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Differential Sensitivity of Rice Cultivars to Salinity and Its Relation to Ion Accumulation and Root Tip Structure

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Abstract: Effects of NaCl on the growth, ion content, root cap structure and Casparian band development were examined in four rice (*Oryza sativa* L.) cultivars with different salt resistance (salt-sensitive indica-type IR 24 and japonica-type Nipponbare and salt-resistant indica-type Nona Bokra and Pokkali). Experiments were conducted to find the differences in salinity resistance during early seedling and developed seedling stages among the cultivars. For salinity treatment, sodium chloride (NaCl) was added to nutrient solution at concentrations of 0, 25 and 50 mM for 7 days from germination to the 7th day (early seedling stage) or from the 7th day to 14th day (developed seedling stage). Growth inhibition by salinity was more prominent in the early seedling stage than in the developed seedling stage. Based on the growth, the order of the sensitivity was IR24>Nipponbare>Nona Bokra>Pokkali. The growth of NaCl-treated rice cultivars relative to control was significantly and negatively correlated with the Na⁺ content and Na⁺/K⁺ ratio in roots and shoots in both stages. Scanning electron microscopic observation revealed that the root cap tissues proliferated and extended to the basal part of the root tip by salinity. The length of root cap was, however, reduced by 50 mM NaCl in sensitive cultivars due to peeling off. An endodermal Casparian band was formed in the basal region of the root tip. Development of the Casparian band was more prominent in sensitive cultivars than in tolerant cultivars. Root cap proliferation might be related to NaCl resistance in rice seedlings, but the Casparian band may not function efficiently in Na⁺ exclusion. Essentially the present results suggest that exclusion of Na⁺ from roots plays a critical role in expression of Na⁺ resistance in rice seedlings and the root cap is important for Na⁺ exclusion.

Keywords: [Casparian band](#), [Ion accumulation](#), [Rice \(*Oryza sativa* L\)](#), [Root tip](#), [Salinity resistance](#), [Sodium chloride \(NaCl\)](#)

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