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VALUABLE SWEET CHESTNUT SELECTIONS (*Castanea sativa* MILL.) FROM EPIRUS – GREECE AND NORTHERN OLTENIA - ROMÂNIA

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ABSTRACT. *The Epirus region in Greece and Northern Oltenia in Romania are areas where the species Castanea sativa Mill. reproduces exclusively by seeds resulting in natural hybrids. For this reason, each plant is a hybrid with a unique genotype and specific phenotype. Following the undertaken study in the two areas a total number of 48 genotypes (30 in Epirus and 18 in Northern Oltenia) were identified and selected. Their selection is based on growth and fruiting characteristics thus revealing their value as genetic resources and even for propagation and growing in commercial orchards. In particular the Epirus selections emphasized large fruits and quality kernels. Most of the Epirus sweet chestnut selections showed no symptoms of infestation by Phytophthora sp. (27 selections) or by Cryphonectria parasitica (25 selections). Only five of the selections from northern Oltenia are infested by Cryphonectria parasitica. Selections will be propagated and introduced into a germplasm collection and 4-6 of them will be recommended for direct use in commercial orchards.*

KEYWORDS: *Castanea sativa, sweet chestnut, diversity, selections*

INTRODUCTION

European or sweet chestnut (*Castanea sativa* Mill.) is a species found in more than 25 countries in Europe (Figure 1). Chestnut has particular

importance due to high nutritional value of its fruit, nectar secreted by the male flowers, valuable pollen and precious wood used in outdoor construction and furniture. Nowadays, there is a trend of increasing chestnut areas and production on the global scale due to the great demand by the human society (Petenella, 2001). Statistical data concerning the year 2011 indicate 540,732 ha of chestnut (including forest areas) and a chestnut fruit production of 2,023,019 t (FAO Stat Database, 2013).

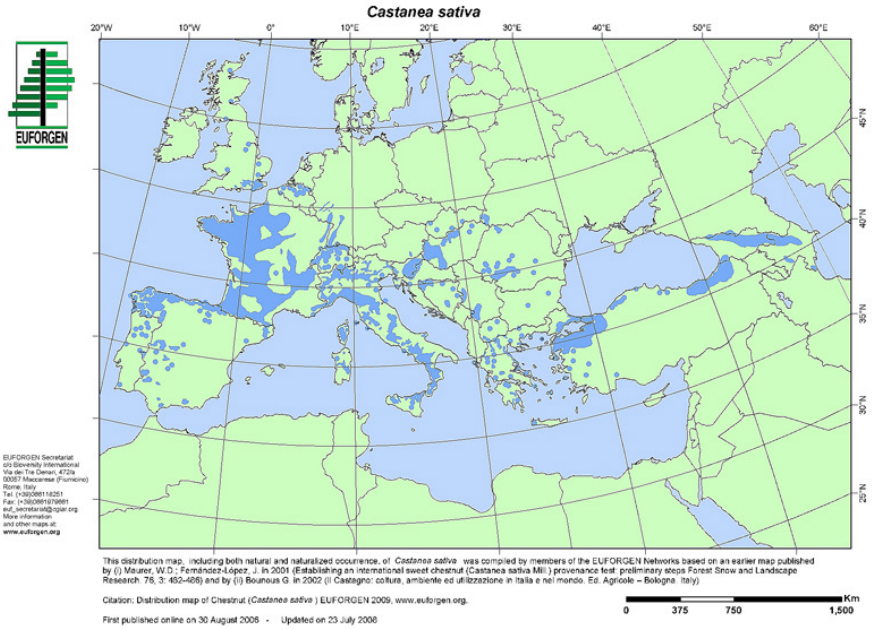

Figure 1. Distribution map of sweet chestnut (*Castanea sativa*). (Source: EUFORGEN, 2009. www.euforgen.org)

Modernizing sweet chestnut cultivation is particularly correlated with the planting material for orchard establishment, its resistance to diseases, the degree of adaptability to environmental conditions from the areas of culture, the level of productivity, and fruit quality. The major problems faced by all

chestnut growing countries are caused by chestnut blight (*Cryphonectria parasitica*) and ink disease (caused by *Phytophtora cambivora* and *Phytophtora cinnamomi*), but also massive overexploitation for wood (Anselmi et al., 1996; Vannini et al., 2002; Bounous et al., 2002). Sweet chestnut is present in many areas of Greece and on a much smaller scale in Romania (Botu et al., 1999). Most of the chestnut trees are natural hybrids on their own roots propagated through seeds thus exhibiting high genetic variability.

The present paper focuses on exploring, identifying, evaluating and selecting sweet chestnut valuable chestnut genetic resources from Epirus - Greece and Northern Oltenia – Romania for introducing and conserving them in germplasm collections. Moreover, they should be used directly for commercial production by the chestnut growers.

MATERIALS AND METHODS

The biological material forming the basis of this work consists of 30 chestnut selections from Epirus and 18 selections from Northern Oltenia. They were selected from the natural hybrid populations from different localities within these two regions. The selected trees are aged from 10 to 96 years. Each selection consists of one individual tree, which will be clonally propagated for introducing it into collections and for further evaluation.

The research methods used for this study were directed for the identification and localization of the sweet chestnut selections using a GPS device; data collection on tree growth comprising growth vigor, trunk cross-sectional area, crown diameter, tree height and crown volume, vegetative and fruiting phenology, fruiting characteristics as well as morphological and biochemical characteristics of fruits.

RESULTS AND DISCUSSION

The Epirus region in Greece and the northern part of the Oltenia region in Romania are known for their tradition in sweet chestnut growing. Because chestnut trees reproduced almost exclusively in the course of time via the

generative way by seeds in these two regions, large sweet chestnut populations have formed consisting of natural hybrids, which are very valuable as genetic resources, but they also have the potential to be used directly for establishing commercial orchards.

Taking into account that the climatic and soil conditions are different in the two areas the most valuable selections should be used in commercial farms within their areas of origin. The 30 selections originating from Epirus and the 18 selections from Northern Oltenia were chosen from individual trees, which do not exhibit infestation symptoms of chestnut blight (*Cryphonectria parasitica*) and ink disease (*Phytoptora* sp.) at the time of selection. In the four years of this study a number of three selections from Epirus were infested by *Phytoptora* sp. and five selections by *Cryphonectria parasitica* while in Northern Oltenia five selections were infested by the *Cryphonectria parasitica* fungus causing chestnut blight disease.

All the 30 selections from Epirus and 18 from Northern Oltenia were assessed to be valuable genetic resources and should be introduced into the germplasm collections due to their distinct inherent characteristics. The selections from Epirus showed large fruits and quality kernels: EPR.04 (fruits of 18.5 g in average), EPR.05 (19.3 g), EPR.08 (18.5 g), EPR.16 (14 g), EPR.25 (15.1 g), and EPR.27 (14.1 g). Out of the sweet chestnut selections from Northern Oltenia, Horezu M.1 (fruits of 14.8 g), Horezu M.2 (16.5 g), Horezu M.3 (14.9 g), Bujoreni C.T3 (14.1 g) and Tismana T.1 selection (17.1 g) exhibited large fruits.

Among the sweet chestnut selections a total of four selections from Epirus and two from Northern Oltenia are particularly valuable to be used directly in the orchards following clonal propagation (Tables 1 to 6).

CONCLUSIONS

Both the Epirus and Oltenia areas are rich in *Castanea sativa* Mill. genetic resources, and in these two areas 48 genotypes were selected to be introduced into germplasm collections. The sweet chestnut selections are

Table 1. Characteristics of the EPR.4 sweet chestnut selection from Epirus (Greece)

Selection:	**EPR.4**	
Location:	Longitude:	$39^0 17' 34.11"$N
	Latitude:	$20^0$59'30.24"E
Tree characteristics	Tree vigor:	medium
	Tree habitus:	lax
	Precocity:	early (4-5 years)
	Productivity:	very good
	Bud break:	medium (09 - 24 April)
	Blooming time:	late (25.05 – 18.06)
	Dichogamy:	protandrous
	Type of male flowers:	longistaminate
	Phytosanitary status:	good
Fruit characteristics	Shape:	oblong
	Color:	dark - brown
	Caliber:	large size (33.2 mm), heavy weight (20.5 g)
	Kernel ratio:	89.7%
	Ripening time:	01 -15 October
	General assessment:	selection with perspective of introduction into growing for pre-mountainous areas from Epirus (600-700 m elevation)

Table 2. Characteristics of the EPR.5 sweet chestnut selection from Epirus (Greece)

Selection:	**EPR.5**	
Location:	Longitude:	$39^0 17' 34.65"$N
	Latitude:	$20^0 59' 32.29"$E
Tree characteristics	Tree vigor:	medium (TCSA = 878 cm^2; crown diameter = 11.5 m, crown volume = 613 m^3)
	Tree habitus:	lax
	Precocity:	early (4-5 years)
	Productivity:	very good and constant
	Bud break:	medium (12 - 25 April)
	Blooming time:	late (25 April - 18 June)
	Dichogamy:	protandrous
	Type of male flowers:	longistaminate
	Phytosanitary status:	very good
Fruit characteristics	Shape:	round
	Color:	brown - reddish
	Caliber:	large size (33.7 mm), large weight (21.3 g)
	Kernel ratio:	96.7% (37.7% total sugar, 4.9% proteins, 2.7% lipids).
	Ripening time:	18 - 27 October
	General assessment:	very valuable selection to be planted into the new orchards from Epirus and surrounding area. It has to be clonally propagated.

Table 3. Characteristics of the EPR.8 sweet chestnut selection from Epirus (Greece)

Selection:	**EPR.8**	
Location:	Longitude:	$39^0 17' 35.52"$N
	Latitude:	$20^0 59' 32.72"$E
Tree characteristics	Tree vigor:	medium (TCSA = 1346 cm^2; crown diameter = 10.0 m, crown volume = 581 m^3)
	Tree habitus:	semi-erect
	Precocity:	early (4-5 years)
	Productivity:	very good and constant
	Bud break:	medium (06 - 18 April)
	Blooming time:	late (08 - 21 June)
	Dichogamy:	homogamous
	Type of male flowers:	longistaminate
	Phytosanitary status:	good, but the original population where was selected is attacked by *Cryphonectria parasitica* fungus
Fruit characteristics	Shape:	elliptic
	Color:	brown - reddish
	Caliber:	large size (33.7 mm), heavy weight (21.3 g)
	Kernel ratio:	97.0% (36.0% total sugar, 4.9% proteins, 2.6% lipids)
	Ripening time:	20 - 30 October
	General assessment:	high agro biological value, after clonal propagation the selection can be introduced into the sweet chestnut orchards from Epirus.

Table 4. Characteristics of the EPR.25 sweet chestnut selection from Epirus (Greece)

Selection:	**EPR.25**	
Location:	Longitude:	$39^0 18' 32.75"$N
	Latitude:	$20^0 59' 23.18"$E
Tree characteristics	Tree vigor:	medium (TCSA = 998 cm^2; crown diameter = 10.5 m, crown volume = 640 m^3)
	Tree habitus:	semi-erect
	Precocity:	early (3-5 years)
	Productivity:	very good and constant
	Bud break:	medium (01 - 16 April)
	Blooming time:	late (28 - 14 June)
	Dichogamy:	protandrous
	Type of male flowers:	longistaminate
	Phytosanitary status:	very good
Fruit characteristics	Shape:	round
	Color:	brown - reddish
	Caliber:	large size (30.4 mm), heavy weight (17.1 g)
	Kernel ratio:	91.8% (37.4% total sugar, 4.8% proteins, 2.1% lipids).
	Ripening time:	27 September - 15 October
	General assessment:	valuable selection for growing into orchards from Epirus and other zones with similar ecological conditions. Propagation of this selection will be done clonally.

Table 5. Characteristics of the Tismana T.1 sweet chestnut selection from Northern Oltenia

Selection:	**Tismana T.1**	
Location:	Longitude:	$45^0$04'23"N
	Latitude:	$22^0$57'32"E
Tree characteristics	Tree vigor:	medium (TCSA = 3017 cm^2; crown diameter = 10.6 m, crown volume = 899 m^3)
	Tree habitus:	lax
	Precocity:	early (4-5 years)
	Productivity:	very good and constant
	Bud break:	medium (20 - 30 April)
	Blooming time:	late (18 June - 10 July)
	Dichogamy:	protandrous
	Type of male flowers:	mezostaminate
	Phytosanitary status:	very good
Fruit characteristics	Shape:	round
	Color:	brown - dark
	Caliber:	large size (28.1 mm), large weight (17.1 g)
	Kernel ratio:	93.0% (35.6% total sugar, 4.7% proteins, 2.7% lipids).
	Ripening time:	30 September - 12 October
	General assessment:	valuable selection, which can be grown in orchards in micro zones with similar climatic conditions after clonal propagation

Table 6. Characteristics of the Horezu M.1 sweet chestnut selection from Northern Oltenia

Selection:	**Horezu M.1**	
Location:	Longitude:	$45^{0'}$10'18"N
	Latitude:	24^{0}00'22"E
Tree characteristics	Tree vigor:	medium (TCSA = 1133cm^2; crown diameter = 7.8 m, crown volume = 344 m^3)
	Tree habitus:	semi - lax
	Precocity:	early (4 - 5 years)
	Productivity:	very good and constant
	Bud break:	14 April - 03 May
	Blooming time:	medium - late (13 - 28 June)
	Dichogamy:	protandrous
	Type of male flowers:	mezostaminate
	Phytosanitary status:	very good
Fruit characteristics	Shape:	round - flat
	Color:	brown - dark
	Caliber:	large size (27.8 mm), large weight (14.8 g)
	Kernel ratio:	91.9% (36.5% total sugar, 5.1% proteins, 2.8% lipids)
	Ripening time:	25 September - 08 October
	General assessment:	the selection have valuable agrobiologic characteristics and can be promoted, after clonal propagation, into orchards from micro zones with similar climatic conditions

distinguished among each other by growth and fruiting characteristics, their respective adaptability to specific ecological conditions and by exhibiting good resistance towards the major chestnut diseases *Cryphonectria parasitica* and *Phytophthora cambivora*. Four selections from Epirus (EPR.4, EPR.5, EPR.8 and EPR.25) and two selections from Northern Oltenia (Tismana T.1 and Horezu M.1) exhibited superior agrobiological value and fruit quality. Due to their characteristics, these selections should be used directly after clonal propagation for establishing chestnut orchards by considering their areas of origin, thus being as valuable as other cultivars that are already present in culture.

REFERENCES

Anselmi, N., Giordano, E., Vannini, A., Troiani, L., Napoli, G. and Crivelli, L. (1996): Il Mal dell'Inchiostro del Castagno in Italia: Una Vecchia Malattia Ritorna Attuale. Linea Ecologica 28: 39–44.

Bounous, G. (2002): Il castagno. Coltura, Ambiente ed Utilizzazioni in Italia e nel Mondo. Ed. Edagricole, Bologna, Italia.

Botu, M., Achim, Gh. and Turcu, E. (1999): Evaluation of Some Chestnut Selections from the Population Formed into the Ecological Conditions from the North - East of Oltenia. Acta Horticulturae 494: 77-84.

Petenella, D. (2001): Marketing perspectives and instruments for chestnut products and services. Forest Snow and Landscape Research 76 (3): 511 – 517.

Vannini, A., Vettraino, A.M. and Anselmo, N. (2002): Patología. pp. 103–111. In: Il Castagno. Coltura, Ambiente ed Utilizzazioni. Bounous, G. (ed), Ed. Edagricole, Bologna.

****Euforgen (2009): Distribution map of chestnut (*Castanea sativa*). www.euforgen.org

****FAO Stat Database Web Page (2013): www.fao.org