1. Proline induces the expression of salt-stress-responsive proteins and may improve the adaptation of Pancratium maritimum L. to salt-stress

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Abstract

Proline is an important component of salt-stress responses of plants. In this study the role of proline as part of salt-stress signalling in the desert plant Pancratium maritimum L. was examined. The data showed that salt-stress brought about a reduction of the growth and protein content, particularly at 300 mM NaCl, that was significantly increased by exogenous proline. In the leaves, salt-stress up-regulated ubiquitin, a small protein targeting damaged proteins for degradation via the proteasome, up to 5-fold as detected by western blotting. This change was also affected by proline even in non-stressed leaves. However, salt-stress resulted in a decrease in the amount of ubiquitin-conjugates, particularly in the roots, and this effect was reversed by exogenous proline. Severe salt-stress resulted in an inhibition of the antioxidative enzymes catalase and peroxidase as revealed by spectrophotometric assays and activity gels, but the activity of these enzymes was also maintained significantly higher in the presence of proline. Salt-stress also up-regulated several dehydrin proteins, analysed by western blotting, even in non-stressed plants. It is concluded that proline improves the salt-tolerance of Pancratium maritimum L. by protecting the protein turnover machinery against stress-damage and up-regulating stress protective proteins.

Keywords: growth; Pancratium maritimum L.; proline; salt-responsive genes

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2. PLANT-GROWTH METABOLISM AND ADAPTATION IN RELATION TO STRESS CONDITIONS .16. SALINITY AND HORMONE INTERACTIONS IN AFFECTING GROWTH, TRANSPIRATION AND IONIC RELATIONS OF PHASEOLUS-VULGARIS

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Abstract

Addition of either abscisic acid (ABA) or kinetin at 10(-6) M to salinized media (20 - 120 mM NaCl) induced remarkable effects on growth of Phaseolus vulgaris plants. Whereas ABA inhibited the plant growth and the rate of transpiration, kinetin induced stimulation of both parameters. Moreover, ABA increased proline and phosphorus concentrations in the salinized plants whilst kinetin decreased them. ABA induced stimulation of the transport of K, Ca and Cl from root to shoot, accumulation of K, Na and Cl in root cells and inhibits the transport of Na and accumulation of Ca. Kinetin appeared to inhibit the transport and accumulation of Na and Cl, transport of K, and stimulates the accumulation of K and Ca as well as the transport of Ca. The highest influence of both ABA and kinetin was mostly observed when these hormones were used in combination with the highest concentration of NaCl (120 mM) in the medium.

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3-EFFECTS OF SALINITY ON GROWTH AND METABOLISM OF PHASEOLUS-VULGARIS

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Abstract

Increasing salinity induced a marked reduction in the plant growth, though Phaseolus seedlings tolerated salinity up to 120 mM NaCl. A great reduction in sugar and protein contents occurred with increasing salinity, whereas soluble nitrogen compounds and the relative contents of the photosynthetic pigments were increased in the treated plants. Increasing Ca concentration in the salinized medium appeared to improve the plant growth and to increase the contents of saccharides and proteins in the NaCl-treated plants. This suggests that Ca could be added to salinized media to overcome the deleterious effects of salinity on the growth and productivity of leguminous crop plants.

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4- EFFECT OF ZN2+ ON WATER AND K+ FLUXES IN DETOPPED MAIZE PLANTS

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Abstract

Water and K+ fluxes were examined in detopped plants of Zea mays L. (cv. White Horse Tooth), which were grown and exuded on half-strength Long Ashton nutrient solution containing the appropriate concentration of Zn2+ at 20-degrees-C. In light-grown plants, 100 and 500 muM Zn2+ increased both water and K+ fluxes in detopped maize plants whereas 1 000 muM Zn2+ inhibited both fluxes. In the dark-pretreated plants, 1 000 muM Zn2+ in the medium stimulated K+ flux. The fluxes of K+, Zn2+, Ca2+ and Mg2+ were usually higher in detopped plants than in intact ones. At 1 000 muM Zn2+ in the exudation medium, Zn2+ concentration was higher in the xylem exudate of dark-pretreated plants than in roots of plants maintained in light. The results are discussed in relation to the influence of Zn2+ on the membrane permeability and transport in plants.

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5- PLANT-GROWTH, METABOLISM AND ADAPTATION IN RELATION TO STRESS CONDITIONS .14. EFFECT OF SALINITY ON THE INTERNAL SOLUTE CONCENTRATIONS IN PHASEOLUS-VULGARIS

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Abstract

In response to salinity, remarkable changes in ion distribution and concentration, proline content, relative growth rate (RGR) and in transpiration rate were maintained in 4-week-old Phaseolus vulgaris plants. Thus increasing salinity levels in the growth medium induced a reduction in the RGR and in the rate of transpiration. In all of the plant organs, Na, Cl and proline concentrations increased continuously whereas K and Ca concentrations decreased with increasing salinity except in the second and third trifoliate leaves. The magnitude of increase in Na concentration in roots was more profound than in leaves. Moreover, Mg was almost unaffected by increasing salinity. On the other hand, desalinization of the growth medium increased the internal contents of K and Ca and largely decreased that content of Na in all of the plant organs. The present changes in the internal ion concentrations are discussed in relation to K - Na selectivity and ion transport in the plant.

Keywords: PHASEOLUS-VULGARIS; SALINIZATION; DESALINIZATION; RGR; TRANSPIRATION; INTERNAL SOLUTES; PROLINE

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