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Responses of Grain Yield and P Uptake to Water Management and Phosphorus in Lowland Irrigated Rice (*Oryza Sativa* L.)

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Abstract

Phosphorus (P) deficiency constitutes a major growth and yield-limiting factor in irrigated and rainfed rice systems in Madagascar. Many soils in Madagascar are highly weathered with a high Fe oxyhydroxide content leading to P sorption and low P availability, and farmers often do not apply mineral P fertilisers leading to a continuous decline in soil P stocks. Appropriate agronomic practices should be designed to increase P availability and improve P fertiliser use efficiency to encourage the application of P inputs. P availability and P uptake by the rice crop may be affected by water management. It is known that relatively high soil water content under frequent irrigation increases soil P mobility and availability through reductive dissolution of P bearing Fe-oxides. On one hand, cycles of alternate wetting and drying (AWD) can increase P availability and acquisition under sub-optimal P supply. On the other hand, as P availability often increases drastically upon flooding, we hypothesised that flooding during the grain filling stage may lead to luxury P loading in grains without increasing grain yield and hence low P utilisation efficiency. The objective of this study was to evaluate grain yield and P uptake of rice under different P rates and water management treatments. The experiment was undertaken in Behenjy (1361 m.a.s.l.), Madagascar using X265 rice variety. A split-plot design was used with 3 irrigation treatments (continuous flooding, continuous flooding until flowering and then drained, and AWD) in main plots, 3 doses of P (0, 10 and 25 kg/ha) in the sub plots, and 4 replications. Results on grain yield and P uptake of rice cultivated in lowland irrigated system, mainly under P stress will be discussed and presented.

Keywords: Alternate wetting and drying; Madagascar; P deficiency