Studies on diurnal and seasonal changes in salinity of water in the soil of the coastal area: For conserving and recovering mangrove vegetations

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Summary

It was observed that roots of mangrove plants usually grow under conditions with higher water potential than that expected from the sea water even though they were growing in the sea. It also has been reported that the growth of the plants was rather suppressed in the culture solution with the salinity as high as the sea water. Therefore, it would be very important to know the actual status of the salinity of water in the soil in estimating the establishment and development of the seedlings. In order to characterize the conditions for conserving and recovering mangrove vegetations, we clarified diurnal and seasonal changes in salinity of water in the soil of the coastal area where mangrove plants are growing in Iriomotejima, Okinawa and also investigated the effects of salinity on the physiology of mangrove plants, *Rhizophora stylosa* Griff., grown in culture solution.

A vinyl chloride pipe with a number of holes on the side for allowing easy passage of water in the soil was put into the soil and a salinometer (Alec Electronics; MDS-CT) was installed in the pipe at about 30 cm in depth. The salinity of water in the pipe was recorded every 10 or 20 minutes. The salinity fluctuated between about 3.4 and 1% through the season, being lower in the winter with a larger amount of precipitation and being higher in the summer with a smaller amount of precipitation. A marked reduction in salinity followed much precipitation. The salinity showed diurnal changes, becoming higher at the high tide and becoming lower at the low tide. The extent of the diurnal change became larger when the salinity was low. At the site of the river mouth, the salinity tended to be lower and the reduction due to precipitation was larger than the site of the coastal area. These results indicate that the salinity of water in the soil was affected significantly by the fresh water coming from the land. However, there was a site where the remarkable effects of precipitation on the salinity were hardly observed even in the mangrove vegetation in the coastal area.

As water uptake rate decreased, the leaf water potential, leaf turgor and leaf diffusive resistance decreased significantly at the midday in the plants, *R. stylosa* grown in the culture solution with 500mM of NaCl than that with 200mM. In the excised root, water uptake rate decreased markedly when it was transferred from the solution with 200mM of NaCl to the solution with 500mM of NaCl. However, the reduction was reversible and the rate increased to the original value in the solution with 200mM of NaCl, thereafter. Osmotic potential of xylem sap from the root was almost equal to the osmotic potential of culture solution at any concentration of NaCl.