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Genetic Analysis of Vegetative-Stage Drought Tolerance in Cowpea

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Abstract

The continued improvement in the yield of cowpea for the semi-arid regions where it is a dominant crop will record rapid progress if the genetic basis for yield under different moisture regimes is better understood. This study investigated the genetic combining abilities and heterosis for grain yield, yield components, earliness to flower and biomass production among diallel hybrids derived from nine cowpea genotypes. Hybrids and their parents were evaluated under adequate soil moisture conditions and conditions of soil moisture stress during the first 30 days of growth. Results showed that soil moisture stress significantly reduced grain yield, biomass production, and the number of pods per plant. Grain size however, increased under moisture stress. Only for grain yield was a significant interaction of moisture regimes and genotypes observed. Genetic control for grain size, number of seeds per pod and days to flowering was dominated by additive genetic effects. For these traits, mass selection is judged adequate to make selection gains. For grain yield, both additive and non-additive genetic effects were dominant, but the greater influence of non-additive effects was observed under both adequate soil moisture and moisture stress conditions. The genetic control of yield under the two soil moisture conditions indicated that grain yield improvement will be more challenging for drought prone regions compared with regions with adequate soil moisture. Nonetheless, careful selection of genotypes that have complementary but different alleles for yield under different soil moisture conditions might permit yield improvement through recurrent selection systems. This study has identified parental lines, developed populations, and provided a breeding strategy for developing cowpea cultivars with higher grain yield potential for the Guinea and Sudan savannah regions of West Africa.

Keywords: Combining abilities, cowpea, developing cowpea cultivars, diallel hybrids, drought tolerance, heritability, heterosis, trait correlation