

Juglans mandshurica: A new alien walnut species for the flora of Türkiye

Juglans mandshurica: Türkiye florası için yeni bir yabancı ceviz türü

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Abstract

Juglans mandshurica Maxim. (Juglandaceae) is recorded as a new woody alien for the vascular flora of Türkiye. Tree-ring evidence from the oldest individual indicates that the taxon was introduced to Artvin- Kemalpaşa at least 19 years ago, a finding supported by observations of both mature individuals and numerous seedlings in Kemalpaşa and the other observed locations. This suggests that *J. mandshurica* is becoming naturalized and could potentially become an invasive species in the Northeast Anatolian region, where several non-native woody species (e.g. *Spiraea japonica* and *Rhus chinensis* var. *chinensis*) have already been recorded. This walnut species is estimated to have been introduced both by humans for its edible seeds (intentionally) and through scatter-hoarding by crows (unintentionally). Its description, illustrations, and photographs, together with a diagnostic key to the species of *Juglans* in Türkiye, are given to facilitate easy identification.

Key Words: Alien, Anatolia, *Juglans*, Juglandaceae

Öz

Juglans mandshurica Maxim. (Juglandaceae), Türkiye'nin vasküler florası için yeni bir odunsu yabancı tür olarak kaydedilmiştir. En yaşlı bireyden elde edilen ağaç halkası kanıtları, taksonun Artvin- Kemalpaşa'ya en az 19 yıl önce yerleştiğini göstermektedir; bu bulgu, Kemalpaşa ve diğer gözlem yerlerinde hem olgun bireylerin hem de çok sayıda fidanın gözlemlenmesiyle desteklenmektedir. Bu, *J. mandshurica*'nın doğallaşmaya başladığını ve hâlihazırda birkaç yabancı odunsu türün (örneğin *Spiraea japonica* ve *Rhus chinensis* var. *chinensis*) kaydedildiği Kuzeydoğu Anadolu yöresinde potansiyel olarak istilacı bir tür haline gelebileceğini düşündürmektedir. Bu ceviz türünün, hem yenilebilir tohumları için insanlar tarafından (kasıtlı olarak) hem de karga ekimi (kasıtsız olarak) yoluyla getirildiği tahmin edilmektedir. Kolay tanımlamayı sağlamak için türün tanımı, çizimleri ve fotoğrafları ile birlikte Türkiye'deki *Juglans* türlerine ait bir teşhis anahtarı verilmiştir.

Anahtar Kelimeler: Yabancı, Anadolu, *Juglans*, Juglandaceae

1. Introduction

Every year, new alien plant species naturalize in Türkiye becoming a part of the wild flora. Particularly, the Northeast Anatolian Region, where new naturalized species are constantly being discovered, is well known as being rich in exotic flora (Terzioğlu and Coşkunçelebi, 2022). Exotic (alien) plants easily colonize this region in Türkiye (Avcı and Avcı, 2014) due to its near-subtropical climate, heavy rainfall, and year-round mist.

The genus *Juglans* L. (Juglandaceae) is a rather small genus of deciduous trees including 21 distinct woody species worldwide (Whittemore and Stone, 1997; Lu et al., 1999; Grimshaw, 2004). Together with *Pterocarya* Kunth, *Juglans* is the second native genus of Juglandaceae in Türkiye (Yaltırık, 1982; Güner et al., 2012). *Pterocarya* is also reported to be the genus most closely related to *Juglans* (Stanford et al., 2000).

Juglans occurs in a very wide range of the world (mainly temperate and subtropical areas of the N Hemisphere, extending into South America) of which the natural range is unclear because of a long history of cultivation (Lu et al., 1999).

Juglans is treated under the four sections (sect. *Juglans* including *J. regia*, sect. *Rhisocaryon*, sect. *Trachycaryon*, and sect. *Cardiocaryon* including *J. mandshurica* Maxim.) based on fruit morphology, wood anatomy, and foliage architecture (Mallikarjuna et al., 2007; Stanford et al., 2000; Grimshaw, 2004). Most of its species are of low economic value and are used only occasionally as timber or as a source of brown dye worldwide (Stanford et al., 2000). However, both *J. regia* and *J. nigra* are widely cultivated and economically important worldwide. In Türkiye, *J. regia* is the only species of the genus *Juglans* cultivated for its edible kernels and valuable timber (Yaltırık, 1982).

During the field study on the distribution of invasive plants in the Eastern Black Sea region, unfamiliar walnut samples at the fruiting stage were collected in Autumn 2024 by the authors. At first glance, these samples differed from the common walnut species (*J. regia*) distributed in Türkiye. In order to identify them, a new fieldwork was planned to collect enough samples in the spring of 2025 at the flowering stage. The first observations and examinations showed that these specimens belong to *J. mandshurica*, native to the Russian Far East to China, N. Korea, and Taiwan (Luan et al., 2021) and have hitherto been reported as introduced into the Baltic States, Central European Russia, Germany, Maryland and New York (USA), the North Cauca-

sus, Sakhalin, Tadjikistan, and the Transcaucasus (Grimshaw, 2004; POWO, 2026; Figure 1).



Figure 1. Distribution of *J. mandshurica* in the world (Modified from POWO, 2026)

Şekil 1. *J. mandshurica*'nın dünyadaki yayılışı (POWO 2026'dan türetilmiştir)

J. mandshurica is a part of the taxonomically unresolved complex, sometimes referred to as *J. mandshurica* s.str. or *J. mandshurica* s.lato. The main confusion is related to the taxonomy of *J. ailantifolia* Carrière, native to Japan, which is sometimes considered a separate species, but often treated only as a variety of *J. mandshurica* (*J. m.* var. *sakhalinensis* (Komatsu) Kitam.). Although this paper does not focus on addressing the taxonomic issues of the *J. mandshurica* complex, the new walnut record is treated as *J. mandshurica* var. *mandshurica* under the broader species concept (POWO, 2026). However, we followed the narrow species concept in the present paper.

This study aims to present a new alien woody taxon from Artvin and Rize provinces, which are located in the north-eastern part of Türkiye and close to the Georgian border. Besides, a detailed taxonomic description, together with illustrations and a diagnostic key to the species of *Juglans* in Türkiye, was prepared here.

2. Materials and Methods

Plant material of this newly recorded species was collected by the authors both in the autumn of 2024 at the fruiting stage and in the spring of 2025 at the flowering stage. The specimens were identified using several relevant publications (Komarov, 1936; Yaltırık, 1982; Lu et al., 1999; Grimshaw, 2004; Luan et al., 2021; Marazzi et al., 2021) and herbarium samples. All characters of the specimens were surveyed by a stereomicroscope in herbarium conditions and during field observations.

The materials recorded here are put into the Herbaria of the Faculty of Forestry (KATO) and the

Department of Biology (KTUB) at the Karadeniz Technical University, Trabzon. The age of the tree was determined by taking a cross-section from the trunk of the oldest individual of *J. mandshurica* (Speer, 2010) recorded in Kemalpaşa. The growth rings visible on the sections were counted to estimate the tree's age, with each ring representing one year of growth. Because the aim was to infer the approximate time of introduction to the site, only this individual was analyzed and no mean age was calculated for the remaining trees.

The description and dichotomous key are prepared based on examination of the Herbarium materials and the relevant literature (Komarov, 1936; Yaltırık, 1982; Lu et al., 1999; Grimshaw, 2004; Luan et al., 2021; Marazzi et al., 2021).

3. Results

Key to the species of *Juglans* in Türkiye

- 1a.** Leaflets (7-) 9-19, abaxially pubescent or rarely glabrescent, margin serrate (rarely serrulate); nuts 2-chambered at base; husk indehiscent *J. mandshurica*
- 1b.** Leaflets 5-9 (-11), glabrous except for hair-tufts in axils of vein beneath, margin entire; nuts 4-chambered at base; husk irregularly dehiscent into 4 valves *J. regia*

Juglans mandshurica Maxim. Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg, sér. 2. 15: 127. 1856. (Figure 2, Figure 3). Manchurian or Chinese Walnut.

=*J. cathayensis* Dode, *J. collapsa* Dode, *J. draconis* Dode, *J. formosana* Hayata, *J. hopeiensis* Hu, *J. stenocarpa* Maxim.

Common names: Madshurian walnut (POWO, 2026).

Vernacular (Turkish) name: Mançurya cevizi, new Turkish name according to guidelines of Menemen et al. (2016).

3.1. Description

A fast-growing, deciduous broad-leaved and robust tree up to 25 m tall. Sometimes, especially in cultivation, it may branch from the base and become shrubby as a result of frost breaking the young shoots in April and causing the loss of apical growth. Bark silvery-grey when young, pale greenish-grey and deeply furrowed with age. Petiole and leaves up to 23 and 90 cm long (or longer in vigorous young trees), respectively.

Rachis ± glandular pubescent; leaflets borne at

right angles to rachis, (7-) 9-19, lateral ones sessile, blade ovate-elliptic to elliptic or long elliptic, 6-17×2-7.5 cm, laterally sessile, the terminal one petiolulate (1-5 cm), tomentose or slightly pubescent below, base subcordate, margin serrate (rarely serrulate), apex shortly acuminate. Male catkins up to 40 cm, slender, yellowish-green, stamens 12-40. Female spike and in upright position, with 5-10 (-13) flowers. Fruits in pendulous clusters, nuts dusky brown, globose-ovoid or ellipsoid (very variable in shape), abruptly terminating in a short point, 3-7.5×3-5 cm; husk densely glandular-pubescent, indehiscent; shell thick, rough, with (4-) 6-8 strong ridges and deep pits and depressions. Kernel sweet, but very difficult to extract. *Fl. Apr-May, fr. Aug-Oct.*

List of examined samples and observations belong to the Manchurian walnut in Türkiye

- A8 Artvin-Kemalpaşa: Liman Village, broadleaf deciduous forest, 41°27'55" N, 41°29'13" E, 13 m, 03.09.2024; ibid, 01.05.2025. Observed by the authors.
- A8 Artvin- Kemalpaşa: Sarp village, broadleaf deciduous forest, 41°31'00" N, 41°33'23" E, 156 m, 03.09.2024. Observed by the authors.
- A8 Artvin- Kemalpaşa: Sarp village, broadleaf deciduous forest, 41°31'01" N, 41°33'29" E, 163 m, 03.09.2024, (KATO: 23244!) and K. Coşkunçelebi 1475a (KTUB!).
- A8 Artvin-Kemalpaşa: Sarp village, broadleaf deciduous forest, 41°31'03" N, 41°32'52" E, 6 m, 03.09.2024. Observed by the authors.
- A8 Artvin- Kemalpaşa: Sarp village, tea (*Camellia sinensis*) plantation and settlement area, 41°31'04" N, 41°32'53" E, 163 m, 03.09.2024. Observed by the authors.
- A8 Rize- Fındıklı: Kıyıcık village, broadleaf deciduous forest, 41°18'26" N, 41°13'21" E, 16 m, 01.05.2025, (KATO: 24462!) and K. Coşkunçelebi 1475b (KTUB!).
- A8 Artvin- Kemalpaşa: City center, tea plantation and settlement area, 41°29'38" N, 41°32'16" E, 28 m, 01.05.2025. Observed by the authors.

3.2. Habitat

In Türkiye, *J. mandshurica* occurs in lowlands, broad-leaved forests, the border of tea plantations, along streams and road sides, and in thickets. Native, naturalized (*) and cultivated (**) taxa that shared the same habitat with *J. mandshurica* were as follows:

- a) **Native taxa:** *Alnus glutinosa* (L.) Gaertn. subsp.

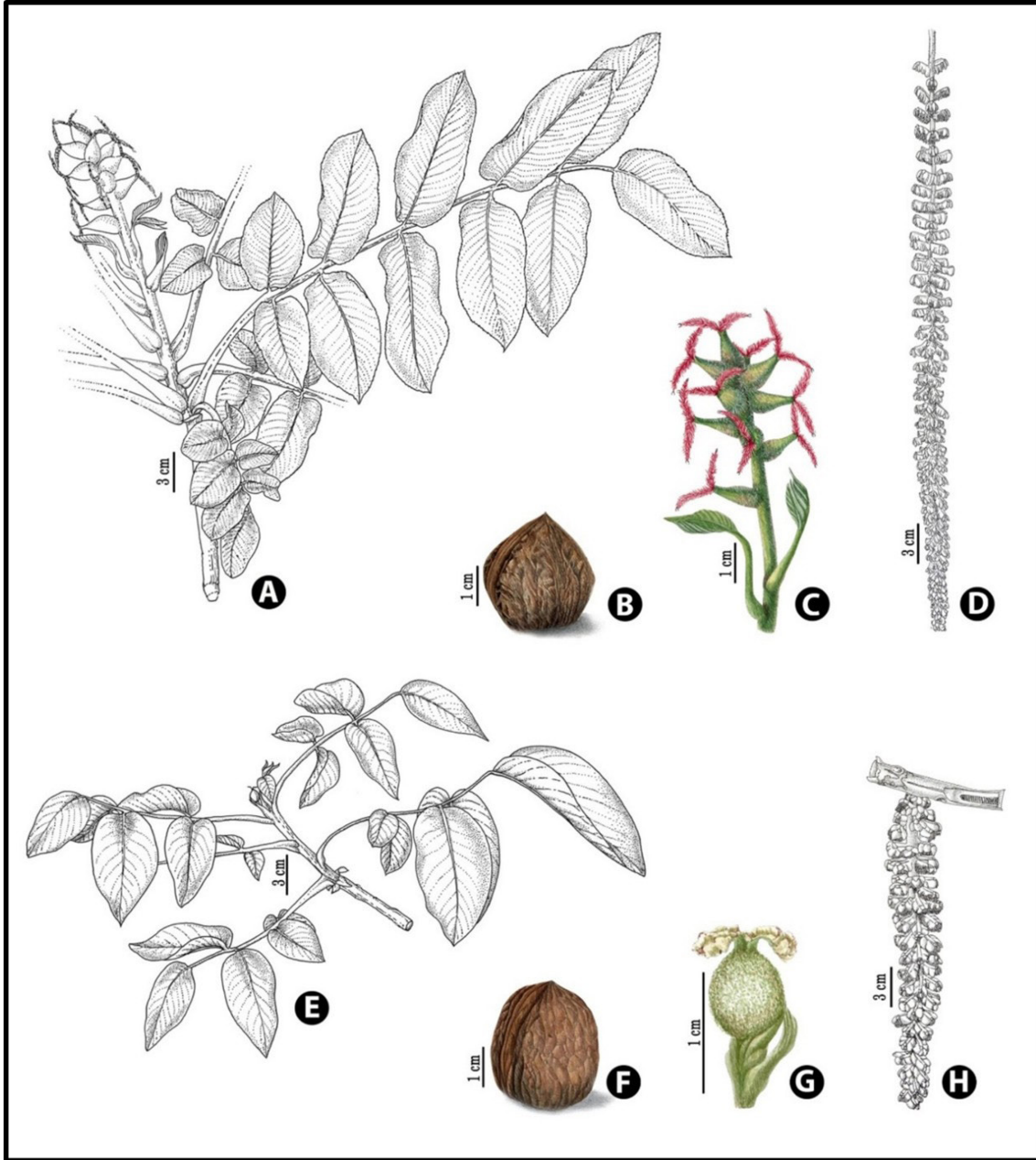


Figure 2. *J. mandshurica*: A) Young shoot with flowering female inflorescence and emerging leaves; B) Rough ridged shell; C) Flowering female inflorescence; D) Male inflorescence. *J. regia*: E) Young shoot with emerging leaves; F) Wrinkled shell without prominent ridges; G) Flowering female flower; H) Male inflorescence

Şekil 2. *J. mandshurica*: A) Dişi çiçek kurulu ve yeni yapraklı genç sürgün; B) Pürüzlü-oluklu endokarp; C) Dişi çiçek kurulu; D) Erkek çiçek kurulu. *Juglans regia*: E) Yeni yapraklı genç sürgün; F) Az pürüzlü, buruşuk endokarp; G) Dişi çiçek; H) Erkek çiçek kurulu

barbata (C.A. Mey.) Yalt., *Ulmus glabra* Huds., *Diospyros loureiroana* G. Don, *Juglans regia* L., *Ficus carica* L. subsp. *carica*, *Sambucus nigra* L., *Rubus sanctus* Schreber, *Clematis vitalba* L., *Hedera colchica* (C. Koch) C. Koch, *Smilax excelsa* L., *Bidens tripartita* L., *Calystegia silvatica* (Kit.) Griseb., *Glechoma hederacea* L., *Lactuca serri-*

la L., *Lapsana communis* L., *Lythrum salicaria* L., *Origanum vulgare* L., *Periploca graeca* L., Gaertn., *Petasites albus* (L.) Gaertner, *Phyllitis scolopendrium* L., *Polygonum persicaria* L., *Primula megaseifolia* Boiss. & Balansa, *Primula vulgaris* Huds., *Pteridium aquilinum* (L.) Kuhn, *Salvia glutinosa* L., *Sambucus ebulus* L., *Solanum nigrum* L.,

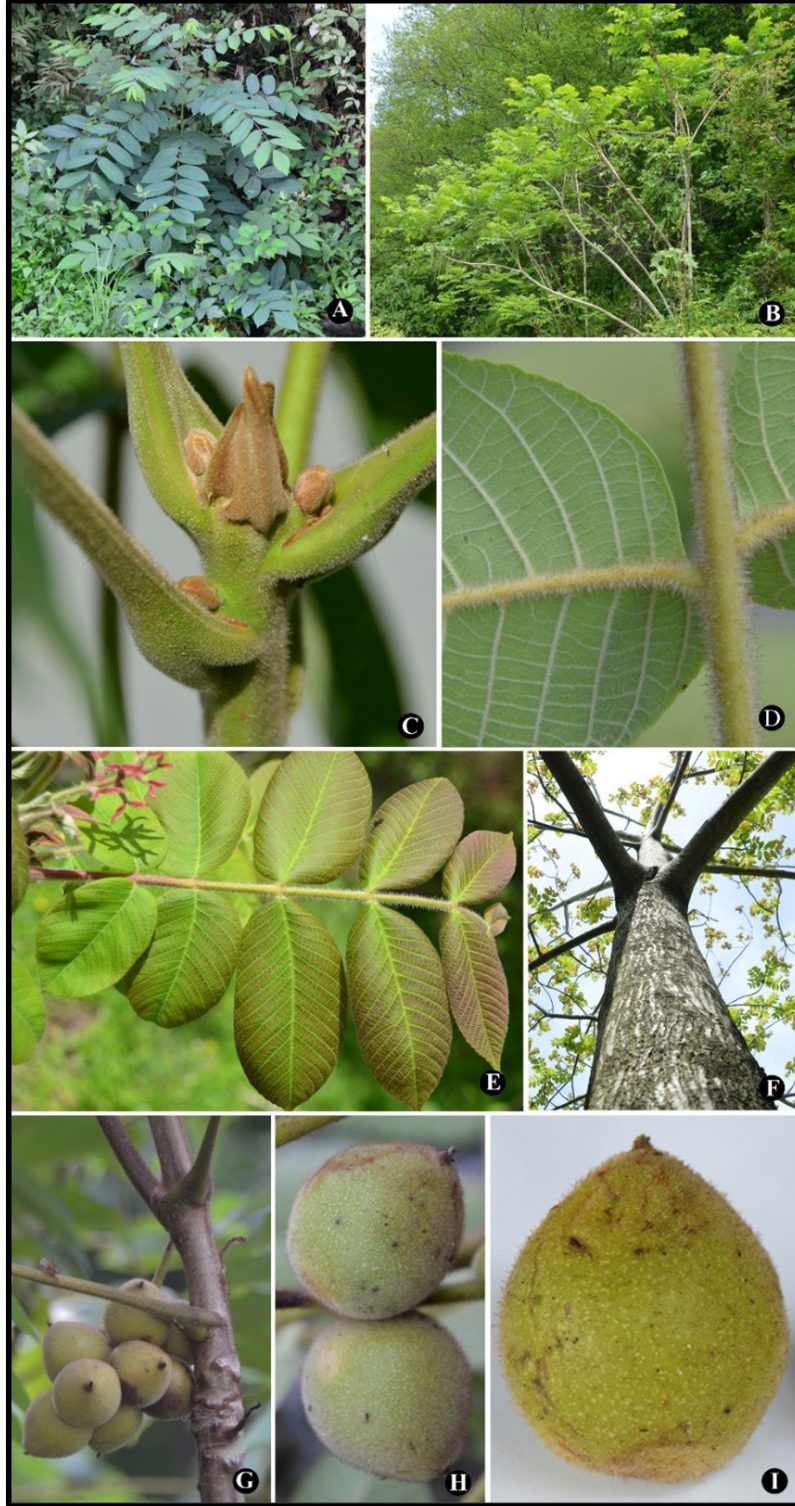


Figure 3. *J. mandshurica*: A) Seedling on the margin of the mixed forest; B) Shrubby individuals on the margin of the stand; C) Terminal and axillar buds on the shoot; D) Abaxially pubescent leaflets with serrate margin; E) Leaflets borne at right angles to rachis; F) Trunk of a young tree; G, H) Mature infructescences; I) Older mature indehiscent fruits, husk with dense glandular-pubescent

Şekil 3. *J. mandshurica*: A) Karışık orman kenarında fidan; B) Meşcere kenarında çalimsı bireyler; C) Sürgünde uç ve yan tomurcuklar; D) Alt yüzeyi tüylü, kenarları testere dişli yaprakçıklar; E) Ana damara dik açı ile bağlı yaprakçıklar; F) Genç bir ağacın gövdesi; G, H) Olgun meyve kurulu; I) Olgun, açılmayan, dış kabuğu yoğun salgı tüylü meyveler

Stachys annua (L.) L., *Viola sieheana* W. Becker,

b) **Naturalized (*) taxa:** **Robinia pseudoacacia* L., **Rhus chinensis* Mill. var. *chinensis*, **Lonicera japonica* Thunb., **Acalypha australis* L., **Ambrosia artemisiifolia* L., **Artemisia verlotorum* Lamotte, **Crassocephalum crepidioides* (Benth.) S. Moore, **Erigeron canadensis* L., **Erigeron floribundus* (Kunth) Sch. Bip., **Commelina communis* L., **Microstegium vimineum* (Trin.) A.Camus, **Oplismenus undulatifolius* (Ard.) P.Beauv., **Persicaria nepalensis* (Meisn.) H. Gross, **Phytolacca americana* L., **Polygonum perfoliatum* L., **Sicyos angulatus* L., **Tradescantia fluminensis* Vell.,

c) **Cultivated (**) taxa:** ***Morus rubra* L., ***Camellia sinensis* (L.) Kuntze., ***Capsicum annuum* L., *Carpesium abrotanoides* L., ***Cucumis sativus* L., ***Cucurbita maxima* Duchesne, ***Phaseolus vulgaris* L., ***Solanum lycopersicum* L., ***Solanum melongena* L., ***Solanum tuberosum* L., ***Zea mays* L.

4. Results and Discussion

The anthropogenic translocation of woody plant taxa over the past few centuries has, in recent decades, resulted in the widespread naturalization and invasion of numerous tree and shrub species (Richardson, 2011). According to Richardson and Rejmánek (2011), 622 species (357 tree and 265 shrubs in 29 plant orders, 78 families, 286 genera) of woody plants have been introduced globally, and most of them have become invasive.

The introduction of alien woody species to new habitats is the first step in the naturalization process and is an ecologically significant event. Naturalization is important for the woody plants, with their long lifespans and large size, which can profoundly and permanently alter the ecosystems they invade. Once established, these trees or shrubs can outcompete native vegetation for light, water, and nutrients, form dense monocultures that reduce biodiversity, and significantly change habitat structure for native wildlife. Furthermore, they can alter fundamental ecosystem processes, such as fire regimes, water availability, and soil chemistry, leading to cascading effects throughout the food web. Therefore, monitoring and preventing the escape of such species is a crucial frontline defense in conservation, as managing a widespread, mature woody invasion is often incredibly difficult, costly, and ecologically damaging.

When writing about the introduction of alien species to a new location, it is very important to know where this taxon has previously been found ran-

domly or naturally. A brief internet search reveals that *J. mandshurica* has escaped into the mountainous regions of the Greater and Lesser Caucasus, the Alazan-Ayrichay Valley, the mountainous part of Lankaran, and the mountainous regions of Nakhchivan (Bussmann et al., 2025) and Ukraine (Mosyakin and Yavorska, 2002). This ergasiophyte also tends to naturalize in the eastern part of Türkiye close to the Georgian border.

Most observations were made in Kemalpaşa, located about 5 km from the Georgian border (Figure 4). It is very important to know whether the tree is known to be growing right behind the border in Georgia or hundreds of kilometers away from Kemalpaşa. According to POWO (2026), *J. mandshurica* is introduced into the North Caucasus, including Georgia and Armenia (Figure 4); however, there is no precise information about its distribution in Georgia.

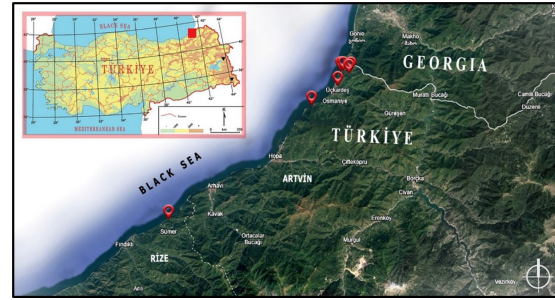


Figure 4. Distribution of *Juglans mandshurica* in Türkiye

Şekil 4. *J. mandshurica*'nın Türkiye'deki yayılımı

Although it is not known for certain how the walnut plant arrived in Türkiye (intentionally or unintentionally), it is thought that its seeds were brought to the country by birds. Although it is not certain how and when it arrived, it is spreading rapidly. We found out that the oldest individual, which we could determine in the field, was precisely 19 years old. This reveals that the species was firstly introduced to Türkiye approximately two decades ago.

If the necessary measures are not taken, it may become an invasive species by completing its naturalization process in Türkiye and increasing its pressure on native species. In this regard, local administrators, farmers, and people living in the region need to be warned. In conversations with villagers in the districts of Kemalpaşa and Fındıklı, where its spread has been detected so far, it has been stated that the people first took this plant for its fruit and planted it in new places, but when they realized that the kernel was small and difficult to extract, they gave up on it and left it to its own de-

vices, but then it spread rapidly on its own (possibly by birds). Public awareness should be created through “citizen science” to stop the spread of *J. mandshurica* in this region of the country before it becomes invasive.

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Authors' contributions

Main idea/Planning: S.Terzioğlu, K. Coşkunçelebi, B. Serdar, Data collection and analysis: S.Terzioğlu, K. Coşkunçelebi, B. Serdar, Melike Çiğdem, Literature review: S. Terzioğlu, Review and correction: S.Terzioğlu, K. Coşkunçelebi, B. Serdar, Botanical Illustration: Melike Çiğdem

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