Research Article

Availability of phosphorus from rock phosphate influenced by sulphure and microbes in inceptisol

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Summary
An incubation study under ambient conditions and simultaneously pot culture experiment on soybean was conducted to observe the availability of phosphorus from rock phosphate due to acidulation effect caused by the sulphure and microorganism like PSB and EM. It was to ascertain the possibility of making use of rock phosphate (low grade) for direct use in soil application were tested in highly phosphorus consumptive soybean crop. The RP @ 75 kg ha was applied in the soil (3kg) in bowl. The treatments were comprised of application of graded levels of elemental S (0, 30, 60 kg ha^{-1}) with and without PSB or EM or PSB + EM. The soils were incubated for 90 days under ambient condition with keeping moisture at field capacity. The results indicated that highest available phosphorus content in RP + S$_{60}$ + PSB which was at par with RP+ S$_{30}$ + PSB + EM, suggests that 30 kg S along with PSB and EM was the best treatment for phosphorus release through solubilization of RP and increase availability of phosphorus to soybean.

Key words : Rock phosphate, Available phosphorus, Sulphur, Microorganism

Introduction

Soybean is the cheapest and main source of dietary protein of majority vegetarian Indians. The soya proteins are superior to most plant proteins by virtue of their high biological value, protein efficiency ratio and essential amino acid, pattern, which resemble to cow milk. The phosphorus improves the yield and quality of crop is well known. The low recovery of applied phosphorus, high fixation in soil and steep hike in the price of phosphoric fertilizers further complicating the problem of phosphorus use by the farmers. The low grade rock phosphate as the indigenous source of phosphorus may mitigate the demand if we improve the techniques for phosphorus solubilisation.

Singh and Amberger (1995) indicated that farm wastage composted in soil will release the organic acids which lead to solubilise RP and reducing the possibility of phosphorus fixation in soil. The phosphate enriched organic manure (PROM) was found most effectively under saline and alkaline condition of soil was reported by Galal (2002). The role of suphure (Talab, 2008) and microorganism (Imade *et al.,* 2010) were reported to contribute the availability of P. It is necessary to observe the individual and combined effects of these ingredients under the inceptisol soil for phosphorus solubility and availability.

In view of above, the present study was undertaken to observe the involvement of elemental S, PSB and EM for improving the soil properties and particularly targeted for phosphorus solubility and availability from rock phosphate.

Resources and Research Methods

The inceptisol soil (pH 8.2, Org.C 0.69%, CaCO$_3$, 6.25 %, available phosphorus 15.23 Kg ha^{-1}, available S 9.05 mg kg^{-1}, bacterial count 15.30 x 10^5 and fungal count 7.84 x 10^4 (cfug^{-1}) was selected for the study. Three kilograms of soil was filled in plastic bowls for each treatment. The rock phosphate (19.17 % total P$_2$0$_5$) was added @75 kg ha^{-1} pot as specified in the treatment. The total fourteen treatments (T$_1$- Absolute control , T$_2$ - 50:75:0 + 5 t ha^{-1}FYM, T$_3$ − RP + S$_0$, T$_4$ − RP+ S$_0$+PSB, R5