Metabolic Studies Related to Salt Tolerance of Mangrove Plants

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Summary

Coastal mangrove plants may produce large amounts of ATP to faciliate the removal and/or transport of excess salts and may also synthesize compounds that function as compatible solutes to lower the osmotic potential of their tissues. In the present study the metabolism of carbohydrates and purine nucleotides was investigated in roots and leaves of 2-year-old seedlings of the mangrove plant, *Avicennia marina.*

The rate of respiration (O_2 uptake) of leaves increased in the presence of increasing concentrations of NaCl in the incubation medium although root respiration was not similarly effected.In roots the rate of release of $^{14}CO_2$ from [1-^{14}C]glucose was more than twice that observed with [6-^{14}C]glucose but similar rates of $^{14}CO_2$ output were obtained when the two forms of labelled glucose were incubated with leaves. The C_6/C_1 ratios observed with roots varied from 0.30 to 0.44 while the ratios of 0.85 to 0.99 were obtained with leaves incubated in the presence of varying concentrations of NaCl. This implies that their is a greater involvement of the oxidative pentose phosphate in glucose catabolism in roots than in leaves.

[U-^{14}C]Sucrose incubated with root segments for 18 h was coverted to CO_2, amino acids, organic acids, sugars and proteins. The incorporation of radioactivity into most of these components was not affected by NaCl. However, the release of $^{14}CO_2$from leaves incubated with [U-^{14}C]sucrose was enhanced by 250 and 500 mM NaCl, but similar effects were not observed with roots. Incorporation of radioactivity from [U-^{14}C]sucrose into malate was enhanced in both roots and leaves by increasing the NaCl concentrations from 100 mM to 500 mM. Independent of NaCl concentration, more than half of the radioactivity in the neutral fraction from leaves was incorporated into an unidentified sugar while in the same fraction from roots the ^{14}C label was associated with glucose, fructose and sucrose. It is tempting to suggest that the unidentified sugar that accumulates in leaves may function a compatible solute.

[8-^{14}C]Adenosine and [8-^{14}C]guanosine were salvaged to nucleotides and nucleic acids by both roots and leaves. Between 20 and 40% of total radioactivity taken up by the plant tissues was incorporated into the ureides, allantoin and allantoic acid, with < 5% being released as $^{14}CO_2$. NaCl at 100 and 500 mM had little effect on the purine salvage and catabolism pathways in *A. marina* although there are reports in the literature on salt stress-induced increases in purine catabolism in glycophytes.

Both leaves and roots of *A. marina.* accumulated glycinebetaine but proline, another potential compatible solute in halophytes, was present in only low amounts. Asparagine was the major free amino acids in leaves and roots of *A. marina.*

The possible roles of the investigated pathways in mangrove plants will be discussed.