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PAPER

SCIENTIFIC AND PRACTICAL FOUNDATIONS OF HIGH YIELD FROM FINE-FIBER COTTON VARIETIES UNDER GLOBAL CLIMATE CHANGE

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Abstract

The article presents some data obtained on the study of the effects of different levels of soil salinity and drought on cotton varieties of fine-fiber cotton under conditions of global climate change. During the experiments, the physiological properties and yield of fine-fiber cotton varieties Surkhon-18, Termiz-202, Termiz-208 and SP-1607 and Surkhon-16 were investigated, as well as aspects of soil salinity and moisture content.

Key words: global climate change, salinity, drought, water scarcity, water exchange, net photosynthetic productivity, productivity.

Introduction

The world's population is expected to reach 10 billion people by 2050, and sustainable feeding will be a major problem. To meet this demand, we need to produce more than 50% of food in a short time. Indicators affecting food production, such as climate change, natural resource shortages, and food waste, should be carefully considered. On the other hand, achieving a sustainable food supply in agriculture depends not only on the balance between food production sustainability, food security and food security, but also on the distribution of food around the world according to the plan [1].

Climate change can be explained by greater variability in precipitation, increased droughts or floods, changes in temperature. The data obtained show that about 90% of arable land is exposed to one or more of the above stresses, causing up to 70% of the crop yield of basic food crops to be lost [2].Regarding the impact of climate on agricultural activities, climate change can affect crop yields both directly and indirectly. Temperature fluctuations, water content and high variability of weather conditions are important factors that directly affect. For example, an increase in temperature leads to a rapid growth of plants, a decrease in the vegetation period and, as a result, a decrease in yield.

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Additionally, pathways such as changes in pests, pathogens, and pollinators can be considered as indirect effects of environmental change on crop productivity [3].

The rise in temperature poses a serious problem to the yield of plants in the future. Thermal stress affects plant productivity differently at the morphological, biochemical and molecular levels. A slowdown in plant growth and development, a decrease in seed germination and a decrease in photosynthetic efficiency lead to loss of yield due to thermal stress. Another effect of high temperatures is to accelerate plant growth, especially in the vegetative stage, to produce fruit or seeds more quickly. It is worth noting that thermal stress can increase drought stress by increasing transpiration and ultimately water evaporation. Changes in natural elements, such as the rise in temperature to 3-5°C over the next 50-100 years, indicate the spread of drought, while human activities such as chemical fertilizers, pesticides and improper use of groundwater resources lead to salt stress. Thus, the increase in environmental stress on plant productivity is inevitable in the future [4].

Soil salinity can be associated not only with factors such as environmental activity or environmental pollution, especially in arid and semi-arid arable land, but also with drought due to lack of Water Resources. Salinity - directly limits crop yields, food security, and agricultural sustainability through its adverse effects on saline lands [5].

Acorns are an important fiber crop grown worldwide and have been struggling recently due to climate change and increased abiotic stress. These stressors negatively affect the overall yield and quality of cotton fibers and seeds. Abiotic stress has led to a 50% reduction in cotton production worldwide. Because cotton is an important crop used in textile production and the food industry, any reduction in yield due to abiotic stress can have global economic consequences [6].

Abiotic stressors are a negative impact barrier for agriculture, dramatically reducing plant growth and productivity worldwide. In the future, the decrease in crop yields in agriculture will be exacerbated by global warming, water shortages and increased pollution, and a decrease in fertile land. The main challenges facing agriculture today and in the future are to increase food production for a growing population in the face of a deteriorating environment in many regions of the world and to do so in a sustainable manner. Thus, in the future, the intensification of environmental stress for plant productivity is inevitable [4].

As one of the main crops in the world, acorns are subject to various environmental influences, and understanding its physiological reactions is essential for Sustainable Agriculture. Physiological changes provide a comprehensive understanding of complex molecular mechanisms in Acorn plants under abiotic stress. In plants, the status of water has a significant effect on stomatal activity, photosynthesis, and nitrate reductase activity in field-grown cotton[8].

Objects and methods of research

As research objects, thin-fibered cotton varieties Gossypium barbadense L. such as Surxon-18, Termiz-208, Termiz-202, SP-1607, and Surxon-16 were used, and the experiments were carried out in laboratory and field conditions under various levels of soil salinity and water deficiency. During the experiments, the physiological indicators studied were determined using methods generally accepted in plant ecophysiology.If you need it in a more scientific, formal, or simplified style, just let me know!

Research results and their discussion

Studies conducted to examine the net productivity of photosynthesis in the investigated varieties showed that this indicator varies depending on the developmental stages of cotton and moisture levels, and that its value increases in all varieties from the budding stage to the boll-formation stage. Certain interrelated aspects of the ecophysiological and productivity characteristics of the thin-fibered cotton varieties Termiz-202, Termiz-208, SP-1607, Surxon-16, and Surxon-18 were scientifically substantiated. If you want, I can also make it more academic or more concise.

Under water-deficient and moderately saline conditions, all studied cotton varieties showed a decrease in yield to varying degrees compared to the control variant. In particular, under soil moisture deficit, the average yield amounted to 32.2 centners in the Surxon-18 variety, 35.4 centners in Termiz-208, 33.4 centners in Termiz-202, 37.9 centners in SP-1607, and 30.7 centners in Surxon-16.

In the moderately saline variant, the yield compared to the control was 31.2 centners in Surxon-18, 34.8 centners in Termiz-208, 32.8 centners in Termiz-202, 37.1 centners in SP-1607, and 29.2 centners in Surxon-16. If you'd like, I can format it in a more academic or publication-ready style.

High tolerance to ecostress factors was identified in the varieties Termiz-208 and SP-1607-18. According to this indicator, the varieties Surxon-18 and Termiz-202 showed intermediate tolerance, while Surxon-16 exhibited low tolerance. The influence of soil moisture and salinity levels on fiber length, fiber yield, and the weight of 1000 cotton seeds varied among the cotton varieties. It was noted that their adaptation to limited moisture and saline conditions is associated with the activity of the physiological and metabolic processes specific to each variety.

Conclusions

Under the water-deficient and moderately saline soil and climatic conditions of the Bukhara region, it is recommended to cultivate the fine-fiber cotton varieties SP-1607, Termiz-208, and Termiz-202, as they exhibit a high degree of tolerance to these adverse factors, along with superior yield, fiber quality indicators, and strong adaptive potential. In contrast, under non-saline or slightly saline conditions with sufficient water availability, it is advisable to grow the fine-fiber cotton varieties Surxon-18 and Surxon-16, which demonstrate lower stress tolerance but possess high yield and quality characteristics.

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