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Effect of cutting severance date on rooting success and Bio-algeen S-90 application on further growth of cherry laurel *Prunus laurocerasus* L.

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Abstract

Cherry laurel (*Prunus laurocerasus* L.) mostly used in horticulture for planting as living hedge, was propagated vegetative by cuttings. The aim of this research was to clear the influence of cutting severance date on rooting ratio and effects of biostimulants using in further cultivation of rooted cuttings. Measured parameters were: the number of rooted cuttings, the number of cuttings with callus formation and the number of not successfully survived cherry laurel cuttings. The results indicated significant influence of severance date of successful rooting of cuttings. Rooting rate ranged between 94-98% for cuttings taken in middle till end of October and 40-79% for cuttings taken in November. A significant effect of Bio-algeen S-90 used foliar in concentration of 0.2% was detected on plant height after 14 days cultivation. After six week cultivation, a significant effect in the watering treatment in 1.0% concentration of Bio-algeen S-90 on the plant height was detected. Although, we found no significant difference in leaf number between control, foliar treatment 0.2% and watering with 1.0% Bio-algeen S-90 after 14 days cultivation but, a significant effect of leaf number in watering treatment, six weeks after application period was confirmed.

Key words: vegetative propagation, leafy cuttings, greenhouse, biostimulants

1 Introduction

Cherry laurel is an evergreen, perennial, woody shrub or tree belonging to the botanical family *Rosaceae*. It is an autochthonous species in Asia (EMEA, 1999) and in the South East Europe (Rao et al., 2008), rather in Anatolia, Caucasus and northern Iran (Schölke and Walther, 2014) and is introduced in wide ranges of temperate climate. Cherry laurel, as broad leaf evergreen, is economically important landscape and horticultural plant (Dirr and Lindstrom, 1990). Many of western and northern European countries follow its dispersal in the nature. In Swiss, cherry laurel is reported as species with rising abundance in their temperate forest and tendency to be invasive (Hättenschwieler and Körner, 2003). On the other hand, Ireland already indicated *Prunus laurocerasus* and *Rhododendron ponticum* as invasive and has introduced control measures for this species (Maguire et al., 2008). *Prunus laurocerasus* belongs to the group of toxic species. It is well known, that species belonging to genus *Prunus* contain cyanogenic glycosides. Leaves of cherry laurel contain 1.0 to 2.5% cyanogenic glycosides, 0.05% essential oil, 1.0% urosolic acid, flavonoids, caffeic and p-coumaric acid, 3.5% lipids and 5-7% ash. The whole plant (leaves, stems, fruits) is actually toxic. The toxicity is attributed to the cyanogenic acid liberated from cyanogenic glycosides (EMEA, 1999). The main toxic glycoside is prunasin (Hérissey, 1907) and sambunigrin (EMEA, 1999). Owing to the bioactive substances, the leaves are used for homeopathic purpose in human (Rao et al., 2008) and veterinary medicine (EMEA, 1999), as for preparation of homeopathic mother tincture according to homeopathic pharmacopoeias. The mother tincture is used, as well as in lower dilutions, for homeopathic treatments for heart diseases, for eye lotions or as antispasmodic (Rao et al., 2008). Leaf extract showed also antifungal effect on bread spoilage fungi, especially against *Fusarium oxisporum* (Sahan, 2011). Earlier investigation showed that the seeds of cherry laurel contain 44,40 % oil on the dry basis, mostly oleic, linoleic and palmitic fatty acid and can be potentially used as renewable source of plant oil for industry purposes (Erciyes et al., 1995). On the other hand, the fruits of selected cultivars in Turkey eg '*Kiraz*' or '*Su*' (Schölke and Walther, 2014) are consumed as fresh, dried, prepared in jam, or as stewed fruit (Yazici at al., 2009). Althought the fruit cherry laurel is edible, it hasn't found its usage within in the group of useful plants for preservation of biological diversity in urban areas (Pohajda, 2008). In Croatia cherry laurel is mostly used for horticultural purposes, for planting as living hedge, because of its decorative dark green, glossy leaves, fragrant flowers and dark fruits. It is fast growing, shade and hedging tolerant (Ribeiro et al., 2010). In arboretum Lisičine there is the richest dendrology collection of cultivars and forms of cherry laurel (Idžojtić et al, 2010). There exist some of the cultivars and different forms of cherry laurel that are naturally spread in the area of East Europe. In the area of East Europe there are three natural sources. These are Strandži mountain in southeast Bulgaria, Šipka mountain in central Bulgaria and Oštrozub in southeast Serbia. The natural source of cherry laurel in Oštrozub was found in the early 1886. by botanicist Josif Pančić. The spreading of wild cherry laurel in the nature is connected with winter hardness, namely, it is limited with +2°C January isotherm (Schölke und Walther, 2014). Although, cultivated forms showed in an experiment better cold tolerance, especially cultivars *´Zambeliana´* and '*Schipkaensis Macrophylla*' (Dirr and Lindstrom, 1990). The sprouts of both cultivars were froze only under -32°C (Dirr and Lindstrom, 1990). The distribution of cherry laurel in the nature is endozoochor through fruit consumation mostly by bluebirds, but also mice seem to play a role in dispersal of this species (Schölke and Walther, 2014).

For horticultural usage, propagation of cherry laurel is mostly vegetative by cuttings, although, propagation with seeds is possible. Generative propagation takes longer time to get mature plant and doesn't guarantee the same traits as plant output. This research aims to clear the influence of cutting severance date on rooting rate, as well as, to prove the effect of biostimulator treatments on further growth of rooted cuttings.

2 Material and Methods

The practical experiment was conducted in late autumn 2008, in a non heated plastic greenhouse of the Agricultural Department in Poreč, Polytechnic of Rijeka, Croatia. The leafy cuttings of cherry laurel were collected from healthy, well developed cherry laurel shrubs in five different dates during October and November 2008 (18.10., 25.10., 01.11., 15.11. and 22.11.). By the selection of the cuttings, special care was given to the cuttings maturity, i.e. basis of the cutting had to be wooden. The cuttings in the length of approximately 15 cm were prepared for rooting by defoliation on their basis. A crossways cut on the basis of cuttings was performed. Additionally, 2 cm of cutting end was dipped in the hormonal powder Germon with 075% of NAA (α-naphthalenacetic acid). After this procedure, cuttings were put in the wooden boxes filled with special Klasmann peat rooting media. At last, the boxes were covered with the transparent PVC film to maintain uniform temperature and humidity, daily controlled and watered as needed. The measured parameters were the number of rooted cuttings, the number of cuttings with callus formation and the number of not successfully survived cherry laurel cuttings. After evaluation of rooting success, rooted cuttings were planted in the 12 cm tops filled with common growth media Klasmann 2. Jung plantlets were twice treated with Bio-algeen S-90, the first group of double foliar treatment in concentration of 0.2%, the second group of double watered with 1.0% concentration. Last group was the control group without treatment, only watered with tap water. Each group contained eight plants in six repetitions. For evaluation of Bio-algeen S-90 treatments we monitored plant height and leaf number per plant.
Experimental data were statistically analysed using Chi-square test for evaluation of significant differences between all pairs of rooting taking data. Classical ANOVA according to F-test with additional Tukey test for multiple comparison between groups were applied for evaluation of Bio-algeen S-90 treatments by $p \leq 0,05$.

3 Results

3.1 Rooting ratio, callus formation and not rooted cherry laurel cuttings

Cuttings from the severance period in October developed callus after ten days already. After twenty days, they began to form first adventive roots.

Table 1 –Rooting length in days

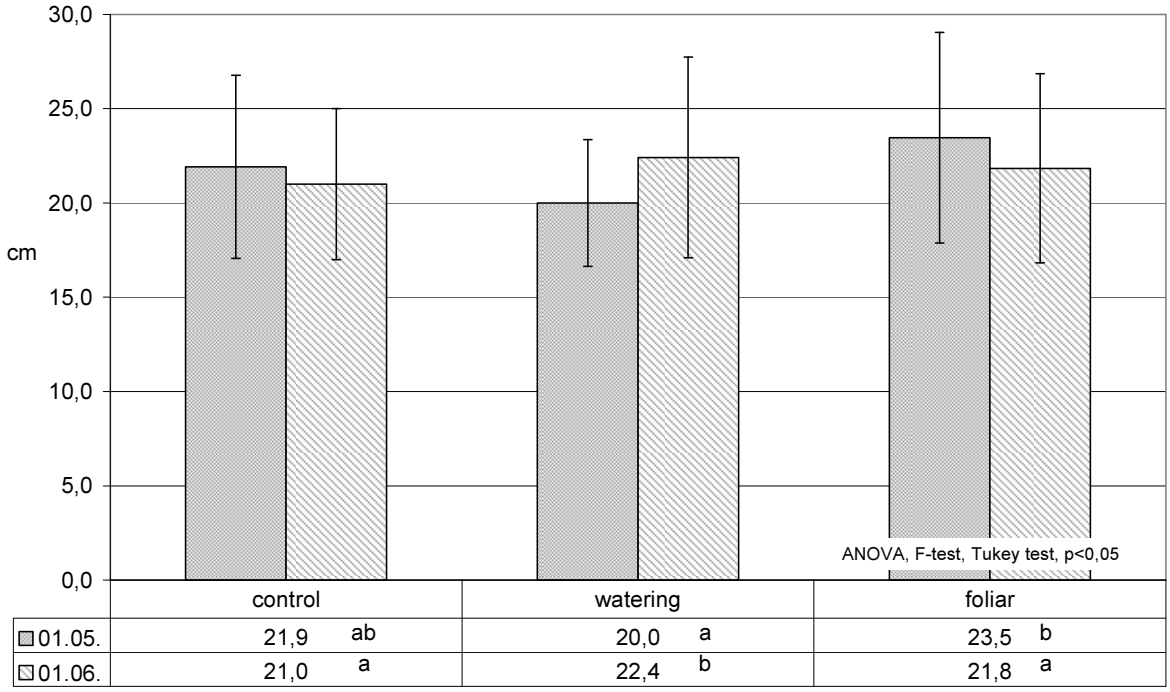
cuttings severance	control - rooting success	rooting period (day)	cuttings with root (n)	cuttings with callus (n)	cuttings without callus and root (n)	number of cuttings -total- (n)	*Sig.* p<0,05*
18.10.	13.04.	**177**	82	12	6	100	*a*
25.10.	13.04.	**170**	88	10	2	100	*a*
01.11.	13.04.	**163**	67	9	24	100	*b*
15.11.	13.04.	**156**	73	6	21	100	*b*
22.11.	13.04.	**149**	29	11	60	100	*c*

* *Chi -square test*

Rooting ratio ranged between 40% and 98%, significant highest rooting rate were proved for cuttings taken at the 18th and 25th October. Significantly lower rooting rates were achieved for cuttings taken in November (Table 1). Yazici's et al. (2009) reported about high rooting ratio of cherry laurel in Turkey. In their experiment rooting ratio ranged between 80% and 90 % for semi hardwood cuttings of three different cherry laurel genotypes.

3.2 Effects of Bio-algeen S-90 treatments in further cultivation of cherry laurel

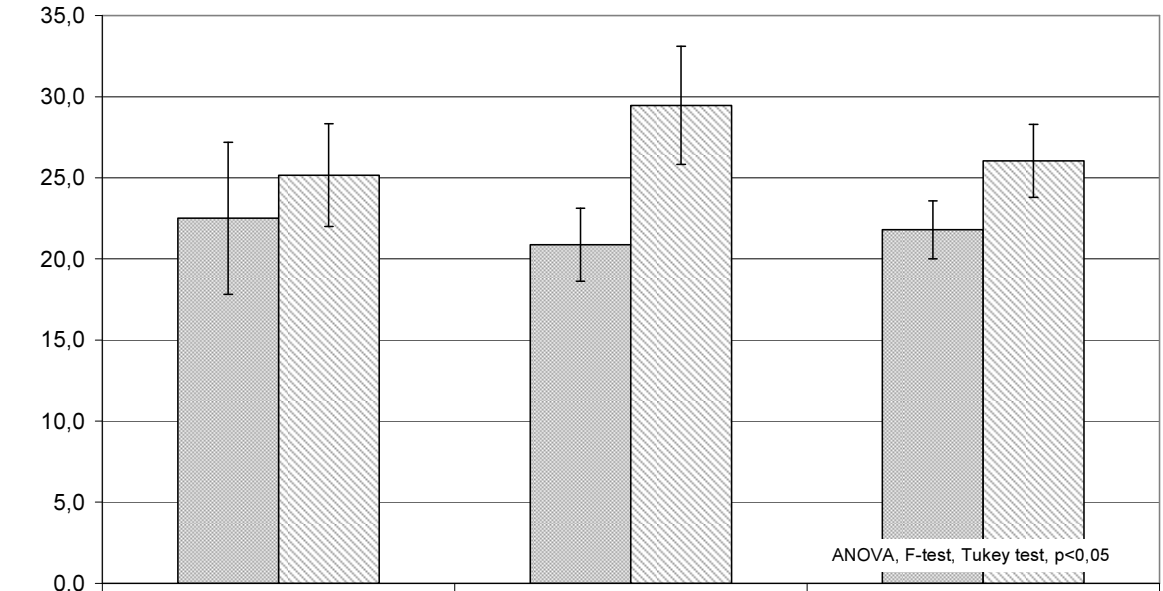
Well rooted cuttings from the first and second rooting period were used as plant material for second part of the research, for the evaluation of Bio-algeen S-90 application in further cultivation of cherry laurel. Statistical analysis confirms positive growing rate in the plant height for double foliar application of Bio-algeen S-90 in concentration of 0.2% compared to the control and double watering with 1.0% after 14 days cultivation (measured on 1st May). After six weeks of cultivation (1st June), a significant effect on plant height in the watering treatment of 1% Bio-algeen S-90 was confirmed (Figure 1).



	control	watering	foliar
01.05.	21,9 ab	20,0 a	23,5 b
01.06.	21,0 a	22,4 b	21,8 a

Figure 1 Height of cherry laurel plant in cm

Application of Bio-algeen S-90 didn't affect leaf number after short period of cultivation (14 days – measured on 1st May), but showed significantly positive effect of watering with 1% Bio-algeen S-90 solution on leaf number after six week cultivation in cool plastic greenhouse (Figure 2).
These results are in accordance with research of Dobromilska et al. (2008) conducted in greenhouse production of cherry tomato with double and triple spraying of Bioalgeen S-90 in concentration of 0.3%. The application of Bio-algeen S-90 increased significantly total and marketable yield of cherry tomatoes. Kwiatkowski and Juszczak (2011) used 1% Bio-algeen S-90 solution in basil (*Ocimum basilicum* L.) cultivation. Biostimulant in 1.0% concentration positively influenced the plant height, the shoot number and the total yield of basil, but had negative effect on the essential oil content. Positive effect of Bio-algeen S-90 application on cherry laurel growth as well as results of investigation of Dobromilska et al. (2010) and Kwiatkowski and Juszczak (2011) aren't in accordance with investigation of Dudaš and Šestan (2014) conducted on Franch marigold (*Tagetes patula* L.) cultivated in cold plastic greenhouse.



	control		watering		foliar	
01.05.	22,5	a	20,9	a	21,8	a
01.06.	25,2	a	29,5	b	26,0	a

Figure 2 Leaf number of cherry laurel plant

The use of Bio-algeen S-90 in 0.2% for double foliar spraying and 0.5% for double watering of French marigold in 10 cm pots hasn't showed any positive effects on plant height, leaf number as well as on buds and flower number. Similar results were obtained by Kažimir et al. (2011) in cucumber (*Cucumis sativa* L.) greenhouse cultivation during the summer period. A positive effect was proved only in autumn peirod of cucumber cultivation.

4 Conclusion

- Statistical analysis of data upraised in this research indicated significant influence of cuttings defining date on rooting success of cherry laurel.
- Rooting rate of cuttings harvested from the middle till the end of October ranged between 94-98% and were statistically higher than rooting rate of cuttings harvested in November, when rooting ranged between 40% and 79%.
- We found a significant effect of Bio-algeen S-90 foliar treatment in concentration of 0.2% on plant height already after 14 days of further cultivation, and significant effect of the watering treatment only after 6 weeks of cultivation.
- There are no significant differences in leaf number per laurel plant between control, foliar treatment 0.2% and watering with 1.0% Bio-algeen S-90 after the short cultivation period. After six weeks of cultivation, plants in watering treatments with 1.0% Bio-agleen S-90 developed significantly more leaves than plants in the control and in the foliar treatment.
- Application of Bio-algeen S-90 in 1.0% solution through watering is better method as foliar application in 0.2% concentration.

References

Dirr, M. A., Lindstrom, O. M., 1990, Leaf and Stem Cold Hardiness of 17 Broadleaf Evergreen Taxa, Journal of Environmental Horticulture, 8(2), 71-73

Dobromilska, R., Mikiciuk, M., Gubarewitz, K. (2008) Evaluation of Cherry Tomato Yielding and Fruit Mineral Composition After Using of Bio-algeen S-90, Journal of Elementol., 13 (4), 491-499

Dudaš, S., Šestan, I., 2014, Effect of seedlings growing technology and Bio-algeen S-90 application on plantlets quality of french marigold (*Tagetes patula* L.) 'Orange Boy', accepted for publication in 2. Collection of Polytechnic of Rijeka (2. Zbornik Veleučilišta u Rijeci), 2014., 10p

EMEA (The European agency for the evaluation of medicinal products), 1999, Prunus laurocerasus - Summary report, Veterinary medicines evaluation unit, http://www.ema.europa.eu/docs/en_GB/document_library/Maximum_Residue_Limits_-_Report/2009/11/WC500015796.pdf from 13.04.2014

Erciyes, F.T., Tüter-Erim, M., Kabasakal, O.S., Dandik, L., 1995, Seed Oil Characteristics of *Onopordum tauricum* Willd. and *Prunus laurocerasus* L., Fat.Sci.Technol.,97,10, 387-388

Hättenschwieler, S., Körner, C., 2003, Does elevated CO2 facilitate naturalisation of the non-indigenous *Prunus laurocerasus* in Swiss temperate forests? Functional Ecology, 17, 778-785

Hérissey, H., 1907, Ueber das Prulaurasin, das Blausäure liefernde Glycosid aus den Blättern von *Prunus laurocerasus*, Archiv der Pharmazie, Volume Bd. 245, Deutscher Apotheker Verlag, 463-468

Idžojtić, M., Zebec, M., Poljak, I. (2010) Revitalizacija arboretuma lisičine. Šumarski list, 1-2, CXXXIV, 5-8

Kažimir, Z., Parađiković, N., Balićević, R., Perica, S., Ravlić, M. (2011) Utjecaj biološke zaštite na prinos krastavaca pri suzbijanju cvjetnog štitastog moljca (*Trialeurodes vaporariorum* Westwood), Agronomski glasnik, 6, 305-315

Kwiatkowski, C., Juszczak, J. (2011) The response of sweet basil (*Ocimum basilicum* L.) to the application of growth stimulators and forecrops, Acta Agrobotanica, 64 (2), 69-76

Maguire, C.M., Kelly, J. and Cosgrove, P.J., 2008, Best Practice Management

Guidelines Rhododendron *Rhododendron ponticum* and Cherry Laurel *Prunus laurocerasus*. Prepared for NIEA and NPWS as part of Invasive Species Ireland.

Pohajda, I., 2008, Useful vegetation of urban green areas to preserve bio-diversity. Maintenance of open spaces, protection of nature in urban areas, Society for Cultural Landscape, Zagreb, 78-79

Rao, P.P., Reddy, K.J., Gupta, H.C., 2008, Pharmacognosy of *Prunus laurocerasus* Linn - A Homeopatic Drug, Indian Journal of Research in Homeopathy, 2, 3, 6-9

Ribeiro, M.M., Collado, L.M., Antunes, M.A., 2010, The influence of indole 3 butric acid in *Prunus laurocerasus* vegetative propagation. ISHS Acta Horticulturae 885, 277-283

Sahan, Y., 2011, Effect of *Prunus laurocerasus* L. (Cherry laurel) leaf extracts on growth of bread spoilage fungi, Bulgarian Journal of Agricultural Science, 17, 1, 83-92

Schölke, G., Walther, D.-R., *Prunus laurocerasus* L. (*Rosaceae*), (Pontische) Lorberkirsche. Steckbrief, Institut für Geobotanik, Universität Hannover, http://www.unics.uni-hannover.de/Geobotanik/Steckbrief-Prunus-laurocerasus.pdf , from 15.04.2014

Yazici, K., Dal, B., Gozlekci, S., Kaynak, L. and Ersoy, N. 2009, Effects of cutting type and duration time on rooting of three cherry laurel (*Prunus laurocerasus* L.) genotypes, Acta Hort. (ISHS) 818:199-204