EFFECT OF ECOSTRESSORS ON THE PHYSIOLOGICAL CHARACTERISTICS OF FINE-STAPLE COTTON VARIETIES UNDER THE CONDITIONS OF BUKHARA PROVINCE

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Abstract. The article presents some data obtained on the level of physiological changes in fine-fiber cotton varieties under different degrees of soil salinity and moisture conditions. During the experiments, the aspects of the physiological characteristics of the fine-fiber cotton varieties Surhon-18, Termiz-202, Termiz-208, SP-1607, and Surhon-16 related to soil salinity and moisture levels were examined. A positive and negative correlation was found between physiological indicators and yield weight in the studied varieties, and such changes are also related to the growth and development stages of the varieties and it was determined that such changes vary at different levels depending on the biological characteristics of the varieties.

Keywords: fine-fiber cotton, salinity, water deficit, salinity, water supply, moisture levels, water exchange, productivity, yield.

Introduction. By 2050, the world's population is expected to reach 10 billion people, and sustainably feeding them will be a major challenge. To meet this demand, we need to produce roughly 50% more food products in a short period of time.

On the other hand, achieving a sustainable supply of food products in agriculture is not only about the sustainability of food production, food security, and food security, but also because great emphasis is placed on the planned distribution and justification of food worldwide, the research being conducted in this area is regarded as one of the most important tasks.

The rise in temperature will pose a serious problem for plant yields in the future. Heat stress affects plant yields at the morphological, biochemical, and molecular levels. Slowed plant growth and development, reduced seed germination, and decreased photosynthetic rates due to heat stress lead to yield loss [1,2].

Eine weitere Auswirkung hoher Temperaturen ist die Beschleunigung des Pflanzenwachstums, insbesondere in der Vegetationsphase, wodurch sich Früchte oder Samen schneller entwickeln können. Es ist zu beachten, dass Hitzestress den Trockenstress verschlimmern kann, indem er die Transpiration und letztlich die Wasserverdunstung erhöht [3].

Finding solutions to ensure long-term sustainable agriculture in the context of environmental limiting factors is a key challenge for future research. Climate change, as one of the major ecological factors, is a concern in many countries. It is expected to become a problem that negatively affects food security and plant breeding, and under such conditions it necessitates the activation of various physiological and biochemical mechanisms in plants. Impact on the yield of fine-fiber cotton varieties. The factors affecting this include a shortened cotton development period, increased boll and flower drop rates, water deficiency during flowering and boll formation, salinity, and high temperatures. All of these factors lead to a decrease in yield and its quality. In this regard, it is possible to identify tolerant genotypes by applying modern physiological, biochemical, and genetic methods [4].

Drought means a decrease in soil water potential, resulting in reduced water uptake by the roots. The molecular-level response of plants involves osmotic remodeling, meaning that the accumulation of various osmolytes and hydrophilic proteins leads to a decrease in the osmotic potential of the cell's cytoplasm. The primary signal arising from drought is hyperosmotic stress, often simply called osmotic stress, since a hypotonic condition is generally not a serious problem for plant cells. In leaves, drought leads to stomatal closure, which is associated with reduced CO_2 uptake, resulting in an imbalance between photosynthetic electron transport and carbon assimilation. As a result, cell dehydration is also associated with an increased production of reactive oxygen species [5].

The growth rate of plants changes dramatically under the influence of adverse external environmental factors. In controlling growth rate, the level of water supply to plants, together with agronomic measures, plays a major role. Plant growth processes are particularly strongly influenced by water deficit. Their growth rate is directly related to the level of water deficit and its intensity. The plant's response to such stressors consists of several stages. Specifically, the plant's reaction to adverse factors includes the individual reaction and restitution (recovery) stages. Water deficiency in the soil slows down growth processes and also negatively affects crop quality. Soil water deficiency affects all developmental stages of plants.

The negative effects of drought persist even after moisture levels have returned to normal. According to many experimental data, plant growth is more sensitive to drought than photosynthesis [6].

Fine-staple cotton varieties are superior to medium-staple cotton varieties in terms of high fiber type, fiber fineness, fiber length, fineness, and strength. Cotton is one of the important industrial crops in our republic that supplies raw materials. For this reason, optimal factors are required to produce sufficiently high and high-quality yields. In the context of global climate change, further improving the agronomic condition of irrigated areas, reducing the effects of water scarcity and soil salinization, and implementing agrotechnical measures improving, identifying crop varieties adapted to stress factors and protective measures, and determining physiological and genetic characteristics that reflect the adaptation coefficient of fine-fiber cotton varieties under unfavorable soil and climate conditions.

Research results and their discussion. Based on laboratory experiments, to assess the effects of water deficit and salinity, the germination rate of fine-fiber cotton seeds, root growth activity, stem length, leaf area, root volume, plant fresh weight, total leaf water content, and other parameters were comparatively analyzed across varieties, and the obtained results were used to plan agronomic measures and the feasibility of using it as a primary criterion for selecting ecostress-tolerant adaptive varieties was demonstrated. Under optimal moisture conditions, all cotton varieties exhibited higher water evaporation at the flowering stage than at the budding stage. The water evaporation of cotton varieties grown under moderate moisture conditions is considerably faster than that of plants under limited moisture conditions. In all varieties tested, limited moisture, i.e., water deficit, negatively affected the plant's water relations.

In establishing the degree of stress factor impact on the yield of fine-fiber cotton varieties, the growth dynamics of the varieties in terms of height, the expansion of their leaf area, and net photosynthesis yield, the degree of variation in yield and quality traits, and physiological tolerance and productivity characteristics were evaluated, and those with high biological and economic yield were identified. varieties were scientifically classified into three groups—highly tolerant, moderately tolerant, and intolerant based on their responses to water deficit and salinity, resulting in higher yields. In studies on the net photosynthetic productivity of the investigated varieties, it was found that this indicator varies depending on the cotton's developmental stages and moisture levels, and that its value in all varieties ranges from flowering to lint formation phase, and that its value increases in all varieties from budding to the cotton boll opening phase. Some interrelationships of the eco-physiological and productivity characteristics of the fine-staple cotton varieties Termiz-202, Termiz-208, SP-1607, Surhon-16, and Surhon-18 were scientifically substantiated.

In the water-deficient and moderately saline variants, all studied cotton varieties showed varying degrees of yield reduction compared to the control variant. In particular, under soil moisture-deficient conditions, the average yield weight in the Surhon-18 variety was 32.2% lower; in the Termiz-208 variety – 35.4; in the Termiz-202 variety –33.4; in the SP-1607 variety –37.9; and in the Surhon-16 variety –30.7 centners. The yield under the average saline condition relative to the control was 31.2 for the Surhon-18 variety, 34.8 for Termiz-208, 32.8 for Termiz-202, 37.1 for SP-1607, and 29.2 for the Surhon-16 variety. High tolerance to eco-stresses was observed in the Termiz-208 and SP-1607-18 varieties, with the Surxon-18 and Termiz-202 varieties occupying intermediate positions and the Surxon-16 variety ranking lowest. Fiber length of cotton varieties, the effects of soil moisture and salinity levels on fiber length, fiber yield, and the mass of 1,000 seeds varied, and it was noted that their adaptation to limited moisture and salinity conditions is linked to the activity of the relevant varieties' physiological and metabolic processes.

Conclusions Factors affecting the yield of fine-fiber cotton include a shortened development period, increased rates of boll and flower drop, flowering, and boll formation. during the boll and flower development stages, water deficiency, salinity, and high temperatures. All of these lead to a decrease in yield and its quality. In this regard, it is possible to identify tolerant genotypes by applying modern physiological, biochemical, and genetic methods. Under the moderately saline and water-deficient soil and climatic conditions of Bukhara province, the adaptively tolerant SP-1607, which exhibits high levels of resistance to these adverse factors as well as high yield volume and quality indicators, The cultivars Termiz-208 and Termiz-202 are recommended for planting. In the province's non-saline soils and under conditions of adequate water supply and climate, it is recommended to plant the Surhon-18 and Surhon-16 varieties, which have low stress tolerance but high yield mass and quality indicators. To obtain a high-quality yield from the above-mentioned fine-staple cotton varieties, it is recommended to implement all agronomic and irrigation measures at a high standard.

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