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Phenotypic plasticity and response to saline stress of seven pasture legumes

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Abstract

The objective of this research was to analyse the phenotypic plasticity and the variation in biomass accumulation, histological and ion accumulation characters under salt stress conditions in seven grass legumes during the establishment phase under controlled glass house conditions. The effect of two salinity levels ($0.02 \text{ dS}\cdot\text{m}^{-1}$ and $10 \text{ dS}\cdot\text{m}^{-1}$) on the accumulation of area and root biomass, histology, and the accumulation of nitrogen, sodium, and potassium were evaluated. Phenotypic plasticity in response to salt stress was calculated in the studied legumes. The characters related to biomass accumulation were significantly affected by salt stress in all legumes studied. As for the histological indicators evaluated, the behaviour showed that salt stress caused a decrease in the width and length of the stomata and an increase in stomatal frequency and histological thickness. The study of the effect of salt stress on the accumulation of ions shows a significant reduction in the content of nitrogen and potassium and a significant increase in the content of sodium in all the species studied. The species *Sesbania rostrata*, *Centrosema pubescens*, *Macroptilium lathyroides*, *Clitoria ternatea*, and *Canavalia ensiformis* showed mean values above 0.40 of phenotypic plasticity for characters related to biomass accumulation. *Macroptilium atropurpureum* and *Leucaena leucocephala*, although they present plasticity, were the species that showed the lowest values. The histological characters evaluated in the legumes studied showed very low values of phenotypic plasticity, although with significant differences between them. Phenotypic plasticity in grass legumes as an indicator of tolerance to salinity. Salinity has a negative effect on the morphological, histological and ion accumulation characters studied in grass legumes. *S. rostrata*, *L. leucocephala*, *C. ternatea*, *C. pubescens*, and *C. ensiformis* showed the highest phenotypic plasticity index in the studied characters against salt stress. The dry matter characters of the aerial part and the root and the accumulation of nitrogen turned out to be the ones with the highest phenotypic plasticity Index in the presence of saline stress.

Keywords: Biomass accumulation, legumes, phenotypic plasticity, salinity