Journal of crop and weed 2(1) : 37-39 (2006)

Growth, yield attributes and yield of different cultivars of groundnut as affected by potassium application

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ABSTRACT

A field experiment was conducted in the summer and rainy seasons of 2002 at the Central Research Farm, Gayeshpur, Bidhan Chandra Krishi Viswavidyalaya under New Alluvial Zone of West Bengal to study the effect of application of four levels of potassium (0, 60, 120 & 180 kg K_2O/ha) on growth, yield attributes and yield of seven cultivars of groundnut. Results revealed that vegetative growth was higher during rainy season than that in the summer season but the later out yielded the former because all yield attributing characters like pods/plant, 100-kernel weight and shelling percentage were higher in summer. Among the cultivars, ICGS-49 gave highest pod yield (1964.1 kg/ha) and kernel yield (1361.1 kg/ha). Application of potassium @180 kg K_2O/ha gave highest yield but were statistically at par with 120 kg K_2O/ha or even 60 kg K_2O/ha .However, its economic dose was 96.3 kg K_2O/ha.

Key words : Groundnut; cultivars; potassium; growth; yield attributes; yield.

The Spanish and Portuguese explorers are the proud discoverers of groundnut in 1502. Since its serendipity, groundnut has emerged as one of the leading oilseed crops in the world, while the productivity of groundnut in India is very low (935 kg/ha) as compared to the world average of 1632 kg/ha. Inadequate and improper fertilizer application is one of the reasons for its low productivity. In fact, balanced fertilizer use is essential not only for increasing the production of groundnut but even for maintaining the present production levels. This is realized when it is evident that an average crop of groundnut removes about 112 kg N, 20 kg P_2O_5 and 84 kg K_2O from one hectare. Potassium deficiency manifests stunted growth with drying up of leaf margins in the crop. Its main function is to promote the formation of oil. Potassium ion (K^+) is also crucial from physiological point of view in case of water uptake and transport.

MATERIALS AND METHODS

The field experiment was conducted during both the summer and rainy seasons of 2002 at Central Research Farm, Gayeshpur, Bidhan Chandra Krishi Viswavidyalaya, West Bengal (23.5°N latitude, 89°E longitude and 9.75 m AMSL) in sandy loam soil (45.17% sand, 33.90% silt and 20.93% clay) containing 0.069% total N, 19.4 kg/ha available P, 192.7 kg/ha available K and 0.71% organic carbon. The soil reaction was neutral (pH 6.9). The mean maximum and minimum temperature during the experimental period were 33.33°C and 22.43°C in summer and 30.72°C and 20.45°C in rainy season respectively. Total rainfall was 883.6mm in summer and 483.5 mm in rainy season with an average RH at 06:35 hr and 13:35 hr were 94.58% and 60.14% in summer and 97.57% and 69.38% in rainy season respectively. The experiment was laid out in split plot design with 3 replications. Seven cultivars of groundnut like ICGS-44 (V_1), ICGS-49 (V_2), TKG-19A (V_3), ICGV-86699 (V_4), SB-XI (V_5), B-95 (V_6) and JL-24 (V_7) were taken as main plot treatments and 4 doses of potassium of 0 (K_1), 60 (K_2), 120 (K_3) and 180 (K_4) kg K_2O/ha as subplot treatments. The source of K was Muriate of Potash. Groundnut was sown on 01.03.2002 and 13.08.2002 in summer and rainy season respectively with a spacing of 40 cm x 20 cm. All the recommended agronomic practices were adopted. The crop received 20 kg N/ha in the form of urea and 60 kg P_2O_5/ha as Single Super Phosphate. The Economic Yield was calculated from the response curve which was quadratic in nature.

RESULTS AND DISCUSSION

Effect of cultivar on growth

There was significant increase in growth attributes and dry matter accumulation in cultivars ICGS-49, ICGS-44 and JL-24 over other cultivars. (Table 1).

Effect of potassium on growth

The plant height increased significantly with increase of potassium application from 0 to180 kg K_2O/ha. Similar results were obtained in case of dry matter

accumulation but results of 120 kg K_2O/ha and 180 kg K_2O/ha were statistically at par and the increase was most significant when potassium dose was increased from 0 to 60 kg K_2O/ha. Potassium was responsible for carbohydrate metabolism and translocation of carbohydrates, therefore growth was enhanced due to K application. The results corroborated with the observations of Barik *et al.*, (1994) and Patra *et al.*, (1996). Nodule number/plant and nodule weight/plant were significantly affected by potassium application (Table 1).

Table 1 Effect of K and cultivar on growth of groundnut

	Plant height(cm) at harvest	No. of nodules/plant at harvest	Weight of nodules / plant (mg) at harvest	Dry matter(g/m^2) at harvest
Cultivars				
ICGS-44	60.6	138.2	185.2	777.3
ICGS-49	63.7	143.6	187.6	783.4
TKG-19A	58.3	141.8	173.4	759.1
ICGV-86699	57.2	136.8	181.2	762.8
SB-XI	56.1	147.2	172.6	758.2
B-95	57.6	142.2	180.5	766.1
JL-24	55.8	137.2	186.3	769.4
CD at 5%	6.43	5.83	8.36	16.23
Levels of K_2O (kg/ha)				
0	58.2	138.7	181.6	748.3
60	59.8	139.2	183.4	789.2
120	60.4	139.4	184.2	796.6
180	60.6	139.7	184.8	799.1
CD at 5%	0.96	1.05	3.68	8.27

Effect of cultivar and potassium on growth

The interaction effect of cultivar and potassium on growth was not significant.

Effect of cultivar on yield attributes and yields of ground nut

Among the cultivars ICGS-49, ICGS-44 and JL-24 produced significantly higher number of pods/ plant with more test weight than the rest (Table-2). In case of pod yield and haulm yield, ICGS-49 proved to be the best cultivar followed by ICGS-44 and JL-24.

The order of performances was ICGS-49 > ICGS-44 > JL-24 > TKG-19A > ICGV 86699 > SB-XI > B-95 with respect to the values of pod yield.

Effect of potassium on yield and yield attributes

The yield attributes like pods/plant, kernel/ pod, 100- kernel weight and shelling percentage increased significantly with increased level of K up to 120 kg K_2O/ha. These results were similar to those of Jana *et al.*, (1990a). Pod yield and kernel yield also increased significantly with increased K-level up to 120 kg K_2O/ha in both the seasons. Mathew *et al.*, (1983) previously reported beneficial effect of K on yield and yield attributes of groundnut.

Interaction effect of cultivar and potassium on yield attributes and yields of groundnut

The interaction effect of cultivar and potassium on yield attributes of groundnut was not significant. However interaction effect on yields was significant. ICGS-49 at all levels of potassium produced significantly higher pod yield, kernel yield and oil yield than other cultivars. Though highest pod yield of ICGS-49 was obtained at 180 kg K_2O/ha (1964.1 kg/ha) which was statistically at par with 120 kg K_2O/ha. The economics of K application was worked out and it was found to lay at 96.3 kg K_2O/ ha for groundnut in New Alluvial Zone.

Table 2 Effect of cultivar and K on yield attributes and yields of groundnut

	Pods /plant	Kernel/ pod	Test weight (g)	Shelling percent age (%)	Pod yield (kg/ha)	Kernel yield (kg/ha)	Haulm yield (kg/ha)	Oil yield (kg/ha)
Cultivars								
ICGS-44	14.6	2.4	68.6	66.9	1903.5	1275.1	4673.4	590.7
ICGS-49	14.9	2.4	69.1	67.9	1912.6	1299.1	4710.4	602.6
TKG-19A	13.5	2.3	66.8	66.4	1855.6	1212.3	4604.4	555.9
ICGV-86699	14.0	2.2	67.7	65.4	1839.3	1202.9	4569.5	557.9
SB-XI	13.8	2.3	66.6	66.2	1834.7	1215.4	4597.5	556.8
B-95	13.3	2.2	70.1	65.0	1826.5	1187.8	4658.7	549.7
JL-24	14.3	2.3	67.1	66.6	1862.4	1231.5	4658.9	567.6
CD at 5%	1.42	0.3	2.91	1.32	23.04	19.07	78.32	26.05
Levels of K_2O (kg/ha)								
0	13.4	2.1	65.9	64.9	1814.3	1217.8	4606.9	539.5
60	13.8	2.2	67.0	65.8	1856.1	1234.7	4632.3	568.4
120	14.3	2.4	68.1	66.6	1882.7	1267.7	4652.2	577.3
180	14.7	2.5	68.7	67.3	1901.3	1285.8	4661.5	598.6
CD at 5%	0.49	0.33	1.01	1.26	24.05	23.42	14.90	15.99

Table 3 Interaction of cultivar and K on pod yield (kg/ha) of groundnut (Avg of summer and rainy seasons)

Cultivar \ KgK_2O/ha	0	60	120	180
ICGS-44	1860.2	1897.3	1932.1	1953.6
ICGS-49	1861.2	1899.0	1948.5	1964.1
TKG-19A	1802.5	1843.0	1877.1	1892.6
ICGV-86699	1797.3	1842.6	1879.2	1877.9
SB-XI	1778.0	1826.1	1852.8	1881.8
B-95	1786.2	1822.9	1835.8	1862.0
JL-24	1814.3	1858.3	1876.4	1910.6
CD at 5%	V X K 35.01		K X V 37.91	

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