Castanea sativa

Castanea sativa in Europe: distribution, habitat, usage and threats

M. Conedera, W. Tinner, P. Krebs, D. de Rigo, G. Caudullo

The sweet chestnut (Castanea sativa Mill.) is the only native species of the genus in Europe. The broad diffusion and active management by man resulted in the establishment of the species at the limits of its potential ecological range, which makes it difficult to trace its original natural area. The present distribution ranges from North-Western Africa (e.g. Morocco) to North-Western Europe (southern England, Belgium) and from south-western Asia (e.g. Turkey) to Eastern Europe (e.g. Romania), the Caucasus (Georgia, Armenia) and the Caspian Sea. In Europe the main chestnut forests are concentrated in a few countries such as Italy, France and the Iberian Peninsula. The sweet chestnut has a remarkable multipurpose character, and may be managed for timber production (coppice and high forest) as well as for fruit production (traditional orchards), including a broad range of secondary products and ecosystem services.

The sweet chestnut tree (Castanea sativa Mill.) is a medium-large deciduous tree that may reach 30-35 m. When cultivated, the tree is long-living (up to 1000 years) and may also reach a significant girth (up to 12 m at breast height). The bark is brown-greyish and often has net-shaped venations with deep furrows or fissures. Leaves are oblong-lanceolate (8-25 cm long, 5-9 cm broad) with a dentate-crenate margin and a brighter green upper leaf surface. This species tree is monoecious and flowers develop in late June to July and may be pollinated by wind (more usual in case of dry weather during flowering) or insects (dominating in wet weather conditions). Male flowers are gathered in catkins (5 to 15 cm in length) whereas female flowers are usually positioned at the base of the male ones in the upper part of the current year’s shoots. By autumn the female flowers develop into spiny cupules (commonly called bur) containing 3-7 brownish nuts that are shed during (September)-October. Some develop into spiny cupules (commonly called bur) containing 3-7 brownish nuts that are shed during (September)-October. Some

Distribution

The distribution area ranges from Southern Europe (Iberian Peninsula, Italy, Balkans, Mediterranean islands) and North Africa (Morocco), to North-Western Europe (England, Belgium) and eastward to Western Asia (North East Turkey, Armenia, Georgia, Azerbaijan, Syria), with an altitudinal range between 200 and 1800 m, depending on the latitude and site aspect. In Europe the sweet chestnut covers an area of more than 2.5 million hectares (about the dimension of Sardinia Island). Most of the area (89%) is concentrated in just a few countries (France, Italy, followed by Spain, Portugal, and Switzerland) with a long tradition of chestnut cultivation. European settlers introduced the species in other continents, so that chestnut trees or plantations are nowadays present in different parts of South and North America as well as Australia. The broad diffusion and active management by man have resulted in the establishment of the species at the limits of its fundamental niche, which makes it nowadays difficult to trace its original range and its ecology. The most probable natural range is delimited by several macro-regions: the Transcaucasian region, north-western Anatolia, the hinterland of the Tyrrhenian coast from Liguria to southern Italy along the Apennine range, the Cantabrian coast on the Iberian peninsula, and probably also the Greek peninsula (Peloponnesse and Thessaly) and north-eastern Italy (Colli Eugane, Monti Benici, Emilia-Romagna). First unambiguous evidences of chestnut cultivation are reported in palynological data of several regions in the Anatolian Peninsula, North-eastern Greece and South-eastern Bulgaria and date back to around 2100-2050 B.C., while Neolithic evidence (4000 B.C.) of cultivation together with walnut and cereals comes from Italy. Nevertheless, chestnut cultivation only took a subsidiary place in the ancient Greek civilization and in the pre-Christian Latin world. The role of chestnut in the Italian territory may have changed at the beginning of the Christian era when people realized that the wood produced from chestnut coppices was so useful and versatile. The Romans may thus have introduced the idea of cultivating the chestnut and in certain cases the tree itself, but no evidence of systematic tree planting exists.

Habitat and Ecology

The sweet chestnut is a warm-temperate deciduous species, that likes a mean yearly temperature ranging between 8° and 15°C and monthly mean temperatures over 10°C during 6 months. The species needs a minimum rainfall that ranges between 1500 and 1800 mm, with a water rate between 1.5 and 2.5 mm/h during the hot season. The highest elevations are recommended for the highest latitudes and vice versa. The chestnut tree displays a high sensitivity to summer droughts issuing from the combination of high temperatures and lack of precipitation. It does not thrive on limestone, preferring well-drained, from

Map 1: Plot distribution and simplified chorology map for Castanea sativa. Frequency of Castanea sativa occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native and introduced spatial range for C. sativa is derived after several sources.

Map 2: High resolution distribution map estimating the relative probability of presence.
very acidic to neutral soils and nutritionally poor sites. This tree can rejuvenate in half-shadow conditions, but needs light for growing from the early pole stage. It is sensitive to late frost and very adapted to fire-disturbance (vigorous re-sprouter). Due to the strong cultivation pressure, it is very difficult to define natural chestnut stands with consociated tree communities. In fact about 90% of chestnut forests, this tree is pure or the dominant species. A good example of a natural community might be the Georgian chestnut forests, where the species grows with other thermophilous broadleaved deciduous species such as oriental beech (Fagus orientalis), hornbeam (Carpinus betulus syn. Carpinus caucasica), black alder (Alnus glutinosa), field elm (Ulmus minor), Cappadocian maple (Acer cappadocicum syn. Acer baetum), Quercus sap., Caucasian zelkova (Zelkova carpinifolia), red lime (Tilia rubra subsp. caucasica syn. Tilia caucasica) and yew (Taxus baccata).15

Importance and Usage

Due to its multipurpose character, the chestnut tree has always been cultivated in different management systems according to the targeted products and services. Chestnut wood is particularly suitable for external use, thanks to its natural high tannin content that acts as a protection against decay. In former times tannin extraction was also a very common use of the timber.16 Due to its high re-sprouting capacity, coppice represents the main type of forest management with about 80% cover of the chestnut forests, supplying principally fire wood, charcoal, poles (fence, pit-props, etc.), and wood for small products (barrels, poles, etc.). Traditional orchards for fruit production (or groves, as some authors call them), which cover about 20% of chestnut forests, consist of open stands, usually composed (or groves, as some authors call them), which cover about 20% of chestnut forests, consisting of open stands, usually composed of grafted trees because of the absence of management, chestnut stands tend to be invaded by coppice stools become unstable and tend to uproot.

Threats and Diseases

Traditional chestnut management approaches (i.e. coppices, high forests, orchards) requires continuous cultural inputs. In the absence of management, chestnut stands tend to be invaded by other species and to evolve towards mixed deciduous forests.17,18 With time-aged and oversized chestnut orchard trees and coppice stools become unstable and tend to uproot,19 disrupting the original chestnut structures within the post-cultural ecosystems. This has caused a severe decrease of biodiversity in the affected regions,20,21 and reduced ecosystem service provision.22 Further threats for chestnut trees include the ink disease (Phytophthora spp), the spread of the newly introduced chestnut blight (Cryphonectria parasitica), and the impact of the Chinese gall wasp (Dryocosmus kuriphilus). The latter is a pest introduced in 2002 in Piedmont and new spreading to other regions, although successfully limited by the specific antagonist, Teryximus spinosus where this biological control has been applied. Further source of economic loss for the chestnut growers are fruit damaging insects such as the chestnut weevil (Curculio calandrae) and torticiles (Cydia splendida; Cydia fagglondiana; Pammene fuscans).23

Field data in Europe (including absence) ☐ Observed presences in Europe ☐

References


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