

EVALUAREA CARACTERISTICILOR POMOLOGICE ALE UNOR SOIURI DE NUC ÎN CONDIȚIILE DIN SUDUL BULGARIEI

POMOLOGICAL CHARACTERISTICS OF LOCAL AND INTRODUCED WALNUT CULTIVARS IN SOUTH BULGARIA

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Abstract

A study of local and introduced walnut cultivars was carried out at the Fruit-Growing Institute – Plovdiv in the period 2018 – 2020. Four introduced walnut cultivars – two Romanian ('Valmit' and 'Valeris') and two Turkish ('Şebin' and 'Yalova 1') – and the standard Bulgarian cultivars 'Izvor 10' and 'Silistrenski' were the object of the study. Their vegetative habits were investigated and biometric measurements of the nuts were performed. Based on the results obtained the pomological characteristics of the studied cultivars were evaluated. When grown in the conditions of South Bulgaria, the cultivars introduced from Romania – 'Valmit' and 'Valeris' and from Turkey – 'Yalova 1', are characterized by very large nuts. 'Izvor 10' and 'Şebin' have a high kernel ratio.

Cuvinte cheie: nuc, soi, local, introdus, caracteristici pomologice

Key words: walnut, cultivars, local, introduced, pomological characteristics

1. Introduction

Taking into consideration the climatic conditions of Bulgaria, walnut cultivars must meet a number of basic criteria (Gandev, 2015). In Bulgarian literature, there are data on foreign walnut cultivars introduced from France, Hungary and the USA (Gandev et al., 2009; Gandev et al., 2011; Gandev et al., 2013). According to Akca and Ozogun (2004), the Turkish cultivars 'Yalova 1' and 'Şebin' are among the leading in distribution in our southern neighbour country. 'Yalova 1' is characterized by large nuts of 16 grams and a kernel ratio of 50%, and 'Şebin' has 67% kernel ratio and 50% laterality, with a nut size of 11 grams. A study conducted in Romania (Cosmulescu et al., 2010) shows that the local cultivar 'Valmit' has large nuts of 14 grams, a kernel weight of 7.8 grams and a kernel ratio of 56.54%. According to Al-Khayri et al. (2019), the Romanian cultivar 'Valeris' has a light coloured kernel, it ripens early and achieves high yields. Gandev et al. (2015) identified the Bulgarian cultivars 'Izvor 10' and 'Silistrenski' as suitable for the establishment of commercial plantations.

The aim of the present study was to describe the complete pomological characteristics of local and introduced walnut cultivars when grown in South Bulgaria.

2. Material and methods

The observations were made in the experimental fields of the Fruit-Growing Institute in the city of Plovdiv with coordinates 42°06'17.1"N, 24°43'17.5" in the period 2018 – 2020. A walnut plantation including the standard Bulgarian cultivars 'Izvor 10' and 'Silistrenski' and the introduced cultivars 'Yalova 1' and 'Şebin' from Turkey and 'Valmit' and 'Valeris' from Romania, was the object of the study. The planting distance was 10 × 9 meters. All the cultivars were grafted on a common walnut (*Juglans regia* L.) rootstock. The trees were trained to an improved layered crown (modified central leader). The experiment was carried out under irrigation conditions using a micro-sprinkler system. The inter-row space in the plantation was naturally grassed and the in-row strips were kept free of weeds by treatment with herbicides. Each cultivar was presented with three trees located randomly in the plantation. Each tree was considered a separate replication. According to the methodology for studying the plant resources of fruit species (Nedev, 1979) the following traits were studied: vegetative habits – flowering period of female and male flowers, growth vigour, crown habitus, ripening period; biometric measurements – nut size, mean weight, nut thickness; organoleptic assessment of the nut – shape, surface, colour, main aperture, kernel skin colour, percentage of kernel ratio; resistance to late spring frosts; response of the walnut cultivars to the economically important diseases anthracnose (*Gnomonia leptostyla*) and bacteriosis (*Xantomonas arboricola* pv. *juglandis*). The results obtained were statistically processed following Duncan's test (Steele and Torie, 1980)

3. Results and discussions

'Izvor 10' cultivar originates from a seedling found in the area of Izvor village, region of Plovdiv. In 1979, it was accepted as a standard cultivar for our country (Fig. 1) (Nedev et al., 1983).

Nuts are medium-sized, 11.3 grams in weight and an elongated shape. The average nut height is 40 mm, width – 31 mm and thickness – 31.9 mm. The shell is 1.4 mm thick, gray-ash in colour, with slight surface rugosity. The main aperture is medium. The kernel is light in colour, its average weight being 6.2 g and it is easily separated from the shell. The kernel ratio is high – 54.8%. When grown in the conditions of South Bulgaria, it is characterized by a medium-early period of ripening – in the first half of September.

Trees are vigorous in growth, the annual shoot length increment being over 30 cm. The crown shape is semi-upright, with an angle of deviation of the skeletal branches within 35-45° and the crown volume at the end of the seventh vegetation is 15.9 m³. Flowering is protogynous, with some overlapping with the period of catkin flowering. The cultivar is susceptible to the attacks by anthracnose (*Gnomonia leptostyla*) and moderately susceptible to bacteriosis (*Xanthomonas arboricola* pv. *juglandis*).

'Silistrenski' cultivar originates from a seedling found in the area of Kalipetrovo village, region of Silistra. In 1967, it was accepted as a standard cultivar for our country (Fig. 2) (Nedev et al. 1983).

Nuts are large, 13.5 grams in weight and elongated in shape. The average nut height is 38.9 mm, width – 35 mm and thickness – 34.9 mm. The shell is 1.6 mm thick, gray-ash in colour, with slight surface rugosity. The main aperture is medium in size. The kernel is lightly coloured with an average weight of 6.1 g and it is easily separated from the shell. The kernel ratio is medium high – 45%. When grown in the conditions of South Bulgaria, it is characterized by a medium-early period of ripening – in the first half of September.

Trees are vigorous in growth, the annual shoot length increment being over 30 cm. The crown shape is semi-upright, with an angle of deviation of the skeletal branches within 55-65° and the crown volume at the end of the seventh vegetation is 12.2 m³. Flowering is protandrous. The cultivar is susceptible to attack by anthracnose (*Gnomonia leptostyla*) and susceptible to bacteriosis (*Xanthomonas arboricola* pv. *Juglandis*).

'Yalova 1' cultivar originates from local forms in the province of Yalova and it is widely spread in Turkey (Fig. 3) (Akca, 2007).

Nuts are very large, 16.8 grams in weight, elongated in shape. The average height of the nut is 45.7 mm, width – 35.4 mm and thickness – 36.2 mm. The shell is 2 mm thick, gray-ash in colour, with slight surface rugosity. The main aperture is moderately large. The kernel is light in colour, with an average weight of 6.8 g and it is easily separated from the shell. The kernel ratio is low – 40.3%. When grown in the conditions of South Bulgaria, it is characterized by a medium late period of ripening – in the second half of September.

Trees are vigorous in growth, the annual shoot length increment being over 30 cm. The crown shape is upright, with an angle of deviation of the skeletal branches within 55-65° and the crown volume at the end of the seventh vegetation is 34 m³. Flowering is protandrous. The cultivar is slightly susceptible to attack by anthracnose (*Gnomonia leptostyla*) and slightly susceptible to bacteriosis (*Xanthomonas arboricola* pv. *juglandis*).

'Şebin' is a Turkish cultivar, originating from Eastern Anatolia (Akca et al., 2015) and it is widely spread throughout Turkey (Fig. 5).

Nuts are small, 9.6 grams in weight and spherical in shape. The average height of the nut is 36 mm, width – 33.1 mm and thickness – 31.5 mm. The shell is 1.4 mm thick, brown in colour, with severe rugosity. The main aperture is large. The kernel is light in colour, with an average weight of 5.2 g and it is easily separated from the shell. The kernel ratio is high – 53.7%. When grown in the conditions of South Bulgaria, it is characterized by a medium late period of ripening – in the second half of September.

Trees are vigorous in growth, the annual shoot length increment being over 30 cm. The crown shape is semi-upright, with an angle of deviation of the skeletal branches within 35-45° and the crown volume at the end of the seventh vegetation is 14.4 m³. Flowering is protandrous. The cultivar is slightly susceptible to attack by anthracnose (*Gnomonia leptostyla*) and slightly susceptible to bacteriosis (*Xanthomonas arboricola* pv. *Juglandis*).

'Valmit' cultivar originates from local forms in the Valcea region, Romania (Botu, 2007). Nuts are very large, 14.8 grams in weight and spherical in shape. The average height of the nut is 39.8 mm, width – 34.5 mm and thickness – 39.8 mm. The shell is 2.1 mm thick, gray-ash in colour, with slight rugosity. The main aperture is large. The kernel is light in colour, with an average weight of 6.4 g and it is easily separated from the shell. The kernel ratio is low – 43%. When grown in the conditions of South Bulgaria, it is characterized by a late period of ripening – after 26 September (Fig. 6).

Trees are vigorous in growth, the annual shoot length increment being over 30 cm. The crown shape is upright, with an angle of deviation of the skeletal branches within 55-65° and the crown volume at the end of the seventh vegetation is 12.7 m³. Flowering is protandrous. The cultivar is slightly

susceptible to attack by anthracnose (*Gnomonia leptostyla*) and slightly susceptible to bacteriosis (*Xanthomonas arboricola* pv. *juglandis*).

'Valeris' is a Romanian cultivar. Nuts are very large, 16.1 grams in weight and spherical in shape. The average height of the nut is 41.5 mm, width – 35.3 mm, and thickness – 37.9 mm. The shell is 2.2 mm thick, gray-ash in colour, with slight rugosity. The main aperture is large. The kernel is light in colour, with an average weight of 6 g and it is easily separated from the shell. The kernel ratio is very low – 35.1%. When grown in the conditions of South Bulgaria, it is characterized by a late period of ripening – after 26 September (Fig. 7).

Trees are vigorous in growth, the annual shoot length increment being over 30 cm. The crown shape is semi-upright, with an angle of deviation of the skeletal branches within 35-45° and the crown volume at the end of the seventh vegetation is 9.9 m³. Flowering is protandrous. The cultivar is slightly susceptible to attack by anthracnose (*Gnomonia leptostyla*) and slightly susceptible to bacteriosis (*Xanthomonas arboricola* pv. *juglandis*).

4. Conclusions

When grown in the conditions of South Bulgaria, the cultivars introduced from Romania – 'Valmit' and 'Valeris' and from Turkey – 'Yalova 1' are characterized by very large nuts.

Kernels of all the studied cultivars are light in colour.

'Izvor 10' and 'Şebin' have a high kernel ratio.

The introduced cultivars 'Yalova 1', 'Şebin', 'Valmit' and 'Valeris' are slightly susceptible to the economically important diseases in walnut – anthracnose (*Gnomonia leptostyla*) and bacteriosis (*Xanthomonas arboricola* pv. *Juglandis*).

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Table and Figures



Fig. 1. Nuts of 'Izvor 10' walnut cultivar



Fig. 2. Nuts of 'Silistrenski' walnut cultivar



Fig. 3. Nuts of 'Yalova 1' walnut cultivar



Fig. 5. Nuts of 'Şebin' walnut cultivar



Fig. 6. Nuts of 'Valmit' walnut cultivar



Fig. 7. Nuts of 'Valeris' walnut cultivar



Izvor 10



Silistrenski



Yalova 1



Şebini



Valmit



Valeris

Fig. 4. Crown habitus of the different walnut cultivars

Table 1. Biometric measurements of the nuts of walnut cultivars

Cultivar	Nut Height (mm)	Nut Width (mm)	Nut Thickness (mm)	Nut Weight (g)	Kernel Weight (g)	Kernel ratio (%)	Shell Thickness (mm)
Izvor 10	40.0 bc	31.0 b	31.9 cd	11.3 c	6.2 b	54.8 a	1.4 c
Silistrenski	38.9 c	35.0 a	34.9 c	13.5 b	6.1 b	45 b	1.6 bc
Yalova 1	45.7 a	35.4 a	36.2 b	16.8 a	6.8 a	40.3 c	2.0 a
Şebini	36.0 c	33.1 b	31.5 d	9.6 d	5.2 c	53.7 a	1.4 c
Valmit	39.8 bc	34.5 a	39.8 a	14.8 b	6.4 ab	43 bc	2.1 a
Valeris	41.5 b	35.3 a	37.9 b	16.1 ab	6.0 b	35.1 d	2.2 a