

Original Research Article

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## Effect of Conjunctive Use of Phosphorus and Bio-Organics on Phosphorus Content and Uptake in Summer Groundnut (*Arachis hypogaea* L.)

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### ABSTRACT

A field experiment was conducted during summer season 2012 at Agronomy Farm, B.A. College of Agriculture, Anand Agricultural University, Anand, to study the effect of conjunctive use of phosphorus and bio-organics on growth and yield of summer groundnut (*Arachis hypogaea* L.) under middle Gujarat conditions. Results revealed that phosphorus application significantly influenced phosphorus content. Treatment 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> recorded significantly higher phosphorus content in kernels (0.48%) and it was remained at par with treatment 25 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> (0.45%). Results indicated that the effects of bio-organics levels in respect of phosphorus content in kernels were found to be significant. Phosphorus content in kernels was significantly higher under treatment Vermicompost 2 t ha<sup>-1</sup> (0.48%) which was remained at par with treatment PSB seed treatment 5 ml kg<sup>-1</sup> seed (0.47%). Highest phosphorus uptake recorded with 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> treatment but bio-organics did not have any significant effect on phosphorus uptake. The results revealed that treatment combination of 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> + Vermicompost 2 t ha<sup>-1</sup> recorded significantly higher phosphorus content in kernel (0.54 %) which was remained at par with treatment combination of 25 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> + PSB seed treatment 5ml kg<sup>-1</sup> seed (0.53 %) and treatment combination of 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> + PSB seed treatment 5ml kg<sup>-1</sup> seed (0.48 %).

#### Keywords

Groundnut,  
Phosphorus,  
PSB,  
Vermicompost.

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### Introduction

The groundnut (*Arachis hypogaea* L.) is one of the important food legume crops of tropical and subtropical parts of the world. It is the world's most popular oilseed crop cultivated in more than 100 countries in all the six continents. Groundnut kernel contains above 40% edible oil, around 25% protein and 18% carbohydrates along with minerals and vitamins. Groundnut oil is free from cholesterol and contains less than 20% saturated fatty acid and hence is heart friendly. Groundnut oil is also considered as the staple and nutritive, as it contains just the

right proportion of oleic (46.5%) and linoleic (31.4%) acids (Mathur and Khan, 1997). Phosphorus play beneficial role in the root development, nodulation and stimulation of the symbiotic nitrogen fixation. It enhances root development and nodulation, improves the supply of nutrients and water increase in photosynthetic area resulting in more dry matter accumulation and yield (Rajanikanth *et al.*, 2008). Phosphorous appear to be a limiting factor in yield. It promotes root development, flowering and fruiting and aids in setting of kernels. It is reported (Nair *et al.*,

1970) that, phosphorus has a very critical role to play in a view of the fact that lack of phosphorus results great reduction in nodulation and nitrogen fixation.

Thus, the phosphatic fertilizers play an important role in achieving higher yield of groundnut crop. Phosphorus fertilization occupies an important place amongst the non-renewable inputs in modern agriculture. Crop recovery of added phosphorus seldom exceeds 20 per cent and it may be improve by the judicious management. It play beneficial role in the root development, nodulation and stimulation of the symbiotic nitrogen fixation. Phosphate solubilizing bacteria (PSB) are a group of beneficial bacteria capable of hydrolysing organic and inorganic phosphorus from insoluble compounds.

Vermicompost is an odourless, clean, organic material containing adequate quantities of N, P, K and several micronutrients essential for plant growth. Humic acid is one of the most important fractions of soil organic matter, it has been reported to increase the yield of crop.

**Materials and Methods**

A field experiment was conducted during summer season 2012 at Agronomy Farm, B.A College of Agriculture, Anand Agricultural University, Anand, the soil of the

experimental area was loamy sand in texture, low in available nitrogen (178.44 kg ha<sup>-1</sup>) and organic carbon (0.36%), medium in available phosphorous (30.08 kg ha<sup>-1</sup>) and high in available potassium (358.86 kg ha<sup>-1</sup>) with pH 7.6.

Twelve treatment combinations comprising three levels of phosphorus viz., control, 25 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and four levels of bio-organics viz., control, PSB seed treatment 5ml kg<sup>-1</sup> seed, vermicompost 2t ha<sup>-1</sup> and humic acid 15 kg ha<sup>-1</sup> were tried in Factorial Randomized Block Design with four replications.

**Results and Discussion**

A perusal of data in tables 1 and 2 revealed that phosphorus application significantly influenced on phosphorus content. Treatment 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> recorded significantly higher phosphorus content in kernels (0.48%) but it was remained at par with treatment 25 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> (0.45%).

Results indicated that the effects of bio-organics levels in respect of phosphorus content in kernels were found to be significant. Phosphorus content in kernels was significantly higher under treatment vermicompost 2t ha<sup>-1</sup> (0.48%) which was remained at par with treatment PSB seed treatment 5ml kg<sup>-1</sup> seed (0.47%).

**Table.1** Phosphorus content (%) in kernel of groundnut as influenced by interaction of phosphorus and bio-organics

Phosphorus (kg ha <sup>-1</sup> )	Bio-organics			
	Control	PSB seed treatment 5 ml kg <sup>-1</sup> seed	Vermicompost 2 t ha <sup>-1</sup>	Humic acid 15 kg ha <sup>-1</sup>
0	0.40	0.41	0.45	0.44
25	0.41	0.53	0.47	0.41
50	0.45	0.48	0.54	0.44
S. Em. ±	0.02			
C.D. (P=0.05)	0.06			
C.V. %	8.52			

**Table.2** Pod yield, haulm yield, P content in kernel and P uptake by kernel of groundnut as influenced by phosphorus and bio-organics

Treatments	Pod yield (kg ha <sup>-1</sup> )	Haulm Yield (kg ha <sup>-1</sup> )	P content in kernel (%)	P uptake by kernel (kg ha <sup>-1</sup> )
<b>Phosphorus (kg ha<sup>-1</sup>)</b>				
0	2208	3754	0.42	11.41
25	2419	4298	0.45	12.38
50	2657	4467	0.48	13.25
S. Em. ±	54.00	116.08	0.01	0.25
C.D. (P=0.05)	155	334	0.03	0.71
<b>Bio-organics</b>				
Control	2002	3751	0.42	3751
PSB seed treatment 5 ml kg <sup>-1</sup> seed	2588	4208	0.47	4208
Vermicompost 2 t ha <sup>-1</sup>	2631	4387	0.48	4387
Humic acid 15 kg ha <sup>-1</sup>	2491	4346	0.43	4346
S. Em. ±	62.36	134.05	0.01	134.05
C.D. (P=0.05)	180	386	0.03	386
C.V. %	8.90	11.13	8.52	11.13
<b>Interaction</b>				
P X B	Sig.	NS	Sig.	NS

The results revealed that treatment combination of 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> + Vermicompost 2 t ha<sup>-1</sup> recorded significantly higher phosphorus content in kernel (0.54 %). Treatment 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> significantly recorded highest phosphorus uptake by kernel. This might be due to the fact that the crop could better take up the said nutrients only when the suitable dose of phosphorus was applied (Deka *et al.*, 2001).

Phosphorus increases the root growth of the crop which ultimately helped in increasing the P uptake by kernel. This result is in accordance with Jana *et al.*, 1990. Vermicompost increase the availability of phosphorus, which is known to develop a more extensive root system and thus enabling the plants to extract water and nutrients from deeper soil depth (Pattar *et al.*, 1999). These all might have contributed towards increased

available phosphorus status of the soil (Kachot *et al.*, 2001).

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