

Field Evaluation of a Biofertilizer Targeting to Reduce TSP Application in Paddy Cultivation

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Sustainable solutions to reduce dependence on chemical fertilizer imports is a current need for Sri Lanka. A study was conducted to evaluate the effect of a phosphate solubilizing bacteria (PSB) based biofertilizer targeting paddy cultivation in the Dry and Intermediate Zones of Sri Lanka under farmer's field conditions. Triple super phosphate (TSP) was used as the P fertilizer at the rate recommended (55 kg/ha) by the Department of agriculture (TSP_{100%}), at 75% or 66% of the recommended rate (TSP_{75%} and TSP_{66%}, respectively) together with PSB. Field studies were conducted in three consecutive *Maha* seasons (2020/21, 2021/22 and 2022/23) in different farm fields spread in the Dry and Intermediate Zones of Sri Lanka. Soils collected before establishing the crop and at harvesting stage were subjected to characterization. Abundance of PSB in the plant rhizosphere was determined at panicle initiation stage. Rice yield and yield components, and grain P levels were determined at harvest. Mehlich-3 extractable P content was ranged from 0.6 to 34 mg/kg. Abundance of PSB in the rice rhizosphere was significantly higher when PSB was applied with TSP compared to TSP_{100%}. Applying a PSB with reduced TSP fertilizer resulted in significantly higher yields compared to TSP_{100%} during *Maha* 2020/21 and *Maha* 2021/22 (average increase of 15% and 13%, respectively). Significantly high P concentration and P uptake in grains was observed under the TSP_{66%}+PSB treatment indicating improved P nutrition. The findings support the effectiveness of the PSB-based biofertilizers as a sustainable supplement to reduce TSP application by 25 to 33% in irrigated paddy cultivation without compromising the yield.

Keywords: Dry and intermediate zones, Phosphate solubilizing bacteria, Rice,

Acknowledgement: Financial support from NRC-TO/16-07 and the technical support from Mahaweli authority of Sri Lanka and Lankem PLC