Phosphorus uptake and use efficiency of mung bean in response to moisture and phosphorus co-limitation

A.H.M.N.P. Abeysinghe[1], W.M.N.D. Gunathilaka[2], K.W.L.K. Weerasinghe[1], M. Ariyarathne[1], B. Marambe[1] and D.M.S.B. Dissanayaka[1*]

[1]Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka
[2]Grain Legume and Oil Crops Research and Development Centre, Angunakolapelessa, Sri Lanka

Abstract

Crop yields are significantly reduced by phosphorus (P) deficiency and drought stress in many cropping systems worldwide. Legume crops are considered as an integral component to sustain the productivity of many cropping systems, where mung bean (*Vigna radiata* L. Wilczek) is recommended as a mid-season crop in selected paddy fields in Sri Lanka by the Department of Agriculture, as an approach to utilize residual moisture. The present study explored the growth performance, P uptake and yield parameters of two mung bean varieties: MI5 and MI6 grown under moisture and P co-limited conditions. Plants were cultivated in pots containing 15 kg soil under two P levels (with and without P application) and two moisture levels (well-watered and water-stressed) imposed during the reproductive growth. The experiment was done as a three factor factorial in completely randomized design with three replicates. Biomass and P accumulation in different plant organs and yield parameters were measured. Plant dry weight, P uptake, and the yield of both varieties were remarkably reduced when plants were exposed to moisture stress and P-deficiency stress. For both varieties, the highest tissue-P concentration was attained with P application under well-watered condition whereas the lowest was recorded from plants under moisture stress and without external P supply. MI6 showed the better ability to acquire more P than MI5 when grown without external P supplement. Increased phosphorus use efficiency (PUE) was shown by the two varieties tested under P-deficient conditions. Across all treatment combinations, MI6 had the highest PUE under water stress and without P application, and also produced a greater pod dry weight compared to MI5 in P-deficient soil. Other yield parameters such as number of pods per plant, pod length, and number of seeds per pod were also greater in MI6 than those of MI5 particularly under well-watered condition. Results clearly demonstrated that co-occurrence of P-deficiency and moisture stress could bring significant yield reduction ($P<05$) in mung bean. Among the two varieties used in the study, MI6 seems to thrive well under P-limited conditions in the absence of soil moisture stress.

Keywords: Drought stress, Phosphorus-deficiency, Yield parameters

[*]***Corresponding Author***: dissanayakauop@yahoo.com