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‘Ahsen’: A Late-leafing, High-yielding, Early-harvest Walnut Variety with Superior Nut Quality

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Walnut (*Juglans regia* L.) is one of the important fruit species with hard-shelled fruits. In addition to its high nutritional value, it has long been a focus of interest for both consumers and producers due to its functional food properties. According to FAO (2025), global production of shelled walnuts increased from 1,287,622 tons in 2000 to 3,988,642 tons in 2023, clearly indicating the growing interest in walnuts. This species is also an indispensable raw material in the furniture, medical, and cosmetic industries.

Walnut breeding studies initially began with the selection breeding of genotypes from seeds derived. Walnut breeding programs gained momentum worldwide in the 20th century. The first studies started in the United States in 1948, followed by Türkiye and France in 1971 and 1977, respectively. Over the past few years, efforts to develop superior walnut varieties have accelerated in many parts of the world. In general, the common goals of walnut breeding programs are high yield, nut quality, taste, late leafing, early harvest and defoliation dates, and disease resistance (Bernard et al. 2018).

Walnuts have always been popular in Türkiye due to being native and widely cultivated and consumed, leading to an increase in walnut breeding studies. Between 1990 and 2025, 63 walnut varieties were registered in Türkiye, with nearly half (31) developed through breeding programs at Kahramanmaraş Sütçü İmam University’s Faculty of Agriculture. These programs aim to develop disease-resistant varieties with late leafing, high yields, and quality nuts, and the research continues (Sütyemez 2000, 2006, 2016; Sütyemez et al. 2019, 2021, 2022). The ‘Ahsen’, identified as having superior qualities after extensive research and careful observations, has been registered within these programs by the Variety Registration and Seed Certification Center of the Republic of Türkiye Ministry of Agriculture and Forestry. This study provides a detailed examination of the development process, pomological, and phenological traits of ‘Ahsen’ and discusses the advantages this new variety offers to producers in light of comparisons with other standard walnut varieties.

Origin

The research that forms the basis of this study was conducted at the Kahramanmaraş Sütçü İmam University, Hard Shell Fruit Application and Research Center (SEKAMER), located at coordinates 37°35′27″N and 37°03′28″E, ∼930 m above sea level. The research area receives an average annual rainfall of 727 mm and has an average temperature of ∼16.9 °C, providing favorable soil structure and climatic conditions for walnut cultivation. Additionally, the region’s soil is suitable for walnut growing.

Since 2005, the walnut breeding programs conducted by the Faculty of Agriculture at Kahramanmaraş Sütçü İmam University have experimented with different hybridization combinations, aiming to combine the characteristics of superior varieties/genotypes. The ‘Ahsen’ is one of the important varieties obtained from these programs. It was derived from the ‘Chandler’ × ‘Maraş 18’ hybrid combination. ‘Chandler’ is one of the most widely cultivated and productive varieties globally, while ‘Maraş 18’ is renowned for both its taste and nut quality. The hybridization of these varieties took place in 2007, and the resulting seeds were sown in the 2008 Trail Plot 1. After 4 years of observations, the best-performing genotypes were identified, and these were grafted onto rootstocks obtained from the same genetic source in 2012. The ‘Ahsen’ grafted saplings, along with the ‘Chandler’ and ‘Maraş 18’, were planted in the Trail Plots 2 with seven replications. As a result of long-term evaluation processes, ‘Ahsen’ was officially registered on 25 Mar 2022. The average data from the years 2019–22 are presented in this study.

Description

This study examines the phenological and pomological traits of the ‘Ahsen’, ‘Maraş 18’, and ‘Chandler’ varieties during the 2019–22 period. To determine plant and nuts traits, the International Plant Genetic Resources Institute (1994) and Union Internationale Pour le Protection des Obtentions Vegetales (2014) criteria were used, and the average data of 26 examined plant characteristics were presented. Phenological observations were conducted every other day throughout the trial years. For pomological analyses, 50 nuts representing each variety were collected during each vegetation period and analyzed. Similar observations and analyses were performed on ‘Chandler’ and ‘Maraş 18’ to highlight their differences from ‘Ahsen’.

Within the scope of the study, 11 phenological observations were conducted. When examining the leafing dates, it was found that ‘Chandler’ served as the reference, with ‘Maraş 18’ leafing 9 d earlier and ‘Ahsen’ leafing 4 d later. This later leafing of ‘Ahsen’ makes it preferable in regions with a high risk of spring frost (Table 1).

Walnut is a monoecious plant species with a high tendency to dichogamy. ‘Ahsen’ showed similar male and female flower activity dates to ‘Chandler’, and ‘Maraş 18’ had earlier values, similar to its leafing date. These

Table 1. Results of some phenological traits of ‘Ahsen’, ‘Chandler’, and ‘Maraş 18’.

Phenological traits	Ahsen	Chandler	Maraş 18
Leafing date (day)	+4	0	−9
First male bloom date (day)	0	0	−7
Last male bloom date (day)	0	0	−10
First female bloom date (day)	−1	0	−7
Last female bloom date (day)	−1	0	−12
Catkin abundance	Intermediate	High	Intermediate
Female abundance	High	High	Intermediate
Lateral bud flowering (%)	92.72	96.43	76.34
Dichogamy status	Protandrous	Protandrous	Protandrous
Harvest date	−22	0	−24
Defoliation date	−12	0	−27

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Table 2. Results of some pomological traits of ‘Ahsen’, ‘Chandler’, and ‘Maraş 18’ nuts.

Pomological Traits	Ahsen	Chandler	Maraş 18
Shape	Broad elliptic	Broad elliptic	Broad elliptic
Shape in lateral view	Broad ovate	Broad ovate	Broad ovate
Shape of base in lateral view	Rounded	Rounded	Rounded
Shape of apex in lateral view (excluding tip)	Rounded	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)	14.28	12.79	14.83
Kernel weight (g)	7.43	6.23	7.62
Kernel percentage (%)	52.03	48.72	51.41
Shell thickness (mm)	1.42	1.21	1.38
Kernel color	Light	Light	Light
Kernel fill	Well	Well	Well
Kernel flavor	Satisfactory	Satisfactory	Satisfactory

Fig. 1. Visuals of the tree and nuts of the ‘Ahsen’ walnut variety.

phenological observations confirmed that ‘Ahsen’ has a protandrous flowering feature, requiring pollinators in orchards with this variety. The variety has a high abundance of female flowers but a slightly lower abundance of male flowers. ‘Ahsen’, which has much higher values than the ‘Maraş 18’ in terms of lateral bud flowering, stands out in terms of productivity (Table 1).

The examinations of the harvest period revealed that ‘Ahsen’ allows for early harvesting during its maturity period. ‘Ahsen’ reaches harvest maturity 22 d before ‘Chandler’. In terms of defoliation dates, it was determined that it entered dormancy 12 d before ‘Chandler’ and 15 d after ‘Maraş 18’ (Table 1).

The 15 pomological traits of the varieties examined in this study are presented comparatively in Table 1. ‘Ahsen’ has a broad elliptic nut shape, whereas its nut shape of base and apex in lateral views resemble those of its paternal parent, ‘Maraş 18.’ In terms of shell texture, ‘Ahsen’ and ‘Chandler’ exhibit medium roughness, whereas ‘Maraş 18’ has a smoother shell. The shell colors of all varieties are in light tones. ‘Ahsen’ has an average shell thickness of 1.42 mm, which is higher than that of its parent varieties. Additionally, removal of kernel halves of ‘Ahsen’ has been determined to be easy (Table 2).

In fruit species where the seed is consumed, such as walnuts, nut weight, kernel weight, and kernel percentage are highly significant. Pomological analyses have determined that the nut weights of the ‘Ahsen’, ‘Chandler’, and ‘Maraş 18’ are 14.28 g, 12.79 g, and 14.83 g, respectively. The kernel weights were recorded as 7.43 g for ‘Ahsen’, 6.23 g for ‘Chandler’, and 7.62 g for ‘Maraş 18’. ‘Ahsen’, the primary focus of this study, exhibited a significantly superior performance compared with ‘Chandler’ in both nut weight and kernel percentage. The most outstanding characteristic of ‘Ahsen’ in terms of nut quality is its kernel percentage of 52.03%. In this aspect, it has demonstrated superior performance compared with its parent varieties. Additionally, ‘Ahsen’ has a light-colored kernel, which enhances its market potential (Table 2).

The short vegetation period of the ‘Ahsen’ not only optimizes production but also provides significant contributions to climate change adaptation. The adaptability of this walnut variety demonstrates its resilience to the uncertainties posed by climate change in modern agricultural practices. Compared with ‘Maraş 18’, this variety exhibits later leafing, high lateral bud flowering, and similar nut quality, while outperforming ‘Maraş 18’ in key characteristics such as kernel percentage. Because of these advantages, ‘Ahsen’ is poised to become one of the prominent walnut varieties in the future. A visual representation of the ‘Ahsen’ walnut tree and its nuts is provided in Fig. 1.

Availability

The name of this variety was inspired by the first author’s daughter’s name, Ahsen. Detailed information on whether scions of the ‘Ahsen’ walnut variety are suitable for walnut growers can be obtained from the Faculty of Agriculture, Kahramanmaraş Sütçü İmam University (Kahramanmaraş, Türkiye).

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