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Biochemical Composition of Fruits of Olive Varieties

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Abstract: in the article, the results of the research carried out for the purpose of studying the biochemical composition of the fruits of olive varieties are presented with an in-depth analysis.

Keywords: olive varieties, fruits, biochemical composition, total dry matter, total sugar, protein, oil, ash.

Introduction

Oil is mainly obtained from the fruits of the olive tree and is distinguished by high demand in the world market. The pulp contains 40 to 70% golden-yellow, aromatic transparent oils. Olive oil is valuable. Olive kernels contain 5-12% oil. However, the highest oil is extracted from the pulp of the fruit.

The energy value of 100 g of ripe fruits of the olive plant is equal to 116 Kk. The biochemical composition of ripe fruits is as follows: dry matter 44%, water-soluble solids 13.1%, alcohol-soluble substances 0.47%, sugar 4.6%, proteins 1.65%, oil 15-24%, ash 6, 4%, 100 g of fruit contains potassium (K) 17 mg, phosphorus (R) 1.6 mg, iron (Fe) 0.4-0.7 mg, sodium (Na) 55 mg, calcium (Ca) 180 mg [1].

Due to the presence of sugar, protein, pectin, ash, vitamins (A, B and C) in olive fruits, the fruit is considered very nutritious. Olive oil contains 2.0-2.7% fatty acids, 70.5-78.4% olein; linolin 7-12%; linolene 0.4-0.8%; palmitate 9-12%; palmitoleic - 0.71-0.76%; arachidonic - 0.42-0.55%; eicosanoin 0.24-0.46 %. It can be seen that olive oil has a high content of oleic acid, which determines its edible and healing properties [2].

Olive oil is rich in polyphenols. The kernel of olive seeds (kernel) contains 12.3% oil, 13.8% protein, 65.5% fiber and 2.2% ash [3].

Olives contain certain types of fatty acids (unsaturated acids), which reduce the level of harmful cholesterol, thereby maintaining the intermediate balance of vital elements in the body. Oil, vitamins and biologically active substances are in certain proportions, which represents the healing properties of olives. All tissues of the olive fruit contain vegetable lipids, high iodine content (in the range of 75-88).

Materials and Methods

The researches were carried out at the Bandikhon experimental farm belonging to the Research Institute of Horticulture, Viticulture and Winery named after Academician M.M.Mirzaev and at the experimental field of the horticultural farm "Sunbul Sultan Moviya" of the Altinsoy district of the Surkhondarya region.

To study the biochemical composition of olive fruits, an average sample of 1.0 kg was taken from each variety and was determined in biochemical laboratory conditions based on A.I. Ermokov's “Methods of biochemical research of plants” methodical manual: dry matter - by a standard method based on drying until it becomes a constant mash; total sugar - according to the Bertrand method; pectin substance - in the carbazol method; additives - polarimetric method; ascorbic acid - by Tilmans method; vegetable oil – in the Soxclet apparatus.

Phenological observations, biometric calculations and laboratory theoretical and practical analyzes carried out during the research were based on Kh.Ch. Buriev and others' "Methodology of calculations and phenological observations during experiments with fruit and berry-fruit plants" [8], mathematical-statistical processing of experimental data B It was conducted according to the method recommended by A. Dospekhov [7].

Results and Discussion

In our experiments, it was observed that after ripening, the fruits of the olive plant turn dark purple and black, and are covered with a waxy dust. With the formation of fruit nodes, the process of olive oil formation in the flesh of the fruit began. According to the data, the oil content of olives was 1.40% in June, and 70-75% increased when ripening in October. In July and August, it was observed that the process of oil formation accelerated. Sometimes the characteristic of the variety also affects this indicator. The seed of the olive fruit is oblong and the skin is very hard. In our experiments, it was observed that olive fruits ripened in October. But the fresh fruits of olives are not suitable for consumption, because they contain oleuropein glucosides, it is recommended to eat them only by salting or marinating them.

The role of the fruit-growing sector of agriculture in providing the population with subtopic fruits and food products in Uzbekistan is incomparable. In particular, in recent years, great opportunities have been created in the cultivation of subtropical fruit crops, as well as the olive plant, on the scale of our country.

In our country, there is not enough scientific and practical information about the olive plant. There are a number of difficulties in the cultivation of the olive plant, especially in the winter season, when olive branches are less resistant to cold than other fruit crops.

The olive plant is a plant that grows in a dry subtropical climate, and it is important to select cold-resistant varieties and develop technologies for its cultivation on a scientific basis. Therefore, the issue of testing and selecting cold-resistant olive varieties in dry subtropical climates is of particular interest.

The purpose of our research is to select cold-resistant olive varieties in the dry subtropical climate of Surkhandarya region. In this work, we conducted experiments to determine the cold tolerance of certain olive varieties using some physiological and biochemical indicators.

Two-year-old seedlings of our olive plant were taken to organize our experiments to elucidate the vegetation process. Some of them were placed with plant containers to study the water regime, the other part was kept at different soil moisture levels and frozen in refrigerators, and the following indicators were determined: carbohydrate metabolism, vitamin supplements, conductivity, protoplasm, water regime and cold resistance characteristics.

Winter hardiness and especially cold hardiness is not a permanent feature of olive. Cold resistance of the olive is primarily caused by changes within the cell. Therefore, the plant is affected by cold in different degrees during the cold winter days. One of the factors that keep olives from frostbite on cold quiche days is the accumulation of sugar in them.

It is known that it is important to study the nature of carbon-water metabolism in all studied plants during the cold war of branches.

Annual shoot leaves were taken for analysis. Amounts of sucrose and maltose were determined. The results of the dynamics of different sugar content in the leaves of some varieties of olive and bruchina during wintering.

Table 1 Changes in the content of glucose in the leaves of olive varieties (in % of dry weight)

Varieties	Years	Phenological phases			
		Budding	Flowering	Fruit bearing	Ripe
Krymskaya 172 (con)	2020	0.17±0.2	0.38 ±0.1	0.49 ±0.2	0.34 ±0.1
	2021	0.14 ±0.1	0.41 ± 0.3	0.45 ±0.4	0.20 ±0.2
	2022	0.18 ±0.3	0.41 ± 0.4	0.55 ±0.4	0.20 ±0.3
	Avg.	0.16±0.2	0.4±0.2	0.49±0.3	0.24±0.2
Nikitskaya I	2020	0.27±0.2	0.60 ±0.4	0.72 ±0.4	0.51 ±0.2
	2021	0.38 ±0.3	0.62 ±0.4	0.77 ±0.3	0.54 ±0.2
	2022	0.52 ±0.3	0.66 ±0.3	0.78 ±0.3	0.57 ±0.3
	Avg.	0.39±0.2	0.62±0.3	0.75±0.3	0.54±0.2
Nikitskaya II	2020	0.39 ±0.1	0.67 ±0.2	0.85 ±0.2	0.60 ±0.2
	2021	0.52 ±0.2	0.62 ±0.1	0.83 ±0.3	0.58 ±0.1
	2022	0.65 ±0.2	0.62 ±0.2	0.78 ±0.1	0.52 ±0.1
	Avg.	0.52±0.1	0.63±0.1	0.82±0.2	0.56±0.1

In our scientific experiments, we checked the amount of glucose in the leaves of olive varieties in the four different phenological phases in the laboratory and analyzed the results. Our control variety Krymskaya 172 had 0.17% glucose in the budding phase of 2020 , while the numbers were 0.49 in the flowering and fruiting phase. %, but as a result of changes in the physiological and biochemical processes in the body of our olive trees, the amount of glucose in the leaves of our olive trees decreased by 0.34% during the ripening phase (see Table 1).

If we look at these numbers in the calculation of 2021, we can see that compared to the first year, the amount of glucose in the budding phase was 0.3% less, but by the flowering phase, our olive trees were able to fill this deficit.

By the time of the fruiting phase, these numbers increased again by 0.4%, and in the later phases, these percentages decreased significantly. Analysis in the third year of our experiment showed that the glucose content of the leaves, which was 0.18% at the beginning of the phenological phases, increased to 0.55% by the time of fruiting and again decreased to 0.20% by the time of fruit ripening.

Looking at the results of our Nikitskaya I variety in this table, it was found that in 2020 alone, compared to our control variety, it was 0.3%, 0.22%, 0.23%, and 0.17% more in the final phase than our control variety.

By 2021, the increasing trend of glucose content in leaves reached 0.77%, and this figure showed an increase of 0.1% by the third year of our scientific experiment. It was found that the average glucose content of the three-year indicators of this variety changed from 0.39% in the budding phase to 0.62% after the flowering phase, and increased by 0.13% after the fruiting phase.

Our third variety, Nikitskaya II, showed the highest indicators of our results regarding changes in the amount of glucose in the leaves of our olive varieties. If we look at these results by years, in the first year of the experiment, it was known that there was 0.39% glucose, in the next phase, the amount of glucose doubled to 0.67%. This growth rate was observed in the next phase as well, and at the end, i.e. when the fruit reached the ripening phase, the amount of glucose remaining in the leaves showed 0.60%.

The percentages in 2021 increased in the first three phases, as in other years, and as always when the fruit ripening phase, these percentages decreased, finally 0.58% glucose remained in the leaves of our olive trees. If we look at the results of our experiment in 2022, in which the first phenological phase started with an amount of 0.65%, then for some reason, in the next phenological phase, as always, this amount decreased instead of increasing, that is, with a loss of 0.65% to 0.3%. we can see that it is manifested. This decrease naturally had a negative effect on the accumulation of glucose in the leaves of our olive trees, which was somewhat less than in previous years.

If we draw a final conclusion to this table, which shows the quantitative change of the amount of glucose in the leaves of olive varieties in their different phenological phases, in almost all of our varieties, the initial quantitative indicators increase in the cross-section of years and phenological phases until the fruit bearing phase, and when it comes to the later phase, i.e., when the leaves reach the ripening phase of the olive fruit we can say that the amount of glucose in all our varieties has decreased.

Changes in the percentage of sucrose in the leaves of olive varietiess relative to dry weight were analyzed during the studies (see Table 2).

Table 2 Changes in the amount of sucrose in the leaves of olive varieties (in % of dry weight), 2020-2022.

Varieties	Years	Budding	Flowering	Fruit bearing	Ripe
Krymskaya 172 (con)	2020	1.84±0.2	0.39±0.1	0.23±0.2	0.60±0.1
	2021	1.96±0.1	0.45±0.2	0.30±0.3	0.77±0.2
	2022	1.78±0.3	0.42±0.1	0.27±0.1	0.64±0.2
	Avg.	1.86±0.2	0.42±0.1	0.26±0.2	0.67±0.1
Nikitskaya I	2020	2.00±0.2	0.48±0.1	0.28±0.2	0.74±0.2
	2021	2.14 ±0.1	0.52±0.2	0.39±0.3	0.86±0.4
	2022	1.96±0.1	0.41±0.2	0.25±0.1	0.68±0.3
	Avg.	2.03±0.1	0.47±0.1	0.30±0.2	0.76±0.3
Nikitskaya II	2020	2.04 ±0.2	0.78±0.1	0.35±0.1	0.87±0.1
	2021	2.20±0.3	0.96±0.1	0.48±0.2	1.01±0.2
	2022	2.11±0.2	0.62±0.1	0.30±0.1	0.92±0.3
	Avg.	2.11±0.2	0.78±0.1	0.37±0.1	0.93±0.2

When it came to the flowering phase, this amount decreased to 0.39%, and this decrease showed 0.23% by the time of fruiting. However, we can see in this table that the amount of sugar in the leaves of olive trees can double by the end of the growing season. That is, the amount of sugar, which was 0.23% in the fruiting phase, increased to 0.60% in the ripening phase.

We can see that in the first phase of 2021, 1.96%, i.e. 0.12% compared to the previous year, increased to 0.77% by the end of our phenological period. In the last year of our research, this control variety started phenophases with slightly lower percentages compared to the previous two years, but the results in the remaining phenophases did not differ much from the previous years.

Looking at our variety Nikitskaya I, which performed slightly better than our control in these lab results, our varieties Nikitskaya I started the budding phase in 2020 with 2.0% sucrose, then our olive trees showed 0.48% at flowering, and then In our tests during the fruiting process, we can see that these numbers are reduced to 0.28%. But this was the last phase of the decline, as we can see that the sugar content of our trees increased by 0.74% when the fruiting period of our olive trees came. In 2021, our variety started phenophases with 0.18% more sucrose compared to 2022 numbers, 0.14% more than at the same time last year. Sucrose content was 0.52% by the flowering phase, and 0.39% by the fruiting period. By the ripening phase, it was found that the amount of sucrose was equal to 0.86%.

If we look at the results of 2022, we can see that our Nikitskaya I variety is lower in this year of the experiment than in the previous two years.

When we studied the change in the amount of sucrose in the leaves of the Nikitskaya II variety in our experiment, like the above varieties, it was in the amount of 2.04% in the budding phase in 2020, and when we checked in the next phenophase process, we witnessed that this number decreased to 0.78%. It was observed that the amount of cumin, which was 0.35% in the fruiting phase, increased to 0.87% at the end.

It was observed that our Nikitskaya II variety showed the highest quantitative index in the second year of our experiment, i.e. in 2021, and did not record such a high result in other years.

If we come to the final conclusion of this table about the changes in the amount of sucrose in the leaves of olive trees, although these changes are in different amounts in all olive varieties, they have the only similarity, that is, in all of these varieties, the amount of sucrose in the leaves decreases from the initial amount until the period of budding, flowering, and fruiting. increases again in the ripening phase of the growing season. We can say from our previous tables that the trend towards increase in the phase after this decrease is related to the amount of sucrose in the leaf, while the opposite is related to the change in the amount of glucose in the leaf.

Table 3 Dynamics of ascorbic acid changes in the leaves of olive plants (in mg.%), 2020-2022.

Varieties	Years	Budding	Flowering	Fruit bearing	Ripe
Krymskaya 172 (con)	2020	100.3±0.3	91.1±0.1	51.3±0.2	93.6±0.2
	2021	105.2±0.2	95.7±0.2	57.8±0.1	98.9±0.1
	2022	98.6±0.1	92.3±0.1	50.4±0.3	90.1±0.3
	Avg.	101.3±0.2	93.0±0.1	53.1±0.2	94.2±0.2
Nikitskaya I	2020	123.8 ±0.4	103.4±0.2	60.7±0.2	99.2±0.1
	2021	130.3 ±0.2	106.8±0.1	65.3±0.1	102.5±0.2
	2022	122.0±0.2	101.2±0.3	59.1±0.1	100.8±0.1
	Avg.	125.3±0.26	103.8±0.2	61.7±0.1	100.8±0.1
Nikitskaya II	2020	154.4±0.2	113.4±0.1	72.2±0.2	105.8±0.2
	2021	167.2±0.1	118.7±0.2	76.7±0.2	112.4±0.1
	2022	152.7±0.2	112.5±0.1	70.1±0.1	103.1±0.2
	Avg.	158.1±0.16	114.8±0.1	73.0±0.1	107.1±0.2

We know that ascorbic acid is a substance that plays an important role in increasing the cold resistance of agricultural plants. However, the process of accumulating ascorbic acid to increase the cold resistance of plants has not been fully studied by scientists. There are a number of views on the amount of vitamin C in plants and its importance in the wintering process.

However, there is very little information on winter accumulation of ascorbic acid in dry subtropical regions, including the olive tree. Information on the amount of vitamin C in olive leaves studied is presented in our Table 3.

The next year, this control variety showed the highest results among the years we conducted research, as can be seen in the cells of our table in 2021. By 2022, we can witness that the minimum amount of ascorbic acid in the leaves of Krymskaya 172 has accumulated.

If we look at the dynamics of ascorbic acid in the leaves of our Nikitskaya I variety in different phenophases, we can see that this variety showed the dynamics of this change with the smallest numbers in 2022, but in 2021, with a small difference compared to the previous year, it spent the development periods with the highest index among the three-year results. we can see.

The three-year average results showed 125.3 mg/% in the budding phase, 103.8 mg/% in the flowering phase, 61.7 % in the fruiting phase and 100.8 mg/% in the dry matter of its leaves by the last phase. we can see in our table that ascorbic acid has accumulated.

Our third variety, that is, Nikitskaya II variety, which is the only one among the three varieties that we have selected by the analysis of the results of the laboratory conducted in each of our researches, showing high indicators.

Nikitskaya II variety showed the presence of 154.4 mg/% ascorbic acid in the budding phase in the year when we started the research, but by the time of flowering, this amount decreased to 113.4 mg/% , and this decrease continued until the fruiting phase. reached 72.2 mg/% , and in the end, these dynamic lines moved upwards and showed 105.8 mg/% .

Looking at the table, we can say that our Nikitskaya II variety is similar to our other varieties, that is, compared to 2020 and 2022, we can say that the dynamics of change in 2021 were reflected in large numbers. Since then, out of three years, this year has been the most optimal temperature and conditions for the growth of our olive trees.

During several years of research, the biochemical composition of the fruits of olive varieties Krymskaya 172, Nikitskaya I, Nikitskaya II was studied and some valuable information was recorded. In order to fully implement the research process, 3 olive varieties were selected, among which Krymskaya 172 was designated as a control variety.

Table 4 Biochemical composition of fruits of olive varieties (in %) 2020-2022.

Varieties	Years	Total dry matter	Total sugar	Protein	Oil	Ash
Krymskaya 172 (con)	2020	44±2.0	4.6±0.4	1.5±0.6	15±2.1	6.4±1.2
	2021	48±2.4	4.9±0.3	1.7±0.4	20±1.7	6.7±0.9
	2022	42±2.7	4.1±0.9	1.3±0.9	24±2.3	6.1±1.3
	Avg.	45±2.4	4.5±0.5	1.5±0.6	20±2.0	6.4±1.1
Nikitskaya I	2020	42±2.5	4.8±0.4	1.4±1.0	19±1.9	6.6±1.3
	2021	45±2.3	5.0±0.3	1.8±0.9	22±2.0	6.5±0.7
	2022	49±2.6	4.3±0.7	1.6±1.3	18±2.2	6.2±1.0
	Avg.	45±2.5	4.7±0.5	1.6±1.1	20±2.0	6.4±1.0
Nikitskaya II	2020	47±2.4	4.7±1.1	1.8±0.8	23±2.0	6.3±0.9
	2021	49±2.1	5.0±0.7	2.0±0.5	26±1.7	6.5±0.7
	2022	43±2.9	4.6±1.0	1.5±1.2	21±2.3	6.6±1.4
	Avg.	46±2.5	4.8±0.9	1.8±0.8	23±2.0	6.5±1.0

When the monitoring results were compared between varieties, it was found that the average value of the total dry matter content in all 3 varieties was almost similar, only the percentage of indicators in the Nikitskaya II variety differed from the control and Nikitskaya I variety by 1%. If we pay attention to the amount of total sugar, we have seen that the 2 varieties have higher values with a difference of 0.2:0.3%, respectively, compared to the Control. The amount of protein also showed that the 2 varieties were different from the control with a difference of 0.1:0.2%. Comparing the percentage of fruit oil content, it was shown that the Nikitskaya I variety produced the same level as the control variety, and Nikitskaya II produced relatively oilier fruits with an indicator of 3% higher than the control variety. On the other hand, when the ash content of olive fruits was analyzed based on the results, it was found that only Nikitskaya II differed from the other 2 varieties with a value of 0.1%, although not significantly.

Therefore, it was noted that in the year when the weather was rich in moisture, the fruit content showed much lower biochemical indicators.

When the results of the analysis were finally summarized, it was found that these 3 varieties of olives have a rich biochemical content and there is no significant difference between the varieties in terms of content.

In the course of conducting scientific research, observations were made on the biochemical parameters of the seeds of the fruits of olive varieties. In this case, the percentage of oil, protein, fiber and ash content of 3 olive varieties was studied and the results were analyzed.

olive variety was selected as the control, but the average oil content of the fruit pit was not significantly higher among the varieties than the control variety, 0.4:0.5%, respectively.

Table 5 Biochemical composition of fruit kernels of olive varieties (in %), 2020-2022.

Varieties	Years	Oil	Protein	Kletchatka	Ash
Krymskaya 172 (con)	2020	12.3±1.5	13.0±1.8	63.4±2.0	2.2±1.4
	2021	12.7±1.0	13.6±1.5	64.0±1.7	2.0±1.2
	2022	11.6±1.4	13.1±2.3	63.5±3.0	1.7±1.6
	Avg.	12.2±1.3	13.2±1.9	63.6±2.2	2.0±1.4
Nikitskaya I	2020	12.5±1.4	13.3±1.9	63.1±2.5	1.9±1.8

	2021	13.1±1.1	13.7±1.4	63.9±2.0	2.4±1.2
	2022	12.2±1.6	13.4±2.2	62.8±2.9	2.3±2.5
	Avg.	12.6±1.4	13.5±1.8	63.3±2.5	2.2±1.8
Nikitskaya II	2020	12.8±1.5	13.2±2.3	65.5±2.3	2.0±1.8
	2021	13.4±1.2	13.8±1.9	67.1±2.0	2.2±1.3
	2022	12.0±1.6	13.5±2.5	66.0±3.1	1.8±2.5
	Avg.	12.7±1.4	13.5±2.2	66.2±2.5	2.0±1.9

If we pay attention to the average percentage of clechatka in the fruit stone between the varieties, it was found that the amount in the control variety is 0.3% less than Nikitskaya I, and 2.6% higher in Nikitskaya II. On the other hand, the results of our experiments over the years revealed that unfavorable weather had a slight effect on the biochemical composition of fruit seeds. As a final conclusion, it can be said that the biochemical composition of the fruit seed was not significantly different in the other 2 varietiess when analyzed in comparison with the control.

Conclusion

When the amount of glucose and sucrose in the leaves of olive varietiess was analyzed between phases, the amount of glucose in the Nikitskaya II variety was at the highest level (0.82%) in the phase of fruiting, and the amount of sucrose was determined in the phase of budding (2.11%). This means 0.25-0.33% more than the control.

The more ascorbic acid, the higher the frost resistance of olive varieties. Ascorbic acid in the leaves of Nikitskaya II variety was found to be 158.1 mg/% in the budding phase , 114.8 mg/% in the flowering phase, 73.0 mg/% in the fruiting phase and 107.1 mg/% in the ripening phase.

It was observed that the total sugar content of the fruit was 0.2:0.3% higher in Nikitskaya I and Nikitskaya II varietiess, respectively, compared to the control. It was observed that the protein content was 0.1:0.2% higher in both varieties compared to the control.

Comparing the level of oiliness of the fruits, it was shown that Nikitskaya I variety (20%) produced the same level as the control variant, and Nikitskaya II produced relatively oilier fruits with an index of 3% higher than the control.

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