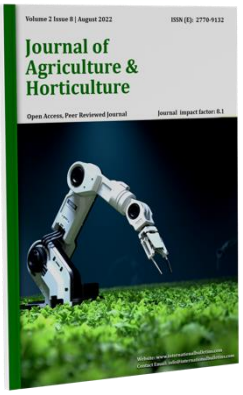

MORPHO-BIOLOGICAL AND ECONOMIC CHARACTERISTICS OF INTRODUCED OLIVE VARIETIES IN SURKHANDARYA REGION

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Abstract. This article presents data on the morphological, biological and economic characteristics of olive tree varieties introduced in the conditions of Surkhandarya region. The article presents the results of a study of the morphological structure, biological characteristics and economic characteristics of olive trees.

Key words: Olive tree, branches and shoots, leaves, flowers, fruits.

The genus Olea belongs to the family *Oleaceae* and consists of 30 species and about 600 genera, which differ from each other in their chromosome composition. For example, in the olive (*Olea europaea* L.), the chromosome number is 2n = 46 [12]. The genus Olea is divided into three sections: *Tetrapilus*, *Paniculatae*, and *Olea*. The genus Olea itself is divided into two sections: *Ligustroides* and *Olea*. The genus Olea contains only one species, *Olea europaea* L. There are about 1000 species (subspecies) of *Olea europaea* L. [13].

The wild olive (*Olea europaea* subsp. *Europaea* var. *Sylvestris*) is native to the Mediterranean basin, while the cultivated olive (*Olea europaea* L.) is native to Spain. However, the wild oleaster differs from the domesticated variety in several characteristics, such as a shorter growing season, shorter fruit size, higher mesocarp ratio, and lower oil content. However, the wild olive and cultivated olive are botanically identical [12]. The olive is a fairly large evergreen tree, sometimes reaching a height of 22 m or more, but in the subtropical regions of the country its height is usually 5 m [1; 2; 5].

The trunk of the olive tree is straight or curved, often branched, large, with age the top becomes thickly layered, forming a hollow. The branches of the first order form the trunk-branch skeleton. The branches of the next order are distant from them. The fruiting of the olive tree begins with the branches of the IV and V orders. Olive fruits are formed on young branches of 1-2 years old, and the number and quality of the fruits depend on the length of the branches.

The main biological distinguishing feature of olives is the intensity of shoot formation, the high arousal of the shoot to vegetative propagation. In olives, the formation of shoots is due to lateral and terminal shoots. In all orders of shoots, the last growing shoot usually continues to give shoots, in the upper order in lateral shoots. The main reproductive mass is provided by shoots of the III and V orders. From these reproductive shoots in the spring of the following year, vegetative organs (leaves and shoots) can develop, as well as reproductive organs (flowers and fruits) [4; 8; 9].

According to the information, the beginning of active vegetation of the olive plant starts from the third ten days of March, when the average daily temperature is +15.8 °C [3]. Not all varieties begin to grow and develop at the same time. The beginning of vegetation lasts until the end of the first decade of April. Differences in varieties made it possible to divide them into three groups: early, middle and late vegetation.

The temperature range required for the beginning of vegetation varies within 203–236 °C in the morning variety groups and 276–310 °C in the evening. In the conditions of the extremely dry typical subtropical climate of southwestern Turkmenistan, when the vegetation period begins for many crops of the Kyzyl-Atrek Experimental Breeding Station, including varieties such as Atrekskaya-6, 11, 4, 7, 9, 2, 15, 16, 20, 6, 13, 5, as well as Bakinskaya-68 and Nikitskaya, among the evening varieties, Azerbaijani varieties - Buzovninsky, Bakinskaya-17, 25 and Santa Katerina - prevail. The vegetation period of crops of the Kyzyl-Atrek Experimental Breeding Station begins faster in the early and middle periods [9; 10].

A number of researchers have focused on the morphological characteristics of the flower and the biology of flowering. Biology of flowering on the morphological description of inflorescences and flowers N.K. Arendt I.A Jigarevich, N.A. Kulieva, V.A. Sholokhova's [14; 6; 7; 11] is somewhat fully covered in their works.

The morphological characteristic of the panicle is a characteristic of the variety. Usually, in varieties with long stalks of panicles, fruit clusters (fruit clusters) appear. Unfortunately, this cannot be considered a positive characteristic of the variety, since additional manual labor is required to remove the fruit clusters during harvesting. In varieties with short stalks of panicles, the fruit is usually almost completely set, and harvesting requires less labor. Varieties differ fundamentally in their structure. The panicle of olives is a panicle consisting of a series of simple and complex layers of small flowers. N.K. Arendt [14] groups varieties according to the morphology of panicles, taking into account the division of flowers into layers, dividing varieties into 7 rows. The number of flowers in a row varies from 3 to 39.

Research method. The research was conducted at the Bandikhon Experimental Farm of the Academician M.M. Mirzaev Research Institute of Horticulture, Viticulture and Winemaking (2015-2020 and 2022-2024).

During the scientific research, the following observations and measurements were carried out:

- Phenological observations: 10%, 75% indicators were recorded in the phases of budding, flowering, fruiting and ripening;
- Biometric measurements: the height of the main stem, the length and number of the first-order side shoots, the length and number of the second-order side shoots, the number of leaves on the main stem, the number of leaves on the first-order side shoots, the number of leaves on the second-order side shoots, and the leaf area were measured throughout the growing season;
- The leaf area was determined using the “Method of calculations and phenological observations in experiments with fruit and berry plants”. In this case, a paper area of a certain unit is taken. For example, 100 cm or 1 dm (10 x 10 cm). The paper was cut, this area was weighed on an accurate scale, and its weight was determined. Similarly, the leaf whose surface area is to be determined is carefully placed on a second piece of paper and a drawing is made by drawing over the surrounding edges with a sharp pencil. The

drawing of the leaf drawn on the paper is carefully cut out. Then the drawing of the leaf on the paper is weighed and its weight is determined. Based on the obtained numbers, an equation is created and the total surface area of the leaf is determined.

For example, 100 cm^2 of paper weighs 680 mg. If the paper on which the picture of the leaf is drawn weighs 570 mg, the equation is:

100 cm^2 — 680 *mg,*

83,8 cm^2=x — 570 *mg,*

- The level of pigmentation (coloring state of fruits) before ripening of fruits was determined, and its dependence on the sum of active temperature (°C), as well as fruit shape, color, weight, complete characteristics, time of entering and ripening, yield were monitored.

Research results. Under the influence of seasonal changes in nature, plants have adapted to this and their genetic characteristics have been formed. During the year, changes in air temperature and humidity, fertilization and water supply, and varying levels of light cause plants to repeat their growth and development phases every year. Therefore, we see annually repeating development phases in fruit crops, including olives.

It is known that in the autumn months the branches stop growing, the leaves fall, and the trees enter the dormant period, which protects them from the low temperatures of the winter months.

The characteristics of the rest period of olive crops, its beginning, duration, exit from this period and the start of vegetation are completely dependent on it and are formed under their influence.

In the climatic conditions of our republic, especially in the Surkhandarya region, at the end of winter and the beginning of spring, the air temperature rises and the beginning of the growth process of fruit trees is observed. This process lasts until late autumn and is repeated every year [15; 16; 17; 18].

Transition periods of phenological phases in olive cultivars are their important biological characteristic and show their adaptation to external conditions and their economic importance.

In addition, flowering times are of great importance in selecting pollinator varieties for each variety.

Fruit ripening times are one of the main indicators of a variety and help to create a plan to fully meet consumer demands throughout the year. Varieties that ripen at different times can provide consumers with a regular supply of olive products. In general, studying the phenology of olive varieties helps to study their requirements for external conditions.

The budding, flowering, and fruit ripening of 15 imported olive varieties were studied (Table 1).

In the cross-section of varieties, the earliest budding of the Krymskaya 172 variety was observed on March 22, and the Pikvalis variety on March 28. All other varieties occupied an intermediate position. The Buzova olive variety imported from Azerbaijan bloomed the earliest among all varieties (16.04), while the Pikvalis variety imported from Russia bloomed the latest (22.04). It was found that the Hemlik, Misri, Vitaken, Chimlali, Nikitskaya I, Nikitskaya II varieties bloomed on April 19. When studying the duration of flowering, it was observed that the Azerbaijan Olive variety bloomed for 6 days, and the Krymskaya 172 (large-sized) Nikitskaya I, Nikitskaya II varieties bloomed for 10-11 days.

Table 1

The results of phenological observation of the transition of vegetation phases in the collection of mother-breeding plants, 2018-2022.

Varieties	The origin of the variety	Buds begin to bud	Flowering, date			Ripening of fruits, date		Budding-technical ripening
			begin	end	duration, day	begin	technical writing	
Krymskaya 172 (Control)	Russia	22.03	18.04	29.04	11	21.09	29.10	217
Azerbaijan Olive	Azerbaijan	23.03	17.04	23.04	6	08.09	07.10	194
Aivalik	Turkey	24.03	20.04	27.04	7	22.08	21.09	177
Buzova olive	Azerbaijan	23.03	16.04	23.04	7	06.09	07.10	194
Hemlik	Turkey	24.03	19.04	27.04	9	19.08	16.09	172
Memeli	Turkey	25.03	20.04	28.04	8	02.09	11.10	196
Pikwali	Russia	28.03	22.04	01.05	9	23.09	20.10	202
Effective	Turkey	25.03	17.04	29.04	12	24.08	24.09	178
Chakir	Turkey	24.03	17.04	27.04	10	30.08	30.09	186
Izmir Safralik	Turkey	24.03	20.04	28.04	8	25.08	29.09	184
Misri	Egypt	27.03	19.04	28.04	9	01.09	20.09	173
Vitaken	Egypt	27.03	19.04	27.04	8	05.09	25.09	177
Chimlali	Egypt	25.03	19.04	29.04	10	05.09	01.10	186
Nikitskaya I	Russia	24.03	19.04	28.04	10	04.09	01.10	187
Nikitskaya II	Russia	25.03	19.04	29.04	10	20.09	15.10	200

- It was observed that the “budding-technical ripening” phase in olive varieties varied across varieties, lasting from 172 to 217 days. Depending on the duration of the budding-technical ripening phase, olive varieties can be divided into three groups:
- - the first group includes varieties that last up to 172-180 days (Aivalik, Hemlik, Effective, Misri, Vitaken);
- - the second group includes varieties that last up to 181-190 days (Effective, Chakir, Izmir Safralik, Chimlali, Nikitskaya I);
- - the third group includes varieties that last up to 191-220 days (Krymskaya 172,

Azerbaijan Olive, Buzova olive, Pikwali, Nikitskaya II).

During the research, when studying the biometric indicators of olive varieties in the collection, it was found that the highest indicator in terms of the length of the main trunk was 190-199 cm in the Krymskaya 172 (size), Pikwali, Misri, Nikitskaya I, Nikitskaya II varieties, while it was 182-188 cm in the Azerbaijan Olive, Memeli, Izmir Safralik, Chimlali varieties. It was observed that the Aivalik, Buzova olive, Hemlik, Effective, Chakir, Vitaken varieties had lower indicators (165-178 cm) compared to other varieties (Table 2).

When measuring the length of the first-order lateral shoots and the number of lateral shoots of the olive varieties in the collection, it was found that the highest indicator was found in the Nikitskaya I variety, with an average length of the first-order shoots of 51 cm and a number of lateral shoots of 12, and in the Nikitskaya II variety, the length was 52 cm and the number of lateral shoots of 16.

Table 2

Biometric indicators of olive varieties in the collection, 2018-2022.

Varieties	Main body height, cm.	The first order is side branches		The second order is side branches	
		average length, cm	number, pieces	average length, cm	number, pieces
Krymskaya 172 (control)	195±3.8	48±2.9	10±1.5	35±3.6	8±1.2
Azerbaijan Olive	186±2.1	42±3.9	7±2.9	31±2.9	7±2.9
Aivalik	178±2.5	44±2.5	8±3.0	33±2.1	8±3.0
Buzova olive	172±3.1	42±2.3	8±2.3	33±2.5	6±2.4
Hemlik	174±2.3	38±2.3	7±2.6	29±2.0	7±2.9
Memeli	182±2.3	36±3.0	7±2.0	30±2.3	7±2.3
Pikwali	190±2.7	46±2.1	9±2.3	33±2.9	8±2.0
Effective	169±1.9	36±3.2	6±3.0	25±2.0	5±1.9
Chakir	173±2.2	34±2.6	6±2.9	29±3.3	6±2.3
Izmir Safralik	188±2.5	45±2.8	9±2.3	34±3.1	8±2.2
Misri	192±2.3	47±2.4	8±2.2	31±2.9	7±2.8
Vitaken	165±2.1	38±3.0	7±2.7	28±2.5	5±2.0
Chimlali	187±3.0	42±2.9	8±2.6	34±2.6	8±2.1
Nikitskaya I	197±2.5	51±3.0	12±2.7	37±1.3	10±2.8
Nikitskaya II	199±3.2	52±2.8	16±2.9	42±2.0	10±2.8

The lowest indicators were observed in the varieties Hemlik, Memeli, Effective, Chakir, Vitaken, with an average length of 34-38 cm of the first-order lateral shoots, with a number of

6-7 lateral shoots, while the Krymskaya 172, Azerbaijan Olive, Aivalik, Buzova olive, Pikwali, Izmir Safralik, Misri, Chimlali varieties had an average length of 42-48 cm, with a number of 7-10 lateral shoots, occupying an intermediate position. When determining the length and number of the second-order lateral shoots, the highest indicator was observed in the Nikitskaya II variety, with a length of 42 cm of lateral shoots, with a number of 10 lateral shoots. The lowest indicator in terms of lateral shoot length was observed in the Effective variety (25 cm), and all other varieties had lower indicators compared to the standard variety.

When analyzing the results of the fruiting and ripening phases for 2021-2022, our Nikitskaya I variety showed earlier fruiting and ripening indicators compared to other years and varieties in these years, that is, if we look at this in figures, it was observed that in 2021, 10% of the fruiting phase occurred on 01.04, and 75% of the fruiting occurred on 06.04. It was found that the indicators for 2022 were almost the same as last year.

The average growing season in our control variant (Krymskaya 172) was 187 days, in the Nikitskaya I variety it was 191 days, and in the Nikitskaya II variety it was 192 days, which was 5 days longer than in the control. Since fruit crops are perennial plants, external conditions affect them not only during the growing season, but also continuously throughout the year.

The geographical location of the Republic of Uzbekistan has a strong influence on climatic conditions, leading to a different distribution and sharp differences in air temperature and humidity, solar radiation and other meteorological elements across the regions of the republic.

The climate of our country is sharply continental, with an annual amplitude of air temperature fluctuations of more than 85 °C. The weather in the winter months is changeable, with sharp transitions from hot to cold. At this time, the absolute minimum air temperature in the climatic conditions of the Surkhandarya region is 20-25 °C.

For this reason, the probability of damage to olive crops from low temperatures in the winter months is very high, and damage to the above-ground part of olive trees, branches and shoots occurs in the winter months. Meteorological data show that severe frosts occur periodically every 15-20 years, and under these conditions the probability of complete destruction of fruit crops is very high. Olive plants enter a dormant period to protect themselves from the adverse conditions of the winter months. This biological feature has been formed over thousands of years (Table 3).

Table 3

The level of winter resistance of olive varieties in the collection (rest period - December, January, February), 2018-2022.

Varieties	Total number of trees	0 points		1 points		2 points		3 points		4 points		5 points	
		number of trees	%	number of trees	%	number of trees	%	number of trees	%	number of trees	%	number of trees	%
Krymskaya 172 (control)	20	20	100	-	-	-	-	-	-	-	-	-	-
Azerbaijan	20	19	95	1	5	-	-	-	-	-	-	-	-

Olive													
Aivalik	20	18	90	2	10	-	-	-	-	-	-	-	-
Buzova olive	20	16	80	-	-	4	20	-	-	-	-	-	-
Hemlik	20	18	90	2	10	-	-	-	-	-	-	-	-
Memeli	20	17	85	-	-	3	15	-	-	-	-	-	-
Pikwali	20	18	90	2	10	-	-	-	-	-	-	-	-
Effective	20	15	75	-	-	5	25	-	-	-	-	-	-
Chakir	20	18	90	2	10	-	-	-	-	-	-	-	-
Izmir Safralik	20	19	95	1	5	-	-	-	-	-	-	-	-
Misri	20	18	90	2	10	-	-	-	-	-	-	-	-
Vitaken	20	17	85	-	-	3	15	-	-	-	-	-	-
Chimlali	20	18	90	2	10	-	-	-	-	-	-	-	-
Nikitskaya I	20	20	100	-	-	-	-	-	-	-	-	-	-
Nikitskaya II	20	20	100	-	-	-	-	-	-	-	-	-	-

During the dormant period, their tolerance to low temperatures is highest, and before and after the dormant period, their tolerance to cold is significantly lower. The highest (25%) cold tolerance level was observed in the Buzova olive variety. From this, it can be concluded that when the level of cold tolerance of the olive varieties in the studied collection during the winter dormant period was assessed by points, most varieties (Buzova olive, Memeli, Effective, Vitaken) received 2 points, the Azerbaijan Olive, Aivalik, Hemlik, Pikwali, Chakir, Izmir Safralik, Misri, Chimlali varieties received 1 point, and all other varieties were 100% cold-resistant, equal to 0 points.

Conclusion

1. It was observed that the budding-technical ripening phase in olive varieties varied across varieties, lasting from 172 to 217 days. Depending on the duration of the budding-technical ripening phase, olive varieties can be divided into three groups:

- the first group includes varieties that last up to 172-180 days (Aivalik, Hemlik, Effective, Misri, Vitaken);

- the second group includes varieties that last up to 181-190 days (Effective, Chakir, Izmir Safralik, Chimlali, Nikitskaya I);

- the third group includes varieties that last up to 191-220 days (Krymskaya 172, Azerbaijan Olive, Buzova olive, Pikwali, Nikitskaya II).

2. The highest indicator of the main stem length of the olive varieties in the collection was found to be 190-199 cm in the Krymskaya 172 (size), Pikwali, Misri, Nikitskaya I, Nikitskaya II varieties, while the Azerbaijan Olive, Memeli, Izmir Safralik, Chimlali varieties had 182-188 cm. It was observed that the Aivalik, Buzova olive , Hemlik, Effective, Chakir, Vitaken varieties had lower indicators (165-178 cm) compared to other varieties.

3. When analyzing the cold resistance of the varieties in the collection, no cold war was observed in the Krymskaya 172, Nikitskaya I, Nikitskaya II varieties. 5% cold war was observed in the Azerbaijan Olive, Izmir Safralik varieties. It was found that 2 out of 20 plants of the Aivalik, Pikwali, Chakir, Misri, and Chimlali varieties were damaged, i.e. 10% were frost-stricken, while the level of frost damage in the Memeli and Vitaken varieties was 15%.

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