

A new distribution of Caucasian wingnut (*Pterocarya fraxinifolia* (Poiret) Spach) in the Kahramanmaras region, Turkey

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Abstract : Caucasian wingnut (*Pterocarya fraxinifolia* (Poiret) Spach) is a relict tree species having limited natural distribution in Turkey. In this study, a new distribution of this species in the Kahramanmaras region was explained. This distribution occurs in Onsenhopuru and Yavuzlar villages and Yesilyore town of Turkoglu district, at elevations between 600 and 640 m along Orcan stream, and continues about 4 km. In this area, Caucasian wingnut had about 100 trees. This distribution area of the species, quite important for biodiversity, should be protected and the existing individuals should be evaluated as a gene resource. Especially vegetative reproduction of the species should be started and the seedlings obtained should be used at the margins of lakes and streams, parks and large gardens, avenues, boulevards, and streets in the region.

Key words : *Pterocarya fraxinifolia*, Natural distribution, Ecological characteristics, Biological characteristics, Protection.

Introduction

The genus *Pterocarya* contains 8 species throughout the world. One of these species is Caucasian wingnut (*Pterocarya fraxinifolia* (Poiret) Spach) occurring in Turkey, the Caucasus, and northern Iran. In Turkey, this species is naturally distributed in northern Anatolia (Kocaeli, Adapazari, Akcakoca, Zonguldak, and Samsun) and southern Anatolia (Mersin, Kahramanmaras, and Gaziantep) (Yaltirik, 1993).

Caucasian wingnut, a Tertiary relict tree species (Mayer and Aksoy, 1998) and regarded as a Hyrcano-Euxine element (Davis, 1982) generally occurs along creek and stream margins or in floodplain areas in Turkey. As a matter of fact, Kayacik (1981) stated that this species requires watery places, loose and moist soils like poplars and willows. Therefore, it is also known as an element of creek vegetation.

Caucasian wingnut is an important tree species for landscape plantings. It was stated that this species can be planted in parks and large gardens, avenues, boulevards, and streets (Atay *et al.*, 1987). However, in Turkey, this species has not been appreciated so far, and it has reduced in number in its natural distribution areas because of human destruction.

One of the distribution areas of Caucasian wingnut in Turkey is Kahramanmaras region in southern Anatolia. The two distribution areas of this species, the central and Turkoglu districts of Kahramanmaras

province were investigated, and some important ecological and biological characteristics of the species were determined (Avsar, 2001). It was reported that this species also occurs in Andirin district of Kahramanmaras (Ansin and Ozkan, 1993), but detailed information of this distribution is not available in the literature.

In this study, a new distribution of Caucasian wingnut in the Kahramanmaras region was explained. This distribution area about which the information is not available in the literature was determined recently by us. Some important ecological and biological characteristics of Caucasian wingnuts in this area were presented, and some suggestions relating to both this area and the use of the species in the region were made.

Materials and Methods

In the study, the properties relating to the Caucasian wingnut distribution such as locality, latitude, longitude, elevation, compartment number of the forest management plan, distance to the main centers of population and the extent of the distribution along the stream were determined. The main climatic data of the nearest meteorological station to this area were obtained, and the climatic conditions of the distribution area were evaluated. In a soil profile excavated, soil depth was measured and soil stoniness was estimated. Then, soil texture and pH were determined by laboratory analysis on the soil sample taken from 0-20 cm depth. Soil texture was determined by using Bouyoucos hydrometer method

(Bouyoucos, 1936), and soil pH was measured in a 1 : 2.5 mixture of soil and distilled water (Gulcur, 1974).

The number, distribution types in the area, stem and crown development, light requirement and regeneration characteristics of Caucasian wingnut trees, tree species accompanying the distribution, and human effects in the area were recorded. In addition, diameter at breast height, height, age, mean total diameter increment, and mean total height increment of 7 trees randomly selected from the area were found. Height growth of the root suckers was measured. Thus, the growth potential of the species was evaluated.

Tree number was found by counting the individuals of which heights were 5 m and more. In order to determine diameter at breast height, the girth of the trees was measured at 1.30 m, then the value found was divided by the number pi (3.14). Tree height was measured by using a heightmeter. Tree age was found by adding 1 to the number of annual rings counted on the increment core taken from 1.30 m. In the large diameter trees, tree age was estimated by adding 1 to the age found through the proportion established between the length of increment core taken from 1.30 m and the number of its annual rings, and the length of stem radius without bark (Avsar, 2001). Mean total diameter increment was calculated by dividing diameter at breast height by tree age, and mean total height increment was calculated by dividing tree height by tree age (Firat, 1962). The heights of 1-year-old root suckers were measured on 30 samples randomly selected at the end of the growing season, and statistical values of the obtained data were calculated.

Thus, some important ecological and biological characteristics of the species in this distribution area

were determined. In addition, the results obtained were compared with literature relating to the distributions of the species both in Turkey and abroad.

Results and Discussion

This distribution of Caucasian wingnut occurs in Onsenhopuru and Yavuzlar villages and Yesilyore town of Turkoglu district of Kahramanmaras province (Fig. 1), along Orcan stream passing these settlement areas, and between northern latitudes of 37°25'-37°26' and eastern longitudes of 36°45'-36°46'. The distribution begins in Onsenhopuru village that is about 24 km far from Kahramanmaras province center, continues in Yavuzlar village and Yesilyore town, and finishes at about 1 km distance to Yesilyore town center. In this site, the species is found at elevations between 600 and 640 m. This distribution area continuing about 4 km is located in the Turkoglu Forest Subdistrict Headquarters of Kahramanmaras Forest Enterprise Directorate. According to the stand map of the forest management plan belonging to this headquarters (Anonymous, 1991), the distribution occurs in the borders of northwest direction of the compartment numbers 88, 109, and 136.

The nearest meteorological station to this area is the Kahramanmaras Meteorological Station located in Kahramanmaras province center, at 572 m elevation, 37°36' N latitude, and 36°56' E longitude. According to the meteorological data recorded at this station from 1929 to 1990, the mean annual temperature, the mean annual relative humidity, and the mean annual rainfall are 16.5°C, 58%, and 709.8 mm, respectively (Anonymous, 1997). According to Erinc's rain's effectiveness index (Cepel,

Table – 1 : Diameter at breast height, height, age, and increment values determined on the some Caucasian wingnut trees

Tree number	DBH (cm)	Height (m)	Age (year)	MTDI (cm/year)	MTHI (cm/year)
1	20.1	13.5	10	2.0	135.0
2	27.4	10.7	13	2.1	82.3
3	31.2	13.8	14	2.2	98.6
4	38.2	11.0	18	2.1	61.1
5	39.5	12.1	19	2.1	63.7
6	44.6	11.8	22	2.0	53.6
7	45.2	11.8	23	2.0	51.3

DBH : Diameter at breast height, MTDI : Mean total diameter increment, MTHI : Mean total height increment.

1983), Kahramanmaras has semi-humid climatic type. In addition, the Mediterranean climate that is a macro-climatic type dominates in Kahramanmaras. It is possible to say that similar climatic properties are also seen in the distribution area of Caucasian wingnut. In a soil profile excavated, it was determined that the soil was deep (>120 cm) and had a high proportion of stone. Soil texture was sandy loam, and soil reaction (pH) was 7.49.

In this site, Caucasian wingnut had about 100 trees distributed in individuals, clumps, and small groups. Caucasian wingnuts had generally crooked stem, and many individuals were forked. Light requirement of this species is high. It orientates its crown towards the light, and therefore its stem has crooked and degraded forms. It can form a large tree by spreading its crown in the light gaps. This species is found together with *Platanus orientalis* L., *Salix alba* L., and *Salix pentandra* L. species along the stream. In addition, it is encountered with *Populus usbekistanica* Kom. s. utsp. *usbekistanica* cv. 'Afghanica' and *Juglans regia* L. species that had been planted by the local people along the stream.

One of the most interesting characteristics of Caucasian wingnuts is that the trees have root suckering and stump sprouting ability. The trees develop long surface roots spreading the surroundings and produce many root suckers from these roots. Then, they can easily cover the surroundings by developing their root suckers. The trees also form many stump sprouts on the stems cut. On the other hand, it was observed that seed yield of the trees was generally low, and any advance reproduction developing from the seed was not present. In this respect, it is understood that the species generally continues its generation by vegetative way in this area.

Diameter at breast height, height, age, and increment values of some Caucasian wingnut trees are presented in Table 1. As seen in the Table, diameters at breast height, heights, ages, mean total diameter increments, and mean total height increments of the trees varied between 20.1-45.2 cm, 10.7-13.8 m, 10-23, 2.0-2.2 cm/year, and 51.3-135.0 cm/year, respectively. Although the trees were quite young, their diameters at breast height and heights were quite high because of the high diameter and height increments. On the increment cores taken from the trees for age determination, it was determined that the trees had about equal diameter increments for every year, the annual rings were quite wide and the annual ring width varied between 1.0 and

1.1 cm. On the contrary, tree height increments varied at considerable amounts. As a matter of fact, it was determined that especially the tree number 1 had very higher height increment than the other trees.

Agricultural and settlement areas are located around Orcan stream along which Caucasian wingnut is distributed. In this respect, the distribution is under the heavy pressure of the local people, and it was determined that the stem and branches of Caucasian wingnuts in this area were cut by the local people in order to obtain firewood. Any important biotic or abiotic pests for this species were not encountered except the human factor.

Caucasian wingnut is generally distributed along creek and stream margins or in floodplain areas in Turkey. The distribution determined recently by us also occurs along stream margins. Similarly, it was reported that this species occurs along river banks or in floodplain areas in Azerbaijan (Anonymous, 2000a) and Georgia (Anonymous, 2000b). In addition, this species is resistant to flooding (Pamay, 1992).

Caucasian wingnut is generally found at elevations between 5 and 1160 m in Turkey (Davis, 1982). It was determined that this species is found at elevations between 740 and 800 m in Derekoy village of the central district, and at 670 m elevation in Altinova village of Turkoglu district in Kahramanmaras (Avsar, 2001). In the area determined recently, it is found at elevations between 600 and 640 m. In this respect, the elevation of the distribution area determined recently is lower than those of the other two distributions in Kahramanmaras. Taeb (1995) also stated that this species is found at elevations up to 300 m in the Hyrcanian region of Iran.

In the present study, it was determined that the soil in the distribution area of Caucasian wingnut was deep and had high stoniness. Soil texture was sandy loam, and soil pH was 7.49. Korkmaz (2001) reported that this distribution area and its close surroundings have colluvial soils. These soils can be characterized by good drainage, lack of saltiness problem, slight alkali pH, A and C horizon, and azonal characteristics. In another study carried out on some soil samples taken from the sites of Caucasian wingnut, Kutbay *et al.* (1999) found that soil texture was sandy loam, sandy clay loam, and loam, soil pH varied between 6.25 and 7.45, and the amount of organic matter was generally quite high. Atay *et al.* (1987) also reported that this species prefers moist

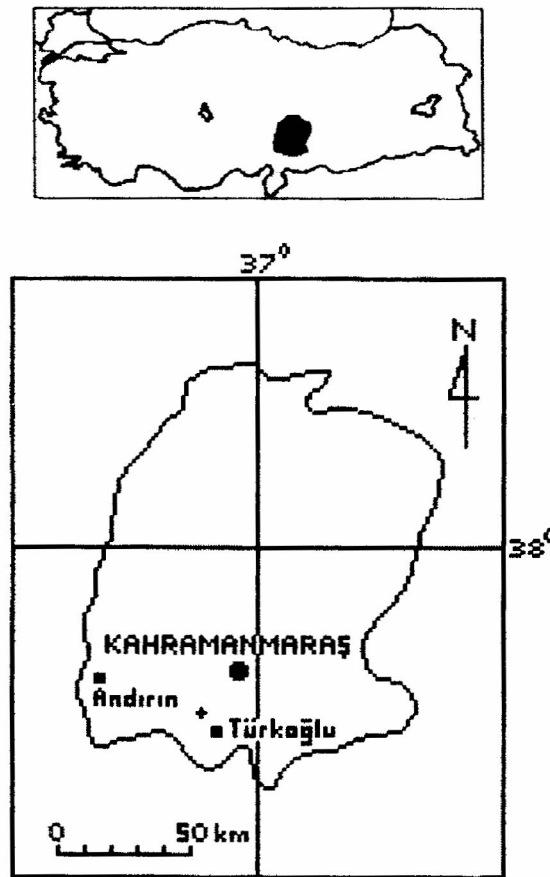


Fig. 1 : The new distribution area of Caucasian wingnut in the Kahramanmaraş region (+ : new distribution).

and nutrient-rich deep soils.

Caucasian wingnut is found together with *Platanus orientalis* L., *Salix alba* L., and *Salix pentandra* L. species in the distribution area determined recently. In its other two distributions in Kahramanmaraş, it is also found together with *Platanus orientalis* L. and *Salix* spp. (Avsar, 2001). In addition, this species is found together with species such as *Alnus glutinosa* (L.) Gaertn. subsp. *glutinosa*, *Salix alba* L., *Castanea sativa* Mill., *Platanus orientalis* L., *Fraxinus angustifolia* Vahl. subsp. *oxycarpa* (Bieb. ex Willd) Franco and Afonso, and *Acer campestre* L. in creek vegetation in the regions of Akcakoca, Adapazari, Karasu, and Sogutlu, northern Anatolia (Kutbay and Ok, 2000).

This species has quite high diameter and height growth potential. At first, this results from own biological characteristics of the species. In addition, as known, in the species that can regenerate both by seed and sprout, the individuals developing from the sprout grow faster than the individuals developing from the seed

especially in early years. In this respect, that Caucasian wingnuts generally develop from root suckers or stump sprouts plays an important role on the quite fast growth of the species. That its distribution areas are generally suitable places in terms of water and nutrition also affects positively the increment. As a matter of fact, Yaltirik (1993) stated that Caucasian wingnut is a species that grows fast in moist loam soils. Kutbay *et al.* (1999) reported that this species grows quite fast, the annual rings of its wood are very wide, and the mean annual ring width is 1 cm. In the present study, it was determined that the annual ring width generally varied between 1.0 and 1.1 cm. Similarly, it was determined that Chinese wingnut (*Pterocarya stenoptera* C. DC.) grows at a phenomenal rate, and a 6-year-old tree was about a height of 7.6 m and stem diameter of 35.6 cm (Gilman and Watson, 1994).

The root suckers of this species also grow very fast. In the present study, it was determined that the

heights of 1-year-old root suckers varied between 28.5 and 242.5 cm, and the mean height was 114.5 cm. Similarly, Avsar (2001) determined that 1-year-old root suckers of the species had the heights varying from 83 to 200 cm, and the mean height was 129 cm in Derekoy, Kahramanmaras.

In the seeds collected from the other two distribution areas of the Kahramanmaras region, it was determined that the proportion of filled seeds was very low, and the seeds of this species had dormancy (Avsar, 2002). The seed yield of the trees in the distribution area determined recently was generally low. This probably may result from being young in age or not having sufficiently developed crowns. In this respect, the possibilities of natural regeneration of this species in the region are seen to be insufficient. However, its strong sprouting ability is an important advantage for continuing its generation. As a matter of fact, in many literatures, it was stated that this species has root suckering and stump sprouting ability (Yaltirik, 1993; Kutbay *et al.*, 1997; Ansin *et al.*, 1998; Avsar, 2001). In this respect, it is possible to say that this species mainly regenerates vegetatively in the region.

The existence of this species is under threat in Turkey. As a matter of fact, it was determined that there were only 18 adult individuals in the Haci Osman Nature Conservation Forest, Samsun (Kutbay *et al.*, 1997). Caucasian wingnut had 38 and 65 trees in Derekoy and Altinova, Kahramanmaras, respectively (Avsar, 2001). It was noted that the species had also 100 trees at the distribution in Gaziantep (Anonymous, 2001). Similarly, in the present study, it was determined that the species had about 100 trees. On the other hand, it was stated that the riparian forests that also has Caucasian wingnut are threatened throughout the Caucasus (Anonymous, 2000a), and the extent of riparian forests that also include Caucasian wingnut has been much reduced in Georgia because of their accessibility (Anonymous, 2000b).

In this new distribution area, the species has limited number of individuals, and it is seen that its existence is under threat because of the destruction. Any protection measure taken by the forestry organization in the region is not also present. In this respect, this distribution area should be protected as soon as possible as a gene resource. This would also provide an important contribution to continuing biodiversity in the region. That especially vegetative reproduction of Caucasian wingnut

is started would be useful. The seedlings to be obtained should be used at lake and stream margins, parks and large gardens, avenues, boulevards, and streets in the region. As well as being a landscape element, the possibilities of using its wood should be evaluated.

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