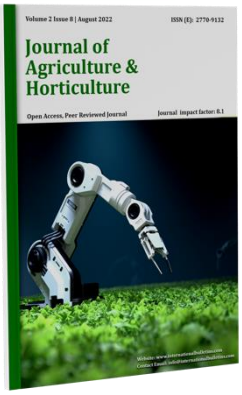

STUDYING THE RELATIONSHIP BETWEEN MORPHO-BIOLOGICAL CHARACTERISTICS OF OLIVE PLANTS AND THEIR GROWTH AND DEVELOPMENT IN DRY SUBTROPICAL CLIMATE CONDITIONS

Abdullayev Saidazim
PhD in agricultural science, Tashkent State Agrarian University
Jurayev Erkin
PhD in agricultural science, Termez State University of Engineering and Agrotechnology
Buriyev Khasan
Doctor of Biological Sciences, professor, Tashkent State Agrarian University
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Abstract. This article presents data on the study of the relationship between the morphological and biological characteristics of the olive plant and its growth and development in a dry subtropical climate. The results of observations of the phenological phases of the olive tree, including the stages of budding, flowering and fruiting, are presented.

Key words: Phenological phase, shoot, flowering, budding, leaf, fruit ripening.

Introduction. It is important to identify olive varieties and their places of origin, and to expand the cultivation of promising varieties by obtaining high-quality products that are best adapted to local environmental conditions [26; 25; 23]. It is known from the literature that wild and cultivated species exist in many olive plantations. Researchers have not been able to accurately assess these two forms using morphological studies due to the similarity of phenotypes [21]. Various studies have used morphological characteristics to distinguish specific olive varieties [24; 22]. The main reason for this is considered to be the influence of the environment (phenotypic plasticity) on specific characteristics or on genetic variation of closely related genotypes, which leads to many incompatibilities.

The main biological distinguishing feature of olives is the intensity of shoot formation, the high arousal of the shoot to vegetative propagation. In olive plants, 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) [7; 17; 18].

The optimum temperature for olive growth is 18–24 °C. Olive growth continues very slowly at temperatures of +8–10 °C, and at stable temperatures below 8 °C, it completely stops developing [9].

According to V.P. Alekseev [2], the optimum for shoot growth appears to be in the range of 22–28 °C, with a slowdown in shoot growth observed only at temperatures above +40 °C.

Cases of olives being scorched or damaged by excessive heat have not been observed even in the hottest deserts, where the maximum temperature exceeds +50 °C.

According to V.A. Sholokhova [19], the optimum temperature for olive growth is +16–24 °C. Shoots grow more intensively in May-June at a temperature of 25 °C, and when the temperature is below 8 °C, growth slows down, and then stops altogether. According to B.N. Milanov [15], the growth of olive shoots in Afghan conditions lasts from March to the second half of November. In June-August, shoot growth slows down, and in some varieties it stops. The second wave of growth begins in September and continues into October.

I.A. Zhigarevich [10], Ali-Zadeh Mahmud [3] noted that in the conditions of the Absheron Peninsula of Azerbaijan, two periods of intensive shoot growth are clearly distinguished - spring-summer (from April to July) and summer-autumn (from the end of August to the middle of November). The most intensive spring and less intensive autumn growth occurs in July and August, when the average air temperature is about 30 °C.

The nature and strength of olive shoot growth are biological characteristics of the variety. The strength and nature of shoot growth depend on the tree habit (shape) and the shape of the branches. When the shoots depart from the branches at an acute angle, the branches form a pyramidal shape, This can be observed in the varieties “Bakinskaya-17”, “Chemberikentskaya”, “Nikitskaya krupnoplodnaya”. In the varieties “Korezholo” and “Nikitskaya” the branches are branched, bent, and the shoots depart from the branch at an angle of more than 50° [8; 10]. Olive flowering occurs during the most difficult period, that is, simultaneously with flowering, there is a strong growth of shoots and leaves. During this period, olives are very demanding on the conditions of cultivation, irrigation and mineral fertilizers. The beginning of the flowering process of the olive plant depends on climatic conditions. For example, olive blossoming begins in February in Syria, Africa and Southern Spain, in March in Sicily and Southern Italy, in April in other regions of the Mediterranean basin, and in May and June in a number of European countries [12].

V.P. Alekseev [2] noted that in Italy, cases of olive flowering twice a year - in spring and autumn - have been described.

In all subtropical regions of our republic, olives bloom only once - in spring. The beginning and duration of olive flowering in different regions of the country are not the same.

According to I.A. Zhigarevich [11], V.G. Abdullayev [1], olives bloom in Azerbaijan and Georgia in June. According to N.K. Arendt [4], the beginning of olive flowering in the conditions of the Southern coast of Crimea is not the same and depends on annual weather conditions.

Olive flowering is observed in various varieties in early-late June, and in some years in early July [19].

The beginning of flowering of the olive tree occurs in the second half of June. Climatic characteristics also have a significant impact on the duration of the flowering period. Thus, in the dry subtropical conditions of Azerbaijan, it lasts an average of 3–6 days, while in the humid climate of the Black Sea coast of the Caucasus, this period extends to 11–15 days [1].

According to the literature, in the conditions of Azerbaijan, the duration of flowering of all olive flowers is 4–5 days, and in the case of incomplete pollination - 7–8 days. From the

Initial opening of the tree flowers to the end of flowering, 8 days pass. Usually, in very dry conditions, it lasts 5–7 days [10].

In the conditions of South-Western Turkmenistan, olive flowering usually begins in the first and second decade of May, about a month earlier than in the Crimea, and 15–20 days earlier than in the Absheron Peninsula of Azerbaijan [6; 10; 13; 16].

The duration of flowering of one inflorescence is 5–8 days, and of the entire tree - 6–14 days, depending on the variety and meteorological conditions of the year. The flowering of one tree lasts an average of 10 days. [12]. In the inflorescence, the upper and middle inflorescences bloom first, then the lower ones. The more inflorescences on a branch, the greater their supply of nutrients, and accordingly, the more branches of the tree will be formed and the higher the fruit yield.

A number of researchers have paid attention to the study of the morphological characteristics of the inflorescence and the biology of flowering. The biology of flowering, which is related to the morphological description of the inflorescence and flowers, is somewhat more fully covered in the works of N.K. Arendt [4], I.A. Zhigarevich [11], N.A. Kulieva [14], V.A. Sholokhova [19].

The morphological characteristic of the inflorescence is a characteristic of the variety. Usually, in long-stemmed varieties of the inflorescence, fruit clusters (fruit clusters) appear. Unfortunately, this cannot be attributed to the positive characteristics of the variety, since additional manual labor is required to remove the fruit from the fruit clusters during harvesting. In short-stemmed varieties of the inflorescence, the fruit is usually almost completely set, and harvesting requires less labor. The varieties differ fundamentally from each other in terms of structure. The panicle of olives is a panicle consisting of a series of simple and complex layers with small flowers. N.K. Arendt [4], taking into account the division of flowers into layers, presents a group of varieties according to the morphology of the panicles, dividing the varieties into 7 rows. The number of flowers in a row varies from 3 to 39.

In the conditions of Turkmenistan, at the end of August, the fruits of the very early and early varieties begin to pigment (color), which is observed when the light side acquires anthocyanin (purple or dark red) color. The period of the onset of pigmentation is characterized by a still low percentage of oil accumulation, and only when fully ripe does it accumulate a large amount of oil [20]. According to the data of Kh.Ch. Buriev et al., counting 100 inflorescences for 2015–2022 showed that there are very large differences between varieties in the number of inflorescence buds per inflorescence of each studied variety. Based on the data obtained, especially taking into account inflorescences, an additional 4-row flower was allocated in the classification, with a number of 37 to 57 flowers, and the number of rows was increased to 11 [5].

Once flowering has ended, olive fruit ripening begins. It continues throughout the dry, hot summer and is characterized by the size and weight of the fruit.

Research method. The research was conducted within the framework of the project at the experimental field of the specialized horticultural farm "Sunbul Sultan Moviya" in the "Dugoba" village of the Oltinsay district of the Surkhandarya region (2015-2020) and at the Bandikhon experimental farm of the Academician M.M. Mirzaev Research Institute of Horticulture, Viticulture and Winemaking (2020-2022).

The objects of the study were the following introduced olive varieties: Krymskaya 172, Azerbaijan olive, Aivalik, Buzova olive, Gemlik, Memeli, Pikvalis, Effective, Chakir, Izmir Safralik, Misri, Vitaken, Chimlyali, Nikitskaya I and Nikitskaya II.

Phenological observations were studied in the experiments: 10%, 75% indicators were recorded in the phases of "budding", "flowering", "fruiting", "ripening". The following biometric measurements were taken during the research: the height of the main stem, the length and number of first-order side shoots, the length and number of second-order side shoots and the number of leaves on the main stem, the number of leaves on first-order side shoots, the number of leaves on second-order side shoots and the leaf area were measured during the growing season.

Research results. In a dry subtropical climate, the growth of perennial olive varieties begins in early spring when the soil temperature warms up to 8–10 °C, and the average daily temperature is 19 °C and above. The beginning of the active vegetation of the olive plant begins in March, when the average daily temperature is +15.8 °C. 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. Depending on the duration of the vegetation period, it can be divided into three varieties: early, mid-ripening and late-ripening. The total temperature required during the beginning of vegetation varies in the range of 203–236 °C for early varieties and 276–310 °C for late varieties.

Table 1

Duration and duration of phenological phases in olive varieties, 2020-2022.

Varieties	Years	Budding		Flowering		Fruiting		Ripening		Growing season
		10%	75%	10%	75%	10%	75%	10%	75%	
Krymskaya 172 (con)	2020	11.03±2.0	16.03±1.0	20.03±3.0	25.03±1.0	02.04±2.0	09.04±1.0	16.09±3.0	23.09±2.0	193
	2021	10.03±2.0	16.03±1.0	18.03±3.0	23.03±1.0	01.04±2.0	06.04±1.0	14.09±3.0	21.09±2.0	190
	2022	10.03±2.0	15.03±1.0	17.03±3.0	22.03±1.0	01.04±2.0	06.04±1.0	13.09±3.0	20.09±2.0	189
	average	10.03±2.0	16.03±1.0	18.03±3.0	24.03±1.0	01.04±2.0	07.04±1.0	14.09±3.0	21.09±2.0	191
Nikitskaya I	2020	13.03±1.0	18.03±1.0	22.03±3.0	27.03±1.0	04.04±2.0	10.04±1.0	17.09±3.0	25.09±2.0	193
	2021	18.03±1.0	22.03±1.0	25.03±3.0	31.03±1.0	06.04±2.0	13.04±1.0	20.09±3.0	28.09±2.0	185
	2022	18.03±1.0	23.03±1.0	27.03±3.0	31.03±1.0	05.04±2.0	11.04±1.0	21.09±3.0	29.09±2.0	183
	average	16.03±1.0	21.03±1.0	25.03±3.0	30.03±1.0	05.04±2.0	11.04±1.0	19.09±3.0	27.09±2.0	187
Nikitskaya II	2020	09.03±3.0	14.03±1.0	18.03±3.0	21.03±1.0	29.04±2.0	07.05±1.0	10.09±3.0	20.09±2.0	191
	2021	05.03±3.0	10.03±1.0	16.03±3.0	19.03±1.0	27.04±2.0	04.05±1.0	07.09±3.0	17.09±2.0	192
	2022	06.03±3.0	09.03±1.0	15.03±3.0	18.03±1.0	26.04±2.0	04.05±1.0	07.09±3.0	19.09±2.0	193
	average	07.03±3.0	11.03±1.0	16.03±3.0	19.03±1.0	24.04±2.0	05.05±1.0	08.09±3.0	21.09±2.0	192

In our Krymskaya 172 (con) variety, the first budding (10%) was observed in the first year of our experiment on 11.03, and 75% budding was achieved on March 16.

In our Nikitskaya I variety, 10% budding occurred on 18.03. in the second year, and 75% budding took another 5 days. In our Nikitskaya II variety, these figures were on 05.03., and 75% budding was observed after 5 days.

The earliest indicator in the flowering phase of the growing season was shown by our Nikitskaya II variety on March 15, 2022, and it took another 3 days for 75% to bloom. In our Nikitskaya I variety, it was found in our experiments that 10% and 75% of the flowering bloomed 5 days later than in our control variant.

The beginning of the fruiting phase (10%) in our control variety fell on average on April 1, and 75% of the fruiting fell on April 7, while in the Nikitskaya I variety, the beginning of the fruiting occurred on April 5; and in the 75% - on April 11. The fruiting process in our Nikitskaya II variety was slightly delayed, with 10% fruiting on April 24, and 75% fruiting on May 5.

Ripening periods in olive varieties varied across varieties. The earliest variety that began ripening was Nikitskaya II, with an average of September 8 and 75% ripening by September 21, while the latest ripening (September 11-19) was observed in Nikitskaya I. Our control variant occupied an intermediate position. Based on the duration of the phases, the vegetation period of olive varieties was determined. The average duration of the phases was 191 days for the Krymskaya 172 (con) variety, 187 days for the Nikitskaya I variety, and 192 days for the Nikitskaya II variety. When analyzed by variety, it was found that the Krymskaya 172 (con) and Nikitskaya II varieties ripen relatively later than the Nikitskaya I variety. From this, it can be concluded that the duration and duration of the phenological phases in olive varieties depend on the biological state of the variety and growing conditions.

When we studied the relationship between the sum of beneficial temperatures and the process of the “Budding” and “flowering” phases of olive plants in our experiments, it was found that the beginning of the “Budding” phase of our control variety, Krymskaya 172, in 2020 fell on 01.04., and the sum of beneficial temperatures was 250 °C. In the following years of our experiment, the sum of beneficial temperatures was 276 °C and 300 °C, with an average sum of beneficial temperatures of 275 °C over the three years. In our control variety, it was found that the mass budding occurred on April 15, 2020, and the total useful temperature was 290 °C, the mass budding occurred on April 17, 2021, and the active temperature was 320 °C, and the mass budding occurred on April 18, 2022, and the total useful temperature was 450 °C (Table 2, Figure 1).

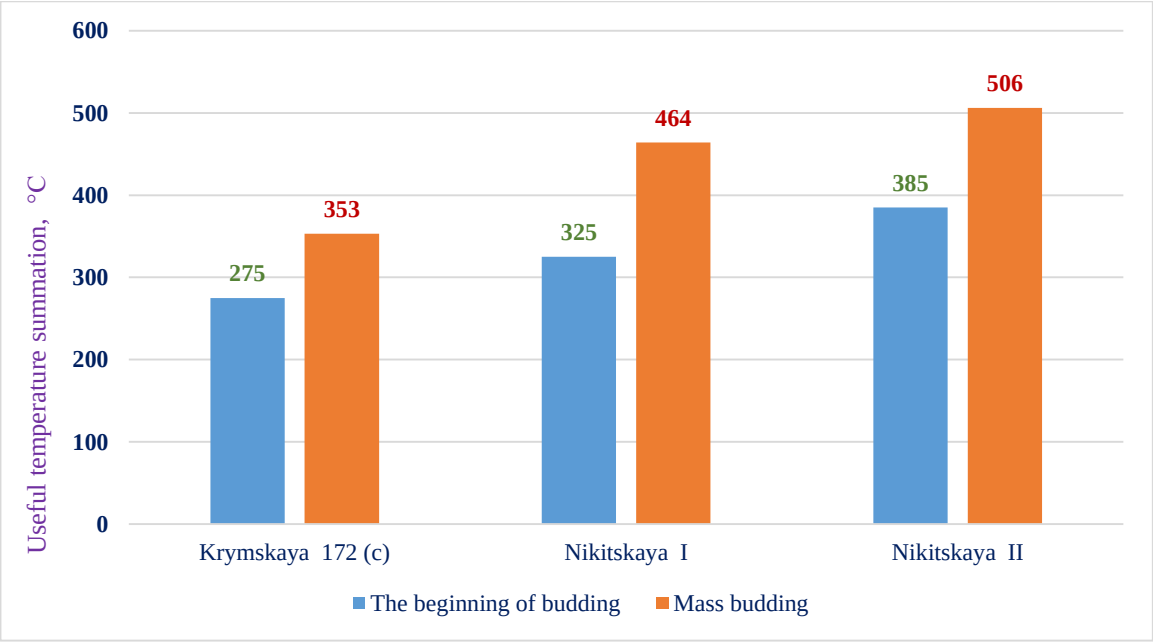

Figure 1. Dependence of the duration of the olive plant budding phase on the beneficial temperature accumulation, 2020-2022.

The beginning of the "flowering" phase of our Krymskaya 172 variety fell on 05.04.2020,

and in subsequent years of our research, it was observed that the first flowering occurred on 09.04 and 12.04.

Table 2

Dependence of duration of vegetation phases of olive plant on useful temperature sum, 2020-2022.

Olive varieties	Years	"Budding" phase				"Flowering" phase			
		Beginning	Active temperature sum, °C	Massive Budding	Active temperature sum, °C	Beginning	Active temperature sum, °C	Massive	Active temperature sum, °C
172 Krymskaya (Con)	2020	01.04	250	15.04	290	05.04	750	20.04	780
	2021	04.04	276	17.04	320	09.04	769	22.04	810
	2022	06.04	300	18.04	450	12.04	780	24.04	840
	Average	03.04	275	16.04	353	9.04	766	22.04	810
Nikitskaya I	2020	06.04	300	15.04	450	11.04	800	20.04	840
	2021	07.04	326	18.04	462	12.04	821	23.04	861
	2022	10.04	350	20.04	480	16.04	840	25.04	870
	Average	07.04	325	17.04	464	13.04	820	23.04	857
Nikitskaya II	2020	10.04	370	20.04	470	15.04	850	25.04	880
	2021	13.04	385	23.04	510	18.04	865	28.04	905
	2022	15.04	400	25.04	540	20.04	880	30.04	920
	Average	12.04	385	22.04	506	18.04	865	28.04	901

After the start of flowering, the beneficial temperature in the first year for the mass flowering process was 780 °C.

In the third year of our experiment with a temperature of 840 °C, our control variety entered the flowering phase on 24.04. Our Nikitskaya I variety initially had a one-day difference in the Budding period in 2020 and 2021, but by the third year this process fell on 10.04, that is, it was found that there was a 3-4 day difference compared to previous years. The mass Budding process began on 15.04. The beneficial temperature was 450 °C, and in the third year these figures were expressed on 20.04 and 480 °C. After the budding phase, the beginning of flowering in our Nikitskaya I variety began on April 11, and it took 9 days until mass flowering, with a cumulative beneficial temperature of 800 °C. In 2021, from April 12 to April 23, the cumulative beneficial temperature was 861 °C, and in 2022, from April 16 to April 25, the cumulative beneficial temperature was 870 °C.

The average temperature sum over the three years required 820 °C for the start of flowering, and 857 °C for mass flowering.

In the Nikitskaya II variety, the budding start date in the first year was 10.04, and mass budding occurred 10 days later, i.e. on 20.04, while the beneficial temperature sum

required 370 ℃ during the start process, and after 10 days this temperature required 470 ℃. In 2021, this variety started budding on 13.04 and entered mass budding on 23.04, requiring 510 ℃ for the beneficial temperature sum. Compared to 2021, in 2022, this variety started budding 2 days later, showing the mass budding process with no more days than in other years. It was observed that the greatest amount of beneficial temperature accumulation occurred during the mass budding process of this variety, that is, on April 25.

In all years of the experiment, it took 10 days from the beginning of the flowering phase of the Nikitskaya II variety to mass flowering, and during this time the useful temperature accumulation was from 880 ℃ to 920 ℃. On average, during 2020-2022, the useful temperature accumulation from flowering to mass flowering was 901 ℃. From this, it can be concluded that the longer the development in phases lasts, and at the same time, the higher the air temperature, the higher the effective temperature accumulation, as reflected in our experiments.

When studying the transition period and duration of biometric indicators in selected olive varieties during the research, the height of the main trunk in the Krymskaya 172 variety was reflected in the growth rate in each year of our experiment, that is, in the first year of our experiment, it was 180 cm, and in the next two years, it showed a growth rate of 15 cm and 30 cm compared to 2020 (Table 3).

In terms of the height of the main trunk, our Nikitskaya I variety was 197 cm on average over three years, but when these figures are viewed over the years, it was found that in 2020 it was 185 cm, in 2021 it was 197 cm, and in 2022 it was 208 cm. The highest result in terms of the above parameter was observed in our third variant of the Nikitskaya II variety, that is, the formation of the main trunk was 187 cm in 2020, 194 cm in 2021, and the highest indicator was 216 cm in the third year of our experiment.

In the first years of the experiment, when we measured the length of the first-order lateral shoots, our control variant (Krymskaya 172) showed that in 2020 it was 38 cm, and the number of lateral shoots was 8, while in 2021 this variant had a length of 48 cm, a number of lateral shoots of 9, and in the third year of our experiment it was 10 cm higher in lateral shoot length and 2 in the number of lateral shoots compared to the previous year.

Table 3

Biometric indicators of selected olive varieties, 2029-2022.

Varieties	Years	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 (Con)	2020	180±3.0	38±2.0	8±1.0	25±3.0	6±1.0
	2021	195±3.8	48±2.9	9±1.3	38±3.8	8±1.2
	2022	210±4.2	58±3.5	11±1.8	42±4.3	10±2.1
	Average	195±3.8	48±2.9	10±1.5	35±3.6	8±1.2
Nikitskaya I	2020	185±4.0	40±1.0	10±2.0	28±1.0	8±2.0

	2021	197±4.0	50±2.9	12±2.7	40±1.6	10±2.8
	2022	208±4.0	62±3.7	14±3.1	48±2.1	12±3.2
	Average	197±4.0	51±3.0	12±2.7	37±1.3	10±2.8
Nikitskaya II	2020	187±4.0	42±1.0	14±2.0	32±1.0	10±2.0
	2021	194±4.9	52±2.7	16±2.9	42±2.0	14±2.2
	2022	216±5.8	65±3.5	18±3.5	52±2.9	16±2.6
	Average	199±4.2	52±2.8	16±2.9	42±2.0	10±2.8

In our Nikitskaya I variety, the average length of lateral shoots was 51 cm, and the number of lateral shoots was 12, and in the Nikitskaya II variety, these indicators were found to be 1-4 cm higher in terms of the length of lateral shoots and 4-6 in terms of the number of lateral shoots than in both our varieties.

The highest indicators of our control variety in terms of the average length and number of secondary lateral shoots were observed in the third year of our experiment, and in our Nikitskaya I variety, these indicators were 28 cm in 2020, 28 cm in 2021, 40 cm and 10 in 2022, and 48 cm and 12 lateral shoots in 2023. It was found that the Nikitskaya II variety also had the highest indicators in terms of these indicators.

During the experiments, the selected olive varieties were analyzed for the number of leaves on the main stem, the number of leaves on the first-order lateral branches, the number of leaves on the second-order lateral branches, and the leaf surface during the fruiting-ripening phase (Table 4).

In the first year of the study, it was found that the number of leaves on the main stem in our control variant was 24, in 2021 it was 25, and in 2022 it was 26. According to these indicators, in 2020, the number of leaves on the main stem in the Nikitskaya I variety was 26, in 2021 it was 27, and in the last year of the experiment it was 29, which was slightly more than in our control variant. In our third variant (Nikitskaya II), it was 30 in 2020, 32 in 2021, and 34 in 2022.

During the research, when the number of leaves on the side branches of the first and second order was analyzed, compared to our control option, the average number of leaves on the side branches of the first order was 81 pieces, and the number of leaves on the side branches of the second order was 57 pieces.

Table 4

Duration and duration of biometric measurements in olive varieties (in the "Fruiting - Ripening" phase), 2020-2022.

Name of varieties	The number of leaves on the main stem, pcs				The first order is the number of leaves on the side branches, pcs				The second order is the number of side branches leaves, pcs				The main, first and second order branches in the tree are leaf level in leaves, cm^2			
	2020	2021	2022	Average	2020	2021	2022	Average	2020	2021	2022	Average	2020	2021	2022	Average

Krymskaya 172	24±6,1	25±5,9	26±6,0	25±6,0	76±8,2	78±8,1	79±8,3	77,7±8,2	52±7,1	52±7,5	54±7,8	52,7±7,4	125,4	126,8	129,1	127,1
Nikitskaya I	26±5,4	27±5,7	29±6,1	27,3±5,7	79±8,8	81±8,9	83±9,0	81±8,9	55±7,5	57±7,8	51±7,9	57,7±7,7	130,0	132,1	131,8	131,3
Nikitskaya II	30±4,0	32±3,9	34±4,2	32±4,0	84±5,2	85±5,4	87±5,5	85,3±5,3	57±6,1	58±6,2	70±6,4	68,3±6,2	134,0	135,1	137,5	135,5
S_x%	4,6	3,5	3,3	2,9	2,4	2,2	1,7	1,7	1,7	2,1	2,6	1,4	1,3	1,2	1,8	0,6

In the Nikitskaya II variety, the number of leaves on the first-order lateral shoots was 7-10 times higher than in our control variant in each year.

As for the number of leaves on the second-order lateral shoots, it was found that in our Nikitskaya II variety, compared to our Nikitskaya I variety, there were 7 more leaves in 2020, 11 more in 2021, and 9 more in the last year of 2022.

Based on the number of leaves by variant, when the total leaf area, that is, the leaf surface, was studied, it was observed that in our control variant, the leaf surface was 125.4 cm^2 in the first year of the experiment, 126.8 in 2021, and 129.1 in 2022. In the second option, it was determined that this indicator was 130.0 cm^2 in the first year, 132.1 cm^2 in 2021, and 131.8 cm^2 in the third year of the experiment, which was slightly smaller than the previous year.

When examining the leaf area of our Nikitskaya II variety in the “Ripening” phase over the years, it was observed that it was 134.0 cm^2 in 2020, 135.1 cm^2 in 2021, and 137.5 cm^2 in 2022.

It can be concluded that the timing and duration of biometric measurements of the selected olive varieties were largely dependent on air temperature, the biological state of the plant, and the agrotechnical conditions of cultivation.

We know that the appearance of olive fruits is of great importance. It is no secret that the pigmentation process does not occur in all fruits at once, therefore, in our table, this process is also structured as the onset and mass onset (Table 5).

Table 5

The duration of the pigmentation process in olives, 2020-2022

Varieties	Years	Pigmentation (coloring condition of fruits)			
		beginning	active temperature sum, °C	Massive	active temperature sum, °C
Krymskaya 172 (Con)	2020	03.10	3750	13.10	3260
	2021	06.10	3810	17.10	3598
	2022	10.10	3870	20.10	3800
	Average	06.10	3810	16.10	3552.6
Nikitskaya I	2020	05.10	3700	14.10	2280
	2021	07.10	3795	19.10	3150
	2022	09.10	3820	23.10	3330
	Average	07.10	3771.6	18.10	2920
Nikitskaya II	2020	02.10	3760	13.10	3270
	2021	05.10	3810	18.10	3600
	2022	09.10	3880	21.10	3810
	Average	05.10	3816.6	17.10	3560

If the start date of this process in our Krymskaya 172 (control) variety was 03.10 in 2020, then 10 days had to pass for the pigmentation process to occur in the mass form, and if the total useful temperature required for the start of the process was 3750 °C, then a temperature of 3260 °C was required for the mass pigmentation process to occur.

In 2021, this process occurred 3 days later than in the previous year, and in 2022, we observed in our experiments that it was delayed by 7 days compared to the previous year. In our second variety, Nikitskaya I, the start of this process was on 05.10 in 2020, the sum of the beneficial temperatures required was 3700 °C, and then for the mass process to occur, it took 9 days and a temperature of 2280 °C. The average of the calculations of our variety over three years showed that the start of the pigmentation process fell on 07.10, and the mass pigmentation process fell on 18.10, and the sum of the beneficial temperatures required for these processes required temperatures of 3771 °C and 2920 °C, respectively. In our Nikitskaya II variety, the start of the process showed on 02.10 in 2020, and the mass start on 13.10, while in 2021 these two indicators showed on 05.10 and 18.10. The fact that temperatures of 3810 °C and 3600 °C are required for these processes to occur is reflected in this table.

If we turn to the figures of our experiments for 2022, the dates 09.10 and 21.10 indicate the elapsed time of two processes, and the temperature required for these two processes to occur was 3880 °C during the initial period and 3810 °C during the mass pigmentation process. Now, if we briefly look at the average calculations of our three varieties, the pigmentation process began on 06.10 in our Krymskaya 172 variety, this date was 07.10 in our Nikitskaya I variety, and 05.10 in our Nikitskaya II variety. The sum of the useful temperatures required for the onset of this pigmentation in our three varieties is 3810 °C in our control variety, 3771 °C in Nikitskaya I, and 3816 °C in our Nikitskaya II variety, the

sum of the active temperatures during the mass pigmentation process is on average over the years: 3552.6; 2920; 3560 ℃ were observed. From the data in this table, it can be seen that the active temperature range for the onset of pigmentation in olive fruits was high, and the mass pigmentation showed a relatively low indicator. This can be explained by the air temperature.

Conclusion

1. The earliest fruit ripening in the Nikitskaya II variety occurred on average on September 8 and full ripening on September 21, while the latest ripening was observed on September 11-19.
2. The beginning of the "Budding" phase of the Nikitskaya II variety in 2020 fell on April 10, and the sum of beneficial temperatures was 370 ℃. In 2021-2022, the sum of beneficial temperatures was 385 ℃ and 400 ℃, with an average sum of beneficial temperatures of 385 ℃.
3. The height of the main stem was 195 cm on average in the Krymskaya 172 (con) variety, and 197 cm in the Nikitskaya I variety, while the Nikitskaya II variety was 4 cm or 2.0% higher than the control.

In the Nikitskaya II variety, the number of leaves on the first-order lateral branches was 7-10 times higher than in our control variant over the years. As for the number of leaves on the second-order lateral branches, it was found that in our Nikitskaya II variety in 2020, it was 7 times higher, in 2021 it was 11 times higher, and in 2022 it was 9 times higher

References:

1.Abdullaev V.G. Agroclimatic resources of the Azerbaijan SSR. Abstract of diss for the degree of candidate of geographical sciences. - Baku, 1976, - 22 p.
2.Alekseev V.P. Olive. Olive tree. Bulletin of the All-Russian Research Institute of Crops, 1954, No. 4. - P. 86-109.
3.Ali-Zade Mahmud. K. Development of olive culture in Azerbaijan. - Bulletin of the All-Russian Research Institute of Crops, 1954, No. 3. - P. 105-110.
4.Arendt N.K. On the issues of biology of flowering and fruiting of olive. Tr. GNBS. – Yalta, 1934, v. 14, vyp. 2. – P. 119–185.
5.Buriev H.Ch., Abdullaev S.B. Development of issues of development biology of olive varieties introduced in Uzbekistan. // International scientific journal "Young scientist" No. 24 (210) / 2018. – P. 109–111.
6.Gorbey D.E. Olive and its prospects in South-West Turkmenistan. // Soviet subtropics, 1940. No. 5. – 27 p.
7.Enileev N.Sh., Enileev Sh.N. Use of artificial substrates for growing olive seedlings from green cuttings. // Bulletin of agrarian science of Uzbekistan. Tashkent, 2005. 4(10). – P. 11-12.
8.Yormatova D.Yo., Khushvaktova H.S., Yuldasheva H.T. The importance of introduction and development of agrotechnology. // Ecology of agricultural production journal. – Tashkent, 2017. – No. 1. – P. 24-25.
9.Zhigarevich I.A. Agromorphological composition of olive flowers and its influence on yield. – Subtropical crops, 1961, No. 3. – P. 89–99.
10.Zhigarevich I.A. Agro-rules for olive cultivation. – Baku, 1980. – P. 35-49.

11.Zhigarevich I.A. On the biology of flowering and ovary shedding in olives.-Proceedings of ANIISiV and subtropical crops, 1962. - P. 3-20.
12.Kamenkovich S.B. Results of olive variety study in South-West Turkmenistan. - Ashgabat: Bulletin of the Academy of Sciences of the TSSR, series of biological sciences, 1964, No. 5. - P. 75-79.
13.Karpova G.E. Row spacing system in young olive plantings. In the book: Fruit, vegetable growing and viticulture in Turkmenistan.-Ashgabat, 1975. - P. 65-71.
14.Kulieva.N.A. Formation of ovule, megasporogenesis and development of female gametophyte of olive in Absheron: Bulletin of the Academy of Sciences of the Azerbaijan SSR, series of biol. sciences, 1969, No. 3, – P. 10–14.
15.Milanov B.N. Biological and agrotechnical bases of olive culture in the conditions of the Jalalabad Valley of Afghanistan. Abstract of Cand. Sci. (Agricultural Sciences) Diss. – Tashkent, 1977. – P. 12–18.
16.Milanov B.N. New olive cultivation area. Proceedings of the R.R.Shredr Research Institute of Vegetable Growing and Winemaking. – Tashkent, 1976, v.37. – P. 93–951.
17.Ramshivili G.G., Barbakadze T.P. Possibilities of development of industrial olive crop in the Georgian SSR. // Subtropical crops, 1976. No. 5-6. – P. 160-163.
18.Soyunov P. - Biological features of olive growth in the conditions of South-West Turkmenistan. // Young scientist. 2011. No. 7. – P. 148-153.
19.Sholokhova V.A. Recommendations for laying out industrial olive plantations and caring for them. – Moscow: Kolos, 1984. – P. 29-38.
20.Sholokhova V.A., Karakhanova S.V. Oil content in fruits of the original parental form and their prospects for hybrids. "New crops in the national economy and medicine" (mat.scient. conf.). – Kyiv, 1976, part 2. – P. 109-117.
21.Belaj, A., Munoz-Diez, C., Baldoni, L., Satovic, Z., &Barranco, D. (2010). Genetic diversity and relationships of wild and cultivated olives at regionallevel in Spain.ScientiaHorticulturae, 124: P. 323–330.
22.Belaj, A., Satovic, Z., Rallo, L., & Trujillo, I. (2002). Genetic diversity and relationships in olive (Olea europaea L.) germplasm collections as determined by randomly amplified polymorphic DNA. Theoretical and Applied Genetics, 105(4), P. 638-644.
23.Charafi, J., El Meziane, A., Moukhli, A., Boulouha, B., El Modafar, C., &Khadari, B. Menara gardens: A Moroccan olive germplasm collectionidentified by a SSR locus-based genetic study. Genet Resour Crop Evol, 2007 – P. 127–136.
24.Navero, D.B., Cimato, A., Fiorino, P., Romero, L.R., Touzani, A., Castaneda, C., Serafini, F., &Navas, I.T. World catalogue of olive varieties. (1st ed.) .Madrid, Spain: International Olive Oil Council. 2000 – P. 267-279.
25.Poljuha, D., Sladonja, B., Setic, E., Milotic, A., Bandelj, D., J. Jakse,J.,&Javornik, B.(2008).DNA fingerprinting of olive varieties in Istria (Croatia) by microsatellite markers.ScientiaHorticulturae, 115. – P. 223–230.
26.Sarri, V., Baldoni, L., Porceddu, A., Cultrera, N.G.M., Contento, A., Frediani, M., Belaj, A., Trujillo, I., &Cionini, P.G. (2006). Microsatellite markers are powerful tools for discriminating among olive cultivars and assigning them to geographically defined populations. Genome, 49. – P. 1606-1615.