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Drought tolerance mechanisms in cassava

Cassava is considered a food security crop in drought-prone regions. The goals of our work are to determine which traits contribute to its maintenance of yield in water stress environments. Our studies in controlled environments indicate that cassava stomata close in response to slight decreases in leaf water status and maintain leaf water potential at values near those of well-watered controls. This is associated with rapid and large increases in abscisic acid (ABA). Also, as stress continues, a substantial fraction of leaves abscise, thereby decreasing transpirational surface area and further conserving water during stress periods. New leaf production and expansion growth is also highly sensitive to water deficit, due to inhibition of leaf cell division, cell expansion. However, growth recovers rapidly after renewed water supply, thereby permitting rapid re-establishment of leaf area. Carbon use is down-regulated by limiting growth and not substantially accumulating osmotically active solutes. Also, petiole and stem carbohydrate reserves are gradually utilized and translocated to sinks throughout the plant. The amount of starch stored in stems is considerable, representing a large share of the total non-structural carbohydrate in a plant at the initial period of storage root growth. In summary, the mechanisms used by cassava to tolerate water deficit episodes are: 1) rapidly limit transpiration such that its tissues are not exposed to injurious low water potential stress, 2) down-regulate growth and carbon consumption in leaves and storage roots, and 3) supply metabolic needs via remobilization from reserves in petioles and stems.