New, Prospective Cotton Variety "Niyat" in Soil-climatic Conditions of Khorezm Region and Its Valuable Economic Characters

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Abstract: This article provides information on the valuable economic characters of the new and prospective variety of cotton "Niyat", which is fast-ripening, fertile, resistant to diseases and pests, with fiber type of IV and V, and adapted to various extreme conditions of the Khorezm region.
The weight of cotton in one bale was found to be an average of 6.2–6.4 grams over the years of observation, an average of 0.4–0.7 grams higher than that of the control navigator. The weight of 1,000 seeds averaged 122–126 grams over the years of the study, which was found to be 8–11 grams higher than the control navigation. Fiber lengths ranged from 33.3 and 35.1 mm, with an average of 34.0 mm. During the years of the study, it was found that the fiber yield of the Niyat variety averaged 40.5%, which is 2.1% higher than the control variety. In the future, it has been proved that the Niyat cotton variety can be used as a starting material for future research on the creation of new ridges and varieties of cotton that are suitable for the soil and climatic conditions of Khorezm region and suitable for double sowing.

Keywords: New, prospective cotton varieties, soil and climatic conditions of the Khorezm region, technological indicators of fiber quality, micronaire, fiber homogeneity index; weight of 1000 seeds.

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1. Introduction

Cotton is grown in around 105 countries and total cotton production during 2018–2019 was 71.02 million tons. India, China, United States of America, Brazil, Pakistan, Turkey, Uzbekistan, Australia, Greece and Benin are the top ten producers (Ishwarappa S. et al. 2020).

Cotton (Gossypium hirsutum L.) is an indeterminate crop. It is grown primarily for fiber (Constable and Bange 2015). Planting density is an important controllable factor in cotton production and has been paid more attention recently (Li et al., 2015; Zhi et al., 2016; Khan et al., 2017). A promising but challenging approach to improving its phenotypes is interspecific introgression, the transfer of valuable traits or genes from the germplasm of another species such as G. barbadense, an important cultivated extra long staple cotton species (Peng Wang et al. 2012).

As a result, on March 10, 2022, the Cotton Campaign ended its call for a global boycott of cotton from Uzbekistan and lifted the Uzbek Cotton Pledge (https://www.cottoncampaign.org/uzbekistan).

No significant success can be achieved without increasing productivity in cotton growing, as in all agricultural production areas. In particular, the development of selection and breeding gives good results in this regard (Abbas A. et al. 2015).

Ramstein et al. (2019) divided the plant breeding process into four phases: Breeding 1, selection using unknown loci; Breeding 2, selection using controlled crosses; Breeding 3, MAS; and Breeding 4, ideotypebased selection and transformation. Breeding 4 is the phase in which new technology is applied, including DNA sequencing, transformation and gene editing, with the aim of detecting causal variants as precisely as possible for breeding applications.

The development of insect resistant cotton cultivars is one of the most effective measures in curtailing the yield losses. Considering the role of morphological and biochemical host plant resistance (HPR) traits in plant defense, 12 cotton genotypes/varieties were evaluated for leaf area, leaf glanding, total soluble sugars, total soluble proteins, total phenolics, tannin and total flavonoids against fluctuating populations of whitefly, thrips and jassid under field conditions (Rizwan Muhammad et al. 2021).

Thirty stable Quantitative trait loci (QTLs) were detected, in which more than a half were detected in the At subgenome (Magwanga et al. 2020).

A total of 96 diferent genotypes of upland cotton (Gossypium hirsutum) were selected from the breeding material and germplasm available at CCS HAU, India, to fnd the novel marker-trait associations for morphological traits used for registration of variety in upland cotton (Pawan Kumar et al. 2021).

To dissect the genetic basis of response to salinity stress, a recombinant inbred line population was developed to compare fiber quality in upland cotton (Gossypium hirsutum L.) under salt stress and normal conditions. Based on three datasets of (1) salt stress, (2) normal growth, and (3) the diference value between salt stress and normal conditions, 51, 70, and 53 QTL were mapped, respectively (An-hui Guo et al. 2021).

The synthetic and natural upland cotton accession PIL 43 differed from each other for several morphological characters. Synthetic possessed a characteristic petal spot, petal margin colouration, filament colouration and was devoid of trichomes on different plant parts (stem, leaves, petioles and bracts) (Suruchi Vij et al. 2020).

It is known that cotton is mainly enriched on the basis of quantitative characteristics; the selection of valuable economic traits, i.e., forms with fast ripening, yield, number of bolls, seed weight and other indicators, as well as the appropriate selection of their hybrids. These traits are polygenic in nature and are complexly inherited. The study of the degree of inheritance of quantitative traits is of particular importance for practical selection (Djanibekov U. et al. 2018).

Breeding earlymaturity cotton with high yields and high-quality crops is sharply constrained by the genetic complexity of the early-maturity trait (Chengqi Li et al. 2020).

In the cotton fields of the Republic of Uzbekistan, primarily two cotton varieties, medium-fiber (Gossypium hirsutum L.) and fine-fiber (G. barbadense L.), are grown. Although fine-fiber cotton varieties are characterized by high fiber quality. And, cotton varieties belonging to this species are adapted to hot climates and are grown only in the southern regions of the country. At the same time, the fertility and fiber yield are also slightly lower than for medium-fiber cotton varieties.

In the Khorezm region, which is one of the northern regions of Uzbekistan, cotton is grown on an average of 45-50% of the total area, which is more than other crops (Tischbein et al. 2013).

2. Materials and Methods

The aim of the research is to study the processes of formation, stabilization, and preservation of morphological characteristics of the L-171-K ridge in the generations, created by targeted replication in populations selected by the method of paired hybridization of *G.hirsutum L.*, as well as to study the adaptability of the prospective *Niyat* variety, which was brought to the level of a new variety on the basis of this ridge, to the soil and climatic conditions of the Khorezm region, through the cultivation and implementation of elite selected seed into production.

Through the methods of hybridization in selection and population analysis of genetics, the fiber quality indicators have been determined with a modern HVI (High Volume Instrument) device at the State Unitary Enterprise "Service Center in the Agro-Industrial Complex" under the Inspectorate for Agro-Industrial Complex and Food Safety.

2.1 Soil and climate conditions of the Khorezm region.

The Khorezm region is situated in the northwest of Uzbekistan, between the Kyzyl-Kum and Kara-Kum deserts. Its geographical area is located at a width of 60.05 and 61.39 to the east and 41.13 and 42.02 to the north, about 230 km away from the present shores of the Aral Sea. The area is 112-138 m above sea level on average. The total field area of the Khorezm region is 6.3 thousand km^2, of which about 2.6 thousand km^2 is irrigated land (Conrad C. et al. 2007).

The climate is dry and continental due to the fact that the Khorezm region is located in the desert and semi-desert regions of Uzbekistan. The average annual temperature is 12.3–12.4°C and the relative humidity ranges from 37–78% all year. According to the forecast of the regional chief hydro meteorological center, the highest temperature is in May-August with the heat reaching 42–44°C above zero, and the coldest days are in December–January with a temperature of -29–32°C below zero. Such a drop in temperature is due to the influx of cold air through the wind. The average annual rainfall in the region is 94–100 mm, the bulk of which falls in the winter and spring months. The amount of monthly transpiration mainly exceeds the amount of precipitation and averages approximately 1500 mm.

The soils of the study area, where the experiments were carried out, are alluvial-meadow and these soils make up 14.2% of the total cultivated area of Khorezm region in the lower the Amu Darya territory. They were formed in conditions of the modern delta. Groundwater is mineralized, occurring at a depth of 1-3 m. According to the agrochemical properties, the soil is characterized by ubiquitous carbonate content, weak texture, low humus content and a strong tendency to salinization. The soil is mainly medium

saline with chloride-sulfate (Abdurakhimov U. et al. 2020).

3. Results and Discussion

Research-investigation work was carried out on 8.2 hectares of farm "*Farrukh*" in the Urgench district of Khorezm region in 2018-2020 and on 3.5 hectares of land of the elite seed farm "*Solay Yakubov*" of the first propagation of seeds in Khanka district. The Khorezm-127 variety of cotton was selected as a control variety. It is grown in large areas in the Khorezm region.

The annual rate of pure nitrogen fertilizer per hectare of feed was 285 kg per hectare, and was given 3 times during the growing season (35% before sowing, 37% during the leaf phase, and 28% during the flowering phase). A total of 230 kg of phosphorus fertilizer was applied, with 60% applied before sowing and 40% applied during the leaf phase.

It was observed that the yield of the *Niyat* variety compared to the control variety Khorezm-127 was 3.1 c/ha in 2018, 3.5 c/ha in 2019, 2.7 c/ha in 2020, and over the years, the average yield was 3.1 c/ha, and the average yield was 39.1 c/ha in the 'Farrukh' farm of Urgench district. The cotton-plant height ranged from 113-117 cm, with an average of 115 cm in 2018-2020. According to Yogesh G. Ban (2015) the fiber quality parameters, viz., 2.5 % span length, uniformity ratio, micronaire value, fiber strength, elongation and fiber maturity exhibited significant decline under late sowing. Braunack et al. (2012) reported that delayed planting resulted in decline in fiber length and micronaire. The growing period of *Niyat* was 118–123 days, and 121 days on average. Over three years, the weight of cotton fiber in one pod averaged 6.2 grams, varying by 0.2 grams, and was found to be on average + 0.3 gr. higher than that of the control variety. The weight of 1,000 seeds averaged 110 gr. over three years, which was 4.1 gr. higher than the control variety. The difference between the varieties was observed between 33.3 and 35.1 mm in terms of fiber length. The three-year data on fiber consumption averaged 39.6%, which was 1.3% higher than the control variety (Table 1).

Table 1. The Economic and Biological Features of the 'Niyat' Cotton Variety Grown in 'Farruh' A/F in Urgench District, Khorezm Region

Indicators	**Unit of Measure**	**"Niyat"**			**Average**	**"Khorezm-127"**			**Average**
		2018	2019	2020		2018	2019	2020	
Yield/ productivity	c/ha	39,3	38,8	39,2	39,1	36,2	35,3	36,5	36,0
Plant height	cm	115	113	117	115	116	114	121	117
Growth period	days	123	118	122	121	122	117	118	119
Weight of cotton in per boll	gr.	6,1	6,3	6,1	6,2	5,8	6,0	6,0	5,9
Weight of 1000 seeds	gr.	111	104	114	110	105,8	107,4	104,5	105,9
Fiber length	mm.	33,4	33,3	35,1	34,0	28,5	29,0	31,8	29,7
Fiber consumption	%	39,4	41,1	38,3	39,6	39,0	37,4	38,5	38,3

The yield of the "Niyat" cotton variety grown in the elite seed farm "Solay Yakubov" of first seed propagation in Khonka district was compared with the control variety "Khorezm-127" and it was observed that the fertility of the variety 'Niyat' was -2.5 c/ha in 2018, -2.6 c/ha in 2019, and -3.6 c/ha in 2020, an average of 2.9 c/ha higher than that of the control variety. Plant height indication fluctuated between 114-118 cm and averaged 116 cm from 2018 to 2020.The growing period of the *Niyat* variety was 117-124 days, and 121 days on average. (Table 2)

Table 2. Valuable Economic and Biological Features of the Cotton Variety 'Niyat' grown at the "Solay Yakubov" Elite Seed Farm of the First Seed Propagation in Khonka District

Indicators	Unit of Measure	"Niyat"			Average	"Khorezm-127"			Average
		2018	2019	2020		2018	2019	2020	
Yield/Productivity	c/ha	38,2	38,7	39,5	38,8	35,7	36,1	35,9	35,9
Plant height	См	116	114	118	116	115	117	120	117,3
Growth period	Day	124	117	121	121	122	116	117	118,3
Weight of cotton in a boll	gr.	6,3	6,1	6,3	6,2	6,0	5,8	6,0	5,9
Weight of 1000 seeds	gr.	110	104	114	109	107,8	108,4	108,5	108,2
Fiber length	mm.	33,3	33,4	35,1	34,0	29,0	28,5	30,8	29,4
Fiber consumption	%	39,8	41,1	40,5	39,6	39,0	38,5	37,4	38,3

The weight of cotton in a pod averaged 6.2–6.4 gr. over the years of observation, which was found to be 0.4–0.7 gr. heavier on average than that of the control variety. The average weight of 1000 seeds per research year was 122-126 grams, which was found to be 8-11 gr. more than that of the control variety. Fiber lengths ranged from 33.3 to 35.1 mm, with an average of 34.0 mm. The fiber yield of the '*Niyat'* variety averaged 40.5%, which is 2.1% higher than the control variety during the years of the study. (Table 2).

The results of the research were studied in the HVI system on quality indicators by comparing the quality of the Niyat variety and "Khorezm-127" grown in elite seed farms of "Farrukh" in Urgench district of the Khorezm region and "Salay Yakubov" in Khanka district (Table 3).

As can be seen from the data in Table 3, the micronaire of the variety "Niyat" is 4.8 high, with an average length of 28.2 mm, a specific tensile strength of 29.9 gs/tex, a uniformity index of 83.7%, a light disposal rate coefficient of 81.7%, and the yellowing rate was 8.4 in the variety grown on the farm of primary propagation of seeds of elite seed farm "Salay Yakubov" in Khonka district.

When comparing these indicators in the HVI system, it was found out that the indications of micronaire was 4.0 with a high average length of 31.7 mm., specific tensile strength was 31.1 gc/T, uniformity index was 84.5%, light disposal rate coefficient was 80.8%, and yellowing rate was 7.2 in terms of quality indicators with the control variety "Khorezm-127" variety and "Niyat" grown on the farm "Farrukh" in Urgench district.

Table 3. Economic Quality Indicators of Cotton Fiber "Niyat"

Variety	MIC	Len		Str	Unf	Rd	+b
		Inch	Mm				
	'Soliy Yakubov' a/f Khonka district, Khorezm region						
"Niyat"	4,8	1,11	28,2	29,9	83,7	81,7	8,4
"Khorezm- 127"	4,7	1,13	28,7	29,6	81,8	77,4	8,3
	'Farrukh' a/f Urgench district, Khorezm region						
"Niyat"	4,0	1,25	31,7	31,1	84,5	80,8	7,2
"Khorezm- 127"	4,6	1,17	29,72	29,6	83,7	78,9	7,2

MIC - micronaire (range 3.5 - 4.9 for 1-2 varieties);
Len - upper average length (1 inch - 25.4 mm);
Str - Specific tensile strength, (gc/T);
Unf - uniformity index;
Rd – light disposal rate coefficient, %;
+ b - degree of yellowing;

The variety 'Niyat' was distinguished by its higher yield than the control variety (38.2-40.0 c/ha), fiber staple length (34.5-35.0 mm), micro-naira (4.3-4.5), and high fiber consumption (38–40%). When the seeds of the variety 'Niyat' were propagated as a result of seed production, the cotton plants of the population retained their originality in terms of morphological characteristics, yield, and fiber quality.

4. Conclusions

The new, prospective 'Niyat' variety of cotton is adapted to the extreme (saline soils, mineralized groundwater, water deficiency, very high temperatures) conditions of the Khorezm region. This variety has four types that meet the requirements of world standards with their textile content, as well as the yield of the variety 'Niyat' is 3–3.5 c/ha higher than the control 'Khorezm–127' variety, with high quality fiber. It has been proved that the Niyat variety of cotton can be used as a main object in future research on the creation of new ranges and varieties of cotton and is suitable for double sowing in the soil and climate conditions of the Khorezm region. We recommended planting the new, promising 'Niyat' variety of cotton in large areas of cotton growing clusters and farms due to its suitability to the soil and climate conditions of the Khorezm region and the Republic of Karakalpakstan.

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The authors have no conflicts of interest to declare that are relevant to the content of this article.