

Plant Growth as Affected by Fresh, Brackish and Sea Water

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Summary

The objectives of the present research are to give several considerations on (1) response of salt tolerant plants to various saline conditions, (2) the concept of water-supply capability of media based on the corresponding experimental results.

Experiment 1: Response of salt tolerant plants to various saline conditions

— The salinity relations of mangrove plants —

In Iriomote Island, Okinawa, Japan, there lived six(6) species of mangrove plants making a zonal distribution according to the salt tolerance. Mangrove plants along Kuira River were analyzed to reveal the mechanism of the tolerance to sodium chloride(NaCl) in water. Concentrations of ions, organic acids, and saccharides in leaves of mangrove plants grown at the river mouth were higher than those at the upper stream where NaCl concentration in the water was much lower. The organic acids and saccharides might have been produced to adjust the osmotic pressure in the plant cells, thus to adapt to the excess cations and salts. Plantations of the mangrove plants depending upon their adaptability to the environmental salinity would lead the recovery of mangrove forests.

Experiment 2: The concept of water-supply capability of media

— Hydraulic characteristics of media as environmental factors —

Hydraulic characteristics of silty soil were measured using the one-step method from saturation up to 2.6 mH₂O in soil-water suction. The supplied amount of water in 1 h was very much restricted when suction became higher compared to the amount that would be attained in infinite duration of time. The water-supply capability(WSC) was defined as the amount of water per unit length of root and unit water-suction that would be supplied from the media to just outside the root in a cycle of period when water was absorbed harmonically with the plant root. New simple formula were deduced to evaluate the WSC. The test-soil's WSC was calculated with the formula and the hydraulic characteristics of the soil. Hydraulic conductivity was a dominant soil factor in determining the value of WSC, whereas soil-moisture diffusivity affected a little.