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Drought Effect on Yield, Leaf Parameters and Evapotranspiration Efficiency of Cowpeas

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Abstract

Two experiments with six cowpea [*Vigna unguiculata* (L.) Walpers] genotypes were carried out in the greenhouse to study the response of yield and related parameters including total leaf area (LA), specific leaf area (SLA), intrinsic transpiration efficiency (TEi), evapotranspiration efficiency (ETE) and stem mass density (SMD) under drought at the generative phase.

In experiment 1 pod mass plant⁻¹ ranged from 51 to 62g under well-watered (ww) conditions with similar pod mass under water deficit (wd) conditions, except ExUkwala which produced very few small pods. The seed yield plant⁻¹ ranged from 38 to 49g for ww plants and 32 to 36g under wd, except ExUkwala. Single grain weight (SGW) of ww treatments ranged from 101 to 230mg, but it ranged from 48mg, 109 to 146 and 190mg under drought.

ETE of ww plants varied between genotypes and was positively correlated to three yield parameters. Under wd rank order of ETE was altered and ETE displayed no significant relationship to yield components. TEi of ww plants had a weak positive correlation to number of seeds plant⁻¹, whereas SMD was positively correlated with pod mass. Correlation of TEi to number of seeds plant⁻¹ remained under wd and SMD had a stronger correlation to seed mass and SGW under drought. Under ww conditions LA had no significant correlation to yield, but SLA was negatively correlated to yield components. LA and SLA showed negative correlations to pod mass, seed mass and SGW under wd.

In experiment 2, ExUkwala and Vita7 did not flower. There were similar ww and wd effects. However, sizes of yield components were several magnitudes lower than in experiment 1. Under ww and wd conditions the relationships of parameters to yield components were similar to those in experiment 1. Further, leaf relative water content (RWC) had a positive correlation to SGW under ww conditions, whereas a positive correlation existed between RWC and pod mass, seed mass and SGW under wd.

The data presented here seem to point to a possibility to select cowpea genotypes under drought during the generative phase for their yield performance using parameters like TEi, SLA and SMD.

Keywords: Cowpea, drought, evapotranspiration efficiency, intrinsic transpiration efficiency, stem mass density, *Vigna unguiculata*, yield components