11.67 ha was estimated. Juvenile male was tracked during 10 months and its estimated home range size was 2.43 ha. Radio-tracked hares showed site fidelity and limited home ranges. Estimated overlapping of home range between individuals is a common pattern, as well as smaller home range size of juveniles.

Key words: European hare, area, home range, radio collar, triangulation

Analiza lovačkih trofeja u Osječko-baranjskoj županiji u razdoblju 2007. - 2012. godine

Goran Andrašević[1], Tihomir Florijančić[2], Ivica Bošković[2], Siniša Ozimec[2]

[1]*F.K. Frankopana 3, Koška, Hrvatska (goran.andrasevic@gmail.com)*
[2]*Sveučilište Josipa Jurja Strossmayera u Osijeku, Poljoprivredni fakultet, Zavod za lovstvo, ribarstvo i pčelarstvo, Kralja Petra Svačića 1d, Osijek, Hrvatska*

Sažetak

Prikazana je struktura lovačkih trofeja ostvarenih odstrjelom divljači u lovištima na području Osječko-baranjske županije u istočnoj Hrvatskoj, tijekom razdoblja od 2007. do 2012. godine. Ocijenjeno je ukupno 2.754 trofeja divljači, od čega 486 (17,64 %) kapitalnih, tj. brojem ostvarenih CIC točaka osvojili su jednu od medalja. Tijekom analiziranog razdoblja primjećen je trend porasta broja trofeja prijavljenih za ocjenjivanje, kao i udio kapitalnih trofeja kod većine vrsta divljači. Posebno je značajan porast broja ocijenjenih trofeja krupnih vrsta divljači: jelena običnog, srne obične i divlje svinje. Kvaliteta trofeja jelenske divljači raste proporcionalno s povećanjem broja ocijenjenih trofeja, što upućuje na pravilno gospodarenje u lovištu. Kod srneće divljači udio kapitalnih primjeraka opada s povećanjem brojnosti i ocijenjenih trofeja, što upućuje da uzgojno-selekcijski rad u lovištu ne slijedi promjene u veličini populacije. Trofejnu strukturu srneće divljači moguće je poboljšati jer populacija posjeduje genetski kapacitet, a potrebno je pojačati kriterije u uzgojno selekcijskom radu te edukaciju lovaca. Udio kapitalnih trofeja u ukupnom broju ocijenjenih trofeja divlje svinje je konstantan i iznosi 25 %. Porastao je broj ocijenjenih trofeja sitne divljači: lisice, jazavca i čaglja, a odstrijeljena su dva državna prvaka jazavca i čaglja.

Ključne riječi: trofej, analiza, divljač, lovište, Osječko-baranjska županija

Analyses of hunting trophies from Osijek-Baranja County during the period 2007-2012

Goran Andrašević[1], Tihomir Florijančić[2], Ivica Bošković[2], Siniša Ozimec[2]

[1]*F.K. Frankopana 3, Koška, Croatia (goran.andrasevic@gmail.com)*
[2]*University Josip Juraj Strossmayer in Osijek, Faculty of Agriculture, Department of Wildlife, Fishery and Beekeeping, Kralja Petra Svačića 1d, Osijek, Croatia*

Summary

Structure of the hunting trophies, acquired by the game culling in the hunting grounds, situated in Osijek-Baranja County (Eastern Croatia), during the period 2007-2012, is presented. Total of 2,754 game trophies has been evaluated, of which 486 or 17.64 % are nominated as capital, so with number of scored CIC points got one of the medals. During the analyzed period, the increasing trend was noticed in number of trophies submitted for the evaluation, as well as percentage of capital trophies in most of the game animals. Increase in number of evaluated trophies of the big game animals, such as: red deer, roe deer and wild boar is of significant importance. The quality of red deer's trophy increase in relation to increase in number of evaluated trophies, thus suggesting the correct management practise in the hunting ground. Percentage of capital trophy specimens in roe deer decline in relation to increase of population size and number of evaluated trophies. This suggests that breeding and selective activities in hunting ground does not follow changes of population size. Trophy structure of roe deer can be improved because the population has its genetical capacity. It is necessary to enforce the criteria in breeding and selective activities, and for further education of the hunters. Percentage of capital trophies within total number of evaluated wild boar's trophies is constant at rate of 25%. Number of evaluated trophies of small game animals, such as red fox, badger and golden jackals, increased, too. During the analyzed period, two national champions of badger and golden jackal have been culled.

Key words: trophy, analyses, game, hunting ground, Osijek-Baranja County

Preliminarno istraživanje ovisnosti dijametra mišićnih stanica fazana (*Phasianus* spp.) u prenatalnom i postnatalnom razvoju o boji ljuske jaja

Zlatko Jojkić[1], Slobodan Stojanović[2], Zoran Ristić[3], Tihomir Florijančić[4], Gordana Ušćebrka[2]

[1]*Veterinarski zavod „Subotica“, Beogradski put 123, Subotica, Srbija*
[2]*Univerzitet u Novom Sadu, Poljoprivredni fakultet, Trg Dositeja Obradovića 8, Novi Sad, Srbija*
[3]*Univerzitet u Novom Sadu, Prirodno-matematički fakultet, Departman za geografiju, turizam i hotelijerstvo, Trg Dositeja Obradovića 3, Novi Sad, Srbija (balzakova@yahoo.com)*
[4]*Sveučilište Josipa Jurja Strossmayera u Osijeku, Poljoprivredni fakultet, Zavod za lovstvo, ribarstvo i pčelarstvo, Kralja Petra Svačića 1d, Osijek, Hrvatska*

Sažetak

Embrionalni razvoj ptica, kao dio ontogenetskog razvoja, predstavlja razdoblje života jedinke kome se danas poklanja sve više pozornosti. Cilj ovog rada bio je istražiti utjecaj boje ljuske jaja na dijametar mišićnih stanica fazana tijekom prenatalnog i postnatalnog razdoblja razvoja. Jaja su ovisno od boje ljuske podijeljena u četiri skupine: tamno smeđa, svijetlo smeđa, smeđe-zelena i zeleno-plava. Za histološke analize uzimani su uzorci *m. biceps femoris*-a i *m. pectoralis superficialis*-a u 17. danu embrionalnog razvoja i 1. danu postnatalnog razvoja. Kod oba promatrana mišića, dijametri mišićnih stanica su bili veći1. dana postnatalnog razvoja u odnosu na 17. dan embrionalnog razvoja. Prema boji ljuske jaja, najmanji dijametar mišićnih stanica izmjeren je u embrija i pilića iz jaja plavo-zelene boje ljuske. Na temelju prikupljenih parametara, zaključeno je da se prema kriteriju boje ljuske jajeta mogu očekivati neizravni učinci na neke od proizvodnih osobina, prvenstveno onih vezanih za kvalitetu i masu mesa.

Ključne riječi: fazan, boja, ljuska jaja, mišićne stanice, embrionalni razvoj

Preliminary research of dependence of pheasants (*Phasianus* spp.) muscle cells diameter in prenatal and postnatal development on the color of eggshell

Zlatko Jojkic[1], Slobodan Stojanovic[2], Zoran Ristic[3], Tihomir Florijancic[4], Gordana Uščebrka[2]

[1]*Veterinary Institute JSC Subotica, Beogradski put 123, Subotica, Serbia*
[2]*University of Novi Sad, Faculty of Agriculture,Trg Dositeja Obradovica 5, Novi Sad, Serbia*
[3]*University of Novi Sad, Faculty of Sciences, Department of Geography, Tourism and Hotel Management, Trg Dositeja Obradovica 5, Novi Sad, Serbia (balzakova@yahoo.com)*
[4]*University Josip Juraj Strossmayer in Osijek, Faculty of Agriculture,Department of Wildlife, Fishery and Beekeeping, Kralja Petra Svačića 1d, Osijek, Croatia*

Summary

Embryonic development of birds, as part of ontogenetic development, is a life-period to whom scientists pay much more attention in recent years. The aim of this study was to investigate the influence of eggshell color on diameter of pheasants muscle cells during prenatal and postnatal periods of development. Depending on the eggshell color, eggs were divided into four groups: dark brown, light brown, brown-green and green-blue. For histological analysis, samples were taken from *biceps femoris* and *pectoralis superficialis* in the 17th day of embryonic development and 1st day of postnatal development. In both of observed muscles, diameter of muscle cells were higher on the 1st day of postnatal development in relation to the 17th day of embryonic development. Related to the eggshell color, the smallest diameter of the muscle cells was measured in embryos and chicks from eggs with blue-green shell. Based on the acquired parameters, it can be concluded that, on the criteria of eggshell color, indirect effects on some of the production characteristics can be expected, primarily related to the quality and weight of the meat.

Key words: pheasant, color, eggshell, muscle cell, embryonic development

Usporedba vrijednosti trofeja srnjaka (*Capreolus capreolus* L.) u Srbiji utvrđenih primjenom CIC formule i mjerenjem mase trofeja

Zoran A. Ristić[1], Milan B. Urošević[2], Darko Drobnjak[2], Milovoje M. Urošević[2], Miroslav I. Urošević[3]

[1]*Univerzitet u Novom Sadu, Prirodno-matematički fakultet, Departman za geografiju, turizam i hotelijerstvo, Trg Dositeja Obradovića 3, Novi Sad, Srbija (balzakova@yahoo.com)*
[2]*Centar za očuvanje autohtonih rasa, Vere Dimitrijević 9, Beograd, Srbija*
[3]*Univerzitet u Novom Sadu, Naučni institut za prehrambene tehnologije, Bulevar cara Lazara 1, Novi Sad, Srbija*

Sažetak

Međunarodni savjet za lovstvo i zaštitu divljači (CIC) još od 1937. godine koristi privremenu formulu za ocjenjivanje trofejne vrijednosti parogova srnjaka. Razlog je u neslaganju lovaca i lovnih stručnjaka oko odabira glavnog elementa za ocjenjivanje: estetske vrijednosti, dužine parogova ili veličine trofeja. Od lovne 2007./2008. godine u Srbiji se koristi pojednostavljeno određivanje vrijednosti trofeja srnjaka, iskazano kao masa parogova. Ovaj pristup omogućuje brz i objektivan izračun cijene trofeja. Budući da po CIC-ovom sustavu ocjenjivanja masa rogova čini 34,5 % ukupne vrijednosti trofeja, potrebno je istražiti koliko je masa trofeja razmjerna vrijednosti obračunatoj primjenom CIC-ove formule, te u kojoj mjeri novi sustav ocjenjivanja trofeja doprinosi postizanju materijalne dobiti za lovišta, odnosno lovačke udruge ili lovcima. Analizirani su trofejni listovi za 194 srnjaka, odstrijeljenih u lovištu „Srpska Crnja“ tijekom 2009. i 2010. godine. Uspoređeni su korelacija mase trofeja i njegove vrijednosti prema CIC-u, te korelacija mase i volumena trofeja. Dobivene vrijednosti su uspoređene s prosječnom dužinom parogova i vrijednosti za estetske elemente, kako bi utvrdili je li masa parogova jedini dobar indikator vrijednosti trofeja. Također su uspoređene cijene trofeja primjenom starog i novog pristupa u ocjenjivanju, kako bi utvrdili je li cijena jednaka u oba pristupa, odnosno koji pristup pogoduje lovcu, a koji korisniku lovišta. Prosječna masa trofeja stečenih u 2009. godini iznosi 252,13 g; minimalna masa je 90 g, a maksimalna 460 g. Minimalni broj postignutih CIC točaka iznosi 49,99; maksimalni 145,7, a prosječni 80,44 točaka. Kod trofeja stečenih u 2010. godini, prosječna masa iznosila je 247,71 g; minimalna masa je 129 g, a maksimalna 480 g. Minimalni broj postignutih CIC točaka iznosi 49,99; maksimalni 142,55, a prosječni 82,00 točaka.

Ključne reči: srnjak, *Capreolus capreolus*, trofej, masa, CIC točke

Prikazani rezultati istraživanja su ostvareni u okviru znanstvenog projekta “TR-31084“, koji je financiralo Ministarstvo prosvete i nauke Republike Srbije.

Comparison between values of roe deer (*Capreolus capreolus* L.) trophies in Serbia evaluated according to CIC formula and by trophy weighing

Zoran A. Ristić[1], Milan B. Urošević[2], Darko Drobnjak[2], Milovoje M. Urošević[2], Miroslav I. Urošević[3]

[1]*University of Novi Sad, Faculty of Sciences, Department of Geography, Tourism and Hotel Management, Trg Dositeja Obradovića 3, Novi Sad, Serbia (balzakova@yahoo.com)*
[2]*Center for Preservation of Indigenous Breeds, Vere Dimitrijević 9, Beograd, Serbia*
[3]*University of Novi Sad, Institute of Food Technology, Bulevar cara Lazara 1, Novi Sad, Serbia*

Summary

International Council for Game and Wildlife Conservation (CIC) is practising a temporary scoring formula for roe deer trophies, since 1937 year. This is caused by a discord between hunters and hunting experts on the issue of main criterion for evaluation: aesthetic values, antlers length or weight and size of the trophy. From the hunting year 2007/2008, a simplified evaluation of roe deer trophy values, based on antlers weight, was introduced in Serbia. This approach enables quick and unbiased estimation of the trophy price. Knowing that, according to CIC procedures, antlers weight makes 34.5% of total trophy value, it is necessary to find out how the trophy weight is in compliance to the value given by the CIC formula; and whether this new approach in trophy evaluation is more beneficial to the hunters, hunting societies or hunters. Data records for 194 roe deer, culled in the hunting ground „Srpska Crnja“ during the 2009 and 2010, were analyzed. Comparison has been made for the correlation between trophy weight and trophy value calculated according to CIC, as well as between weight and volume of the trophy. The obtained values were compared to an average antlers length and points awarded for the beauty in order to determine whether the antlers weight is the only good indicator of the trophy values. Prices of roe deer trophy, calculated under the old and new approach were compared in order to estimate whether the trophy price is equal in boath approaches, and which is more beneficial related to the hunter or hunting ground owner. The weight of roe deer trophies acquired in 2009 ranged from 90 to 460 g, with 252.13 g in average. The values of scored CIC pointes ranged from 49.99 to 145.7, with 80.44 CIC points in average. In roe deer trophies acquired in 2010, the weigh of trophies ranged from 129 to 480 g, with 247.71 g in average. The values of scored CIC points ranged from 49.99 to 142.55, with 82.00 CIC points in average.

Key words: roe deer, *Capreolus capreolus*, trophy, weight, CIC points

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Trend in the gonadosomatic index of some large mammals in Croatia

Tomislav Dumić[11], Hrvoje Novosel[2,] Dražen Degmečić[3], Albert Ofner[4], Tihomir Florijančić[1], Miroslava Jauk[1]*, Nikica Šprem[2]

[1]*University Josip Juraj Strossmayer in Osijek, Faculty of Agriculture, Department of Hunting, Fishery and Beekeeping, Kralja Petra Svačića 1d, Osijek, Croatia (tomislav.dumic@zg.t-com.hr)*
[2]*University of Zagreb, Faculty of Agriculture, Department of Fisheries, Beekeeping, Game Management and Special Zoology, Svetošimunska cesta 25, Zagreb, Croatia*
[3]*Croatian Forests Ltd., Forest Administration Osijek, Š. Petefija 35, Bilje, Croatia*
[4]*Croatian Forests Ltd., Forest Administration Karlovac, Put D. Trstenjaka 1, Karlovac, Croatia*

Summary

This contribution deals with the annual changes in the gonadosomatic index (GSI) for most species of large mammals in Croatia, which includes their pre-rutting, rutting and post-rutting period. It provides a comparable value of the GSI in relation to weight and age of the animals. The actual testicular mass of 61 roe deer, 34 red deer, 87 wild boars and 3 bears was obtained after animals have been shot in legal hunt. Recorded measures were used to calculate the GSI as relation of gonad mass and body mass (in grams). Statistical analysis, test and calculations were performed using STATA/ic 12 for UNIX software package. Mean GSI values were calculated by two age groups (young and adult) for all analyzed species. Difference of mean GSI values between species was determined using ANOVA, regardless to the age group (young $F_{2,62}$=3.39, P>F 0.0401; adult $F_{2,62}$=101.94, P>F > 0.001), with the highest GSI mean value recorded in wild boars (young 0.32; adult 0.58). High positive correlation coefficient between gonad and body mass was recorded in wild boar (0.8746) and somewhat lower in roe deer (0.6693). Correlation coefficient values of two other analyzed species do not indicate any possible link between body mass and the mass of the gonads. Peak GSI values, as well as peak gonad mass values that closely match specie's mating period, were recorded in age group of adult roe deer, while young category of the same species reaches GSI peak values in period one month earlier

Key words: Croatia, GSI, mammals, testes, mass, correlation

[1] Student of the Postgraduate doctoral study „Agricultural Sciences“ study program „Hunting and Cynology“

Hematological values in red deer (*Cervus elaphus* L.) hinds after anesthesia and reversal

Neška Vukšić[12], Tihomir Florijančić[1], Ivica Bošković[1], Tomislav Šperanda[2], Dinko Jelkić[3], Mislav Đidara[1], Marcela Šperanda[1]

[1]*University Josip Juraj Strossmayer in Osijek, Faculty of Agriculture, Kralja Petra Svačića 1d,Osijek, Croatia (marcela.speranda@pfos.hr)*
[2]*Medical-Intertrade, Franje Tuđmana 3, Sveta Nedelja, Croatia*

Summary

Wild animals, like hinds, may need to be immobilized for a variety of reasons. During the anesthesia, blood cells counts is changing, which is very important for the specific situation during and after embryo transfer. The objective of this study was to determine hematological values, differential blood cell count in the venous blood of hinds before intravenous anesthesia by xylazine, ketamine, tiletamine-zolazepam solution, 30 minutes after anesthesia and after atipamezol reversal. Investigation was conducted on 26 hinds of red deer. Animals were prepared for the embriotransfer surgery and the mixture of ketamine, xylazine, tiletamin and zolezepam has been applied. Blood was collected immediately after physical restraining, 30 minutes after anesthesia and after Antisedan® application. Blood samples were obtained from the jugular vein using a Venoject® vacutainer, 2 ml with EDTA as anticoagulant. Instrument Sysmex poch-100iV was used for determination of the hematological parameters and blood cells count. Differential leucocyte counts were determined on blood smears prepared according to Pappenheim. Significantly (P<0,01) lower WBC and RBC values had hinds after anesthesia and after antidote as well, despite to trend of rising towards values before anesthesia (WBC 8.63: 6.46:7.44 x109L-1; RBC 11.92:9.42:8.42). Hemoglobin concentration was also lower after anesthesia and after reversal, but MCHC was higher after reversal. Share of neutrophils and lymphocytes is significantly (P<0.001) increased after anesthesia and after antidote. Hinds showed lower percentage of monocyte and eosinophil in all groups. Although the sudden changes in blood cells count happened after xylazine, ketamine, tiletamine-zolazepam solution mixture, all parameters were within the reference range. An evident sign of stress was present, but it lasted for a short time, so it can be that mixture used for anesthesia had no detrimental effect on further surgery course.

Key words: red deer, anesthesia, blood cells count, surgery preparation

[2] Student of the Graduate Study, Programme „Hunting and Beekeeping“

Zimski gubici pčela u Hercegovini u 2011./2012. godini

Jozo Bagarić[1], Janja Filipi[2], Nikola Kezić[3]

[1]*Sveučilište u Mostaru, Agronomski i prehrambeno-tehnološki fakultet, Biskupa Čule 10, Mostar, Bosna i Hercegovina*
[2]*Veleučilište „Marko Marulić“ u Kninu, Petra Krešimira IV. 30, Knin, Hrvatska*
[3]*Sveučilište u Zagrebu, Agronomski fakultet, Zavod za ribarstvo, pčelarstvo, lovstvo i specijalnu zoologiju, Svetošimunska 25, Zagreb, Hrvatska*

Sažetak

Cilj istraživanja bio je utvrditi zimske gubitke pčela na prostoru Hercegovine u 2011/2012. godini. Primjenom upitnika radne grupe I COLOSS-COST projekta, provedena je anketa u proljeće i ljeto 2012. godine u Savezu udruga „Kadulja“i udruzi „Vrisak. Obuhvaćeno je ukupno 43.500 košnica. Pčelari iz Saveza udruga „Kadulja“ imaju 32.850 košnica u općinama: Neum, Stolac, Čapljina, Mostar, Čitluk, Ljubuški, Grude, Široki brijeg, Posušje i Rama-Prozor. Pčelari iz udruge „Vrisak“ imaju 10.650 košnica u općinama: Tomislavgrad, Livno, Kupres, Glamoč i Grahovo. Autohtona siva pčela *(Apis melifera carnica*) prilagođena je na lokalne pašne, klimatske i tehnološke uvjete na cijelom istraživanom području. Tijekom 2011./2012. ukupno je stradalo 10.875 pčelinjih zajednica ili 25 %, od čega su 6.242 zajednice (19 %) zimski gubici. Pčelari kao uzroke visokih gubitaka pčelinjih zajednica navode bolesti, tehničko-tehnološke pogreške i klimatske prilike tijekom 2011. godine. Među bolestima je najviše prisutna varooza, a manje nozemoza. Kao jedini tehničko-tehnološki razlog stradavanja pčelinjih zajednica navedena je nedovoljna količina hrane za zimovanje. Nepovoljna pčelarska godina navedena je kao klimatski uzrok stradavanja pčelinjih zajednica. Obilne proljetne kiše zabilježene su u ožujku i travnju u mediteranskoj regiji Hercegovine, a u niskoj Hercegovini tijekom svibnja i lipnja. Medonosno je bilo tek nešto mandarine, tilovine (zanovijet), kadulje i drače. Dodatna nepogodnost bila je povećana količina padalina u razdoblju cvatnje livada u višim i planinskim dijelovima Hercegovine, primjerice na prostoru Tomislavgrada, Livna, Grahova, Glamoča i Kupresa. Nakon vlažnog perioda uslijedio je topli i sušni period pa je unos meda bio vrlo malen. Fluktuacije klimatskih prilika oslabile su pčelinje zajednice i omogućile brži razvoj bolesti. Značajne promjene vremenskih prilika tijekom zime: visina snijega od 50 cm u Mostaru, temperatura zraka do 10 ^{o}C tijekom deset dana, utjecale su na povećanje uginuća u zimskom razdoblju 2011/2012. godine.

Ključne riječi: Hercegovina, pčela, zimski gubici, klima

Honey bee winter losses in Herzegovina in 2011/2012

Jozo Bagarić[1], Janja Filipi[2], Nikola Kezić[3]

[1]*University of Mostar, Faculty of Agriculture and Food Technology, Biskupa Čule 10, Mostar, Bosnia and Hercegovina*
[2]*University of Applied Sciences „Marko Marulić" in Knin, Petra Krešimira IV. 30, Knin, Croatia*
[3]*University of Zagreb, Faculty of Agriculture, Department of Fisheries, Beekeeping, Game Management and Special Zoology, Svetošimunska 25, Zagreb, Croatia*

Summary

The aim of this research was to determine winter losses of honey bee colonies in Herzegovina in 2011/2012. The survey was carried out in spring and summer 2012, by using standard questionnaire developed by Working Group I of the COLOSS network, in the Union of beekeeper's associations "Kadulja" and association "Vrisak". Total of 43,500 beehives has been comprised. Beekeepers from the association "Kadulja" have 32,850 beehives in the municipalities: Neum, Stolac, Čapljina, Mostar, Čitluk, Ljubuški, Grude, Široki Brijeg, Posušje, and Rama-Prozor. Beekeepers from the association "Vrisak" have 10,875 beehives in the municipalities: Tomislavgrad, Livno, Kupres, Glamoč and Grahovo. Autochthonous carniolan honey bee (*Apis mellifera carnica*) is adapted to local pasture, climate and management conditions within all surveyed area. Total colony losses during 2011/2912 were 10,875 colonies or 25%, of which number 6,242 colonies (19%) are related to winter losses. As the causes for such high winter losses of honey bee colonies, beekeepers pointed out: diseases, mistakes in management, and climate conditions during 2011. Among diseases, varoosis is the mostly present, and nosemosis is less present. The only cause defined as mistake in management is insufficient quantity of food stored for wintering. As an impact of climate conditions, an unfavourable pasture conditions were present during the year, causing losses of honey bee colonies. Intensive rainfalls occurred in the spring (March and April) in the Mediterranean region of Herzegovina, and later in May and June, in lowland Herzegovina. Production of honey was very low and present only in Tangerine, Golden Rain, Sage and Christ's Thorn. Additionally, disadvantage was increasing rainfall quantities during the spring, in the period when grasslands flowering in higher and mountainous parts of Herzegovina, such as: Tomislavgrad, Livno, Grahovo, Glamoč and Kupres. This humid period was followed by the warm and dry period, causing the very low intake of honey in the beehives. Fluctuations of climate conditions weakened the colonies and enabled faster development of diseases. Significant changes in weather conditions during the winter: 50 cm height of snow cover, and air temperature up to 10 ^{o}C in ten-day period, had direct impact on increasing honey bee winter losses in the period 2011/2012.

Key words: Herzegovina, honey bee, winter losses, climate

Physicochemical characteristics and antioxidant capacity of everlasting, *Helichrysum italicum* (Roth) G. Don., honey

Ivana Flanjak, Ljiljana Primorac, Daniela Kenjerić, Blanka Bilić

University Josip Juraj Strossmayer in Osijek, Faculty of Food Technology, Franje Kuhača 20, Osijek, Croatia (iflanjak@ptfos.hr)

Summary

Everlasting, *Helichrysum italicum* (Roth.) G. Don., is aromatic and therapeutic plant used in folk medicine since ancient times. It is distributed around Mediterranean region and grows in arid, stony and sandy areas. The data of typical Mediterranean honeys characterization (e.g. sage, rosemary, lavender) are available in the literature, but not for the everlasting honey. Objective of this preliminary study was to determine physicochemical characteristics, antioxidant capacity and total phenol content of everlasting honey. Pollen analysis was performed and the following physicochemical characteristics were determined: moisture, electrical conductivity, HMF content, diastase activity, pH and acidity, specific rotation and colour. Antioxidant capacity was determined by FRAP (Ferric Reducing Antioxidant Power) and DPPH (2,2-diphenyl-1-picrylhydrazyl) methods, and total phenol content by modified Folin-Ciocalteu method. The results showed that everlasting honey has high diastase activity and total acidity, as well as antioxidant capacity and total phenol content.

Key words: everlasting, honey, characterization

Sadržaj hidroksimetilfurfurala (HMF) u bosanskohercegovačkim medovima

Bedrija Alić, Lejla Spiljak

Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet, Zmaja od Bosne 8, Sarajevo, Bosna i Hercegovina (lejlaspiljak@yahoo.com)

Sažetak

Čovjek stoljećima koristi med u ishrani, zbog njegove nutritivne vrijednosti i ostalih sastojaka, ali i zbog ljekovitih svojstava. Kakvoća meda jedan je od bitnih faktora njegovog plasmana na tržištu. Pojedine vrste meda se kvalitativno međusobno razlikuju zbog utjecaja različitih faktora, kao što su klimatski uvjeti, proizvodni uvjeti, botaničko podrijetlo, pakovanje, uvjeti i vrijeme skladištenja. Prikazani su rezultati analize 91 uzorka različitih vrsta medova, prikupljenih na više lokacija u Federaciji Bosne i Hercegovine. Istraživanje je provedeno radi određivanja bitnog parametra, hidroksimetilfurfurala (HMF), koji ima primjenu u kontroli kakvoće meda jer pokazatelj zagrijavanja, neprikladnog skladištenja i patvorenja meda. Utvrđeno je da sadržaj HMF-a u livadskom medu iznosi u rasponu 2,43-51,69 mg/kg, u medljikovcu 0,36-5,91 mg/kg; bagremovom 1,73-354,73 mg/kg; kestenovom medu 0,16-43,00 mg/kg i 0,72-16,38 mg/kg u kaduljinom medu.

Ključne riječi: med, HMF, kakvoća, Bosna i Hercegovina

Content of hydroxymethylfurfural (HMF) in Bosnian and Herzegovinan honeys

Bedrija Alić, Lejla Spiljak

University of Sarajevo, Faculty of Agriculture and Food Sciences, Zmaja od Bosne 8, Sarajevo, Bosnia and Herzegovina (lejlaspiljak@yahoo.com)

Summary

Man is using for centuries honey in the diet because of its nutritional value and other ingredients, but also because of its healing properties. The quality of honey is one of the important factors of its placement on the market. Certain species of honey differ qualitatively, because of the influence of different factors, such as: climate conditions, production conditions, botanical origin, packaging, and conditions during storage period. Results of the analyses of 91 samples of different types of honey, collected from multiple locations in Federation of Bosnia and Herzegovina are presented. The study was conducted in order to determine important parameter: hydroxymethylfurfural (HMF), which has an application in quality control of honey as an indicator of warming, inadequate storage and adulteration of honey. The content of HMF in meadow honey ranged 2.43-51.69 mg/kg; in honeydew 0.36-5.91 mg/kg; in black locust honey 1.73-354.73 mg/kg; chestnut honey 0.16- 43.00 mg/kg, and in sage honey from 0.72 to 16.38 mg/kg.

Key words: honey, HMF, quality, Bosnia and Herzegovina

Book of Abstracts

Animal Husbandry

07

Stočarstvo

Zbornik sažetaka

Genetska raznolikost slavonsko srijemskog podolca: analiza rodovnika

Mato Čačić[1], Zdravko Barać[1], Marija Špehar[1], Dalibor Janda[1], Maja Dražić[1], Aleksandar Kljujev[1], Zdenko Ivkić[1], Vlatka Čubrić Čurik[2], Ino Čurik[2]

[1]*Hrvatska poljoprivredna agencija, Ilica 101, 10000 Zagreb, Hrvatska (mcacic@inet.hr)*
[2]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska cesta 25, 10000 Zagreb, Hrvatska*

Sažetak

Slavonsko srijemski podolac je jedna od tri hrvatske izvorne pasmine goveda i prema veličini rasplodne populacije sa 154 grla (9 bikova i 145 krava) treća je izvornih pasmina goveda (HPA, 2012.). Vjerodostojna matična evidencija omogućava plansko vođenje uzgoja u cilju povećanja genetske varijabilnosti i izbjegavanje štetnih utjecaja inbridinga (uzgoja u srodstvu). Kako je populacija slavonsko srijemskog podolaca u Hrvatskoj genetski vrlo mala (N_e = 33,9) postoji veliki rizik od njezinog izumiranja ili značajnog gubitka genetske varijabilnosti. Za vjerodostojno i uspješno plansko vođenje uzgoja i provedbe uzgojnog programa, nužno je učiniti sistematizaciju uzgoja temeljem rodovničkih podataka, a plansko vođenje uzgoja (planski pripust) organizirati prema linijama bikova i rodovima krava. Iz tog razloga provedena je sistematizacija uzgoja slavonsko srijemskog podolca (izgradnja rodovnika), a rezultat sistematizacije je definiranje 5 linije bikova i 13 roda krava. Osim planskog vođenja uzgoja, sistematizacija omogućava vjerodostojnije utvrđivanje demografskih parametara, procjenu genetske varijabilnosti, ali i efikasnu provedbu molekularnih istraživanja.

Ključne riječi: slavonsko srijemski podolac, rodovnik, sistematizacija, genetska raznolikost

Genetic diversity of Slavonian Syrmian Podolian cattle: pedigree analysis

Mato Čačić[1], Zdravko Barać[1], Marija Špehar[1], Dalibor Janda[1], Maja Dražić[1], Aleksandar Kljujev[1], Zdenko Ivkić[1], Vlatka Čubrić Čurik[2], Ino Čurik[2]

[1]*Croatian Agricultural Agency, Ilica 101, 10000 Zagreb, Croatia (mcacic@inet.hr)*
[2]*Faculty of Agriculture, University of Zagreb, Svetošimunska road 25, 10000 Zagreb, Croatia*

Summary

Slavonian Syrmian Podolian cattle is one of three Croatian autochthonous cattle breeds and by the breeding population size of 154 heads (9 bulls and 145 cows) it is the second Croatian autochthonous breed (CAA, 2012.). Reliable herd book records allow planned conducting of breeding with goal of increasing genetic variability and avoiding harmful influence of inbreeding. Since Slavonian Syrmian Podolian cattle population in Croatia is genetically very small (N_e = 33.9), there is a large risk of extinction or significant loss of genetic variability. For reliable and successful planned conducting of breeding and implementation of breeding program, it is necessary to make a systematization of breeding based on pedigree records, and planned conducting of breeding (planned mating) organize by bull lines and cow lines. For this reason, systematization of Slavonian Syrmian Podolian cattle has been carried out (pedigree construction), and the result of systematization is defining 5 bull lines and 13 cow lines. Besides planned conducting of breeding, systematization allows more reliable determination of demographic parameters, genetic variability estimation, but also an efficient application of molecular researches.

Key words: Slavonian Syrmian Podolian cattle, pedigree, systematization, genetic diversity

Assessment of TNF-α and leptin gene expression by RT-PCR in blood of cows with left abomasal displacement

Alparslan Kadir Devrim[1], Mahmut Sözmen[2], Kürşad Yigitarslan[3], Mert Sudagidan[4], Orhan Kankavi[1], Halil İbrahim Atabay[5]

[1]*Department of Biochemistry, Faculty of Veterinary Medicine, Mehmet Akif Ersoy University, 15 030 Burdur, Turkey (akdevrim@hotmail.com)*
[2]*Department of Pathology, Faculty of Veterinary Medicine, Ondokuz Mayıs University, 55 139 Samsun, Turkey*
[3]*Department of Surgery, Faculty of Veterinary Medicine, Mehmet Akif Ersoy University, 15 030 Burdur, Turkey*
[4]*Mehmet Akif Ersoy University Scientific and Technology Application and Research Center, 15 030 Burdur, Turkey*
[5]*Izmir Institute of Technology, 35 430 Izmir, Turkey*

Summary

The aims of this study are to evaluate the TNF-α and leptin gene expression in blood from Holstein cows with left abomasal displacement and to correlate it with induced liver injury. The TNF-α and leptin expression in blood samples was determined by RT-PCR after normalisation using the constant expression of the housekeeping GAPDH gene in cows with left abomasal displacement (LAD) (n = 20) before surgery and 7 days after as well as in healthy controls (n = 10). Plasma hepatic enzyme (AST: aspartate aminotransferase, ALT: alanine aminotransferase and ALP: alkaline phosphatase) activities were measured in parallel. Plasma AST and ALP activities dramatically increased in diseased cows during the preoperative period and then declined. Although not significantly, the leptin expression tended to decrease in LAD affected cows while the TNF-α expression tended to increase during the postoperative period. These results suggest that TNF-α may be associated with liver damage during abomasal displacement and that leptin was inversely correlated.

Key words: Cow, TNF-α, leptin, left abomasal displacement, RT-PCR, liver enzymes.

Debljina slanine mjerena u živo i mesnatost svinja

Zrinko Dujmović[1], Ana Kaić[2], Dubravko Škorput[2], Zoran Luković[2]

[1]*Merkur Veterinarska Ambulanta d.o.o., Dudinjak 9, Slavonski Brod, Hrvatska*
[2]*Sveučilište u Zagrebu Agronomski fakultet, Svetošimunska 25, Zagreb, Hrvatska (lukovic@agr.hr)*

Sažetak

Cilj istraživanja bio je odrediti povezanost između mjerenja debljine leđne slanine na živim životinjama i mesnatosti polovica mjerene na liniji klanja. Debljina leđne slanine izmjerena je na 90 tovljenika visokomesnate hibridne linije prosječne tjelesne mase 103 kg ultrazvučnim uređajem Renco Lean-Meater na tri mjesta prema uputama za provedbu programa uzgoja svinja u Hrvatskoj. Između izmjerenih vrijednosti debljine leđne slanine, kao i između prosječne debljine leđne slanine i mesnatosti polovica određene metodom dvije točke na liniji klanja izračunati su korelacijski koeficijenti. Dobivene vrijednosti korelacijskih koeficijenata koje se kreću u rasponu od -0.5 do -0.6 pokazuju važnost praktične primjene ultrazvučnih urađaja u selekciji svinja na mesnatost.

Ključne riječi: svinje, debljina leđne slanine, mesnatost, ultrazvuk

Backfat thickness measured in vivo and leanness of pigs

Zrinko Dujmović[1], Ana Kaić[2], Dubravko Škorput[2], Zoran Luković[2]

[1]*Merkur Veterinary Ambulance, Dudinjak 9, Slavonski Brod, Croatia*
[2]*University of Zagreb Faculty of Agriculture, Svetošimunska 25, Zagreb, Croatia (lukovic@agr.hr)*

Summary

Aim of the study was to determine relationship between measurements of backfat thickness *in vivo* and pig carcass leanness measured at slaughter line. Backfat thickness was measured on 90 lean hybrid line fatteners with average final live weight of 103 kg using ultrasound device Renco Lean-Meater at three locations according to Croatian pig breeding programme implementation instructions. Correlation coefficients were calculated between backfat thickness measured by ultrasound, average backfat thickness and carcass leanness obtained by two points method at slaughter line. Their values ranged between -0.5 and -0.6. This showed importance of practical use of ultrasound devices in selection on higher leanness in pigs.

Key words: pigs, backfat thickness, leanness, ultrasound

Utjecaj dodatka inokulanta na frakcije proteina kukuruzne silaže u uvjetima induciranog kvarenja

Marija Duvnjak, Siniša Škvorc, Kristina Kljak, Darko Grbeša

Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska (mduvnjak@agr.hr)

Sažetak

Silažni inokulanti su najčešći tip aditiva koji se koristi u proizvodnji silaža te je ovo istraživanje provedeno kako bi se utvrdio utjecaj dodatka inokulanta na frakcije proteina kukuruzne silaže u uvjetima induciranog kvarenja (aeracija). Za siliranje su korištena tri različita hibrida kukuruza žutog zrna (Bc 418b, Bc 678 i Bc exp 6) proizvedena pri istim proizvodnim uvjetima u poljskom pokusu postavljenom kao slučajni blok raspored u pet ponavljanja. Svako ponavljanje je silirano (31,01 – 38,52% ST) u 30L plastične posude sa i bez dodatka komercijalnog inokulanta u koncentraciji $1x10^7$ CFU/g svježeg materijala. Posude su aerirane 21 i 60 dana nakon zatvaranja. U pokusu su praćeni sadržaji sirovog proteina, topivog sirovog proteina, amonijaka od ukupnog dušika i ukupnih zeina u zrnu kukuruza. Rezultati analiza su pokazali da aeracija uzrokuje značajan pad ($P<0,05$) koncentracije zeina (sa 63,90 na 39,44mg/g ST), te blagi porast topivog sirovog proteina (sa 24,00 na 32,06mg/g ST) i amonijaka (sa 4,38 na 8,44% NH_3/N). Sadržaj sirovog proteina pokazuje trend blagog pada iako nije utvrđena statistički značajna razlika između uzorkovanja. Silaža hibrida Bc 418b u uvjetima induciranog kvarenja je imala više ($P<0,05$) amonijaka (11,05% NH_3/N) u usporedbi sa silažom hibrida Bc 678 (6,55% NH_3/N). Nije utvrđena statistički značajna razlika ($P>0,05$) u kvaliteti proteina silaže sa inokulantom i bez inokulanta. Aeracija potiče proteolitičke reakcije pri čemu dodatak inokulanta nema utjecaj na frakcije proteina u ekstremnim uvjetima induciranog kvarenja.

Ključne riječi: inokulanti, frakcije proteina, aeracija

Influence of inoculant additives on protein fractions in spoilage induced corn silage

Marija Duvnjak, Siniša Škvorc, Kristina Kljak, Darko Grbeša

University of Zagreb, Faculty of Agronomy, Svetošimunska 25, Zagreb, Croatia (mduvnjak@agr.hr)

Summary

Silage inoculants are the most common type of additives used in the silage production and this research was conducted in order to determine the influence of inoculant additives on protein fractions in spoilage induced corn silage (aeration). The three different yellow corn hybrid (Bc 418b, Bc 678 and Bc exp 6) produced in the same production conditions in a split plot field test with five replicates were used for silages. Each repetition (31.01 – 38.52% DM) was silaged in 30L plastic containers with and without commercial inoculant in a concentration $1x10^7$ CFU/g of fresh material. The containers were aerated 21 and 60 days after closing. The contents of crude proteins, soluble crude protein, ammonia in the total nitrogen and total zein in the corn grain were monitored. The analyzes showed that the aeration caused a significant decline ($P<0.05$) of zein concentrations (from 63.90 to 39.44mg/g DM), and a slight increase of the soluble crude protein (from 24.00 to 32.06mg/g DM) and the ammonia (from 4.38 to 8.44% NH_3/N). The crude protein content showed a slight decline, although the difference between sampling was not statistically significant. The spoilage induced Bc 418 silage had a higher ($P<0.05$) ammonia (11.05% NH3/N) compared with the Bc 678 silage (6.55% NH3/N). The difference in protein quality between silage with and without inoculant was not statistically significant ($P>0.05$). The aeration stimulates proteolytic reactions whereat the inoculant additive has no influence on the protein fractions in the extreme conditions of induced spoilage.

Key words: inoculant additives, protein fractions, aeration

Local and genome-wide admixture levels in cattle indicate selective sweeps

Anamarija Frkonja[1], Urs Schnyder[2], Ino Curik[3], Johann Sölkner[1]

[1]*University of Natural Resources and Life Sciences Vienna, Department of Sustainable Agricultural Systems, Division of Livestock Sciences, Gregor Mendel Str. 33, A-1180 Vienna, Austria (anamarija.frkonja@boku.ac.at)*
[2]*Qualitas AG, Chamerstrasse 56, Ch-6300 Zug, Switzerland*
[3]*University of Zagreb, Faculty of agriculture, Department of Livestock Sciences, Svetošimunska 25, 10000 Zagreb, Croatia*

Summary

Large-scale genotyping of SNPs has shown great promise for identifying markers which could be linked to ancestry. In this work, we focus on the obtaining regions under selection according to F_{ST} as a measure of population differentiation. Furthermore, after obtaining region with large F_{ST}, differences in allele frequency in two pure breeds were compared. The cattle population investigated is Swiss Fleckvieh, a composite of Red Holstein Friesian and Simmental cattle with very wide range of crossing. Nine chromosomes had SNPs with very high Fst (>0.7), based on information of 100 Holstein Friesian and Simmental animals, each. The top signal both according to F_{ST} and average difference in allele frequency for every SNP in region (0.41) was found on chromosome 6, close to insulin-like growth factor binding protein 7. A total of reported 28 QTL regions are overlapping the region on CHR 6 reported here, many of them responsible for milk yield and composition. Even more (36) QTL regions overlap another of our candidate regions on CHR 5 many of these connected to reproduction. This is indicating selective sweeps in one of the breeds.

Key words: Swiss Fleckvieh, selection signatures, local admixture

Linije bikova Holstein pasmine

Zdenko Ivkić[1], Marija Špehar[1], Damir Rimac[2], Pero Mijić[3], Tina Bobić[3], Drago Solić[1], Vesna Bulić[1], Zdravko Barać[1]

[1]*Hrvatska poljoprivredna agencija,Ilica 101, Zagreb, Hrvatska (zivkic@hpa.hr)*
[2]*Hrvataski sabor, Trg. sv. Marka 6, Zagreb, Hrvatska*
[3]*Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska*

Sažetak

U radu je proučavano porijeklo bikova Holstein pasmine koji su korišteni u Uzgojnom programu goveda u Hrvatskoj od siječnja 1974. do listopada 2012. godine. Bikovi potječu iz nacionalnog uzgojnog programa ili su živi uvezeni iz drugih uzgoja. Rezultati rada uključuju ranije istraživanje (98 bikova do 2003. godine). Ukupno je analizirano 160 bikova iz četiri centra za umjetno osjemenjivanje. Svi bikova potječu od samo četiri bika rodonačelnika. U liniji 1 (Pawnee Farm Arlinda Chief), koja vuče porijeklo od američkog bika rodonačelnika Governer of Carnation (USA 629472), se nalazi ukupno 47 bikova ili 29%. U liniji 2 (Carline-M Ivanhoe Bell), a koja potječe od kanadskog bika rodonačelnika Montvic Chieftain (CAN 95679), se nalazi 34 bika ili 21%. Linija 3 (Round Oak Rag Elevation) uključuje 75 bikova ili 47%, a vuče porijeklo od američkog bika rodonačelnika Wisconsin Admiral Burke Lad (USA 697789). Linija 4 ima samo 4 bika ili 3%, a potječe od kanadskog bika rodonačelnika Seiling Pet King (CAN 165178). Od američkih rodonačelnika potječe 122 bika ili 76%, dok od kanadskih rodonačelnika 38 bikova ili 24%. Od 2003. godine je porastao udio bikova iz linija s američkim rodonačelnicima, a smanjio se iz linija s kanadskim rodonačelnicima (5%). Unatoč povećanju ukupnog broja bikova (čak 80% u odnosu na ranije istraživanje) nije došlo do povećanja broja linija, što ukazuju na povećani rizik od pojave uzgoja u srodstvu.

Ključne riječi: bikovi, Holstein pasmina, linije, centri za umjetno osjemenjivanje

The lines of Holstein bulls

Zdenko Ivkić[1], Marija Špehar[1], Damir Rimac[2], Pero Mijić[3], Tina Bobić[3], Drago Solić[1], Vesna Bulić[1], Zdravko Barać[1]

[1]*Croatian Agricultural Agency, Ilica 101, Zagreb, Croatia (zivkic@hpa.hr)*
[2]*Croatian Parliament, Trg. sv. Marka 6, Zagreb, Croatia*
[3]*Faculty of Agriculture in Osijek, Josip Juraj Strossmayer University of Osijek, Petra Svačića 1d, Osijek, Croatia*

Summary

The objective of this study was to determine the origin of the Holstein bulls that have been included in the cattle breeding program in Croatia since January 1974 to October, 2012. The bulls come from national cattle breeding program, or they were imported from other breedings. The results included the previous research of origin for Holstein bulls (98 bulls until year 2003). All together, 160 bulls from four A. I. Stations were analyzed. The bulls came from four founders. Line 1, (Pawnee Farm Arlinda Chief) that originated from the American founder Governer of Carnation (USA 629472) obtained 47 bulls or 29%. Line 2 (Carline-M Ivanhoe Bell) which started with the Canadian founder Montvic Chieftain (CAN 95 679) included 34 bulls or 21%. Line 3 (Round Oak Rag Elevation) had 75 bulls or 47%, and originated from the American founder Wisconsin Admiral Burke Lad (USA 697 789). Line 4 was the smallest one with only 4 bulls (3%) and originated from a Canadian bull Seiling Pet King (CAN 165 178). All together, 122 bulls (76%) originated from the American founders, while 38 bulls (24%) originated from Canadian founders. The proportion of bulls coming from American founders has been increased since 2003 (5%). At the same time, the proportion of bulls originated from Canadian founders decreased for 5%. Despite the increased number of bulls (80% compared to the previous research) the number of lines remained constant, indicating higher risk of inbreeding.

Key words: bulls, Holstein breed, lines, AI station

Kontrola uzgoja u srodstvu – on line aplikacija

Zdenko Ivkić, Marija Špehar, Dalibor Janda, Drago Solić, Vesna Bulić, Zdravko Barać

Hrvatska poljoprivredna agencija, Ilica 101, Zagreb, Hrvatska (zivkic@hpa.hr)

Sažetak

Intenzivno korištenje bikova iz najpoznatijih linija dovodi do njihovog sužavanja. Uzgoj u srodstvu (eng. inbreeding) predstavlja sparivanje krava ili junica i bikova koji su rodbinski povezani. Posljedica takvog sparivanja je pojava inbriding depresije, koja se očituje u slabljenju proizvodnih (smanjena mliječnost krava, manja porodna težina i slabija vitalnost teladi, te manji dnevni prirast i završne težine u tovu) i funkcionalnih osobina (povećana dob kod prvog teljenja i reproduktivni problemi krava tj. krave teže ostaju steone, produžava se servis period i međutelidbeno razdoblje, a veći je i broj mrtvorođene teladi). Cilj rada je predstaviti tehničko rješenje (on-line aplikaciju), koja kroz tri generacije predaka traži zajedničkog pretka potencijalnim roditeljima. Uzgajivač aplikaciji pristupa preko web stranice Hrvatske poljoprivredne agencije (www.hpa.hr), uz prethodno logiranje. Kontrolu uzgoja u srodstvu je moguće načiniti za pojedinu kravu ili za cijelo stado (matična ženska grla starija od godine dana). Rezultat je kreiranje izvještaja na kojem se nalaze krave ili junice koje imaju zajedničkog pretka sa odabranim bikom. U tom se slučaju ne preporuča sparivanje roditelja. Ostale krave u stadu koje se ne pojave na izvještaju nisu u užem srodstvu sa odabranim bikom. Glavne prednosti aplikacije su: jednostavna provjera srodstva budućih roditelja, zadržavanje razine inbreeding-a u prihvatljivim granicama i planiranje nabave sjemena prema karakteristikama porijekla stada.

Ključne riječi: uzgoj u srodstvu, on-line aplikacija, krave, bikovi

Inbreeding control – on line application

Zdenko Ivkić, Marija Špehar, Dalibor Janda, Drago Solić, Vesna Bulić, Zdravko Barać

Croatian Agricultural Agency, Ilica 101, Zagreb, Hrvatska (zivkic@hpa.hr)

Summary

The intensive use of bulls from most famous lines leads to their narrowing. Inbreeding is defined as maiting of cows or heifers and bulls that are closely related. The consequence of such mating is inbreeding depression, which is reflected in declining of production (decreased milk production, lower birth weight and vitality of calves as well as lower daily gain and final weight in fattening bulls) and functional traits (increased age at first calving, fertility difficulties i.e. lower insemination rate, longer days open, and prolonged calving period, and increased stillbirth rate. The aim of this paper was to represent technical solution (on-line application), which is looking for common ancestor in potential parents through three generations of ancestors (sires, grandsires, grand grandsires; from both side). The breeders could rich the application on website of Croatian Agricultural Agency (www.hpa.hr) with previously logging. Inbreeding control is possible on individual or the herd level (herdbook females older than one year). The result is on-line report witch contains females that have common ancestor with the selected bull. In this case is not recommended to make mating. Other females in herd, which is not showed in the report, do not have common ancestor with selected bull. The main advantages of this application are: easy check of relatedness for potential parents, keeping inbreeding in acceptable range, and planning to buy semen by considering the female pedigree.

Key words: inbreeding, on-line application, cows, bulls

Utjecaj okolišnih čimbenika na kemijski sastav Bc hibrida kukuruza

Kristina Kljak, Darko Grbeša, Zlatko Svečnjak

Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska (kkljak@agr.hr)

Sažetak

Dosadašnja istraživanja ukazuju da okolinski čimbenici mogu utjecati na kemijski sastav zrna hibrida kukuruza. Cilj istraživanja bio je utvrditi utjecaj okoline na sadržaj glavnih hranjivih tvari u zrnu Bc hibrida kukuruza (Bc 354, Bc 394, Bc 462, Bc 572, Bc 678 i Pajdaš) raširenih u proizvodnji. Istraživani hibridi uzgojeni su u Lovasu 2008. godine (okolina Lovas), te sljedeće (2009.) godine u Rugvici (okolina Rugvica) u uvjetima intenzivne agrotehnike. Tijekom srpnja i kolovoza, odnosno razdoblja nalijevanja zrna, u okolini Lovas, palo je ukupno svega 22,3 mm oborina uz srednju dnevnu temperaturu od prosječno 23,2°C. U okolini Rugvica zabilježeno je ukupno 71 mm oborina i srednja dnevna temperatura od prosječno 22,3°C. Okolina Lovas imala je za oko 13% manju masu 1000 zrna u usporedbi s okolinom Rugvica, što je vjerojatno rezultat nepovoljnijih vremenskih prilika (nedostatka vode) tijekom nalijevanja zrna. Svi hibridi osim Bc 354 u okolini Lovas imali su (u prosjeku g/kg prema drugoj okolini) značajno viši sadržaj sirovih bjelančevina (102 vs. 98), sirovih masti (43 vs. 40) i neutralnih detergent vlakana (97 vs. 87), dok su u okolini Rugvica imali značajno viši sadržaj škroba (733 vs. 717), šećera (27 vs. 24) i kiselih detergent vlakana (33 vs. 28). Te statistički značajne, ali apsolutno male razlike u kemijskom sastavu zrna rezultirale su u neznatno nižem sadržaju neto energije za svinje većine hibrida u okolini Lovas (u prosjeku 13,04 MJ/kg) u usporedbi s okolinom Rugvica (u prosjeku 13,14 MJ/kg).

Ključne riječi: zrno kukuruza, hibrid, hranjive tvari, okolina, razdoblje nalijevanja zrna

Effect of environment on the chemical composition of Bc maize hybrids

Kristina Kljak, Darko Grbeša, Zlatko Svečnjak

Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia (kkljak@agr.hr)

Summary

Researches so far indicate that environment could have effect on the chemical composition on maize hybrid grains. The aim of this research was to explore the effect of environment on main nutrients content in Bc maize hybrid grains (Bc 354, Bc 394, Bc 462, Bc 572, Bc 678 and Pajdaš) widely distributed in production. Tested hybrids were grown in Lovas in 2008 (environment Lovas), and next season (2009) in Rugvica (environment Rugvica) under intensive agro-technique conditions. During July and August, i.e. grain filling phase, total of 22.3 mm of rainfall with average daily temperature 23.2°C was observed at environment Lovas. A 71 mm of rainfall with average daily temperature 22.3°C was observed at environment Rugvica. The 1000 kernel weight was 13% lower at environment Lovas when compared to environment Rugvica, which is probably due to more adverse weather conditions (water deficit) during grain filling phase. All hybrids except Bc 354 at environment Lovas had (average g/kg compared to the other environment) significantly higher content of crude protein (102 vs. 98), crude fat (43 vs. 40) and neutral detergent fiber (97 vs. 87) while at environment Rugvica had higher content of starch (733 vs. 717), sugar (27 vs. 24) and acid detergent fiber (33 vs. 28). Those statistically significant although absolutely small differences in chemical composition, for most of the tested hybrids resulted in slightly lower net energy for pigs in environment Lovas (averagely 13.04 MJ/kg) when compared to Rugvica (averagely 13.14 MJ/kg).

Key words: corn grain, hybrid, nutrients, location, grain filling phase

Utjecaj kastracije na odlike trupova holštajn junadi

Miljenko Konjačić[1], Ivica Kos[1], Tomislav Jakopović[2], Ante Ivanković[1], Ivan Širić[1], Dejan Marenčić[3]

[1]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska(mkonjacic@agr.hr)*
[2]*Belje d.d. Industrijska zona 1 Mece, Darda, Hrvatska*
[3]*Visoko gospodarsko učilište, Mislava Demerca, Križevci, Hrvatska*

Sažetak

Cilj rada bio je utvrditi utjecaj kastracije muške junadi holštajn pasmine na rezultate tova i odlike trupova na liniji klanja. Istraživanje je provedeno na 43 juneta od kojih je 21 bilo kastrirano pri prosječnoj tjelesnoj masi od 220 kg. Utvrđeno je da su kastrirana junad imala značajno manju klaoničku masu te manji topli i hladni randman (P<0,05), kao i kalo hlađenja (P<0,001). Ocjenjivanjem trupova na liniji klanja nije utvrđena značajna razlika u klasi i stupnju zamašćenosti između kastrirane i nekastrirane junadi. Analizom podataka utvrđen je značajno veći (P<0,05) neto dnevni prirast nekastrirane (521,98 g/dan) u odnosu na kastriranu junad (471,29 g/dan), dok razlike u bruto dnevnom prirastu nisu bile značajne. Disekcijom rebrenog isječka između 9. i 11. rebra utvrđen je značajno veći (P<0,01) udio masnog te manji udio mišićnog tkiva u kastrirane junadi, dočim je udio kostiju bio podjednak u obje istraživane skupine. Procijenjeni udio intramuskularne masti *musculus longissimus dorsi* na presjeku između 6. i 7. rebra ukazuje da su kastrirana junad imala značajno veću mramoriranost (P<0,05). Dobiveni rezultati ukazuju na negativan utjecaj kastracije holštajnske junadi na većinu istraživanih parametara osim na kalo hlađenja i mramoriranost mesa.

Ključne riječi: kastracija, holštajn, junad, osobine trupova

The effect of castration on carcass characteristics of Holstein young bulls

Miljenko Konjačić[1], Ivica Kos[1], Tomislav Jakopović[2], Ante Ivanković[1], Ivan Širić[1], Dejan Marenčić[3]

[1]*Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia (mkonjacic@agr.hr)*
[2]*Belje d.d. Industrijska zona 1 Mece, Darda, Croatia*
[3]*College of Agriculture at Križevci, Mislava Demerca 1, Križevci, Croatia*

Summary

The aim of this study was to determine the effect of castration of Holstein male calves on the fattening results and carcass characteristics. The study was conducted on 43 calves, of which 21 were castrated at an average body weight of 220 kg. Castrated bulls had significantly lower slaughter weight and smaller hot and cold dressing percentage ($P<0.05$), as well as losses in carcass weight after chilling ($P<0.001$). Castrated and intact bulls did not differ in conformation score and carcass fatness. Intact bulls had significantly higher ($P<0.05$) net daily gain (521.98 g/day) compared to castrated (471.29 g/day) animals, while there was no significant differences between investigated groups in total daily gain. Significantly higher fat percentage, followed by lower lean percentage ($p<0.01$) was determined by the dissection of the 9-10-11 rib cut for castrated animals, while the proportion of bone was equal in both studied groups. Visual estimation of intramuscular fat share of the *musculus longissimus dorsi* at the cross-section between 6^{th} and 7^{th} rib showed that castrated bulls had significantly higher marbling score compared to the intact animals ($P<0.05$). These results indicate the negative effect of castration of Holstein bulls on majority of parameters studied except the losses in carcass weight after chilling and marbling score.

Key words: castration, Holstein, beef, carcass characteristics

Mogućnosti suzbijanja neugodnog mirisa mesa po nerastu u populacijama svinja Republike Hrvatske

Boris Lukić, Goran Kušec, Ivona Đurkin

Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (blukic@pfos.hr)

Sažetak

Neugodan miris i okus mesa je pojava koja nastaje termičkom obradom mesa spolno zrelih muških svinja. U stočarskom uzgoju, kastracija muških svinja dugi je niz godina uobičajena veterinarska mjera koja se primjenjuje radi izbjegavanja ove nepoželjne pojave. Osim preventivnog djelovanja na pojavu neugodnog mirisa, kastriranjem su životinje manje agresivne te se njihovo ponašanje lakše kontrolira. S druge pak strane, kastriranjem životinja nepovoljno se djeluje na neka važna proizvodna svojstva kao što su dnevni prirast, konverzija hrane i mesnatost polovica. Uz navedene nedostatke, u posljednjih desetak godina kastriranje je kritizirano od strane svjetskih udruga za dobrobit životinja, stoga je u zemljama Europske unije kastracija od 1. siječnja 2012. trebala biti izvođena uz primjenu anestetika, dok je krajnji cilj u potpunosti isključiti kastraciju do 2018. godine. Selekcija primjenom genomskih informacija je, dugoročno promatrajući, najprihvatljivija metoda u prevenciji ove pojave. Između dva kemijska spoja, odgovornih za neugodan miris - skatola i androstenona, postoji niska genetska korelacija i visoki heritabilitet što predstavlja snažnu osnovu za provođenje selekcije. Metode novih generacija sekvenciranja genoma s visokom gustoćom polimorfizama jednog nukleotida (engl. SNP-Single Nucleotide Polymorphisms) i nižim troškovima omogućuju da genomska selekcija postane komercijalno ostvariva i učinkovita mogućnost u izbjegavanju neugodnog mirisa mesa nerasta u populacijama svinja.

Ključne riječi: neugodan miris mesa, genomska selekcija, polimorfizmi, svinje

Possibilities of avoiding boar taint in pig populations in the Republic of Croatia

Boris Lukić, Goran Kušec, Ivona Đurkin

Faculty of Agriculture, University of J.J. Strossmayer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (blukic@pfos.hr)

Summary

Boar taint is characterized with unpleasant odour and taste that occur when cooking meat from sexually mature male pigs. In livestock production, castration of male pigs was common veterinary practice for many years, the main aim being the avoidance of this undesirable trait. Beside the prevention of odour, castration makes animals easier to control and less aggressive. On the other hand, castration of animals negatively affects some important production traits such as daily gain, feed conversion and carcass leanness. Moreover, in the last ten years, castration is criticized by the world organization for animal welfare. As a result, since January 1st 2012 in the European Union, castration had to be performed using anaesthetics, while the final goal is to completely avoid castration by the year 2018. Selection by using genomic information is most acceptable long-term methodology against boar taint. Between two chemical compounds responsible for the occurrence of boar taint - skatole and androstenone, exists low genetic correlation and high heritability, what represents a strong basis for the implementation of selection. Next generation sequencing technologies with high density SNP (Single nucleotide Polymorphisms) genotyping and eventually lower costs, makes genomic selection commercially feasible in avoiding boar taint in pig populations.

Key words: boar taint, genomic selection, polymorphisms, pigs

Levels of acute phase response, lipid peroxidation and antioxidant substances in the left and right abomasum displacement in cows

Nuri Mamak[1], Alparslan Kadir Devrim[2], Hasan Aksit[3], İsmail Ayetkin[4], Ramazan Yildiz[1]

[1]*Mehmet Akif Ersoy University, Faculty of Veterinary Medicine, Department of Internal Medicine, Burdur, Turkey (nurimamak@hotmail.com)*
[2]*Mehmet Akif Ersoy University, Faculty of Veterinary Medicine, Department of Biochemistry, Burdur, Turkey*
[3]*Balıkesir University, Faculty of Veterinary Medicine, Department of Biochemistry, Balıkesir, Turkey*
[4]*Balıkesir University, Faculty of Veterinary Medicine, Department of Internal Medicine, Balıkesir, Turkey*

Summary

The aim of this study was to evaluate the metabolic changes occur in Holstein cows with left and right abomasal displacements. For this purpose; total sialic acid (TSA), malondialdehyde (MDA), glutathione (GSH), ceruloplasmin (CPN), aspartate transaminase (AST), alanine transaminase (ALT), triglycerides (TG) and cholesterol (CHOL) levels were measured in the blood serum samples. Three study groups were designed; left abomasal displacement (LAD) (n = 18), right abomasal displacement (RAD) (n = 7), and control (n = 8). TSA values of the LAD group elevated significantly ($P<0.0001$). In the LAD group, CPN and AST increased significantly ($P<0.0001$) as well. Compared to the control group, GSH decreased significantly in both LAD and RAD groups ($P<0.0001$). MDA, ALT, TG, and CHOL values did not display statistically significant differences between groups. Among the clinical examination parameters, rumen contraction rates were decreased in both LAD and RAD groups significantly ($P<0.0001$). These data suggest that oxidative damage along with other mechanisms might have taken part in the pathogenesis of abomasal displacement.

Key Words: cow, abomasum displacement, acute phase response, lipid peroxidation, oxidative stress

Analysis of the relationships between type traits and functional longevity in Croatian Holstein cattle using a Weibull proportional hazards model

Nikola Raguž, Sonja Jovanovac

Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia (nraguz@pfos.hr)

Summary

Survival analysis using a Weibull proportional hazards model was applied to evaluate the effect of linear type traits on functional longevity in Croatian Holstein cows. The data set consisted of 2,066 registered Holstein cows that first calved from 2001 to 2011. Longevity was defined as the number of days between first calving to culling or censoring. Cows alive at the end of the study (52.4%) were treated as right censored. Type information consisted of 18 linear type traits scored during the first lactation. The Weibull model included the time-dependent effects of the relative milk production within herd, year*season of calving and parity, as well as the time-independent effects of the herd size, region, age at first calving and type traits. Udder traits of highest impact on longevity were udder depth, fore udder attachment, rear udder width and suspensory ligament where lower scores were associated with higher culling risks. Very angular animals had approximately 1.7 times lower risk to be culled then non-angular animals. Animals with shallow body were exposed to 3.8 times higher risks of culling in compare to animals with deep body. An intermediate optimum was found for the rump angle where animals with high and slope pinbones had about 1.5 times higher risks to be culled than animals with average rump angle. Animals with biological extremes for the rear legs side view had almost 3.0 times higher risks of culling than average scored animals. It could be concluded that some of the type traits, especially udder traits could serve as early predictors of functional longevity in Croatian Holstein cows.

Key words: Holstein cows, longevity, type traits, survival analysis.

Dobrobit životinja kao mjera programa ruralnog razvoja

Drago Solić[1], Vesna Gantner[2], Maja Dražić[1], Zdenko Ivkić[1], Marija Špehar[1], Zdravko Barać[1]

[1]*Hrvatska poljoprivredna agencija ,Ilica 101, Zagreb, Hrvatska (dsolic@hpa.hr)*
[2]*Ministarstvo poljoprivrede, Ulica grada Vukovara 78, Zagreb, Hrvatska*

Sažetak

Dobrobit životinja zauzima važno mjesto u programu ruralnog razvoja zemalja Europske unije. Unutar programskog razdoblje 2007-2013 je odobreno 90 Programa za ruralni razvoj, od kojih 21 uključuje mjeru „Plaćanja za dobrobit životinja“. Dobrobit životinja se može promatrati kao višeznačajan pojam s obzirom na razinu utjecaja na cjelokupnu stočarsku proizvodnju. Prva razina podrazumijeva obvezujuću primjenu europske zakonske regulative kojom je propisana odgovornost, obveze i dužnosti uzgajivača radi zaštite životinja. Druga razina podrazumijeva primjenu visokih standarda dobrobiti životinja koji prelaze relevantne zakonske propise. Predložene mjere moraju uključivati poboljšanje standarda na barem jednom od slijedećih područja: a) opskrba vodom i hranom usklađena s prirodnim potrebama životinja; b) uvjeti smještaja, kao što su raspoloživi prostor, stelja, prirodno svjetlo; c) otklanjanje mogućnosti sustavnog ozljeđivanja, izolacije ili stalnog držanja na vezu; d) sprječavanje bolesti do kojih dolazi uglavnom zbog načina uzgoja ili/i uvjeta držanja životinja. Treća razina podrazumijeva upotrebu primijenjenih standarda dobrobiti životinja u promociji potrošnje stočarskih proizvoda. Često nazivi ovakvih standarda kupcu sugeriraju da su životinje tijekom uzgoja na farmama imale najveću moguću razinu dobrobiti. Cilj ovog rada je predstaviti mjere za povećavanje dobrobiti životinja, a koje će Republika Hrvatska predložiti u sklopu programa ruralnog razvoja za razdoblje od 2014-2020 godine.

Ključne riječi: dobrobit životinja, ruralni razvoj, Hrvatska, Europska Unija

Animal welfare as a measure of the Rural Development Programme

Drago Solić[1], Vesna Gantner[2], Maja Dražić[1], Zdenko Ivkić[1], Marija Špehar[1], Zdravko Barać[1]

[1]*Croatian Agricultural Agency ,Ilica 101, Zagreb, Croatia (dsolic@hpa.hr)*
[2]*Ministarstry of Agriculture, Ulica grada Vukovara 78, Zagreb, Croatia*

Summary

Animal welfare has an important share in the rural development program of the European Union. Within the programming period 2007-2013 was approved 90 programs for rural development, of which 21 included a measure "Payments for the welfare of animals." Animal welfare can be viewed as a multidimensional term based on the influence to the overall livestock production. The first level involves the application of a compulsory European legislation which requires responsibilities, obligations and duties of animal breeder to protect the animal welfare. The second level involves the application of high animal welfare standards that exceed the relevant legal regulations. These measures should include improving standards in at least one of the following areas: a) the supply of water and feed in line with the natural needs of animals, b) housing conditions, such as available space, litter, natural light, c) removal of the possibility of systemic injury, isolation or permanent housing in the tie-stall housing systems d) prevention of the diseases occurring mainly because of the of the farming and / or keeping system. The third level involves the use of applied animal welfare standards in promoting the consumption of animal products. Often, the names of such standards suggest consumers that the animals during breeding on farms had the highest possible level of well-being. The aim of this paper is to introduce measures to increase the welfare of the animals that Croatia will propose as a part of a rural development program for the period 2014-2020.

Key words: animal welfare, rural development, Croatia, European Union

Utjecaj genetskih grupa na procjenu uzgojnih vrijednosti u populaciji svinja u Hrvatskoj

Dubravko Škorput[1], Vedran Klišanić[2], Željko Mahnet[2], Zoran Luković[1]

[1]*Sveučilište u Zagrebu Agronomski fakultet, Svetošimunska 25, Zagreb, Hrvatska (dskorput@agr.hr)*
[2]*Hrvatska poljoprivredna agencija, Poljana Križevačka 185, Križevci, Hrvatska*

Sažetak

Cilj istraživanja bio je odrediti utjecaj genetskih grupa u modelu za procjenu uzgojnih vrijednosti na genetske trendove za debljinu slanine u populaciji svinja u Hrvatskoj. U istraživanju su korišteni podaci iz testiranja nazimica u proizvodnim uvjetima u razdoblju od 1998. do 2008. godine. Analizirani su genetski trendovi za pasmine landras i veliki jorkšir na četiri velike farme uključene u uzgojni program za svinje. Za procjenu uzgojnih vrijednosti korišten je model sa sistematskim utjecajima sezone, genotipa i težine na kraju testa korigirane na 100 kg. Slučajni dio modela sadržavao je interakciju stado-godina, okolišni utjecaj zajedničkog legla te aditivni genetski utjecaj. Analizirano je 16 527 na farmi A, 1 599 na farmi B, 5 456 na farmi C i 2 840 na farmi D. Prema spolu životinje, porijeklu (domaća ili uvozna selekcija) i godinama rođenja definirano je ukupno 8 genetskih grupa. Korelacije između uzgojnih vrijednosti procijenjenih modelima sa i bez genetskih grupa kretale su se između 0.96 do 0.98. Unatoč visokim korelacijama, genetski trendovi procijenjeni sa modelom s genetskim grupama razlikovali su se od genetskih trendova procijenjenih s modelom bez genetskih grupa. Analiza je pokazala da je uključivanje genetskih grupa u model za procjenu uzgojnih vrijednosti opravdano kada postoji intenzivan uvoz genetskog materijala u uzgojni program.

Ključne riječi: svinje, genetske grupe, genetski trendovi

Effect of the genetic groups on the prediction of breeding values in pig population in Croatia

Dubravko Škorput[1], Vedran Klišanić[2], Željko Mahnet[2], Zoran Luković[1]

[1]*University of Zagreb Faculty of Agriculture, Svetošimunska 25, Zagreb, Croatia (dskorput@agr.hr)*
[2]*Croatian Agricultural Agency, Poljana Križevačka 185, Križevci, Croatia*

Summary

The aim of the study was to determine the effect of the genetic groups in the model for genetic evaluation on the genetic trends for backfat thickness in the pig population in Croatia. Data records from field test for gilts from 1998 to 2008 were used. Genetic trends for backfat thickness for Landrace and Large White breeds in four large scale farms within National breeding programme for pigs were analyzed. Model for prediction of breeding values with fixed effects of season, genotype and weight at the end of the test corrected on 100 kg was used. The random part of the model contained herd-year effect, common litter environment effect and additive genetic effect. 16 527 data records from farm A, 1 599 from farm B, 5 456 from farm C and 2 840 from farm D was analysed. Genetic groups were defined according to the sex of the animals, origin (domestic or imported selection) and year of birth. Correlations between breeding values were in range from 0.96 to 0.98. Despite high correlations, genetic trends were changed when models with genetic groups were used. Analysis showed that inclusion of the genetic groups in the model for genetic evaluation is justified when intensive import of genetic material in breeding programme exists.

Key words: pigs, genetic groups, genetic trends

Book of Abstracts

Viticulture, Enology and Pomology

08

Voćarstvo, vinogradarstvo i vinarstvo

Zbornik sažetaka

Uvometrijske karakteristike autohtonih sorata vinove loze Dalmacije (*V. vinifera* L.)

Željko Andabaka, Darko Preiner, Domagoj Stupić, Jasminka Karoglan Kontić, Zvjezdana Marković, Edi Maletić

Agronomski fakultet Sveučilišta u Zagrebu, Zavod za vinogradarstvo i vinarstvo, Svetošimunska 25, Zagreb, Hrvatska (zandabaka@agr.hr)

Sažetak

Prema povijesnim podatcima vinova loza počela se u Dalmaciji uzgajati prije više od dvije tisuće godina. Prije pojave filoksere u Hrvatskoj se uzgajalo preko 400 sorata od čega samo u Dalmaciji 200. Većina od tih sorata su bile autohtone. Danas još uvijek nalazimo preko 120 autohtonih sorata od kojih većina njih nije pravilno zaštićena i evaluirana. Većina od tih sorta se nalaze samo u kolekcijama ili kao pojedinačni trsevi u starim vinogradima. Cilj ovoga rada je utvrditi njihove gospodarske i uvometrijske karakteristike te ih tako na pravi način valorizirati. Uvometrijska istraživanja provedena su na 37 autohtonih dalamtinskih sorata na dvije lokacije. Prva lokacija bila je hrvatska nacionalna kolekcija autohotnih sorata u Jazbini (Zagreb), a druga kolekcija dalmatinskih autohtonih sorata Duilovo (Split). Nakon berbe koja je obavljena u punoj zrelosti odvojen je prosječni uzorak od 5 grozdova od svake sorte na kojem je provedena uvometrija (dimenzije grozda i bobica) i analiza mehaničkog sastava grozda (% udio peteljkovine i bobica) prema Prostoserdovu, te osnovne kemijske analize mošta: sadržaj šećera (Oe˚) i ukupnih kiselina (g/l) u moštu, pH vrijednost mošta. Kod istraživanih sorata utvrđena je značajna razlika između sorata u osnovnim uvometrijskim karakteristikama poput mase grozda, mase bobice, te mehaničkom sastavu grozda. Također je utvrđena značajana razlika između sorata u osnovnim kemijskim pokazateljima kakvoće mošta.

Ključne riječi: sorta, lokacija, uvometrija

Uvometric characterisation of autochthonous dalamtian cultivars of grapevine (*V. vinifera* L.)

Željko Andabaka, Darko Preiner, Domagoj Stupić, Jasminka Karoglan Kontić, Zvjezdana Marković, Edi Maletić

University of Zagreb, Faculty of Agriculture, Department of Viticulture and Enology. Svetošimunska 25, Zagreb, Croatia

Summary

According to historical data, the grapevine in Dalmatia began to grow more than two thousand years ago. Before phylloxera, in Croatia grew over 400 cultivars of which only in Dalmatia 200. Most of these cultivars were autochthonous. Today there are still more than 120 native cultivars with most of them being properly conserved and evaluated. Most of these cultivars are found only in collections or as individual vines in old and abundant vineyards. The aim of this paper is to determine their economic and uvometric characteristics and thus properly validated. Uvometric analysis were conducted at 37 dalamtian autochthonous cultivars in two locations. One location was the croatian national collection of autochthonous grapevine cultivars in Jazbina (Zagreb), a second collection of autochthonous dalmatian grapevine cultivars in Duilovo (Split). After the harvest, which was performed at full maturity is separated the average sample of 5 bunches of each variety on which was conducted uvometric (size of bunch and berry) and cluster analysis of mechanical composition (percentage of stems and berries) by Prostoserdovu and basic chemical analysis of musts: sugar content (Oe ˚), total acidity (g / l), pH value. In the studied cultivars showed significant differences between cultivars in uvometric characteristic such as bunch weight, berry weight, and mechanical composition of grapes. It was also found significant differences between cultivars in the chemical indicators of must.

Key words: variety, location, uvometric

Effects of different planting heights from grafting point for grafted vine ratios and nursery yields of some grape varieties on 41B rootstock

Alper Dardeniz[1], Murat Seker[1], Mehmet A. Gundogdu[1], Tolga Sarıyer[1], Arda Akçal[1] and Rukiye Tunçel[2]

[1]*University of Çanakkale Onsekiz Mart, Faculty of Agriculture, Department of Horticulture Canakkale, Turkey (adardeniz@comu.edu.tr)*
[2]*Republic of Turkey Ministry of Agriculture and Rural Affairs Provincial Directorate of Agriculture, Düzce, Bolu – Turkey*

Summary

This research was conducted in Bayramiç-Çanakkale, Turkey in 2007 and 2008 years. 'Sultani Çekirdeksiz', 'Cabernet Sauvignon', 'Chardonnay', 'Alphonse Lavellée', 'Superior Seedless' and 'Merlot' grape varieties grafted on 41B rootstock were used as research materials. In this study, effects of different planting heights from grafting point (< 8.0 cm , 8–10.5 cm, 10.5–13.0 cm and 13.0 cm >) on best grown nursery plant ratio (%) and first grade plant yield (%) were determined in the nursery. For this purpose, total 9600 grafted vine plants were grown (200 grafted vine plants x 4 repeats x 2 years x 6 different combinations of scion/rootstock) and examined at the end of vegetation periods. The obtained results showed that different planting heights from grafting point affected the vine ratios and nursery yields. Under 8 cm (52,93 %) and between 8 cm to 10,5 cm (52,94 %) of planting heights did not affect the grafted vine ratio statistically even though there were some differences among scion/rootstock combinations. However, between 10,5 cm to 13 cm (52,20 %) and over 13 cm (49,21 %) planting height affected the investigated parameters significantly. For the first grade plants amount, increasing planting heights increased the yield of the plants. The highest nursery plant yields were obtained from 'Cabernet Sauvignon'/41B (56.48 %) and 'Sultani Çekirdeksiz'/41B (55,53 %) scion/rootstock combinations.

Key words: Grafted vine saplings, planting height of grafting point, nursery ratio, first length grafted vine ratio.

The root system of M9, M26 and MM106 rootstocks in pseudogley

Gordana Đurić[1], Nikola Mićić[2]

[1]*Genetic Resources Institute, University of Banja Luka*
[2]*Faculty of Agriculture, University of Banja Luka, Bulevar vojvode Petra Bojovića 1A, 78000 Banjaluka, Bosnia and Herzegovina (gordana.djuric@griunibl.rs.ba)*

Summary

The characteristics of the root system in M9, M26 and MM106 apple vegetative rootstocks are presented in this paper for an orchard at the time of full productivity in the plain pseudogley conditions. The previous research conducted in this orchard determined the alternating existence of two microsites, namely typical conditions of plain pseudogley and micro-depressions. Increased and prolonged moisture was identified in micro-depression conditions throughout the year in comparison to typical conditions of the plain pseudogley. The root system of the rootstocks under study was analysed in both microsites. The analysis of fine roots was conducted by using monolith method. The structure and penetrability depth of the root system were determined by a wall profile method. Histological analyses were done on fine roots using the paraffin technique and staining with Delafield's hematoxylin as well as differential staining according to Gerlach. A microsite has significant impact on all growth indicators of the root system in the rootstocks analysed. M9 and MM106 rootstocks showed the best root activity in typical pseudogley conditions, whilst in micro-depression conditions MM106 and M9 were the most active. M26 rootstock had the least active root system in both microsites.

Key words: monolith, profile, main roots, absorbing roots, histological sections.

Utjecaj rane ručne i strojne defolijacije na kultivare Sauvignon bijeli, Merlot i Cabernet sauvignon (*Vitis vinifera* L.)

Mato Drenjančević, Vladimir Jukić

Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska (mato.drenjancevic@pfos.hr)

Sažetak

Cilj istraživanja bio je utvrditi utjecaj rane ručne i strojne defolijacije na prinos, sadržaj šećera i ukupnu kiselost u moštu kultivara Sauvignon bijeli, Merlot i Cabernet sauvignon (*Vitis vinifera* L.). Istraživanje je provedeno tijekom 2012. godine u vinogradima smještenim u Zmajevcu, vinogradarska regija Istočna kontinentalna Hrvatska, podregija Podunavlje, vinogorje Baranja. Pokus je postavljen po split-plot metodi s tri sorte u tri ponavljanja s podčimbenicima koji su se sastojali od kontrolnog tretmana (bez defolijacije), strojna defolijacija i ručna defolijacija (uklonjeno 6 donjih listova po mladici). Ručna i strojna defolijacija izvršena je neposredno pred početak cvatnje (E-L faze 16-17). Visoko značajne razlike ustanovljene su između sorata za sva istraživana svojstva. Najniži prosječni prinos svih triju sorata postignut je kod tretmana s ručnom defolijacijom i on je statistički značajno manji u odnosu na druga dva ($P \leq 0,01$). Nisu utvrđene statistički značajne razlike između kontrolnog tretmana i strojne defolijacije u prinosu. Ručna defolijacija najizraženije je djelovala na smanjenje prinosa kod kultivara Sauvignon bijeli. Ukupna kiselost i količina šećera u moštu nije značajno varirala po svim tretmanima primijenjenim na pojedinoj sorti, kao ni između pojedinih tretmana. Najviša ukupna kiselost izmjerena je kod kultivara Cabernet sauvignon i ona se statistički značajno razlikovala u odnosu na druga dva kultivara($P \leq 0,01$). Količina šećera u moštu visoko je značajna između sorata i najveću količinu šećera postigao je kultivar Merlot.

Ključne riječi: rana defolijacija, prinos, količina šećera, ukupna kiselost, vinova loza

The influence of early hand and mechanical leaf removal on Sauvignon blanc, Merlot and Cabernet Sauvignon (*Vitis vinifera* L.)

Mato Drenjančević, Vladimir Jukić

Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Petra Svačića 1d, Osijek, Croatia (mato.drenjancevic@pfos.hr)

Summary

The aim of this research was to identify the impact of early hand and mechanical leaf removal on yield, soluble solids and total acidity in must of Sauvignon blanc, Merlot and Cabernet Sauvignon. The research was carried out during year 2012, located in Zmajevac, east continental vinegrowing region, subregion Podunavlje, vineyards Baranja. The experiment was set up according to split-plot desing in three replications and was composed of control treatment (without leaf removal), mechanical defoliation and hand defoliation (removing 6 lower leaves per shoot). Hand and mechanical defoliation was performed either pre-bloom (E-L stages 16-17). Hand defoliation treatments significantly decreased average yield for $P \leq 0,01$, considering the control and mechanical defoliation treatments. There were no significant differences in yield between control and mechanical defoliation treatments. Hand defoliation affected the reduction of yield in cultivar Sauvignon blanc the most. Applied treatments haven't affected the change of sugar content in must. Total acidity in must hasn't variated in varieties same as in certain treatments. Cabernet Sauvignon significantly increased average total acidity for $P \leq 0,01$, considering the other two cultivars. Merlot significantly increased average sugar content, considering the other two cultivars.

Key words: early leaf removal, yield, soluble solids, total acidity, Vitis vinifera

Prorjeđivanje plodova jabuke sorte 'Gala'

Dunja Halapija Kazija, Tvrtko Jelačić, Bernardica Milinović, Danijel Čiček, Predrag Vujević

Hrvatski centar za poljoprivredu, hranu i selo, Zavod za voćarstvo, Rim 98, Zagreb, Hrvatska (dunja.halapijakazija@hcphs.hr)

Sažetak

U proljeće 2012. godine je u pokusnom voćnjaku Zavoda za voćarstvo, Hrvatskog centra za poljoprivredu, hranu i selo izvršeno je prorjeđivanje jabuka sorte 'Gala'. Cilj pokusa je bio utvrditi utjecaj prorjeđivanja na rodnost i kvalitetu plodova. Pokus se sastojao od četiri tretmana: kontrola, ručno prorjeđivanje, prorjeđivanje amonij tiosulfatom (ATS) i prorjeđivanje kombinacijom bezliadenina (BA) i naftiloctene kiseline (NAA). Jabuke su tretirane amonij tiosulfatom u koncentraciji od 0,5 %, dok je koncentracija BA iznosila 150 ppm –a, a NAA 15 ppm - a. Mjerena su slijedeća svojstva: prirod, broj plodova i postotak obojenosti plodova po stablu. masa, veličina, čvrstoća i boja ploda, tirtacijske kiseline i topiva suha tvar refraktometrijski. Svojstva su statistički obrađena analizom varijance i Duncanovim višestrukim rang testom. Značajno viši prirod po stablu su imale kontrola (11,96 kg) i ATS (9,44 kg), od BA + NAA (6,76 kg) i ručnog prorjeđivanja (4,46 kg). Obojenost plodova između 50 - 75 % bila je značajno najveća kod BA + NAA (54,89 %), a najmanja kod ATS – a (23,83 %). Masa ploda je bila značajno najveća kod ručnog prorjeđivanja (158,21 g), a najmanja kod ATS – a (120,59 g). Značajnih razlika nije bilo kod svojstava topiva suha tvar i titracijska kiselina čije su prosječne vrijednosti iznosile 14,68 °Brix – a i 2,64 g/l, kao jabučna. Kombinacija BA i NAA je uspješno prorijedila, dok ATS u koncentraciji od 0,5 % nije prorijedio jabuke.

Ključne riječi: jabuka, BA + NAA, ATS, prirod, masa ploda

Fruit thinning of 'Gala' apple trees

Dunja Halapija Kazija, Tvrtko Jelačić, Bernardica Milinović, Danijel Čiček, Predrag Vujević

Croatian Centre for Agriculture, Food and Rural Affairs, Institute of Pomology, Rim 98, Zagreb, Croatia (dunja.halapijakazija@hchps.hr)

Summary

In spring of 2012 in experimental orchard of the Institute of Pomology fruit tinning of 'Gala' apple trees was conducted. The aim of this study was to estimate thinning effect on yield and fruit quality of 'Gala' apples. The experiment had following treatments: non thinned, hand tinned, ATS (0,5 %) and mix of BA (150 ppm) and NAA (15 ppm). The following features were measured: yield, number of fruits and percentage of coloration per tree, average fruit weight, size, firmness and colour, titratable acidity and soluble solids. Data were statistically processed by variance analysis and Duncan multiple range test. Non thinned treatment (11,96 kg) and ATS (9,44 kg), had significantly higher yield per tree than BA + NAA (6,76 kg) and hand thinned treatment (4,46 kg). Coloration of fruits between 50 – 75 % was significantly biggest by BA + NAA (54,89 %), and smallest by ATS (23,83 %). Fruit weight was significantly biggest by hand thinned treatment (158,21 g), and smallest by ATS (120,59 g). There were no significant differences in the features of soluble solids and titrable acids. Their average values were 14,68 °Brix i 2,64 g/l per malic. Combination of BA and NAA had conducted tinning successfully, while ATS tretment in concentration of 0,5 % has not done so well.

Key words: apple, BA+NAA, ATS, yield, fruit weight

Utjecaj uvjeta vrenja komine grožđa cv. Graševina bijela na kemijski sastav rakije komovice

Snježana Jakobović[1], Pavica Tupajić[2], Marija Pecina[2], Mario Jakobović[3]

[1]*Zavod za znanstveni i umjetnički rad HAZU Požega, Županijska 9, Požega, Hrvatska (sjakob@hazu.hr)*
[2]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska cesta 25, Zagreb, Hrvatska*
[3]*Veleučilište u Požegu, Vukovarska 17, Požega, Hrvatska*

Sažetak

Cilj ovog rada bio je ispitati utjecaj uvjeta alkoholnog vrenja komine grožđa na kemijski sastav rakije komovice. Provedena su istraživanja kemijskog sastava rakija proizvedenih od komine grožđa cv. Graševina bijela prevrele uz epifitnu mikrofloru i uz dodatak selekcioniranog kvasca. Komina grožđa ostala nakon prešanja masulja u proizvodnji bijelog vina Graševina vinogorja Kutjevo tretirana je sa 30 g kvasca Uvaferm CM /100 kg komine te pod jednakim uvjetima kao i netretirana komina uskladištena u plastičnim posudama tijekom 3 tjedna, u tri repeticije s ciljem provođenja alkoholnog vrenja. Alkoholno prevrela komina je, odvojeno po ponavljanjima, uz dodatak vode destilirana pomoću jednostavnog destilacijskog uređaja izrađenim od bakra, dvokratnim postupkom. Analiza hlapivih sastojaka rakija provedena je metodom plinske kromatografije. Rakije dobivene od komine prevrele uz dodani kvasac imale su signifikantno niže koncentracije metanola, 2-butanola i etil-acetata od rakija dobivenih od komine prevrele uz epifitne kvasce. Koncentracija izoamilnog alkohola, izobutanola i n-propanola bila je znatno viša u rakijama dobivenim od komine prevrele uz dodani kvasac.

Ključne riječi: komovica, metanol, viši alkoholi, etil-acetat

Effect of fermentation conditions of grape pomace cv. Graševina bijela on the chemical composition of grape marc brandy

Snježana Jakobović[1], Pavica Tupajić[2], Marija Pecina[2], Mario Jakobović[3]

[1]*Zavod za znanstveni i umjetnički rad HAZU Požega, Županijska 9, Požega, Hrvatska (sjakob@hazu.hr)*
[2]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska cesta 25, Zagreb, Hrvatska*
[3]*Veleučilište u Požegu, Vukovarska 17, Požega, Hrvatska*

Summary

The aim of this work was to study the effect of alcohol fermentation of grape pomace on the chemical composition of grape march brandy. Conducted are research the chemical composition of grape pomace brandy produced from grapes cv. Graševina fermented with indigenous yeasts and with the addition of selected yeasts. Grape marc left after pressing in the production of white wine Graševina vineyards Kutjevo was treated with 30 g of yeast Uvaferm CM / 100 kg pomace and under the same conditions as the untreated pomace stored in plastic containers for 3 weeks, in three repetitions to enforce the alcoholic fermentation. Alcoholic fermented grape pomace is separated by the replicates, with the addition of distilled water using a simple distillation unit made of copper, sequential procedure. Analysis of volatile compounds of brandy were performed by gas chromatography. Brandy made from pomace fermented with added yeast had significantly lower concentrations of methanol, 2-butanol and ethyl acetate from grape pomace brandy obtained from fermented by indigenous yeasts. The concentration of isoamyl alcohol, isobutanol and n-propanol was significantly higher in grape pomace brandies obtained from fermented by yeast added.

Key words: grape marc brandy, methanol, higher alcohols, ethyl acetate

Prikladnost nekih sorti jabuke za sušenje

Tvrtko Jelačić, Bernardica Milinović, Dunja Halapija Kazija, Danijel Čiček, Predrag Vujević, Ante Biško

Hrvatski centar za poljoprivredu, hranu i selo, Zavod za voćarstvo, Rim 98, 10 000 Zagreb, (tvrtko.jelacic@hchps.hr).

Sažetak

Cilj istraživanja bio je na temelju fizikalnih, kemijskih i organoleptičkih parametara sedam sorti jabuka: Zlatni delišes, Idared, Cripps Pink, Fuji, Elstar, Topaz i Jonagold utvrditi koje su sorte pogodne za proces sušenja. Analizirani su fizikalni parametri: masa ploda 177,1 g (Cripps Pink) – 242 g (Jonagold), visina ploda 63 mm (Elstar) – 75 mm (Zlatni delišes), obujam 78,1 mm (Cripps Pink) - 85,0 mm (Idared), tvrdoća ploda 5,9 kg/cm² (Jonagold) - 7,9 kg/cm² (Cripps Pink), kemijski parametri: ukupna topiva suha tvar refraktometrijski 14,8 Brix° (Idared) - 16,8 Brix° (Cripps Pink), ukupne titracijske kiseline izražene kao jabučna 2,30 g/l (Fuji), - 8,42 g/l (Topaz). U ovom istraživanju korištena je kontejnerska komorna sušara (KKS 10) kapaciteta 40 kg ploda, programirana na desetosatni interval. Mjerenjem randmana, tj odnosa ukupne težine kriške jabuka prije i poslije sušenja kretao se od 13,5 % (Jonagold) do 21,12 % (Fuji). Postotak vlage u sušenom proizvodu kretao se od 5,26% (Jonagold) do 8,19% (Idared). Mjerenjem boje spektrofotometrom središnje kriške jabuke prije i nakon sušenja utvrđeno je da se vrijednost L* (svjetlina) najmanje promijenila kod sorte Fuji (78,01 – 76,82), a najviše kod sorte Cripps Pink (80,00 – 76,72). Degustacija sorti u istraživanju pokazala je da je sorta Zlatni delišes izgledom najprivlačnija (ocjena 4,07), a s obzirom na okus najbolje se pokazala sorta Jonagold s ocjenom 3,9.

Ključne riječi: jabuka, sorte, sušenje, organoleptika

Suitability of some apple varieties for drying

Tvrtko Jelačić, Bernardica Milinović, Dunja Halapija Kazija, Danijel Čiček, Predrag Vujević, Ante Biško

Croatian Centre for Agriculture, Food and Rural Affairs, Institute of Pomology, Rim 98, 10 000 Zagreb, (tvrtko.jelacic@hchps.hr).

Summary

The aim of the research was to determine which varieties are most suitable for drying process on the basis of physical, chemical and organoleptic parameters of seven apple varieties: Golden Delicious, Idared, Cripps Pink, Fuji, Elstar, Topaz and Jonagold. Physical parameters were analysed: fruit mass of 177.1 g (Cripps Pink) – 242 g (Jonagold), fruit height of 63 mm (Elstar) – 75 mm (Golden Delicious), fruit circumference of 78.1 mm (Cripps Pink) – 85.0 mm (Idared), fruit firmness 5.9 kg/cm² (Jonagold) – 7.9 kg/cm² (Cripps Pink), chemical parameters: total soluble solids refractometrically 14.8 Brix° (Idared) – 16.8 Brix° (Cripps Pink), total titratable acidity expressed as malic acid of 2.30 g/l (Fuji), - 8.42 g/l (Topaz). Container drying chamber (KKS 10) of 40 kg fruit capacity was used in this research, programmed at ten-hour interval. Reduction percentage, i.e. the proportion of total weight of an apple slice before and after drying amounted from 13.5 % (Jonagold) to 21.12 % (Fuji). Humidity percentage in a dried product amounted from 5.26% (Jonagold) to 8.19% (Idared). Measuring the colour of the middle apple slice by spectrophotometer before and after drying determined that the L* value (lightness) has least changed with Fuji variety (78.01 – 76.82), and most with Cripps Pink variety (80.00 – 76.72). Tasting of varieties in this research has shown that Golden Delicious is the most attractive variety in appearance (marked 4.07), and Jonagold proved to be the most agreeable in terms of taste, marked 3.9.

Key words: apple, varieties, drying, organoleptics

Utjecaj stupnja zrelosti na sastav ukupnih polifenola i antocijana u grožđu cv. Plavina i Lasina (*Vitis vinifera* L.)

Marko Karoglan[1], Mirela Osrečak[1], Bernard Kozina[1], Gorjan Dugonjić[2], Marko Rundek[2]

[1]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska (mkaroglan@agr.hr)*
[2]*Studenti Agronomskog fakulteta Sveučilišta u Zagrebu*

Sažetak

Cilj ovog istraživanja bio je utvrditi utjecaj stupnja zrelosti grožđa na sadržaj ukupnih polifenola i antocijana kultivara Plavina i Lasina u uvjetima vinogorja Pirovac-Skradin, vinogradarske podregije Sjeverna Dalmacija, proizvodnih godina 2010. i 2011. U sklopu ovog istraživanja bili su popraćeni i osnovni parametri kakvoće grožđa, kao što su sadržaj šećera i ukupne kiselosti. Kvantitativne promjene u sastavu ukupnih polifenola i antocijana u kožici i sjemenkama određene su u tri stupnja zrelosti. U prvom roku berba je obavljena 15 dana ranije od uobičajene u datom agroekološkom području, drugi rok bio je uobičajeni rok berbe, na osnovi vanjskog izgleda grožđa, te razine šećera i ukupne kiselosti, dok je treći rok obavljen 15 dana nakon prethodnog termina berbe. Reprezentativni uzorci grožđa (100 bobica) sakupljeni su nasumično u tri repeticije sa više različitih trsova i sa različitih dijelova većeg broja nasumično odabranih grozdova. Rezultati istraživanja pokazali su da je u trećem roku berbe Plavina imala najviši sadržaj šećera u grožđu u obje godine istraživanja. Nasuprot tome, 2011. godine razina ukupnih polifenola i antocijana u grožđu bila je najniža upravo u trećem roku berbe, što isključuje korelaciju između sadržaja šećera i ukupnih polifenola i antocijana u grožđu. Nadalje, pokazalo se da je razina ukupnih antocijana u grožđu Lasine u obje godine istraživanja bila najviša u prvom roku berbe, desetak dana ranijem od uobičajenog (tehnološkog) roka berbe.

Ključne riječi: Plavina, Lasina, stupanj zrelosti grožđa, polifenoli, antocijani

The effect of ripening stage on total polyphenols and anthocyanins content in grapes of cv. Plavina i Lasina (*Vitis vinifera* L.)

Marko Karoglan[1], Mirela Osrečak[1], Bernard Kozina[1], Gorjan Dugonjić[2], Marko Rundek[2]

[1]*Faculty of Agriculture, Zagreb, Svetošimunska 25, Zagreb, Croatia (mkaroglan@agr.hr)*
[2]*Students of Faculty of Agriculture, Zagreb*

Summary

The aim of this research was to determinate the impact of grape ripening stage on total polyphenols and anthocyanins content in grapes of Plavina and Lasina cultivars, grown on Pirovac-Skradin winegrowing hills, subregion North Dalmatia, in 2010-2011 years. The basic quality parameters such as soluble solids and total acidity, were also measured. Quantitative changes in total polyphenols and anthocyanins content in skins and seeds were determined in three ripening stages. First harvest date was about 15 days earlier than usual in those agroecolgical conditions. The second was performed as usually, based on visual quality of grapes, and soluble solids and total acidity levels. Finally, the third harvest date was about 15 days after previous term. Representative grapes samples (100 berries) were colected randomly, in three replicates, from several randomly selected vines and grapes. Obtained results showed that the sugar content in Plavina grapes was the highest in the latest ripening stage in both experimental years. Conversely, in 2011 year, total polyphenols and anthocyanins in grapes of Plavina were the lowest just at the latest ripening stage, which excluded any possible correlation between sugar, total polyphenols and anthocyanins content. Furthermore, the level of total anthocyanins in grapes of Lasina, in both years, was the highest in the earliest ripening stage, about 15 days earlier than usual (techological) harvest term.

Ključne riječi: Plavina, Lasina, grapes ripening stage, polyphenols, anthocyanins

Utjecaj tretmana i položaja eksplantata na *in vitro* aksilarno grananje izdanaka i zakorjenjivanje jabuke sorte Topaz

Snježana Kereša[1], Anita Mihovilović Bošnjak[1], Marijana Barić[1], Ivanka Habuš Jerčić[1], Hrvoje Šarčević[1], Ante Biško[2]

[1]Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska (skeresa@agr.hr)
[2]Hrvatski centar za poljoprivredu, hranu i selo, Hondlova 2/11, 10000 Zagreb, Hrvatska

Sažetak

Sorta Topaz pripada grupi čeških kultivara jabuke s visokim sadržajem šećera i ukupnih kiselina. Osim kvalitete ploda koju preferiraju potrošači, sorta Topaz je otporna na krastavost ploda. Ta činjenica predstavlja još jedan razlog za širenje nasada ove sorte u europskim voćnjacima, osobito u organskoj proizvodnji. S obzirom na malo dostupnih informacija o potencijalu ove sorte jabuka za propagaciju *in vitro*, procijenjena je uloga nekoliko faktora u mikropropagaciji. Rezultati pokazuju da je 1 mg/L tidiazurona (TDZ) dao najveći broj izdanaka (3.6) po jednom inokuliranom izdanku, međutim ti su izdanci bili aberantni. Tretmani s 0.5 ili 1 mg/L 6-benzilaminopurina (BA) ili BA (0.5) + 1.5 mg/L kinetina (Kin) razvili su prosječno 1.9-2.5 izdanaka, s tim da se ta dva tretmana nisu statistički značajno razlikovala. S obzirom na tip eksplantata, najbolji rezultat je postignut s izdancima odrezanog vrha, postavljenim vertkalno, iako se nisu statistički značajno razlikovali od intaktnih izdanaka postavljenih vertikalno kao ni od jednonodalnih segmenata položenih vodoravno. Izdanci tretirani s 2 mg/L indol-3-maslačne kiseline (IBA) razvili su prosječno najveći broj korjenčića (6.6) te im je postotak zakorjenjivanja bio najveći (68.7%).

Ključne riječi: jabuka, Topaz, mikropropagacija, tretmani, tip eksplantata, zakorjenjivanje

Axillary shoot proliferation and *in vitro* rooting of apple cv. Topaz- Impacts of treatments and explant orientation

Snježana Kereša[1], Anita Mihovilović Bošnjak[1], Marijana Barić[1], Ivanka Habuš Jerčić[1], Hrvoje Šarčević[1], Ante Biško[2]

[1]*University of Zagreb Faculty of Agriculture, Svetošimunska 25, 10000 Zagreb, Croatia (skeresa@agr.hr)*
[2]*Croatian Centre for Agriculture, Food and Rural Affairs, Hondlova 2/11, 10000 Zagreb, Croatia*

Summary

Topaz belongs to a group of apple varieties with high sugar content and high acidity, developed in Czech Republic. Besides its fruit quality preferred by consumers, ´Topaz´ is also scab-resistant. This fact is the most important characteristic which is providing another reason for significant spread of this cultivar in European orchards, especially in the organic fruit production industry. Considering the sparse information about the potential of this apple tree to be propagated *in vitro*, the role of several factors on micropropagation of apple cv. Topaz was evaluated. The results showed that 1 mg/L thidiazuron (TDZ) gave the highest number of shoots (3.6) per inoculated shoot, but the shoots obtained on this medium were fasciated. Media with 0.5 or 1 mg/L 6-benzylaminopurine (BA) or BA (0.5) + 1.5 mg/L kinetin (Kin) produced in average of 1.9-2.5 microshoots with no significant differences among them. Considering different explants types the best results gave decapitated microshoots placed vertically although not significantly different from those obtained from intact microshoots placed vertically and one-nodal segments placed horizontally. Shoots treated with 2 mg/L of indole-3-butyric acid (IBA) showed the highest average root number (6.6) and the highest percentage of rooting (68.7%).

Key words: apple, Topaz, micropropagation, media, explant type, rooting

The (r)evolution of Wine cellars

Nina Levičnik

University of Ljubljana, Faculty of Architecture, Zoisova 12, 1000 Ljubljana, Slovenija. (e-mail: nina.levicnik@siol.net)

Summary

Storage rooms for wine are created simultaneously with the emergence of systematic cultivation of the vine, no later than in the Roman period. History of storage rooms of agricultural products, including the wine, is as long history as the settlement on our ground. Wine cellars are (or were) primarily located in the wine-growing regions and designed for viniculture. Individual wineries (of wine retailers, restaurants and individuals) located outside the wine regions and are primarily designed to store and / or sale the wine. Wine cellars can in terms of architecture according to the relationship between the wine cellar and building complex divided into: (1) autonomous wineries (2) wine cellars, which are part of the residential / commercial buildings; (3) other forms of wine cellars. The key difference between the first two groups and the last is the purpose of use - the first two groups are primarily intended for grape reproduction and wine production, wine cellars in the third group are intended for storage, presentation and / or sales. The past was dominated by the first group of wine cellar, but today the majority of wine cellars occur within the (residential and / or commercial) buildings. The key difference between the dominant segments from the past and present is in the conversion of buildings – once were used exclusively for viticulture, but today more and more objects in the segment of wine architecture are primarily aimed for tourism and hospitality, only secondary to viticulture.

Key words: Gastronomy, Tourism, Viticulture, Wine Architecture, Wine Cellar

Ujecaj Plants Protector Thiofera na rast i kvalitetu prinosa u voćarstvu

Elizabeta Matahlija

Plodovi zemlje d.o.o., Kralja Zvonimira 187a, Šibenik, Hrvatska (elizabeta.matahlija@inet.hr)

Sažetak

Ekstremne vremenske pojave (suša, poplave, izrazito visoke ili niske temperature, tuča, olujni vjetrovi) uzrokuju značajne gospodarske štete u poljoprivrednoj proizvodnji. Štete uzrokovane niskim temperaturama uslijed pojave kasnog proljetnog te ranog jesenskog mraza u nasadima također nisu zanemarive. U pojedinim godinama gospodarske štete mogu dovesti do proglašenja elementarne nepogode. Stoga, učinkovito rješenje za probleme uzrokovane temperaturnim ekstremima i ostalim abiotskim stresnim činiteljima u poljoprivrednoj proizvodnji u zadnjih par godina postaje sve značajnija potreba. Jedno od učinkovitih rješenja za probleme u voćarskoj proizvodnji je Plants Protector Thiofer. Njegovom primjenom mogu se umanjiti negativni učinci abiotskih i biotskih stresnih činitelja (visoke i niske temperature, suša, mraz, bolesti, štetnici...) u voćarskoj proizvodnji. Plants Protector Thiofer je preparat koji sadrži hranjiva te je obogaćen bakterijama roda *Thiobacillus spp*. Ima višestruki pozitivan učinak jer svojim djelovanjem omogućava aktivaciju mehanizama obrane biljke na ekstremno niske i visoke temperature, sušu, presađivanje, bolesti i štetnike. Plants Protector Thiofer biljka može apsorbirati preko lista i korijena. Vremenski period njegovog djelovanja u biljci je 15 dana. Nakon što je biljka apsorbirala Plants Protector Thiofer unutar kratkog vremena u biljci dolazi do povećanja intenziteta metabolizma što rezultira povećanim sadržajem aminokiselina, proteina, šećera, vitamina, minerala te osmotskog tlaka u biljci. Kod biljaka izloženim stresnim učincima niskih temperatura Plants Protector Thiofer uzrokuje povećanu sintezu ATP-a povećane aktivnosti enzima i transporta elektrona u procesima fotosinteze te povećan sadržaj šećera čiji se mehanizam zaštite biljke sastoji u povećanju udjela vezane vode i direktnog zaštitnog djelovanja na osjetljive stanične membrane. Tim mehanizmima Plants Protector Thiofer povećava otpornost biljke te umanjuje mogućnost nastanka oštećenja biljnog tkiva uslijed djelovanja niskih temperatura. Iskustva i rezultati demonstracijskih pokusa u voćarskoj proizvodnji pokazuju da je nakon pravilne i pravodobne primjene Plants Protector Thiofera u nasadu moguće postići: smanjenje potrošnje pesticida i umjetnih gnojiva, stvaranje nepovoljne mikroklime u nasadu za razvoj patogenih bolesti i štetnika, povećanu otpornost biljke na niske i visoke temperature, regulaciju pH tla te u konačnici bolju kvalitetu prinosa.

Ključne riječi: Plants Protector Thiofer, abiotički stresni činitelji, niske temperature

Impact of Plants Protector Thiofer on the yield increase and quality in fruit production

Elizabeta Matahlija

Plodovi zemlje d.o.o., Kralja Zvonimira 187a, Šibenik, Croatia (elizabeta.matahlija@inet.hr)

Summary

Extreme weather conditions (droughts, floods, extremely high or low temperatures, windstorms etc.) cause significant economic losses in agricultural production. Damages caused by freezing temperatures during late spring or early autumn frost in plantations are also not insignificant. In some years economic losses in agricultural production can even lead to a natural disaster declaration. In the last few years it has become more important to find effective solution to the problems caused by increased temperature extremes frequency and other abiotic stresses in the agricultural production. One of the solutions to these challenges in fruit production is Plants Protector Thiofer. Its application can reduce the negative effects of abiotic and biotic stresses (high temperatures and drought, freezing temperatures, frost, disease, pests) in fruit production. Plants Protector Thiofer is a product that has nutrients and is enriched with *Thiobacillus spp*. It has a multiple effect in plants because it allows the plant to trigger self-defense mechanisms due to the extreme cold and hot temperatures, drought, transplanting, pests and diseases. Plant can absorb Plants Protector Thiofer through the leaves and roots. It stays active in the plant for 15 days. Once the plant has absorbed Plants Protector Thiofer within a short time the intensity of plant metabolism increases which results in increased content of amino acids, proteins, sugars, vitamins, minerals and osmotic pressure. In plants exposed to stress conditions caused by low temperatures Plants Protector Thiofer application causes increased synthesis of ATP, increased activity of the enzyme and electron transport during photosynthesis, increased sugar content. The sugar protective mechanism against low temperatures comprises of its direct impact on sensitive cell membrane and thus increased proportion of bound water in the plant cells. Thereby, Plant Protector Thiofer increases the plant resistance and reduces the possibility of plant tissue damages due to the low temperature conditions. The experiences and results of several demonstration experiments in fruit production show that after proper and timely application of Plants Protector Thiofer in the plantation reduced using of pesticides and fertilizers, creating unfavorable microclimate on the plantation for the development of pathogenic diseases and pests, increased plant resistance to low and high temperatures, regulation of the soil pH and ultimately a better yield quality can be achieved.

Key words: Plants Protector Thiofer, abiotic stresses, freezing temperatures

Utjecaj antistresnog mikrobiološkog preparata Plants Protector Thiofer na bolju kondiciju vinograda

Elizabeta Matahlija

Plodovi zemlje d.o.o., Kralja Zvonimira 187a, Šibenik, Hrvatska

Sažetak

Iskustva i rezultati demonstracijskih pokusa pokazuju da je nakon pravilne i pravodobne primjene Plants Protector Thiofera u nasadu moguće postići: smanjenje potrošnje pesticida i umjetnih gnojiva,stvaranje nepovoljne mikroklime u nasadu za razvoj patogenih bolesti i štetnika, otpornost biljke na niske i visoke temperature, regulaciju pH tla te u konačnici bolju kvalitetu prinosa. Nadalje, Thiobacillus ssp. bakterije transformiraju hranjive elemente u tlu u lako pristupačnu formu za biljku te oksidiraju sumpor do u biljci lako pristupačnog sulfata. Tako u konačnici biljke imaju na raspolaganju optimalno hranjiva u pristupačnom obliku. Sumpor ima važnu ulogu u otpornosti biljaka prema visokim temperaturama i suši jer održava ionsku ravnotežu u protoplazmi te biokoloidima stanice. Također sumpor je odavno poznat kao najstariji fungicid.

Ključne riječi: mraz, stres, Plants Protector Thiofer

Impact of antistress biofertilizer Plants Protector Thiofer on the better shape of vineyard

Elizabeta Matahlija

Plodovi zemlje d.o.o., Kralja Zvonimira 187a, Šibenik, Croatia

Summary

Experiences and results of several demonstration experiments show that after proper and timely implementation of Plants Protector Thiofer can be achieved: reducing the consumption of pesticides and fertilizers, unfavorable microclimate on the plantation for the development of pathogenic diseases and pests, plant resistance to low and high temperature, regulating the pH of the soil and ultimately a better quality of yield. Furthermore, Thiobacillus ssp. bacteria transform the nutritional elements in the soil in an easily accessible form for the plant. Therefore plants have optimal nutrients available in an accessible form. They also oxidize sulfur in the form that is ready for plant absorption. Sulfur plays an important role in plant resistance to high temperatures and droughts, as it maintains the ionic balance in the protoplasm and bio colloids of cells. Also, sulfur has long been known as the oldest fungicide.

Key words: frost, stress, Plants Protector Thiofer

Osobine rasta 11 novih sorti šljiva

Zdravko Miholić

Poljoprivredna savjetodavna služba, Ul. Fra Andrije Kačića Miošića 9, Zagreb, Hrvatska (zdravko.miholic@savjetodavna.hr)

Sažetak

Istraživanje je obavljeno na introduciranim sortama šljiva: Boranka, Timočanka, Top Five, Top Taste, Top Star, Top Gigant, Top 2000, Jojo, Hagnta, Elena i Top Hit, cijepljenima na podlogu P myrobalana i posađenima na razmak 4,0m x 3,7m. Pokus je postavljen u proljeće 2008. Cilj istraživanja bio je istražiti bujnost rasta 11 sorti šljiva te njihovu pogodnost za rezidbu i formiranje uzgojnog oblika. Top Taste, Elena, Top Five i Top Hit su pokazale najveću bujnost u pokusu. Najmanja bujnost stabla zabilježena je kod sorte Top 2000, a zatim i kod sorti Top Gigant, Jojo i Haganta. Najbolju pogodnost na rezidbu i formiranje uzgojnog oblika pokazale su sorte Top Star, Jojo i Top Five. Puno zahtijevnije u tom smislu su sorte Top Taste, Top Gigant i Boranka Sorte: Top 2000, Top Gigant, Boranka i Haganta obećavajuće su u smislu modernog uzgoja pri povećanoj gustoći sklopa.

Ključne riječi: šljive, sorte, rast, podatnost za formiranje, gustoća sklopa

Growth characteristics of 11 new plum cultivars

Zdravko Miholić

Agricultural advisory service, Ul. Andrije Kačića Miošića Fra 9, Zagreb, Croatia (zdravko.miholic@savjetodavna.hr)

Summary

The research was conducted on introduced plum cultivars: Boranka, Timočanka, Top Five, Top Taste, Top Star, Top Gigant, Top 2000, Jojo, Haganta, Elena i Top Hit grafted on rootstock P. myrobalana and planted at the distance 4,0m x 3,7m. The trial was established in the spring of 2008. The purpose of the research were investigated tree vigour of 11 plum cultivars and it flexibility on pruning and training. Top Taste, Elena, Top Five and Top Hit was the most vigorous in this trial. The weakest tree vigour was observed on Top 2000, followed by Top Gigant, Jojo and Haganta. The best flexibility on pruning and training were recorded with Top Star, Jojo i Top Five. Much more trouble are caused by Top Taste, Top Gigant and Boranka. Cultivars: Top 2000, Top Gigant, Boranka and Haganta looks promising for modern plum growing at high density.

Keywords: plum; cultivars; tree vigour; flexibility, density

Rezultati usporednih morfoloških i pomoloških mjerenja dva uzgojna oblika za jabuku na pokušalištu Donja Zelina

Bernardica Milinović, Tvrtko Jelačić, Dunja Halapija Kazija, Danijel Čiček, Ante Biško, Predrag Vujević

Hrvatski centar za poljoprivredu, hranu i selo, Zavod za voćarstvo, Rim 98, 10 000 Zagreb, Hrvatska, (e-mail: bernarda.milinovic@hcphs.hr)

Sažetak

U sklopu Alpe Adria projekta: 'Uzgojni oblik Bibaum® nasuprot vitko vreteno', 2008. god. u pokusnom voćnjaku Zavoda za voćarstvo u D. Zelini mjerenjem morfoloških i pomoloških svojstava sorte Zlatni delišes Klon B, uspoređena su dva različita uzgojna oblika – Bibaum® i vitko vreteno. Stabla su cijepljena na podlogu M9. Pokus je postavljen kao slučajni blokni raspored u tri repeticije s četiri stabla. Razmak sadnje za vitko vreteno je 1,0×3,2, a za Bibaum® 1,5×3,2 m. U nasadu je proveden sustav navodnjavanja kap po kap, ugrađena je armatura i protugradne mreže. Cilj istraživanja je bio usporediti kvalitetu plodova, urod, bujnost i rast stabla te utrošeno radno vrijeme u voćnjaku za ova dva uzgojna oblika za jabuku. U periodu od 2010.-2012. god. mjerena su slijedeća svojstva: promjer debla, visina, širina i debljina stabla, urod po stablu, masa i obujam ploda, topiva suha tvar, čvrstoća ploda, ukupne kiseline. Plodovi su sortirani prema osnovnoj boji (zelena, zeleno-žuta, žuto-zelena i žuta) i obujmu (do 70 mm, 70-80 mm, više od 80 mm), te postotku mrežavih plodova. Rezultati mjerenja na uzgojnim oblicima u istraživanju statistički su se razlikovali u svim godinama za svojstva: prosječna masa ploda, postotak plodova sa žutom osnovnom bojom te topiva suha tvar. Uzgojni oblik Bibaum® imao je u prosjeku manje plodove (199,97 g) te manji sadržaj suhe tvari (15,36 °Brixa) od vitkog vretena (200,74 g; 15.63 °Brixa).

Ključne riječi: jabuka, uzgojni oblik, Bibaum®, masa ploda

Results of comparative morphological and pomological measurements of two apple training systems in Donja Zelina Experimental orchard

Bernardica Milinović, Tvrtko Jelačić, Dunja Halapija Kazija, Danijel Čiček, Ante Biško, Predrag Vujević

Croatian Centre for Agriculture, Food and Rural Affairs, Institute of Pomology, Rim 98, 10 000 Zagreb, Croatia, (e-mail: bernarda.milinovic@hcphs.hr)

Summary

Within the framework of Alpe Adria project: 'Bibaum® training system versus slender spindle', in 2008 in Experimental orchard of the Institute of Pomology in D. Zelina, by measuring of morphological and pomological characteristics of Golden Delicious Clone B cultivar, two different training systems - Bibaum® and slender spindle were compared. Trees were grafted on M9 rootstock. Trial was set up as a randomized block design with three repetitions of four trees. Planting distance for slender spindle is 1,0 × 3,2 m and for Bibaum® 1,5 × 3,2 m. Drip irrigation systems, as well as hail nets are installed in orchard. The aim of this research was to compare fruit quality, yield, tree growth and vigour and work time in orchard for these two apple training systems. In period from 2010 – 2012 following characteristics were measured: tree circumference; tree height, width and thickness; yield per tree; fruit weight and dimensions; fruit firmness and total acidity. Fruits were graded according to ground-colour (green, green-yellow, yellow-green and yellow) and fruit circumference (< 70 mm, 70 – 80 mm, > 80 mm), and percentage of russeting. Results of measurements of training systems statistically differed in all years for following characteristics: average fruit weight, percentage of fruits with yellow ground-colour and total soluble solids. Bibaum® training system had smaller fruits (199,97 g) and lesser total soluble solids content (15,36 °Brix) then slender spindle (200,74 g; 15.63 °Brix).

Key words: apple, training system, Bibaum®, fruit weight

Genetika populacija jabukova savijača (*Cydia pomonella* L.) u Hrvatskoj

Ivana Pajač Živković, Ivan Pejić, Božena Barić

Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska (ipajac@agr.hr)

Sažetak

Genetika jabukova savijača *Cydia pomonella* (CM) (Linnaeus) proučavana je na tri populacije štetnika u Hrvatskoj. Jedna populacija štetnika nije bila izložena insekticidnim tretmanima, dok su druge dvije bile izložene intenzivnim insekticidnim tretmanima. Izolacija genomske DNA jabukova savijača izvedena je pomoću komercijalnog kompleta za izolaciju DNA (GenElute^{TM} Mammalian Genomic DNA Miniprep Kit, Sigma Aldrich, Njemačka). Genotipizacija primjeraka jabukova savijača provedena je na 10 mikrosatelitnih markera (SSR). Produkti dobiveni u postupku PCR-a razdvojeni su metodom vertikalne elektroforeze u 6 %-tnom poliakrilamidnom gelu, te vizualizirani bojenjem u srebru. Analizom molekularne varijance (AMOVA) provedenom na tri populacije jabukova savijača, nisu utvrđene statistički značajne razlike u genetskoj strukturiranosti populacija. Unatoč činjenici da razlike u genetskoj strukturiranosti populacija nisu bile statistički značajne, populacija štetnika iz netretiranog voćnjaka imala je najveći prosječni broj alela te najveći broj jedinstvenih alela u usporedbi s populacijama štetnika iz tretiranih voćnjaka. Ovi rezultati upućuju na moguće snižavanje bogatstva alela štetnika uslijed primjene insekticidnih tretmana. Rezultati genetskih istraživanja upućuju na određene promjene u genetskoj strukturi populacija jabukova savijača iz tretiranih voćnjaka koje su utjecale na povećanje reproduktivne sposobnosti štetnika, a samim time i na promjene u njegovoj biologiji.

Ključne riječi: jabukov savijač, voćnjaci jabuke, SSR, genetska varijacija, AMOVA

Genetics of codling moth (*Cydia pomonella* L.) populations in Croatia

Ivana Pajač Živković, Ivan Pejić, Božena Barić

Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia (ipajac@agr.hr)

Summary

The genetics of three codling moth *Cydia pomonella* (CM) (Linnaeus) populations from Croatia was investigated with one population being without chemical control treatment and two populations being subjected to chemical control treatments. For population genetic analysis total genomic DNA was extracted from CM individuals using the GenEluteTM Mammalian Genomic DNA Kit (Sigma-Aldrich, Germany). To assess genetic polymorphism, CM individuals were genotyped at 10 microsatellite loci (SSR). Amplification of PCR products was performed by following standardized procedures and visualization of fragments was done on 6% polyacrylamide gels followed by silver staining. Analysis of molecular variance (AMOVA) performed on the three CM populations, revealed no significant variance in the genetic structure. CM population from untreated orchard had the greatest average number of alleles and the largest number of private alleles compared to the treated orchards despite the fact that the differences in genetic structure were not statistically significant. This indicates that insecticide treatments potentially lower allelic richness. The results of genetic studies suggest certain changes in the genetic structure of codling moth populations which were subjected to chemical control treatments that have increased its reproductive capacity and have therefore caused changes in its biology.

Key words: codling moth, apple orchards, SSR, genetic variation, AMOVA

Leaf mineral concentration of six olive cultivars cultivated on calcareous soil

Igor Pasković[1], Slavko Perica[1], Marija Pecina[2], Katarina Hančević[1], Marija Polić-Pasković[3], Mirjana Herak-Ćustić[2]

[1]*Institute for Adriatic Crops and Karst Reclamation, Split, Put Duilova 11, 21000 Split, Croatia (igor.paskovic@krs.hr)*
[2]*University of Zagreb, Faculty of Agriculture, Svetošimunska 25, 10000 Zagreb, Croatia*
[3]*Meja Gaj 155D, 51226 Hreljin, Croatia*

Summary

There are limited numbers of scientific publication regarding genotypic differences which exist among olive cultivars concerning nutrient uptake. For that purpose, the object of our study was to determine possible differences between leaf mineral content of six selected olive cultivars since leaf nutrient analysis is consider being the best method for diagnosing olive tree nutritional status. Plant material was obtained from an olive collection, grown on calcareous soil maintained at Institute of Adriatic Crops and Karst Reclamation, Split, Croatia. The study was conducted with two Croatian autochthonous olive cultivars (Istarska bjelica, Lastovka), two Italian cultivars (Pendolino, Leccino), one Spanish cultivar (Hojiblanca) and one Greek cultivar (Koroneiki). Completely randomized design was applied. Selected olive cultivars in our experiment demonstrated different nutrient leaf concentration, which is of particular importance for fertilization requirements and fertilization practice in Croatian orchards grown on calcareous soil. This study has shown questionably low Mg concentration in all olive cultivars with exception for Hojiblanca cultivar. Also, only Croatian cultivars Istarska bjelica and Lastovka as well as Spanish cultivar Hojiblanca recorded sufficient levels of iron leaf mineral content. Regarding other elements studied (P, K, Ca, Zn, Mn, Cu) all cultivars were above literature cited thresholds for possible deficiencies.

Key words: Olive cultivars, mineral nutrition, calcareous soil, Mg, Fe

Changes in the volatile composition of white nectarine at different stages of fruit growth

Murat Seker[1], Neslihan Ekinci[2], Mehmet Ali Gundogdu[1], Engin Gur[2]

[1]*University of Çanakkale Onsekiz Mart, Faculty of Agriculture, Department of Horticulture Canakkale, Turkey (mseker@comu.edu.tr)*
[2]*University of Çanakkale Onsekiz Mart, Lapseki Vocational College, Lapseki, Çanakkale, Turkey*

Summary

White nectarines have small fruits with white-cream color and have high market value because of its unique aroma and attractive appearance. They have similar tree characteristics compare to standard peach and nectarine varieties. The most important fruit characteristic of white nectarines is flavor richness. The white nectarines have more volatiles than those of common peaches and nectarines especially for esters, lactones and terpenoids. This experiment was performed in 2012 fruit growth and ripening season. In this experiment, volatile contents were investigated during two different fruit growth times (June 15th and July 15th) and ripening time (August 15th) by using diethyl ether solvent for liquid-liquid extractions. The identification of volatile constituents was performed by Gas Chromatography / Mass Spectrometer (GC/MS) instrument. The numbers and relative ratios of fruit volatiles including C_6 compounds, esters, aldehydes, lactones, terpenoids, alcohols, ketones and other compounds were determined. According to the obtained results, the overall ester, lactone and terpenoid contents increased roughly 2-3 folds from first sampling time (June) to ripening stage (August).

Key words: *Prunus persica*, aromatic compounds, volatiles, flavor.

Investigation of volatile compounds of different plum varieties in the ecological conditions of northwestern of Turkey

Murat Seker[1], Neslihan Ekinci[2], Mehmet Ali Gundogdu[1], Engin Gur[2]

[1]*University of Çanakkale Onsekiz Mart, Faculty of Agriculture, Department of Horticulture Canakkale, Turkey (mseker@comu.edu.tr)*
[2]*University of Çanakkale Onsekiz Mart, Lapseki Vocational College, Lapseki, Çanakkale, Turkey*

Summary

Aroma is one of the essential factors for the evaluation of plum fruit quality. Production of aroma compounds is an important factor determining final sensory quality of fruit produce and hence consumer satisfaction, and is directly influenced by variety characteristics. In this experiment aroma fractions of commercial plum varieties including 'Angeleno', 'Formosa', 'Papaz', 'President', 'Santa Rosa', 'Stanley', 'Black Beauty', 'Black Amber', 'Italyan' and 'Climax' were investigated by using diethyl ether solvent for liquid-liquid extractions. The identification of volatile constituents was performed by Gas Chromatography / Mass Spectrometer (GC/MS) instrument. A total of 68 volatile constituents was identified and relatively quantified. Those compounds included C_6 compounds, esters, aldehydes, lactones, terpenoids, alcohols, alcanes, ketones and other compounds. The concentrations of the volatiles were significantly changed among the varieties. The major volatile constituents of the varieties were hexanal, 2-hexenal, benzaldehyde, (E)-2-octenal, hexyl acetate, ethyl acetate, 4-hexen-1-ol acetate, (E)-2-hexen-1-ol acetate, D-limonene, linalool, 6-methyl-5-hepten-2-one, 1-hexanol, (Z)-3-hexen-1-ol, 2-ethyl-1-hexanol, γ-decalactone.

Key words: Prunus salicina, Prunus domestica, Prunus spinosa, aromatic compounds, flavor.

Osjetljivost različitih kultivara jabuke na alternarijsku trulež ploda (*Alternaria alternata* (Fr.) Keissl.)

Zdravka Sever[1], Sandra Pavić[2], Željka Juzbašić[2], Karolina Sever[2], Tihomir Miličević[1]

[1]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska (zsever@agr.hr)*
[2]*Student diplomskoga studija Fitomedicina, Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska*

Sažetak

Jabuka (*Malus domestica* Borkh.) je jedna od najznačajnijih voćnih vrsta u svijetu, a tako i u Republici Hrvatskoj. Kako bi se osigurala opskrba tržišta plodovima tijekom cijele godine jabuka se skladišti nakon berbe. Jedan od uzročnika propadanja plodova tijekom skladištenja je alternarijska trulež ploda, uzrokovana gljivama iz roda *Alternaria.* Cilj ovog istraživanja je bio utvrditi osjetljivost kultivara jabuke *Idared*, *Zlatni delišes*, *Granny Smith*, *Florina* i *Melrose* na vrstu *Alternaria alternata* (Fr.) Keissl., te način prodora patogena u plod. Testovi patogenosti su provedeni inokulacijom gljive *A. alternata* na oštećen i neoštećen plod odabranih kultivara jabuke. Nakon sedam, 14 ili 21 dan inkubacije zabilježena je pojava simptoma alternarijske truleži i izmjeren je promjer nastalih lezija. Izračunata je prosječna brzina rasta lezija i izražena u mm na dan. Provedena je statistička obrada podataka analizom varijance (ANOVA). Utvrđena je značajna razlika u osjetljivosti kultivara pri inokulaciji na oštećen plod. *Zlatni delišes* se pokazao kao najotporniji kultivar, budući da na plodovima nisu zabilježeni simptomi zaraze s *A. alternata*. Tipične lezije su se pojavile na plodovima preostalih kultivara. Međutim, *Idared* se pokazao kao manje osjetljiv kultivar u odnosu na *Granny Smith*, *Florina* i *Melrose*. Istraživanjem je utvrđeno da je *A. alternata* tipičan parazit rana, budući da nije bilo pojave simptoma alternarijske truleži niti na jednom kultivaru pri inokulaciji na neoštećen plod.

Ključne riječi: jabuka, kultivar, alternarijska trulež, *Alternaria alternata,* test patogenosti

Sensitivity of different apple cultivars to Alternaria rot (*Alternaria alternata* (Fr.) Keissl.)

Zdravka Sever[1], Sandra Pavić[2], Željka Juzbašić[2], Karolina Sever[2], Tihomir Miličević[1]

[1]Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia(zsever@agr.hr)
[2]Student of MSc Phytomedicine Faculty of Agriculture, University of Zagreb, Svetošimunska 25, Zagreb, Croatia

Summary

Apple (*Malus domestica* Borkh.) is one of the most significant fruit species worldwide, including Croatia. Apple fruits are stored after harvest in order to provide market with quality fruits yearlong. Fungi from genus *Alternaria* are one of many causal agents of fruit deterioration during storage. The objectives of this study were to determine sensitivity of apple cultivars *Idared*, *Golden Delicious*, *Granny Smith*, *Florina* and *Melrose* to *Alternaria alternata* (Fr.) Keissl., and to establish pathogen's ability to infect fruit. Pathogenicity tests were conducted. Inoculations were done both on wounded and unwounded apple fruits of chosen cultivars. The appearance of symptoms was recorded, and lesion diameters were measured one, two or three weeks after inoculation. Average lesion growth was calculated and expressed in mm per day. Growth was analysed with the analysis of variance (ANOVA). Statistical analysis has shown significant differences between the cultivars in sensitivity to Alternaria rot. Symptoms of infection with *A. alternata* did not develop on cultivar *Golden Delicious*, therefore we concluded that it was the least sensitive cultivar. Tipical lesions developed on other cultivars. *Idared* showed to be least sensitive by comparison with *Granny Smith*, *Florina* and *Melrose*. Results of this study have shown that *A. alternata* is a typical wound parasite, since symptoms of Alternaria rot were not recorded on either cultivar when inoculated on unwounded fruit.

Key words: apple, cultivar, Alternaria rot, *Alternaria alternata*, pathogenicity test

Biokemijsko - fiziološke karakteristike ploda kruške u ovisnosti o položajua na stablu

Sanda Stanivuković[1], Boris Pašalić[2], Gordana Đurić[1],

[1]*Institut za genetičke resurse Univerziteta u Banjoj Luci, Bulevar vojvode Petra Bojovića 1A, Banja Luka, Bosna i Hercegovina (sanda.gracanin@griunibl.rs.ba)*
[2]*Poljoprivredni fakultet Univerziteta u Banjoj Luci, Bulevar vojvode Petra Bojovića 1A, Banja Luka, Bosna i Hercegovina*

Sažetak

Biokemijsko - fiziološka proučavanja plodova kruške sorte Pakams Trijumf na različitim pozicijama (vrh, sredina, baza) i ekspozicijama (istok, zapad) na stablu izvršena su tijekom 2010. i 2011. godine u nasadu kruške u Jurkovici - općina Gradiška. Stabla ispitivane sorte posađena su u pravcu sjever - jug, uzgajana u uzgojnom obliku vitko vreteno na sijancu divlje kruške i u vrijeme istraživanja nalazila su se u razdoblju punog plodonošenja. Vrijeme berbe plodova utvrđeno je na osnovi ranijih prosječnih parametara stupnja zrelosti. Prilikom berbe, plodovi su označeni fotopozicioniranjem. Plodovi su analazirani neposredno nakon berbe i nakon mjesec dana skladištenja u hladnjači s normalnom atmosferom. Svi podaci obrađeni su statistički, računanjem srednjih vrijednosti i pripadajućih mjera varijabiliteta. Podaci su obrađeni analizom varijance u trofaktorijelnom pokusu 2 × 2 × 3 (godina × ekspozicija × pozicija), posebno nakon berbe i nakon skladištenja plodova, a značajnost razlika utvrđena je testom najmanje značajne razlike. Rezultati istraživanja jasno pokazuju da je prisutno različito ponašanje plodova ispitivane sorte nakon berbe i nakon skladištenja. Naime, analiza varijance pokazuje da pozicija odnosno ekspozicija utječe na biokemijsko - fiziološku konstituciju ploda dok analize interakcijskih efekata ukazuju da postoje odstupanja u pojedinim slučajevima od osnovnih pravila izraženih kao utjecaj navedenih faktora.

Ključne riječi: kruška, sazrijevanje plodova, kvalitet, čuvanje plodova.

Biochemical - physiological characteristics of pear fruit depending on the position in the tree

Sanda Stanivuković[1], Boris Pašalić[2], Gordana Đurić[1],

[1]Institut for Genetic Resources, University of Banja Luka, Bulevar vojvode Petra Bojovića 1A, Banja Luka, Bosnia and Herzegovina (sanda.gracanin@griunibl.rs.ba)
[2]Faculty of Agriculture, University of Banja Luka, Bulevar vojvode Petra Bojovića 1A, Banja Luka, Bosnia and Herzegovina

Summary

Biochemical - physiological studies of pear fruit Pakams Triumph varieties at different positions (top, middle, base) and exposures (east, west) on the tree were made in 2010. and 2011. in pear orchards in Jurkovica - Gradiska municipality. The trees of the studied cultivar are planted in a north - south direction, grown in the slender spindle training system on the wild pear seedlings and in the study time they were in full fruiting period. Harvest time was determined based on the previous average parameters of maturity level. During the harvest, the fruits were marked by photo position. The fruits are analized immediately after harvest and after a month of refrigerated storage with normal atmosphere. All data were analized statistically, by calculating the mean values and associated measures of variability. Data were analized using analysis of variance in the three factor experiment 2 x 2 x 3 (year x exposure x area - zones), especially after harvest and after storage of fruit, and significant difference was found in the least significant difference test. Results clearly indicate the presence of the different behavior of the cultivars of fruits after harvest and after storage. The variance analysis shows that the position or exposure affects the biochemical - physiological constitution of fruit, while interaction effects analyzes indicate that in some cases there are differences from the basic rules demonstrated of the impact of the aforementioned factors.

Key words: pear, fruit maturation, quality, storage of fruit.

Utjecaj ekološki prihvatljivih tretmana na antioksidativnu aktivnost plodova jagode tijekom skladištenja

Ivna Štolfa[1], Aleksandar Stanisavljević[2], Sanela Marić[1], Seada Marić[1], Rosemary Vuković[1], Zorana Katanić[1], Tanja Žuna Pfeiffer[1], Dubravka Špoljarić[1], Teklić Tihana[2]

[1]Odjel za biologiju, Sveučilište J. J. Strossmayera u Osijeku, Cara Hadrijana 8/A, Osijek, Hrvatska (ivnastolfa@yahoo.com)
[2]Poljoprivredni fakultet Sveučilišta J.J. Strossmayera u Osijeku, Kralja Petra Svačića 1d, Osijek, Hrvatska

Sažetak

Skladištenje voća učinkovit je način za održavanje kvalitete plodova nakon berbe. Kao i ostalo svježe voće, jagode su vrlo osjetljive i zbog visokog stupnja metaboličke aktivnosti imaju vrlo kratak rok trajanja. Kako bi se izbjeglo smanjenje kvalitete plodova jagoda tijekom skladištenja primjenjuju se različiti tretmani kao što su izlaganje niskim temperaturama ili visokim koncentracijama CO_2. Cilj ovog istraživanja bio je utvrditi kako ekološki prihvatljivi tretmani (otopina salicilne kiseline, otopina koloidnog srebra i ozon) utječu na ukupnu antioksidativnu aktivnost (UAA) plodova jagoda (*Fragaria* x *ananassa* Duch.) sorte Albion tijekom 7 dana skladištenja pri 4 ºC. Praćene su promjene koncentracije ukupne askorbinske kiseline (AA), koncentracije ukupnih fenola (PHE) i UAA u plodovima jagoda. Svi primijenjeni tretmani uzrokovali su povećanje UAA u plodovima jagoda tijekom cijelog razdoblja skladištenja, a koncentracije AA 5. i 7. dana skladištenja. Najveći učinak na povećanje UAA i koncentracije PHE 5. i 7. dana skladištenja imao je tretman salicilnom kiselinom, a na povećanje koncentracije AA, tretman plodova jagoda otopinom koloidnog srebra. Utvrđena je statistički značajna pozitivna korelacija između koncentracija PHE i UAA te AA i UAA. S obzirom na dobivene rezultate, primijenjeni tretmani mogli bi imati pozitivan učinak na očuvanje kvalitete i nutritivne vrijednosti plodova jagoda tijekom skladištenja.

Ključne riječi: jagoda, skladištenje, ukupna antioksidativna aktivnost, fenoli, askorbinska kiselina

The impact of environmentally friendly postharvest treatments on the antioxidant activity of strawberry fruits during storage

Ivna Štolfa[1], Aleksandar Stanisavljević[2], Sanela Marić[1], Seada Marić[1], Rosemary Vuković[1], Zorana Katanić[1], Tanja Žuna Pfeiffer[1], Dubravka Špoljarić[1], Teklić Tihana[2]

[1]*Department of Biology, University of J. J. Strossmayer in Osijek, Trg Ljudevita Gaja 6, Osijek, Croatia (ivnastolfa@yahoo.com)*
[2]*Faculty of Agriculture, University of J.J. Strossamyer in Osijek, Kralja Petra Svačića 1d, Osijek, Croatia*

Summary

Fruit storage is an effective way to maintain the quality of the fruit after harvest. Like other fresh fruit, strawberries are very sensitive having a very short shelf life due to high metabolic activity. In order to avoid a reduction in the quality of strawberry fruit during storage, different postharvest treatments, such as exposure to low temperatures or high concentrations of CO_2, are used. The aim of this study was to determine how environmentally friendly postharvest treatments with the salicylic acid solution, the colloidal silver solution and ozone affect the total antioxidant activity (TAA) of strawberry fruits (*Fragaria* x *ananassa* Duch. cv. Albion) during 7 days of storage at 4 °C. The changes in the concentration of total ascorbic acid (AA), total phenols (PHE) and TAA were measured. All applied postharvest treatments resulted in the increase of TAA in strawberry fruits throughout the storage period, and the increse of AA concentration on the 5th and 7th day of storage. The salicylic acid treatment influenced the increase in the concentration of PHE and TAA on the 5th and 7th day of storage while the treatment with colloidal silver affected the increase in AA concentration. There was a statistically significant positive correlation between the concentration of TAA and both PHE and AA concentrations. The obtained results show that applied postharvest treatments could have a positive impact on the preservation of the quality and nutritional value of strawberry fruit during storage.

Key words: strawberry, postharvest storage, total antioxidant activity, phenols, ascorbic acid

Utjecaj besjemenih bobica na kvalitetu vina sorte Grk (*V. vinifera* L.)

Domagoj Stupić, Darko Preiner, Željko Andabaka, Jasminka Karoglan Kontić, Zvjezdana Marković, Edi Maletić

Sveučilište u Zagrebu, Agronomski fakultet, Svetošimunska cesta 25, 10000 Zagreb, Hrvatska, (dstupic@agr.hr)

Sažetak

Grk bijeli, autohtona hrvatska sorta sa područja Dalmacije, jedna je od rijetkih sorata koja posjeduje funkcionalno ženski cvijet. Zbog razvoja zakržljalih prašnika često u vrijeme oplodnje dolazi do partenokarpije odnosno do razvoja neoplođenih besjemenih bobica. Besjemene bobice kod sorte Grk čine značajni udio u ukupnoj masi grozda. Kako bi se utvrdio utjecaj besjemenih bobica na kvalitetu vina sorte Grk provedene su osnovne mehaničke karakteristike grozda te je utvrđena značajna razlika u masi neoplođenih bobica s obzirom na njihov udio u grozdu. Osnovnom kemijskom analizom mošta (šećer, ukupna titracijska kiselost, pH) utvrđena je razlika u količini šećera i ukupnih kiselina u moštevima dobivenim iz oplođenih i neoplođenih bobica. Signifikantna razlika utvrđena je u sadržaju vinske i jabučne kiseline i ukupnih hlapivih terpena između neoplođenih i oplođenih bobica u grozdu. U svrhu utvrđivanja kvalitete vina od sorte Grk provedena je vinifikacija izborom grozdova sa različitim udjelom neoplođenih bobica (20%, 50% i 80%). Kemijskom i organoleptičkom analizom vina također je utvrđeno da sadržaj alkohola i ukupnih kiselina utječe na parametre kvalitete i organoleptička svojstva vina.

Ključne riječi: Vitis vinifera L., Grk bijeli, partenokarpija, besjemene bobice, slobodni hlapivi terpeni.

Impact of unfertilized berries on the quality of Grk bijeli (*V. vinifera* L.) wine.

Domagoj Stupić, Darko Preiner, Željko Andabaka, Jasminka Karoglan Kontić, Zvjezdana Marković , Edi Maletić

Department of Viticulture and Enology, University of Zagreb, Faculty of Agriculture, Svetosimunska 25, 10000 Zagreb, Croatia (dstupic@agr.hr)

Summary

Grk bijeli, indigenous Croatian variety mostly cultivated on Dalmatian coast, one of the few varieties that possess a functional female flower. Because of developing puny stamens often during fertilization occurs parthenocarpy and the development of unfertilized, seedless berry. Seedless berries usually takes a significant proportion of the total mass of the cluster. To determine the impact on wine quality, clusters of cv. Grk were implemented to the basic mechanical analyses of the cluster. Significant difference was determined in weight of unfertilized berries with respect to their share of the cluster. Basic chemical analysis of must (sugar, total titratable acidity, pH) was determined by the difference in the quantity of sugar and acid between fertilized and unfertilized berries. A significant difference also was found in the content of tartaric and malic acid and total volatile terpenes (FVT) between unfertilized and fertilized berries per bunch. In order to determine the quality of wine there was conducted vinification of clusters with different procent of unfertilized berries (20%, 50% and 80%). Chemical and organoleptic analysis of the wines has also been found that the content of alcohol and acid affects the quality parameters and organoleptic properties of wine.

Key words: Vitis vinifera L., Grk bijeli, parthenocarpy, unfertilized berries, free volatile terpenes (FVT)

Pogodnost sorata jabuke u sustavu ekološke zaštite

Vesna Tomaš, Krunoslav Dugalić

Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska (vesna.tomas@poljinos.hr)

Sažetak

Na Poljoprivrednom institutu Osijek, provedeno je dvogodišnje istraživanje (2011/12.) čiji je cilj bio istražiti pogodnost sorata u sustavu ekološke zaštite kao i učinkovitost ekoloških zaštitnih sredstava na ispitivanom sortimentu na dvije glavne bolesti krastavost i pepelnicu(*Venturia inaequalis* i *Podosphaera leucotricha*). U istraživanje je uvršten standardni sortiment u Rebublici Hrvatskoj, ukupno šesnaest sorti i četrnest tolerantnih sorti na glavne bolesti. Rezultati ovog dvogodišnjeg istraživanja su pokazali da standardne sorte ne mogu konkurirati tolerantnim sortama u sustavu ekološke proizvodnje. Sorta Elstar polučila je najbolje rezultate učinka ekoloških zaštitnih sredstava na glavne bolesti krastavost i pepelnicu (*Venturia inaequalis* i *Podosphaera leucotricha*) u odnosu na kontrolu. Od tolerantnih sorti najbolji odgovor na učinkovitost ekološke zaštite dala je sorta Priam u odnosu na kontrolu u obje ispitivane godine. Sorte Enterprise, Realka, Rene, Rewena i Topas potvrdile su svoju apsolutnu otpornost prema glavnim bolestima jer su i u kontroli pokazale maksimalnu zdravstvenu ispravnost lista i ploda.

Ključne riječi: pogodnost, sorta, jabuka, ekološka zaštita bilja, bolesti

Suitability of varietes of apples in the system of ekological protoection

Vesna Tomaš, Krunoslav Dugalić

Agricultural Institut Osijek, Južno predgrađe 17, Osijek, Croatia (vesna.tomas@poljinos.hr)

Summary

On the Agricultural Institute Osijek conducted two year reaserch(2011/12.) aimed at surching suitability of varietes in the system of ekological production and efficiency of ekological protection product on the tested varieties on two major apple diseases *Venturia inaequalis* and *Podosphaera leucotricha.* The study included standard varietes in Republic of Croatia, a total of sixteen varites and fourtheen varieties that proved to be tolerant to major diseases. The results of this two year study showed that the standard variety can not compete with tolerant varieties in ekological production . Elstar variety showed the best response to the effectiveness of ekological protection product to protect the fruit from *Venturia inaequalis* and *Podosphaera leucotricha* during both reaserch years. Among tolerant varieties, the variety Priam confirmed as the best in ecological protection terms compared with control. The varieties Enterprise, Realka, Rene, Rewena and Topas showed their absolute resistence to major diseases and in the control and showed their optimal health of leaves and fruit.

Key words: suitability, variety, apple, ekological plant protection, diseases

Utjecaj niske temperature na antioksidativni odgovor listova dvaju kultivara maslina uzgajanih na različitim supstratima

Tanja Žuna Pfeiffer[1], Ivna Štolfa[1], Mate Žanić[2], Nikola Pavičić[3], Vera Cesar[1], Hrvoje Lepeduš[4]

[1]*Odjel za biologiju, Sveučilište J. J. Strossmayera u Osijeku, Cara Hadrijana 8/A, Osijek, Hrvatska*
[2]*Geront d.o.o., Franje Tuđmana bb, Kaštel Novi, Hrvatska (mzanicst@yahoo.com)*
[3]*Agronomski fakultet Sveučilišta u Zagrebu, Svetošimunska 25, Zagreb, Hrvatska, profesor emeritus*
[4]*Poljoprivredni institut Osijek, Južno predgrađe 17, Osijek, Hrvatska*

Sažetak

Maslina je jedna od najvažnijih kultiviranih biljaka mediteranskog podneblja. S ciljem utvrđivanja razlika u otpornosti listova dvogodišnjih stabala maslina (*Olea europea* cv. Leccino i cv. Oblica) uzgojenih na različitim vrstama supstrata (tlo i kokosova vlakna), stabla su izložena niskoj temperaturi (-5 °C) jednu (12 h), dvije (24 h) i četiri (48 h) noći. Utvrđeno je da niska temperatura u listovima obje sorte maslina na oba supstrata dovodi do porasta koncentracije H_2O_2, intenziteta lipidne peroksidacije i koncentracije proteinskih karbonila. Aktivnosti katalaze i askorbat-peroksidaze mijenjale su se ovisno o kultivaru, vrsti supstrata i periodu izloženosti niskoj temperaturi. Listovi oba kultivara maslina uzgojenih na supstratu od kokosovih vlakana imali su bolji antioksidativni odgovor na nisku temperaturu vjerojatno zbog visokih koncentracija dušika i fosfora utvrđenih u supstratu.

Ključne riječi: maslina, katalaza, askorbat-peroksidaza, niska temperature

The influence of low temperature on antioxidative leaf response of two olive cultivars grown on different substrates

Tanja Žuna Pfeiffer[1], Ivna Štolfa[1], Mate Žanić[2], Nikola Pavičić[3], Vera Cesar[1], Hrvoje Lepeduš[4]

[1]*Department of Biology, University of J. J. Strossmayer in Osijek, Cara Hadrijana 8/A, Osijek, Croatia*
[2]*Geront d.o.o., Franje Tuđmana bb, Kaštel Novi, Croatia (mzanicst@yahoo.com)*
[3]*Faculty of Agriculture, University in Zagreb, Svetošimunska 25, Zagreb, Croatia, professor emeritus*
[4]*Agricultural Institute Osijek, Južno predgrađe 17, Osijek, Croatia*

Summary

Olive is one of the most important cultivated Mediterranean plants. In order to determine the differences in cold resistance of two, two-years-old olive cultivars (*Olea europea* cv. Leccino and cv. Oblica) growing on different types of substrates (soil and coconut fibres), the trees were exposed to low temperature (-5 °C) for one (12 hours), two (24 hours) and four (48 hours) nights. The results showed that low temperature caused an increase in H_2O_2 concentration, level of lipid peroxidation and carbonyl protein content in both cultivars and on both substrates, respectively. The catalase and ascorbate peroxidase activities significantly varied depending on the cultivar, the substrate type and the time of exposure to low temperature. Both cultivars growing on coconut fibres showed a better antioxidative response to low temperature, probably due to the higher nitrogen and phosphorus concentration established in this type of substrate.

Key words: olive, catalase, ascorbate peroxidase, low temperature