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Effect of planting geometry and nitrogen management on groundnut (*Arachis hypogaea*) in loamy sand soil of Rajasthan*

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The groundnut (*Arachis hypogaea* L.*)* is one of the major oilseed crops of the country but its production needs to be enhanced to meet the national shortfall as availability of edible oil in India is about 12 kg/head/year against the balanced nutritional requirement of 14.8 kg/head/year (MOF 2009). To meet the vegetable oil requirement of the country at optimum level, we have to increase our production from present level of 29.75 to about 55 million tonnes by 2020 AD to achieve near self-reliance in vegetable oil production (Hegde 2009).

India is one of the largest producers of oilseeds in the world accounting for 8% of the global oilseeds production using 14% world land area and notified as second largest producer of groundnut. This crop occupied an area 6.2 million ha with production of 7.3 million tonnes and productivity of 1 180 kg/ha (MOF 2009–10). In rainy (*kharif*) season, groundnut (*Arachis hypogaea* L.) is an important oilseed crop grown in the country. We should give greater emphasis on planting geometry and nitrogen management for proper and balanced nutrition to oilseed crops. Keeping this background an experiment was conducted to study of effect of planting geometry and nitrogen management on growth and yield attributes of groundnut.

A field experiment was conducted to at Agricultural Research Station, Bikaner during *kharif* 2006 on loamy sand soil, slightly alkaline in reaction, poor in organic carbon (0.07%), low in available N (88.25 kg/ha), medium in P (23.80 kg/ha) and K (169.0 kg/ha). Fifteen treatments combinations of three planting geometry (30 cm×10 cm, 22.5 cm×10 cm and 22.5 cm×8 cm and 5 levels of nitrogen [control, 20 kg N/ha as basal dose, 40 kg N/ha as basal dose, 40 kg N/ha (½ basal dose and ½ top-dressing at 30 days after sowing), 60 kg N/ha (1/3 as basal and 2/3 as top-dressing in two equal splits at 30 and 60 days after sowing) were laid out in split-plot design with four replications using 'TG 37A' (Spanish bunch variety) crop were sown on 25 June 2006 with varying planting geometry.

Dry matter accumulation/plant, nodules/plant, chlorophyll content and yield attributes (pods/plant, test weight and harvest index) were observed maximum in 30 cm×10 cm planting geometry (Table 1). However kernels/pod, shelling percentage and pod yield were significantly higher in 22.5 cm×10 cm crop geometry. Almost similar trend was also observed by Jadhav *et al*. (2000). Whereas, haulm yield and biological yield was recorded maximum under 22.5 cm×8 cm, closely followed by 22.5 cm×10 cm planting geometry, which were significantly higher over the planting geometry of 30 cm×10 cm. This might be due to lesser competition amongst plants for space, light and nutrition as well and competition increased simultaneously at closer geometry as evident from data of nutrient concentration in plants. The results are in close conformity with the findings of Ramesh and Reddy (2006). Further narrowing planting geometry at 22.5 cm×8 cm resulted in significant decrease harvest index compared to both 30 cm×10 cm and 22.5 cm×10 cm, thus realizing less yield due to more competition for space, water, light and nutrients.

Application of 40 kg N/ha significant improved growth characters (dry matter accumulation, chlorophyll content, nodules/plant) yield attributes like pod/plant, test weight, kernels/pod and yields. Further increase in N level to 60 kg N/ha failed to show statistical superiority in this respect. Though application of 20 kg N/ha and 40 kg N/ha (as either the mode of application, viz full dose as basal or ½ basal + ½ top dressing at 30 days after sowing) showed non-significant differences for the various growth, yield components, ie pod, haulm and biological yield of groundnut. This agrees with finding of Mohapatra and Dixit (2010). Further increasing in the nitrogen dose up to 40 kg/ha (½ basal and ½ top-dressing) also increased nodule/plant due to

*Short note

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Table 1 Effect of planting geometry and nitrogen management on growth development, yield and yield-attributes in groundnut

Treatment	Plant stand (lac/ha)	Dry matter accumulation (g/plant)	Chlorophyll content (mg/g)	Nodules/ plant	Pods/ plant	Kernels/ pod	Test-weight (g)	Shelling percentage	Pod yield (kg/ha)	Haulm yield (kg/ha)	Biological yield (kg/ha)	Harvest index (%)
Planting geometry												
30 cm×10 cm	3.1	23.2	2.5	152.4	25.2	2.0	344.5	62.8	2 100.0	3 882.0	5 988.0	35.1
22.5 cm×10 cm	4.2	20.9	2.0	140.1	24.1	2.2	343.9	65.5	2 424.0	4 871.0	7 295.0	33.4
22.5 cm×8 cm	4.6	18.1	1.9	129.9	21.2	2.1	340.0	64.3	2 199.0	5 275.0	7 474.0	29.6
SEm±	0.0	0.1	0.1	1.1	0.5	0.0	0.9	0.6	54.2	132.3	138.2	0.9
CD (*P*=0.05)	0.1	0.3	0.2	3.8	1.9	0.1	3.2	2.0	187.7	458.0	478.4	3.0
Nitrogen management												
Control (no nitrogen)	3.9	19.9	1.9	130.6	19.1	1.9	324.4	60.5	1 952.0	4 089.0	6 041.0	32.6
20 kg N/ha (as basal dose application)	4.0	20.6	2.1	138.0	22.9	2.0	336.6	63.6	2 211.0	4 469.0	6 680.0	33.3
40 kg N/ha (as basal dose application)	4.0	20.8	2.1	142.7	25.0	2.1	346.0	65.0	2 376.0	4 999.0	7 376.0	32.6
40 kg N/ha (½ as basal dose and ½ as top dressing at 30 DAS)	4.0	21.1	2.3	145.7	25.2	2.2	352.1	65.6	2 361.0	5 007.0	7 367.0	32.4
60 kg N/ha (1/3 as basal dose and 2/3 as top dressing in two equal splits at 30 and 60 DAS)	4.1	21.1	2.4	147.0	23.4	2.2	354.7	66.2	2 306.0	4 827.0	7 134.0	32.5
SEm±	0.0	0.2	0.1	1.7	0.8	0.0	2.2	0.8	79.9	152.0	168.2	1.1
CD (*P*=0.05)	NS	0.4	0.2	4.9	2.3	0.1	6.2	2.3	229.0	436.0	482.5	NS

high carbohydrates and energy supply to root as well as nodules in groundnut which results in higher N fixation. The results indicated that number of pods/plant was significantly improved with increasing level of nitrogen up to 40 kg/ha (as basal) whereas, number of kernel/pod, test weight and shelling percentage (Table 1) were reported positively up to the highest nitrogen dose (60 kg/ha). The positive response of various yield components to nitrogen fertilization could be ascribed to over all improvement in crop growth.

Further, poor yield response of groundnut in terms of pod yield at highest nitrogen level (60 kg N/ha) can be attributed to limitation of the crop to utilize accumulated dry matter for yield formation under study. Significant improvement in haulm yield due to successive increase in nitrogen application up to 40 kg/ha (as basal and½ basal and ½ top-dressing) could be ascribed to its direct influence on dry matter accumulation, plant stand; biological yield is a function of pod yield and haulm yield. Similar finding were reported by Karunakaran *et al.* (2010). Results of the present investigation suggested that groundnut gave significantly higher pod yield at planting geometry of 22.5 cm×10 cm. Application of 40 kg N/ha (either full dose as basal or ½ basal + ½ top-dress at 30 days after sowing) proved almost identical with 20 kg N as basal with respect to pod yield.

SUMMARY

The experiment was conducted during *kharif* 2006 to study the effect of planting geometry and nitrogen management on growth and yield attributes of groundnut (*Arachis hypogaea* L.). The principal findings revealed that growth parameters, viz dry matter accumulation/plant, chlorophyll content, nodules/plant and yield attributes like pods/plant, test weight and harvest index were observed maximum in 30 cm×10 cm lanting geometry. However, kernel/pod, shelling percentage and pod yield were significantly higher in 22.5 cm×10 cm crop geometry. The haulm yield and biological field were recorded maximum under 22.5 cm×8 cm planting geometry. Application of 40 kg N/ha significantly improved the studied growth characters, yield attributes and yield. The maximum

pod and biological yield were recorded with application of 40 kg N/ha.

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