

Morphological and Micro
morphological
characteristics of carob seeds
(*Ceratonia siliqua* L.) of “Komiža”
Ecotype, Population of Drvenik Mali
Island

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Kvaternjak

Introduction

- Carob tree (*Ceratonia siliqua* L.) $2n = 24$, is a plant belonging to the Fabaceae family (Ekinçi, Yilmaz and Ertekin, 2010).
- Carob tree is a perennial leguminous evergreen tree native to the coastal regions of Mediterranean basin and southwest Asia, and is considered to be an important component of vegetation for economic and environmental reasons (Karababa and Coşkuner, 2013).
- The ancient Greeks brought it from its native Middle East to Greece and Italy, and it was also disseminated by the Arabs along the North African coast and north into Spain and Portugal, Carob has been neglected with respect to both cultural practices and research and development. It was spread in recent times to other Mediterranean-like regions such as California, Arizona, Mexico, Chile and Argentina by Spanish , and also to parts of Australia by Mediterranean emigrants and to South Africa and India by the English (Akbulut and Bayramoglu, 2013; Rababah et al., 2013).

Introduction

- In the 4th century A.D. the Roman and Byzantine weight for carat was based on the weight of the seed of the carob tree (Oddy and La Niece, 1986).
- However, the variability of pre-metrication carat weight standards is also around 5% suggesting that human rather than natural selection gave rise to the carob myth (Turnbull et al., 2006).

Introduction

- **Carob seeds are very important source of Galactomannans → Carob gum (E410) → important role in food and pharmaceutical industry!**
- Galactomannans are polysaccharides consisting of a mannose backbone with galactose side groups (more specifically, a (1-4)-linked beta-D-mannopyranose backbone with branchpoints from their 6-positions linked to alpha-D-galactose, i.e. 1-6-linked alpha-D-galactopyranose).

Introduction

- Due to a breeding objectives for carob (Batlle and Tous, 1997) the aim of this research is to find the variability in morphological and micro morphological characteristics of carob seeds (*Ceratonia siliqua* L.) of “Komiža” Ecotype, within population of Drvenik Mali island.
- These research were conducted during the year of 2014 which was the first year of four annual research project TEUCLIC “Taxonomy, ecology and utilization of carob tree and bay laurel in Croatia”. Supported by Croatian Foundation for Science. IP-2013-11-3304.

Location of Drvenik Mali island

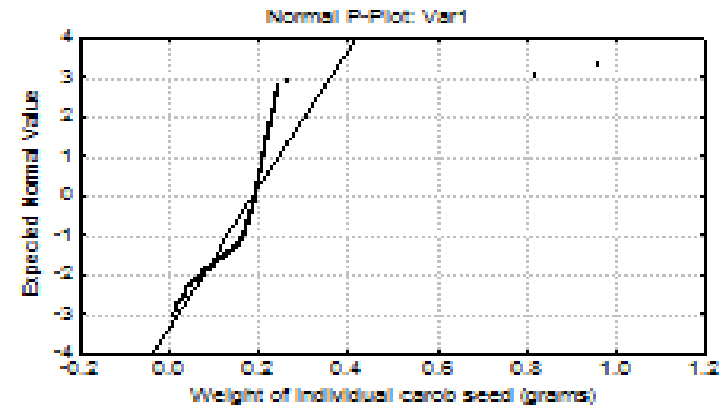
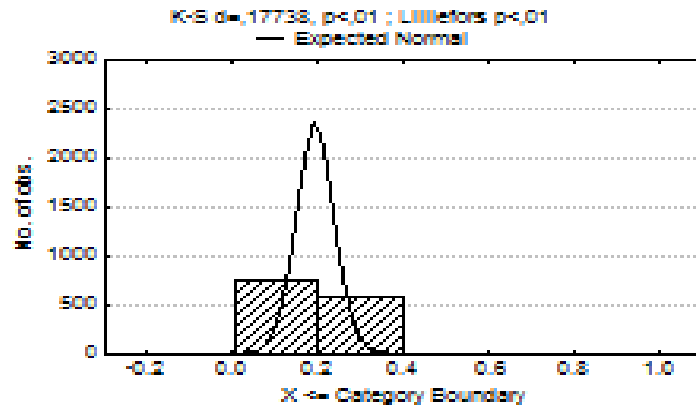


Materials and methods

- The samples of carob pods and leafs were collected during the September of 2014 in phase of maturity. Altitude and latitude of every location of habitat were determined by GPS locator (Voucher No. for every plant). **N=1309** (a very huge sample!)
- Standard morphometrical methods (analitical balance Mettler Toledo and caliper)
- Micrographic analysis was performed using a binocular magnifier Carl Zeiss – Stemi 2000-C at 2x magnification and a binocular microscope Carl Zeiss Axiolab with normal and phase contrast objective (Ph2) (Carl Zeiss Microscopy, Jena, Germany) at 4x and 40x magnification.
- Statistical analysis was performed by standard descriptive statistics, using the Statistica SixSigma software.

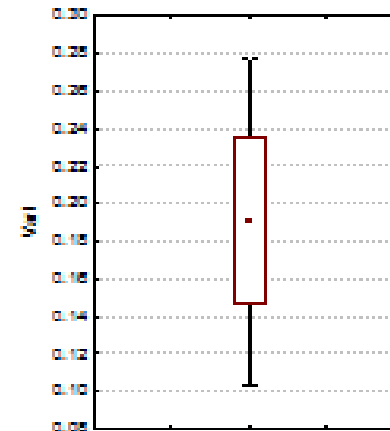
Results and discussion

Parameters of descriptive statistics for weight of carob tree (*Ceratonia siliqua* L.) individual seeds of "Komiža" ecotype, population of Drvenik Mali island (N=1309)



Summary Statistics: Vari

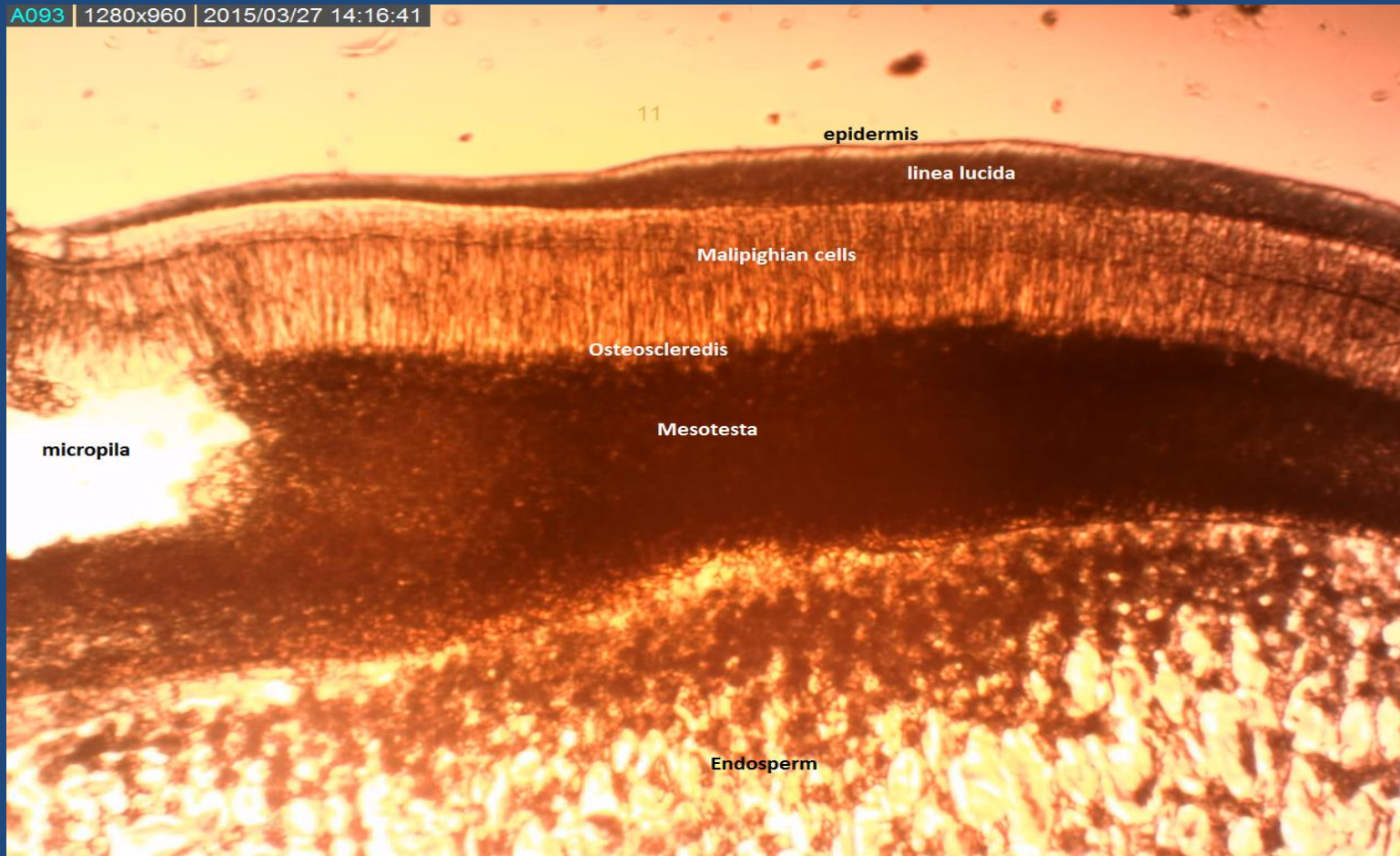
Valid N=1309	Lower Quartile= 0,182200
% Valid obs.= 88,625592	Upper Quartile= 0,209800
Mean= 0,190792	Percentile 10,00000= 0,154600
Confidence -95,000%= 0,188388	Percentile 90,00000= 0,220700
Confidence 95,000%= 0,193198	Range= 0,996700
Trimmed mean 5,00000%= 0,193640	Quartile Range= 0,027600
Winsorized mean 5,00000%= 0,191223	Variance= 0,001958
Grubbs Test Statistic= 17,553280	Std.Dev.= 0,044334
p-value= 0,000000	Confidence SD -95,000%= 0,042688
Geometric Mean= 0,184852	Confidence SD +95,000%= 0,046101
Harmonic Mean= 0,172797	Coef.Var.= 23,236854
Median= 0,197200	Standard Error= 0,001225
Mode= 1,000000	Skewness= 5,274714
Frequency of Mode= 9,000000	Std.Err. Skewness= 0,067625
Sum=249,746700	Kurtosis=104,732252
Minimum= 0,012300	Std.Err. Kurtosis= 0,135148
Maximum= 0,999000	



In our case CV=23.23 % which corresponds with the results of Turnbull et al. 2006 (CV=23 %)

Results and discussion

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Except our microphotograph of carob seed anatomy, there isn't any other microphotograph of anatomy of carob seed in literature. Except one drawing in: "Plant Anatomy", Fahn (1990), which is also cited by Derek et al. in: Encyclopedia of Seeds (2006).

Why these researches are important?

- Yesterday (Monday, September 14) it was a round table – Do we still need classical botany?
- My answer is: - Yes, we do!
- Why? Carob tree (*Ceratonia siliqua* L.) is nutritionally and protectively very valuable plant and without knowledge about its botanical characteristics, development of carob tree production will be strictly limited.
- However, development of production of carob in Croatia might have a positive impact on economical and consequently demographical revitalization of Croatian islands.
- Unfortunately, in last decade, because of aggressive urbanization of Croatian islands, a lots of carb trees has been reclaimed. So, one of the specific goals of this project is to stop that tendency, because the carob tree is one of the important economic resources of Croatian islands.
- And not to mention the environmental influence.

Acknowledgment

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Thank you!

