INDICATORS OF THE RESILIENCE OF FINE-FIBER COTTON VARIETIES OF GOSSYPIUM BARBADENSE L. UNDER STRESS CONDITIONS

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Annotation. This article presents some data obtained on the level of physiological changes in small-fiber cotton varieties under various stress conditions. Rising temperatures pose a serious threat to future harvests. This article shows that stress affects the yield of fine-fiber cotton varieties in different ways at the morphological, biochemical, and molecular levels. Slowing of growth and development of cotton varieties, reduced seed germination, and decreased photosynthesis rates as a result of heat stress lead to reduced yields. losses, and that such changes vary to different degrees depending on the stages of growth and development of varieties and their biological characteristics.

Key words: water supply, fine fiber cotton, varieties, moisture levels, transpiration, water regime, productivity.

Introduction. Sustainable cotton cultivation requires a clear understanding of the impact of water scarcity on cotton and the development of appropriate mitigation methods [1]. Drought affects physiological and biochemical processes in cotton, especially photosynthesis. Water stress reduces water availability and carbon uptake for photosynthesis and affects plant development [2].

One-third of the world's agricultural land suffers from water shortages. Droughts regularly reduce the yield of mesophytic crops and can exacerbate the problem of global climate change. Water stress or drought can affect reproductive growth phases, reducing agricultural productivity [3]. Salinity and drought are two of the most important environmental problems that reduce crop productivity worldwide [4,5].

Excessive salt concentration in the soil disrupts water absorption and ion balance in cotton plants, leading to ion poisoning, stunted growth, leaf burns, and reduced yields. Salt stress is one of the main factors limiting agricultural productivity in the biosphere. Salinity significantly threatens the growth, productivity, and quality of cotton fiber [6].

Research results and discussion. According to the information obtained from our scientific research, water deficiency in the soil has a negative effect on water absorption and utilization by plants and causes changes in water balance. This leads to water deficiency in cotton leaves. In addition, at high air temperatures and low relative humidity, especially in the afternoon, the water deficit in plant leaves is high, which negatively affects water metabolism in plants. Plant physiology shows that drought affects water absorption and use by plants, causing changes in water balance and water deficiency in plant organs, especially in leaves. Based on data obtained from assessing the effect of humidity on residual water deficiency in leaves, it was noted that residual water deficiency was significantly higher during flowering than during tillering and budding, under both humidity conditions for all varieties.

The residual water deficit in leaves during the flowering phase was also studied. During the flowering phase, the residual water deficit in leaves in the morning at sufficient humidity was 2.62% for the Surkhan-18 variety, 1.68% for the Termez-208 variety, 2.00% for the Termez-202 variety, 1.39% for the SP-1607 variety, and 2.87% for the Surkhan-16 variety. In the morning, under conditions of limited humidity, this indicator was 3.11% for the Surkhan-18 variety, 2.05% for the Termez-208 variety, 2.46% for the Termez-202 variety, 1.81% for the SP-1607 variety, and 3.25% for the Surkhan-16 variety. When studying the process at noon, i.e., between 12:00 and 14:00, the residual water deficit in the leaves was 2.94% for the Surkhan-18 variety, 1.86% for the Termez-208 variety, 2.46% for the Termez-202 variety, 1.69% for the SP-1607 variety, and 3.42% for the Surkhan-16 variety under optimal humidity conditions. Under conditions of limited humidity, this indicator reached 3.25% for the Surkhan-18 variety, 2.24% for the Termez-208 variety, 2.89% for the Termez-202 variety, 2.10% for the SP-1607 variety, and 3.89% for the Surkhan-16 variety.

During the flowering phase, when residual water deficiency in the leaves was observed in the evening between 4:00 p.m. and 6:00 p.m., it was 3.37% for the control variety Surkhan-18, 2.38% for the variety Termez-208, 2.89% for the variety Termez-202, 1.89% for the variety SP-1607, and 3.82% for the variety Surkhan-16. Under conditions of limited moisture in the evening, this indicator was 3.86% for the Surkhan-18 variety, 2.74% for the Termez-208 variety, 3.41% for the Termez-202 variety, 2.46% for the SP-1607 variety, and 4.37% for the Surkhan-16 variety. In all variants with limited moisture, the water deficit was significantly higher than in variants with optimal moisture. Significant differences in the above indicators were noted between the studied varieties. The highest residual water deficit was found in plants of the Surkhan-16 variety grown under conditions of limited moisture at all stages of development. With a decrease in moisture levels, an increase in these indicators was observed. The lowest value was observed in the SP-1607 variety grown under optimal humidity conditions. The Termiz-208, Termiz-202, and Surkhan-18 varieties occupied intermediate positions for this indicator.

The concentration of cell sap in all cotton varieties grown in highly saline soil conditions is significantly higher than in plants grown in non-saline conditions. It was observed that the concentration of cell sap in non-saline variants of all varieties was lower than in saline variants. With an increase in soil salinity, the concentration of cell sap in all varieties also increased. The highest values were recorded for cotton varieties grown in saline soil conditions At the flowering stage in non-saline conditions, the value was 12.8 for the SP-1607 variety, 13.6 in the moderately saline variant, and 15.8 in the highly saline variant; in the control variant of the Termiz-208 variety, it was 12.4, in the moderately saline variant, it was 13.0, and in the highly saline variant, it was 15.2; 12.0 in the control variant of the Termiz-202 variety, 12.5 in the variant with medium salinity, and 13.6 in the variant with high salinity; 11.6 in the control variant of the Surkhan-18 variety, 12.2 in the variant with medium salinity, and 13.2 in the variant with high salinity;

In the control variant of the Surkhan-16 variety, it was 11.2, in the variant with average salinity, it was 12.0, and in the variant with high salinity, it was 12.6.

Conclusions. Assessment of the effect of salinity on cell sap concentration shows that during the flowering and tillering stages, all cotton varieties studied exhibited the same patterns as during the boll formation stage. In other words, salinity led to an increase in cell sap concentration. Based on the above, it can be said that the concentration of cell sap in cotton leaves depended on the concentration of salts in the soil, the stages of cotton development, and the biological characteristics of the varieties. According to the data obtained on the assessment of the effect of salinity on cell sap concentration, sharp differences between varieties were also noted. The highest results were observed in the SP-1607 and Termiz-208 varieties. The lowest indicator was recorded in the Surkhan-16 variety.

It was noted that in unsalted environments, the osmotic pressure of cell sap was lower than in environments with medium and high salinity. Conversely, in soils with high salinity levels, the osmotic pressure of cell sap was higher. Expressed in figures, for the Surkhan-18 variety, it was 6.08 in the control, 6.67 in the medium salinity environment, and 7.68 in the high salinity environment; for the Surkhan-18 variety, it was 5.63 in the control, 6.36 in conditions of medium salinity, and 7.17 in conditions of high salinity; in the Termiz-208 variety, it was 7.07 in a non-saline environment, 7.72 in an environment with average salinity, and 8.56 in an environment with high salinity; In the Termiz-202 variety, osmotic pressure was 6.38 in unsalted soil, 7.14 in conditions of medium salinity, and 7.93 in conditions of high salinity. For cotton variety SP-1607, this indicator was 7.12 in unsalted conditions, 8.06 in conditions of medium salinity, and 9.26 in conditions of high salinity. Similar conditions were observed during the flowering and storage phases of cotton varieties. With increasing salinity, osmotic pressure increased significantly. For the SP-1607 variety, the highest pressure was recorded during storage in high salinity conditions. The lowest osmotic pressure was observed in the Surkhan-16 variety. In general, plant cells adapt to maintain osmotic pressure balance under salinity conditions. Adaptation mechanisms are important for plant stress resistance under salinity conditions. In addition, osmotic pressure control is better developed in salt-tolerant varieties.

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