BIOLOGICAL SCIENCES

STUDY OF THE SALT-RESISTANCE QUALITIES OF PALLIDIUM 596 (*HORDEUM VULGARE SUBSP. VULGARE VAR. PALLIDIUM*) BARLEY SAMPLE USING DIFFERENT DIAGNOSTIC METHODS

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Abstract

It is a known fact that salt stress causes a number of phisiological and biochemical processes in plants. Using various diagnostic methods we attempted to study these processes, to provide preliminary information regarding the plants' salt-resisting qualities. The study was carried out on Pallidum 596 (*Hordeum vulgare subsp. vulgare var. pallidum*) barley variety.

The first phase of the impact of salt stress on the plants' growth were studied. It has been known that the salt stress causes the accumulation of inhibitors slowing the plants growth which, in turn, lowers the number of growth facilitating hormones.

One of the methods used to determine the plant's stress resistance has been the study of changes in quantity of chlorophyll (a+b).The study of this indicator has shown that the impact of 0.25% salt exposure did not cause significant changes in the amount of chlorophyll (a+b) in leaves of studied variety compared to the control variant. Due to the 0.5% salt exposure, the amount of chlorophyll (a+b) in the leaves decreased slightly compared to the control, which suggests that this variety is more resistant to salt.

Keywords: barley, salt resistance, growth inhibition, chlorophill (a+b)

Introduction

The recent climate changes on the earth have caused the aggravation of the ecological situation and salinization of arable lands. Therefore, finding plant varieties and forms that are resistant to stress factors, but at the same time economically important, ensuring their cultivation in such lands is one of the urgent problems of the day. One of the stress factors is salinity. During the impact of salt on the plant body, at the initial stage, the body tries to adapt resisting the conditions in which it finds itself. At this time, a number of physiological and biochemical processes occur in the plant body. Thus, the processes of breaking down starch into sugar and proteins into amino acids lead to an increase in the amount of non-protein nitrogen and, as a result, damage to cells. Also, the activity of the ribonuclease enzyme increases, which accelerates the breakdown of RNA and stops the synthesis of DNA.

Also, salt stress affects the height of the plant. During this time, growth retarding inhibitors (abscisic acid and ethylene) accumulate, the amount of height-stimulating auxin and hibberlin decreases. As a result, growth inhibiting hormones are greater than growth stimulating hormones, resulting in retardation of plant growth.

During salt stress, organic compounds such as sorbitol, glycine betanin, and at the same time proline amino acid, repeatedly increase. Also, due to salt stress, the breakdown of green plastids occurs, which naturally leads to a decrease in the contribution of chlorophyll. The less the amount of chlorophyll changes due to stress exposure, the more resistant that plant is considered, which allows genotypes to be evaluated according to resistance to stress [Aliyev, Abbasov, Rahimli, 2014].

Therefore, in recent times, various diagnostic methods are used to study the physiological-biochemical processes that ensure the resistance of plants to unfavorable environment.

Salt tolerance is the ability of plants to accelerate normal growth and development in salinity conditions. If the NaCl in the soil exceeds 0.5% of salt, such soils are considered saline. 30% of arable land in the world is under salinity stress [Aliyev, 2015].

Using them, the study aimed to study the effect of salt stress on the Pallidium 596 barley sample.

Materials and research methods

The study was carried out on Pallidium 596 (*Hordeum vulgare subsp. vulgare var. pallidum*) variety. Various diagnostic methods were used in the study**.**

In order to study the effect of salt stress, the seeds of the above-mentioned variety were planted in pots. The research work was carried out with the scheme of control-soil+0.25%, NaCl-soil+0.5%. The seeds of each variety were planted in pots according to this scheme. After one week, the height of the plants in the experimental variants compared to the control was measured and samples were taken from the leaves for the determination of the amount of chlorophyll (a+b) and proline amino acid. The changes in the amount of chlorophyll were carried out based on the methodology proposed by the Russian Institute of Botany [Udovenko, 1975]. 96% alcohol was added to the taken leaf circles. After keeping in a dark place for 5-6 days (until

the circles turn completely white), the amount of chlorophyll was determined in a spectrophotometer (UV-3100PC) at 2 wavelengths (E665-649nμ), and the amount of carotenoids was determined at 450nμ. After the impact of stress (xl "a" and xl "b"), the degree of stress-depression was found by comparing the percentage of change with respect to the control, and the extent to which those samples were resistant to stress factors was determined. The less the amount of pigments changes due to the impact of stress, the more resistant the samples become.

The amino acid proline is also of great importance in assessing the resistance of plants to salt stress tolerance. Under normal physiological conditions, proline is transported to the reproductive organs of plants. This acid is essential for seed and pollen formation.

Under stressful conditions, proline amino acid accumulates and increases in quantity, acting as an antioxidant and protecting the plant from negative effects of the environment. Therefore, this indicator is used as a biochemical marker of sustainability. The amount of proline amino acid was determined by the Bates method at a wavelength of 520 nm [Bates, Woldren, Teare. 1973].

Research results and discussion

It is known that a number of physiological and biochemical processes occur in plants during stress. Since many of these processes are of a defensive nature, they enable the plant to adapt to its environment. If the stress lasts temporarily, the plant has the ability to restore itself.

The soil environment in which plants grow and develop is the carrier of soluble salts that they use. However, when the amount of soluble salts is higher than the tolerance limit of plants, a number of difficulties arise.

In one of the research-experimental options which was carried out in comparison with control, 0.25% NaCl was added to the soil in one pot, and 0.5% NaCl was added to the soil in another pot. After one week, the height of the plants in the experimental variants compared with control is measured and content of chlorophyll (a+b) and proline amino acids in the leaves is determined.

Observations on plants showed that the difference between the height of plants growing in soil with added 0.25% salt and the height of plants growing in the control variant is very small and growth retardation was 5% compared to the control variant.

Growth retardation of plants was observed mostly due to the effect of 0.5% salt. So, compared to the control, this indicator is 14%.

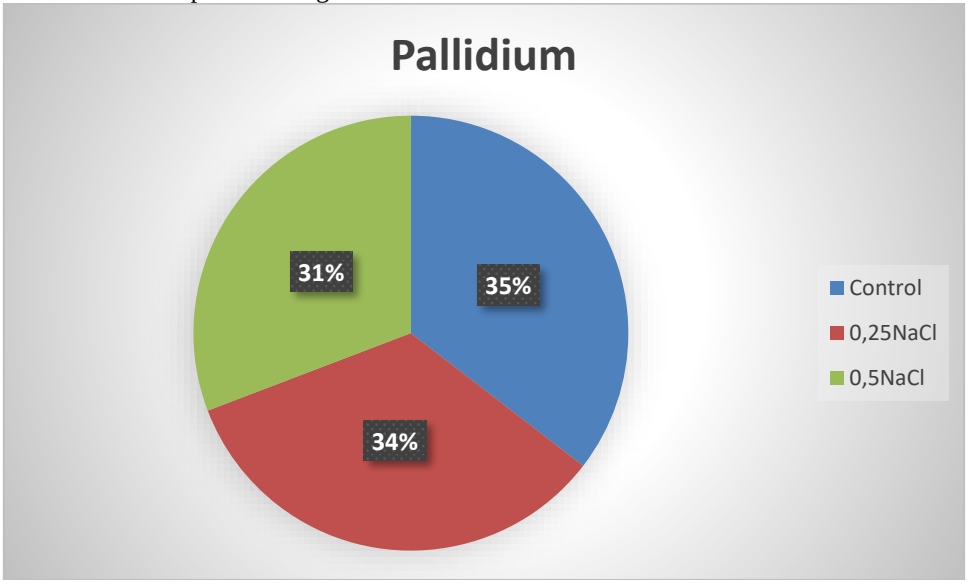

Fig. 1. Changes in plant height due to the effect of salt stress of different concentrations.

The effect of 0.25% salt did not cause significant changes in the amount of xl (a+b) compared to the control variant. Due to the effect of 0.5% salt, the amount of xl (a+b) in the leaves was depressed by 4%. This change in the amount of chlorophyll (a+b) as a result of stress suggests that the Pollidium 596 variety is salt tolerant. This result is consistent with the results of other researchers [Ivanov, 2013].

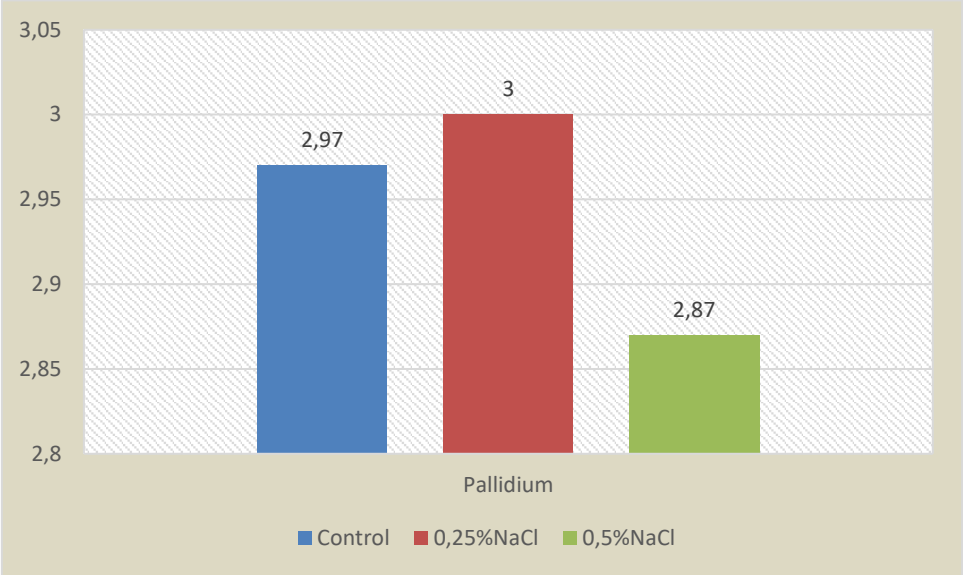

Fig. 2. Changes in the amount of chlorophyll (a+b) due to salt stress with different concentrations.

The amount of proline amino acid, which is a biochemical marker of sustainability, was slightly decreased due to the effect of 0.25% salt compared to the control, and this indicator is equal to 0.5%. In our opinion, the slight reduction in the amount of proline amino acid due to the effect of 0.25% salt is the result of the adaptation of the plant to this dose of stress, as the reserve acid is broken down and used for metabolism as a result of stress [Bates, Woldren, Teare, 1973; Kolupaev, Weiner, Yastreb, 2014].

On the contrary, due to the effect of 0.5% salt, the amount of proline amino acid increased by 1.2% in this variety. The increase in the amount of proline amino acid after this concentration of salt is the response of plants to this concentration. At this time, the organism's metabolism stops temporarily, and proline amino acid accumulates without consumption, protecting the plant from stress.

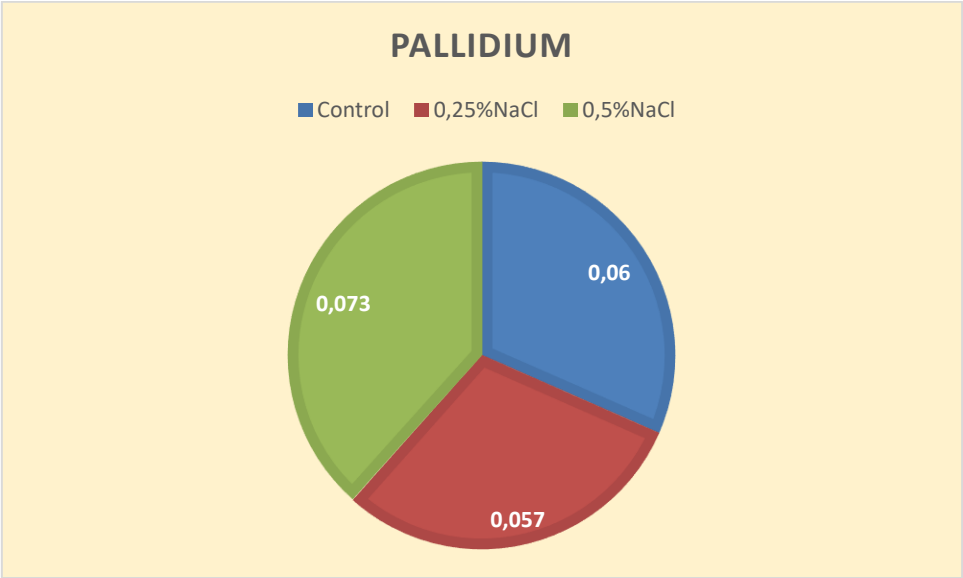

Fig. 3. Changes in the amount of proline amino acid under the influence of salt stress of different concentrations.

As a result of the research carried out with the help of various diagnostic methods, it was determined that the Pallidium 596 variety of barley is resistant to salt, and as the concentration of salt in the soil increases, the effect of stress also increases, which significantly manifests itself in the morphological, physiological and biochemical indicators of the plant.

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