SITUATION OF SWEET CHESTNUT (*CASTANEA SATIVA* MILL.) IN SPAIN, GALICIA: A REVIEW

L. Melicharová[1], O. Vizoso-Arribe[2]

[1]Czech University of Life Sciences Prague, Faculty of Forestry and Wood Sciences, Prague, Czech Republic
[2]University of Santiago de Compostela, Campus Lugo, Department of Agroforestry, Santiago de Compostela, Spain

The article describes the distribution of sweet chestnut (*Castanea sativa* Mill.) in the northern part of Spain – Galicia. This part of Spain, which is forested more than other parts of Spain, is characterized by high precipitations that make very favorable conditions for growth of chestnut. Chestnut can be found here in the orchards (plantations), coppice and natural forests. The species has been replaced by faster growing and more marketable tree species. These include *Eucalyptus globulus*, *Eucalyptus nitens*, *Pinus pinaster* Ait. and *Pinus sylvestris* L. Other problems are diseases which have attacked the chestnut stands. There are two most serious and most widespread – Ink disease that is caused by cinnamon fungus (*Phytophthora cinnamomi* Rands.) and cancer of chestnut bark (*Cryphonectria parasitica* Murr. Barr.). Ink disease or 'La tinta' as well as cancer 'El chancro' have spread throughout the Spain. Chestnuts have been growing in Spain especially for fruit; cultivation for wood is not very common, although it has an excellent hard wood and grows relatively quickly. Moreover, its growing-stock per one hectare exceeds the average. Chestnut is very attractive deciduous tree and it should be still counted with it in the future.

Castanea sativa Mill.; diseases; deciduous tree; fruit; sweet chestnut

INTRODUCTION

Sweet chestnut (*Castanea sativa* Mill.) is a multipurpose species that is cultivated for timber, nut, tannin, and contributes positively to the forestry landscape (Pereira-Lorenzo et al., 2009). It is a native tree of mountainous regions of Western Asia, North Africa and Southern Europe. The Atlantic regions of France, Spain and Portugal make up one of the most important areas of the native European chestnut species, *C. sativa* Mill. (Conedera et al., 2004; Krebs et al., 2004). From eastern European areas, first the Greeks and later the Romans, took part in spreading chestnut as a crop by grafting (Costa et al., 2005; Pereira-Lorenzo et al., 2006). The Romans are thought to have introduced the chestnut to Northern Europe (Conedera et al., 2004). Plantations were established with multiple local cultivars that had been selected by growers from wild populations (Costa et al., 2005; Pereira-Lorenzo et al., 2006) that provided high-quality nuts and timber (Pereira-Lorenzo et al., 2010).

The earliest record of chestnut cultivation is in Theophrastus' *Enquiry into Plants*, written in the 3rd century BC. However, pollen analysis from Insubria, the lakes area on the modern present Swiss-Italian border, shows *Castanea sativa* Mill. that occurred here 10,000 years ago onwards. During Roman times, chestnut cultivation took place in Insubria. Chestnut cultivation became common in many European countries during late Roman times and the Middle Ages (Conedera et al., 2004).

The distribution of chestnut in Spanish territory is disjoint, monospecific stands occupy 137,657 ha. The biggest range is in the north, between Galicia and Navarra, with 70% of the total. The grafted chestnut is dominant in the centre and east of Galicia; in Asturias dominates the low forest and high forest stands are developed as a result of recolonization processes (Fernández-López et al., 2005). In the region of Galicia, chestnut occupies an area of 28,689 ha (Ministry of Agriculture, Fisheries and Food, 1980), accounting for about 50% of the chestnut production in Spain. Most chestnut groves are grafted with nut cultivars, and in some areas there are dual purpose cultivars for nut and timber. Chestnuts have been grown in this region since the Middle Ages, and some of the current cultivar names date from that era (Justo et al., 1991).

The Third National Forestry Inventory Publisher in 2006 (www.mma.es) shows a total area of 124,053 ha of pure *C. sativa* forests and 55,416 ha of *C. sativa* mixed with other broadleaves (*Quercus robur*, *Cerasus avium*, *Betula celtiberica*, *Acer pseudoplatanus*, *Crategus* spp., *Sambucus nigra*, *Rosa* spp., *Ilex aquifolium* – survey by Melicharová, Vizoso, 2011). This inventory does not consider the area formed by the Canary Islands with 2,000 ha, or the provinces

of Zamora, Salamanca, Avila and Malaga, with an estimated surface 5,000 ha. (Pereira-Lorenzo et al., 2009).

The largest continuous area is the Northwestern region (Fig. 1), from Galicia to Navarra, occupying 70% of the total chestnut Spanish area (mentioned above), in this area is mainly Atlantic, increasing annual temperature oscillation from the coast to the mountains; besides in inland mountains of South Galicia and León temperature and summer drought are more extreme. Several discontinuous patches of chestnut grow under the Mediterranean climate in Central West Spain (12%), and in the South (10.3%). Extreme drought conditions occur in Sierra de Aracena and Guadalupe with a drought period close to 4 months. These patches, occupying a few thousand or hundred hectares, are separated by several hundred of kilometres and probably are reproductively isolated among them. Most areas occupied by mono-specific chestnut forests in Spain are coppices (36.0%) and orchards (37.5%), while high forest was very scarce in the past and is actually increasing. In the Northern area there are frequent processes of recolonization of abandoned agricultural lands and grafted chestnut orchards, while in the South natural regeneration is absent due to the intensive land use and perhaps to low survival of young seedlings under drought conditions (Fernández-López et al., 2005).

Also there is another factor with a great historical importance for landscape modeling: forest fires. During the second half of the 1970's, the 1980's and more recently, in the years like 2006, forest fires had a great impact on the previous reforestation efforts and originated extensive unproductive lands. It would be important to know the answer to one of the most important questions in the forest policies in the northwest Iberian Peninsula during the last decades: Which are the origin and the reason of these forest fires? There is no unique or simple answer. Several factors provide a part of the answer: the land property structure, the ignorance of the risks in forest lands, the rural people affect their land (special idiosyncrasy of the north rural people)… These factors draw a framework that can identify why during the last forty years the Galician forest fires represented more than a half of all Spanish forest fires (Xunta de Galicia, 2001). For example, during 1989 – 200,000 ha were burned only in Galicia. In Asturias almost 45,000 ha were burned during the most critical years as 1985 (Díaz-Maroto, Vila-Lameiro, 2008).

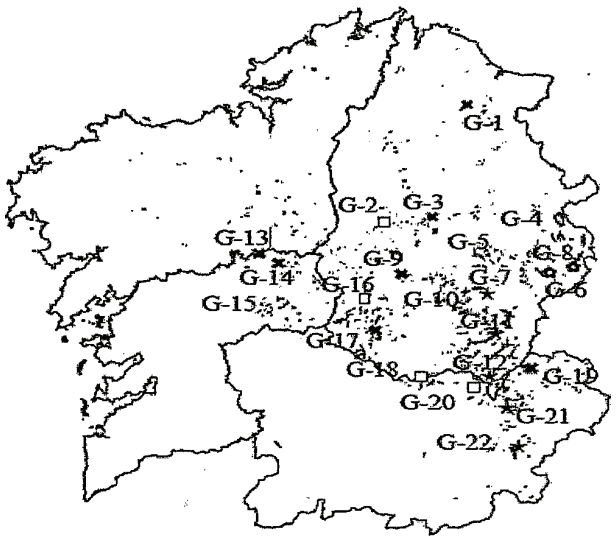

Fig. 1. Distribution map of chestnut forests in Galicia. Sample plots according to Blanco et al., (2000)

As it is known, these fires (especially grazing fires) imply the bush and partially the high forest destruction. The previous vegetation will be substituted by colonizing vegetation, being the first step of the herbaceous development. However, when there are superficial fires, several ligneous species or not desirable by cattle regenerate quickly generating dense bush. These bushes consist of *Pteridium aquilinum*, *Asphodelus albus*, *Erica australis*, *E. arborea* favour forest fire and also are favoured by repeated fires (Amaral, 1990; Lloret et al., 2002).

Fig. 1. Distribution map of chestnut forests in Galicia (Blanco et al., 2000)

Chestnut (*Castanea* sp.) belongs to the *Fagaceae* family and is a close relative of oaks and beech. The chestnut tree is a large, relatively fast-growing deciduous hardwood, similar to oak by its appearance. Male and female flowers are found on the same tree but cross-pollination is essential for good fruit set. There are many chestnut species but the most common and commercially important are *Castanea sativa* (European or Sweet chestnut), *C. crenata* (Japanese chestnut), *C. mollissima* (Chinese chestnut), and *C. dentata* (American chestnut). There are at least a further 16 species and many species hybridise freely. The nuts produced by the genus *Castanea* should not be confused with those produced by horse chestnuts (*Aesculus hippocastanum* L.) or the tubers formed by water chestnuts (*Trapa natans* L.) (Clover et al., 2011).

Soils suitable for sweet chestnut include humic and district Cambisols, haplic and district Luvisols and haplic Alisols (soil types according to the FAO's soil system). Nevertheless, in some districts of Spain, such as Asturias, Catalunya, and Extremadura, the dominant soils with chestnut coppices are humic Cambisols. This indicates that the best soil conditions for producting chestnut forests vary according to the different Spanish districts. Even these differ from the recommended criteria for France, which mainly refer to soil texture and water balance (Bourgeois, 1992). In all districts, however, soil suitable for chestnut should: (1) have a fair to high pluviometry with no soil dryness

during summer; (2) be deep with not too high content of stones and/or clays; (3) have good soil permeability; (4) be acid, but not too much; and (5) contain a fair amount of soil organic matter (Berrocal del Brio et al., 1998).

Chestnut tree in Spain could be found between the altitudes 500–1,200 m a.s.l. but in Sierra Nevada there are chestnuts at the altitude 1,500 m a.s.l. Climate for growing chestnuts is optimal humid. This tree is moderately heliophilous. Optimal precipitations range between 1,000–2,000 mm per year (Berrocal del Brio et al., 1998). This tree species is very sensitive to late spring and early autumn frosts but in Spain there are no such problems because the temperatures are not extremely high or low.

UTILISATION

Chestnuts are a major food crop in Asia (especially China, Japan and Korea) and Europe (especially France, Italy, Portugal, Turkey and Spain), and are an important source of high quality, durable, hardwood timber and commercially extracted tannins. The nuts themselves are nutritious and gluten-free and are eaten fresh or processed in a variety of forms such as paste, puree, crumb, confectionery, and flour (Clover et al., 2011). In Spain nuts are collected by growers, then sold by intermediaries to industries, central markets and food platforms. Minimum postharvest treatments are disinfestations, brushing and packaging. Only a few producers possess large orchards to be able to sell their own production; these may be found mainly in Central Spain (Pereira-Lorenzo et al., 2009).

Commercialised nut production was about 20,000 t according to the FAO in 2000 (www.fao.org), even though it was around 100,000 t in 1961, close to the Italian production. The latest statistics of 2006 accounted 59,084 t harvested on only 27,511 ha in Galicia. This register did not take into account Andalusia with 12,9 t, Asturias with 10 t, or Castilla-Leon with 800 t. Four main chestnut industries, grouped in 'Proagrosilva', an association located in Galicia, commercialize over 90% of their fresh chestnuts as transformed, dried and peeled chestnuts (Pereira-Lorenzo et al., 2009).

Wood of sweet chestnut has a similar golden colour to oak, but with stronger grain and occasional dark brown mineral streaks. Weight around 540 kg.m^{-3}. This wood is of medium density; it has a low bending strength, medium crushing strength and very low stiffness and resistance to shock loads. If bent in the green state it is liable to rupture on the inner side. Air-dried wood has a good stem bending classification, although intolerant of pin knots.

Timber of sweet chestnut is hard-wearing, strong and durale, and relatively light when compared to other hardwoods, making it ideal for cladding. Additionally, sweet chestnut is known to be a very stable timber, resulting in less movement, distoring or splitting. As being similar to oak, sweet chestnut has a high tannin content, so for use should be taken with non-corrosive fixing (Berrocal del Brio et al., 1998). In Spain timber logs are used as structural material for buildings in many towns in Northern and Central Spain for furniture, such as beds, dressing tables, kitchen cabinets, doors, as well as for fences, parquets, shelves for wine barrels and baskets. Baskets were very important for transporting fish along Northern Spanish coast or for carrying bunches and other horticultural products at harvest time. Grape harvest baskets can still be found in Central Spain. The cycle period in coppice stands depends upon the diameter of the shoots needed to make the different parts of baskets (Pereira-Lorenzo et al., 2009).

Table 1. Timber volume of sweet chestnut in Spain (Berrocal del Brio et al., 1998)

Stand age	The lowest (m^3/ha)	Average (m^3/ha)	The highest (m^3/ha)
30	50	75	90
60	150	200	300
90	250	350	450
120	300	450	600

Stands of sweet chestnut have very high timber volume (Table 1).

At the end of the nineteenth century, European chestnut was dramatically threatened by ink disease (*Phytophthora* spp.). In order to maintain the chestnut production, Asian species resistant to *Phytophthora* were introduced in the Atlantic area, like in south-western France (Lafitte, 1946). These Asian varieties were found to be unsuitable for the Atlantic environmental conditions. In France, Schad et al., (1952) began a breeding programme to select the interspecific hybrids which offered characteristics more similar to the European species and included the ink disease resistence of the Asian species, as well. In Spain, a similar hybridisation programme between *C. crenata* and *C. sativa* was set out by Gallastegui (1926), being followed later on by Urquijo (1944). Some hybrids are vigorous and suitable for timber production, others have a good compatibility with cultivars as rootstocks (Urquijo 1944, 1957), i.e.: (Pereira-Lorenzo et al., 1997). In Portugal, the first interspecific hybridisations were initiated in 1947 by Bernardino Barros Gomes. The male parents were *C. crenata* 'tamba' (Gomes-Guerreiro, 1948, 1957) and in some cases, *C. crenata* pollen was brought from Spain (Vieira Natividade, 1947; Pereira-Lorenzo et al., 2010).

In the research of clonal forestry, Josefina Fernández-López has been working with her team in Centro de Investigación e Información Ambiental en Lourizán, Pontevedra.

Ink disease is one of two most destructive diseases affecting *Castanea sativa* Mill. It causes root and collar rot of adult trees and of seedlings in nurseries, plantations and forests. Symptoms of the disease on adult trees include chlorotic leaves reduced in size, thinning of the crown, and immature husks remaining on the tree after leaf-fall. Flame shaped dark necroses are evident on the collar of the tree after debarking. It is the large roots that are mainly infected. They produce a black exudate that stains the surrounding soil, especially during spring and fall. On young trees with smooth bark, the necroses are visible without debarking as depressed, slightly cracked areas at the base of the stem. Infected seedlings in nurseries or plantations undergo a rapid or gradual wilting of the leaves. In the root system, there is an extensive necrosis of the tap root that extends to the lateral roots and up the stem for some centimetres (Vannini et al., 2001).

Also very important and big mortality factor of sweet chestnut is chestnut blight caused by the fungus *Cryphonectria parasitica*. Conidia and ascospores of *C. parasitica* are spread by wind and rain, but are also transmitted by beetles (there were found nearly 69 species of insects which can carry inoculum of *C. parasitica*, Russin et al., 1984) and birds. Entry into wood is via wounds produced by the insect vectors. Spread within the host is rapid unless cankers form which temporarily restrict the fungus. The fungus can exist as a saprobe on broad-leaved trees beyond its parasitic host range. Fan-shaped, buff-coloured mycelial wefts form in the inner bark and cambium. Reddish perithecia are produced in groups. Long, coiled tendrils of conidia exude from pycnidia in wet weather (Anderson et al., 1914; Boyce, 1961; Darpoux et al., 1975).

C. sativa is the main chestnut species in Spain, even though Galician interespecific hybrids have also been in use for forestry, nut production and as rootstocks since the 1950's. In Spain, the main threat to Chestnut cultivations are diseases, mainly Ink disease (*Phytophthora* spp.) and blight (*Cryphonectria parasitica*), and abandonment. However, chestnut cultivation areas have been increasing during the last years due to new economical and cultural interests (Pereira-Lorenzo et al., 2010).

From the existing data, it seems that it could be possible to increase the area of chestnut forests because they can occupy mostly the climax areas where *Quercus pyrenaica* Willd., *Q. robur* L., and *Q. suber* L. grow. One limiting factor, however, is the increasing mean age of the people living in rural, mountainous areas (Moreno et al., 1998). Only some developing districts, close to the Portuguese border (western Spain) that still have a small young population (e.g. in the Aliste district, province of Zamora), are making efforts to improve the remaining chestnut orchards and to reforest the area with chestnut forests. They are seeking financial support for this from the European Union. Nevertheless, the current situation is that chestnut forests are disappearing from the best timber areas (e.g. in Galicia and Navarra) in favour of other tree species. The orchards are tending to be abandoned in areas where the Spanish economy has improved as a result of tourism, becoming peri-urban areas with industrial zones, or modern, intensive agriculture has been implemented. Some of the old orchards are being converted to coppices and, in this way, the surface of chestnut coppices has been almost maintained in Spain (Gallardo-Lancho, 2001).

Also chestnut forest (in this part of Spain called 'souto' – i.e. a forest where have been growing only chesnuts trees) is a place where we can find a big number of animals species for example: *Lagarto verdinegro*, *Chalcides striatus*, *Eslizon tridactilo*, *Culebra de escalera*, *Rhinechis scalaris*, *Vipera seoanei cantábrica*, *Víbora cantábrica*, *Dendrocopos major*, *Picus viridis*, *Colirrojo real*, *Busarda ratanero*, *Troglodytes troglodytes*, *Rana patilarga*, *Alytes obstetricans*, *Capreolus capreolus*, *Lucanus cervus*, *Apodemycus sylvatica* etc. (Fernández-Manso et al., 2010).

Forests have nowadays increased their importance for sequestering atmospheric CO_2 (Kyoto agreement). Therefore areas with chestnut may be extended if they are managed as coppice. Because chestnut orchards have a limited economical yield in postindustrial societies, a decrease in nut production in the European Union is foreseeable (Gallardo-Lancho, 2001).

REFERENCES

AMARAL, J.: Iberian Flora II, CSIC, Madrid 1990: 15–36. (in Spanish)

ANDERSON, P.J. – RANKIN, W.H.: Endothia cancer of chestnut. Cornell University, Agricultural Experiment Station, Bulletin No. *347*, 1914.

BERROCAL DEL BRIO, M. – GALLARDO LANCHO, F.J. – CARDEÑOSO HERRERO, M.J.: Sweet chestnut. Madrid, Ediciones Mundi-Prensa, *180*, 1998: 147. (in Spanish)

BLANCO, A. – RUBIO, A. – SÁNCHEZ, O. – ELENA, R. – GÓMEZ, V. – GRAÑA, D.: Autecology of the chestnuts from Galicia (Spain). Investigación Agraria, Systemas y Recursos Forestales, *9*, 2000: 337–361. (in Spanish)

BOURGEOIS, C.: The Chestnut. I.D.F., Paris, 1992. (in French)

BOYCE, J.S.: Forest Patology. McGraw-Hill Book Company, London, UK, 1961, 572.

BRAGANÇA, H. – SIMÕES, S. – ONOFRE, N. – SANTOS, N.: Factors influencing the incidence and spread of chestnut blight in northeastern Portugal. Journal of Plant Pathology, *91*, 2009: 53–59.

CONEDERA, M. – KREBS, P. – TINNER, W. – PRADELLA, M. – TORRIANI, D.: The cultivation of *Castanea sativa* (Mill.) in Europe, from its origin to its diffusion on a continental scale. Vegetation History Archaeobotany, *13*, 2004: 161–179.

COSTA, R. – RIBEIRO, C. – VALDIVIESSO, T. – ASSUNÇÃO, A. – FONSECA, L. – SOARES, F. – CARVALHO, L. – BORGES, O.: Characterization of chestnut varieties of specific regions with designation of origin. In: Actas do 5ºCongresso Florestal Nacional, Viseu 2005, Digital support. (in Portuguese)

CLOVER, G. – WARD, L.: *Castanea* (Sweet chestnut) & *Castanopsis* (Chinquapin). Post–Entry Quarantine Testing Manual, Ministry of Agriculture and Forestry, Investigation and Diagnostic Centre – Tamaki, 2011.

DARPOUX, H. – RIDE, M. – BONDOUX, P.: Outbreaks of *Endothia parasitica* on chestnut in France. Comptes Rendus de l'Académie d'Agriculture de France, *43*, 1975: 670–674. (in French)

DÍAZ-MAROTO, I.J. – VILA-LAMEIRO, P.: Historical evolution and land-use changes in natural broadleaved forests in the north-west Iberian Peninsula. Scandinavian Journal of Forest Research, *23*, 2008: 371–379.

FERNÁNDEZ-LÓPEZ, J. – ZAS, R. – BLANCO-SILVA, R. – DÍAZ, R.: Geographic differentiation in adaptive traits of wild chestnut Spanish populations (*Castanea sativa* Miller). Investigación Agrararias: Sistema Recurursos Forestales, *14*, 2005: 13–26. (in Spanish)

FERNÁNDEZ-MANSO, A. – MARTÍNEZ, C. – NESPRAL, A.: A future for the chestnut, studies on the chestnut in the region of El Bierzo. 1st Edition, Asociacíon A Morteira, Spain, 2010, 146–157. (in Spanish)

GALLARDO-LANCHO, J.F.: Distribution of chestnut (*Castanea sativa* Mill.) forests in Spain: possible ecological criteria for quality and management (focusing on timber coppices). Forest Snow and Landscape Resesearch, *76*, 2001: 477–481.

GALLASTEGUI, C.: Techniques of artificial chestnut breeding. Boletín Real Sociedad Ciencias Naturales, *26*, 1926: 88–94. (in Spanish)

GOMES-GUERREIRO, M.: Some Studies of the Genus *Castanea*. Publicação da Direcção Geral dos Serviços Florestais e Aquícolas, Lisboa, 1948. (in Portuguese)

GOMES-GUERREIRO, M.: Sweet Chestnut. Publicação da Direcção Geral dos Serviços Florestais e Aquícolas, Lisboa, 1957. (in Portuguese)

JUSTO, M.J. – ALMEZ, M.L.: Documentary Sources at the University of Santiago de Compostela. Pergameos da Serie do Arquivo Historici Universitario. Años 1237/1537. Diplomática, Consello da Cultura Galega, 1991. (in Galician, Spanish)

LAFITTE, G.: The Japanese Chestnut in Basque country. Mendionde, *69*, 1946. (in French)

LLORET, F. – CALVO, E. – PONS, X. – DIAZ-DELGADO, R.: Wildfires and landscapes patterns in the Eastern Iberian Peninsula. Landscape Ecology, *17*, 2002: 745−759.

MASILLA –VÁZQUEZ, J.P. – OTERO, P.R. – VARELA, P.C. – CORRAL, S.C. – VÁZQUEZ, I.C.: Pests and Diseases of Chestnut in Galicia. Xunta de Galicia, Consellería de Agricultura, Gandería e Política Agroalimentaria, 2000: 45–75. (in Spanish)

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD: The First National Inventory of Hardwoods. MAPA, Madrid, Spain, 1980. (in Spanish)

MORENO, M.C. – FERNÁNDEZ, G. – ORTUÑO, S.F.: Economics of chestnut (*Castanea sativa* Mill.) in Spain. Revista Forestal Española, *18*, 1998: 11–21. (in Spanish)

PEREIRA-LORENZO, S. – FERNANDEZ-LOPEZ, J.: Propagation of chestnut cultivars by grafting: methods, rootstocks and plant quality. Scientia Horticulturae, *72*, 1997: 731–739.

PEREIRA-LORENZO, S. – RAMOS-CABRER, A.M. – DÍAZ-HERNÁNDÉZ, M.B. – CIORDIA-ARA, M. – RÍOS-MESA, D.: Chemical composition of chestnut cultivars from Spain. Scientia Horticulturae, *107*, 2005: 306–314.

PEREIRA-LORENZO, S. – DÍAZ-HERNÁNDÉZ, M.B. – RAMOS-CABRER, A.M.: Use of highly discriminating morphological characters and isoenzymes in the study of Spanish chestnut cultivars. Journal of the American Society for the Horticultural Science, *131*, 2006: 770–779.

PEREIRA-LORENZO, S. – RIOS-MESA, D. – GONZALES-DIAZ, A.J. – RAMOS-CABRER, A.M.: The Chestnuts of the Canary Islands. CCBAT Cabildo de Tenerife, CAP – Cabildo de La Palma, 2007. (in Spanish)

PEREIRA-LORENZO, S. – DÍAZ-HERNÁNDÉZ, M.B. – RAMOS-CABRER, A.M.: Following Chestnut Footprints (*Castanea* spp.) Cultivation and Culture, Folklore and History, Traditions and Uses (Sulle Orme del Castagno *Castanea* spp.). In: The 1st European Congress of Chestnut – Castanea 2009, October 13–16, 2009, Belgium. Scripta Horticulturae, *9*, 2009: 135–142.

PEREIRA-LORENZO, S. – LOURENÇO-COSTA, R.M. – RAMOS-CABRER, A.M. – MARQUES-RIBEIRO, C.A. – SERRA DA SILVA, M.F. – MANZANO, G. – BARRENECHE, T.: Variation in grafted European chestnut and hybrids by microsatellites reveals two main origins in the Iberian Peninsula. Tree Genetics & Genomes, *6*, 2010: 701–715.

RUSSIN, J.S. – SHAIN, L. – NORDIN, G.L.: Insects as carriers of virulent and cytoplasmatic hypovirulent isolates of the chestnut blight fungus. Journal of Economic Entomology, *77*, 1984: 838–846.

SALVADÓ, M.P.: Sweet Chestnut. Editorial Sintes, S. A., Les Fonts de Terrassa, Barcelona, 1987: 45–52. (in Catalan, Spanish)

SCHAD, C. – SOLIGNAT, G. – GRENTE, J. – VENOT, P.: Research on chestnut stand in Brive. Annales d'Amelioration des Plantes, *2*, 1952: 369–453. (in French)

URQUIJO, P.: Aspects of obtaining disease-resistant chestnut hybrid. Boletín Vegetal Entomología Agrícola, *12*, 1944: 447–462. (in Spanish)

URQUIJO, P.: The regeneration of chestnut. Estación de fitopatología del castaño (INIA), *54*, 1957: 1–16. (in Spanish)

VANNINI, A. – VETTRAINO, A.M.: Ink disease in chestnuts: impact on the European chestnut. Forest Snow and Landscape Resesearch, *76*, 2001: 345–350.

VÁZQUEZ, J.P.M. – CORRAL, C.S. – OTERO, R.P. – VARELA, C.P.: Phytosanitary Problems of Oak and Chestnut in Galicia. Imprenta diputación de Pontevedra, 2003: 218. (in Spanish)

VIEIRA NATIVIDADE, J.: Four Years of the Campaign in the Defense and Reconstitution of Chestnut. Edição da Junta Nacional das frutas, Lisboa, 1947. (in Portuguese)

XUNTA DE GALICIA: O Monte Galego en Cifras [The Galician Forest in Data]. Consellería de Medio Ambiente, Santiago de Compostela, 2001. (in Spanish)

Received for publication on September 30, 2011
Accepted for publication on May 28, 2012

MELICHAROVÁ, L. – VIZOSO-ARRIBE, O. (Česká zemědělská univerzita v Praze, Fakulta lesnická a dřevařská, Praha, Česká republika; University of Santiago de Compostela, Campus Lugo, Department of Agroforestry, Santiago de Compostela, Spain)

Přehled současného stavu kaštanovníku jedlého (*Castanea sativa* Mill.) ve Španělsku

Scientia Agric. Bohem., *43*, 2012, 78–84

Článek pojednává o rozšíření kaštanovníku jedlého (*Castanea sativa* Mill.) v severní části Španělska – Galícii. Tato část Španělska je velmi lesnatá a vyznačuje se vysokým množstvím srážek, díky nimž zde má kaštanovník velmi příznivé podmínky k růstu. Kaštanovník můžeme najít v sadech (plantážích), výmladkových porostech a lesích. Tato dřevina je vytlačovaná rychleji rostoucími a lépe zpeněžitelnými druhy dřevin. Jedná se zejména o *Eucalyptus globulus*, *Eucalyptus nitens*, *Pinus pinaster* Ait. and *Pinus sylvestris* L. Další problémem jsou nemoci, které napadají porosty kaštanovníku. Nejzávažnější a nejrozšířenější jsou dvě – inkoustová nemoc, která je způsobená plísní skořicovníku (*Phytophthora cinnamomi* Rands.) a rakovina kůry kaštanovníku (*Cryphonectria parasitica* Murr. Barr.). Inkoustová nemoc nebo-li ʻLa tintaʼ je rozšířena v celém Španělsku, stejně je tomu i u rakoviny kůry ʻEl chancroʼ. Kaštanovník se ve Španělsku pěstuje zejména pro plody, pěstování pro dřevní hmotu není příliš časté, ačkoli tato dřevina má výborné, tvrdé dřevo a roste poměrně rychle. Navíc její hektarová zásoba převyšuje obvyklý průměr. Kaštanovník je velmi atraktivní listnatá dřevina a do budoucna by se s ní mělo i nadále počítat.

Castanea sativa Mill.; nemoci; listnatá dřevina; plody; kaštanovník setý

Contact Address:

Ing. Lenka Melicharová, Česká zemědělská univerzita v Praze, Fakulta lesnická a dřevařská, katedra pěstování lesů, Kamýcká 129, 165 21 Praha 6-Suchdol, Česká republika, tel. +420 720 326 842, e-mail: melicharova@fld.czu.cz