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‘Bayındır’: A New Cultivar of *Juglans regia* L.

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Walnut (*Juglans regia* L.) is one of the most valuable fruit species, holding a significant place in human nutrition throughout history. In recent years, walnut consumption has increased due to its rich nutritional content and the growing awareness of mindful eating. Walnuts are of great importance to human health, the ecological cycle, and sustainable agriculture.

Walnut cultivation faces many challenges today, including global climate change, decrease in agricultural land, disease, and pests. These factors increase restrictions on plant cultivation, including walnut cultivation, day by day. Responsibilities of plant breeders have become even more crucial, especially for fruit species such as walnuts, which experience a continuously growing demand. Therefore, the development of high-yielding, high-quality walnut varieties that are resistant to biotic and abiotic stress factors has become increasingly critical on a global scale.

Breeding studies on walnuts first started with selection breeding and continued for many years (Bernard et al. 2018; Sütyemez et al. 2019, 2022). However, in recent years, cross-breeding studies have increased to obtain more resistant and superior varieties due to the influence of abiotic and biotic stress factors. In the literature, it is generally accepted that good walnut varieties should be productive (with lateral bud flowering), have smooth and thin-shelled nuts, an average fruit weight of 10 g or more, a kernel percentage of more than 50%, and resistance to diseases such as anthracnose, blackline, and *Agrobacterium tumefaciens* (Gradziel et al. 2009; Sütyemez et al. 2021; Vahdati 2019; Zhao et al. 2020).

Türkiye has significant potential for walnut production with its wide genetic diversity and suitable ecological conditions. For this reason, some scientists in Türkiye have initiated cross-breeding programs to develop walnut varieties that can better adapt to different environmental conditions and compete at international standards. In this article, the pomological and phenological traits of the ‘Bayındır’ walnut variety, which was developed as a result of a cross-breeding program in Türkiye, are discussed in detail. Comparisons were also made between this variety and two standard varieties (‘Chandler’ and ‘Maraş 18’), and their differences are discussed.

Origin

This study was conducted at the Kahramanmaraş Sütçü İmam University Hard Shell Fruit Research and Application Center. The study area (SEKAMER) is located in the province of Kahramanmaraş, Türkiye (37°35′27″N, 37°03′28″E), at an altitude of 930 m above sea level with a temperate climate. The annual precipitation is 727 mm, and the average temperature is 16.9 °C. The soil structure is generally suitable for walnut cultivation.

Walnut breeding studies at Kahramanmaraş Sütçü İmam University started in 2005 and is ongoing. This walnut breeding program aims to develop genotypes with late-leafing; early-harvesting; early-defoliation; and productive, high-quality nuts. For this purpose, different hybridization combinations have been made in the breeding program using several walnut varieties as parents. ‘Bayındır’ is a walnut variety obtained from the combination of ‘Pedro’ × ‘Maraş 18’ as parents. ‘Maraş 18’ stands out in walnut cultivation in Türkiye because of its quality. ‘Pedro’, of American origin, is a variety with high lateral bud flowering. The reason the varieties were selected as parents was to combine these traits in one plant. The cross of the two varieties was carried out in Apr 2007. The seeds obtained were sown in Trial Plot 1 in 2008. Observations were made on the developing plants for 4 years, and 15 superior genotypes were selected from these progenies. These selected genotypes were planted in Trial Plot 2 in 2012, with seven trees per genotype grafted onto seedlings obtained from the same seed source. The saplings were planted with a tree spacing of 8 × 7 m. During the development of the saplings, standard cultivation methods were applied. To ensure accurate identification of vegetative characteristics, no treatments or pruning were carried out, allowing the trees to grow naturally. Data regarding all necessary plant characteristics of the walnuts on this trial plot were recorded annually.

A new walnut variety/patent application was made to the Variety Registration and Seed Certification Center of the Republic of Türkiye Ministry of Agriculture and Forestry in 2019, with reports consisting of data obtained consecutively over the years. As a result of the scientific evaluations made by this institution for 3 consecutive years, ‘Bayındır’ was patented on 3 Mar 2022.

Description

The averages of 11 phenological observations and 15 pomological analyses obtained from the ‘Bayındır’ walnut variety from 2019 to 2022 are presented here. The criteria of IPGRI (1994) and The International Union for the Protection of New Varieties of Plants (UPOV) (2014) were used to determine plant and nuts traits. Additionally, data from the ‘Chandler’ and ‘Maraş 18’ varieties, which are grown as standard varieties both worldwide and in Türkiye, are also presented and compared.

One of the most important differences between the ‘Bayındır’ and other varieties is its leafing date. During the examined vegetation periods, the leafing dates of the varieties were determined from early to late as ‘Maraş 18’, ‘Chandler’, and ‘Bayındır’, respectively. Walnut is a fruit species that can be affected by spring frosts. ‘Chandler’, on the other hand, is known as one of the varieties with relatively late leafing worldwide. However, ‘Bayındır’ shows superior performance by leafing out even later than ‘Chandler’.

Walnut is one of the monoecious plant species and a species with a high tendency to dichogamy. Through our research, it was determined that the ‘Bayındır’ showed protandrous flowering. Therefore, orchards established with this variety will require a pollinator. The ‘Kaman-1’ variety, registered by Mehmet Sütyemez in 2010, is recommended as a pollinator.

‘Bayındır’ has superior characteristics compared with ‘Chandler’ in terms of harvest date and defoliation date. Its late leafing and early defoliation dates give this variety a short vegetation period, providing a significant advantage in terms of protection from

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Fig. 1. Image of the 'Bayındır' tree and nuts.

Table 1. Results of some important phenological and pomological traits of 'Bayındır', 'Chandler', and 'Maraş 18'.

Phenological and pomological traits	Bayındır	Chandler	Maraş 18
Leafing date	18 Apr	16 Apr	7 Apr
First male bloom date	19 Apr	20 Apr	13 Apr
Last male bloom date	28 Apr	30 Apr	20 Apr
First female bloom date	25 Apr	29 Apr	22 Apr
Last female bloom date	2 May	10 May	28 Apr
Catkin abundance	High	High	Intermediate
Female abundance	High	High	Intermediate
Lateral bud flowering (%)	97.48	96.43	76.34
Dichogamy status	Protandrous	Protandrous	Protandrous
Harvest date	9 Sep	2 Oct	8 Sep
Defoliation date	18 Nov	2 Dec	5 Nov
Nut shape	Broad elliptic	Broad elliptic	Broad elliptic
Nut shape in lateral view	Broad ovate	Broad ovate	Broad ovate
Nut shape of the base in lateral view	Rounded	Rounded	Rounded
Nut: shape of apex in lateral view (excluding tip)	Truncate	Truncate	Rounded
Shell texture	Medium	Medium	Smooth
Shell color	Light	Light	Light
Shell strength	Intermediate	Weak	Intermediate
Ease of removal of kernel halves	Easy	Very easy	Easy
Nut weight (g)	14.78	12.79	14.83
Kernel weight (g)	7.67	6.23	7.62
Kernel percentage (%)	51.94	48.72	51.41
Shell thickness (mm)	1.31	1.21	1.38
Kernel color	Light	Light	Light
Kernel fill	Well	Well	Well
Kernel flavor	Satisfactory	Satisfactory	Satisfactory

autumn frosts. It was determined that 'Bayındır' reached harvest maturity ~3 weeks earlier than 'Chandler' and very close to 'Maraş 18'. 'Bayındır' is shown in Fig. 1.

Pomological analyses were performed on 50 nuts taken to represent each tree in three vegetation periods for both standard varieties and 'Bayındır', and average data were presented. 'Bayındır' also has important characteristics in terms of pomological properties. The variety, with a broad elliptical nut shape, has moderate shell texture, a light shell color, a tendency for the fruit to easily separate from the shell, and a light kernel color. The shelled nut weight of the variety was determined as 14.78 g, which is superior to the 'Chandler'. The most striking feature of 'Bayındır' is its kernel percentage value. The kernel percentage of the variety was determined to be 51.94%, compared with 48.72% for 'Chandler' and 51.41% for 'Maraş 18'. Shell thickness is 1.31 mm. Other phenological and pomological data are presented in Table 1, and an image of the 'Bayındır' nuts is shown in Fig. 1.

Availability

'Bayındır' saplings or scions for grafting can be obtained by appointment from the Faculty of Agriculture, Kahramanmaraş Sütçü İmam University, Kahramanmaraş, Türkiye.

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