

Original Research Article

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Effect of Phosphorus and Gypsum on Growth, Yield and Economics of Groundnut (*Arachis hypogea* L.)

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ABSTRACT

Keywords

Groundnut, kharif, Gypsum, Phosphorus, Growth, Yield, Economics

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The experiments comprising of 9 treatments, viz. Phosphorus at 40, 50 and 60 kg/ha along with 3 levels of Gypsum at 200, 300 and 400 kg/ha. It was laid out in a Randomized Block Design and replicated thrice. Maximum plant dry weight was recorded with Phosphorus 60 kg/ha along with Gypsum 400 kg/ha. Yield attributes namely more number of pods/plant and kernel yield was recorded with Phosphorus at 60 kg/ha along with Gypsum at 300 kg/ha. Net Returns and Benefit Cost Ratio was also recorded in the aforesaid treatment.

Introduction

Groundnut (*Arachis hypogea* L.) is an important oil seed crop and a grain legume. India is the second largest producer of Groundnut after China. It contributed to sustainable agriculture being a legume and is cultivated in both *kharif* and *Zaid* by farmers. According to (Satish *et al.*, 2011), groundnut is primarily used for extraction of oil, with an analysis of about 46.70%. It is also consumed directly because of its high food value, which is again due to its higher content of protein (22.0%), carbohydrate (10.0%) and minerals (3.0%).

Among different agronomic practices, nutrient management is one which accelerates growth and productivity of the crop. Phosphorus is essential for the formation of chlorophyll and protoplasm, cell division and development of meristematic tissues, also helps in the seed development and maturity of plant. This nutrient is required for synthesis of oil, protein, acid and is also involved in formation of glucosinolates which on hydrolysis increases the oil content. Its deficiency causes severe restriction in the growth of plant tops and root (Mirvat *et al.*, 2006).

Gypsum is widely used as a source of Calcium and Sulphur for groundnut worldwide. The dissolution of gypsum is fairly rapid and therefore readily adds Ca and S to the podding zone. Survey data from the small holder farming sector has shown that the majority of the farmers apply gypsum to get good yield of groundnut (Sreelatha *et al.*, 2004). Application of gypsum split doses facilitate the calcium and Sulphur requirement for better shell development and oil content in critical pod development period of plant growth.

Materials and Methods

A field experiment was conducted during *kharif* 2019 at Central Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj, (U.P). The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.3), low inorganic carbon (0.57%), medium in available N (230 kg/ha), high in available P (32.10 kg/ha) and low in available K (346 kg /ha). The treatments consists of 3 levels of Phosphorus viz. P₁ (40 kg P₂O₅/ha), P₂ (50 kg P₂O₅/ha), P₃ (60 kg P₂O₅/ha) and 3 levels of Gypsum viz. G₁ (200 kg CaSO₄.2H₂O/ha), G₂ (300 kg CaSO₄.2H₂O/ha) and G₃ (400 kg CaSO₄.2H₂O/ha) as both basal and side dressing. There were 9 treatments each replicated thrice. The experiment was laid out in Randomized Block Design. It was sown on 20th July 2019 at a spacing of 30 cm × 10 cm. Nitrogen (20 Kg/ha) and Potassium (40 Kg/ha) are applied at basal and Nitrogen was applied as splits (Basal and split at 30 DAS).

Results and Discussion

Dry weight was significantly affected by phosphorus and gypsum at different levels. Groundnut crop fertilized with the application of phosphorus 60 kg/ha along with gypsum 400 kg/ha (75% basal + 25% side dressing at

35 DAS) was significantly resulted in plant highest Dry weight (56.3g) at 100 DAS (Table 1).

The increases in dry weight due to phosphorus application may be due to the fact that phosphorus is known to help in the development of more extensive root system Sharma and Yadav (1997) and thus enables plants absorb more water and nutrients from depth of the soil. This in turn could enhance the plant's ability to produce more assimilates which were reflected in the enhanced biomass production.

Yield attributes and yield were also significantly affected by phosphorus and gypsum at different levels. Groundnut crop fertilized with the application of phosphorus 60 kg/ha along with gypsum 300 kg/ha (75% basal + 25% side dressing at 35 DAS) was significantly resulted in Number of Pods/Plant (32) and Kernel yield (2484.3 kg/ha) (Table 1)

The increased number of Pods/Plant might be due to effect of phosphatic fertilizer that increased nutrient availability, resulting in better nutrient absorption and crop growth. The results are in conformity with the findings of Bandopadhyay and Samui (1999), Choudary *et al.*, (2015), Hasan and Ismail (2016) and Amruth *et al.*, (2017). Application of gypsum increased the haulm yield and kernel yield of groundnut crop. Further, application of gypsum each at basal and flowering recorded the highest kernel yield. The increase in haulm and kernel yield due to application of gypsum was attributed to concomitant influence of Sulphur released from the gypsum on availability of other nutrients from the soil and their extraction by the plant seems to have provided congenial nutritional environment for the plants. Further, calcium plays an important role in the reproductive development of the

groundnut crop, thereby increased the pod yield. These results are in agreement with the

findings of Rao and Shaktawat (2001) and Sreelatha *et al.*, (2004).

Table.1 Effect of phosphorus and gypsum on growth, yield and economics of groundnut

Treatments	Dry weight (g/plant) at 100 DAS	Pods/Plant (No.)	Kernel Yield (kg/ha)	Net Returns (Rs./ha)	Benefit Cost Ratio
1. 40 kg P/ha + 200 kg G/ha (100% basal)	44.3	25.6	1658.27	100969	3.01
2. 40 kg P/ha + 300 kg G/ha (100% basal)	44.5	25.2	1735.27	106357	3.04
3. 40 kg P/ha + 400 kg G/ha (100% basal)	45.1	26.1	1711.60	102568	2.91
4. 50 kg P/ha + 200 kg G/ha (50% basal + 50% side dressing at 35 DAS)	49.3	27.6	2218.00	149694	3.85
5. 50 kg P/ha + 300 kg G/ha (50% basal + 50% side dressing at 35 DAS)	51.6	27.3	2376.33	162393	3.99
6. 50 kg P/ha + 400 kg G/ha (50% basal + 50% side dressing at 35 DAS)	54.3	27.4	2203.67	145074	3.59
7. 60 kg P/ha + 200 kg G/ha (75% basal + 25% side dressing at 35 DAS)	55.6	29	2254.00	152937	3.9
8. 60 kg P/ha + 300 kg G/ha (75% basal + 25% side dressing at 35 DAS)	55.8	32	2484.30	172058	4.16
9. 60 kg P/ha + 400 kg G/ha (75% basal + 25% side dressing at 35 DAS)	56.3	31.3	2264.00	150365	3.68
SEm (±)	1.96	1.27	73.7	-	-
CD (P=0.05)	5.87	3.82	220.96	-	-

The highest net returns (172058 Rs./ha) and B:C ratio (4.16) were obtained in groundnut fertilized with 60 kg P/ha + 300 kg G/ha (75% basal + 25% side dressing at 35 DAS) (Table 1). The increase in net returns and B:C ratio of groundnut crop in the same unit area obtained from the application of phosphorus 60 kg/ha along with gypsum 300 kg/ha (75% basal + 25 % side dressing at 35 DAS) because of optimum fertilizer doses are available for the crop and moreover, the split application of gypsum leads to availability of Sulphur and calcium to crop during grand growth phase leads to better growth and development of pods.

In conclusion the light of above study application of phosphorus 60 kg/ha along with gypsum 300 kg/ha (75% basal + 25% side dressing at 35 DAS) recorded maximum yield and economic returns.

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