

Walnut ‘Esterhazy kесеi’ for Small-scale Cultivation

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Walnut ‘Esterhazy kесеi’ has a late bloom as well as a pollen shedding period, enabling it to be grown successfully at more locations. As a result of some superior characteristics, such as late budbreak time, large nut size, excellent kernel characteristics, attractive appearance, and low yield, this variety can be planted in hobby gardens and landscapes.

Origin

The Carpathian Basin, where Hungary is located, is rich in Persian walnut (*Juglans regia* L.) genotypes, which ensure an excellent base for selection from the local population (Iordănescu et al., 2021; Trandafir and Cosmulescu, 2020). Walnut production in Hungary started with the planting of seedlings of French-bred varieties at the beginning of 20th century. As a result of generative propagation until 1970, there was an opportunity for natural gene flow between the local walnut genotypes and the seedlings derived from the French varieties. One of the most grown genotypes derived from this mixed population was ‘Esterhazy II’, which comprised the Hungarian walnut industry at that time. ‘Esterhazy II’ had an early budbreak, making it possible to grow successfully on fruit sites, where the table grapes (Guld et al., 2019; Kupe et al., 2021) and apricot were produced (Karatas, et al., 2021; Mendelné and Mendel,

2021). There are several Esterhazy (its synonyms are Eszterházy and Eszterházi) cultivars on the National Variety List of German-speaking countries (Austria, Germany, Switzerland), where they are currently important in backyard production (Böllersen, 2017). During collection it is possible to obtain some Esterhazy genotypes derived from progeny located in the western part of Hungary, which were observed and evaluated at our experimental orchard. From this collection, a variety called ‘Esterhazy kесеi’ (“kесеi” meaning late) was selected.

The experimental orchard was planted on chernozem soil with a high lime content (pH, 8; total lime content in the top 60-cm layer, 5%; humus content, 2.3% to 2.5%; Aranytype cohesion index, 40, which refers to medium compactness) and is established in Érd, Hungary (lat. 47°20′11″N, long. 18°51′53″E; elevation, 127 m above sea level). The US-bred standard cultivar Chandler was included in the trial as a reference cultivar. All observed trees were grafted on *J. regia* seedlings, with five replications of each in a 10- × 10-m spacing, trained as a central leader canopy. Phenological and pomological characteristics were collected between 2010 and 2021. During this period, the average yearly temperature was 11.4 °C, the average yearly temperature during the growing season (between March and September) was 16.7 °C, the number of days with frost during spring (between March and May) was 5.7 d/month, the average yearly precipitation was 548.1 mm, and the annual hours of sunshine was 2080 h.

Methods

Phenological and pomological traits of the cultivars included in the trial were evaluated

using the International Union for the Protection of New Varieties of Plants (2017) walnut descriptors. In addition, a new index called the cracking rate was introduced, which is the ratio of halves to the whole kernel weight. Furthermore, DNA fingerprint analysis was conducted using eight simple sequence repeat markers to determine the uniqueness of each genotype.

Description

‘Esterhazy kесеi’ is an unknown pedigree plant selected from the local population (Supplemental Fig. 1). It has a late budbreak—11 d later than ‘Chandler’. Its first pollen shedding also starts 11 d later than the control variety. The first pistillate flowers of both varieties open almost at the same time (Supplemental Fig. 2). The rate of homogamy is high on ‘Esterhazy kесеi’; thus, it can be planted without pollinizers, but there is no homogamy on ‘Chandler’, because there is a small window between the first male and female blooms. Approximately 15% to 30% of female flowers of ‘Esterhazy kесеi’ appear on the lateral buds. This value is two to four times less compared with ‘Chandler’. Based on the flower characteristics, both genotypes are protandrous varieties. The harvest date of ‘Esterhazy kесеi’ is 6 d before ‘Chandler’, which means it is in the third week of September. The difference in ratio of female flowers on the lateral buds and the high ratio of homogamy results in a low yield of ‘Esterhazy kесеi’ compared with the control. There is no difference in tree vigor, growth habit, branching, and susceptibility to natural walnut blight infection; both varieties have intermediate tree vigor, a semierect growth habit, semidense branching, and are moderately susceptible to natural walnut blight infection (Table 1).

Nuts of the examined cultivars were large (nut length of both varieties, 38.3 mm; nut diameter, 36.8 mm for ‘Esterhazy kесеi’ and 33.6 mm for ‘Chandler’) and round; their roundness index is 0.9. Nut width (diameter) of both varieties reaches the premium-grade categories, because these values are more than 32 mm. Both varieties had a light-brown shell color, and their shell surface was moderately grooved. There were no significant differences in shell thickness. Shell strength was intermediate. The dried nut weight of ‘Esterhazy kесеi’ was heavier (14.5 g/dried nut) than ‘Chandler’ (11.9 g/dried nut). ‘Esterhazy kесеi’ produced a heavier kernel (6.7 g/kernel) compared with ‘Chandler’ (5.5 g/kernel). No significant difference in kernel percentage and in the cracking index of both varieties was observed. It was easy to remove the yellowish white kernels of ‘Esterhazy kесеi’ and ‘Chandler’ from their shells (Table 2, Fig. 1).

Availability

On application for registration as a landrace variety, ‘Esterhazy kесеi’ with its official description was added to the National Catalogue in 2022. Propagation trials testing

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Table 1. Tree and phenological characteristics of ‘Esterhazy kесеi’ in comparison with the standard cultivar Chandler.^z

Trait	Esterhazy kесеi	Chandler	SD _{5%}
Beginning of budbreak, d (mean ± SD)	27 Apr. ± 3.8 a	16 Apr. ± 10.0 b	4.9
End of budbreak, d (mean ± SD)	4 May ± 4.3 a	24 Apr. ± 7.3 b	5.1
First pollen shedding date, d (mean ± SD)	3 May ± 2.8 a	23 Apr. ± 4.7 b	3.3
End of pollen shedding date, d (mean ± SD)	12 May ± 4.3 a	4 May ± 6.4 ab	4.1
First pistillate receptivity date, d (mean ± SD)	6 May ± 3.7 a	5 May ± 3.7 a	4.4
End of pistillate receptivity date, d (mean ± SD)	12 May ± 3.7 a	13 May ± 5.1 a	3.9
Ratio of female flowers on lateral buds	15% to 30%	60% to 80%	15
Dichogamy	Protandrous with homogamy	Protandrous with no homogamy	—
Harvest date, d (mean ± SD)	21 Sept. ± 3.2 a	27 Sept. ± 6.4 a	5.2
Yield efficiency, kg·cm ⁻² (mean ± SD)	0.24 ± 0.04 a	0.36 ± 0.06 b	0.08
Tree vigor	Intermediate	Intermediate	—
Growth habit	Semierect	Semierect	—
Branching	Semidense	Dense	—
Susceptibility to natural walnut blight infection	Moderately susceptible	Moderately susceptible	—

^zDates are 12 years (2010–21).

Lowercase letters a and b indicate significantly different groups at SD_{5%}, while characteristics being not significantly different from each other at SD_{5%} are indicated with the same letter.

Table 2. Nut and kernel traits of ‘Esterhazy kесеi’ in comparison with standard cultivar Chandler.^z

Trait	Esterhazy kесеi	Chandler	SD _{5%}
Nut height, mm (mean ± SD)	38.3 ± 2.5 a	38.3 ± 1.9 a	0.9
Nut width, mm (mean ± SD)	34.0 ± 2.1 a	33.0 ± 1.7 a	0.8
Nut diameter, mm (mean ± SD)	36.8 ± 1.9 a	33.6 ± 1.8 b	0.7
Roundness index (mean ± SD)	0.9 ± 0.04 a	0.9 ± 0.04 a	0.05
Shell color	Light brown	Light brown	—
Shell surface	Moderately grooved	Moderately grooved	—
Shell thickness, mm (mean ± SD)	1.7 ± 0.2 a	1.6 ± 0.2 a	0.2
Shell strength	Intermediate	Intermediate	—
Nut weight, g (mean ± SD)	14.5 ± 1.8 a	11.9 ± 1.2 b	0.7
Kernel weight, g (mean ± SD)	6.7 ± 1.4 a	5.5 ± 0.9 b	0.5
Kernel percentage, % (mean ± SD)	45.5 ± 6.2 a	46.3 ± 5.1 a	2.1
Cracking index, % (mean ± SD)	80.0 ± 15.9 a	86.7 ± 11.1 a	14.2
Ease of kernel removal	Very easy	Very easy	—
Kernel color	Yellowish white	Yellowish white	—

^zDates are 12 years (2010–21).

Lowercase letters a and b indicate significantly different groups at SD_{5%}, while characteristics being not significantly different from each other at SD_{5%} are indicated with the same letter.



Fig. 1. Nuts of ‘Esterhazy kесеi’ walnut.

“traditional” hand-grafting propagation started in 2019. Virus-free material is available in the nuclear stock of the Hungarian University of Agriculture and Life Sciences Research Center for Fruit Growing.

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