

Genetics evaluation of phosphorus utilization in tropical cowpea (*Vigna unguiculata* (L) Walp)

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Abstract

Genetics evaluation of phosphorus utilization in cowpea (*Vigna unguiculata* (L) Walp) was studied in a cross involving a tropically adapted genotype (IT90K-277-2) with a reported positive response to rock phosphate (RP) and a second genotype (IT89KD-288) that responds negatively to RP, using generation mean analysis of the parents, their F₁, F₂ and the two backcross generations. Highly significant differences among the six generations with respect to seed phosphorus (P) concentration and grain yield per plant were observed. The F₁ progenies produced seeds with higher seed P concentration (0.31 mg/g) than the mid-parent value (0.27mg/g). Mean yield per plant in the F₁ (48.03g) that was significantly greater than the mid-parent value (28.85g) was also observed suggesting positive heterosis for the two traits. Backcrossing to both parents showed good convergence of genes on the recurrent parents. Possibility of transgressive segregation for seed P concentration and grain yield per plant in the F₂ generation was also observed. Absence of significant reciprocal differences among individuals in the F₁ and F₂ populations suggested lack of maternal and cytoplasmic effects. Non-additive gene action (dominance and epistasis) made significant contributions to total genetic variations in both traits within the cross. Whereas seed P concentration was observed to be under polygenic control, number of genes for seed yield per plant was biased downward by epistasis. Observed narrow-sense heritability estimate (H_N) for seed P concentration of 50.51% and very low (0.040) expected genetic gain in the F₃ over the F₂ means suggested that although expected progress from selection could be lowered by non-additive gene effects, this trait could be transmitted to the offsprings of hybridization program with huge success, through backcrossing. Although, available soil P (6.03 –8.09mg/kg) was observed to be below the critical level, phosphorus uptake in the F₁ and the segregating generations was observed to be higher than what obtained in the parents to suggest that the progenies of a P-efficient x P-inefficient cross would be efficient in P utilization.