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Productivity of Thin Fiber Cotton Varieties Under Conditions of Stress Factors

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Abstract: The article presents the data obtained on the study of yield and quality indicators of different thin-fibre cotton varieties. The number of crop elements, crop weight and quality indicators were determined in all varieties. Based on the mentioned results, it was noted that the above parameters change in various degrees in the section of the varieties and are related to the biological and variety characteristics of the varieties.

Keywords: cotton varieties, stress factors, high temperature, biological yield, yield quality.

Introduction

Abiotic stressors have a strong negative effect on agricultural plants, reducing plant growth and productivity. Water scarcity, soil salinity, and high temperatures are among the main causes of declining crop yields and food supplies around the world. Therefore, the study of the effects of abiotic stressors on plants and the mechanisms of stress resistance is one of the main areas of plant physiology. Mechanisms of resistance to abiotic stress also include practical aspects, such as reducing the harmful effects of stress in different ways or using native varieties adapted to combined stress as a source of genetic material [1-5].

Climate change inevitably leads to the deterioration of the ecological situation, which causes the salinization of fertile soils, resulting in a sharp decrease in the productivity of agricultural crops. Saline soils are common in many countries of the world. They cover about a quarter of the earth's surface, including half of all irrigated land, and the saline areas are expanding. In the arid climate, almost all irrigation water evaporates, and soil salinity is gradually increasing [6-10].

Abiotic stressors are a major impediment to agriculture, dramatically reducing plant growth and productivity worldwide. Future declines in agricultural crop yields will be exacerbated by global warming, increased pollution, and declining fertile land. The main challenge facing agriculture today and in the future is to increase food production for an ever-growing population in many regions of the world in a deteriorating environment. Minimizing exposure to various abiotic stressors is a common challenge [12–14].

Harmsel-prone regions experience prolonged high temperatures (39.0-47.0 ℃) due to solar heating during the summer months, and this causes the atmospheric air to dry up to 9-17% during the day. Long summer weather drought occurs. A very low level of relative air humidity causes a high level of moisture deficit in the atmosphere due to a further increase in temperature [15-16].

The lack of moisture is manifested in the form of air suction power, and atmospheric pressure, and the dry-hot light air sucks the moist air from the earth's surface, plants, and the surroundings with great force like a pump. This phenomenon occurs over a large area, and a large gap is formed due to the ascent of heated dry-light air entering the regional cloud. It causes the relatively cold, moist, heavy air masses around the dry region to shift, change direction, and move. These air masses get stronger and have a great speed, creating winds coming from the north, west and northwest. This heavy airflow pushes the hot-dry air settled in the regions around Kyzylqum and Karakum, Turkmenistan, Afghanistan, and sometimes even further away, to the east, and creates global warming winds [17-20].

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Methodology

During the research, 9 different types of thin fibre cotton were used. An increase in the daily need for nutrients, a change in the ratio of demand for nutrients, i.e., a change in the content of vital complex compounds in the assimilates formed as a result of biochemical and physiological processes, and exchange-reduction reactions in cotton were found. Significant quality changes occur in the phases of flowering, general flowering, budding, and bud maturation, and changes in the composition of complex substances formed during this period, and the ratio of elements absorbed from the soil also changes.

Results and discussion

During the period of quality changes in cotton development, for example, gross shedding of crop elements was noted. During this period, extremely high air temperature, and dry-hot wind blowing cause or aggravates the shortage of water and food elements, and interruptions in the supply of water and food may also occur. This is confirmed by the fact that in special experiments where daily water consumption was provided and macro and microelements were used, no spillage of the grain occurred. It can be mentioned that in our experiments, in the phases of gross flowering and ripening of buds, compost mixed with macro elements was used as mulch, and the number of pods was 1-2 pieces.

As one of the effective low-cost measures to protect the cotton from the "abnormal situation" occurring in July-August, we can recommend deep (45 cm) ploughing with the complete turning of the land.

During long years of tillage and crop cultivation, not only humus is present in the tillage layer, therefore, all the elements known to us are assimilated, and it was found that its freely assimilated and general form also decreases. The complex combinations of used organic, mineral fertilizers and chemical substances processed by the soil fauna were found to move, absorb and accumulate under the driving layer in the soil analysis. It was found that by softening this layer and bringing it to the surface of the earth, it is possible to enrich and increase the strength of the driving layer.

Studies on the growth, development and yield of new varieties of fine-fibre cotton, which are being planted in the southern region and are undergoing extensive testing, have been conducted.

According to this, in May-June, cotton varieties developed rapidly and 50% of the plants bloomed in 54.4-59.1 days, 17.8-20.4 pieces of crop elements were collected, including 2.7-3.2 pieces of bolls. it should be noted that it was used effectively. From the last ten days of June, the weather conditions changed, very hot days began, the air was very dry and very hot during the day, and winds at a speed of 5-10 m/s were repeated. Cotton was in the phase of flowering and bud ripening, due to the influence of the climate, cracks appeared at the seams of the bolls, and in the morning it was noted that the green, stagnant bolls were shed. In the following days (29-30.06) the spill increased and began to take on a gross appearance. From the beginning of July, the daytime temperature rose to 46.5 ℃, and warm, strong winds became active. It repeated for 5 days at a speed of 10-19 m/s and caused damage to crops. Due to the extremely high temperature lasting 11 days (23.06-04.07), cotton varieties, including thin-fibre varieties, were completely dry and shedding off bolls. In the 2nd and 3rd ten days of July, the maximum temperature increased further (38.9-45.7 ℃), and the average daily temperature was 41.2-41.4 ℃. It was observed that the rate of development of cotton varieties was significantly reduced under the influence of high temperature and heat. In July, under the influence of climate changes, 7.0-15.4 pieces (26-48%) of bolls, flowers and small bolls dried up in cotton varieties, according to the phenological data conducted on September 1, 19.7-24.2 bolls as a result of the applied agrotechnical measures were found to be preserved.

It was found that 13.0-17.1 bags were added as a result of the measures applied in July when the temperature was extremely high. The opening of 50% of pods was 97.1-103 days (on July 23-29) according to varieties.

In a short period of time, it was noted that the cotton varieties had a rapid development in June and July, a sufficient harvest (19.7-24.2 bolls), turning of bolls into bolls, ripening of bolls, and the beginning of the opening of the first bolls.

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Table 1. Yield of new varieties of fine fiber cotton. ts/ha

No	*Varieties*	*I*	*II*	*III*	*average*
2020					
1	St. Surkhan-14	37.0	36.4	37.8	37.1
2	SP-1607	38.1	39.2	40.3	39.2
3	Termiz-202	39.9	39.0	40.4	39.8
4	Termiz-208	37.6	36.6	38.0	37.4
5	Surkhan-16	36.6	37.7	38.7	37.7
6	Surkhan-18	35.5	35.0	36.9	35.8
7	Surkhan-103	32.0	31.2	33.1	32.1
8	Surkhan-106	26.2	35.4	37.0	36.2
9	ST-1651	34.0	36.3	36.2	35.5
2021					
1	St. Surkhan-14	40.2	38.8	39.3	39.4
2	SP-1607	43.5	40.4	41.4	41.8
3	Termiz-202	40.7	39.1	39.7	39.8
4	Termiz-208	41.2	39.7	40.0	40.3
5	Surkhan-16	40.6	39.0	39.7	39.8
6	Surkhan-18	39.6	38.2	39.5	39.1
7	Surkhan-103	34.1	33.3	34.6	34.2
8	Surkhan-106	40.4	39.3	39.7	39.8
9	ST-1651	38.8	37.2	38.3	38.1
2022					
1	St. Surkhan-14	36.3	34.7	36.9	36.0
2	SP-1607	37.4	36.2	37.9	37.2
3	Termiz-202	37.2	35.9	38.3	37.5
4	Termiz-208	38.0	36.6	38.5	37.7
5	Surkhan-16	36.3	35.6	36.1	36.0
6	Surkhan-18	33.5	33.7	34.8	34.0
7	Surkhan-103	29.5	28.9	30.4	29.6
8	Surkhan-106	34.1	35.2	36.0	35.1
9	ST-1651	33.2	33.0	34.0	33.4

In the proposed cotton agrotechnics, when ploughing, planting, watering, feeding and other agrotechnical measures are applied in the optimal period and norms in the conditions of dry and extremely hot climates with water scarcity, the roots deepen, and the effective use of the moisture and nutrients of the lower layers, and the vegetative and generative organs it was found that high yield, high-quality fibre and seed can be obtained in return for proper management [1-4].

32.1-39.8 tons/ha in 2020, 34.2-41.8 tons/ha in 2021, and 29.6-37.7 tons/ha in 2022 were harvested from cotton varieties. Fibre and seed quality characteristics of the obtained crop were determined (Table 2). According to it, the average fibre length of the Surkhan-14 variety was 35.1 mm. The fibre length symbol is ST-1651 grade (39.9 mm), SP-1607 grade (37.8 mm), Surkhan-18 grade (37.2 mm), Surkhan-14, Surkhan-16 grade (36.9-36 .3 mm) in other varieties is 35.0-35.7 mm, the weight of one pod is higher in Surkhan-106, SP-1607, Termiz-202, ST-1651 and Surkhan-16 varieties (3.0-3 .7 gr), it was found that it is 2.8 gr in other varieties. Seed weight (1000 seeds) SP-1607 variety (118 gr), Termiz-208 variety (117.4 gr) is high, 116.0-115.8 gr in other varieties and 115.4 gr in Surkhan-103 variety it was determined.

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Table 2. Fibre and seed of new varieties of fine fibre cotton are valuable economic indicators

No	Varieties	Fibre length, mm	Fibre output, %	Weight of 1000 seeds, gr	Weight of 1 bag, gr	According to many years of data			
						Fibre output, %	Weight of 1 bag, gr	Weight of 1000 seeds, gr	Fibre length, mm
1	St. Surkhan-14	35.1	36.9	115.2	2.8	33.6-39.8	2.6-3.4	107-124	33.6-36.4
2	SP-1607	39.8	37.8	118.0	3.5	34.0-28.2	3.3-3.7	104-125	36.4-40.1
3	Termiz-202	37.5	35.4	120.1	3.4	33.9-47.6	2.6-3.6	112-132	34.0-32.4
4	Termiz-208	38.0	35.0	117.4	3.0	34.2-44.3	2.6-3.5	114-140	34.2-39.5
5	Surkhan-16	37.0	36.3	114.3	3.0	33.9-42.0	2.7-3.3	107-126	34.1-37.7
6	Surkhan-18	38.0	37.2	115.8	2.8	33.7-37.8	2.5-3.5	114-137	34.3-38.8
7	Surkhan-103	38.2	35.4	115.4	2.8	33.7-36.1	2.3-3.5	111-125	35.5-38.7
8	Surkhan-106	37.6	35.7	116.0	3.7	33.7-36.1	3.5-4.0	113-124	35.1-38.2
9	ST-1651	39.9	35.5	116.0	2.0	34.2-39.9	3.3-4.4	113-127	33.0-40.3

Conclusion

It was found that when the agrotechnical measures mentioned above are used, the tillage and subsoil layer of the soil will not be compacted, it will be kept in an optimal amount, the tap roots and lateral roots will spread in the deep layers, and as a result of the efficient use of soil moisture and nutrients, the cotton yield and fibre and seed quality will be high. As one of the effective, low-cost measures to prevent the loss of crop elements under the influence of dry and extremely high temperatures, which is considered as an "anomalous situation" in July in Ghoza, it is recommended to completely turn the land and carry out deep (43-45 cm) ploughing in November, to give plow water in November- in December, we recommend irrigating the arable layer (0-50 cm) at the rate of moistening (1000-1200 m^3/ha), planting the seed in dry soil and watering it with seed water (600 m^3/ha). It is recommended to use the variety SP-1607, which is resistant to the extreme conditions of the southern region, as a starting source in selection and genetic research. It is recommended to continue scientific research on the studied varieties to improve specific agrotechnics for obtaining high yield and high-quality fiber from new cotton varieties with thin fibers. Also, it is recommended to accelerate the introduction of energy and resource-saving technologies for increasing cotton productivity in cooperation with clusters, farms and agricultural enterprises interested in adopting more efficient use of achievements and innovative technologies.

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