



→ 2.1.7 **Nguku Barbara. D. (2010). A selection system based on secondary traits for phosphorous use efficiency in common bean (*Phaseolus Vulgaris* L.) (Supervisor: Dr D. M. Lungu).**

Production of common bean (*Phaseolus vulgaris* L.) is often limited by the availability of soil phosphorus (P). The main objective of this study was to evaluate the use of secondary traits in selection for high phosphorus use efficiency under low phosphorus soil conditions in common bean. The genotypic differences on growth and yield of common bean in response to P supply were evaluated in a field experiment. Six genotypes (NBi 07, Sarbyt 07, Navy beans, NBi 08, Uy 96 and Wanja) different in their P use efficiency were grown at four levels of applied P (0, 40, 80 and 120 kg P/ha) in a split plot design with three replications. Phosphorus was the main plot factor and genotypes as the sub plot factor. The effects of genotype, phosphorus and the genotype x phosphorus interaction were significant for most traits. Growth was affected differently among the genotypes by low P. Low P supply increased the root dry weight and decreased the leaf and shoot dry weight. Wanja showed the highest root: shoot dry weight

demonstrating a vigorous rooting under stress. The smallest root: shoot dry weight by Navy bean followed by Sarby 07 indicated that more assimilates were allocated to the shoots than to the roots. Low P availability also reduced the leaf area (LA). At lower applied P level of 0 kg P/ha, green leaf number relatively decreased while plants under high P supply had increased the formation of new leaves. Number of pods per plant was the most affected component by P deficiency, explaining the superiority of efficient genotypes under low P, and it has a predominant influence on yield either at low or high fertility levels. Uy 96 and NBI 08 had higher number of pods per plant, and also a relatively higher grain yield. Uy 96, NBI 08 and Wanja had higher yields of 4848, 2762 and 2263 kg/ha, respectively. Orthogonal contrasts showed significant differences between high and low yielding genotypes (NBI 08+Uy 96 Vs NBI 07+Sarby 07). There was no significant difference between genotypes of the same group (Uy 96 Vs NBI 08 and NBI 07 Vs Sarby 07). Several traits found to have greater influence on the yields performance such as number of pods per plant, 100 seed weight, plant height, green leaf number, leaf area, root dry weight, shoot dry weight and leaf dry weight. This study identified that, the use of these traits as selection criteria would lead to greater yield performance under low soil P and therefore these traits are suggested to be used as selection criteria in the breeding program for Phosphorus Use Efficient genotypes.