ABSTRACT

of the dissertation work by Azhitayeva Laura on the topic «Economic and biological justification and assessment of cultivation of new varieties and hybrid forms of grapes in the conditions of the south of Kazakhstan», submitted for the degree of Doctor of Philosophy (PhD) in the educational program 8D08103 – «Horticulture»

Relevance of the research topic. In accordance with the requirements of intensification, the issue of developing domestic varieties of fruit, berry crops, and grapes aligns with the socio-economic goals outlined in the strategic development plans of the Republic of Kazakhstan. Varietal and breeding-genetic improvement contributes to increasing the profitability of fruit growing and viticulture. The planting of seedlings of new domestic and adapted foreign varieties helps provide the population with high-quality new products and raw materials for the food industry.

Currently, the development and implementation of domestic grape varieties into production and obtaining high-quality products that are competitive with foreign varieties is a relevant issue. Work in this direction is important in terms of increasing the efficiency of the country's agriculture, strengthening export potential, and meeting consumer demand in the domestic market.

The climatic conditions and soil characteristics of Kazakhstan are favorable for cultivating domestic grape varieties. However, to ensure competitiveness in the global market, it is necessary to grow high-quality and high-yielding varieties. Foreign varieties, especially those imported from southern regions, are in high demand, but they do not always fully adapt to local climate conditions. Therefore, there is a need for the widespread implementation of domestic varieties and the improvement of their quality characteristics.

New varieties and hybrid forms of grapes from domestic breeding programs, due to a combination of economically valuable traits, cluster size, and overall refinement, surpass many zoned varieties and may be of interest to both large and small businesses.

Objective of the dissertation research:

To identify promising grape varieties and hybrid forms based on a set of economically valuable traits and to improve cultivation technologies under the conditions of southern Kazakhstan.

Research tasks:

- to study the biological characteristics of overwintering of grape varietal samples and shoots;
- to determine the productivity of shoots in the studied varietal samples;
- to select grape varieties based on economically valuable traits;
- to assess the resistance of grape varieties to diseases (mildew *(Plasmopara viticola),* oidium *(Uncinula necator)*);
- to demonstrate the effectiveness of the studied elements of grape cultivation technology in southern Kazakhstan;
- to evaluate the economic efficiency of grape cultivation in the southern regions of Kazakhstan.

Research Methods.

In conducting scientific research, widely accepted methodologies, validated by long-standing practice, were used. The study of the hybrid pool was carried out in accordance with the following methodological recommendations:

«Methodical Guidelines for Grape Variety Selection» by E.A. Egorova.

This contains scientific and practical recommendations applied in grape variety selection, the breeding of new varieties, and improving their quality characteristics.

«Adaptation Potential of Grapes During the Winter Period Under Stressful Temperatures» by G.S. Morozova.

This examines the ability of grapes to adapt during the winter period, particularly under the influence of low temperatures and frosts. It provides important information on methods and approaches used to increase the frost resistance and survival of grapes under stressful conditions.

Methodologies «Viticulture and Fundamentals of Ampelography»

Viticulture is the process of growing grapes, caring for them, harvesting, and processing. Research was conducted according to the methodological guidelines on grape selection and variety study by M.A. Lazarevsky and B.A. Dospikhov.

Main points to be defended:

The study justifies the economically valuable traits for growing new varieties and hybrid forms of grapes, confirming their suitability for cultivation in southern regions.

An assessment of the effective organization of viticulture and the resistance of new varieties to diseases was conducted.

It is shown that new varieties possess high quality and yield, allowing them to successfully compete in the market of Southern Kazakhstan.

Based on the research results, it has been established that the cultivation of new grape varieties is financially efficient for farming operations.

Description of the main research results.

The degree of winter survival of grapes was calculated. Resistance to harsh winter conditions varied depending on the variety and hybrid form, ranging from 50.47% (hybrid DX-17/90) to 83.77% (variety Mereytoy-50). Several varieties and hybrids with survival rates above 70% were identified: Mereytoy-50 — 83.77%, Azim — 75.17%, DV-10/11 — 74.37%, and Aisulu — 72.67%. The control variety Muskat vengerskiy (c) showed 58.8%, while the lowest values were recorded for KII-1/29 — 51.83% and DX-17/90 — 50.47%.

In terms of yield (c/ha), the best results were shown by the varieties and hybrid forms: KV-2/9 — 191.87 c/ha, DV-10/11 — 174.03 c/ha, DV-7/17 — 173.33 c/ha, Azim — 174.1 c/ha, Aisulu — 170.3 c/ha, and Mereytoy-50 — 162.2 c/ha. The lowest yields were recorded for Muskat vengerskiy (c) — 102.23 c/ha, Kara Koz — 98.53 c/ha, and DX-17/90 — 96.3 c/ha. These results indicate the varying yield potential of the varieties.

Based on a set of economically valuable traits, the following grape varieties and hybrid forms were selected: Mereytoy-50, Aisulu, Azim, KV-2/9, DV-7/17, and DV-10/11.

When studying mildew *(Plasmopara viticola)* damage, the highest degree of leaf damage was observed in the following varieties and hybrid forms: Muskat vengerskiy

(c), Aisulu, DV-7/17, DX-17/90, and KII-1/29 — from 2.0 to 2.5 points. In terms of shoot damage: Muskat vengerskiy (c), KII-1/29, DV-7/17, and DX-17/90 — 2.0 to 2.6 points. For berry damage: Muskat vengerskiy (c), Aisulu, DV-7/17, and DX-17/90 — 2.2 to 2.5 points.

Regarding oidium *(Uncinula necator)* damage, the highest resistance was shown by the varieties Mereytoy-50, Kara Koz, Akmaral, Azim, as well as the hybrid forms DV-10/11 and KV-2/9. Leaf damage ranged from 0.9 to 1.3 points. Shoot damage for Mereytoy-50, Kara Koz, Kazakhstan-20, Akmaral, Azim, DV-10/11, and KV-2/9 was 1.0 to 1.3 points. Berry damage for Mereytoy-50, Kazakhstan-20, Azim, and DV-10/11 ranged from 0.43 to 1.1 points.

Using six molecular markers, carriers of resistance genes to oidium *(Uncinula necator)* were identified among the varieties and their hybrid forms of Kazakhstan breeding. Nine varieties with positive alleles were determined: Aisulu, Kara Koz, Zhemchug Saba, Taifi Rose, Mereytoy-50, Muskat vengerskiy (c), Akmaral, Azim, and Kazakhstan-20. Additionally, three hybrid forms showed good results: DV-10/11, KII-1/29, and KV-2/9.

Using five molecular markers, carriers of resistance genes to mildew *(Plasmopara viticola)* were identified among the varieties and hybrid forms of Kazakhstan breeding. Three varieties with positive alleles were identified: Zhemchug Saba, Taifi Rose, and Muskat vengerskiy (c), as well as three hybrid forms: DV-10/11, KII-1/29, and KV-2/9.

For the variety Mereytoy-50, the survival rate of buds, depending on the load, showed higher results compared to the control variety: at 80 buds — 84.03%, at 110 buds — 83.60%, at 130 buds — 84.33%. Thus, the variety Mereytoy-50 showed high bud survival at all loads, although there was a slight decrease at 110 buds. The hybrid form KV-2/9 also showed higher bud survival rates compared to the control variety: at 80 buds — 63.60%, at 110 buds — 63.43%, at 130 buds — 62.67%. The highest survival was observed at a load of 80–110 buds, while the rates decreased at 130 buds.

Yield elements also depended on the shoot length and varietal characteristics. Over three years, the highest winter survival was observed in the variety Mereytoy-50: at 4–8 buds — 84.87–86.23%, and at 12 buds — a decrease to 83.20%.

In terms of yield, the hybrid KV-2/9 demonstrated outstanding results. The average three-year yield ranged from 184.5 to 223.0 c/ha. The variety Mereytoy-50 also showed good results: with an increased load from 40 to 55 shoots, the yield increased significantly: Muskat vengerskiy (c) — 126.7 c/ha, Mereytoy-50 — 158.5 c/ha, KV-2/9 — 223.0 c/ha. Thus, the yield was 1.2–1.7 times higher compared to the control variety.

The best yield results were obtained with medium pruning length: Mereytoy-50 — 163.0 c/ha, KV-2/9 — 225.2 c/ha. Compared to Muskat vengerskiy (c), the yields were 1.3–1.8 times higher. With short and long pruning, yields were lower: for Mereytoy-50 — an average of 143.0–139.3 c/ha, for KV-2/9 — 192.6–211.1 c/ha. For the Hungarian Muscat variety, the yield with long pruning dropped to 94.1 c/ha.

The highest economic efficiency compared to the control variety was noted for the hybrid forms KV-2/9, DV-10/11, DV-7/17, and the varieties Azim and Mereytoy-50.

According to the research results, the best production indicators were achieved with medium (7005.3 thousand/ha) and long (6535.3 thousand/ha) pruning lengths. Options with 8–12 buds were found to be economically more efficient compared to 4-bud options: with 8 buds — an advantage of 1044.7 thousand/ha, with 12 buds — an advantage of 574.9 thousand/ha.

Justification of the novelty and importance of the obtained results.

Scientific novelty of the research.

For the first time, a comprehensive economic and biological characterization of 7 grape varieties and 5 hybrid forms of table grapes was provided under the conditions of southern Kazakhstan, focusing on their adaptability and productivity elements. The biological features of vineyard formation and the resistance of various grape varieties to diseases were determined, allowing for the consideration of regional agricultural technologies.

Practical significance of the research.

The studied grape varieties and hybrid forms have demonstrated high competitiveness under the climatic conditions of southeastern Kazakhstan.

As a result of summarizing their agrobiological characteristics, the following table grape varieties and hybrids of Kazakhstani selection were identified as promising: Mereytoy-50, Aisulu, Azim, KV-2/9, DV-7/17, and DV-10/11. These promising varieties and hybrids have been transferred for production trials to the following farms: LLP "AqNiet Agro Gardens", LLP "Saryagash Zher Syy" and LLP "Tenge".

With the aim of producing high-quality products, this work holds scientific and practical significance. The promising hybrid forms of grapes from Kazakhstani selection have undergone State varietal testing, and patents have been obtained for the varieties Bakbarys, Ayaulym, and Alua.

Compliance with the directions of scientific development or state programs.

This dissertation is also substantiated within the framework of the program-targeted funding project BR10765032 "Development of new varieties and hybrids of fruit, berry, nut-bearing crops, and grapes based on advances in biotechnology and IT technologies, along with the creation of cultivation technologies tailored to different regions of Kazakhstan" (State Registration No. 0121RK00793) carried out during the period 2021–2023.

Description of the doctoral candidate’s contribution to the preparation of each publication.

The author independently formulated the aim and objectives of the research, developed a methodology for studying the biological characteristics of growing grape varieties and hybrid forms under the conditions of Southern Kazakhstan, and determined their ecological and physiological characteristics. The author also conducted field research and laboratory analyses. The obtained data were processed and subjected to statistical analysis.

Publication of dissertation results.

The main results of the dissertation were published in 11 scientific articles, including: 1 article in a journal indexed in the Scopus database with a Q3 quartile index (31%), 3 articles in scientific journals recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Science and Higher

Education of the Republic of Kazakhstan, and 4 publications in the proceedings of international scientific conferences. Additionally, 3 patents for breeding achievements were obtained. The author's h-index is 1.

Volume and structure of the dissertation.

The total volume of the dissertation is 165 pages. The dissertation consists of an introduction, 5 sections, conclusions, and recommendations for production. The work includes 34 figures, 14 tables, and 10 appendices. The list of references contains 155 sources.