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

ORLANDO GUENNI1 and ZDRAVKO BARUCH2
1Universidad Central de Venezuela (UCV). Facultad de Agronomía. Maracay, Venezuela.

Introduction

• In savanna ecosystems, rainfall seasonality is the main cause of variation in forage yield and quality.
• Since extended dry periods are common in these regions, identification of plant traits promoting long term persistence under drought is a critical issue for forage plant adaptation.
• Under natural conditions, the progressive exposure to drying stress during the low-rainfall period is a critical issue for forage plant adaptation.

Materials and Methods

• Plants were grown in PVC pots (10 cm d., 50 cm depth) under glasshouse conditions. Soil sterilization and Rhizobium inoculation prevented any possible nutrient deficiency. Average daily air temperature fluctuation was 17-32°C, and maximum PAR=1200 µmolm-²s-1 (14 hrs).
• All species were watered to field capacity for 40 days. Afterwards, three irrigation treatments were imposed, so soil moisture was kept at the following matrix potentials: -0.05, -0.3 and –1.5 MPa. Plants were cut after 30 days of preconditioning and let to regrow for about 45 days under the same treatments before final harvest.
• Plant measurements were: a) biomass production and partitioning (S:R ratio), leaf area (LA), and e) specific leaf weight (SLW).

Results

• Variation in all measured plant traits was high within treatments, probably because the plant material is relatively wild or still incompletely selected for uniformity.
• Total plant biomass at the end of the regrowth period (Fig. 1) was only modified in C. macrocarpum and C. rotundifolium, where final yield under low soil moisture regimes was even higher than control (-0.05 MPa). C. brasiliense was the only species in which total biomass tended to decrease with water deficits (Fig. 1).
• Leaf, stem and consequently, shoot biomass, followed the same trend as in Fig. 1. However, during the preconditioning period, above-ground biomass in C. macrocarpum and C. rotundifolium was similar among treatments. In these species, the observed increase in total biomass (Fig. 1) was the result of an increase in both, shoot and root biomass. In C. macrocarpum, total and shoot biomass varied little among treatments during and after the preconditioning period. In C. brasiliense, the decrease in total biomass was the net result of a marked decrease in shoot biomass, as root dry weight remained similar among treatments.

Conclusions

• LA decreased at low water potentials during the preconditioning period. Subsequently, low moisture had negative (C. brasiliense) and positive (C. rotundifolium) effects in LA. Similar positive effects were also observed in C. molle and C. macrocarpum at -0.3 MPa, though not significant.
• During preconditioning, SLW was relatively similar among treatments, but at final harvest it increased by low water contents in all species except C. rotundifolium.
• The S:R remained similar among treatments in C. macrocarpum, but was markedly decreased at low soil water contents in C. molle and C. brasiliense. An increase in S:R was observed in C. rotundifolium at -0.3 MPa.

Contact: Orlando Guenni
Universidad Central de Venezuela
Facultad de Agronomía, Instituto de Botánica Agrícola
Apartado Postal 4579
Maracay 2101, Venezuela
Phone: +58-243-461 76 23
Fax: +58-243-461 76 23
Email: guenni@agr.ucv.ve
Web: www.agr.ucv.ve