

Effect of variety, potassium and planting method on growth and yield of rainy-season groundnut (*Arachis hypogaea*)

A. K. PATRA¹, R. C. SAMUI AND S. K. TRIPATHY²

Department of Agronomy, Faculty of Agriculture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, West Bengal 741 252

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ABSTRACT

A field experiment was conducted during the rainy season (*kharif*) of 1992 and 1993 at Kalyani, to study the effect of potassium application and planting method on groundnut (*Arachis hypogaea* L.) 'JL 24' groundnut was found superior to 'ICGV 86015'. Application of 50 kg K₂O/ha significantly increased growth attributes (plant height, leaf-area index and dry-matter production) and pod and oil yields. Planting in flat bed with earthing up (FBE) at 25 days after sowing showed better response than planting in flat bed without earthing up (FB) and broad-bed and furrow method (BBF). Increase in pod and oil yield by 7.6 and 7.1% respectively were recorded by planting in the FBE over planting in the FB.

Recent on-farm trials conducted in India indicated that improved genotype contributed 25–28% to yield increases, while improved management practices 30–32% (Nageswara Rao, 1992). Earlier results showed that earthing up increased pod yield (Agasimani *et al.*, 1986). Planting in broad bed and furrow method also results in significantly higher pod yield than conventional methods (Hadvani *et al.*, 1993). Present investigation was therefore carried out to study the response of groundnut to potassium and different planting methods.

MATERIALS AND METHODS

The field experiment with groundnut was conducted at the Farm, BCKVV, Kalyani, during the rainy season (*kharif*) of 1992 and 1993. The soil was sandy loam in texture and medium in fertility status (0.7% organic

carbon, 0.06% total N, 16.5 and 162 kg available P₂O₅ and K₂O/ha, respectively) and neutral in reaction (pH 7.4). The experiment was laid out in factorial randomized block design with 2 varieties ('JL 24' and 'ICGV 86015'), 2 levels of potassium (0 and 50 kg K₂O/ha) and 3 planting methods [flat bed without earthing up (FB), flat bed with earthing up (FBE) and broad bed and furrow (BBF)] in 3 replications. The crop was sown in lines 30 cm apart on 13 July and 3 July and harvested on 2 November and 26 October during 1992 and 1993 respectively. In the BBF method, seed furrows were made 30 cm apart and after each 4 furrows 30 cm wide with 15 cm depression was made. Fertilizers 20 kg N and 40 kg P₂O/ha were applied as basal dressing in the form of urea and single superphosphate respectively.

Present address: ¹ Regional Research Station, OUAT, Chiplima, Orissa 768 025; ² Agricultural Research Station, OUAT, Berhampur, Orissa 761 001

Table 1. Effect of variety, potassium and method of planting on growth of groundnut in *kharif* (pooled data of 1992 and 1993)

Treatment	Plant height (cm)	Leaf-area index at			Dry-matter production (g/m ²)				NAR (g/m ² /day)	
		50 days	70 days	90 days	50 days	70 days	90 days	110 days	50–70 days	79–90 days
Variety										
‘JL 24’	67.9	1.65	3.65	1.88	255	444	664	701	5.97	5.48
‘ICGV 86015’	67.3	1.62	3.44	1.82	250	424	652	672	5.46	5.72
CD (P = 0.05)	NS	NS	0.12	NS	NS	7.2	5.8	4.7	0.12	0.17
K ₂ O (kg/ha)										
0	66.5	1.62	3.44	1.74	247	426	650	680	5.74	5.77
50	68.6	1.65	3.65	1.94	258	442	666	692	5.70	5.44
CD (P = 0.05)	0.70	NS	0.12	0.11	6.5	7.2	5.8	4.7	NS	0.17
Planting method										
FG	62.7	1.63	3.51	1.81	249	427	643	672	5.58	5.44
FBE	68.0	1.59	3.61	1.88	255	437	666	695	5.84	5.60
BBF	67.7	1.69	3.52	1.84	254	438	665	691	5.77	5.69
CD (P = 0.05)	NS	NS	NS	NS	NS	8.7	6.9	5.6	NS	0.21

FB, Flat bed, FBE, flat bed with earthing up; BBF, broad bed and furrow; *days, days after sowing; NAR, net assimilation rate; NS, not significant

Potassium as muriate of potash was applied as per treatment. Earthing up was done at 25 days after sowing (DAS) according to the treatment requirement. The crop remained free from major incidence of insect pests and diseases and was irrigated as and when required. In each plot, second row from each side of the plot was earmarked for destructive sampling and rest of the plot (15 m²) for determination of yield and yield components. Oil content in kernel was determined by Soxhlet's extraction method. Cost of various inputs and crop-management practices in producing the crop and the price of groundnut pod and haulm were estimated as per available market information.

RESULTS AND DISCUSSION

Growth

'JL 24' recorded significantly higher leaf-area index (LAI) only at 70 days but dry-matter production and net assimilation rate were higher at all the stages in this variety compared with 'ICGV 86015' (Table 1). Application of 50 kg K₂O/ha significantly increased plant height, and all other growth parameters. Planting in the FBE, and BBF methods increased the dry matter at all the stages and net assimilation rate at 70–90 days over planting in FB method. There was no significant variation in growth attributes by planting in FBE or BBF method.

Yield attributes and yield

'JL 24' recorded significantly higher number of pods/plant, shelling (%) 100-kernel weight, and higher pod, oil and haulm yields than 'ICGV 86015' (Table 2.). The respective increases in yield of 'JL 24' over 'ICGV 86015' were 6.2, 13.8 and 5.9%. Application of potassium had no significant effect

on yield attributes of *kharif* groundnut; however, a marginal benefit was recorded in all cases.

Application of K @ 50 kg/ha significantly increased pod yield only in 1992; however, the increase was significant when data were pooled over 2 years. Pooled data showed that K significantly increased the oil yield, whereas it had no significant effect on haulm yield. The increase in pod yield was due to the fact that K influenced the physiological processes that are directly related to symbiotic N₂ fixation, photosynthesis and carbohydrate translocation for pod growth. Higher yield in groundnut owing to application of K was also observed by Dubey *et al.* (1986). The yield attributes were not significantly influenced by planting methods; however, pod and oil yields were significantly influenced. Highest yields were recorded with planting in the FBE method. It showed 7.6 and 7.1% increase in pod and oil yield respectively over planting in the FB method. Earthing up at 25 days loosened the soil at root zone which facilitated the symbiotic N₂ fixation and aeration and thus positively influencing growth and yield of groundnut. Higher yield of groundnut by earthing up was also reported by Agasimani *et al.* (1986). Variety and application of potassium had no significant effect on harvest index. Highest harvest index was recorded with the FBE method.

Economic returns

'JL 24' recorded significantly higher gross and net returns than 'ICGV 68015'. Application of K significantly increased gross return; however, it had no significant effect on net return. Planting in the FBE method significantly increased both gross and net returns. Earthing up recorded Rs 918/ha extra net return. It may be concluded

Table 2. Effect of variety, potassium and method of planting on yield attributes, pod, oil and haulm yields, harvest index and economics of *kharif* groundnut (pooled data of 1992 and 1993)

Treatment	Pods/ plant	Shelling (%)	100-kernel weight (g)	Ped yield (kg/ha)			Oil yield (kg/ha)	Haulm yield (kg/ha)	Harvest index (%)	Economic returns (Rs/ha)	
				1992	1993	Pooled				Gross	Net
Variety											
'JL 24'	18.6	70.9	47.7	2,447	2,478	2,463	857 (49.1)	7,312	25.21	22,886	12,969
'ICGV 86015'	16.5	68.5	35.8	2,294	2,344	2,319	753 (47.5)	6,903	25.15	21,558	11,637
S. Em ($\pm$)	0.34	0.42	0.48	15	11	8	3	32	0.07	93	80
CD (P = 0.05)	1.00	1.23	1.41	43	32	23	9	94	NS	272	234
K ₂ O (kg/ha)											
0	17.5	69.4	41.4	2,320	2,399	2,360	794 (48.2)	7,058	25.07	21,941	12,247
50	17.7	69.9	42.1	2,418	2,423	2,421	816 (48.4)	7,157	25.28	22,500	12,351
S. Em ($\pm$)	0.34	0.42	0.48	15	11	8	3	32	0.07	93	80
CD (P = 0.05)	NS	NS	NS	43	NS	23	9	NS	NS	272	NS
Planting method											
FB	17.1	69.9	42.7	2,316	2,323	2,320	784 (48.3)	7,058	24.76	21,580	12,038
FBE	18.2	69.6	40.9	2,448	2,545	2,497	840 (48.2)	7,183	25.80	23,187	12,956
BBF	17.6	69.5	41.8	2,348	2,366	2,357	791 (48.3)	7,080	25.00	21,921	11,931
S. Em ($\pm$)	0.41	0.50	0.58	18	13	10	4	38	0.08	112	96
CD (P = 0.05)	NS	NS	NS	53	39	28	11	NS	0.25	327	282

FB, Flat bed; FBE, flat bed with earthing up; BBF, broad bed and furrow; NS, not significant
 Figures in parentheses represent oil content (%) in kernel

that earthing up is beneficial in *kharif* groundnut:

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