

The distribution of *Castanea sativa* and its ability to regenerate in the Czech Republic

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Abstract: *Castanea sativa* is a type of cultivated chestnut tree found in the Czech Republic, growing in both lowland and midland regions. These trees are usually planted individually or in pairs, with over half of the plantings located in urban areas. One-fifth of chestnut trees thrive in parks, while chestnut orchards or forest stands make up only one-tenth of the areas where chestnut trees are located. In the Czech Republic, approximately 30 ha are covered by chestnut trees. Regeneration of chestnut trees occurs in only 6% of the localities due to regular lawn mowing. However, 40% of the surveyed forests showed signs of regeneration, demonstrating the species' ability to regenerate under Central European climate conditions.

Keywords: Central Europe; European chestnut; sweet chestnut; urban greening

European chestnut, also known as sweet chestnut *Castanea sativa* Mill. (Fagales: Fagaceae) is a deciduous tree native to the Mediterranean region, spanning from the Caspian Sea to the Atlantic Ocean (Figure 1). Chestnut forests cover an extensive area of approximately 2 530 000 ha (Fernández-López, Alía 2003; Conedera et al. 2004).

C. sativa has a long history of cultivation in Europe (Conedera et al. 2004). This versatile tree spe-

cies is highly valued for its wood, edible nuts, and its role in urban ecosystems (Bounous, Marinoni 2005). In Southern Europe, chestnuts have traditionally provided a vital source of nourishment and firewood for communities in mountainous regions (Conedera et al. 2004; Pinto-Correia, Vos 2004). Chestnut wood is used in construction, furniture making, agricultural tools, basketry, and cooperage (Everard, Christie 1995).

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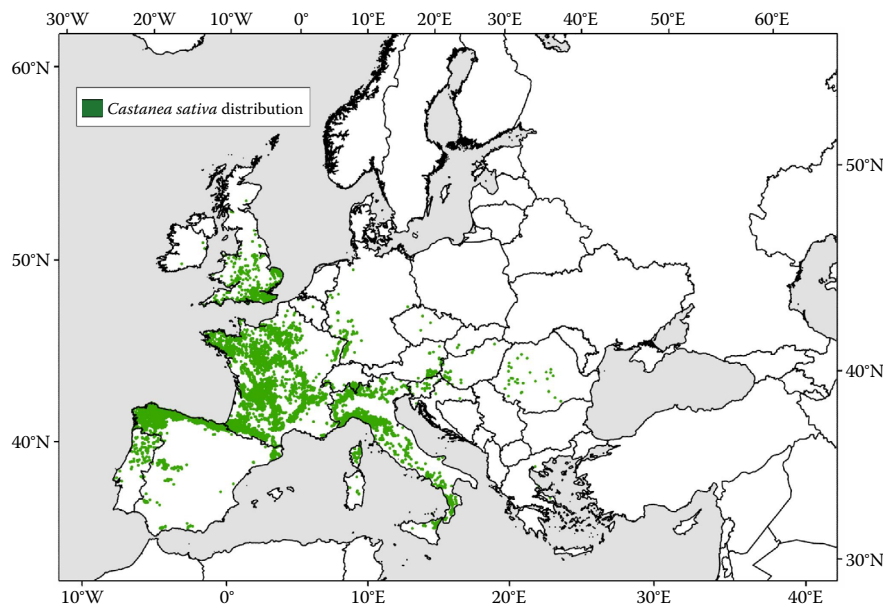


Figure 1. The distribution of *Castanea sativa* (green) in Europe

The distribution of chestnut was determined based on occurrence data from Mauri et al. (2017), with a buffer of 10 km around each record

This paper aims to monitor the distribution of the chestnut and its ability to regenerate in the Czech Republic.

MATERIAL AND METHODS

Between August and November 2022, we conducted field visits to 330 localities across the Czech Republic, where we documented chestnut trees. Our

documentation was based on the literature, public sources, and the iNaturalist database (Figure 2) (Svoboda 1978; Haltofová, Jankovský 2003; Vopálka Melicharová 2021; iNaturalist 2022). Of course, it was not possible to survey all known and published localities; on the other hand, many trees in well-known sites have disappeared. The main goal was to investigate as many sites as possible to ensure that the entire territory of the Czech Republic was even-

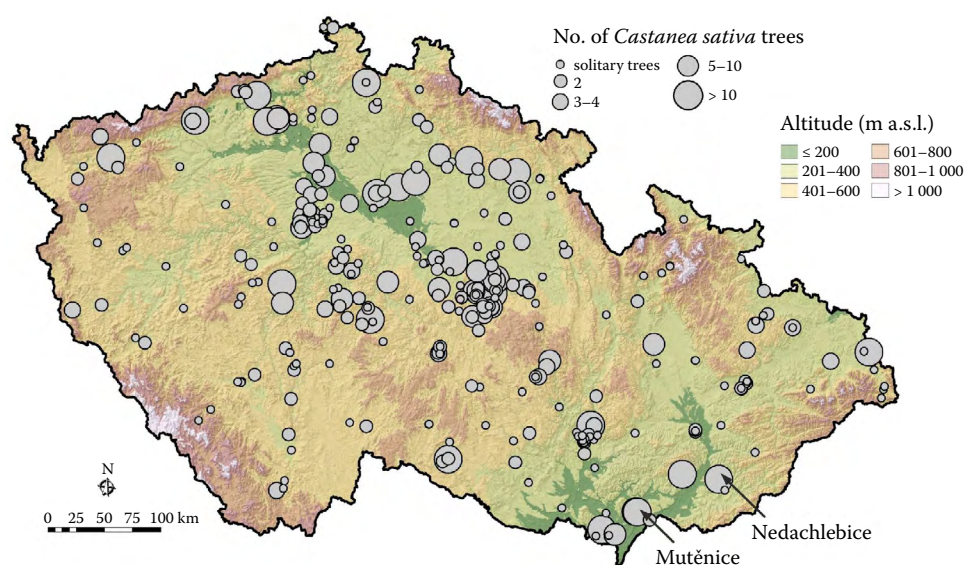


Figure 2. Spatial distribution of *Castanea sativa* in the Czech Republic based on the 330 studied localities in 2022, with circle size representing the number of trees across different altitudinal zones

ly covered. In total, we examined over 1 800 trees, see Table S1 in the Electronic Supplementary Material (ESM). We recorded the habitat in which the chestnut trees grew, i.e. village or town, forest, non-urban area, castle park, town park, and chestnut orchard, and we established the proportion of localities by habitat. In individual habitats, we checked whether the trees grow singly, in pairs, or in small groups (3 to 4, 5 to 10) or whether no more than ten trees grow on the site. The presence of natural rejuvenation, i.e. young trees growing under the canopy of an adult forest, was also monitored at the sites.

RESULTS AND DISCUSSION

C. sativa is recognised as a cultivated species in the Czech Republic and is distributed from lowland to midland regions (Table 1). Most chestnut trees are either singularly planted or found in pairs at the 330 localities we studied (Figure 2). Over half of the localities are situated in urban areas within municipalities. One-fourth of the localities with chestnut trees are in castle or town parks, while chestnut orchards or forest stands exclusively occupy only ca. one-tenth of localities with chestnut trees. Sites with chestnut trees growing in non-urban areas, a region located outside cities and towns – such as trees growing along roads, in alleys, etc. – are represented by only 20 localities (Table 2). In the Czech Republic, chestnut tree coverage spans approximately 30 ha, with the largest chestnut tree orchards encompassing an area of nearly 1.1 ha (Haltofová et al. 2013).

Clusters of *C. sativa* are mainly found in a few areas, particularly in major cities such as Prague and Brno, where they have been intentionally planted in parks and gardens. Only six percent of localities (Table 2) where chestnut trees grow experience regeneration, mainly due to intensive maintenance

practices such as regular lawn mowing. On the other hand, 40% of the surveyed forests showed signs of regeneration (Table 2), highlighting the species' ability to regenerate under Central European climate conditions. However, the potential for regeneration is not a major concern in the Czech Republic, as chestnuts are not widely used in the food industry (Bělková et al. 2017). In the central regions of the Czech Republic, *C. sativa* trees can be found outside major urban centres, often appearing at the forest perimeters. This phenomenon can be attributed to the dispersal of seeds by animals into natural areas from the historical chestnut orchard in the town of Nasavrky, established in 1776 (Vopálka Melicharová, Kupka 2021) (Figure 2).

Trees over fifty years old are most found in parks or forests, where typically one, and sometimes two or more trees per locality, have managed to survive to the present day. Since the year 2000, there has been a noticeable increase in the number of tree localities due to the more widespread planting of chestnut trees in parks and gardens (Vopálka Melicharová, Kupka 2021).

In some areas, chestnut trees grow naturally or are intentionally cultivated within forest stands. However, broad-leaved mixed forests typically only host a few dozen mature chestnut trees.

Out of the 330 localities we inspected, 144 (44%) were already known from previous publications (Svoboda 1978; Haltofová, Jankovský 2003; Vopálka Melicharová 2021). We discovered 178 new localities and found eight from the iNaturalist database. In 15% of the localities we visited, the chestnut trees mentioned in the data were not found, likely due to the outdated information (20 years old), and the trees may have died or been removed. In 75 localities (more than 20%), chestnut trees were planted within the 20 years since the publication of the overview of *C. sativa* in the Czech Republic (Haltofová, Jankovský 2003).

Successive severe infestations, along with the changes in climate conditions and summer droughts, as well as fungal infections, can cause *C. sativa* trees to die, including younger ones (Moriya et al. 2003; Lieutier, Paine 2016). In Southern Moravia, *C. sativa* trees are already in decline. In a forest area (in the village of Muténice, see Figure 2), there was a significant increase in tree mortality (out of a total of 19 trees). In 2021, 33% of these trees were observed to be dry, and this percentage increased to 68% in 2022. In contrast, within a stand

Table 1. Elevation of localities with *Castanea sativa* trees in the Czech Republic

Elevation (m a.s.l.)	Number of localities
100–199	24
200–299	99
300–399	90
400–499	62
500–599	39
600–699	14
Above 700	2
Total	330

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Table 2. The number of localities in the Czech Republic where chestnut trees grow and regenerate according to their habitat (a locality is defined as a site with the occurrence of at least one *Castanea sativa* tree)

Habitat	Number of localities	Number of localities with regeneration
Village or town	178	2
Forest	39	14
Non-urban area	20	2
Castle park	64	1
Town park	26	0
Chestnut orchard	3	2
Total	330	21

that is part of a larger forest complex at the village of Nedachlebice, about one-third of the 49 trees were found to be dry in both 2021 and 2022. While drought is likely the main cause of this phenomenon, it is important to consider the possibility of ink disease, which is caused by *Phytophthora cinnamomi* Rands. This disease is the second-most severe disease affecting chestnut trees (Vannini et al. 2010).

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