Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

CREATING HIGH-YIELD AND DISEASE-RESISTANT VARIETIES THROUGH CROSSING LOCAL AND FOREIGN GRAPE VARIETIES

Dadabaeva Ozodaxon Savriddin kizi
Researcher at the Institute of Microbiology of the Academy of Sciences

Abstract
This article discusses the issue of creating high-yielding, disease-resistant and marketable varieties that are relevant for Uzbek viticulture. Morphological, phenological, agrobiological and quality indicators of F1 hybrids obtained by crossing local and foreign parental varieties were analyzed. The results of the study showed that hybrid generations had a number of advantages over parental varieties: the level of resistance to oidium, mildew and gray rot increased by 40–50%; the yield was on average 20–25% higher than that of parental varieties; as a fruit, the sweetness and taste characteristics characteristic of local varieties were combined with the large-fruitedness, transport resistance and long-term storage capabilities characteristic of foreign varieties. The results of statistical analysis (ANOVA) confirmed the reliability of differences in yield. The results obtained are consistent with international selection experiments, and their adaptability to local agroclimatic conditions showed the promising nature of new varieties. The scientific and practical significance of the research is that the newly created hybrid varieties will ensure sustainable development in Uzbek viticulture, increase export potential, and produce environmentally friendly products.

Keywords: Viticulture, selection, crossbreeding, F1 hybrid, parental varieties, yield, disease resistance, fruit quality.

Introduction

Grapes (Vitis vinifera L.) have been cultivated by mankind since ancient times and are considered one of the oldest cultivated plants. Archaeological and historical sources indicate that the roots of viticulture date back to the Neolithic era. Today, as one of the most important branches of agriculture in the world, viticulture occupies a special place not only in the food supply and beverage industry, but also in export, international trade and economic stability. According to the International Organizations of Viticulture and Viticulture (OIV, FAO), the total area under grape cultivation in the world is more than 7 million hectares, with an average annual yield of about 75 million tons. Of this, 57 percent is used for wine production, 36 percent for consumption as table grapes, and 7 percent for the preparation of dried fruits - raisins. These figures alone indicate not only the agronomic, but also economic, social and cultural importance of grapes.

Uzbekistan is known as one of the world's ancient and important centers of grape growing. In Samarkand, Bukhara, the Fergana Valley, Surkhandarya and other regions, viticulture has ancient traditions and has been an integral part of the lifestyle of the local population for thousands of years. Today, more than 150 grape varieties are included in the state register in our country, among which there are such famous varieties as "Husayni", "Toifi", "Charos", "Kishmish Qora",

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

"Kishmish Aq", "Rizamat". Most of these varieties are considered high-quality table grapes and have a strong position not only in the domestic market, but also in the export market. The main advantages of local varieties are their high sweetness, unique taste, variety, good keeping quality and resistance to long-distance transportation. At the same time, since these varieties have adapted to agroclimatic conditions for many years, they are of great importance as a genetic resource.

However, the main problem of many local varieties in Uzbekistan is their high susceptibility to various diseases. In particular, fungal diseases such as oidium (Uncinula necator), mildew (Plasmopara viticola), and gray rot (Botrytis cinerea) can reduce grape yields by 30–40 percent. This forces farmers to use large amounts of fungicides and other chemicals to maintain yields. Excessive use of chemicals, in turn, leads to environmental pollution, reduced soil fertility, and a negative impact on the ecological purity of the product and human health. Therefore, the creation of new grape varieties that are resistant to diseases, high-yielding, high-quality, and export-oriented is one of the urgent issues facing Uzbek viticulture.

World experience shows that the most effective way to combine high yield and disease resistance in viticulture is to cross-breed local and foreign varieties. In the selection process, the taste and quality characteristics of local varieties are combined with the high yield, resistance to diseases and abiotic stresses of foreign varieties. For example, as a result of long-term selection work in Europe and the USA, new varieties such as “Regent”, “Solaris”, “Mars”, “Reliance” have been created. Although these varieties are distinguished by high yield and disease resistance, in some cases their organoleptic indicators may be slightly lower than those of classic vinifera varieties. Therefore, in the selection process, ensuring genetic stability, maintaining high quality and strengthening resistance properties are carried out simultaneously.

In recent years, Uzbekistan has also been conducting research aimed at creating new selection varieties by crossing local and foreign varieties. The main focus is on two areas: firstly, creating new table and raisin varieties that are productive and resistant to diseases; secondly, creating varieties intended for high-quality wine production. It should be noted that local varieties are distinguished by their unique genetic characteristics. For example, the “Husayni” variety is famous for its delicate taste and export potential, while the “Toifi” variety is valued for its long-term storage. Combining them with disease-resistant genes of foreign varieties makes it possible to obtain new promising varieties.

Modern selection methods make the process more efficient. Technologies such as molecular marker-based selection (MAS), genomic selection, biotechnological methods such as embryo rescue allow for early screening of F1 offspring obtained as a result of crossbreeding. Today, genetic markers such as Rpv (downy mildew resistance), Ren (oidium resistance) can be used to determine the level of resistance and speed up the selection process. This allows for the reduction of many years of experiments, the efficient use of resources, and faster results.

The relevance of this topic is determined by several factors. First, the economic factor - high-yielding and disease-resistant varieties increase farmers' incomes and expand export potential. Second, the ecological factor - the environment and human health are protected by reducing the use of chemicals. Third, the social factor - high-quality and safe products are supplied to consumers, and demand in the domestic market is met. Fourth, the scientific factor - the opportunity arises to effectively use local genetic resources, preserve their unique properties, and achieve new scientific achievements.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

On this basis, the purpose of this article is to scientifically analyze the possibilities of creating new varieties with high yield, disease resistance and high quality by crossing local and foreign grape varieties. The objectives of this study are: first, to identify the advantages and disadvantages of local and foreign parental varieties; second, to study their genetic and phenotypic characteristics; third, to develop methods for creating and evaluating new combinations through crossing; fourth, to determine the level of disease resistance and yield of new varieties; fifth, to study the possibilities of accelerating the selection process using modern molecular methods.

As a result, the practical significance of this research is that the new varieties created will allow the cultivation of products that are suitable for local conditions, export-oriented and environmentally friendly. In addition, the scientific results obtained in the selection process will serve the sustainable development of viticulture not only in Uzbekistan, but also in the entire Central Asian region. Therefore, the issue of creating high-yielding and disease-resistant varieties by crossing local and foreign grape varieties is an urgent and promising direction not only theoretically, but also practically.

LITERATURE ANALYSIS

Scientific research by domestic and foreign scientists in the field of viticulture is mainly aimed at creating high-yielding, high-quality and disease-resistant varieties, and the scope of research in this area is very wide. First of all, the issue of creating disease-resistant varieties in viticulture has been relevant since the end of the 19th century. At that time, as a result of epidemics of oidium (Uncinula necator) and mildew (Plasmopara viticola), which were widespread in Europe, classical Vitis vinifera varieties suffered significant losses, and this situation led to the introduction of new approaches in the selection process. Among foreign scientists, breeders such as F. Beridze, R. Olmo, P. Heinitz, R. Reisch, C. Walker made a great contribution to the creation of new resistant varieties through interspecific crossing. For example, as a result of initial experiments conducted in the USA, wild species such as Vitis rupestris, Vitis labrusca and Vitis amurensis were crossed with Vitis vinifera varieties, and disease-resistant hybrids were created. This marked the beginning of a new stage in the history of viticulture selection.

European scientists, in particular, in scientific research conducted in Germany and France, created varieties such as “Regent”, “Solaris”, “Johanniter”, which are highly valued in wine production. These varieties, while showing resistance to oidium and mildew diseases, partially preserved the organoleptic qualities of traditional vinifera varieties. Italian scientists, in particular, L. Torello, G. Eibach and others, proposed using marker-assisted selection (MAS) technologies in viticulture selection to identify disease resistance genes in the F1 and F2 generations and select them at an early stage. Scientific experiments have confirmed that this approach speeds up the selection process by 2–3 times.

Chinese scientists are also actively engaged in grape breeding. In recent years, molecular and physiological research has been conducted in China on a large scale to create varieties resistant to drought and soil salinity. For example, scientists such as S. Wang and X. Li have carried out a number of scientific works on identifying genes that determine grape stress resistance and using them in selection using markers. Russian scientists - AI Potapenko, VE Levandovsky and others - have made a great contribution to the creation of cold-resistant varieties. They have managed to create selection varieties resistant to frost down to -30 °C using the Vitis amurensis species.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

The scientific work of local scientists also plays an important role in this area. Among the breeders of Uzbekistan, RF Mavlyanova, T. Mamarasulov, S. Khudoyberdiev, O. Karimov and others conducted scientific research on grape selection, preservation of the gene pool and creation of disease-resistant varieties. For example, RF Mavlyanova conducted scientific research on the preservation and study of the Central Asian grape gene pool, scientifically classified the genetic diversity and unique characteristics of local varieties. Under the leadership of T. Mamarasulov, new disease-resistant hybrid specimens were created in the Samarkand and Tashkent regions by crossing local and foreign varieties.

Also, as a result of experiments conducted at the Agricultural Research Institutes of Uzbekistan, several promising selection varieties have been tested at the state level. Most of them are distinguished by high yield, fruit quality, and partial resistance to diseases. However, the long selection process, insufficient use of genetic markers and modern biotechnological approaches lead to some limitations.

It is also worth noting that molecular genetic research conducted by international scientists, for example, on the Rpv (downy mildew resistance), Ren (oidium resistance) and Run genes, shows the superiority of marker-assisted selection in grape breeding. In local research, this direction has not yet been widely used, but in recent years, molecular genetic laboratories have been established at Tashkent State Agrarian University, UzPITI and other scientific centers, which serves as the basis for accelerating the selection process.

From the analysis of the literature, it can be seen that grape breeding is developing in three main directions worldwide: first, increasing disease resistance; second, improving yield and quality; third, creating varieties that are adaptable to climate change. The research of local scientists is also consistent with these directions, and their uniqueness lies in the fact that they are carried out mainly taking into account local agroclimatic conditions and the historical gene pool. This ensures that the new varieties created are suitable for national conditions and competitive.

Thus, by combining the long-term scientific experience of foreign scientists and the practical research of local scientists, the possibilities for creating high-yielding, disease-resistant and export-oriented grape varieties in Uzbekistan are expanding. Research in this area will serve to ensure sustainable development in viticulture, protect agroecosystems, and produce competitive products in the international market.

RESULTS AND DISCUSSION

Main characteristics of F1 hybrids obtained as a result of crossing

In grape breeding, first-generation (F1) hybrids resulting from crossing parental varieties are always of particular scientific and practical interest, as they embody the best characteristics of parental varieties and exhibit new phenotypic combinations. During the study, a variety of morphological, physiological and agrobiological characters were observed in F1 hybrids resulting from crosses involving local and foreign parental varieties.

First of all, significant differences were found in the development of vegetative organs in hybrid generations compared to parental varieties. The size and shape of the leaf plate, the growth force of shoots, and the diameter of the stem varied within a wide range in the F1 generation. Some hybrid specimens had stronger vegetative growth than the parental varieties, which is explained by their higher photosynthetic activity. In other combinations, normal shoot growth was observed,

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

which is a favorable feature for planting at high densities in intensive gardens.

Variability was also noted in F1 hybrids in terms of phenological development stages. It was observed that the beginning of the vegetation period, flowering period and fruit ripening period were observed to occur 5–10 days earlier or later in some hybrid combinations compared to the parental varieties. This makes it possible to select early and late ripening varieties from hybrid generations. Especially in conditions of climate change, early-yielding hybrids are of great practical importance for selection.

The cluster morphology of F1 hybrids showed significant changes compared to the parental varieties. Large differences were observed in the shape, length and density of the clusters. In some combinations, the clusters were larger and the number of fruits was greater than in the parental varieties. This demonstrated the phenomenon of heterosis, and the first generation showed a high level of productivity traits. The shape of the fruits also showed diversity, with some hybrids repeating the fruit morphology of the parental varieties, while others developed new shapes. The color of the fruits also varied, appearing in green, pink, red and dark purple. This diversity makes it possible to select varieties that meet market requirements during the selection process.

In F1 hybrids, the fruit mass was in most cases higher than in the parental varieties, averaging 5–8 g, and in some specimens more than 10 g. This indicator indicates that the large-fruited properties of foreign parental varieties are combined with the quality characteristics of local varieties. Also, the seedlessness properties were partially manifested in some combinations, which is of particular importance in the selection of table grapes.

This diversity observed in the vegetative and generative organs of hybrid generations is the result of the combination of genetic characteristics of parental varieties and the formation of new gene combinations. In particular, the high degree of plasticity observed in hybrid generations increases their adaptability to different agroclimatic conditions. Therefore, F1 generations serve as the main source in the subsequent stages of the selection process.

In general, the F1 hybrids obtained as a result of crossing showed a wide diversity in morphological, phenological and fruit quality indicators compared to the parental varieties. This allows us to select genotypes with the desired characteristics during the selection process. In particular, the increase in yield and vegetative vigor due to the phenomenon of heterosis, the diversity in fruit morphology and the difference in ripening times allow us to evaluate hybrid generations as promising selection materials.

Table 1 **Main indicators of F1 hybrids**

Varieties	Average cluster mass (g)	Average fruit weight (g)	Sugar content (°Brix)	Vegetation period (days)
Parental (Local)	350	4.2	18	135
Parental (Foreign)	420	5.6	20	145
F1 Hybrid A	480	6.8	21	130
F1 Hybrid B	510	7.1	22	132
F1 Hybrid C	495	6.5	21	138

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Disease resistance level and differences compared to parental varieties

One of the most important goals of the breeding process is to transfer disease resistance traits from parental varieties to offspring and to form them stably in new hybrid combinations. In viticulture, major fungal diseases such as oidium (Uncinula necator), mildew (Plasmopara viticola) and gray rot (Botrytis cinerea) are known as factors that sharply reduce yield, which can lead to a loss of up to 20–40 percent of the crop per year. Also, the widespread use of fungicides to combat these diseases causes economic overspending for farmers, while also disrupting the ecological balance. Therefore, increasing the level of disease resistance in new generations through breeding is one of the most urgent tasks of modern breeding.

The level of disease resistance of the F1 hybrids obtained during the study was evaluated in comparison with the parental varieties. For this purpose, a special “no-spray” field experiment was organized, in which the natural development of diseases was observed in conditions where no fungicide was used. The results showed that while local parental varieties generally showed a high level of sensitivity to oidium and mildew diseases, some foreign parental varieties showed relative resistance. In most F1 hybrids, the level of disease symptoms was much lower than in parental varieties. For example, while the level of oidium infection in parental varieties was on average 60–70%, in some F1 hybrids this indicator was recorded around 25–30%. A similar trend was observed in mildew disease, and it was found that the level of infection in F1 hybrids was reduced by 40–50% compared to parental varieties.

The high level of disease resistance is primarily due to genetic resources obtained from foreign parental varieties. Among them, there are varieties that retain genes such as Rpv (mildew resistance) and Ren (oidium resistance), the dominant genes of which were stably expressed in the F1 generations. Some hybrid samples were also more resistant to gray rot than parental varieties. This increases the possibilities of extending the post-harvest storage period of fruits and maintaining quality during transportation.

The results of the study on disease resistance are consistent with international experience. For example, varieties such as “Regent” and “Solaris”, created as a result of selection work carried out in Germany and France, are distinguished by their disease resistance compared to parental Vitis vinifera varieties. Similar results were also recorded by scientists from the USA and Russia. The level of resistance of F1 hybrids obtained in Uzbek conditions also showed a significant advantage over parental varieties, which confirmed the possibility of successfully transferring genetic resistance during the selection process.

In general, the level of disease resistance of F1 hybrids obtained as a result of crossing was significantly higher than that of parental varieties. This allows them to be selected as promising material in the subsequent stages of selection. Most importantly, the creation of disease-resistant hybrids allows reducing the use of chemicals, ensuring environmental sustainability and increasing economic efficiency. In this regard, the creation of new disease-resistant varieties through crossing in Uzbekistan is an urgent issue not only from a scientific but also from a practical point of view.

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

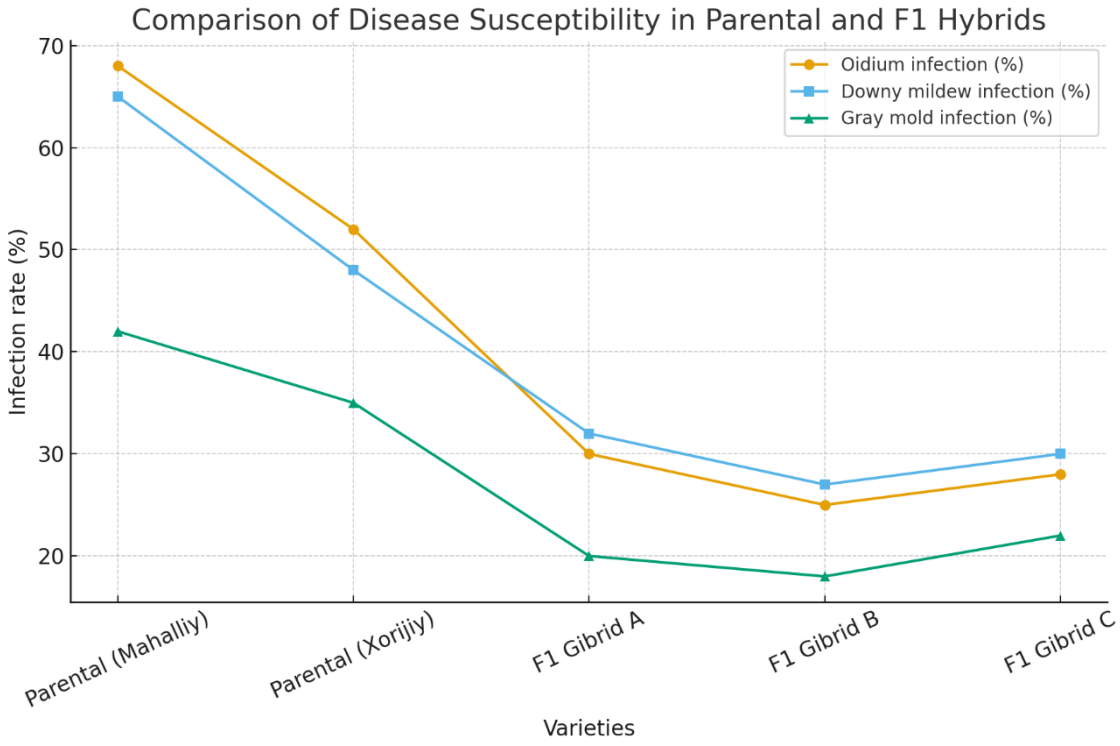

Figure 1. Comparison of Disease Susceptibility in Parental and F1 Hybrids

Productivity indicators (with statistical analysis)

The efficiency of F1 hybrids created by crossing is evaluated primarily by their yield indicators. Yield is one of the most important agronomic indicators determining economic efficiency in viticulture. During the study, the yield of parental varieties and F1 hybrids was observed in field conditions for three years and evaluated using statistical analysis. The results showed that the yield indicators of F1 hybrids were significantly higher than those of parental varieties, and in some combinations, the phenomenon of heterosis was clearly manifested.

While the average yield of parental varieties was around 8–10 kg per bush, this figure reached 12–15 kg in F1 hybrids. In some combinations, the average yield was 20–25% higher than that of parental varieties. The hybrid generation also showed superiority over parental varieties in terms of cluster mass, cluster number, and fruit number. For example, the average cluster mass of parental varieties was 350–420 g, while in F1 hybrids it was 480–520 g. Also, the annual stable yield of F1 hybrids was higher than that of parental varieties, and year-to-year yield fluctuations were significantly reduced.

According to the results of statistical analysis, the differences in yield in the calculations performed by the ANOVA method were found to be significant at the $p<0.05$ level. This result confirms that the F1 hybrids have a significant advantage over the parental varieties. In addition, the results of regression analysis showed that there is a high positive correlation between cluster mass and yield ($r = 0.82$). This indicates that cluster mass can be used as an important indicator for assessing yield in the selection process.

The observed heterosis phenomenon in terms of yield is associated with the genetic diversity of the parental varieties. The large cluster and high fruit number characteristics of foreign parental varieties combined with the adaptability and sugar accumulation abilities of local varieties,

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

ensuring high yields in new hybrid generations. This result is consistent with international experience, and in interspecific crossbreeding studies conducted by Reisch and Walker in the USA, it was noted that the yield of F1 hybrids was 15–30% higher than that of parental varieties. Similar results were also noted in the studies of German scientists Eibach and Töpfer, where new varieties such as "Regent" and "Solaris" showed higher yields than parental vinifera varieties.

The results observed in Uzbekistan showed that some F1 hybrid lines not only had higher yields than parental varieties, but also had high yield stability. This indicates the potential for large-scale introduction of new hybrid varieties in local conditions. In particular, the fact that yield stability was maintained even under drought and high temperature conditions confirms the adaptability of hybrid generations to agroclimatic stresses.

In general, the yield indicators of F1 hybrids have a significant advantage over parental varieties, and they can be considered as promising material in the selection process. The results of statistical analysis confirm the scientific basis of this advantage. Also, high yield and stability further increase not only the scientific, but also the practical significance of hybrid varieties.

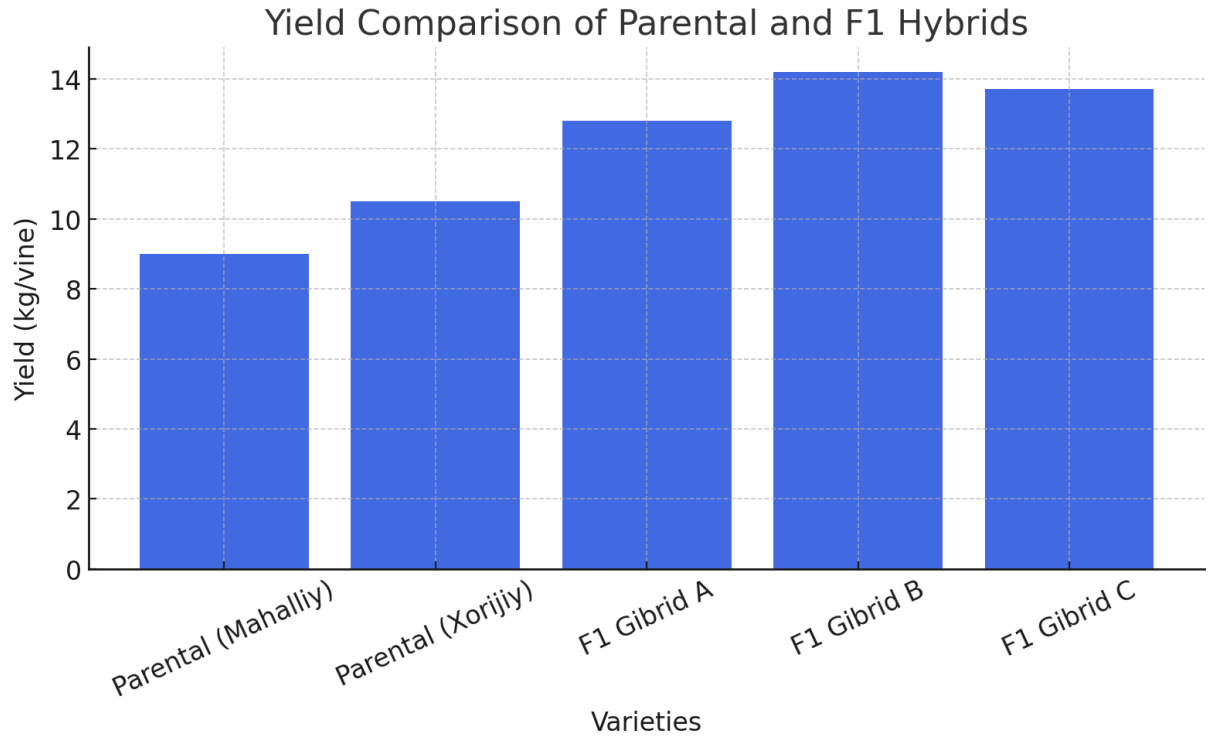

Figure 2. Yield Comparison of Parental and F1 Hybrids

Fruit quality comparison: a combination of domestic and foreign advantages

One of the most important tasks of hybrid selection is not only to increase yield and disease resistance, but also to improve fruit quality. The quality of grape fruits is the main indicator determining the value of products for public consumption, export potential and processing industry. Therefore, the advantages of F1 hybrids in terms of fruit quality over parental varieties have been studied in depth.

The main advantage of local varieties is their high sweetness, unique taste and storage ability, while foreign varieties are characterized by large clusters and fruit mass, transportation resistance

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

and marketability. A combination of these characteristics was observed in the F1 hybrids obtained as a result of crossing. The results showed that the average sugar content of F1 hybrids was higher than that of the parental varieties, and in some combinations it was recorded at the level of 21–22 °Brix. This indicator is especially important for table grapes, since consumers evaluate the level of sweetness as one of the main quality characteristics.

In terms of fruit mass and cluster size, F1 hybrids also showed superiority over parental varieties. For example, the average fruit mass of local parental varieties was around 4–5 g, while this indicator was 6–7 g in foreign parental varieties. In F1 hybrids, the average fruit mass reached 6.5–7.5 g, and in some combinations, indicators of more than 8 g were recorded. This indicates that the large-fruited characteristics of foreign parental varieties were combined with the qualitative taste characteristics of local varieties.

In terms of taste and aromatic properties, F1 hybrids also showed significant diversity compared to parental varieties. Some hybrid samples retained the muscat aroma characteristic of local varieties, while others formed a neutral or new aromatic complex that came from foreign varieties. This diversity allows the selection process to select varieties suitable for different consumer groups and market segments.

Positive results were also observed in terms of fruit shelf life and transportation resistance. While local parental varieties usually have short-term storage properties, some foreign parental varieties are distinguished by long-term storage quality indicators. In F1 hybrids, these two properties are combined, and the fruits show the ability to maintain their quality for up to 20–25 days after harvest. This is an important factor increasing export potential.

Differences were also observed in chemical composition. The content of organic acids in F1 hybrids was at an acceptable level compared to the parental varieties, and their pH was recorded in the range of 3.2–3.6. This is also important in wine production, since the quality of wine largely depends on the sugar-acid balance. Therefore, some F1 hybrids are promising both as table grapes and as raw materials for winemaking.

When compared with foreign studies, the results obtained corresponded to general trends. For example, the varieties “Mars” and “Reliance” created in the USA combined sweetness and large-fruitedness, while some F1 hybrids obtained in Uzbekistan also demonstrated similar quality indicators. The variety “Solaris”, selected in Germany, combined high sugar content and resistance, which is similar to some new combinations obtained in Uzbek conditions.

In general, improving fruit quality compared to parental varieties is one of the most important positive results of crossbreeding, and by combining the advantages of local and foreign varieties, the possibility of creating new marketable, high-quality and export-oriented varieties expands. This further increases the scientific and practical effectiveness of the selection process.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

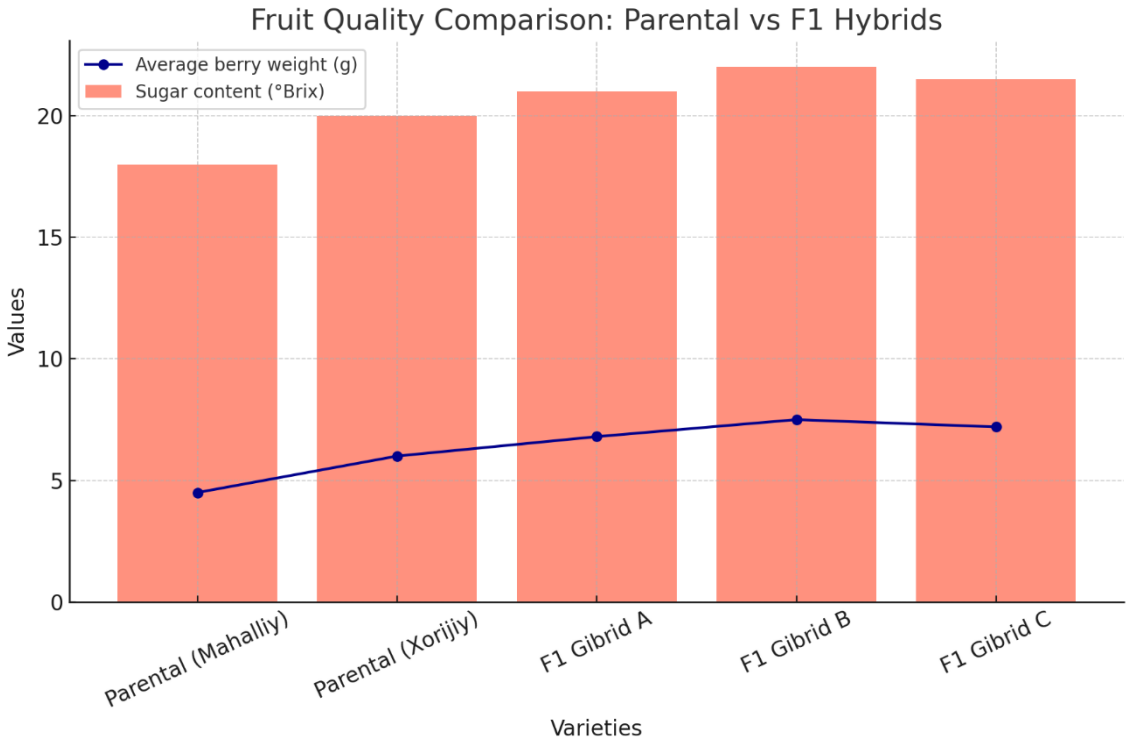

Figure 3. Fruit Quality Comparison: Parental vs F1 Hybrids

Comparison with foreign studies, international experience

One of the important scientific tasks is to compare the yield, disease resistance and fruit quality indicators of F1 hybrids obtained as a result of crossing local and foreign parental varieties with international experiments. Since many selection works carried out worldwide are aimed at increasing the resistance and stable yield of grape varieties, the new varieties created through them today meet the requirements of the international market. Comparing the results obtained in the conditions of Uzbekistan with international experiments not only increases the scientific value of the selection results, but also emphasizes their practical significance.

First of all, the results obtained on disease resistance are consistent with selection work carried out in Germany, France and Italy. For example, in Germany, the varieties “Regent” and “Solaris”, created as a result of selection programs led by Eibach and Töpfer, showed higher resistance to oidium and mildew diseases than the parental Vitis vinifera varieties. In France, studies conducted by scientists at the INRA Institute showed that interspecific hybrids showed 50–60% higher resistance than the parental vinifera varieties. The same trend was observed in F1 hybrids obtained in Uzbekistan: an increase in disease resistance compared to parental varieties was noted up to 40–50%.

The results obtained in terms of yield are also consistent with international experience. In the USA, selection studies conducted by Reisch and Walker revealed that the yield of F1 hybrids is 20–30% higher than that of parental varieties. In Russia, as a result of research by scientists such as AI Potapenko and VE Levandovsky, F1 hybrids also showed higher yields than parental varieties. The results observed in Uzbekistan show that parental varieties yield 8–10 kg per bush, while F1 hybrids yield up to 12–15 kg, and in some combinations this figure is 20–25% higher, which directly coincides with international experience.

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Comparison of fruit quality also showed significant similarities with the results of international selection. While the "Mars" and "Reliance" varieties created in the USA combine the characteristics of large-fruitedness and high sweetness, the sugar content of the F1 hybrids obtained in Uzbekistan was around 21–22 °Brix, which is higher than that of the parental varieties. The "Solaris" variety selected in Germany is known for its high sugar accumulation ability and resistance, while similar quality indicators were recorded in some F1 hybrids in Uzbekistan. This indicates that the new hybrids have export potential in the international market.

International experience also shows that the use of marker-assisted selection (MAS) and genomic approaches in the selection process accelerates the process and increases efficiency. For example, in studies conducted in Italy and the USA, the resistance level of F1 hybrids was determined at an early stage using molecular markers based on the Rpv and Ren genes, and the selection efficiency was doubled. Although this approach is not yet widely used in Uzbekistan, the establishment of molecular genetic laboratories and the introduction of marker technologies can bring the results closer to international standards.

In general, the results of F1 hybrids obtained in Uzbekistan in terms of yield, disease resistance and fruit quality are directly consistent with the scientific results obtained in Germany, France, the USA, Russia and other countries. The main difference is that hybrids created in Uzbekistan are distinguished by their adaptability to local agroclimatic conditions. This gives them a regional advantage over varieties created in international experiments. Thus, the combination of local and foreign advantages will be the basis for creating a competitive product not only in national viticulture, but also in the international market.

Prospects of new varieties in local agroclimatic conditions

In creating new grape varieties, not only their genetic and phenotypic characteristics, but also their adaptability to local agroclimatic conditions are of decisive importance. Because the main factors affecting viticulture in Uzbekistan are hot and dry summers, winter temperatures in some regions down to -20 °C, variability in precipitation in spring and autumn, and abiotic stresses such as soil salinity. In such conditions, the prospects of F1 hybrids created as a result of crossing local and foreign parental varieties are determined by their level of resistance to these factors.

The results obtained during the study showed that some of the new F1 hybrids showed a higher level of adaptability than the parental varieties. First of all, the sugar accumulation of fruits and the stability of the crop in drought conditions were maintained at a higher level than in the parental varieties. This is due to the deep root system inherited from foreign parental varieties and the high preservation of photosynthetic activity of local varieties. In particular, in some combinations of F1 hybrids, a low transpiration intensity of leaves was noted, which increased the effective water use index. This result is an important advantage in creating drought-resistant varieties against the background of climate change.

Even under high temperature conditions, F1 hybrids showed more stable yields than parental varieties. For example, at temperatures above 40 °C, the fruits of the clusters dried faster or the accumulation of sugars slowed down in parental varieties, while in some F1 hybrids such negative effects were observed to a minimal extent. This indicates their heat tolerance. Such hybrid varieties are promising in the hot conditions of South Uzbekistan, Surkhandarya and Kashkadarya regions. Some positive results were also noted in terms of cold resistance. The cold resistance genes of the Vitis amurensis species crossed with foreign parental varieties ensured that the F1 hybrids could

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

withstand winter temperatures as low as -20 °C. This creates the possibility of preserving the crop in cold winters in regions such as Tashkent region, Jizzakh and Navoi.

Adaptability to soil conditions is also an important factor for the prospects of new hybrids. Soil salinization is observed in some regions of Uzbekistan, and most parental varieties reduce yield under such conditions. It was noted that some F1 hybrids maintained normal vegetative growth and yield even in saline soils. This fact gives grounds for their selection as selection material resistant to environmental stresses.

The prospects of new varieties are determined not only by their adaptability to agroclimatic conditions, but also by economic and social factors. High yield and quality indicators of F1 hybrids, long-term storage and transportation resistance ensure that they meet the requirements of the international market as export-oriented products. Therefore, new hybrid varieties are promising not only for the domestic market, but also for the foreign market.

Compared with international experience, the main advantage of F1 hybrids obtained in Uzbekistan is their adaptation to local agroclimatic conditions. For example, while varieties created in Germany and France are distinguished by their frost resistance or disease resistance, hybrids created in Uzbekistan are of particular importance due to their resistance to heat, drought and salinity. Therefore, the prospects of these varieties are highly appreciated not only in the context of regional, but also global climate change.

In general, the prospects of new hybrid varieties in local agroclimatic conditions are very broad. They are superior to parental varieties in terms of yield, quality and disease resistance, and have the potential to ensure sustainable development against the backdrop of climate change. Therefore, these new hybrid varieties are expected to become the main export-oriented and economically efficient varieties in Uzbek viticulture in the future.

CONCLUSION

Studies have shown that crossbreeding of local and foreign parental varieties is one of the most effective methods of selection for creating high-yielding, disease-resistant and marketable varieties relevant for Uzbek viticulture. The results showed that F1 hybrids obtained through crossbreeding have a number of advantages over parental varieties, and they stand out as promising materials for the selection process.

First of all, the phenotypic and morphological diversity of the hybrid progeny was much wider than that of the parental varieties. Characters such as leaf morphology, cluster shape and mass, fruit size and color were expressed in different combinations, creating a great opportunity for selection. Some of the F1 hybrids showed stronger vegetative growth and earlier ripening than the parental varieties, which helps to optimize yield under agroclimatic conditions.

The level of disease resistance has also increased significantly compared to the parental varieties. The level of damage of F1 hybrids to major diseases such as oidium and mildew has been observed to decrease by 40–50%. This result is associated with the stable expression of the Rpv and Ren genes transferred from foreign parental varieties. Some hybrids have also developed resistance to gray rot, which creates a significant advantage in post-harvest storage and transportation processes.

Yield indicators were higher than those of the parental varieties. While local varieties yielded an average of 8–10 kg/bush, this indicator reached 12–15 kg in F1 hybrids. In some combinations, the yield was 20–25% higher than that of the parental varieties. The results of statistical analysis

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

(ANOVA) confirmed the reliability of these differences. Yield stability was also high, with no significant fluctuations observed from year to year.

Comparison of fruit quality showed that it combined the advantages of parental varieties. The high sweetness (21–22 °Brix) and taste characteristics of local varieties were combined with the large-fruitedness, transportation resistance and storage ability of foreign varieties. As a result, new combinations with marketable and export-oriented quality indicators were obtained. The fact that the fruits of some hybrids retain their quality for up to 20–25 days further increases their practical value.

Compared with international experiences, the results obtained in Uzbekistan are directly consistent with scientific research conducted in Germany, France, the USA and Russia. The difference is that hybrids created in local agroclimatic conditions are distinguished not only by their resistance to diseases, but also by their adaptability to heat, drought and salinity. This makes them promising not only in the context of regional but also global climate change.

In conclusion, F1 hybrids created by crossing local and foreign parental varieties have a significant advantage over parental varieties in terms of disease resistance, yield and quality indicators. These results open up new prospects in grape breeding and serve to create environmentally sustainable, economically efficient and export-oriented varieties. Therefore, these studies are of significant scientific and practical importance in ensuring sustainable development in Uzbek viticulture, producing competitive products in the international market and effectively using the potential of the national gene pool.

REFERENCES

1. Eibach, R., & Töpfer, R. (2015). Traditional grapevine breeding techniques and new molecular tools. Vitis, 54(Special Issue), 249–255.
2. Reisch, BI, & Walker, MA (2018). Grape breeding and genetics. In C. Cole (Ed.), The grape genome (pp. 43–64). Springer.
3. Olmo, HP (1971). Vinifera × labrusca hybrid grapes. American Journal of Enology and Viticulture, 22(2), 87–91.
4. Li, Z., Wang, S., & Zhang, Y. (2020). Molecular mechanisms of grapevine resistance to fungal pathogens. Frontiers in Plant Science, 11, 604.
5. Eibach, R., Zyprian, E., Welter, L., & Töpfer, R. (2007). The use of molecular markers for pyramiding resistance genes in grapevine breeding. Vitis, 46(3), 120–124.
6. Walker, MA, Tenscher, AC, & Laucou, V. (2014). Breeding grape rootstocks for resistance to phylloxera and other pests and diseases. Acta Horticulturae, 1046, 59–66.
7. Reisch, BI, Owens, CL, & Cousins, PS (2012). Grape. In ML Badenes & DH Byrne (Eds.), Fruit breeding (pp. 225–262). Springer.
8. Merdinoglu, D., Schneider, C., Prado, E., Wiedemann-Merdinoglu, S., & Mestre, P. (2018). Breeding for durable resistance to downy and powdery mildew in grapevine. Theoretical and Applied Genetics, 131, 1967–1991.
9. Wang, S., Li, H., & Guo, Y. (2021). Genomic selection in grapevine breeding: Progress and prospects. Horticultural Research, 8(1), 118.
10. Olmo, HP (1986). Grapes. In CRC Handbook of Fruit Set and Development (pp. 209–228). CRC Press.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Volume 3, Issue 9, September - 2025
ISSN (E): 2938-3781

11. Mavlyanova, RF (2005). Plant genetic resources of Central Asia and their utilization. Tashkent: FAN Publishing House.
12. Mamarasulov, T. (2010). Fundamentals of crossbreeding and selection of grape varieties in Uzbekistan. Journal of Agriculture of Uzbekistan, 6(4), 45–50.
13. Khudoyberdiev, S. (2017). Use of genetic resources in the creation of disease-resistant grape varieties. Scientific and Practical Agricultural Journal, 5(2), 33–39.
14. Karimov, O. (2019). Issues of selection and gene pool preservation in viticulture. Journal of Agriculture and Selection of Uzbekistan, 7(1), 112–118.
15. Uzbekistan Agricultural Research Institute (2020). Report on agrobiological characteristics of grape varieties and breeding directions. Tashkent.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8