ABSTRACT

The topic of this doctoral thesis is: Reaction of legumes under salt stress. The paper attempts to answer the question about the possibility of the use of halophytic habitats for *Fabaceae* crop plants cultivation. In the course of the experiments 8 different research tasks were carried out that examined the various physiological and biochemical processes occurring in legumes under salt stress. Results were to indicate whether there is a change in the processes due to the salt stress levels or they can serve as indicators of stress intensity. In order to compare the achieved results, experiments were conducted in a greenhouse in pots filled with soil and in big containers filled with perlite medium and located in a plastic tunnel in which plants have been grown under quasi field conditions. The conducted experiments revealed potential indicators responsible for the plant's survival under adverse conditions, as well as rank for tested plants in resistance to stress.

Tested *Fabaceae* plant species were used due to their high economic value, representing an important role as alternatives to the soya meal protein source used as a component of animal feed (pea, lupine yellow, blue lupine, white lupine, soybean), as well as constituting an important element of crop rotation, contributing to a number of positive impacts on soil.

Salt stress and its effects are the result of over-intensification of agriculture and a result of human activity, the Earth's population growth and deepening of climate changes, which could largely limit crop production in areas not yet affected by saline soils, needed to feed the growing of the population. In the study, salt stress intensity value was determined based on literature data and preliminary tests. In greenhouse conditions concentrations of 0 - 150 $mmol*dm^{-3}$ NaCl while the during experiment in perlite concentrations of 0 - 70 $mmol*dm^{-3}$ NaCl were used. The salt solutions were supplemented by a balanced nutrient solution that contained all of the major macro and micronutrients, in order to minimalize toxicity of mono medium.

In this work, a number of physiological studies were conducted. Measurement of fresh and dry weight of the aerial parts and roots, the degree of hydration of the tissue, cytoplasmic membrane permeability changes and measurements of the activity of nodule bacteria symbiosis with legumes. Additionally, biochemical analyses (concentration of free proline, abscisic acid and soluble sugars profile) were performed in order to recognize processes responsible for the phenomenon of plant tolerance to salt stress.

Each of the experiments performed determined the individual indicator, which bear witness to the intensity level of stress. The results, however, indicated the lack of a universal parameter for all tested species, which would allow a precise alignment of all species in sensitivity to salinity

It has been shown that the salinity has limited impact on the growth of legumes in perlite, reducing the weight of aboveground plant of an average of 40%. Stress conditions cause an increase of accumulation of the osmolite compounds (sugars), amino acid proline, as well as plant hormone ABA in plants both growing in the soil and perlite. The negative impact of Na^+ and Cl^- is also manifested in the process of lowering the activity of nodule bacteria symbiosis with legumes and changes in the process of accumulation elements in ionic form.