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Grass species under increasing salt stress conditions - a pot experiment

Artur Adamczak, Elżbieta Bilińska, Romuald Mordalski and **Waldemar Buchwald**
Institute of Natural Fibers and Medicinal Plants, Poland

Statement of the Problem: Improper farming and climate changes increase the area of saline soils. The right selection of crops can reduce the negative influence of this process. The aim of the study was to determine the effect of increasing salt stress on some grasses. Methodology: Three species distinguished by the wide ecological scale and considerable biomass production: Calamagrostis epigejos, Festuca arundinacea, and Spartina pectinata were selected for testing. The specimens were planted in pots containing a mixture of sand and peat (1:3). After 10 days of plant acclimatization, the experiment was started. The containers were irrigated with distilled water (control) or sodium chloride solution at concentration of 150 mM (8.766 g NaCl/L, 40 days) and then 250 mM (14.610 g/L, 30 days). Findings: Depending on the species, the mean salt content in the soil, calculated on the basis of electrolytic conductivity measurements, increased to 21.9-23.7 g/L. In the control samples, it ranged from 0.7 to 1.3 g NaCl/L. After the end of experiment, air-dry weight of above-ground plant parts was on average lower by about 35% (C. epigejos), 26% (F. arundinacea) and 16% (S. pectinata) compared to the control. In the case of rhizomes with roots, the observed weight loss was greater, and it amounted to about 76, 50 and 33%, respectively. Conclusion & Significance: The investigated species are characterized by relatively high salinity resistance, and they can be used in degraded lands. Despite increasing salt stress, they remained viable and continued to grow. S. pectinata showed the highest tolerance to NaCl. In turn, C. epigejos reacted most strongly to salt stress.

Figure 1: Effect of salinity (150 mM NaCl solution: 40 days + 250 mM: 30 days) on grass growth.

Recent Publications

1. Anderson EK, Voigt TB, Kim S, Lee DK (2015) Determining effects of sodicity and salinity on switchgrass and prairie cordgrass germination and plant growth. Industrial Crops and Products 64:79-87.
2. Henschke M, Borowiak K (2018) Effect of salinity on selected physiological and morphological characteristics of Spartina pectinata (Link.) 'Aureomarginata'. Acta Scientiarum Polonorum, Hortorum Cultus 17(6):115-123.
3. Li N, Kang Y, Li X, Wan S (2019) Response of tall fescue to the reclamation of severely saline coastal soil using treated effluent in Bohai Bay. Agricultural Water Management 218:203-210.

4. McSorley KA, Rutter A, Cumming R, Zeeb BA (2016) Chloride accumulation vs chloride excretion: Phytoextraction potential of three halophytic grass species growing in a salinized landfill. Science of the Total Environment 572:1132-1137.
5. Pawłowicz I, Waśkiewicz A, Perlikowski D, Rapacz M, Ratajczak D, Kosmala A (2018) Remodeling of chloroplast proteome under salinity affects salt tolerance of Festuca arundinacea. Photosynthesis Research 137(3):475-492.

Biography

Artur Adamczak is a graduate of the Faculty of Biology at the Adam Mickiewicz University in Poznań (Poland). Since 2007, he has been working at the Department of Botany, Breeding and Agricultural Technology of Medicinal Plants, Institute of Natural Fibres and Medicinal Plants in Poznań. In his scientific work, he undertakes a variety of research topics in the field of chorology, ecology and systematics of plants, paying special attention to native medicinal species: their morphological and phytochemical variability and the utility value of the obtained plant raw material. He is the author or co-author of nearly 100 publications and conference presentations.

artur.adamczak@iwnirz.pl

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