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Effect of NaCl on the Peroxidase Activity of Seedlings with Different Salt Resistance

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ABSTRACT

According to the research, barley seedlings are more resistant to salt, therefore as the NaCl concentration is increased (25-100 mM) the peroxidase activity in roots had a linear increase. Above ground parts of barley, seedlings were different under the salt stress, compared to the root. The peroxidase activity increased when NaCl concentration was lower (25-50 mM), and decreased when the concentration was higher (50-100 mM) in above ground parts of barley seedlings. The activity of the enzyme was rather higher than in control, but it never had a linear increase. The process of H_2O_2 gathering under salt stress was faster in body parts, compared to the roots of wheat and barley seedlings. Therefore the peroxidase reactions in body parts have not linear increase.

INTRODUCTION

Salinity of soils decreases agricultural fertility [Yershov, 2006], sometimes even triggering its destruction.

As we know, different anions and cations in plant bodies affect metabolic processes, including respiration, photosynthesis, growth and development. Enzymatic reactions play a key role in maintaining such physiological functions [Gasimov, 2012].

According to the references, the negative effect of salts on plants is severe during the first period of ontogenesis, and plants are less sustainable to salinity during this period [Weiping Chen *et al.* 2010].

It is of great importance to study the early diagnosis of resistance of plants to salts in order to solve the problem and increase salt resistance. Therefore, the investigation of salt effect on plant bodies has theoretical and practical importance. Physiological and biochemical processes in the early development stages of seedlings need to be studied for this purpose. Hence, the first physical and chemical processes in the plant cells strictly affect the later intracellular metabolic process in the plant body.

The toxic effects of salts on plant bodies are related to irregular activity of cell enzymes, say some researchers. It is no by chance, as the living organisms maintain themselves, and enzymes are maintaining components for most of the physical and biochemical processes.

According to the results of multiple investigations for studying the salt resistance of plants, hydrogen peroxide is gathered in plant cells under salt stress, which negatively affects plants [Garifizanov *et al.*, 2012]. And peroxidase enzyme brakes it into water and atomic oxygen, thus making it harmless.

Unfortunately, researchers on the activity of peroxidase in plant seedlings, which differ for their salt resistance under extreme salinity, are few in number. Peroxidase is one of the enzymes of alternative (parallel) respiratory pathway and takes an active part in cell metabolism. Therefore, the study of the changes in the peroxidase activity under NaCl in the early and fast development period of seedlings, which differ for their salt resistance, is of great importance. It enables to specify adequate and peculiar features of peroxidase reactions under salt stress.

MATERIALS AND METHODS

The peroxidase activity in seedlings is determined by colorimeter [Yermakov, 1987] and calculated by the reaction speed. A seven-day barley, wheat, triticale, and rye seedlings, which differ for their salt resistance (barley » wheat » triticale » rye) are chosen for the study.

The results of the researchers included statistics and the accuracy is less than 3 percent.

RESULTS

As the concentration of NaCl is increased the peroxidase activity in plant roots and bodies increased as well. Peroxidase activity in roots and bodies of barley, wheat, triticale, and rye seedlings had a linear increase at 25-50 mM NaCl. It shows decrease of H_2O_2 in both parts. Although the peroxidase activity in above ground parts of wheat seedlings decreased at 75 mM NaCl, it was higher than in control.

As the development of the roots and above ground parts of triticale and rye seedlings had a strong decrease at 75 mM NaCl, it was impossible to study them (germination was very low at 75 mM NaCl).

According to the research, barley seedlings are more resistant to salt, therefore as the NaCl concentration is increased (25-100 mM) the peroxidase activity in roots had a linear increase. Above ground parts of barley, seedlings were different under the salt stress, compared to the root. The peroxidase activity increased when NaCl concentration was lower (25-50 mM), and decreased when the concentration was higher (50-100 mM) in above ground parts of barley seedlings. The activity of the enzyme was rather higher than in control, but it never had a linear increase. The process of H_2O_2 gathering under salt stress was faster in body parts, compared to the roots of wheat and barley seedlings. Therefore the peroxidase reactions in body parts have not linear increase.

As to the researchers, the change of the peroxidase activity in seedlings under salt stress is adequate.

The peroxidase activity in different plants differs in number. The change of the peroxidase activity in seedlings under salt stress is adequate, because the amount of hydrogen peroxide, used as substrate of enzymes in cells, does not reach the maximum. Since, any enzymatic

reactions, as well as the reactions with the presence of peroxidase are the first order reactions and not dependent on the amount of substrate [Abdıyev, 2017].

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