

IMPORTANCE OF SELECTION VARIETIES IN THE PRODUCTION OF ECOLOGICALLY CLEAN APPLE PRODUCTS

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The article provides extensive information on the economic and biological characteristics of apple varieties cultivated in the conditions of the Guba-Khachmaz economic zone, introduced, and obtained through selection at the Scientific Research Institute of Fruit and Tea Growing, and on the mechanical composition of the soil in which they are cultivated, electrical conductivity, etc. indicators (nitrogen, phosphorus, Ca, humus, Ph). As a result of the study, the chemical and mechanical composition, tasting value, resistance to diseases and pests, as well as transport resistance of varieties grouped into summer (Zirve, Ziya, Lala, Nigar), autumn (Marfa, Sülh) and winter (Giziltaj, Ulvi, Vatan, Zumrud, etc.) were determined, and varieties with high economic efficiency were selected. According to the productivity indicators, the varieties Zia (18 tons), Sülh (23 tons), Makhmeri, Chiraggala (25 tons), Elvin, Emil, Shabran (27 tons) and Sadaf (30 tons) stood out. The highest indicator in terms of the amount of soluble dry matter was recorded in Lale, Makhmeri, Davamli with 11.5%, Khazar with 11.7%, vitamin “C” was recorded in Emil, Sadaf with 4.35 mg/%, and Giziltaj, Makhmeri varieties with 4.61 mg/%. In terms of sugar content, the summer varieties Lale with 9.15%, the winter varieties Gobustan, Chiraggala, Giziltaj, Khazar, Makhmeri, Davamli, Emil, Elvin with 9.13-9.14% and Sadaf with 9.61% showed good results. Compared to other varieties, the highest yield of commercial varieties of the first group was observed in the varieties Gobustan, Ulvi, Nubar, Vatan, Emil, Elvin (75%), Giziltaj (76%), Chiraggala, Davamli, Makhmeri, Sadaf (77%) and Sevinj (78%). According to their transport resistance, Zirve, Ziya, Gobustan, Zumrud, Khazar, Eldar, Nubar, Vatan, Nuran, Sarvan, Chiraggala, Elvin, Payizlig Guba, Qishlig Guba, Shabran varieties were selected as medium transport resistance, while Qiziltaj, Ulvi, Makhmeri, Davamli, Emil, Sadaf and Sevinj varieties were selected as good transport resistance varieties.

Keywords: *Apple, Gene pool, Quality, Ecology, Azerbaijan.*

FORMULATION OF THE PROBLEM

The current state of the environment is the result of the long-term evolution of living and non-living nature all over the world. In the modern world, producing ecologically clean products is one of the most urgent problems of the day. It is impossible to imagine the modern life of mankind without ecological knowledge. Currently, inter-republican scientific conferences, symposiums, etc. are regularly held in all countries of the world on the implementation of the necessary measures to produce ecologically clean products. Every year, Azerbaijani entrepreneurs organize an activity called “healthy lifestyle” to produce ecologically clean products. Research work is ongoing on the creation of new varieties that are highly efficient and surpass previous varieties in terms of their superior characteristics through selection that is suitable for the soil and climatic conditions of each economic region. In order to obtain ecologically clean products in fruit growing, breeding scientists prefer to create varieties resistant to the most common diseases and pests today and use innovative technologies to achieve high-quality fruit (apple) products with minimal use of pesticides [1].

Azerbaijan is a country with a rich gene pool of fruit plants, where more than 500 forms and varieties of apple plants alone are cultivated. These varieties are widely distributed in the region as folk selection, introduced, and Scientific Research varieties of Fruit and Tea Growing. Considering the high genetic characteristics of the varieties, their long-term adaptation to the soil-climatic conditions of Azerbaijan, and their ecological efficiency, they were involved in the selection program, and new apple varieties were obtained using maternal and paternal pairs [3].

The obtained selection varieties were resistant to diseases and pests compared to other varieties, which ultimately led to a partial reduction in the use of pesticides in the fight against them in order to obtain an ecologically clean fruit crop. Since their mechanical and chemical indicators are economical for farmers, these varieties are cultivated in large areas to grow an ecologically clean apple crop. In this regard, Elvin-2015, Sevinj-2015, and Zumrud-2020 were regionalized from these varieties [4].

Ecologically clean and efficient, promising and regionalized varieties are currently being introduced in the fruit-growing regions of our country.

MATERIALS AND METHODS

The creation of ecologically clean new apple varieties is located at the Guba Auxiliary Experimental Farm of the Scientific Research Institute of Fruit and Tea Growing, located in the Guba-Khachmaz economic region. The farm is located at an altitude of 750 m above sea level, and its area is 250 ha. Apple varieties are mainly cultivated on the farm. The annual rainfall here is 530 mm, of which 353 mm covers the period from April to October. The average annual temperature is 9.7-11.3 °C, the minimum is 18.5-20.4 °C, the summer temperature (in July-August) is 21.7-36.3 °C. The total active temperature above 10 °C during the year is 3450-3469 °C. The soils are gray, tugai, tugai-meadow, chestnut, mountain forest brown and brown soils. The duration of the active development phases of the apple plant under the research conditions, depending on the pomological characteristics of the varieties, is 222-235 days, during which the average daily air temperature is 9.5-13.4 °C.

The selection varieties of the Scientific Research Institute of Fruit and Tea Growing, obtained by artificial pollination from local and introduced varieties included in the gene pool of apple plants in Azerbaijan, were used as research material.

Scientific novelty of the research. For the first time in Azerbaijan, the new selection varieties of the Scientific Research Institute of Fruit and Tea Growing, obtained from local and introduced varieties included in the gene pool of apple plants, were grouped into summer, autumn, and winter varieties, the mechanical and chemical indicators of the fruits were analyzed, and the varieties that differed in their resistance to diseases and pests and quality indicators were selected and their role in the cultivation of ecologically clean fruit crops was determined.

The research was carried out mainly by N.I. The program methodology of Vavilov's "Introduction, Variety Study and Selection of Fruit Plants" (1970) was used. The resistance of varieties to spot disease was determined by the 5-point scale table of the Michurinsky methodology (1973); Sugar (total, sucrose, monosaccharide) by the Bertrand method; Soluble dry matter - by drying in a thermostat at a temperature of 105°C; Ascorbic acid (vitamin "C") - by the method of Tilmans and Murin; The tasting price of the fruits was determined based on the price given by the tasting commission.

RESULTS AND DISCUSSION

As globalization increases among the countries of the world, problems also increase. One of the main priorities in modern times is to more correctly meet the needs of the growing population for agricultural and other ecological food products. Currently, the existing land fund in our independent republic has been privatized and is operating in the direction of peasant (farmer) farms. Fruit orchards (apple) are being planted based on new innovative technologies. Introduced varieties are used in the planting of those orchards, most of which are not adapted to the soil-climatic conditions of our republic and are environmentally unsuitable for our country. In order to partially eliminate these shortcomings, the gene pool of apple plants existing in our republic has been studied since 1982, forms and varieties with high ecological efficiency have been selected and involved in the selection program, and varieties that are historically suitable for the soil-climatic conditions of our country have been created. Those varieties have been submitted to the Agrarian Services Agency, and some of them have been regionalized for fruit-growing regions and have begun to be applied. The varieties obtained through selection were divided into three groups according to their ripening period: summer, autumn and winter, their productivity indicators, chemical composition, transportability, etc. indicators were determined and the results are shown in Table 1. As can be seen from Table (1), the average weight of 1 fruit in summer varieties was 110-123 grams, and the highest weight was recorded in the Nigar variety (123 g). The average weight of 1 fruit in autumn varieties was between 130-210 grams, and the Marfa variety stood out with the highest indicator of 130 grams. In winter varieties, the average mass of 1 fruit was between 110-130 grams, and the highest indicator was observed in the varieties Giziltaj, Ulvi, Nubar, Davamli, Shabran (125 grams), Gobustan, Makhmeri, Chiraggala, Emil, Elvin, Payizliq Guba, Qishliq Guba, Sevinj and Sadaf (130 grams). The average productivity indicators per hectare in summer varieties were between 13-18 tons/ha, and the highest indicator was in the Ziya variety (18 tons), in autumn varieties it was 20-23 tons/ha, and the highest indicator was recorded in the Marfa variety with 20 tons. The average productivity indicators of winter varieties were 13-30 tons/ha, and compared to other varieties, the varieties Gobustan, Giziltaj, Ulvi, Nubar, Vatan, Davamli, Payizliq Guba, Qishliq Guba, Chiraggala and Makhmeri

stood out with 20-25 tons. The highest yield indicators among winter varieties were recorded in Emil, Elvin, Shabran, and Sadaf varieties (27-30 tons/ha). The average infection rate of varieties with spot disease was estimated at 0.7-1.3 points. Compared to other varieties, the highest infection rates were recorded in summer varieties Nigar (1 point), autumn varieties Marfa (1.2 points) and Sülh (1.3 points), winter varieties Nubar, Vatan (1.1 points), Zümürd, Nuran (1.2 points), Khazar, Eldar, Makhmeri, Sarvan, Autumn Guba (1.3 points), and Winter Guba (1.4 points). Infection below 1 point was observed in the summer varieties Zirve, Ziya (0.8) and Lale (0.9), and the winter varieties Davamli, Emil, Sadaef (0.6), Gobustan, Chiraggla, Elvin, Shabran (0.7), Giziltaj, Ulvi, Sevinj (0.8).

The tasting value of the fruits was assessed at 5 points. According to the tasting assessment, the highest indicator was recorded in the summer varieties Zirve, Ziya with 4.5-4.6 points, and the winter varieties Emil, Emil (4.5 points), Makhmeri, Sadaef, Sevinj (4.6 points) and Giziltaj. In the autumn varieties Marfa and Sülh, these indicators (4.0 points) were somewhat lower.

The amount of soluble dry matter in the fruits of all varieties was more than 10%. These indicators varied between 10.3-11.7% according to the varieties. The soluble dry matter content of Zirve (11.3%), Ziya (11.4%), Lale (11.5%), Gobustan (11.3%), Qiziltaj (11.4%), Khazar (11.7%), Makhmeri (11.5%), Chiraggala (11.4%), Davamli (11.5%), Elvin (11.3%), Sadaf (11.4%), and Sevinj (11.3%) varieties was higher than that of other varieties.

The total sugar content among the varieties was observed between 8.56-9.64%. The lowest sugar content was recorded in the Sülh variety (8.56%), the highest sugar content was recorded in the Sevinj variety (9.64%). In terms of sugar content, the summer varieties Lale with 9.15%, winter Gobustan, Chiraggala, Giziltaj, Khazar, Makhmeri, Davamli, Emil, Elvin and Sadaf varieties with 9.13-9.14% showed good results.

Among the varieties, the lowest indicator of the amount of vitamin "C" was recorded in the Eldar and Lale varieties with 2.41-2.61 mg/%, and the highest indicator was recorded in the Giziltaj and Makhmeri apple varieties with 4.61 mg/%. In summer varieties, these indicators varied between 2.61-3.61, in autumn varieties - 2.63-2.64, and in winter varieties - 3.20-4.45 mg/%.

The shelf life of the fruits after harvesting maturity under normal conditions was determined and it was concluded that the shelf life of summer varieties (Zirve, Ziya, Lale, Nigar) is 18-23 days, and the shelf life of autumn varieties Marfa and Sülh is a maximum of 27-30 days. Winter varieties can be stored for a longer period (110-140 days). Among the varieties, the yield of commodity varieties of group I was 63-71% in summer varieties, 64-66% in autumn varieties, and 65-78% in winter varieties. The highest commercial yield of varieties was recorded in Ziya (summer) with 71%, Gobustan, Ulvi, Nubar, Vatan, Emil, Elvin with 75%, Giziltaj with 76%, Makhmeri, Chiraggala, Davamli, Sadaef with 77%. The transport resistance of fruits was evaluated according to the indicators of weak, medium and good. According to these indicators, Zirve, Ziya, Gobustan, Zümürd, Khazar, Eldar, Nubar, Vatan, Nuran, Sarvan, Chiraggala, Elvin, Payizlig Guba, Qishlig Guba, Shabran varieties were selected as medium transport resistant varieties, and Giziltaj, Ulvi, Makhmeri, Davamli, Emil, Sadaef and Sevinj varieties were selected as good transport resistant varieties.

Table 1. Quality indicators of ecologically pure apple varieties

Sort	Ripening period	Average weight of one fruit, g	Average yield per hectare, tons	Resistance to spot disease, 5 points	Tasting price, out of 5 points	Soluble dry matter, %	Total sugar, %	Vitamin C, mg%	Duration of stay, days	First group commodity variety yield, %	Transportability of fruits
Zirve	Summer	120	15	0.8	4.5	11.3	9.13	3.21	18-20	65	Medium
Ziya	Summer	120	18	0.8	4.6	11.4	9.13	3.22	18-23	71	Medium
Lala	Summer	110	13	0.9	4.2	11.5	9.15	2.61	18-20	66	Weak
Nıgar	Summer	123	13	1.0	4.0	10.9	8.61	3.61	18-20	63	Weak
Marfa	Autumn	130	20	1.2	4.0	10.6	8.59	2.63	25-30	64	Weak
Sulh	Autumn	210	23	1.3	4.0	10.7	8.56	2.64	27-30	66	Weak
Gobustan	Winter	130	21	0.7	4.2	11.3	9.13	3.64	120-130	75	Medium
Zumrud	Winter	118	18	1.2	4.0	10.4	8.61	3.63	115-120	70	Medium
Giziltaj	Winter	125	22	0.8	4.8	11.4	9.14	4.61	120-135	76	Good
Khazar	Winter	120	18	1.3	4.1	11.7	9.14	3.71	120-130	70	Medium
Eldar	Winter	110	13	1.3	4.0	10.3	8.62	2.41	110-120	65	Medium
Ulvi	Winter	125	20	0.8	4.4	10.3	8.62	4.21	125-130	75	Good
Nubar	Winter	125	20	1.1	4.1	10.4	8.61	3.61	110-120	75	Medium
Vatan	Winter	123	20	1.1	4.1	10.4	8.62	3.61	125-130	75	Medium
Makhmari	Winter	130	25	1.3	4.6	11.5	9.14	4.61	130-135	77	Good
Nuran	Winter	120	13	1.2	4.0	10.5	8.63	3.21	120-125	66	Medium
Sarvan	Winter	120	13	1.3	4.0	10.3	8.63	3.15	115-120	67	Medium
Chiraggala	Winter	130	25	0.7	4.2	11.4	9.13	4.15	120-126	77	Medium
Davamli	Winter	125	20	0.6	4.1	11.5	9.14	3.55	120-126	77	Good
Emil	Winter	130	27	0.6	4.5	11.2	9.14	4.35	125-130	75	Good
Elvin	Winter	130	27	0.7	4.5	11.3	9.14	4.25	125-130	75	Medium
Payizlig Guba	Winter	130	21	1.3	4.1	10.4	8.21	3.22	115-120	68	Medium
Qishlig Guba	Winter	130	22	1.4	4.1	10.4	8.21	3.20	122-130	70	Medium
Shabran	Winter	125	27	0.7	4.2	10.5	8.41	3.41	120-130	71	Medium
Sadaf	Winter	130	30	0.6	4.6	11.3	9.61	4.35	130-140	77	Good
Sevinj	Winter	130	27	0.8	4.6	11.4	9.64	4.37	130-135	78	Good

CONCLUSION

Since local and selected varieties adapted to historical soil and climatic conditions surpass introduced varieties in terms of their agricultural biological characteristics and quality indicators, as well as resistance to diseases and pests, it is possible to achieve high productivity and partially protect our country from existing ecological problems by applying innovative technologies to these varieties and creating new industrial-type orchards.

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