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THE INFLUENCE OF HIGH AIR TEMPERATURE ON COTTON VARIETIES: ADAPTATION, PHYSIOLOGICAL AND CHEMICAL PROCESSES

Norboeva Umida Toshtemirovna
Doctor of Science in Biology, Professor,
Bukhara State University, Bukhara, Uzbekistan

Shukurova Shakhlo Gulmurodovna
2nd Stage Graduate Student,
Bukhara State University, Bukhara, Uzbekistan

A B S T R A C T	K E Y W O R D S
In this article, the data obtained on the effect of plant adverse stress factors on the transpiration rate and cell sap concentration of cotton cultivars of high temperatures are presented. In addition, the current theoretical and scientific problems of studying and revealing the negative effects of high air temperature on plants, as well as the information conducted on the study of scientific and research work in this field are presented.	Stress factor, transpiration rate, cell sap concentration, physiological and biochemical properties, medium fibre cotton, global climate, level of resistance.

Introduction

In the world, in recent years, the yield of agricultural crops has decreased under the influence of various abiotic stress factors, among which high air temperature takes the main place in terms of negative effects. According to statistical data, the yield of agricultural crops has decreased by 9-40%, wheat by 27% and cotton by 10-40% due to the effect of high air temperature. In this regard, the deepening of scientific research works in this direction and the development of measures aimed at saving the perishing crop remains one of the urgent problems.

According to the World Meteorological Organization, in recent years, the average temperature of the earth has increased by +1.1 degrees. In the forecast analysis of the Intergovernmental Council on Climate Change, it is recognized that the average air temperature in Central Asia is expected to rise up to +3-4 degrees in the coming years. Such a change in air temperature and +40 ℃ during the harvesting period of cotton Serious damage to the increase in the increase in the increase in the increase in the increase in the increase in yield and quality indicators in the study of the physiological and biochemical forms of cotton, in studying the physiological and biochemical forms of cotton, studying the physiological and biochemical properties.

All physiological and chemical processes take place within a certain temperature limit. Accordingly, the heat factor also plays a major role in the geographical distribution of plants. During evolution, plants are well adapted to low and high-temperature effects. But this adaptation will not be so complicated, therefore, extremely low and extremely high temperatures can cause all kinds of damage to plants, even kill them. If the temperature drops below a certain minimum, the plant begins a rest period; in this case, breathing and some other functions are inhibited but continue. Moderate, but long-lasting heat, especially intense heat with a short duration, causes irreversible changes in plants.

Most plants grow in climates where high temperatures are typical for them. Due to its adaptation to growth in such environmental conditions, it is not damaged by high temperatures. Experiments show that plants that grow in bright, dry, hot places are more resistant to heat than plants that grow in cool places. In temperate climates, fruits and berries (grapes, apples, etc.) are usually damaged by high temperatures, and in some cases the sun hits them. Heat damage can also be observed in deserts. But this phenomenon is manifested differently in different plants in these lands. Under the influence of high temperatures, plants dry up and the assimilation balance is disturbed, that is, it accelerates respiration and slows down photosynthesis. In addition, high temperatures can damage cells and even kill cytoplasm. In cases where the temperature rises above the maximum level, plants stop growing and go into a state of rest (for example, in hot deserts), and if they rise again, they die completely. It should be noted that the high temperature that kills plants is always higher than the optimum temperature of the growing point. The organs of plants growing in the temperate zone are usually damaged by heat when the air temperature is between 40 °C and 55 °C.

The heat resistance of plants depends to a large extent on long-term exposure to high temperatures. According to the manifestation of heat resistance, plants are divided into three groups:

1) Heat-resistant plants - plants that can effectively reduce their temperature due to transpiration (these mainly include soft-leaved plants);

2) Heat-tolerant plants are plants that grow in dry and humid places (these can withstand short-term heat sometimes up to 60 °C);

3) Heat-resistant plants are mainly bottom plants, such as thermophilic bacteria and blue-green algae. However, closely related species often differ by this characteristic.

In addition, heat tolerance is as directly related to water deficit as cold tolerance, because the more water a plant receives (or the more water deficit a plant experiences), the higher the heat (or cold) tolerance. Devices that protect plants from heat damage and overheating include the following. For example, the thinness of the leaf plate with high transpiration (reduces the temperature of the leaf); location of leaves in a vertical position relative to sunlight; leakage of the surface of the leaves - serves as a screen to reflect the insolation; the presence of hairs or coins that protect deep tissues from heating; having a thin layer of phloem tissue that protects the cambium; These include high carbohydrates and low water in the cytoplasm, high intensity of transpirational cooling, separation of tissues (for example, cambium) with another tissue layer, etc.

In scientific research, it has been noted that climate change is causing extreme temperatures in several regions of the world. The stress temperature factor has a multifaceted negative effect, from cotton growth and development to economic performance indicators. Several strategic methods have been proposed to prevent such problems and minimize their damage. These are the planting of hot temperature-resistant cultivars, wild type in the selection process and genetic mapping by identifying useful stress factor tolerance genes or markers [1-2].

Extremely hot temperatures (40-500C) in the southern and partly central regions of our republic in June, July and August, and the heating of the air, sometimes the appearance of dust-pollen winds, is the critical period of cotton varieties demanding water and nutrients, i.e. flowering-harvest collection. falling into the stage leads to the death of a large number of crop elements, to the drying of combs before they form, and to a sharp violation of morpho-physiological and biochemical processes in the plant. Because, for most plants, the optimal temperature for growth and development is +35-360C, and it has been found that increasing the temperature damages them or causes a certain part of the crop elements to be shed [3-5].

Even when cotton is provided with sufficient water, tolerance to high temperature and solar insolation show the following reactions in the plant: phototaxis has been found to cause transpiration activity through stomata and sunlight-dependent modification of leaf plates for optimal photosynthesis [6].

Studies have shown that the increase in air temperature above the optimal level caused several metabolic and physiological processes, including chlorophyll synthesis, reproductive activity, pollination, protein formation, enzyme activity, leaf turgor pressure, transpiration activity, fibre strength, and pod retention [7]

Not all varieties of cotton can withstand the vagaries of the weather, excessive rainfall, sudden changes in weather or the movement of hot air flow in the climate from south to north.].

In the southern and partly central regions of our country, that is, in Kyziriq, Termiz, Muzrabod, Sherabad, Kashkadarya region, Mubarak, Koson, Kasbi and Karshi districts of Kashkadarya region, almost all of Bukhara region and in large areas of Kyziltepa and Navbahor districts of Navoi region, cotton is cultivated, although cotton is a heat-loving tropical plant. However, the summer heat and high temperature caused great damage to its productivity [14].

According to G.S. Zaitsev, the cotton plant requires a certain temperature sum for each period of its growth and development, and he noted that only when this temperature sum is created, does the cotton go to the last stage of development [11-13].

An analysis of the literature on the effects of extreme factors on the growth, development and physiological processes of plants, including cotton, and high-temperature resistance, is available, and the information from this literature is in the direction of plant physiology, biochemistry, genetics and selection, but based on the hybridization of wild species with local cotton varieties and cultivated varieties. the study of the durability of the received ridges showed that the scientific resources for selection and use in practical selection work are insufficient, and it is urgent to carry out research in this direction.

Research Objects and Methods

The varieties "Sultan", Bukhara-102 belonging to the group of medium fibre cotton varieties were used as the object of research. Currently, these varieties are planted in large areas in several regions of our republic. During the experiments, grassland-alluvial soils common in the region were used. Such soils form the main areas of the Bukhara region.

Some physiological indicators during the vegetation period were analyzed in all variants of the experiments in medium and high-temperature conditions.

In the experiments, the rate of transpiration was determined by weighing leaves, and the concentration of cell sap was determined using a refractometer.

Results and Discussion

Transpiration is one of the important physiological processes, and the main transpiration organ is the leaf. Water evaporates from the leaf surface mainly through the stomata. As a result of this, the amount of water in the leaf cells decreases, and water absorption through the root increases, that is, the absorption power increases. An increase in the suction force in the leaves activates the process of drawing water from the leaf veins and canals. The activity of transpiration depends on the air temperature and living conditions of plant species, etc. [14].

The value of the rate of transpiration in plants is related to many external factors. These include air temperature, relative humidity, soil and climate conditions, wind, solar radiation, soil moisture, plant development stages, and cultivar characteristics, among others. Transpiration is not only the evaporation of water through the leaf but also water adsorption and movement of water and dissolved substances through the plant. The rate of transpiration of cotton varies during its ontogeny. Also, the rate of transpiration depended on the amount of metabolic and bound water in the plant and the colloidal properties of the cell protoplasm [15].

Many scientists have conducted scientific research on the rate of transpiration, which is the basis of the water exchange processes of plants [16].

In the course of our research, the transpiration rate of Sultan, Bukhara-102 varieties of cotton was determined in the phases of budding and flowering in different air temperature conditions in the morning 8-10, noon 12-14, and evening 16-18.

According to the data obtained from the results of the research, it was observed that the transpiration rate in the varieties was active in the morning hours, and its activity slowed down in the evening hours, in the conditions of air temperature (+25-36 ℃) in the I-variant of the experiment. The transpiration rate ranges from 47.8 to 73.2 mg. g/h in the morning, 37.0 to 58.3 mg. g/h in the afternoon, and 30.0 to 50.4 mg. g/h in the evening. was observed to be in the range of

In the second variant of the experiment, it was shown that the transpiration rate increases according to the biological characteristics of cotton when the transpiration rate goes from morning hours to afternoon hours under conditions of high air temperature (+35-45 ℃). In this option, the rate of transpiration in the afternoon hours95.5from mg/ghour158.3mg/g up to hours, in the evening hours ranged from 82.1 mg/g to 150.2 mg/g h, with higher values for Bukhara-102 and was recorded in the variety.

The highest transpiration rate is in the middle of the day, that is, the air temperature is the highest (+35-45℃) was noted when It was known that the rate of transpiration in these varieties decreased during the afternoon and evening hours. The extremely high temperature of the experiment (+40-50℃) in the studied cotton varieties, the rate of transpiration accelerated in the afternoon and slowed down in the evening.

During our experiments, we also studied the effect of high temperature on the concentration of cell sap in the leaves of cotton cultivars. It is known that the vitality of cells depends on the existence of a constant metabolic process. Cells constantly receive substances from the external environment or adjacent cells, and release some, on the contrary, that is, the life of the plant takes place through the interaction of cells with external and internal environmental factors. The most important of these is the entry and intercellular movement of water and substances dissolved in it from the external environment. In these processes, osmotic potential plays an important role in plant cells. This follows from the laws of diffusion and osmosis. Therefore, the concentration of cell sap determines the osmotic pressure of the plant, the turgor state and the ability to absorb water from the outside. The high concentration of cell sap is one of the indicators that protect the plant from heat and water shortage [17].

Under high-temperature conditions, some high-molecular compounds in the cell can break down and affect the concentration of cell sap. At a temperature of +40 °C and higher, physiological functions in plant tissue cells are disturbed and they die. First of all, the structural composition of the cell plasmalemma is disturbed and the osmotic properties of the cell change [18-23]. According to V. F. Altergot and other scientists, under extremely high-temperature conditions, proteins break down and turn into amines, and amines lead to the poisoning of plant tissue cells, have a negative effect on metabolism, and prevent the active transition of cell physiology [24-28].

In our research, the effect of high temperature on the concentration of cell sap and its osmotic pressure was also studied. The concentration of cell sap in cotton varieties was determined at the stages of budding, flowering, and budding. According to the analysis of the results of the experiments, the concentration of sap in the leaf tissue cells of cotton varieties increased depending on the air temperature levels.

In the control variant of the experiment, the concentration of cell sap in the stage of budding, flowering, and budding in varieties and rows at air temperature (+25-30 °C) was 7.0, 8.9, 10-10.0, 11.0, 14.0%, respectively. was observed between It was known that the concentration of cell sap in the stage of budding, flowering, and budding was equal to % Sultan (7.9; 8.5; 11.2), Bukhara-102 (9; 12; 12). In variant II of the experiment, with an increase in air temperature (+40-45 °C), the concentration of cell sap in cotton varieties during the stages of budding, flowering, and budding was 9.9, 14.0, 14.6-11.0, 13.0, 18, respectively. Observed in the range of 0%, it was found that it decreased by 2.9.0, 5.0, 4.6-1.0, 2.0, and 4.0%, respectively, compared to the control variant.

Conclusions

When the physiological processes of cotton varieties under high-temperature conditions were studied, it was observed that there is a connection with the physiological characteristics of their resistance to high temperature. The process of water evaporation through the leaf and the concentration of cell sap allow us to determine the resistance of the studied varieties to high temperatures. Of these, the value of the concentration of leaf tissue cells is an important physiological process that increases tolerance to high temperatures.

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