

## Effect of biophos and phosphate levels on growth and yield of groundnut and available nutrient status of the soil

B. M. Kamble\*, B. A. Chougule, S. D. Rahod and P. K. Rathod

Agricultural Research Station, K. Digraj. Dist - Sangli - 416 305 (M.S.) India

(Accepted : March, 2006)

A field experiment was conducted to study the effect of biophos and phosphate levels on plant growth, yield of groundnut and availability of nutrients in Sawargaon soil series. The highest pod, haulm yield, 100 kernel weight, shelling percentage and protein content in kernel of groundnut was obtained in treatment 100 %RD of  $P_2O_5$ + Biophos 2.50 kg ha<sup>-1</sup>. The yield and yield contributing characters were gradually increased with increase in levels of phosphorus with and without biophos inoculation. There was significant increase in available nitrogen and phosphorus whereas potassium was gradually increased with increase in levels of phosphorus and biophos. The available phosphorus and potassium decreased with advance growth period of the crop; whereas the nitrogen content was not decreased in the soil at harvest.

**Key words :** Pod, Haulm, Protein, Available N, P, K, Biophos culture

### INTRODUCTION

INDIA is the largest groundnut growing country in the world and second largest producer of groundnut next to china. The groundnut being a legume, require higher quantity of phosphorus for root development, better tillering, essential for many metabolic processes and small quantity of nitrogen. Phosphatic fertilizers added to soil, the part of phosphorus is utilized by the plants and remaining phosphorus is fixed in the form of insoluble phosphorus. The phosphate solubilizing bacteria and fungi solubilize the insoluble phosphorus to soluble form and makes it available to plants, Wani. et. al. (1979). Groundnut crop showed better response to phosphorus management, Jana et. al. (1990). The present investigation, was, therefore, undertaken to study the effect of biophos (phosphate solubilizing micro organisms) and phosphate levels on growth and yield of groundnut and available nutrient status of the soil.

### MATERIAL AND METHODS

A field experiment was conducted during Kharif 1994 at Rahuri on Sawargaon soil series having available N-205 Kg ha<sup>-1</sup>, P-5.48 Kg ha<sup>-1</sup> and K-308 Kg ha<sup>-1</sup>. Twelve treatments combinations were tested with three replications in randomized block design consisting of three levels of biophos culture (0, 1.25 and 2.50 Kg ha<sup>-1</sup>) and four levels of phosphorus (0, 50, 75 and 100 % of recommended dose of 50 Kg  $P_2O_5$  ha<sup>-1</sup>). Uniform basal applications of N @ 25 Kg ha<sup>-1</sup> through urea and phosphate through single super phosphate (SSP) as per treatment was applied at the time of sowing. Groundnut seeds (JL-24) were inoculated with PSM. The net plot size was 3.8 x 3.0 m and dibbling of seed was done at a distance of 30 X 10 cm. The soil samples (15 cm depth) from each plot at flowering, pod formation and harvest stage were collected, air dried and passed through 2mm sieve and used for estimation of available N by alkaline  $KmO_4$  method (Sahrawat and Burdford, 1982), P by 0.5M  $NaHCO_3$  at pH 8.5 asorbic acid method (Watanbe and Olsen, 1965) and K by 1N  $NH_4OAc$  at pH 7.0 method (Jackson, 1973). The dry matter yield, haulm yield, dry pod yield, shelling percentage and 100 kernel weight were recorded. The N content in diacid ( $H_2O_2 : HClO_4$ ) extract of kernel was estimated by following standard method. The treatment details are as follows

### RESULTS AND DISCUSSION

The data revealed that the haulm and pod yield of groundnut was not influenced significantly (Table 1). However, the haulm

and pod yield of groundnut increased with the biophos inoculation to seed over control (uninoculated). The haulm and pod yield gradually increased with the increase in the levels of phosphorus with and without biophos inoculation over treatment  $T_1$ . The highest haulm and pod yield was recorded in 100 % recommended dose of  $P_2O_5$  alongwith biophos inoculation @ 2.5 Kg ha<sup>-1</sup> ( $T_{12}$ ). There was increase in haulm and pod yield by 3.53 and 7.51 per cent respectively in the treatment  $T_{12}$  over treatment  $T_6$ . Ahmad and Jha (1977) observed that *Bacillus megaterium* was more efficient in releasing native p or p from single super phosphate.

The shelling percent and protein content in groundnut kernel was significantly influenced by different treatments. The highest shelling percent (73.97) was recorded in the treatment  $T_{12}$ ; where as 100 kernel weight was non significant. The protein content in kernel gradually increased with increase in levels of biophos and phosphate over control. The highest shelling percent, protein content and 100 kernel weight was recorded 100 % recommended dose of  $P_2O_5$  alongwith biophos inoculation @ 2.5 Kg ha<sup>-1</sup>. Wani. et. al. (1988) reported that 100 kernel weight increased with increase in levels of single super phosphate as well as boronated super phosphate. The increase in crude protein content with p application and its availability might be due to its role in protein synthesis. Increase in crude protein by increasing phosphorus level was also reported by Singh and Ahuja (1985).

It is seen that the available N and P in the soil was significantly influenced by different treatments at all growth stages; whereas K was non significantly (Table 2). The available N content in soil increased with the levels of phosphorus and biophos over control. The highest available N was recorded in treatment  $T_{12}$  which was on par with treatments  $T_{11}$  and  $T_6$  at flowering stage and  $T_{10}$ ,  $T_{11}$  and  $T_6$  at pod formation and harvest stage. The available N decreased upto pod formation, it might be due to higher uptake of nitrogen and increased availability at harvest stage due to fixation of nitrogen by groundnut crop. The influence of phosphorus levels on nitrogen fixation may be attributed to the increased supply of photosynthates (Graham and Rosas 1979).

The available phosphorus content in the soil at flowering was significantly higher under biophos @ 1.25 and 2.5 Kg ha<sup>-1</sup> in treatments  $T_2$ ,  $T_3$  and non significant at pod formation and harvest stage. This might be due to mineralisation and solubilization of inorganically fixed soil phosphorus by organism (Gerretsen, 1948 and Sundara Rao and Sinha 1963). The significant difference in available phosphorus was noticed in the treatments  $T_4$ ,  $T_5$ ,  $T_6$ . Whereas the  $T_6$  was on par with 75 %

\* Author for Correspondence