General and Special Qualities for Roots of CAM Species. (S06-nobel152528-Oral)

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Abstract:

Roots of Crassulacean acid metabolism (CAM) plants, such as the desert succulents Agave deserti and Ferocactus acanthodes as well as the widely cultivated Opuntia ficus-indica, are relatively shallow, with mean depths of only 9-10 cm. Such a shallow root distribution allows the plants to take advantage of light rainfalls. The roots also exhibit rectifier-like properties; the hydraulic conductivity is relatively high when the soil is wet and then decreases during drought, reducing the inevitable water efflux from the plant when the soil water potential becomes less than that of the root. Also during drought, the roots shrink and the developing root-soil air gaps decrease water loss from the plants. During extended drought the large decrease in soil hydraulic conductivity is the main factor preventing water loss from desert succulents in particular and plants in general. The responses of roots of CAM plants to soil water potential and temperature at various depths in the soil also have ecophysiological ramifications. For instance, the seasonality of root growth on different slopes helps determine species composition. Aquaporins (water channels in membranes) can help regulate water loss from CAM plants during drought. Hormones such as abscisic play a role in root responses of the hemiepiphytic CAM plant, Hylocereus undatus, whose roots occur in a small soil volume subjected to extremely rapid changes in water content. Although root distribution and growth are difficult to monitor in the field, studies of roots have provided many provocative results that can be especially noteworthy for plants in water-limited environments.

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