

Plant Growth as Affected by Fresh, Brackish and Sea Water

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Summary

Objectives of the present research is to give some consideration on (1) the adaptation of Salicornia europaea to brackish water, (2) growth response of potato (Solanum tuberosum) plantlets in vitro to water excited by monochromatic visible light, and (3) diffusion of NaCl in gelled culture medium in plant tissue culture, based upon the corresponding experimental results.

Experiment 1: Adaptation of Salicornia europaea to brackish water

Salicornia europaea was cultivated at different NaCl concentrations in solution for irrigation, using pots with sand. Concentrations of Na⁺, Cl⁻, fructose, glucose, malic acid and oxalic acid in the plant body increased with increasing the concentrations of NaCl in culture solution. These result may be explained by the regulatory mechanism of water potential in plant cells exposed to different NaCl concentrations in the sap.

Experiment 2: Growth response of potato plantlets in vitro to water excited by monochromatic visible light

Water excited by a specific monochromatic visible light promoted the growth of potato (Solanum tuberosum cv. Benimaru) plantlets in vitro. Leafy single node cuttings of potato explants cultured in vitro for 20 days on Murashige and Skoog (1962) sugar-free medium at an air temperature of 23 C, photoperiod of 16 h/d with fluorescent lamps, photosynthetic photon flux density of 90 $\mu\text{mol}/\text{m}^2/\text{s}$. The dry weight and chlorophyll content of the plantlets were 1.5 times greater in the treatment with excited water than in the control treatment with non-excited water.

Experiment 3: Diffusion of NaCl in gelled culture medium in plant tissue culture

Diffusion coefficients of NaCl in agar culture medium for plant tissue culture were measured at different agar concentrations (4–32 g/l). The diffusion coefficients were not affected significantly by agar concentration and were comparable to that of NaCl in free water (1.3 cm^2/d) and to those of sucrose and oxygen in free water. From this result, we can conclude that transportation of nutrients and oxygen around the roots of plantlets in agar medium should be largely restricted by the low value of diffusion coefficient in agar medium.