Click www.researchjournal.co.in/online/subdetail.html to purchase.

*Internat. J. agric. Sci. Vol.3 No.1 January 2007 : 228-231*

# Studies on the efficiency of rock phosphate as a source of phosphorus to pigeonpea (*Cajanus cajan*) in acid laterite soil of West Bengal

**D. Dutta**

Bidhan Chandra Krishi Viswavidyalaya, Regional Research Substation, Sekhampur, BIRBHUM, (W.B.) INDIA

## ABSTRACT

Field experiment on pigeonpea [*Cajanus cajan* (L.) Millsp.] with cultivar 'UPAS 120' was conducted during rainy *(kharif*) seasons of 2004 and 2005 at the Regional Research Substation, Sekhampur, to evaluate the effect of Rock Phosphate (RP) alone and with single super phosphate (SSP), farm yard manure (FYM) and phosphate-solubilizing bacteria (PSB) on crop productivity, phosphorus uptake and availability of phosphorus in acid laterite soil of West Bengal. The results revealed that the root nodulation, growth and yield parameters were highest in the treatment which received 50 % RP + 50 % SSP along with FYM and PSB, which was significantly different from the treatment with 100 % SSP alone. This treatment produced significantly higher seed yield (28.20 % and 8.29 %) over the control (no phosphorus) and 100 % SSP alone respectively. The phosphorus availability in soil was gradually increased from the initial stage in all RP treated plots, while a declining trend up to harvest stage was found with 100 % SSP alone. The highest uptake of phosphorus in the crop was also registered by the treatment with 50 % RP + 50 % SSP in combination with FYM and PSB. The study indicated that the integrated use of the indigenous source of phosphorus (RP), SSP, organic manure (FYM) and bio-fertilizer (PSB), besides curtailing the input cost, can effectively be used to improve yield of the long duration pigeonpea crop and to increase phosphorus availability in soil.

**Key words :** Pigeonpea, Rock Phosphate, Phosphorus.

## INTRODUCTION

Pigeonpea [*Cajanus cajan* (L.) Millsp.] is one of the most important *kharif* pulses suitable for rainfed upland situation. With regards to its production, the average yield of the crop is low mainly due to lack of proper nutrient management. Phosphorus is the backbone of any nutrient management programme for intensive cropping system. It is well known that the phosphorus is one of the major nutrients which is required in large quantities particularly for pulse crop for nodulation, N fixation, optimal growth and yield, but it is a major constraints as 98 % of soils in India have inadequate supply of P (Kanawar and Grewal, 1990). So, there is an imminent need for application of P to achieve higher yields of crops in the soils having low P availability (Goswami and Kamath, 1999). However, phosphatic fertilizer is a costly input. Large amounts of low-grade rock phosphate have been located in some parts of India, of which an economically viable deposit occurs in Mussoorie (U.P). In order to make economic use of these materials, they have to be directly used as fertilizer. Keeping this in view, the present investigation was under taken to elicit information on the crop yield, P availability and uptake of P as influenced by application of Mussoorie Rock Phosphate alone and in conjugation with SSP, organic manure (FYM) and bio-fertilizer (PSB) to pigeonpea in acid laterite soil of West Bengal.

## MATERIALS AND METHODS

The field experiment was conducted during rainy (*kharif*) seasons of 2004 and 2005 at the Regional Research Substation, Sekhampur, Birbhum, West Bengal ($23^0 54^/$ N latitude and $87^0 34^/$ E longitude), using pigeonpea variety 'UPAS 120'in rainfed upland situation. The soil of the experimental site was acid lateritic (Entisol) having sandy-clay loam in texture with a pH of 5.6, organic carbon 0.46%, available P11.88 kg/ha, available K 210 kg/ha. The experiment was laid out in a randomized block design with three replications and fourteen treatments given below.

T -Control (no phosphorus); $T_2$ -100 % $P_2O_5$ as SSP (50 kg $P_2O_5$ /ha); $T_3$ -100 % $P_2O_5$ as RP (50 kg $P_2O_5$ /ha); $T_4$ -$T_3$ + Phosphate-solubilizing bacteria (PSB) for seed inoculation as well as soil application; $T_5$ -$T_3$ + Farm yard manure (FYM) @ 5 t /ha; $T_6$-$T_5$ + PSB (seed inoculation as well as soil application); $T_7$-75 % $P_2O_5$ as RP + 25 % $P_2O_5$ as SSP; $T_8$ -$T_7$ + PSB (seed inoculation as well as soil application); $T_9$ -$T_7$ + FYM @ 5 t /ha; $T_{10}$ -$T_9$ + PSB (seed inoculation as well as soil application); $T_{11}$-50 % $P_2O_5$ as RP + 50 % $P_2O_5$ as SSP;

$T_{12}$ -$T_{11}$ + PSB (seed inoculation as well as soil application); $T_{13}$ -$T_{11}$ + FYM @ 5 t /ha and $T_{14}$ -$T_{13}$ + PSB (seed inoculation as well as soil application).

The crop was sown at 50 cm x 20 cm spacing during the month of July and harvested during December. Well-decomposed FYM was applied first to the plots as per the treatment schedule and incorporated to the soil 7 days prior to sowing. A basal dose of N @ 20 kg /ha and $K_2O$ @ 30 kg /ha were given uniformly to all the plots. Mussoorie rock phosphate (contains 18 % $P_2O_5$) was mixed thoroughly in the soil and the entire dose of P was applied as basal as per the treatments. Phosphate-solubilizing bacteria (*Psuedomonas striate*) was applied @ 2 kg /ha to soil and 600 g for inoculation of 20 kg seed before sowing. The total rainfall during the crop period was 1050 and 1130 mm in 1$^{st}$ and 2$^{nd}$ year of experimentation.

Soil samples were collected at 50, 100 and 150 days after sowing (at harvest stage) and analyzed for available P by Olsen's method (Jackson, 1973). P content in the crop (seed and stover) at harvesting stage was determined by