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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

STUDY OF AGROBIOLOGICAL CHARACTERISTICS OF PEACH VARIETIES INTRODUCED IN GUBA-KHACHMAZ ECONOMIC REGION

Specialities: 3103.04 – Breeding and seed production

Field of science: Agricultural sciences

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The dissertation work was carried out at the "Fruit Plant Breeding" and "Plant Protection" departments, "Fruit Processing and Storage Technologies" laboratory and Zardabi Scientific Experience Base of the Scientific Research Institute of Fruit and Tea Growing of the Ministry of Agriculture of the Republic of Azerbaijan.

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INTRODUCTION

Relevance of the topic and degree of development. The total area of peach plantations in our republic is 7184.3 ha, of which 3486.0 ha belongs to the Guba-Khachmaz economic region. This is 48.5% of peach plantations. 5,579.6 ha of peach plantations in our republic are made up of productiveorchards. To ensure the dynamic development of fruit growing, to increase peasant (farmer) interest and productivity, the main direction of fruit cultivation in accordance with market requirements is the study of farm biological characteristics of new, more productive, disease and pest-resistant, as well as frost-resistant fruit plant varieties. For the reason fruit growing is one of the priority areas of the agricultural sector, it is an important area that allows currency flow to the country, provides employment, and is labor-intensive, so the presented research work has a decisive role in solving the current issues in meeting the demand for responsive, competitively productive, high-quality, disease- and pest-resistant varieties whose meets the requirements of the market economy in meeting the demand for fruit products in the food ration of the population, and in establishing gardens equipped with new technologies and cultivation systems. Various fruit varieties, including peaches, have been researched in different periods in Azerbaijan, but now there is a need to conduct research in this direction according to the requirements of the modern era.

Object and subject of the research. Melox 26, Melox 31, Melox 37, Netix 25, Netix 28, Netix 30, Netix 34, Redix 25, Redix 27, Redix 30, Redix 2-110, Malix 25, Malix 36, Malix 145, Guayox 30, Guayox 35, Gartairo, Gardeta peach varieties planted in the field of Scientific Experiment Base LLC named after Zardabi of the Scientific Research Institute of Fruit and Tea Growing were taken as the object of the research andfarm biological characteristics of the varieties and fruit quality indicators were compared with the Fadai (c) variety.

The purpose and tasks of the research. The purpose of the research is to select productive, disease- and pest-resistant varieties with high quality and quantity indicators adapted to the region's soil-climate

conditions based on the study of the agrobiological characteristics and quality indicators of 18 peach plant varieties introduced from Spain to the Guba-Khachmaz economic region, in order to meet the population's demand for fruit products and the selection of starting material for use in selection-oriented research works to increase the selected varieties in peasant farms (for the purpose of planting new gardens) and in the creation of new varieties.

To achieve this goal, the following tasks have been set:

- Determination of vegetation period, agrobiological characteristics, productivity, disease and pest resistance of 18 introduced peach varieties;
- Selection of varieties adapted to the soil and climate conditions of Guba-Khachmaz region based on the study of economic-biological characteristics and quality indicators of 18 introduced peach varieties;
- Preparation and application of planting material from selected varieties;
- Involvement of varieties selected for their productivity and high quality indicators in gene pool-collection gardens, expansion of planting area in farmers' (peasant) farms;
- Conducting economic evaluation of selected varieties for use in selection-oriented research.

Methods of research. The experiments were carried out by using performed methods of G.A.Lobanov, A.S.Morozova and others (1973), Y.N.Sedov and T.S.Ogoltsova (1999), G.E.Shults (1981), B.A.Dospexov (1985), G.K.Karpenchuk and G.K.Melnik (1987), B.G.Kaplan (1970) where taking into account their methodological guidelines available in this field.

The main provisions of the defense:

1. Comprehensive assessment of economic and biological characteristics of introduced varieties is the basis for their future use;
2. For a comprehensive assessment of the economic and biological characteristics of the introduced varieties, the study of the problems related to the morphometric and economic characteristics of the varieties is essential;
3. For the wide cultivation of promising varieties adapted to a

specific area, it is also essential to determine the biochemical composition of their fruits, productivity indicators, and the degree of infection with diseases and pests.

4. Complex (biological and commercial) assessment of introduced plants is a serious basis for the future use of their varieties with high economic and biological characteristics in modern selection programs and application in rural (farm) farms.

Scientific novelty of the research. For the first time, 18 peach varieties introduced from Spain were comprehensively evaluated in the soil and climate conditions of the Guba-Khachmaz economic region, and the phenogram of these varieties, characteristics of the relative dormancy and vegetation period, active development stages, morphometric measurements, leaf apparatus of the trees belonging to the varieties, development dynamics of the stems, total number of annual fruits, yield and quality indicators of fruits were studied and the varieties Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta were selected whiches adapted to local environmental conditions, productive, resistant to diseases and pests, export-oriented, with high quality indicators.

Theoretical and practical application of the research. As a result of the conducted research, a comprehensive evaluation of the farm biological characteristics, productivity, quality indicators, resistance to diseases and pests and economic efficiency of the introduced peach varieties was carried out and 6 varieties (Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta) were selected for their positive characteristics.And these were considered appropriate to use them as material for scientific researchers in the creation of new varieties in scientific-research works for selection, and as a variety that meets the requirements of the market economy, in the planting of new gardens in peasant (farmer) and other farms, as a result, the cultivation of this plant in large areas is food will lead to an increase in the share of fruit products in the diet.

Approbation and application of work. The results of the research work were presented at the scientific conference of young scientists on "Innovations in biology and agriculture for solving global problems" (Baku, 2018), "Intensive horticulture in Azerbaijan:

achievements, perspectives, problems and solutions" at the Republican scientific-practical conference (Ganja, 2020), "New directions of agricultural development and environmental protection" at the republican scientific conference (Baku, 2021), "Application of science-teaching-production trends in the development of priority production areas in horticulture: the path from theory to practice" at the republican scientific-practical conference (Ganja, 2022), X International scientific and practical conference held in Chicago, USA (Chicago, 2022), at the international conference on "Biodiversity, soil and water resources of Shusha and its surrounding areas: A vision for the future" (Baku-Shusha, 2022), as well asreported at the scientific seminar of the Agricultural Research Institute of the Ministry of Agriculture of AR (March 28, 2024). Based on the results of the research, 15 scientific works corresponding to the dissertation topic were published, 8 of them are scientific articles (4 in journals included in the international summarizing and indexing database), 6 are theses and conference materials (abroad - 1) and 1 is a booklet (recommendation). In order to reproduce the varieties selected according to the results of the research, 0.60 ha of Guayox 35 and Gardeta varieties at the Gabala Support Station of the Scientific Research Institute of Fruit and Tea Growing and gene pool collection gardens have been established in the area of 2.3 ha of Netix 25, Redix 25, Netix 30, Melox 31 and Gardeta varieties at the Scientific Experiment Base named after Zardabi. Among the selected varieties, Netix 25, Redix 25, Netix 30, Melox 31 and Guayox 35 varieties were planted in peach orchards for the purpose of application in farms on a total of 10 ha in the territory of Ashaghi Lagar village, Gusar region, and Garteda variety in 6 ha in the territory of Imamgulukend village, Gusar region. Taking into account the demand for Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta varieties selected for their farm biological characteristics, planting material was prepared to achieve regionalization of these varieties, and submitted to the Khachmaz State Variety Trialof the Agrarian Services Agency under the Ministry of Agriculture of the Republic of Azerbaijan.

The name of the institution where the dissertation work was performed. The dissertation work was carried out at the “Fruit

Plant Breeding" and "Plant Protection" departments, "Fruit Processing and Storage Technologies" laboratory, and Zardabi Scientific Experience Base of the Scientific Research Institute of Fruit and Tea Growing.

Structure and volume of dissertation. Dissertation work introduction (13553 marks), 4 chapters (Chapter I 51816 marks (1.1 – 26421; 1.2 – 25395); Chapter II 14164 marks; Chapter III 61826 marks (3311; 3.1 – 3772; 3.2 – 2411; 3.3 – 13680; 3.4 – 4905; 3.6– 20588; 3.7 – 9431); chapter IV 44886; 4.3 – 3997; 4.4 – 22110; 4.5 – 3397, conclusion (3930 marks), recommendations (657 marks), consists of a bibliography, appendices, 43 figures and 23 tables. The thesis consists of 183 pages, totaling 190832 characters (excluding figures, tables, appendices and the bibliography).

SUMMARY OF REFERENCES
CHAPTER I. IMPORTANCE, HISTORY, DISTRIBUTION, AREA, TOTAL PRODUCTION, BOTANICAL DESCRIPTION, BIOLOGICAL CHARACTERISTICS AND ECOLOGICAL ASPECTS OF THE PEACH PLANT

1.1. General and bioecological characteristics of the peach plant

In this chapter, the current situation of the studied issue is explained. The importance, history, distribution area, area, total production, botanical description, biological characteristics and ecological aspects of the peach plant are detailed. The results of the research conducted on the peach plant in different countries of the world were analyzed and a comparative analysis was carried out. Peach is native to China [8]. In nature, peach species are distributed in the mountainous regions of China at an altitude of 1200-7000 m above sea level.[1]

Peach varieties require an optimal temperature of +8.+ 12°C

[1] Опанасенко, Н.Е., Елманова, Т.С. О распространении и засухоустойчивости персика (*Persica vulgaris* Mill.) (обзорная статья) // Бюллетень Государственного Никитского ботанического сада, - Ялта: - 2017. № 123, - с. 65-71.

for flowering, and approximately +23°C for fruit ripening[2]. The critical and dry months for the peach plant are July-August, and this occurs when the air humidity is 82% or more, and the average temperature is above +25.0°C[3]. Since the peach plant is a light-emitting plant, well-lit areas should be selected in peach cultivation and pruning should be carried out to ensure good lighting of the inner part of the umbrella. The fruits on such plants have a beautiful color and high taste qualities [5, 16].

1.2. A brief description of the study of peach varieties in the world and in Azerbaijan

The peach plant is a very valuable fruit plant, and many selection works have been carried out in order to enrich the variety composition of this plant in the world. The United States is at the forefront of creating new varieties through selection, and successful results in this direction have been achieved by D.Hough, F.Anderson, F.Zaiger, R.Bernhard, S.A.Sokolova, A.C.Rajabli and other breeders, and those varieties are spread in many countries of the world.[4]

CHAPTER II. CONDITION, MATERIAL AND METHODOLOGY OF THE RESEARCH

This chapter describes the soil-climate conditions of the research area. Guba-Khachmaz economic region is located in the north-east of Azerbaijan and its area is 8% of the total area of the republic (696 thousand ha). It is surrounded by the Samur-Devachi plain and the Great Caucasus mountains. Tuphandag, Shahdag and Bazarduzu mountains are located in the territory of this region and are 4206, 4250 and 4485 m above sea level and are always covered

[2] Рындин, А.В., Драгавцева, И.А., Мохно, В.С. Соответствие требований культуры персика условиям среды Влажных Субтропиков России // Садоводство и виноградарство, - Москва: - 2013. № 1, - с.24-29.

[3] Абильфазова, Ю.С.Изменение количественного содержания сахара в плодах персика // Субтропическое и декоративное садоводство, - Сочи: - 2019. № 68, - с. 152-156.

[4] Еремин, В.Г. Результаты клоновой селекции в обновлении сортимента персика // -Краснодар: Научный журнал Куб ГАУ, - 2010. №63 (09), -s. 281-290.

with snow. The Guba-Khachmaz economic region is bordered by the Russian Federation from the north, Shamakhi region from the south, and the shores of the Caspian Sea from the east. Haladar Pass located in this area is the lowest point in the watershed (1700 m).[5]

Methods of research. Research materials are Melox 26, Melox 31, Melox 37, Netix 25, Netix 28, Netix 30, Netix 34, Redix 25, Redix 27, Redix 30, Redix 2-110, Malix 25, Malix 36, Malix 145, Guayox 30, Guayox 35, Gartairo, Gardeta peaches and their nectarine group varieties, and these varieties were compared with the zoned selection Fadai variety.

Regular phenological observations were made on the varieties, the opening of flower and leaf buds, flowering (beginning - 5%, mass - 70%, end - 95%), the beginning and end of the development of the 1st and 2nd necks in the pods, and the ripening of fruits, the phenological phases such as leaf fall (beginning - 5%, end - 95%) were recorded, the total vegetation period, infection with powdery mildew, leaf curl, hole spot, moniliosis diseases, green peach moth, red fruit mite and oriental fruit borer degrees (5-point scale: 0-no infection; 1-very little infection; 2-low infection: up to 10% infection; 3-moderate infection: up to 25% infection; 4-strong infection: up to 50% up to infection; 5-very strong infection: more than 50% infection is observed), taste value, juiciness, etcwas determined. taking into account the existing methodical instructions in this field, by G.A. Lobanov, A.S.Morozov and others. (1973)[6], Y.N.Sedov və T.P.Oqoltsovanın (1999)[7] və Q.E.Şultsun (1981)[8], economic efficiency and processing of statistical digital material by B.A.Dospexov (1985)[9], G.K.Karpenchuk and G.K.Melnik (1987),

[5] Bəyəhmədov, İ. Şaquli zonallıq üzrə alma bitkisinin aqrobioloji xüsusiyyətləri / İ.Bəyəhmədov. -Bakı: [Müəllim], -2020. -248 s.

[6] Лобанов, Г.А., Морозова, Т.В. и др. Программа и методика сортоизучения плодовых, ягодных и орехоплодных культур / Орел: Труд. -1973. -с.491.

[7] Седов, Е.Н., Огольцова Т.П. Программа и методика сортоизучения плодовых, ягодных и орехоплодных культур / Под общей редакцией Е.Н.Седова, Т.П.Огольцова // Орел: Изд-во Всероссийского научно-исследовательского института селекции плодовых культур. -1999. -с.608.

[8] Щульц, Г.Э. Общая фенология / -Л.: Наука. -1981. -с.16-20.

[9] Доспехов, Б.А. Методика полевого опыта / -М.: Колос. -1968. -с.332.

and express-calculation methodologies by B.G.Kaplan (1970)[10], and the quality of fruits was carried out according to the "European Economic Commission standard FFV-26 of the United Nations regarding control of the marketing and commercial quality of peaches and nectarines".

Leaf surface area was determined using a planimeter, and mass was determined using a Precisa BJ 6100 D electronic scale. From the morphometric indicators of the varieties, the height of the tree, the cross-section of the stem, the diameter of the canopy, the height of the trunk, the projection area and the volume of the canopy were determined on the basis of generally accepted methods in horticulture. Thus, the volume of the umbrella (CH) V= hxS/3, and the projection area of the umbrella (CPS) was calculated based on the formulas $S=\pi r2$.

Soluble dry matter (in %) (S.D.M.) method of measuring the juice obtained from the pulp of the fruit in a refractometer brand RL3, moisture content – 100-1050C drying of the material in a J.P.Selecta thermostat until constant weight; sugar percentage – Bertrand method; vitamin C - Tilmans method; acidity - determined by titration in 0.1 n (NaOH) alkaline solution in the presence of an indicator.

EXPERIMENTAL PART
CHAPTER III. DEVELOPMENT BIOLOGY AND FARM INDICATORS OF NEWLY INTRODUCED PEACH VARIETIES

In this chapter, the development biology and economic indicators of newly introduced peach cultivars, the characteristics of the relative dormancy period, the characteristics of the vegetation period, the developmental stages, morphometric measurements, the surface area of the leaf blade, the degree of disease and pest infestation, the development dynamics of the buds and the total number of annual buds are presented.

[10] Каплан, Б.Г. Экспресс-расчет основных математико-статистических показателей // -Баку: Маариф. -1970. 446 с.

3.1. Characterization of the relative dormancy period of newly introduced peach cultivars

As a result of the study, the phase of relative dormancy for varieties lasted 112-142 days, on average 123-135 days. This period is the same (129 days) in Netix 28, Netix 34, Redix 2-110 varieties as compared to the control variety (Fadai), and it was long (123-128 days) Melox 26, Netix 25, Redix 25, Malix 25, Redix 27 and Gartairo varieties (130-135 days), while in other varieties it lasted relatively short. The duration of the relative rest period was the least in Malix 145 (123 days) and the longest in Netix 25 (135 days) compared to the control (Fadai) and other research varieties.

3.2. Characterization of the vegetation period of newly introduced peach cultivars

The vegetation period of fruit plants includes the following stages of development: bud opening, flowering, fruit ripening, leaf opening and shedding. The development of fruit plants in spring begins with the swelling of shoots and continues against the background of a gradual increase in temperature. Plant development is closely related to temperature changes. One of the most important periods in the development of a peach plant is the period of bud swelling and bud opening characterized by the appearance of calyx, calyx leaves, and later petals. At this stage, plants require high temperatures (+5ºC above). This phenophase varies significantly over time, depending on the year, and is an important biological characteristic characteristic of a certain variety. It is possible due to the fact that the rate of flowering in shoots is weak, the varieties are more resistant to frost and spring frosts.[11]

3.3. Active (phenology) developmental stages of peach varieties

The agrobiological characteristics of the introduced peach varieties were studied, the opening of flower buds was the earliest on March 12, 2020, in the Gardeta variety, when the average daily temperature was +9.4ºC, the maximum temperature was +18.7ºC, and

[11] Елманова, Т.С. Содержание регуляторов роста в генеративных почках персика // - Ялта: Труды Никитского ботанического сада, - 2005. Том 125, - s. 47-56.

the humidity was 73.3%. On April 4, 2019, the average daily air temperature was +12.5ºC, the maximum temperature was +23.5ºC, and the humidity was 68.9% in Melox 37 variety.

There was a difference of 8 days in the stage of bud opening (initiation of vegetation) between cultivars by year. The beginning of the flowering phase for varieties is from 01.IV-10.IV in 2018 when the average daily air temperature is +13.4ºC, in 2019 it is from 03.IV-18.IV when it is +15.4ºC and in 2020 +11 , when it was 9ºC, it covered the dates of 20.III-05.IV months.

Flowering begins in some years when the average daily air temperature is between +9.2...+14.7ºC Netix 25 (02.IV-12.IV), when between +8.5...+14.7ºC Netix 30 (01.IV-12.IV), between +8.5...+12.8ºC Redix 30 (01.IV-10.IV), between +8.2...+14.7ºC Netix 34 (31 .III-12.IV) and between +7.8...+14.7ºC in Guayox 35 varieties (30.III-12.IV) compared to Fxdai (c) variety (31.III-13.IV) has been the same.

This indicator was observed relatively early in Redix 25 (28.III-08.IV), Malix 25 (01.IV-10.IV), Guayox 30 (29.III-08.IV), Gartairo (26.III-05.IV) and Gardeta (20.III-03.IV) varieties and relatively late in other varieties. The end of flowering covered 17.IV-26.IV in 2018, 17.IV-30.IV in 2019, 03.IV-21.IV in 2020.

The period of fruit harvesting maturity covered the dates in 2018 is 12.VII (+18.9ºC)-12.X (+12.6ºC), in 2019 it is 09.VII (+17.2ºC)-04.X (+10, 2ºC) and 13.VII (+20.1ºC)-02.X (+13.5ºC) in 2020.

Compared to (02.IIV-07.IIV) in Fadai (c) variety, the harvesting maturity period Melox 26 (23.VII-24.VII), Netix 25 (09.VII-12.VII), Redix 25 (09.VII- 13.VII) and Malix 25 (16.VII-20.VII) varieties were observed relatively early, and in other varieties relatively late.

Compared to the Fadai (c) variety and the research varieties in the research years, Netix 25 (09.VII-12.VII) and Redix 25 (09.VII-13.VII) varieties are faster, Melox 37 (02.X-12.X) variety was recorded as the latest ripening variety.

Depending on the economic-biological characteristics of the varieties and the soil-climatic conditions of the area, the vegetation period lasted 229-235 days, covering the period from the opening of

shoots to the end of leaf shedding [1, 2, 3, 12, 14].

3.4. Morphometric measurements of peach cultivars

A comparative analysis of the morphometric measurements of peach varieties (tree height, stem cross-section, canopy diameter, stem height, canopy projection area and volume, leaf lobe surface area, leaf lobe surface area per tree) shows that introduced peach varieties, Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta varieties have high indicators compared to other varieties in terms of all their parameters among the compared to Fadai (c) variety [4, 7].

Melox 26 (2.37 m^2) compared to Fadai (c) variety, has the lowest indicator on the projection area of the conopy and the highest indicator is Netix 25 (3.39 m^2), Redix 25 (3.46 m^2), Melox 31 (3.33 m^2), Guayox 35 (3.39 m^2), Netix 30 and Gardeta (3.52 m^2) was recorded.

Conopy volume was less in Melox 26 (1.63 m^3), Malix 25, Redix 27 and Netix 34 (2.03 m^3), Netix 28 (2.04 m^3), Guayox 30 (1.97 m^3), Redix 30 and Redix 2- 110 (2.08 m^3), Malix 145 (1.78 m^3), Melox 37 (2.18 m^3), Malix 36 (1.89 m^3) and Gartairo (2.14 m^3) varieties compared to the variety Fadai (c) variety (2 ,22 m^3), and was more in Netix 25 and Melox 31 (2.73 m^3), Redix 25 (2.86 m^3), Netix 30 (2.95 m^3), Guayox 35 (2.78 m^3) and Gardeta (2,91 m^3) varieties (Figure 1).

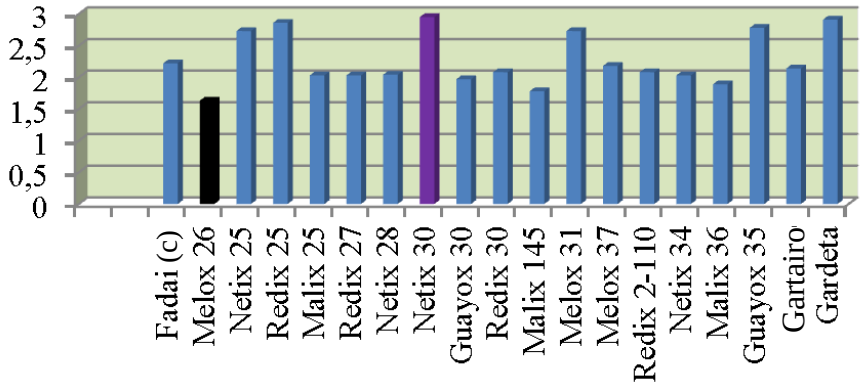

Figure 1. Conopy volume, m^3

3.5. Leaf blade surface area in introduced peach cultivars

According to the surface area of one leaf blade, compared to Fadai (c) variety, the lowest indicator is Melox 26 (25.5 cm^2), Redix 27 (26.5 cm^2), and the highest indicator is Netix 25 and Melox 31 (35.5 cm^2), Redix 25 (36.5 cm^2), Netix 30 (32.5 cm^2), Guayox 35 (33.3 cm^2) and Gardeta (34.0 cm^2) were recorded. Compared to Fadai (c) varieties, Malix 36, Melox 26, Guayox 30 (13.7-13.9 m^2) have a very low indicator of the surface area of the leaf blade per tree, while the highest indicators recorded in Netix 25 (16.7 m^2), Redix 25 (20.1 m^2), Netix 30 (17.9 m^2), Melox 31 (17.5 m^2), Guayox 35 (16.8 m^2) and Gardeta (17.8 m^2) varieties (Figure 2).

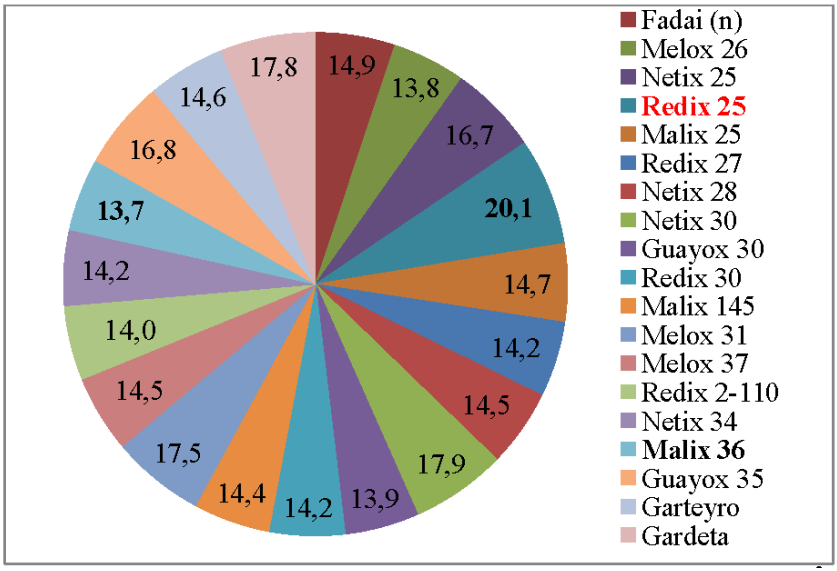

Figure 2. The surface area of the leaf blade in peach varieties, m^2

3.6. Disease and pest infestation rates of newly introduced peach cultivars

During the research years, under the conditions of the Guba-Khachmaz economic region, the average indicator of the infection rate of the introduced varieties of the peach plant with moniliosis, powdery mildew, leaf curl, clusterosporios ois diseases varied between 0.3-2.3 points for the varieties (Figure 3).

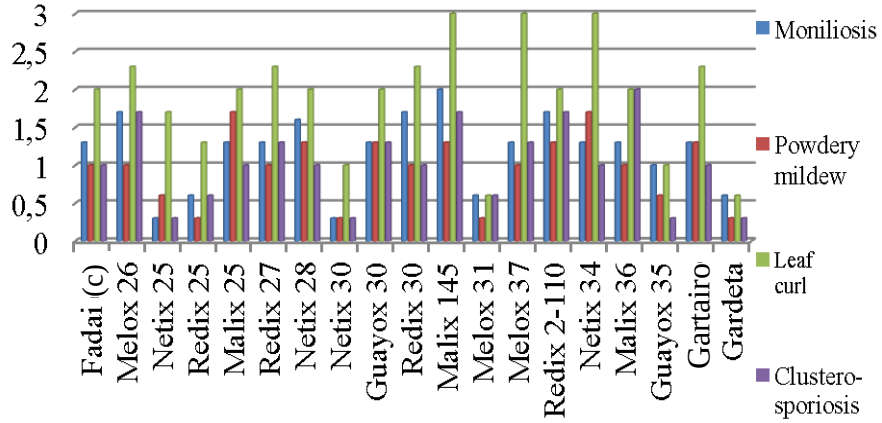

Figure 3. Disease infection rate of peach varieties (points)

The average indicator of the infection rate of the studied cultivars with green peach moth, red fruit mite and eastern fruit-eating pests varied between 0.3-2.6 points (Figure 4).

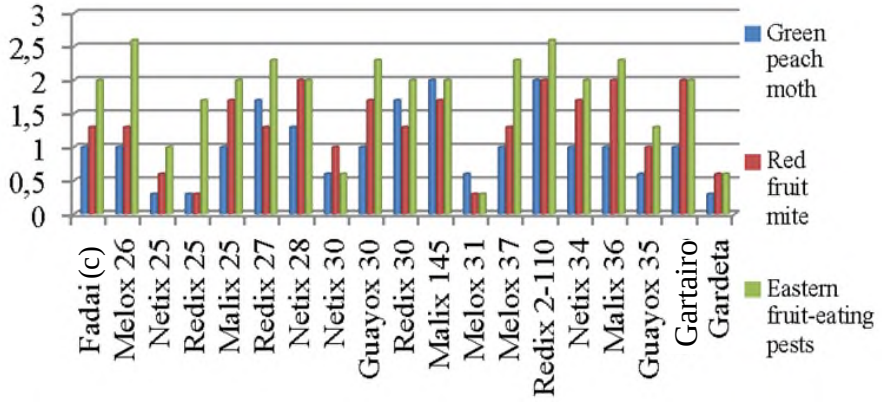

Figure 4. Pest infection rate of peach cultivars (points)

Introduced peach cultivars Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta was selected as a resistant variety to moniliosis, powdery mildew, leaf curl, clusterosporiosis, green peach moth, red fruit mite and eastern fruit borer pests with the least infection compared to Fadai (c) variety [6].

3.7. Growth dynamics of shoots and total number of annual shoots

As a result of the research work, it was determined that the formation of buds in introduced peach varieties was recorded on April 20-25 in early-flowering varieties, and on April 26-30 in late-flowering varieties. In the studied varieties, the first stage of the development of one-year corns (I stage) was completed on July 23-26, and the second stage (II stage) was completed on September 4-6.

The average length of one-year-old cows (averaged over 3 years) varied between 48.6-66.1 cm. As can be seen from the diagram, the longest stem was recorded in Netix 30 (66.11 cm), Guayox 35 (65.8 cm) and Netix 25 (64.8 cm), and the shortest stem was Malix 145 (48.6 cm), (Figure 5) [11].

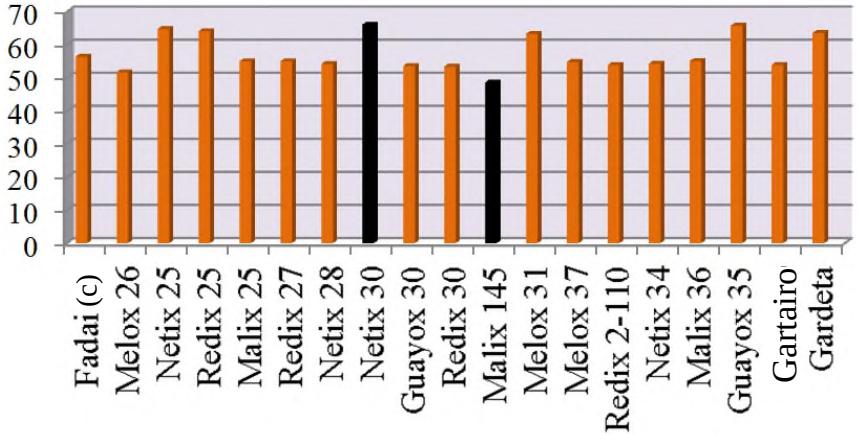

Figure 5. Comparison of pith development of introduced peach cultivars

Netix 25 (3304.8 cm), Redix 25 (3205 cm), Netix 30 (3238.9 cm), Melox 31 (2975.1 cm), Guayox 35 (3224.2 cm), Gardeta (3116.4 cm) cultivars had a high total of the length measurements of annual stems, and this indicators are 17.2-13.7-14.9-5.5-14.3 and 10.5% more compared to the Fadai (c) cultivar according to varieties.

CHAPTER IV. EFFICIENCY OF VARIETIES

In this chapter, the productivity of peach varieties, yield of commercial varieties, quality indicators of their fruits, caliber measurements, chemical composition, economic efficiency and profitability of varieties were investigated and economic evaluation was carried out.

4.1. Productivity of peach varieties

According to the results of the research conducted in 2018-2020, yield indicators per 1 tree were 2.1-1.8 1.5-2.8-1.4 and 1.9 kg/tree more than Netix 25 (14.2 kg/tree), Redix 25 (13.9 kg/tree), Netix 30 (13.6 kg/tree), Melox 31 (14.9 kg/tree), Guayox 35 (13.5 kg/tree) and Gardeta (14.0 kg/tree) varieties of the introduced peach plant compared to the control variety (Fadai) by, and the average yield indicators per area unit are 13.76 cent/ha, 11.77 cent/ha, 9.77 cents/ha, respectively, 19.09 cent/ha, 9.33 cent/ha, 12.43 cent/ha were more (Table 1) [9].

Table 1

Productivity indicators of introduced peach cultivars

Varieties	Average yield in years of study, kg/tree	Productivity per hectare, cent			Medium product, cent
		2018	2019	2020	
1	2	3	4	5	6
Fadai (c)	12,1	57,27	82,58	101,89	80,58
Melox 26	10,3	46,62	71,92	86,58	68,37
Netix 25	14,2	66,60	98,56	117,88	94,34
Redix 25	13,9	64,60	96,57	115,88	92,35
Malix 25	11,4	56,61	79,92	90,57	75,7
Redix 27	11,5	55,27	86,58	87,91	76,58
Netix 28	11,6	53,94	81,25	96,57	77,25
Netix 30	13,6	63,27	93,24	114,55	90,35
Guayox 30	11,0	49,95	73,26	97,23	73,48
Redix 30	10,4	46,62	68,59	92,57	69,26
Malix 145	11,2	53,28	73,26	96,57	74,37
Melox 31	14,9	73,26	103,89	121,87	99,67
Melox 37	11,6	54,61	82,58	95,23	77,47
Redix 2-110	10,9	53,28	77,92	87,91	73,03

Continuation of Table 1

1	2	3	4	5	6
Netix 34	10,7	46,62	69,93	98,56	71,70
Malix 36	11,0	53,28	75,92	91,24	73,48
Guayox 35	13,5	66,60	89,91	113,22	89,91
Gartairo	10,6	46,62	71,26	93,90	70,59
Gardeta	14,0	65,26	95,23	118,54	93,01

4.2. Quality indicators of fruits

In the introduced peach varieties, according to the average weight of 1 piece of fruit, compared to the Fadai (c) variety, the highest indicator recorded in Redix 25 (142.73 gr), Netix 25 (141.7 gr), Netix 30 (143.6 gr), Guayox 30 (133.56 gr), Melox 31 (144.73 gr), Guayox 35 (139.06 gr) and Gardeta (141.46 gr), the highest indicator according to the average volume of 1 fruit recorded in Netix 25 (144.03 ml), Redix 25 (155.36 ml), Netix 30 (150.5 ml), Melox 31 (149.76 ml), Netix 34 (147.53 ml) and Gardeta (145.03 ml) and the highest density according to the density of one fruit were recorded in Netix 25 (4.63 kg/cm^2), Redix 25 (5.63 kg/cm^2), Netix 30 (5.0 kg/cm^2), Melox 31 (4.53 kg/cm^2), Guayox 35 (4 .46 kg/cm^2) and Gardeta (5.46 kg/cm^2) varieties [10].

Except for Melox 37 (69.33) variety, the fruit yield of all varieties in group I was higher than that of Fadai (c) (70%) variety. In the fruits of peach varieties, yield of the second group varied between 9.18...19.5% according to the varieties. The highest yield of this group was recorded in Fadai (c) and Redix 30 varieties with 18.38-19.5%. Netix 25 (9.54%), Redix 25 (10.7%), Netix 30 (10.0%), Melox 31 (9.18%), Guayox 35 (9.6%) and Gardeta (9.35 %) cultivars yield of group II was 9.2-8.38% less compared to the control (Fadai) cultivar. The indicator for non-standard variety yield (III group) varied between 6.0-15.17%. Non-standard variety yield was recorded mostly in Melox 37 (15.17%), Melox 26 and Malix 36 varieties (12%), which compared to Fadai (c) (11.62%) variety and this is 3.55-3.17 % more. In other varieties, this indicator varies between 6-11.3%, and the least non-standard yield were observed in fruits of Netix 30 (6%), Redix 25 (7%), Netix 25 (7%), Melox 31 (7%), Guayox 35 (6 ,2%) and Gardeta

(7%) varieties (Table 2).

In the general evaluation, the quality indicators of the fruits were determined between 3.8-4.9 points for the varieties. Melox 26, Redix 27, Redix 2-110 varieties are 3.8-3.9 points lower than Fadai (c) variety, Malix 25 (4.2 points), Netix 28 (4.3 points), Redix 30 (4,3 points), Malix 36 (4.3 points), Malix 145 (4.1 points), Melox 37 (4.0 points), Netix 34 (4.2 points) and Gartairo (4.1 points), Guayox 30 (4.4 points) varieties had a relatively low index. Among the varieties, the highest quality indicator is Netix 25 (4.8 points), Redix 25 (4.6 points), Netix 30 (4.9 points), Melox 31 (4.7 points), Guayox 35 (4.5 points) and Gardeta (4.5 points) varieties [10].

Table 2

Quality of introduced peach fruits indicators (average for 2018-2020)

Varieties	Fruit mass, gr medium	Commodity variety output,%-with			Transportability
		I qrup	II qrup	q/s	
Fadai (c)	131,73	70,0	18,38	11,62	medium
Melox 26	109,6	72,33	15,67	12,0	medium
Netix 25	142,73	82,0	9,54	8,46	good
Redix 25	141,7	82,3	10,7	7,0	good
Malix 25	130,63	79,35	13,65	7,0	medium
Redix 27	121,6	75,8	15,2	9,0	medium
Netix 28	113,66	74,5	14,2	11,3	medium
Netix 30	143,6	84,0	10,0	6,0	good
Guayox 30	133,56	72,36	17,0	10,64	medium
Redix30	123,0	71,0	19,5	9,5	medium
Malix 145	114,76	72,3	16,7	11,0	medium
Melox 31	144,73	83,82	9,18	7,0	good
Melox37	103,13	69,33	15,5	15,17	medium
Redix 2-110	125,4	78,0	13,45	8,55	medium
Netix 34	130,6	75,34	14,36	10,30	medium
Malix 36	111,53	73,4	14,6	12,0	medium
Guayox35	139,03	84,2	9,6	6,2	good good
Gartairo	114,3	77,34	15,33	7,33	medium
Gardeta	141,46	83,65	9,35	7,0	good

Compared to the Fadai (c) variety, among the varieties with round fruits according to the caliber size, the highest index is Netix 25 (74x73x71mm), Redix 25 (75x73x70 mm), Netix 30 (74x72x70 mm), Melox 31 (75x75x71mm) and Gardeta (73x71x68 mm). Among the varieties with flat fruits, it was observed in the Guayox 35 (44x79x78 mm) variety (Table 3).

Table 3

Caliber indicators of fruits of introduced peach varieties, in mm

Varieties	2018	2019	2020	The average indicator for the years of study, mm
Fadai (c)	71x70x69	70x68x66	72x71x69	71x69x68
Melox 26	61x60x59	60x58x57	62x61x60	61x59x58
Netix 25	73x71x70	75x73x71	75x75x73	74x73x71
Redix 25	75x73x70	75x72x68	75x74x72	75x73x70
Malix 25	67x64x65	68x67x67	69x66x68	68x65x66
Redix 27	62x61x60	62x60x59	63x62x58	62x61x59
Netix 28	63x62x65	64x62x67	65x61x69	64x61x67
Netix 30	75x73x72	74x74x70	73x70x69	74x72x70
Guayox30	38x70x68	36x67x66	43x77x80	39x71x71
Redix 30	66x65x63	65x66x62	67x67x64	66x66x63
Malix 145	67x65x62	68x63x62	64x63x62	66x63x62
Melox 31	76x75x71	75x75x72	76x75x70	75x75x71
Melox 37	58x65x60	57x65x61	56x68x62	57x66x61
Redix 2-110	69x70x68	68x70x67	70x70x69	69x70x68
Netix 34	64x65x69	64x64x69	64x68x65	64x65x67
Malix 36	62x63x63	70x68x67	69x68x65	67x66x65
Guayox 35	45x78x79	44x80x78	45x79x79	44x79x78
Gartairo	63x62x64	61x63x65	62x63x65	62x63x64
Gardeta	72x71x69	75x70x66	74x71x68	73x71x68

4.3. Chemical composition of fruits of peach varieties

The chemical composition of the peach varieties introduced in the research years compared to the Fadai (c) variety studied, the highest

indicator for the amount of soluble dry matter is Netix 25 (16.71%), Redix 25 (17.11%), Netix 30 (17.60%)), Melox 31 (16.90%), Guayox 35 (16.85%) and Gardeta (16.92%),with average sucrose content ranging from 2.51-8.97%, the highest in Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta (8.71-8.50-8.97-8.17-7.32-8.63%), compared to Fadai (c) cultivar (5.65%). The highest index for total sugar was Netix 25 (10.87%), Redix 25 (10.64%), Netix 30 (11.94%), Melox 31 (12.06%), Guayox 35 (10.28%) and Gardeta (11 ,08%) by being recorded in varieties, Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta varieties differed the most according to the amount of vitamin "C" (5,58-6,98-6,58-5,97-5,94-8,36 mg/100g) (Table 4).

Table 4

Chemical analysis indicators of fruits of introduced peach varieties (in % by wet weight) 2018-2020 average

Varieties	Sugar, %			Acidity	Vitamin "C", mg/100gr
	Monosac-charide	Sucrose	Total		
Fadai (c)	2,59	5,65	8,24	0,89	3,87
Melox 26	2,16	3,34	5,50	0,69	2,30
Netix 25	2,16	8,71	10,87	0,72	5,58
Redix 25	2,14	8,50	10,64	0,87	6,98
Malix 25	2,19	6,57	8,76	1,56	4,41
Redix 27	2,16	6,15	8,31	0,86	3,54
Netix 28	1,11	6,96	8,07	0,79	4,69
Netix 30	2,97	8,97	11,94	0,70	6,58
Guayox 30	1,43	6,15	7,58	0,67	4,93
Redix 30	1,33	7,18	8,51	0,68	3,27
Malix 145	1,39	2,51	3,90	0,49	3,89
Melox 31	3,89	8,17	12,06	0,61	5,97
Melox 37	1,21	8,26	9,47	0,68	4,86
Redix 2-110	1,68	6,97	8,65	0,84	2,43
Netix 34	1,67	7,06	8,73	0,54	4,77
Malix 36	1,82	7,16	8,98	0,97	2,99
Guayox 35	2,96	7,32	10,28	0,83	5,94
Gartairo	2,16	5,21	7,37	1,16	5,0
Gardeta	2,45	8,63	11,08	0,98	8,36

4.4. Agrobiological characteristics of newly introduced peach cultivars

This section provides information on the agrobiological characteristics of the introduced peach varieties, including the control variety Fadai variety (the origin of the variety, the shape of the tree, umbrella, leaves, flowers and fruits, the biochemical composition of the varieties, productivity, resistance to diseases and pests and transportation).

4.5. The economic efficiency of the varieties

In the research years of 2018-2020, the cost of cultivating 1 ha of orchards planted with introduced peach varieties was 2568-2600 manats, the cost of one centner of the product varies between 26.1-37.6 manats, the average selling price of 1 kg of fruit was 0.90 manat.

Netix 25 (27.5 man), Redix 25 (28.1 man), Netix 30 (28.7 man), Melox 31 (26.1 man), Guayox 35 (28.8 man), which differ from other varieties in their high productivity and Gardeta varieties (27.9 mans) compared to the control variety (Fadai) (32.0 man), the cost of the product was 3.2...5.9 manat less, and the profit and net income from product sales was more.

The profit (monetary income) obtained from the sale of peach varieties Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta, which differ according to their agro-biological characteristics and productivity, is 8490-8311-8131-8970-8091-8370 according to the varieties and it was 1238-1059-879-1718-839-1118 manats (1 ha) more than the control variety (Fadai) (7252 manats). The profit obtained from other varieties varied between 6153...6972 manats, which is 1099...280 manats less than the control variety (Fadai).

According to the net income obtained after deducting the cost incurred per area unit from the profit Netix 25 (5896 manat), Redix 25 (5719 manat), Netix 30 (5541 manat), Melox 31 (6370 manat), Guayox 35 (5501 manat) and Gardeta (5777 manat) varieties had superior indicators, which are 1225-1048-870-1699-830-1106 manats higher than the control variety (Fadai) (4671 manat), respectively. According to the obtained net income, the lowest

indicator with 3585-3664 manats was recorded in Melox 26 and Redix 30 varieties.

The profitability of varieties varied between 139-245%. According to profitability, the lowest indicator is in Melox 26 and Redix 30 varieties with 139-142%, the highest indicators were recorded in Netix 25 (227%), Redix 25 (220%), Netix 30 (213%), Melox 31 (245%), Guayox 35 (212%) and Gardeta (222%) varieties that this indicator is 47-40-33-65-32-42% higher than the control variety (Fadai) (180%) according to the varieties (Table 5).

Table 5

Economic efficiency of introduced peach cultivars

Variety	Productivity, cen/ha	Cost per hectare, man	Profitability, %	Economic evaluation compared to varieties,%
Fadai (c)	80,58	2581	180	100
Melox 26	68,37	2568	139	77,2
Netix 25	94,34	2594	227	126,1
Redix 25	92,35	2592	220	122,2
Malix 25	75,70	2576	164	91,1
Redix 27	76,58	2577	167	92,7
Netix 28	77,25	2577	169	93,8
Netix 30	90,35	2590	213	118,3
Guayox 30	73,48	2573	157	87,2
Redix 30	69,26	2569	142	78,8
Malix 145	74,37	2574	160	88,8
Melox 31	99,67	2600	245	136,1
Melox 37	77,47	2578	170	94,4
Redix 2-110	73,03	2573	155	86,1
Netix34	71,70	2572	150	83,3
Malix 36	73,48	2574	156	86,6
Guayox 35	89,91	2590	212	117,7
Gartairo	70,59	2571	147	81,6
Gardeta	93,01	2593	222	123,3

An economic evaluation of 18 peach varieties introduced in the conditions of the Guba-Khachmaz economic district was carried out. The economic efficiency of the varieties Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta compared to the control variety (Fadai) (100%) was 126.1-122.2-118.3-136.1-117.7-123.3% according to the varieties. was relatively high.

The lowest indicator on the economic evaluation was recorded in Melox 26, Guayox 30, Redix 30, Malix 145, Recorded in Redix 2-110, Netix 34, Malix 36, Gartairo varieties (77.2-87.2-78.8-88.8-86.1-83.3-86.6 and 81.6%) [13].

During 2018-2020, we studied the economic and biological characteristics of 18 introduced peach varieties and selected 6 varieties with high quality indicators and economic and biological characteristics. It was determined that Melox 31, Redix 25, Netix 25, Netix 30, Guayox 35 and Gardeta varieties have higher efficiency compared to Fadai (c) and other varieties [15].

CONCLUSION

1. In the 2018-2020 research years, the flowering phase lasted 12-16 days for the varieties, the earliest flowering was recorded on 20.03.2020 in the Gardeta variety and the latest flowering was recorded on 18.04.2019 in the Melox 37 variety. According to the time of fruit ripening, the varieties are early ripening (Netix 25, Redix 25, Malix 25), medium ripening (Melox 26, Redix 27, Gartairo and Gardeta), very late ripening (Malix 145, Melox 37 and Malix 36) and other varieties are medium, it is divided into 4 groups, including late ripening.
2. The morphometric measurements of the cultivars, including tree height of 2.06-2.52 m, canopy projection area size of 2.37-3.52 m^2, canopy volume of 1.63-2.95 m^3 and leaf area per tree compared to the Fadai (c) variety, the highest indicator was observed in Redix 25 (20.1 m^2) and the lowest indicator was observed in Malix 36 (13.7 m^2).
3. Compared to the control variety (Fadai), Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta varieties are more resistant to moniliosis, powdery mildew, leaf curl,

clusterosporiosis (hole spotting), green peach blight, red was evaluated as a resistant variety against fruit mite and eastern fruit borer pests.

4. Average productivity indicators of Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta varieties (94.34-92.35-90.35-99.67-89.91-93.01 cents/ha) Fadai (80.58 cents/ha) according to the average weight of one fruit, being 13.76-11.77-9.77-19.09-9.33-12.43 cents/ha more than Redix 25 (142.73 gr), Netix 25 (141.7 gr), Netix 30 (143.6 gr), Guayox 30 (133.56 gr), Melox 31 (144, 73 gr), Guayox 35 (139.06 g) and Gardeta (141.46 gr), Netix 25 (4.63 kg/cm^2), Redix 25 (5.63 kg/cm^2), Netix 30 (5,0 kg/cm^2), recorded in Melox 31 (4.53 kg/cm^2), Guayox 35 (4.46 kg/cm^2) and Gardeta (5.46 kg/cm^2) cultivars, in these cultivars the yield of the I group commercial cultivar (more than 80%) and due to its high resistance to transport, it was rated as the best agriculturally important variety.
5. Relatively high indicators compared to Fadai (c) and other research varieties in terms of caliber are Netix 25 (74x73x71mm), Redix 25 (75x73x70 mm), Netix 30 (74x72x70 mm), Melox 31 (75x75x71mm), Gardeta (73x71x68 mm) and Guayox 35. (44x79x78 mm) variety, correspondingly soluble dry matter for those varieties is 16.71-17.11-17.60-16.90-16.85-16.92%; vitamin "C" 5,58-6,98-6,58-5,97-5,94-8,36 mg/100g; total sugar was determined to be 10.87-10.64-11.94-12.06-10.28-11.08 %.
6. The cost of cultivating in one hektar of orchards planted with introduced peach varieties is 2568-2600 manat, the cost of one centner of product varies between 26.1-37.6 manat, Netix 25 (27.5 manat), Redix 25 (28,1 manat), Netix 30 (28.7 manat), Melox 31 (26.1 manat), Guayox 35 (28.8 manat) and Gardeta (27.9 manat) cultivars cost control variety (Fadai) compared to (32.0 manat) 3.2...5.9 manat less, the profit obtained from the sale of products was 8490-8311-8131-8970-8091-8370 manat according to varieties, and the profit control variety (Fadai) (7252 manat) was 1238-1059-879-1718-839-1118 manat and the net income was 1225-1048-870-1699-830-1106 more manat.

7. Based on the results of the research conducted in 2018-2020, an economic evaluation of 18 peach varieties introduced in the conditions of the Guba-Khachmaz economic district was carried out, the highest profitability indicators are more control variety (Fadai) (100%) Netix 25 (227%), Redix 25 (220%), Netix 30 (213%), Melox 31 (245%), Guayox 35 (212%) və Gardeta (222%) 26,1-22,2-18,3-36,1-17,7-23,3%.

RECOMMENDATIONS

1. Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta varieties selected from 18 peach varieties introduced in the Guba-Khachmaz economic region, taking into account the adaptation to the climatic conditions of the geographical area, valuable economic and biological characteristics, high quality indicators, efficiency and profitability it is reasonable to use these varieties in selection-oriented research works for the creation of new high-yielding varieties;
2. It was recommended to plant the peach varieties Netix 25, Redix 25, Netix 30, Melox 31, Guayox 35 and Gardeta selected for their high efficiency, productivity and quality indicators in farms and to expand seedling production.

The list of published works on the topic of the dissertation

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3. Sərhədova, Z.F., Sadıqov Ə.N. İntroduksiya olunmuş şaftalı sortlarının aktiv inkişaf fazaları // - Gəncə: Xəbərlər məcmuəsi, - 2019. № 2 (76), - s. 21-25.
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16. Qaraqurbanlı İ.S., Əliyev Ə.M., Osmanov D.E., Sərhədova Z.F. Şaftalı ağaclarının formalaşdırılması və budanmasına dair tövsiyələr / Müəllim nəşriyyatı, Bakı: -2022, 14 s.

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