第 48 卷第 10 期
2021 年 10 月

湖南大学学报（自然科学版）
Journal of Hunan University（Natural Sciences）

Vol. 48. No. 10.
October 2021

Open Access Article

SCIENTIFICALLY BASED QUALITY CONCEPT OF SEEDING SEEDS OF VARIETIES GOSSYPIUM HIRSUTUM L. IN UZBEKISTAN

Abdujalil Narimanov
Institute of Genetics and Experimental Plant Biology, Academy of Sciences of the Republic of Uzbekistan, Uzbekistan.

Abdulakhat Azimov
Institute of Genetics and Experimental Plant Biology, Academy of Sciences of the Republic of Uzbekistan, Uzbekistan.

Anna Shodmanova
Institute of Genetics and Experimental Plant Biology, Academy of Sciences of the Republic of Uzbekistan, Uzbekistan.

Veronika Kim
Institute of Genetics and Experimental Plant Biology, Academy of Sciences of the Republic of Uzbekistan, Uzbekistan.

Gulruza Rustamova
Institute of Genetics and Experimental Plant Biology, Academy of Sciences of the Republic of Uzbekistan, Uzbekistan.

Abstract. This article speaks of the need for specific soil and climatic conditions to study in more detail the degree of variability of the properties of seeds and their conjugation. It is especially important to establish the nature of the relationship traditionally taken into account in the selection of linear dimensions and the mass of the seed. It is necessary to correctly distinguish the process of germination associated with qualitative changes in the seed, with the period of germination, i.e. the duration of certain transformations. With a single process of seed development during their sorting (calibration), one controlled parameter is insufficient, which does not allow the selection of biologically more valuable seeds. According to the qualifications of ISTA (International Association for the Control of Seed Quality), the end of the seed germination process in the physiological sense is the appearance of a root (pecking); in the control-seed analysis - the development of the root and cotyledons to a state that makes it possible to judge the ability of the seed to produce a healthy plant under favorable conditions; in agronomic - the emergence of seedlings.

抽象的。本文谈到需要特定的土壤和气候条件来更详细地研究种子特性及其结合的可变程度。建立传统上在选择线性尺寸和种子质量时考虑的关系的性质尤为重要。有必要正确区分与种子质量变化相关的发芽过程、发芽期，即某些转化的持续时间。在分选（校准）期间种子

Received: August 12, 2021 / Revised: September 08, 2021 / Accepted: September 30, 2021 / Published: October 10, 2021

About the authors：Abdujalil Narimanov

Corresponding author- Email:

发育的单一过程中，一个受控参数是不够的，这不允许选择更具生物学价值的种子。根据ISTA（国际种子质量控制协会）的资格，生理意义上的种子萌发过程的结束是出现根（啄）；在对照种子分析中 - 根和子叶发育到可以判断种子在有利条件下生产健康植物的能力的状态；在农艺方面 - 幼苗的出现。

1 Introduction

Increasing the yield and quality of cotton and other crops products largely depends on the quality of seeds of zoned varieties. The cotton seed, like the seeds of other plants, is a living organism, from the embryo of which the future plant develops. The seed is the carrier of all biological, economic and varietal properties of the plant [12, 17].

The use in the seed business of the links between the physical properties of cotton seeds and their biological usefulness is important for improving the methods of selection of high-quality seed material [8].

This problem attracts both the mechanism of synthesis and accumulation itself - both the factor of their vitality and the mechanism of seed germination due to the nutrients accumulated in the seeds [3].

The main mechanism for the synthesis of organic substances in plants is photosynthesis, which occurs mainly in leaves, stems, inflorescences, fruits and immature seeds.

“The process of building fruit, ie. of seeds proper by plants is the most difficult and most important period in the life of an organism, during which most of the other functions of the life process of a plant either temporarily stops completely or greatly slows down in their functions ”- emphasized I.V. Michurin.

Only after completing development and receiving the necessary supply of nutrients from the mother plant, the seeds are separated from it and enter on an independent life path.

Good development, healthy and proper vigor of the mother plant determine the normal formation of seeds and their good quality [7, 18].

Therefore, a high culture of seed fields, ensuring the production of healthy, strong and productive seed plants, biologically consonant with the process of evolution from lower plants to higher ones is a powerful step in the same direction [11].

Scientists Strona I.G., Prikladov N.V. proposed a scientific development linking the external controlled parameters of seeds with the internal processes of their germination due to accumulated nutrients [9, 13].

Earlier studies to determine the relationship of the size and weight of seeds with their sowing and yield properties were not always confirmed in practice [5].

This relationship was denied, and the main distinguishing feature of full-fledged seeds was proposed to consider not the size, but their ratio [6].

This inconsistency is explained by the fact that low-quality seeds are often found in the large fraction, and full-value seeds among the relatively small ones [10, 16].

Regarding the smallest seeds, most researchers and practitioners adhere to the same point of view, the most recognized is the use of a mixture of medium and large seeds for sowing, besides, they fully reflect the biological characteristics of the variety [9, 15].

However, its compromise is quite obvious, which indicates the need for further improvement in the selection of more complete seeds. According to GOST 20290-74 “Seeds of agricultural crops.

Determination of the sowing qualities of seeds. Terms and definitions, it follows that completed seeds are seeds that, when fully ripened, have reached the form, with the maximum expression of all structures, characteristic of the variety, line and hybrid ".

It is known from earlier works that the length, width and thickness of seeds have an unequal correlation with their mass and completeness: the smallest is the length, the largest is the thickness [2].

Among the reasons - the violation of the relationship between the size and weight of seeds with indicators of their biological usefulness, one can indicate the degree of seed fulfillment [14, 19].

By the beginning of the opening of the capsule, the seed reaches the so-called morphological maturity, but does not yet have good germination energy and germination. Full maturity of the seed, when it will have a high degree of viability and germinate normally, occurs after a certain period of post-harvest ripening, which is called the dormant period. The duration of the dormant period depends on the varietal characteristics and conditions in which the seeds developed and matured on the mother plant, as well as on the storage conditions of the seed after harvesting it from the field. It can last anywhere from a few days to one to two years. During this period, physiological and biochemical processes take place in the seeds, as a result of which they acquire full maturity and readiness for germination [1, 3].

2 Materials and methods

The researches of Gossypium Hirsutum L. varieties have been carried out according to the rules of ISTA (International Seed Control Association). ISTA was founded in 1924 with the aim of developing and publishing standard procedures for seed quality control.

Also, sowing properties - a set of signs characterizing the suitability of seeds for sowing was determined by sampling seeds and analyzing according to UzGovSt 1080: 2005 raw cotton seed and cotton seeds sown. Sampling methods and UzGovSt 1128: 2006 sowing cotton seeds. Germination methods.

3 Results and Discussion

As a result of our research, the ratio of some elements of the seed in% depending on the size of the seed was determined.

Reserve nutrients are in the seeds in the form of a special formation - endosperm and perisperm, or are part of the embryo - its cotyledons.

Regardless of the place of deposition of reserve nutrients, they make up 80 - 90% of the total mass of the seed. The ratio of some elements of the seed in % (per cent) is shown in Fig. 1.

As can be seen from Fig. 1, the ratio of the elements of the seed (seed coat, bud and cotyledon) of cotton is described depending on their size (large, medium, small). The larger the seed, the greater the number of elements in the seed. Such elements as seeds, seed coat, bud and cotyledons in large seeds are (6.8; 0.9 and 93%), in medium seeds, respectively (7.7; 1.0 and 91.2%), in small seeds - (8.3; 1.2 and 90.3%).

The establishment of the physiological usefulness and vitality of the completed cotton seeds made it necessary to develop methods that would allow for the mass selection of such seeds.

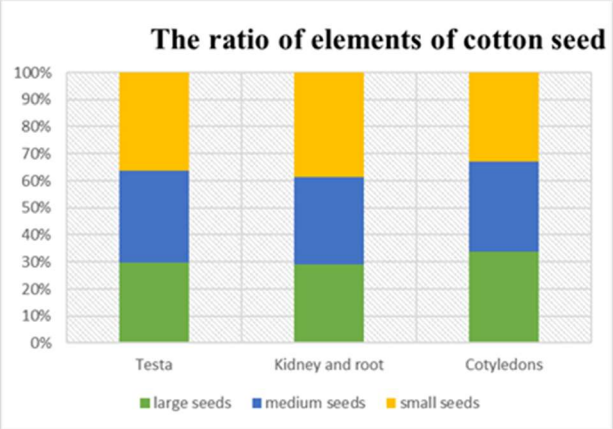
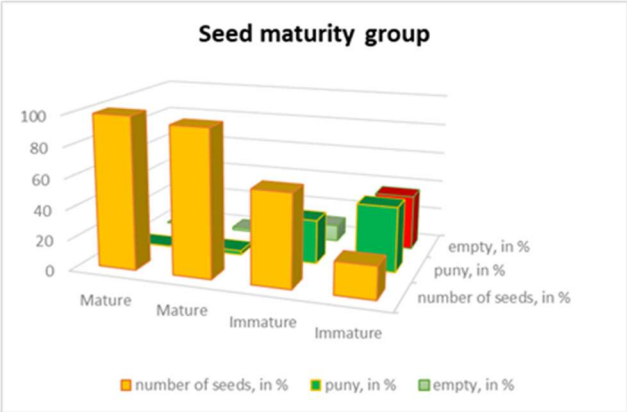


Fig. 1. The ratio of some elements of the seed in %

On the basis of the results of laboratory - field experiments, a direct dependence of the fulfillment of seeds on their maturity was noted, Fig. 2.

The main criterion for the viability of seeds during their ripening is maturity. It is different depending on the early maturity of the variety, mineral nutrition and water regime.



Rice. 2. Fulfillment of cotton seeds depending on from their maturity

Fulfillment was determined by cutting the seeds and dividing them by eye into four groups according to the degree of nucleus formation by maturity groups.

Among the mature seeds of the first and second maturity groups, with a normally developed and intensely colored stratum corneum, there are those in which the embryo is underdeveloped or not developed.

As can be seen from Fig. 2. in the first group of anger, the number of mature seeds was 99.4%, of which 0.2% were puny and 0.4% were empty. In the seeds of the second group, these were shown to be (95.5; 2.6 and 1.9).

In the seeds of the third group of maturity, more than half of the seeds are fulfilled and capable of germination. The number of mature seeds was 60.3%, puny 28.8% and empty 10.9%.

In the fourth group of fulfilled seeds, only one fifth, the rest are puny and empty, respectively (21.2; 42.5 and 36.3) are not capable of germination.

The selection of seeds according to their weight and fulfillment showed significant advantages of the latter method. In this regard, three degrees of fulfillment have been established: well- fulfilled, medium-fulfilled, and puny.

Puny - these are seeds that are insufficiently fulfilled, unnaturally shriveled due to unfavorable conditions for their development.

The general biochemical composition of cotton seeds is given depending on the degree of maturity,% (according to M.K. Aleksandrov). According to the degree of maturity, cotton seeds are divided into mature, immature and unripe, you can see this from fig. 3.

As can be seen from Fig. 3.in mature seeds, such indicators as (weight of 1000 seeds, omission, kernel, husk, oil, protein, fiber, ash) were (117.9; 16.9; 51.3; 48.7; 23.2; 19 , 6; 24.2; 3.9). In unripe seeds, the indicators corresponded to: (89.2; 17.7; 40.3; 59.7; 19.0 18.2; 18.2; 23.4; 4.0). This composition in immature cotton seeds was (48.7; 19.7; 28.6; 71.4; 3.8; 13.7; 28.8; 4.0).

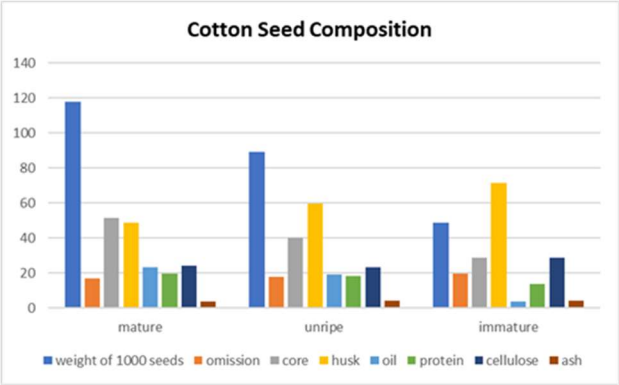


Fig. 3. The composition of cotton seeds, depending on the degree of maturity,%

In our studies, 25% were allocated to the best and worst fractions, and 50% to the average. Consequently, this explains the different quality of seeds in terms of fulfillment, which also correlates with the absolute weight. With an increase in the maturity coefficient of seed cotton, the absolute weight of seeds increases depending on their maturity, you can see from Fig. 4.

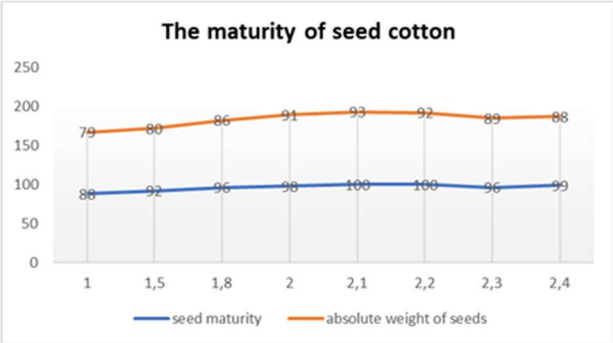


Fig. 4. Dynamics of seed maturity and their absolute weight depending on the maturity of seed raw cotton

The indicator of seed fulfillment shows the conditions for their growing, makes it possible to compare the conditions of individual years (even if a crop was obtained with the same mass of 1000 seeds), to reveal the reaction of crop varieties to growing conditions, etc. This method is suitable for all crops and gives much to the agronomist and researcher.

We present data on seed fulfillment (%) as the cotton capsule ripens by day, Fig. 5.

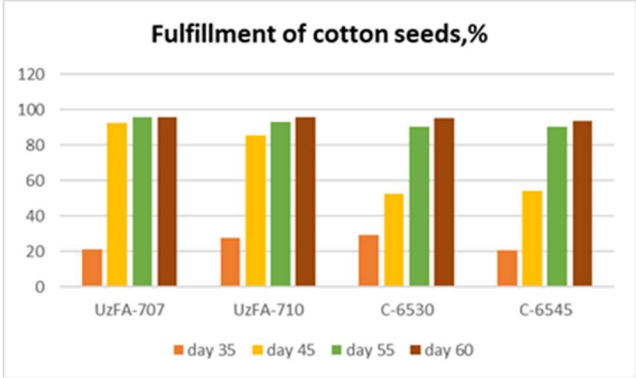


Fig 5. Seed Fulfillment (%) depending on the ripening of the cotton capsule (day)

Analyzing the data in Fig. 5, it can be seen that, depending on the cotton variety, according to the seed fulfillment%, the varieties UzFA-707 and UzFA-710 stand out as the capsule ripens, so on the 35th day it was (21.4 and 27.9%), on the 45th day (92.5 and 85.7%), on the 55th day (96.0 and 93.3%), on the 60th day (96.0 and 95.6). The smallest movements were observed in the C-6545 variety, respectively (20.9; 54.1; 90.5; 93.5).

It is impressive that comparatively larger seeds require less moisture during germination, swell at a more rational rate, guarantee a high yield, at the same time they are more resistant to unfavorable conditions [8, 10].

After fertilization, the ovary grows intensively, reaching its maximum size within three weeks. But in such a capsule, the seeds are not yet formed. This process takes place over the next six weeks.

According to A.A. Narimanov. [9, 11], a capsule with valves grows up to 45 days, raw up to 45-55, valves up to 25, 1000 seeds weight up to 55, seed peel up to 60, embryo - 55 days.

We determined that an increase in the weight of seeds in cotton varieties in grams as the capsule ripens by day, it you can see from fig. 6. The largest mass of seeds (g / day) was in the varieties UzFA-710 and S-6530 (on days 30, 35, 40, 45, 55 and 60), it was (63.2 and 63.5; 63.5 and 64.5; 84.6 and 87.2; 100.4 and 95.8; 104.6 and 105.7; 116.0 and 117.1 and 119.8 and 122.8 g). And the smallest indicators were in the C-6545 variety, respectively (59.0; 62.9; 82.6; 93.8; 101.2; 103.5 and 104.3 g). Accordingly, the weight of the seeds increases with the maturation of the cotton capsule.

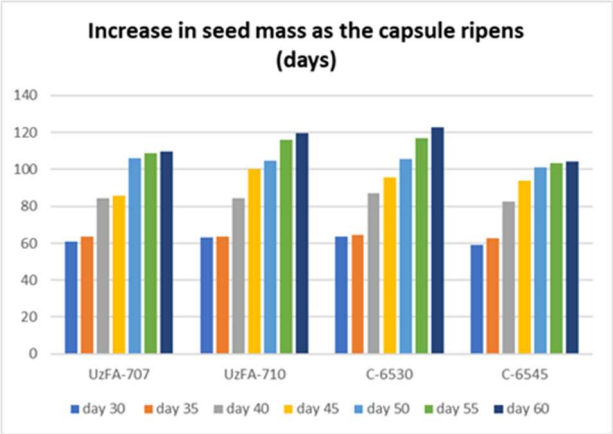


Fig 6. Increase in the mass of seeds (g) depending on the ripening of the cotton boll (days)

Under unfavorable soil and climatic conditions of growth, typical for the variety, plants fully mobilize their capabilities and form seeds with the maximum possible length, width and thickness. Thus, the largest seeds are obtained with 100% fulfillment.

To determine the fulfillment of seeds, you can take the ratio of the mass of 1000 pieces. seeds by lot to weight 1000 pcs. seeds of the largest fraction as determining the sufficient limit of seed fulfillment. The seed is suitable for sowing if the seed volume is at least 60%.

With a comparative characteristic of seed lots of equal value in terms of controllable parameters, their differentiation in quality at a number of ginneries is possible in terms of the percentage of seed completion.

For scientific research, a simple technique is applicable for determining the fulfillment of seeds through the ratio of the cross-sectional area to the area of a circle, the diameter of which is equal to the width of the seed, it you can see from fig. 7.

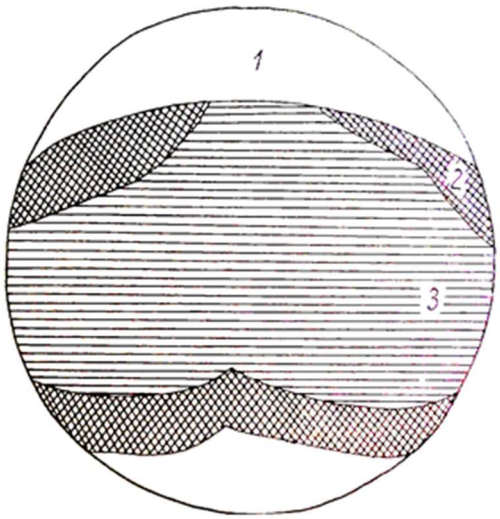


Fig. 7. Cross-sectional area of the seed. 1 - a circle with a diameter equal to the width of the seed, 2 - well fulfilled seed, 3 - puny fulfilled seed.

Thus, there is a single process of seed development, which can be characterized by the degree of fulfillment.

The implementation of these proposals requires the creation of fundamentally new means of separation and revision of the traditional technology of sorting (calibrating) seeds.

With a single process of seed development during their sorting (calibration), one controlled parameter is insufficient, which does not allow the selection of biologically more valuable seeds.

A sorting principle is needed that allows to select from a seed lot not some fraction by length, thickness or width, but that part of the seeds that will provide the highest plant productivity.

It is known that within a seed lot there are seeds with different ratios of length, width and thickness.

The general rule for all parties is the excess of the length in comparison with the other two parameters. According to the ratio of thickness and width - parameters, taking into account the sizes on which most sorting (calibration) methods are based, two fractions of seeds are possible: with a predominance of width over thickness and thickness over width.

This will allow us to introduce a new indicator - sorting index (I) - the ratio of the thickness of the seed (a) to its width (b). It can be equal to 1, more or less than it:

I> 1 - sorting (sizing) by thickness;

I<1 - sorting (sizing) by thickness;

I = 1 - in both sizes.

4 Conclusion

In connection with the above, it is necessary in specific soil and climatic conditions to study in more detail the degree of variability of the properties of seeds and their conjugation. It is especially important to establish the nature of the relationship traditionally taken into account in the selection of linear dimensions and the mass of the seed.

It is necessary to correctly distinguish the process of germination associated with qualitative changes in the seed, with the period of germination, i.e. the duration of certain transformations.

According to the qualifications of ISTA (International Association for the Control of Seed Quality), the end of the seed germination process in the physiological sense is the appearance of a root (pecking); in the control-seed analysis - the development of the root and cotyledons to a state that makes it possible to judge the ability of the seed to produce a healthy plant under favorable conditions; in agronomic - the emergence of seedlings.

Consequently, where all stages of the corresponding laboratory analyzes are coordinated and on their basis the appropriate sorting of seeds is carried out, the effect of the action of the control and seed service when selecting a high-quality seed pool for sowing is obvious..

References

1. Gulyaev, R.A., Lugachev, A.E., Usmanov, Kh.S., The current state of production, processing, consumption and quality of cotton products in the leading cotton-growing countries of the world. Tashkent: "Paxtasanoat ilmiy markazi" AA, (2017).
2. Gulyaev, R.A., Kadirov, J.Dj, Lugachev, A.E., Mardonov, B.M., Nazirov, R.R., Akhmedov, A.A., Kamalov, N.Z., Borodin, P.N., Uzbek cotton: competitive advantages and achievements in cotton scince. International Cotton Conference Bremen 2016, Cotton: connecting high tech and nature. Materials of the International Cotton Conference Cotton: Combining High Technologies and Nature. Germany. Bremen Bremen Cotton Institute, 16-18 March, (2016).
3. Jen, R.K., Amei, R.D., What is germination? Physiology and biochemistry of seed germination dormancy. Moscow, Kolos, (1982).

4. Jabborova, D.P., Narimanov, A.A., Enakiev, Y.I., Davranov, K.D., Effect of bacillus subtilis 1 strain on the growth and development of wheat (Triticum aestivum l.) under saline condition. Bulgarian Journal of Agricultural Science, 26(4), (2020).
5. Jabborova, D., Wirth, S., Kannepalli, A., Narimanov, A., Desouky, S., Davranov, K., Sayyed, R., El Enshasy, H., Abd Malek, R., Syed, A., Bahkali, A., Co-inoculation of rhizobacteria and biochar application improves growth and nutrientsin soybean and enriches soil nutrients and enzymes. Agronomy. Multidisciplinary Digital Publishing Institute, 10 (8), (2020).
6. Illy, I.E., The supply of storage substances from the endosperm to the axial part of the germinating embryo. Biochemical and physiological studies of seeds, Irkutsk. (1979).
7. Kim, V., Narimanov, A., Mavlyanova, R., Formation of A High-Quality Crop of Vegetable Soybeans with Repeated Cultivation On Gray-Soil Soils of Uzbekistan. International Journal of Academic Research in Business, Arts and Science, 2(9), 2020.
8. Kim, V.V., Narimanov, A.A., Increasing the productivity and quality of vegetable soybeans in using various growth stimulants in Uzbekistan. International journal of innovations in engineering research and technology. Novateur publications International journal of innovations in engineering research and technology, 7(12), (2020).
9. Narimanov, A., Azimov, A.A., Kim, V.V., Environmental sustainability assessment of cotton varieties of Uzbekistan bred. International Journal of Botany Studies, 5(5), (2020).
10. Narimanov, A., Gaibullaev, N., Early maturity and productivity of new mid-season varieties of cotton in the state variety areas of the republic: State of selection and seed production of cotton and prospects for its development: Proceedings of the international. Scientific-practical conferences. Tashkent, (2006).
11. Narimanov, A.A., High seed vitality as the most important factor in their full germination. Monograph. From Fan. Academy of Sciences of the Republic of Uzbekistan, (2000).
12. Prikladov, N.V., Growth strength of plant seeds. Abstract of thesis. Dis.doc. biol. sciences. Tomsk. (1962).
13. Sirojidinov, B.A., Abdullayev, A.. Sherimbetov, A.G., Narimanov, A.A., Omonov, B.A., Tolerance of New Introgressive Hybrid and Backcross Forms Pathogenic Micromitisms (Verticillium dahliae Kleb and Fusarium oxysporum f.sp. vasinfectum). American Journal of Plant Sciences, 9(6), (2018).
14. Rashidova, D.K., Shpilevsky, V.N., Improving the definition of the quality of sowing seeds of agricultural crops. Monograph. Tashkent, (2017).
15. Rozmetov, K. S., Obtaining high-quality and uniform cotton seeds for precise seeding, Technical sciences in Russia and abroad: materials of the I International. scientific. conf. Moscow: Your printing partner, (2011).
16. Simongulyan, N.G., Mukhamedkhanov, S.R., Shafrin, A.N., Cotton genetics,

selection and seed production. Mekhnat Publishing House, (1987).

17. Strona, I.G., Methods for studying the growth force of crop seeds. Moscow, Kolos, (1964).
18. Khasanov, R.K., Narimanov, A.A.., Gubanova, N.G., Sadikova, Z.Y., Investigation of the genetic basis of salt tolerance in cotton. Journal European science review, 2 (2019).
19. Yunuskhanov, Sh., Abdurazakova, Z.L., Kurbanbaev, I.Dj., Narimanov, A.A., Azimov, A.A., Protein markers in cotton species G. hirsutum L., G. barbadense L. and their correlation with various characters. Journal European science review. 2 (2019).