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Selection for Adaptation to Water Stress and Low-Phosphorus Soil Conditions in Cowpea (*Vigna unguiculata* (L.) Walp.)

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Abstract

Cowpea (*Vigna unguiculata* (L.) Walp.) relatively inexpensive sources of high-quality protein and important in the nutrition of poor households. Water stress reduce photosynthesis and carbohydrates for pod filling, which can lead to a decrease in yield. The detrimental effect of water stress can be reduced by phosphorus application to the soil.

The objective of this study is to investigate the types of adaptation and existence of genetic variation for Phosphorus efficiency of 40 cowpea genotypes under water stress and control conditions. This was to understand the effect of low P and water stress on yield and yield parameters. The cowpea genotypes were subjected to three treatments (0 mg P kg^{-1} soil + no water treatment (control), 60 mg P kg^{-1} soil as Triple Super Phosphate + water treatment and 60 mg P kg^{-1} soil as Triple superphosphate + no water treatment under greenhouse conditions.

Chlorophyll content, plant height, yield parameters, dry biomass, soil water and temperature were examined at vegetative and mature stages. Drought stress reduced the growth, chlorophyll content of the leaves, yield and all the yield parameters measured. However, Asontem, GH-2209,F2T2K66 and GH-6060 were less affected. More cowpea genotypes were effectively responded at 60 mg P kg^{-1} soil without water stress. Best Five (Asontem, GH-2200, GH-2309, F2T2K66 and GH-6060) and worse five (Asomdwee, GH-5344, Hans adua, Nketewade and F2T2A36) genotypes were selected based on their biomass production for a detailed study in the field.

The findings suggested that genetic variability and heritability existed among the cowpea genotypes evaluated. The selected ten genotypes will be used to critically assess the response and adaptation of cowpea to different climate scenario under water stress and low soil phosphorus condition.

Keywords: Cowpea genotypes, climate change and water stress, greenhouse experiment, low phosphorus soils, phosphorus use efficiency, triple superphosphate

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