



## RESEARCH PAPER

# Effect of nutrient management on growth, yield and quality of *Kharif* groundnut

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**Abstract :** Agronomic investigation was carried out to study the influence of nutrient management on growth yield and quality of *Kharif* groundnut. The results revealed that, the balanced nutrition through STCR equation proved its superiority by recording significantly maximum growth and yield attributes during both years. Application of fertilizer as per STCR (25 q ha<sup>-1</sup>) equation recorded maximum and significantly higher dry pod yield (23.08 and 24.49 q ha<sup>-1</sup>) than recommended dose of fertilized during both years. This indicates that, the application of fertilizer dose as per soil test crop response (STCR) equation achieved the yield target of 25 q ha<sup>-1</sup> in *Kharif* groundnut with less than 10 per cent variation (-5.8 %). The maximum oil content (50.04 and 50.22%) was recorded under application of fertilizer dose as per soil test and maximum protein content (25.61 and 25.67%) was observed in fertilizer dose as per STCR equation and at par with fertilizer dose as per soil test during both the years. Application of fertilizer as per STCR equation to *Kharif* groundnut registered significantly higher total uptake of nitrogen (124.48, 126.58 kg ha<sup>-1</sup>), phosphorus, (25.93 and 25.97 kg ha<sup>-1</sup>) and potassium (77.53 and 78.92 kg ha<sup>-1</sup>) than rest of treatments.

**Key Words :** *Kharif* groundnut, Nutrient management, Dry pod, Quality, Nutrient uptake

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## INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is the premier oilseed crop of India, occupies an area of 6.7 million ha and contributes 7.3 million tonnes towards oilseed production. India stands first in area and second in production and fifth in productivity (995 kg ha<sup>-1</sup>) Anonymous (2012). The approach of general fertilizer recommendations related to soil test ratings was in common use though it has its shortcoming. Because of the changing trend in agriculture, yield target concept and fertilizer recommendations for maximum profit per

hectare became more promising. Yield target concept has the added advantage that targets can be varied by taking into consideration the resources available. The targeted yield concept has proved to be superior to others whose theoretical basis and proof was demonstrated by Ramamoorthy *et al.* (2009). Targeted yield approach has been an unique one in the sense that this method not only indicates soil test based fertilizer dose, but also the levels of yield, the farmers can hope to achieve if good agronomy is followed in raising the crop. The present investigation was conducted with an objective to study

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the effect of nutrient management on growth, yield potential and quality of *Kharif* groundnut.

## MATERIAL AND METHODS

A field experiment was conducted during 2011-12 and 2012-13 at Department of Agronomy, Mahatma Phule Krishi Vidyapeeth, Rahuri (M.S.). The soil of the experimental site was sandy clay loam in texture with low in available nitrogen (168.41 kg ha<sup>-1</sup>), medium in phosphorus (15.69 kg ha<sup>-1</sup>) and high in potassium (427.00 kg ha<sup>-1</sup>) and moderate in Fe (6.89 µg g<sup>-1</sup> of soil), Mn (9.51 µg g<sup>-1</sup> of soil), Zn (0.62 µg g<sup>-1</sup> of soil) and Cu (3.41 µg g<sup>-1</sup> of soil). The soil was slightly alkaline in reaction (pH 8.20) with 0.29 dSm<sup>-1</sup> electrical conductivity and 0.54 per cent organic carbon content. The treatment consisted of four nutrient management practices *viz.*, T<sub>1</sub>- recommended dose of fertilizer; T<sub>2</sub>- fertilizer dose as per soil test; T<sub>3</sub>- fertilizer dose as per STCR equation (25 q ha<sup>-1</sup>) and T<sub>4</sub>-control treatment. The experiment was laid out in Randomized Block Design with nine replications. The fertilizer dose was applied as per treatment through urea, DAP, single super phosphate and muriate of potash. Groundnut seed (CV. JL-501) was inoculated with *Rhizobium* and phosphate solubilizing bacteria culture for all treatments except control. The crop was sown at a spacing of 30 cm × 10 cm. All the recommended package of practices were followed during the period of investigation.

## RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

### Growth attributes :

The data presented in Table 1 revealed that, the nutrient management through STCR equation proved its superiority by recording maximum growth attributes *viz.*, plant height (29.14 and 31.14 cm), number of branches plant<sup>-1</sup> (6.82 and 6.96), plant spread (28.46 and 28.96 cm), number of leaflets plant<sup>-1</sup> (55.19 and 57.78) and leaf area plant<sup>-1</sup> (10.18 and 10.74 dm<sup>2</sup>) than rest of treatments at harvest during both the years. The control treatment registered significantly minimum values of all growth attributes during both the years of experimentation. This might be because of balanced nutrition in yield target approach increases the uptake of essential nutrients and

which accelerates the activities of cell elongation and cell multiplication as well as metabolic activities resulted in increasing all the growth attributes. Similar results were recorded by Dudhatra *et al.* (2002) and Jordan *et al.* (2002).

### Yield attributes and yield :

Data presented in Table 2 indicated that, application of fertilizer dose as per STCR equation (25 q ha<sup>-1</sup>) registered significantly higher number of total pods plant<sup>-1</sup> (23.76 and 30.64), weight of pods plant<sup>-1</sup> (19.11 and 24.37 g), weight of karnels plant<sup>-1</sup> (13.41 and 17.48 g) and weight of 100 karnels (37.31 and 37.49 g) than rest of treatments during both the years. However, the total number of pods plant<sup>-1</sup> and 100 karnels weight was at par with fertilizer dose as per soil test during second year and weight of kernel during first year.

Application of fertilizer as per STCR (25 q ha<sup>-1</sup>) equation recorded maximum and significantly higher dry pod yield (23.08 and 24.49 q ha<sup>-1</sup>) and it was 40.47 and 39.06 per cent higher than recommended dose of fertilized during both years. The yield target of 25 q ha<sup>-1</sup> was achieved by STCR equation (23.08 and 24.49 q ha<sup>-1</sup>) with less than 10 per cent variation (-5.8 %).

While fertilizer dose as per soil test was found second best treatment (18.91 and 19.59 q ha<sup>-1</sup>) during both years. The control treatment registered significantly minimum dry pod yield (7.96 and 6.63 q ha<sup>-1</sup>) of groundnut than rest of treatments during both years. The balanced nutrition increases the chlorophyll content in leaves, which accelerate the photosynthetic rate and translocation of photosynthates towards reproductive parts (pods). Similar results were recorded by Safwat *et al.* (2002); Ghosh *et al.* (2003) and Varalakshmi *et al.* (2005).

### Quality studies :

The maximum oil content (50.04 and 50.22%) was recorded under application of fertilizer dose as per soil test and at par with fertilizer dose as per STCR equation and recommended dose of fertilizer during both the years. Whereas, the maximum protein content (25.61 and 25.67%) was observed in fertilizer dose as per STCR equation and at par with fertilizer dose as per soil test and recommended dose of fertilizer during both the years. This might be because of groundnut karnels were accumulated higher concentration of nitrogen which increases the protein and oil synthesis (Table 3). Similar results recorded by Tomar *et al.* (2007) and Ali *et al.*

(2012).

### Total nutrient uptake :

The total nutrient uptake by groundnut was influenced significantly due to different nutrient management treatments during both the years. Application of fertilizer as per STCR equation to *Kharif* groundnut registered significantly higher total uptake of nitrogen (124.48, 126.58 kg ha<sup>-1</sup>), phosphorus, (25.93 and 25.97 kg ha<sup>-1</sup>) and potassium (77.53 and 78.92 kg ha<sup>-1</sup>) than fertilizer dose as per soil test, recommended dose

of fertilizer and control treatments during both the years. This might be because of STCR yield target approach of fertilizer application provides balanced nutrition to groundnut which produced more yield and nutrient uptake hence, there was lesser content of residual soil available nitrogen, phosphorus and potassium. Similar findings were reported by Patel *et al.* (2007); Ramesh *et al.* (2009); Walia *et al.* (2009) and Vidyavathi *et al.* (2012).

### Conclusion :

Application of fertilizer dose as per soil test crop

**Table 1 : Growth attributes of groundnut as influenced by different treatments at harvest**

Treatments	Plant height (cm)		Number of branches plant <sup>-1</sup>		Number of leaflets plant <sup>-1</sup>		Plant spread (cm)		Leaf area plant <sup>-1</sup> (dm <sup>2</sup> )	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
<b>Nutrient management</b>										
T <sub>1</sub> -Recommended dose of fertilizer	27.81	28.47	6.35	6.36	47.83	50.57	26.64	26.89	8.72	9.21
T <sub>2</sub> -Fertilizer dose as per soil test	28.10	30.16	6.76	6.75	51.50	52.71	27.17	27.87	9.43	9.87
T <sub>3</sub> - Fertilizer dose as per STCR eq <sup>n</sup> (30q ha <sup>-1</sup> )	29.14	31.14	6.82	6.96	55.19	57.78	28.46	28.96	10.18	10.74
T <sub>4</sub> -Control (No fertilizer )	23.12	22.91	4.78	4.41	37.60	35.66	16.23	15.73	4.06	3.99
S.E. ±	1.06	0.77	0.35	0.34	1.33	1.46	0.67	0.63	0.19	0.20
C.D. (P=0.05)	3.09	2.23	1.02	0.97	3.87	4.26	1.94	1.85	0.56	0.58
General mean	27.04	28.17	6.18	6.12	48.03	49.18	24.62	24.86	8.10	8.45

**Table 2 : Yield attributes and dry pod yield of groundnut as influenced by different treatments**

Treatments	No. of pods plant <sup>-1</sup>		Weight of pods plant <sup>-1</sup> (g)		Weight of karnels plant <sup>-1</sup> (g)		Weight of 100 karnels (g)		Dry pod yield (q ha <sup>-1</sup> )	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
<b>Nutrient management</b>										
T <sub>1</sub> -Recommended dose of fertilizer	19.56	25.54	16.26	19.35	11.16	13.63	35.22	35.64	16.43	17.61
T <sub>2</sub> -Fertilizer dose as per soil test	20.17	28.42	17.01	21.76	11.76	15.46	36.53	36.47	18.91	19.59
T <sub>3</sub> - Fertilizer dose as per STCR eq <sup>n</sup> (30q ha <sup>-1</sup> )	23.76	30.64	19.11	24.37	13.41	17.48	37.31	37.49	23.08	24.49
T <sub>4</sub> -Control (No fertilizer )	13.05	12.57	8.45	8.38	5.74	5.67	34.36	32.53	7.96	6.63
S.E. ±	0.91	0.92	0.59	0.75	0.53	0.46	0.54	0.47	0.59	0.52
C.D. (P=0.05)	2.66	2.67	1.72	2.20	1.54	1.35	1.57	1.36	1.71	1.54
General mean	19.13	24.29	15.21	18.46	10.52	13.06	35.85	35.53	16.59	17.08

**Table 3 : The oil content, protein content and nutrient uptake of *Kharif* groundnut as influenced by different treatments**

Treatments	Oil content (%)		Protein content (%)		Total nutrient uptake (kg ha <sup>-1</sup> )					
	2011	2012	2011	2012	2011			2012		
					N	P	K	N	P	K
<b>Nutrient management</b>										
T <sub>1</sub> -Recommended dose of fertilizer	49.14	49.53	25.03	25.42	90.30	16.83	57.90	94.68	17.94	61.45
T <sub>2</sub> -Fertilizer dose as per soil test	50.04	50.22	25.48	25.58	103.19	19.67	64.15	106.31	20.57	66.37
T <sub>3</sub> - Fertilizer dose as per STCR eq <sup>n</sup> (30 q ha <sup>-1</sup> )	49.78	49.84	25.61	25.67	124.48	25.93	77.53	126.58	25.97	78.92
T <sub>4</sub> -Control (No fertilizer )	47.25	47.09	24.26	24.13	41.52	7.54	28.71	33.78	6.01	25.40
S.E. ±	0.49	0.29	0.34	0.34	2.15	0.45	1.30	2.23	0.52	0.99
C.D. (P=0.05)	1.42	0.84	0.99	0.98	6.27	1.32	3.79	6.51	1.50	2.89
General mean	49.05	49.17	25.09	25.20	89.87	17.50	57.07	90.34	17.62	58.04

response (STCR) equation was achieved with the yield target of 25 q ha<sup>-1</sup> in *Kharif* groundnut by  $\pm 5.8$  per cent variation. The oil and protein content in groundnut karnel was improved by application of fertilizer as per STCR equation.

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