GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 11, Issue 09, Sep. (2023)

RESULTS OF CLUSTER ANALYSIS ON COTTON FAMILIES AND LINES BASED ON PAIR AND COMPOSITE HYBRIDS

Barotova Anisa Razzokovna
Tashkent State Agrarian University, Specialty "Selection and Seed Breeding", Independent Researcher

Kholmurodova Guzal Ruzievna
Tashkent State Agrarian University,
Doctor of Agricultural Sciences. (DSc), Professor

Tangirova Gulchekhra Nasridinovna
Tashkent State Agrarian University,
Doctor of Philosophy (PhD), Associate Professor

ABSTRACT

In the article, it is mentioned that it is important to create and introduce productive selection varieties of cotton, which meet the requirements of the world market, which are quick-ripening, fiber quality, suitable for different soil-climate regions, and researches are aimed at bringing out the results of composite breeding to the full extent. In the researches, information on the separation of cotton families and lines into clusters based on valuable economic characteristics based on the cluster dendrogram was given, and it was explained that as a result of dividing families and lines into groups according to clusters, it is possible to combine them according to valuable economic characteristics.

Keywords: cotton, fiber quality, soil-climate regions, selection, composite breeding, cluster dendrogram, cluster.

ҒЎЗАНИНГ ЖУФТ ВА КОМПОЗИТ ДУРАГАЙЛАШ АСОСИДА ОЛИНГАН ОИЛАЛАР ВА ТИЗМАЛАРИДА КЛАСТЕРЛИ ТАҲЛИЛ НАТИЖАЛАРИ

Баротова Аниса Раззоковна
Тошкент давлат аграр университети “Селекция ва уруғчилик” ихтисослиги мустақил тадқиқотчиси

Холмуродова Гўзал Рўзиевна
Тошкент давлат аграр университети, қишлоқ фанлари доктори. (DSc), профессор

Тангирова Гулчехра Насридиновна
Тошкент давлат аграр университети, қишлоқ фанлари фалсафа доктори (PhD), доцент

АННОТАЦИЯ

Мақолада ғўзанинг тезпишар, тола сифати жаҳон бозори талабларига жавоб берадиган, турли тупроқ-иқлим минтақаларига мос, ҳосилдор янги селекция навларини яратиш ва ишлаб чиқаришга жорий этиш муҳим аҳамиятга эга эканлиги, тадқиқотларда композит

чатиштиришнинг самарасини тўла юзага чиқаришга қаратилганлиги келтирилган. Изланишларда ғўза оила ва тизмаларининг кластерли дендрограмма асосида қимматли хўжалик белгилари бўйича кластерларга ажралиши бўйича маълумотлар келтирилиб, оила ва тизмаларни кластерлар бўйича гуруҳларга ажратиш натижасида қимматли хўжалик белгилар бўйича бирлаштириш имкониятини бериши ёритилган.

Калит сўзлар: ғўза, тола сифати, тупроқ-иқлим минтақалар, селекция, композит чатиштириш, кластерли дендрограмма, кластер.

INTRODUCTION

"The global financial volume of cotton will reach 46.5 billion dollars by 2027, and the annual growth rate from 2020 to 2027 is 2.74 percent"1. In order to solve these problems on a global scale, it is important to use various breeding methods in cotton selection, which are widely used in other agricultural crops. As a result of transgressive variation occurring in composite hybridization in cotton, the increase in the possibility of isolating recombinants, which are the source of new genetic variations, which gives the opportunity to create new varieties with a positive set of valuable economic characters in a short time, has been confirmed in the selection of other crops. In this case, the probability of achieving a high level of success does not increase with the complexity of the breeding methods, but the parental varieties are carefully selected for a certain positive character, and the efficiency of the targeted genes increases.

Today, 90 percent of the cotton fiber grown in the world belongs to the cultivated G. hirsutum L. type. In 86 countries where cotton is grown, 20-22 mln. Tons of fiber are extracted and exported. One of the important problems in cotton breeding is the creation of high-yielding, fast-maturing varieties with high fiber yield and quality and their wide use in production. Due to the increase in the number of people on the earth and the reduction of irrigated arable land, it is important to get a high-quality harvest suitable for different soil and climate regions without expanding the arable land in the agriculture of the countries of the world.

Global climate change in the world, the emergence of new races of disease-causing agents and the numerous damage caused by harmful insects indicate the need to create new varieties of cotton that are resistant to adverse factors. This problem can be solved by attracting new donors with unique characteristics to the selection work. Compared to the world's major cotton-growing countries, India, China, Pakistan, the USA and Brazil, the cotton varieties grown in our Republic have a number of advantages in terms of quick ripening, fiber quality, yield and some other valuable features. Most developed cotton cultivars do not fully meet today's requirements for early ripening, fiber yield and quality, as well as tolerance to biotic and abiotic factors. One of the ways to solve the above-mentioned actual problem is to create new cotton varieties that are fast-ripening, productive, resistant to diseases, and whose fiber quality meets the requirements of today's world market.

In our republic, extensive measures are being taken to create competitive, high-yielding new cotton varieties. Today, the creation of productive cotton varieties suitable for different soil and climate regions is urgent in our country, and a number of researches are required in this regard. In this regard, it is important to expand research and development activities on the creation and introduction into production of new selected varieties of agricultural crops that are

resistant to diseases and pests, suitable for soil and climate conditions. Considering the above, the topic of this work is aimed at bringing out the full effect of composite breeding. The Decree of the President of the Republic of Uzbekistan No. PF-5853 dated October 23, 2019 "On approval of the strategy of agricultural development of the Republic of Uzbekistan for 2020-2030" defines the tasks of "creating new selective varieties of agricultural crops adapted to local soil, climate and ecological conditions". Therefore, in the selection of cotton varieties, it is important to increase the possibility of isolating recombinants, which are the source of new genetic variations, resulting from transgressive variation in comduragayposit hybridizations, which are effective in creating new varieties with a positive set of valuable economic traits and high fiber yield in a short period of time. The Decree of the President of the Republic of Uzbekistan No. PF-5853 dated October 23, 2019 "On approval of the strategy of agricultural development of the Republic of Uzbekistan for 2020-2030" defines the tasks of "creating new selective varieties of agricultural crops adapted to local soil, climate and ecological conditions". Therefore, in the selection of cotton varieties, it is important to be effective in creating new varieties with a positive set of valuable economic traits through composite hybridization.

"PQ-308 of the President of the Republic of Uzbekistan dated July 7, 2022 "On additional organizational measures to increase cotton productivity, introduce science and innovation in cotton cultivation"1, President of the Republic of Uzbekistan dated January 28, 2022 "On further development of seed production of agricultural crops" This dissertation research serves to a certain extent in the implementation of the tasks defined in the decision PQ-106 "On additional measures" and other regulatory legal documents.

Today, many researches have been carried out on the creation of varieties of cotton with unique characteristics, intra-species and inter-species hybridization, creation of new enriched varieties based on the obtained hybrids. Regarding the creation of new genotypes of cotton, foreign scientists P.Kammacher, C.Polsson; J.F. Wendel, R.C. Cronn; I.E. Endrizii et al (1999), and others carried out theoretical and practical studies. Among them, scientists of our republic L.G.Arutyunova, M.Pulatov, A.Egamberdiev, Q.Teshaboev, V. A. Avtonomov, Sh. E. Namazov, M. B. Khalikova, T. Seytnazarova, V. Ristakov, I. Madrahimov, P.Sh.Ibragimov, P.Ibragimov, Sh.E.Namazov, G.R.Kholmurodova, S.G'.Boboev carried out theoretical and practical research. In this regard, the All-Russian Research Institute of Plant Science named after N.I. Vavilov (Russia), the Chinese Academy of Agricultural Sciences (China), the Central Institute of Cotton Research and the National Bureau of Plant Genetic Resources (India), Cotton Selection, Seeding and Cultivation Agrotechnologies Research is being conducted at the Research Institute (Uzbekistan), the Institute of Genetics and Experimental Plant Biology, the National University of Uzbekistan (Uzbekistan) and other research institutions.

Today, in the world, research is being carried out in a number of priority directions on the analysis of genetic and selection methods for creating cotton varieties with a set of valuable economic characters, including expanding the possibilities of using certain methods of complex hybridization when the yield of varieties decreases for various reasons in agricultural crops, different methods researching the level of heredity of recurrent varieties in new lines obtained with, creating varieties with high productivity, quick ripening, fiber yield and quality indicators.

The aim of the research was to create high-yielding, quick-ripening, high fiber quality and yield,

resistant to some diseases initial materials for practical selection by means of composite hybridization in medium fiber cotton.

As the object of the research, families and ridges created on the basis of Sultan, Jargorgon, L-151, Gulistan, Tashkent-6 and Bukhara-6 varieties of cotton belonging to the G. hirsutum L. variety and S-6524 variety were used as a model variety.

The subject of the study is to determine the transgression of the characters in the resources obtained in the double and composite hybridization methods and the correlation between the valuable economic characters of the hybrids in the hybrids.

RESEARCH METHODS

Research results of the Uster HVI Spectrum fiber classification system in the testing laboratory of the "Agro-Industry Complex Service Center" on the basis of the methodical guide "Field Experiment Methods" (2007) adopted by UzPITI .Mathematical and statistical analysis was carried out based on Dospekhov's "Metodika polevogo opyta" (1985) manual. Clustering was calculated and analyzed based on Rstudio computer program.

LITERATURE REVIEW

Currently, in order to create new varieties of cotton that meet the world standards, it is necessary to carry out various simple and complex crossings with the varieties belonging to the Gossypium L. family, to study the inheritance of unique and valuable economic traits in hybrid generations, to evaluate the valuable economic traits of high-generation hybrids and selection materials and their effective use of genetic potential in genetics and selection practice is required [1].

The wide range of possibilities of using different, i.e. double, complex and double hybrid breeding methods in cotton and other plants has been studied in many breeding researches. The effectiveness of the complex hybridization method depends on how well the selected initial parental forms transfer useful characters to new varieties. The effectiveness of complex hybridization in the selection process is that, as a result of the use of the method, it is possible to embody the unique characteristics of varieties of different genetic origin in a single genotype in a short period of time. It is noteworthy that in hybrids created on the basis of a complex hybridization method, variability of quantitative traits is formed on a large scale, and the possibility of extensive selection in these hybrid populations is high [2; 3; 4].

According to cluster analysis Ivanishchev V.V. [1; 69-77-b], taking into account the diversity of varieties in a large collection and the wide range of studied characters, the use of multivariate statistical methods, in particular, cluster analysis, for their analysis and systematization is of urgent importance. Clustering methods are used in various scientific and technical fields to combine objects into groups with similar characteristics, as well as to solve segmentation problems for compressing large volumes of data and creating scientifically based classifications. Kodirova G.A., Kubankova G.V., Litvinenko O.V. [3; According to studies 54-61-b], the Varda method (the measure of proximity of objects is the Manhattan distance) and the k-means method (5 clusters, 10 repetitions) were used as a clustering algorithm. By standardizing the mean values of each symbol in the range of -2.7 to +2.7 units, the different indicators in the measurement units were brought into a uniform system. When choosing the number of clusters,

a similarity level of 15% was considered optimal. For each trait, the test for differences between clusters was calculated by the method of parametric analysis of variance.

RESEARCH RESULTS

Cluster analysis is a multivariate analysis that identifies features that objects have in common and groups them into similar groups based on these features. Cluster analysis is a type of data characterization when there is no reference or control option for the analysis (see Figure 1). It consists of combining samples into groups based on the degree of similarity of characters. The main methods of hierarchical cluster analysis include the nearest neighbor method, the complete linkage method, the average linkage method, and Varda's methods. The result of these is a structured dendrogram.

Therefore, cluster analysis method was used to determine the degree of diversity of the samples of this variety in terms of valuable economic traits and group them according to their proximity and distance to each other. Cluster analysis is based on a program that combines various algorithms used in the classification of various objects under study. As a result of applying these operations, the initial set of objects is divided into clusters or groups of objects that are similar to each other. That is, they are characterized by not one, but several indicators, and their integration into groups (clusters) is carried out in a multidimensional space. There are agglomerative and iterative divisive methods of clustering. In the agglomerative method, the closest objects are successively combined into one cluster. Such a sequence can also be represented in the form of a dendrogram. In this method, the algorithm starts by measuring the distance between objects. This distance is one of the indicators that determine the proximity of objects to each other.

Cluster analysis is a software-based method that combines various algorithms used in the classification of samples of the studied variety. As a result of the application of various operations, the initial totality of varieties and ranges is divided into clusters or groups of samples of the variety that are similar to each other. That is, they are characterized by not one, but several indicators, and their integration into groups (clusters) is carried out in a multidimensional space.

There are agglomerative methods of clustering, and in the agglomerative method, the closest objects are successively combined into one cluster. It is more convenient to express such a sequence in the form of a dendrogram, and using this method, the algorithm begins with a mathematical measurement of the distance between objects. This distance is one of the indicators determining the mutual proximity of objects.

In our experiment, the classification of families and lineages into clusters was carried out using the computer program Rstudio.

The description of the studied 10 families and 3 ridges according to economic characteristics was used as initial data for cluster analysis. Our goal was to determine the degree of diversity of these cultivars in terms of valuable economic traits and group them according to their mutual affinity, and cluster analysis was used to achieve this goal. This method is based on the determination of the Euclidean distance between varieties, as mentioned in the previous sections, and this distance is measured not in a plane, but in a multidimensional space.

Tabular information on the separation of cotton families and ridges into clusters according to economic characteristics showed that, according to the data of Table 1, in families No. 1, 2, 3, 4, 5, that is, respectively, O-28, O-27, In the O-25, O-26 and O-31 families, mainly according to a number of economic characteristics, the number of pods (26 in the O-28 family, 25 in the O-27 family, 26 in the O-25 family, 25 in the O-26 family, 27 units in the O-31 family), fiber yield (39.1% in the O-28 family, 38.9% in the O-27 family, 39.6% in the O-25 family, 39.3% in the O-26 family, O-31 39.7% in the family and fiber length (33.6 mm in the O-28 family, 34.7 mm in the O-27 family, 33.2 mm in the O-25 family, 33.4 mm in the O-26 family, 33.4 mm in the O-31 family 34.8 mm), the weight of cotton in one bag (7 g in the O-28 family, 6 g in the O-27 family, 6 g in the O-25 family, 6 g in the O-26 family, 7 g in the O-31 family) and other valuable household it was noted that they have indicators that are close to each other in terms of signs. In turn, in the 6th and 8th families O-3411 and O-3398, the number of bolls is 27, respectively, the weight of cotton in one boll (7 g in the O-3411 family and 6 g in the O-3398 family), fiber output is 42.1% and 40 .9%, 34.3 mm and 34.7 mm in fiber length, 112 and 111 days in quick cooking in the 7th and 9th families O-2757 and O-3407, the number of pods in both families is 26 pieces, the weight of one pod 7 g and 6 g, productivity was 165 g/plant, 164 g/plant, fiber length was 34.8 mm and 34.7 mm, and it was shown that they were close to each other in terms of valuable economic characters. The 10th and 11th family O-3406 and T-3377 lines are close to each other, 111 days and 110 days respectively, the number of bolls per plant is 28, the weight of cotton per boll is 6 g, and the productivity index is 169.4 g/plant. and 170.1 g/plant. , fiber yield was 42.4% and 41.8%, fiber length was 36.2 mm and 36 mm.

12th and 13th rows T-3378 and T-3379 ripened 111 days and 110 days respectively, the number of bolls per plant is 29 and 28, the weight of cotton per boll is 8 g, the productivity per plant is 175.5 and 180 g/plant., fiber yield was 42.8% and 42.4%, fiber length was 35.5 mm and 36.2 mm.

This indicates that these families and ridges are very close to each other in valuable economic traits.

According to the cluster analysis, the minimum number of clusters in which varieties are combined is 4, and the maximum number is 7. When separations into these groups were analyzed, it was found that the 5-cluster analysis was the most moderate to determine the closeness of the cultivars in terms of valuable economic traits (see Figure 1).

O-28, O-27, O-25 and O-31 families are connected to one cluster in the 1st cluster position, and O-341 in the 6th and 8th numbers; The families of O-3398 were more closely grouped into another cluster, i.e. cluster 2. O-2757; O-3407 families are located in the 3rd cluster number and correspond to the 7th and 9th numbers of these families. O-3406 is in the 10th and 11th numbers; T-3377 families are located in cluster number 4. T-3378 in case of 5 clusters; T-3379 ridges corresponded to the 12th and 13th numbers.

1-table Cotton families and ridges on valuable farm signs separation into clusters

№	Family and ranges	speed indicator	number of cells	cotton weight in a bag	1000 seed weight	productivity indicator	fiber output indicators	fiber length indicators
1	O-28	115	26	7	120	138.5	39.1	33.6
2	O-27	110	25	6	120.5	145.5	38.9	34.7
3	O-25	111	26	6	122.5	140.3	39.6	33.2
4	O-26	112	25	7	123.5	140	39.3	33.4
5	O-31	113	27	8	125	141.6	39.7	34.8
6	O-3411	114	27	7	122	156	42.1	34.3
7	O-2757	112	26	7	125	165	42.2	34.8
8	O-3398	112	27	6	125.5	150.2	40.9	34.7
9	O-3407	111	26	6	122.5	164.7	39	34.7
10	O-3406	111	28	6	127.5	169,4	42.4	36.2
11	T-3377	110	28	7	130.3	170,1	41.8	36
12	T-3378	111	29	8	130.2	175.5	42.8	35.5
13	T-3379	110	28	8	132.1	180	42.4	36.2

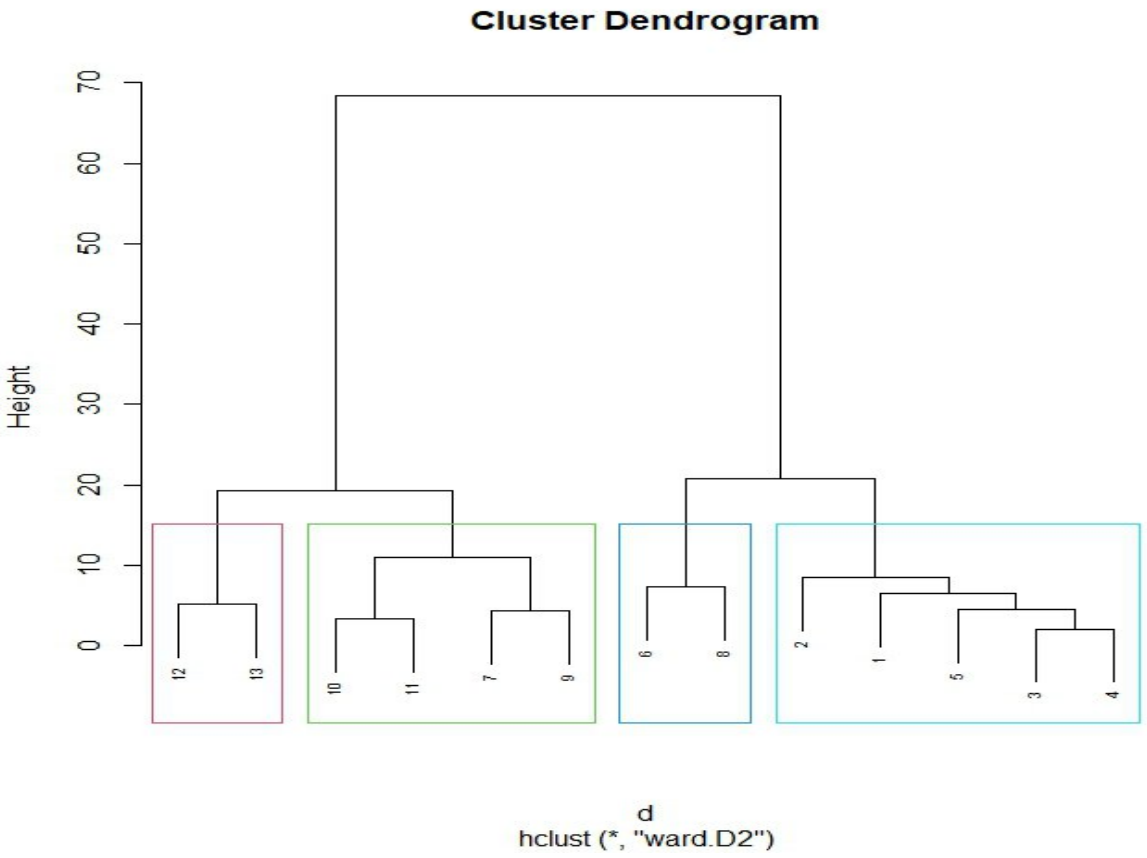

Figure 1. Cluster dendrogram of families and lineages

Based on the cluster dendrogram of cotton families and lines, they were tabulated into clusters according to economic traits. In this table, numbers of families and lineages by cluster numbers, families and lineages combined into clusters are presented (see Table 2).

2-table Cotton families and ridges on valuable farm signs separation into clusters

Number of clusters	Number of families and ranges	Clustered families and lineages
1.	1; 2; 3; 4; 5;	O-28, O-27; O-25; O-31
2.	6; 8;	O-341; O-3398
3.	7; 9;	O-2757; O-3407
4.	10; 11;	O-3406; T-3377
5.	12; 13	T-3378; T-3379

Therefore, the grouping of families and lineages by clusters provides an opportunity to combine them by valuable economic traits.

CONCLUSIONS

In conclusion, it should be noted that in relation to the correlation between productivity per plant and the weight of cotton in one boll, O-26 from the families based on pair hybridization, O-2757 and O-3406 from the families obtained by the composite hybridization method, in all the lines created, that is, T-3377, T -3378 and T-3379 lines have a strong correlation;

the correlation between the length of the fiber is weakly positive correlation of O-28, O-27 and O-26 based on pair hybridization and O-3407, O-3406 from composite hybridization based families, weak positive correlation of all generated lines;

O-25 from families based on pair hybridization with 1000 seed weight, families based on composite hybridization, and all lines created weakly positive correlations;

according to the correlative relationship between fiber length and fiber yield, families O-26, O-31, families based on pair hybridization, families O-3411, O-2757, O-3398, O-3406, families based on composite hybridization, weak positive correlations in all the generated lines;

in the relationship between fiber yield and weight of 1000 seeds, O-28, O-26, O-31 from families based on pair hybridization, families O-3411, O-2757, O-3398, O-3406 from families based on composite hybridization, weak in all the created lines however, positive correlations are observed, and it is appropriate to use them as starting material in future genetic-selection studies.

Grouping of families and lineages into clusters provides the opportunity to combine valuable economic traits.

REFERENCES

1. Kholmurodova G.R., Rasulov I.M., Joraev S.T., Toreev F.N. Cotton genetics, selection and seed production. Textbook Lesson press publishing house. Tashkent, 2021. 330 p

2. Kholmurodova G.R., Namazov Sh. E., Mirkhomidova N.A., Matyakubov S.K. Yusupov A.Kh., Rustamov N.S. Mashrapov H.T. Analyzing formation of fiber the length of selection materials created by means of several types of hybridization methods in breeding G. Hirsutum L. Varieties. European Journal of Molecular & Clinical Medicine ISSN 2515-8260 Volume 8, Issue

1, 2021.R.1316.
3. Juraev, S. T. (2022). Changes in the weight of raw cotton in one box in varietary cotton hybrids. Spectrum Journal of Innovation, Reforms and Development, 10, 18-21.
4. Jurayev, S. T. (2022). Yield of cotton lines in different climatic-soil conditions of Uzbekistan. International Scientific Journal Theoretical & Applied Science, 11(1), 310-313.
5. Xolmurodova, G. R., Tangirova, G. N., Jo'rayev, S. T. (2022). Селекция и семеноводство сои. LESSON PRESS, 1(1), 88.
6. Jo'rayev, S. T., Xudarganov, K. O. (2022). Qishloq ekinlari urug‘chiligi va urpug‘shunosligi. LESSON PRESS, 1(1), 167.
7. Jo'rayev, S. T. (2022). Go'za seleksiyasi va urug'chiligi. LESSON PRESS, 1(1), 288.
8. Jo'rayev, S. T., Ashurov, M., Narmatova, G., Toreev, F., Akhmedov, D., Mavlonova, N., Ergashev, J., Baratova, A. (2022). Cotton breeding and seed production. LESSON PRESS, 1(1), 224.
9. Jo'rayev, S. T. (2022). G‘o‘zaning introgressiv duragay va tizmalirning O‘zbekistondagi xar xil tuproq sharoitlarda bo‘lgan adaptiv patinsolidan foydalanish. LESSON PRESS, 1(1), 211.
10. Jo'rayev, S. T. (2022). G‘o‘za genetikasi. LESSON PRESS, 1(1), 96.
11. Jo'rayev, S. T., Ergashov, J. A. (2022). Moyli ekinlar seleksiyasi va urug‘chiligi. LESSON PRESS, 1(1), 120.
12. Жураев, С. Т. (2022). Оценка волокна гибридов хлопчатника, выращенных в различных регионах Узбекистана. Министерство сельского хозяйства и продовольствия Республики Беларусь учреждение образования «Гродненский государственный аграрный университет», 1(52-55), 5.
13. Djonibekova, NE, Jo‘raev, ST, Inoyatova, MH (2022). Effect of bap concentration and content of food environment on “in vitro” regeneration of rizamat (vitis vinifera l) cultivar. European Journal of Agricultural and Rural Education (EJARE), 3(2), 75-78.
14. Joraev, S. T., Ismoilov, A. A., Dilmurodov, Sh. D. (2022). Yasmiq nav va tizmalarining o’suv davri. Xorazm Ma’mun Akademiyasi, 22(6), 5-11.
15. Joraev, S. T., Raimova, D. (2022). Взаимосвязь периода вегитации линий хлопчатника с Некоторыми хозяйственно-ценными признаками в зависимости от регионов возделывания. Tafakkur manzili ilmiy-uslubiy jurnali, 1(1), 4-14.