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Effect of layouts and spacing on yield and quality of bold seeded summer groundnut (*Arachis hypogaea* L.)

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ABSTRACT

The present investigation entitled, "Effect of layouts and spacing on yield and quality of bold seeded summer groundnut" was carried out at the Central Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri during summer 2005. The experiment was laid out in split plot design with twelve treatment combinations and the number of replications was four. The three main plot treatment consists of three planting layouts *viz.,* ridges and furrows, broad bed furrow and flat bed layouts and the four sub plots treatment consist of four spacing *viz.,* 30 x 10 cm, 30 x 15 cm, 45 x 10 cm and 45 x 15 cm. The plant growth in terms of plant height, spread, number of branches and total dry matter produced were maximum in BBF and followed by RF and same were minimum in flat bed method. Similarly characters such as protein content, hundred seed weight, kernel, oil and protein yield were all significantly more to BBF layout. The yield contributing characters such as weight of pods, weight of kernels, number of kernels per plant, total number of pods per plant, shelling percentage, dry pod yield and haulm yield were also significantly better in case of BBF followed by RF with 30 x 10 cm spacing. Based on above findings it could be concluded that growing groundnut on broad bed furrow (BBF) at 30 x 10 cm spacing was found beneficial proposition for achieving higher productivity.

Key words : Layouts, Spacing, Quality, Bold seeded, Groundnut.

INTRODUCTION

Groundnut (*Arachis hypogaea* Linn.) is the fore most important oil seed crop of India. It is used not only as edible oil, but also in manufacture of soaps, hydrogenated vegetable oil, toilet requisites and for culinary purpose at well. The kernels are rich in protein and vitamins *viz.,* A, B_1, B_2 and E and the cake is rich in protein content (46 %) which is best source of animal and poultry feed and also good source of manure haulms rich in protein (10-12 %) are palatable and used as nutritional feed for cattle. During 2003-04 the area under this crop in India was 60.02 lakh ha with production of 8.33 million metric tonnes with productivity of 774 kg ha^{-1} (Anonymous, 2005). Maharashtra occupied an area of 3241 lakh ha with annual production of 3552 lakh metric tonnes with productivity of 1096 kg ha^{-1} in *khairf* season of 2003-04. During summer season, it occupied an area of 547 lakh ha with production of 816 lakh metric tonnes with the productivity of 1492 kg ha^{-1} (Anonymous, 2005). There are excellent prospects for growing groundnut, in summer season under irrigated conditions. There is a need to evolve suitable agronomic practices for efficient and economic use of irrigation water and fertilizers so as to increase area and production of groundnut.

Groundnut pods grow underground, therefore the loose and well aerated seed bed is important as loose soil surface is useful for penetration of pegs and development of pods. Thus, the crop has potentially to increase the yield during summer season. However, the main hurdle in extension of groundnut for summer cultivation is lack of information on field layouts and water management technology. Broad bed furrow technique provides loose soil mass for development of pods besides, the furrows are useful both for irrigation and drainage of excess water as groundnut is more sensitive to water fluctuations and more or less at critical groundnut stages adversely affect the yield. Studies at ICRISAT showed that increasing yield of groundnut can be obtained by growing it on broad bed furrow (Anonymous, 1987), Nalawade and More (1993) reported significant response of broad bed furrow technique resulting in higher pod yield.

Recently evolved groundnut variety TPG-41 is found highly productive during *kharif* as well as in summer season. However, the plant structure of this variety is compact and under normal spacing of 30 x 10 cm same space between rows remain unoccupied by the plant hence there is scope to increase the plant density either by changing intra row spacing. Therefore, it is necessary to determine suitable planting layout and plant spacing of crop during summer season.

In view of the above considerations, the present investigation was planned with objective of to know the suitable layouts and spacing for bold seeded summer groundnut.

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MATERIALS AND METHODS

The present investigation entitled, "Effect of layouts and spacing on growth, yield and quality of bold seeded summer groundnut" was conducted at Central Farm, M.P.K.V., Rahuri during summer, 2005. The experiment was laid out in split plot design with twelve treatment combinations and the number of replications was four. The three main plot treatment consists of three planting layouts *viz.*, ridges and furrows, broad bed furrow and flat bed layouts and the four sub plot treatment consists of four spacing *viz.*, 30 x 10 cm, 30 x 15 cm, 45 x 10 cm and 45 x 15 cm. The soil was clayey in texture and alkaline in reaction (pH 8.2), low in available nitrogen (260.2 kg ha^{-1}), medium in available phosphorus (18.05 kg ha^{-1}) and high in available potassium (426.8 kg ha^{-1}).

Treatment details

S. No.	Treatment details	Symbol
A.	Field layout	
1.	Ridges and furrows	L_1
2.	Broad bed furrows	L_2
3.	Flat bed method	L_3
B.	Spacing	
1.	30 x 10 cm	S_1
2.	30 x 15 cm	S_2
3.	45 x 10 cm	S_3
4.	45 x 15 cm	S_4

Fertilizer – 50 : 100 N : P_2O_5 kg ha^{-1}
Variety – Bold seeded groundnut variety TPG-41

$$\text{Shelling percentage} = \frac{\text{Weight of kernels}}{\text{Weight of pods}} \times 100$$

Protein percentage = Total N x 5.46
(AOAC, 1990)

Oil content (%) – To determine oil percentage in kernel a representative kernel sample was taken and NMR (Nuclear magnetic Resonance) Spectrometry (Jambhunathan *et al.,* 1985) technique was adopted for determination of oil content.

RESULTS AND DISCUSSION

Hundred seed weight

The weight of 100 seeds was 72.37 g (Table 1).

Effect of field layouts

The maximum hundred seed weight was obtained due to broad bed furrow layout followed by ridges and furrows and minimum was due to flat bed layout.

Effect of spacing :

The minimum and significantly less hundred seed weight was due to more spacing (45 x 15 cm) while it was maximum and significantly more due to minimum spacing (30 x 10 cm).

Shelling percentage :

The data presented in Table 1, reveal that the mean shelling percentage of experimental groundnut TPG-41 was 65.08 per cent.

Effect of field layouts :

The maximum and significantly more shelling percentage was recorded from broad bed furrow followed by ridges and furrow and flat bed layout.

Effect of spacing :

There was graded and significant decrease in the shelling percentage with increase in plant spacing.

Effect of interaction :

The shelling percentage was significantly influenced by the interaction of field layouts and plant spacing.

The shelling percentage due to BBF in case of 30 x 10 cm spacing was more than the rest of the combinations and significantly less due to flat bed method with 45 x 15 cm spacing.

Yield studies :

Dry pod yield :

The data reveal that the dry pod yield of summer groundnut was 24.06 q ha^{-1}.

Effect of field layout :

It was maximum due to BBF layout than ridges and furrow and flat bed method. The flat bed method was statistically at par with ridges and furrow layout. The flat bed method recorded the lowest pod yield than other layouts. The BBF provided a loose soil mass with adequate soil moisture. These conditions favourably influenced the easy peg penetration, pod development and thereby the shelling percentage, thus enabling the plants to express their potential to large extent. Nodulation was also significantly greater in case of BBF. Which reflected in increasing the dry pod yield of groundnut. These results corroborate the findings of Patil (1991), Desai and Kenjale (1992), Kadam (1998), Pawar (2000), Ingole *et al.* (2000) and Sonwalkar (2005).

Table 1 : Mean hundred seed weight (g) and shelling percentage, mean dry pod and haulm yield (q ha^{-1}) as influenced by periodically by different treatments

S. No.	Treatments	100 seed weight (g)	Shelling percentage	Dry pod yield (q ha^{-1})	Haulm yield (q ha^{-1})
A.	Field layout (Main plot)				
	Ridges and furrows	71.91	65.68	24.45	50.48
	Broad bed furrows	74.90	69.00	25.47	52.58
	Flat bed furrows	70.28	60.56	23.90	49.34
	'F' test	Sig.	Sig.	Sig.	Sig.
	S.E. $\pm$	0.49	0.71	0.17	0.34
	C.D. at 5 %	1.70	2.48	0.58	1.19
B.	Spacing				
	30 x 10 cm^2	80.50	68.08	27.37	56.51
	30 x 15 cm^2	78.04	66.66	26.53	54.78
	45 x 10 cm^2	67.02	64.16	22.78	47.05
	45 x 15 cm^2	63.92	61.41	21.73	44.87
	'F' test	Sig.	Sig.	Sig.	Sig.
	S.E. $\pm$	0.40	0.31	0.14	0.28
	C.D. at 5 %	1.17	0.90	0.40	0.82
C.	Interaction				
	S.E. $\pm$	0.70	0.53	0.23	0.49
	C.D. at 5 %	N.S.	1.55	N.S.	N.S.
	General mean	72.37	65.08	24.60	50.80

Effect of spacing :

It was maximum and significantly more due to maximum population due to less spacing (30 x 10 cm). It was minimum and significantly less due to the minimum population due to more spacing (45 x 15 cm).

Raghavaiah *et al.* (1995) found that high density sowing adopting 30 x 10 cm spacing resulted in significant pod yield enhancement (4.05 t ha^{-1}) over low density sowing at 30 x 15 cm and 30 x 20 cm (3.58 t ha^{-1}) highlighting the importance of maintaining adequate plant stands for releasing higher yield which was due to less interplant competition for various growth factors. These results confirm the findings of Sandhu and Hundal (1993) and Gosh *et al.* (2005).

Dry haulm yield :

The data reveals that the haulm yield was 50.80 q ha^{-1}. It was maximum in BBF layout and ridges and furrow and flat bed layouts were statistically at par with each other haulm yield q ha^{-1}.

Table 2 : Shelling percentage of groundnut as influenced by the interaction

Layouts	Shelling (per centage)				
	30 x 10 cm	30 x 15 cm	45 x 10 cm	45 x 15 cm	Mean
Ridges and furrows	69.00	67.50	64.50	61.75	65.68
Broad bed furrows	72.75	71.00	68.00	64.25	69.00
Flat bed method	62.50	61.50	60.00	58.25	60.56
Mean	68.08	66.66	64.16	61.41	65.08

SE $\pm$ at the same level of B = 0.53, B at same level of A = 0.85
CD at 5 % at the same level of B = 1.55 (NS), B of same level of A = 2.69 (NS)

The flat bed method produced less haulm yield per ha than other treatment because of more soil compaction and less nutrient uptake by plants in flat bed layouts. These findings are in conformity with those reported by Sandhya *et al.* (1994) and Sonwalkar (2005).

Effect of spacing :

Maximum yield was produced when crop was grown of 30 x 10 cm. The crop sown of 45 x 15 cm spacing reduced significantly the haulm yield of groundnut crop. Similar results were obtained by Deshmukh *et al.* (1999) and Ramajyothi *et al.* (2004).

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