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Physiological and Morphological Responses of Four Centrosema Species to Preconditioning Periods of Soil Water Deficits: An Ongoing Research in Venezuela

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Abstract

A critical environmental constraint in seasonal savannah ecosystems is the lack of available soil water during the dry period. This is usually accompanied by high temperatures, which induce a high evaporative demand. Identification of plant traits promoting survival and long term persistence under drought are necessary for any intended use of legume species to improve forage resources in these areas.

The genus Centrosema comprises 34 species which are native to the American tropics and subtropics. Some of these species show a combination of escape, avoidance and tolerance strategies that allow for better performance under soil drought. Though a positive correlation exists between the degree of osmotic and stomatal adjustment and drought tolerance, an inverse correlation has also been reported. Within Centrosema, it is more likely that a wider interspecific variation exists in the degree of control of stomatal closure and other traits such as: reduced leaf area, deep rooting and accumulation of osmosolutes, which contribute to reductions in water loss and prolonged plant growth.

It is well known that the response to water deficits will depend on the duration and intensity of soil drought. Likewise, many plants can withstand more intensive water deficits when subjected to a conditioning or hardening period in comparison to well-watered plants, due to the capacity to express all the inherent mechanisms available for survival under drought.

Consequently, a glasshouse experiment has been set up to study the morphological and physiological responses of four Centrosema species (*C. rotundifolium* CIAT 5721, *C. molle* CIAT 15160, *C. macrocarpum* CIAT 5713 and *C. brasilianum*) to water stress after a conditioning period. This acclimation phase consists in subjecting 50 days old plants to three soil water holding capacities: 100, 67 and 33 % of field capacity, for a period of about 20 days. Subsequently, plants are re-watered for 3–5 days before being exposed to a continuous soil drying in comparison to well-watered controls. Water relations, photosynthesis, soil water use, plant yield and biomass allocation will be measured during the drying phase. Results are expected to identify distinct mechanisms responsible for observed differences in growth and survival under field conditions.

Keywords: Acclimation, biomass production and allocation, centrosema, photosynthesis, soil drought, water relations, water use

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