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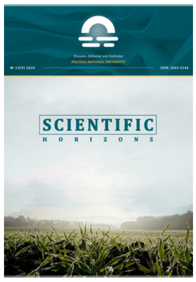

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Assessment of barley varieties by the level of genotypic variability of quantitative traits

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Abstract. The investigation of the genetic variability of barley varieties is particularly important in the context of a changing climate and the need to ensure agricultural productivity in the face of environmental challenges. The purpose of the study was to assess the tolerance of barley varieties to soil salinity in order to identify the most productive and adapted varieties. To achieve this goal, the salt tolerance of barley varieties was diagnosed and varieties that showed high resistance to salinity were identified. As a result of a study of 45 varieties of barley, it was found that 37 of them showed salt tolerance, but as they grew, some of them could not cope with salinization

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and stopped their development. Of these 37 varieties, 13 genotypes were selected, which had real salt tolerance and continued to grow and develop under stressful conditions, having the ability to give a satisfactory yield in comparison with the standard variety. These varieties are successfully used as testers in hybrid crosses and have a combination of useful characteristics, which makes them valuable for agricultural practice. The study also showed that different characteristics have different degrees of genetic variability. Thus, according to the data obtained, the number of grains in the ear and the weight of 1000 grains have high genetic variability, indicating the importance of genetic factors in their formation. These characteristics play a key role in the selection of plants to increase the yield and quality of grain. The results obtained are of practical importance for agricultural producers, as they can more accurately choose barley varieties that are most suitable for local conditions. This contributes to an increase in yield and product quality, which is important for ensuring food security and economic efficiency of agriculture

Keywords: yield; salt tolerance; selection; breeding; aridity

INTRODUCTION

The selection of agricultural crops, including barley, is an important stage in increasing agricultural productivity and ensuring food security. Genotypic variability, that is, the diversity of genetic characteristics of barley varieties, plays a key role in the development and introduction of new varieties that can meet the needs of agriculture. In addition, their adaptation to various environmental conditions depends on the modification and genetic variability of cultivated plants (Hudzenko *et al.*, 2021).

The study of adaptive changes and genetic variability of cultivated plants is an object of research within the framework of ecological breeding carried out in various natural conditions. Currently, statistical methods are available that combine ecological and geographical data with information about plant characteristics to create strategies aimed at identifying the features of the genetic structure of plant populations based on the characteristics of their germplasm (FIGS). This approach allows identifying links between plant traits and environmental parameters, which can help in identifying regions where germplasm with certain useful traits can be found. Then, based on the information received, it is possible to select suitable samples for further research from large collections of germplasm. An alternative approach is to identify places where new collections of germplasm should be collected in order to look for rare features. This can significantly speed up the selection process.

Conducting research in the field of assessing the genotypic variability of barley varieties, Y. Turuspekov *et al.* (2016) argue that in Kazakhstan, as in many other countries, special attention is paid to the selection and assessment of barley varieties with high yields, adapted to local agro-climatic conditions and other important qualities. Assessment of the genotypic variability of quantitative traits of varieties plays a key role in this process, allowing the identification of the most promising varieties for further development and introduction into agriculture.

Barley is considered a crop that is relatively well adapted to the soil salinity, and different genotypes of barley have the potential for high yields even in saline conditions. Many researchers who studied resistance at a non-genetic level, including A. Zatybekov *et al.* (2020) and A. Dreiseitl (2020), demonstrated a wide range of genetic variability in barley, especially in relation to its salt tolerance. Therefore, the study of the germplasm of barley and its genetic reactions to different levels of salinity can be an important and useful continuation in the existing area of research.

Research on biological and agronomic tolerance of barley varieties to salinity remains extremely important for several reasons. According to A. Amalova *et al.* (2021) changing climatic conditions in the world, including an increase in the frequency of extreme weather events, may be accompanied by an increase in soil salinization in some regions. Conducting such studies plays a key role in the development of barley varieties that are able to survive and grow on saline soils, which, in turn, helps agricultural enterprises adapt to new climatic realities.

Y. Genievskaya *et al.* (2023) argue that the increase in the level of soil salinity in some regions of the world is caused not only by climate change, but also by improper use of water resources and other human factors. This creates an urgent need for plant varieties that can successfully grow and develop on saline soils, ensuring food security and increasing agricultural productivity. Such studies contribute to the conservation of soil resources, reduce the cost of fertilisers and agrochemicals, and the introduction of modern biotechnological methods to create resistant varieties of barley.

Researchers dealing with the topic of assessing barley varieties by the level of genotypic variability of quantitative traits face several difficulties, namely: a limited amount of research; difficulties in methodology; insufficient attention to certain aspects, such as the influence of the environment and genetic factors on quantitative traits; heterogeneity of research data. To solve these problems and promote further research, it is necessary to develop general methodologies for assessing genotypic variability, and to assess which varieties of barley adapt better to extreme climatic conditions, which will help farmers choose the most suitable varieties.

Thus, the study of the biological and agronomic resistance of barley varieties to salinization remains relevant and important for ensuring the sustainability of agriculture, increasing productivity and mitigating the negative effects of climate change and ecology. The purpose of the study is to assess the level of resistance of barley varieties to soil salinization to develop and recommend the most productive and adapted varieties to improve agriculture and sustainability in a changing climate. To achieve this goal, the following tasks were set: to diagnose the salt resistance of barley varieties, and to identify crop varieties that have shown high resistance to salinity.

MATERIALS AND METHODS

A field experiment was conducted in 2021 to evaluate barley varieties by the level of genotypic variability of quantitative traits. The research was conducted on the territory of Kazakh Scientific Research Institute of Rice Growing named after I. Zhakhayev, Kyzylorda city. The climate in the Kyzylorda region is characterised as sharply continental with pronounced seasons. Summers are hot and dry, and winters are cool and unstable, with little snow. The annual precipitation is about 130 mm, and in some very dry years, it can drop to 40 mm. The aridity of the climate is the main limiting factor for agriculture and vegetation in this area. The soils on the experimental site belong to the type of meadow-swamp soils. The humus content in the soil is 1.03%, which indicates very low fertility. A dense residue above 1% indicates the presence of organic material in the soil. The mechanical composition of the soil is characterised as a medium loam. The object of the study was 42 collectable samples of barley, the world collection (Table 1). This set of samples represents a variety of genetic and ecological groups of barley from different regions of the world and provides a basis for research in the field of breeding, genetics, and agronomy of this crop. The seeding rate is 65 grains per 1 m.

Table 1. *Barley varieties under study*

No.	Ecological and geographical group	Quantity	Variety samples	Country/scientific organisation
1	Samples from Kazakhstan	10	Jailau, Saule, Asem	LLP "Kazakh Research Institute of Agriculture and Plant Growing"
			Syr Aruy, Inkar, Shahristan, Kaysar	Kazakh Scientific Research Institute of Rice Growing named after I. Zhakhayev
			Granal, Karabalyksky 150	Karabalyk Agricultural Experimental Station
2	Samples from CIS-countries	5	Odesky 100, Dnipropetrovsky 435, Dnipropetrovsky 85, Donetsky 8, Kharkivsky 74	Ukraine
3	European group	10	Spring, Marni, Steploe, Scarlett, Millita	Germany
			Ruby, Accent, Diamond, Forum, Amulet	Czech Republic
4	Anatolian Group	7	k-6891, k-6853, k-520645, k-6848	Turkey
			Rihane, Harmal, Legnee	Syria
5	North American group	10	Atlas 46, MT960225, Keystone, Baronesse, Conrad, Stark	USA
			Stm 48076, Palliser, Harrington, k-920	Canada
	Total	42		

Source: *compiled by the authors*

Soil analyses were carried out in the laboratory of the Joint Stock Company (JSC) National Centre of Expertise and Certification in the city of Kyzylorda, which has the appropriate accreditation status. In the course of the study, the methodology of the state variety testing of agricultural crops was used, which provided for strict monitoring of the parameters of the growth and development of wheat plants. The following parameters were measured: length of the upper internode, number of plants that yielded, plant height, number of ears per square metre of plot, weight of 1000 grains, number of grains in each ear, and total weight of grains harvested from each plant.

The number of productive barley stems was calculated by counting the number of stems on an area of 1 m^2. The number of ears was calculated using the sampling method on each square metre of the field to determine the sowing density. The weight of 1000 grains was determined by taking two samples of 500 grains and weighing with an accuracy of 0.01 g. The weight of grain from the ear – by collecting samples of ears and subsequent weighing of grains. To diagnose salt tolerance, the method of assessing salt tolerance through seed germination in salt solutions was used. This method can determine the salt tolerance of plants and assess their ability to survive and grow in saline soils. The method of genetic analysis was used to assess the genotypic variability, which makes it possible to assess the diversity of genetic characteristics of barley varieties in the study. Thus, the conducted experiments considered the features of climate, soil cover, and observation methods, which allowed the study to obtain reliable results and draw conclusions regarding the assessment of barley varieties by the level of genotypic variability of quantitative traits. The obtained results were processed for reliability using two-factor analysis of variance using Microsoft Excel and the Statistica 10 software suites. The authors adhered to the standards of the Convention on Biological Diversity (1992) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (1979).

RESULTS

Cultural specifics of barley cultivation in Kazakhstan in 2021 were influenced by various climatic and soil factors, which affected the effectiveness of this agricultural process. Usually, the cultivation of barley in Kazakhstan includes early sowing, following rice. According to the agrochemical analysis of the soil, the average content of dense residue ranges from 0.6% to 0.9%. On such a medium-saline background, varieties differ little in salt tolerance. For a more accurate assessment of the differences in salt tolerance, a highly saline background with a dense residue content of 1.65% was used, for which barley was the predecessor, and barley sowing was carried out at a late date.

In 2021, Kazakhstan experienced an extremely dry climate, with only 21 mm of precipitation recorded during the growing season. The drought in May had a particularly negative impact on the growth and development of barley, when the air temperature reached 43.3°C, with a complete absence of precipitation. The combination of atmospheric and soil drought negatively affected the formation of plants and yields. In June and July there was unstable temperature and lack of precipitation. On some days, the air temperature rose to an abnormal +52°C, which accelerated the ripening and filling of grain. The growing season of barley was 66-70 days, which is respectively almost 3 weeks earlier than in previous years. Such stressful climatic conditions only aggravated the negative impact of repeated sowing of barley by barley. This led to the development of fusarium root rot, atmospheric and soil drought, and an increase in the content of dense residue in the soil to 1.62%. Also in 2021, characterised by unfavourable climatic conditions, barley plants faced a number of adverse factors that seriously affected their development and yield. Late spring frosts and lack of moisture in the soil posed serious challenges for the crop. Plants began to show signs of stress, such as a decrease in leaf turgor, yellowing and drying of leaves, and sometimes even complete death of plants.

The study was carried out considering the biological salt tolerance and agronomic salt tolerance of varieties. This important study identified differences in the breeding material depending on its geographical origin. Out of the total number of 45 varieties studied, it was found that 37 genotypes had biological salt tolerance, which can be useful when grown in saline or saline soils. However, despite their ability to transfer salt, they were unable to maintain their viability when re-sowing barley. It is important to note that among the studied varieties, 13 genotypes were identified that had true salt resistance. These varieties have demonstrated the ability to maintain productivity even under stress conditions, such as unfavourable climatic conditions and soil salinity. The obtained results emphasise the importance of long-term breeding programmes and research in order to create resistant plant varieties capable of coping with adverse environmental conditions and providing sustainable products even in conditions of climatic fluctuations and soil salinity (Fig. 1).

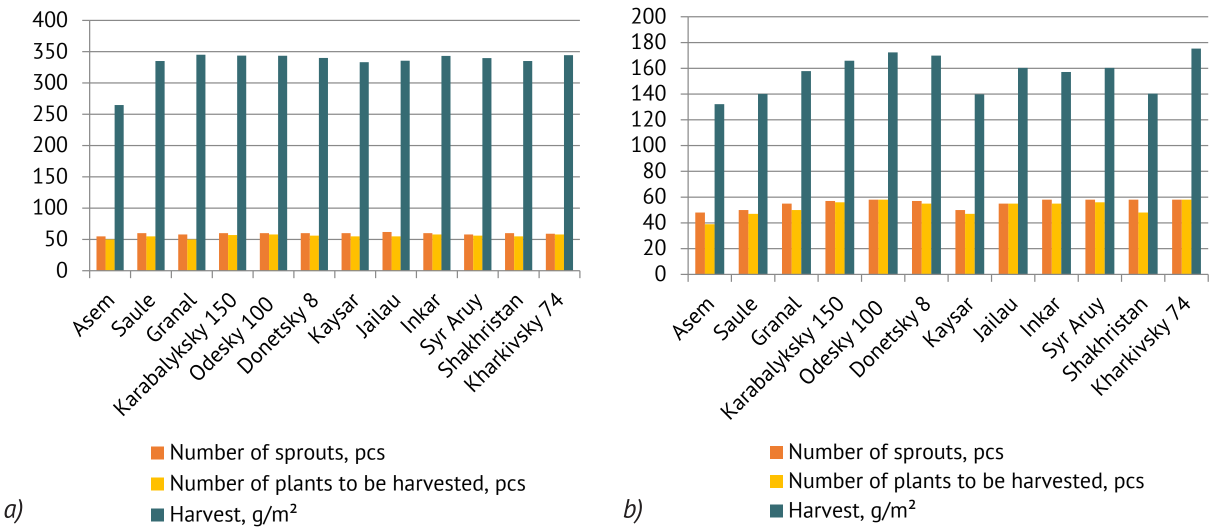

Figure 1. *The impact of predecessors on the level of barley yield in rice crop rotation: a) predecessor – rice; b) predecessor – barley*

Source: *compiled by the authors*

Notably, the selected 13 varieties that have real salt resistance are actively used as reference samples in cross-hybridisation and represent important suppliers of genetic characteristics that can be useful in the selection process and the development of breeding programmes for improving barley varieties. The analysis of the data obtained allows drawing several important conclusions. Thus, different varieties of barley have different yields depending on their predecessors. For example, the Asem variety has a yield of 264.8 g/m² after rice and 132.1 g/m² after barley. This indicates that the predecessor affects yield, and the need for careful selection of the predecessor when planning crop rotations and determining which crops are best combined with barley to maximise yield. Some barley varieties, such as Odesky 100 and Kharkivsky 74, show stable yields regardless of the predecessor. This may be important for farmers who are looking for sustainable varieties that can produce a good harvest in various conditions.

The results of the study indicate that the arid climate and repeated sowing of barley have a significant impact on the development of quantitative characteristics of this crop. It is especially important to note that these factors not only affect the yield, but also modify other quantitative characteristics of barley, such as the number of ears, grain weight, and even the structure of plants (Fig. 2).

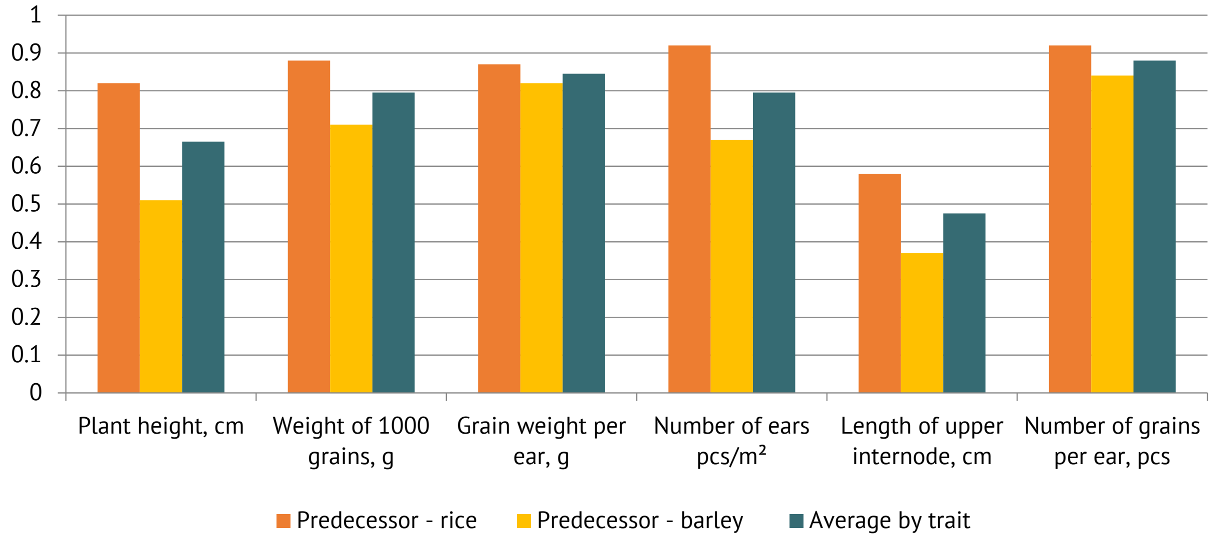

Figure 2. *Modification of genotypic variability under the influence of predecessors*
Source: *compiled by the authors*

Thus, the data obtained reflect the influence of predecessors (rice and barley) on the genotypic variability of some quantitative traits of barley culture. For example, the height of plants and the number of ears per 1 m² were higher with the predecessor "rice" compared to "barley". The average value for plant height was 0.82 for the predecessor "rice" and 0.51 for "barley". Similarly, the number of ears per 1 m² was higher with the "rice" predecessor (0.92) compared to "barley" (0.67).

The characteristics of the length of the upper internode, the number of grains in the ear, the weight of 1000 grains and the total weight of the grain also show variations depending on the predecessor. Therefore, in general, it can be concluded that the choice of a predecessor can affect the genotypic variability of barley and its quantitative characteristics. Thus, the study showed that dry climate and repeated sowing lead to changes in the growth and development of barley plants, which, in turn, affects the quantity and quality of the crop. This modifying effect emphasises the importance of adapting agricultural practices and varieties to specific climatic conditions and agrotechnical factors in order to achieve optimal results in agriculture.

A subsequent study of the genetic variability of quantitative traits of barley allows us to identify several key observations. Different characteristics have different degrees of genetic variability. Signs such as the number of grains in an ear and the weight of 1000 grains have a high genetic variability – more than 49%, which means that genetic factors play an important role in their development. In addition, these two parameters play an important role in the selection of plants at the early stages of hybridisation in order to assess their productivity. This is information that can be valuable in the selection of barley varieties in order to increase the yield and quality of grain.

Genetic variability in traits, such as yield and duration of the growing season, is also high. This underlines the importance of genetic diversity in the selection of barley varieties and the selection of suitable varieties for specific climatic and soil conditions. On the other hand, plant height varies significantly depending on growth factors and the interaction between plant genetic information and climatic conditions. This is due to the low value of the genotypic variability of this trait, which was only 12.3%. Thus, the height of plants is more affected by external factors and growing conditions than by genetic characteristics (Table 2).

***Table 2.** Percentage contribution of the studied factors to the variability of economically important characteristics of the barley crop*

Features	Genotype	Random factors
Yield	25.8**	2.1
Duration of the growing season	27.8**	10.5
Weight of grain from the ear	10.2**	5.2
Number of grains in one ear	50.6**	3.1
Weight of 1000 grains	49.2**	3.7
Number of productive stems	13.2**	4.1
Productive tilling capacity	15.7**	3
Plant height	12.3**	4.3

Note:** reliable: at P<0.01
***Source:** compiled by the authors*

In general, the data obtained emphasise the importance of the genetic diversity of barley varieties and the need to take this diversity into account when breeding and selecting varieties to optimise grain yield and quality in various climatic conditions. Analysis of genetic variability among varieties showed that the conditions of subsequent sowing of barley had the greatest impact on quantitative characteristics. As a result of the study, genotypes with a high level of characteristics in this set were identified, especially with respect to drought resistance, which was determined based on the length of the upper internode as a phenotypic indicator (Fig. 3).

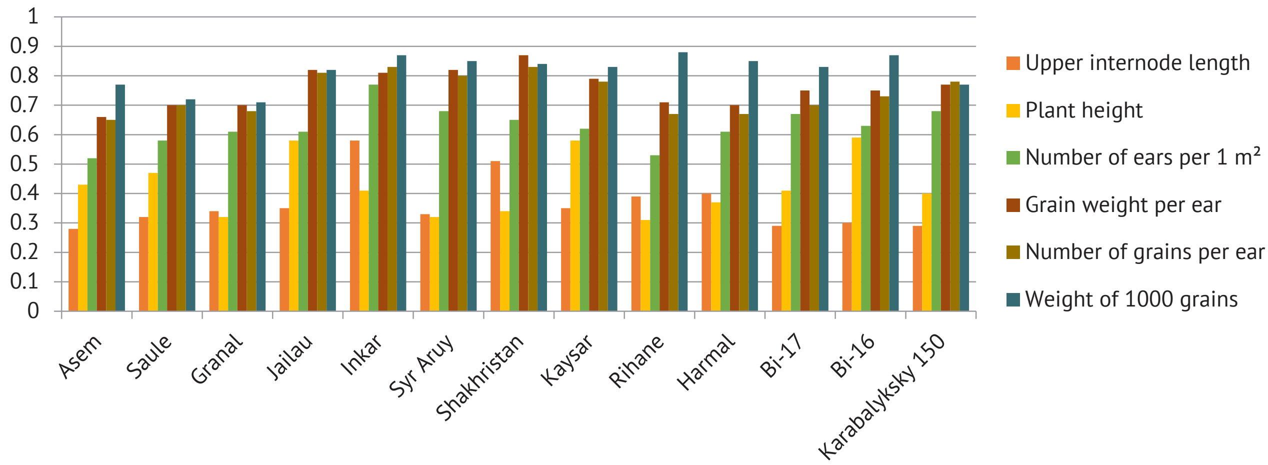

***Figure 3.** The level of genetic variability of quantitative characteristics in the context of crop rotation with rice (barley as predecessor)*
***Source:** compiled by the authors*

According to the results, significant variability was found in key characteristics, such as the number of ears per m^2, plant height, the length of the upper internode, the weight of 1000 grains, the weight of grains in the ear, and the number of grains in the ear between different varieties. This highlights the potential for improving yields and product quality through breeding and selection work. This allows breeders and agronomists to more accurately select barley varieties that are best adapted to specific growing conditions, considering the desired product characteristics. In addition, observing the differences between barley varieties from different regions (Kazakhstan, Syria) emphasises the importance of local adaptations and specific characteristics for each region. This means that the selection of varieties for specific climatic and soil conditions can be more effective if the genetic characteristics of varieties adapted to these conditions are considered.

In general, the results obtained emphasise the importance of the genetic diversity of barley varieties and the need for intensive breeding and agrotechnical solutions to optimise yields in various agro-climatic zones and improve the quality of agricultural products.

DISCUSSION

The study of genotypic variability in barley varieties and the maintenance of varietal biodiversity have profound ecological and agricultural implications. An important environmental benefit is the resilience of agriculture to adverse conditions, such as climate change or disease epidemics, due to the variety of varieties that are ready to adapt to changes. It also helps to reduce the use of chemical pesticides and fertilisers, which has a positive impact on the environment and human health (Beleggia *et al*., 2021).

Moreover, the assessment of genetic variability contributes to the conservation and increase of the genetic resources of cultivated plants, which is strategically important for agricultural sustainability and food safety. Knowledge of genotypic variability allows creating varieties that are better adapted to changing climatic conditions and can increase yields and product quality. Thus, the assessment of the genetic variability of barley varieties has a direct impact on the conservation of natural resources, the level of productivity and economic efficiency of agriculture, and contributes to food security (Dracatos *et al*., 2019; Hickey *et al*., 2021). The selection of agricultural crops, including barley, is the most important component of the agricultural sector of Kazakhstan, since the country has a variety of agro-climatic zones, from steppes to mountainous areas, and, consequently, there is a need for adapted and productive varieties capable of providing stable and high yields in various regions (Iannucci *et al*., 2021).

Scientific research devoted to the assessment of varieties of barley and other crops by the level of genotypic variability of quantitative traits is carried out regularly in agricultural research institutions, universities, and agricultural enterprises. These studies help to select and develop varieties that are best adapted to specific growing conditions and have the best agricultural characteristics. They provide important information for agricultural research and allow optimising agricultural practices in a climate with low precipitation and aridity (Czembor *et al*., 2021). There are also studies that confirm the presence of intraspecific variability among barley varieties. This means that even within the same species, there may be different genotypes with different characteristics (Alipour *et al*., 2019; Bukhari *et al*., 2021).

Along with this, M.Zh. Nurpeissov *et al*. (2015) note that there is a need to increase agricultural productivity in Kazakhstan, where agricultural products, including cereals, play an important role. The assessment of genotypic variability allows creating new varieties capable of providing high yields and product quality, which, in turn, contributes to an increase in the overall productivity of agriculture. In addition, the creation of varieties with high resistance to pests and diseases is also important to reduce crop losses and increase stability. The findings of many authors, in particular A.T. Pham *et al*. (2020) and R. Sharma *et al*. (2018), also show that genetic variability depends on specific climatic, soil, and other regional factors. This may emphasise the importance of choosing varieties, considering the specific conditions of regional cultivation, which is also demonstrated in the study.

A. Zatybekov *et al*. (2020) emphasise that changing climatic conditions can seriously affect agro-climatic situation in various regions of Kazakhstan. Assessment of genotypic variability plays an important role in the creation of varieties that can successfully adapt to new climatic conditions and extreme events, such as droughts and high temperatures. Thus, it contributes to ensuring the sustainability of agriculture to environmental changes and the preservation of high crop productivity in a changing climate, which is also reflected in the study. It is important to note that some barley varieties can detect high genetic diversity, which manifests itself in significant fluctuations in quantitative characteristics in different growing conditions and in different regions. This may indicate the possibility of selecting varieties that are most suitable for specific regional conditions (Kaur *et al*., 2022).

Some varieties may have low genetic variability, which means that quantitative traits remain stable under different conditions. This can be useful for farmers who are looking for stable and predictable results when growing barley (Wiegmann *et al*., 2019). Along with this, F. Novakazi *et al*. (2020) note that an important result of research may be an assessment of the quality of products obtained from different varieties of barley. Some varieties may have a high protein content, which is important for beer production, while others may stand out with good yields.

A study by M. Mehnaz *et al*. (2021) shows that the results of assessing the genetic variability of barley varieties play an important role in agriculture and plant breeding. They help agricultural producers and researchers to choose and develop the best varieties, considering different growing conditions and consumer preferences. This is important for increasing the productivity and efficiency of agricultural production. The results obtained coincide with the findings of A. Jamshidi & H.R. Javanmard (2018), who found a high degree of heritability in the grain yield from the plant, and in the yield index, the weight of 1000 grains, and the number of grains per ear. The highest level of variability, both genetic and phenotypic, was found in the grain yield from the plant. The researchers also found that some signs, such as the height of the barley plant, the length of the ear, the length of the awn, had moderate heritability.

J. Wang and Z. Zhang (2021) point that the study of genotypic relationships between traits that affect grain yield allows to more accurately determine the real links between them, since it excludes the influence of the environment. According to the results of the researchers, the yield of barley grain demonstrated a significant positive genotypic correlation with the length and number of awns on the ear, the number and weight of grains on the ear. These results indicate that the genes that control these traits may be related. They can be located close to each other on the same chromosome or be controlled by a single pleiotropic gene. Therefore, the selection to improve these characteristics can be used for indirect selection to increase grain yield, which is also demonstrated in the study.

Considering these factors, the assessment of genotypic variability of barley varieties in Kazakhstan remains the most important and urgent task for the agricultural sector of the country. Kazakhstan, with its diverse climatic and soil conditions, has a huge potential for the production of different barley varieties, and the assessment of genetic variability helps agricultural specialists to choose and develop the most suitable varieties for specific regions and conditions. Understanding genotypic variability also allows breeders to develop barley varieties that can better adapt to changing climates and ensure stable yields even under extreme weather events. This contributes to the sustainable development of agriculture and contributes to the achievement of food security, which is a critical aspect for ensuring the food sovereignty and well-being of the nation. Thus, the assessment of genotypic variability of barley varieties in Kazakhstan remains an integral part of the country's agricultural development strategy and contributes to its sustainable future in agriculture.

The mentioned research papers and the results of the study of the genetic variability of barley varieties in Kazakhstan provide valuable information for agricultural practice and scientific research in the country. These data not only help to optimise the selection of varieties for cultivation in various regions of Kazakhstan, but also contribute to the development of more effective methods of breeding and adaptation to changes in the environment. Considering the challenges associated with climate change and increased requirements for food security, the assessment of genotypic variability remains a key tool for ensuring sustainable agricultural development in Kazakhstan. It contributes to the creation of barley varieties that can successfully adapt to new conditions and ensure stable and high yields, which is critically important for the food security and economic development of the country.

CONCLUSIONS

In 2021, Kazakhstan experienced an extreme drought, which had a serious impact on agriculture, including barley cultivation. These natural factors greatly affected plant growth, yield, and the general condition of crops, and also led to the emergence of various diseases and deterioration of soil characteristics. In the course of the study, 37 genotypes were identified among 42 barley varieties, which showed biological salt tolerance but could not cope with the re-cultivation of barley. However, out of these 37 genotypes, 13 varieties were isolated, which had true salt resistance and continued to grow and develop even under stressful conditions of repeated sowing. It is worth noting that these selected varieties are widely used as testers in hybrid crosses and have many useful characteristics. Many local barley varieties were created based on these genotypes.

It was also found that different characteristics have different degrees of genetic variability. The number of grains in an ear and the weight of 1000 grains have a high genetic variability exceeding 49%, which indicates a significant influence of genetic aspects on their development. These traits also play a key role in the selection of plants to increase productivity and grain quality. On the other hand, the height of plants depends more on external conditions and interaction with the environment, which is reflected in the low level of genetic variability of this trait (12.3%). The high genetic variability of traits, such as yield and duration of the growing season, emphasises the need to consider genetic diversity in the selection of barley varieties, especially in the context of changing climatic conditions. Thus, the results obtained can help agricultural specialists and breeders to make more informed decisions when choosing barley varieties and determining optimal crop rotations to increase yields and agricultural efficiency.

The practical significance of the results lies in the fact that they allow agricultural producers to more accurately select barley varieties that best match local climatic and soil conditions. This can significantly increase productivity and product quality. The prospect of further research consists in analysing the genomes of barley varieties to identify specific genes and molecular mechanisms responsible for various characteristics, which can contribute to more accurate molecular breeding.

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CONFLICT OF INTEREST

None.

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Оцінка сортів ячменю за рівнем генотипової мінливості кількісних ознак

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Анотація. Дослідження генетичної мінливості сортів ячменю особливо важливі в контексті мінливого клімату та необхідності забезпечення продуктивності сільського господарства в умовах екологічних викликів. Мета проведеного дослідження полягала в оцінці стійкості сортів ячменю до засолення ґрунту для виявлення найбільш продуктивних та адаптованих сортів. Для досягнення поставленої мети, було проведено діагностику солестійкості сортів ячменю та ідентифіковано сорти, що проявили високу стійкість до засолення. У результаті дослідження 45 сортозразків ячменю було виявлено, що 37 із них виявляли солевитривалість, але в міру зростання деякі з них не справлялися із засоленням і припиняли свій розвиток. З цих 37 сортів було обрано 13 генотипів, які мали справжню солестійкість і продовжували рости й розвиватися в стресових умовах, володіючи здатністю давати задовільний врожай, як порівняти з сортом-стандартом. Ці сорти успішно використовуються як тестери в гібридних схрещуваннях і мають безліч корисних характеристик, що робить їх цінними для сільськогосподарської практики. Також дослідження показало, що різні характеристики мають різний ступінь генетичної мінливості. Так згідно з отриманими даними, кількість зерен у колосі та маса 1000 зерен мають високу генетичну мінливість, вказуючи на важливість генетичних чинників у їхньому формуванні. Ці характеристики відіграють ключову роль у доборі рослин для збільшення врожайності та якості зерна. З іншого боку, висота рослин залежить від зовнішніх умов і взаємодії з навколишнім середовищем, що відображається в низькому рівні генетичної мінливості цієї ознаки (12.3 %). Отримані результати мають практичне значення для сільськогосподарських виробників, тому що вони можуть точніше обирати сорти ячменю, які найбільше підходять для місцевих умов. Це сприяє збільшенню врожайності та якості продукції, що є важливим для забезпечення продовольчої безпеки та економічної ефективності сільського господарства

Ключові слова: врожайність; солестійкість; добір; селекція; посушливість