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Effects of Combined Application of Organic Manures and Biofertilisers on Soil Fertility and Grain Yield of Black Gram (*Vigna mungo* (L.) Hepper)

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Abstract

India is the leading country in area, production (25 %) and growing wide variety of pulse crops but still the largest importer of pulses with 34 % of the global food use. The national average pulse productivity (597 kg ha^{-1}) is far below than the global average of 857 kg ha^{-1} . Consequently, per capita availability of pulses declined from 60.7 to 29.4 g day⁻¹ during 1951 to 2007. This is mainly due to the growing importance on cereal crops, decreasing soil nutrient status and emerging secondary and minor nutrient deficiencies. Therefore, a field experiment was conducted with black gram (*Vigna mungo* (L.) Hepper) in Tamil Nadu, India to investigate the influence of farm yard manure (FYM), neem cake (NEC) in combination with *Rhizobium leguminosarum* bv. *phaseoli* (RHL), *Pseudomonas fluorescense* (PSF). Parameters of assessment were soil fertility, grain yield, plant dry matter and protein content of black gram seeds. The highest grain yield (1122 kg ha^{-1}) was recorded with combined application of NEC+RHL+PSF, which is 194 % higher than control treatment. Combined application of RHL+PSF with either NEC or FYM increased the soil organic carbon by 30 %, over control. The addition of nitrogen in soil was ranged from 3.2 to 43 kg ha^{-1} in treated plots. RHL inoculation with either NEC (15 kg N ha^{-1}) or FYM (26 kg N ha^{-1}) recorded higher nitrogen addition than PSF. On the other hand, PSF application recorded higher phosphorus availability than RHL treatments. Co-inoculation of RHL+PSF with NEC was the most potent combination with the addition of 43 kg N ha^{-1} and 4.2 kg P ha^{-1} than FYM. Contrastingly, negative balance was observed with potassium availability. Unlike nitrogen and phosphorus, combined inoculation of RHL+PSF with FYM increased the bacterial, fungal and actinomycetes population by 172, 333 and 268 %, respectively, over initial soil status. The NEC+RHL+PSF combination increased the average total plant dry matter and seed protein content by 158 and 30 %, respectively, over control. The results indicate that integrated supply of RHL and PSF along with NEC or FYM plays a significant role in improving soil fertility and pulse productivity.

Keywords: Co-inoculation, black gram, neem cake, per capita availability, productivity, pulses