

Effect of inorganic and bio-fertilizers on growth and yield of summer groundnut

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ABSTRACT : A field experiment was conducted during the summer season of 2011 at Research Farm, Department of Agronomy, College of Agriculture, Latur to evaluate the effect of inorganic and bio-fertilizers on growth and yield of summer groundnut. The experiment was laid out in Factorial Randomized Block Design with nine treatment combinations of three levels of fertilizers and three treatments of bio-inoculants replicated three times. The results of experiment revealed that the higher level of inorganic fertilizer (37.5:75:0 kg NPK ha⁻¹) recorded significantly maximum growth and yield attributes consequently results in higher pod yield while it was found to be at par with the fertilizer level of 25:50:0 kg NPK ha⁻¹. The seed treatment of dual inoculation of bio-fertilizers (*Rhizobium* + PSB) recorded higher growth and yield attributes.

Key Words : Summer groundnut, Inorganic fertilizers, Bio-fertilizers

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The productivity of groundnut under Indian condition is very low, mainly due to cultivation of oilseeds under starved condition. While oilseeds are more nutrient exhaustive there is wide gap in fertilizer demand and application. The grim situation of oilseed nutrition in the country indicates that only about 1/3 of fertilizer needs are actually applied. Thus, there is urgent need for steeping use of major, secondary and micronutrients (Hegde and Sudhakarbabu, 2009). This situation can be changed by applying optimum chemical fertilizer dose, use of organic fertilizers especially bio fertilizers. The excessive use of chemical fertilizers may harm to the soil fertility and productivity, which can be overcome by the use of bio fertilizers. As groundnut is a legume crop it has ability to fix the free atmospheric nitrogen in root nodules. *Rhizobium* spp. inoculants have favourable effect on legumes like groundnut (Joshi *et al.*, 1989). This inoculants helps to meet the additional N demand of the plant by increasing nodulation enabling realization of the yield potential to the plant. Phosphorus plays an important role in nodulation of legume crops. Phosphobacterium and phosphate solubilizing bacteria able to convert the phosphate present in soil from unavailable to available form. It has indirect effect on nodulation (Ghosh and Poi, 1998) which contribute to increase in yield of legume

crop like groundnut. Though bio-fertilizers helps to provide nutrients to crop but these cannot replace the inorganic fertilizers. Hence, integrated use of both will be more beneficial and environment friendly. It was felt necessary to conduct present experiment to study the effect of judicious and combined use of inorganic and bio-fertilizers (*Rhizobium* and PSB) on growth and yield of summer groundnut.

RESEARCH PROCEDURE

The field experiment was conducted at Research Farm in Department of Agronomy, College of Agriculture, Latur during summer season of 2011. The soil of the experimental plot was clayey in nature, slightly alkaline in reaction, low in available nitrogen (190.61 kg ha⁻¹), medium in available phosphorus (22.44 kg ha⁻¹) and high in available potash (385.00 kg ha⁻¹). The experiment was laid out in Factorial Randomized Block Design which was replicated thrice. There were nine treatment combinations comprising three levels of inorganic fertilizer *viz.*, F₁: 12.5: 25: 0, F₂: 25: 50: 0 and F₃: 37.5: 75: 0 kg NPK ha⁻¹ and three treatments of bio fertilizers (B₁: *Rhizobium* spp., B₂: PSB and B₃: dual treatments of *Rhizobium* spp. + PSB). The total rainfall received during crop growth period was 97.7 mm distributed in 10 rainy days.

The seed of groundnut variety LGN-1 was sown on flat bed by dibbling two seeds per hill at 30 cm x 10 cm distance on 18th of February. The fertilizers were applied as per treatments and whole quantity of fertilizers was applied as a basal dose. Seed were treated with biofertilizers as per treatments before sowing. All the necessary cultural and protective operations were carried out as per standards at specific interval. The crop was harvested at 18th June 2011. As summer groundnut is irrigated crop, total eight irrigations were given with an interval of 8 to 10 days along with taking care of critical growth stages of crop.

RESEARCH ANALYSIS AND REASONING

The experimental findings obtained from the present study have been discussed in following heads:

Growth attributes:

Data in Table 1 revealed that the application of 37.5:75:0 kg NPK ha⁻¹ significantly improved the growth attributing parameters viz., plant height (cm), number of branches plant⁻¹, number of functional leaves plant⁻¹, leaf area plant⁻¹, number of root nodules plant⁻¹, number of pegs plant⁻¹, number of flowers plant⁻¹, number of pegs plant⁻¹, number

Table 1: Growth attributes of summer groundnut as influenced by different treatments

Treatments	Plant height (cm)	No. of branches plant ⁻¹	No. of functional leaves plant ⁻¹	Leaf area plant ⁻¹	No. of root nodules plant ⁻¹	No. of pegs plant ⁻¹	No. of flowers plant ⁻¹	Dry matter plant ⁻¹
Inorganic fertilizers levels (kg NPK ha⁻¹)								
F ₁ : (12.5:25:0)	43.32	6.72	52.56	19.94	64.22	28.00	2.95	29.22
F ₂ : (25:50:0)	49.87	7.56	57.98	24.82	71.22	32.78	4.24	34.03
F ₃ : (37.5:75:0)	51.93	7.96	58.96	26.45	74.44	34.78	4.69	36.63
S.E. ±	1.29	0.26	1.75	1.08	2.27	1.27	0.18	1.03
C.D. at 5%	3.87	0.77	5.23	3.23	6.81	3.81	0.55	3.09
Biofertilizers								
B ₁ : <i>Rhizobium</i> spp.	47.94	7.26	54.66	22.38	68.56	30.67	3.84	31.90
B ₂ :PSB	45.31	6.83	54.16	21.86	63.64	29.56	3.35	29.74
B ₃ : <i>Rhizobium</i> spp. + PSB	51.87	8.16	60.73	27.16	77.67	35.31	4.69	38.23
S.E. ±	1.29	0.26	1.75	1.08	2.27	1.27	0.18	1.03
C.D. at 5%	3.89	0.77	5.23	3.23	6.81	3.81	0.55	3.09
Interaction effect								
S.E. ±	3.87	0.45	3.02	1.87	3.94	2.20	0.32	1.78
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS
General mean	48.37	10.42	10.42	23.73	69.96	31.85	3.96	33.29

NS=Non-significant

Table 2: Yield attributes and yield of summer groundnut as influenced by different treatments

Treatments	Dry pod yield plant ⁻¹	Dry pod yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)	Biological yield (kg ha ⁻¹)	Seed index (g)	Harvest index (%)
Inorganic fertilizers levels (kg NPK ha⁻¹)						
F ₁ : (12.5:25:0)	4.64	1492	2449	3941	34.18	37.53
F ₂ : (25:50:0)	8.23	2400	3612	6012	34.58	39.91
F ₃ : (37.5:75:0)	8.77	2480	3888	6368	35.50	38.93
S.E.±	0.36	63	94	125	0.36	-
C.D. at 5%	1.10	188	183	376	NS	-
Biofertilizers						
B ₁ : <i>Rhizobium</i> spp.	7.16	2159	3310	5469	34.86	39.50
B ₂ :PSB	6.13	1831	2977	4808	34.21	38.08
B ₃ : <i>Rhizobium</i> spp. + PSB	7.95	2381	3630	6011	35.20	39.61
S.E.±	0.36	63	94	125	0.36	-
C.D. at 5%	1.10	188	283	376	NS	-
Interaction effect						
S.E.±	0.64	109	164	217	0.62	-
C.D. at 5%	NS	NS	NS	NS	NS	-
General mean	7.22	2124	3291	5419	34.75	38.92

NS=Non-significant

of flowers plant⁻¹ and dry matter plant⁻¹ over lower levels of fertilizers, but was at par with application of 25:50:0 kg NPK ha⁻¹. These observations are in conformity with the results of Bhalerao *et al.* (1993), Panwar and Singh (2003) and Srinivasan and Angayarkanni (2008).

The dual inoculation of *Rhizobium* spp. + PSB to groundnut seed significantly enhanced the growth attributing parameters *viz.*, plant height (cm), number of branches plant⁻¹, number of functional leaves plant⁻¹, leaf area plant⁻¹, number of root nodules plant⁻¹, number of pegs plant⁻¹, number of flowers plant⁻¹ and dry matter plant⁻¹ over alone inoculation of *Rhizobium* spp. and PSB. In respect of individual bio-fertilizer inoculation, *Rhizobium* spp. treatment recorded superiority over PSB inoculation. These results are similar to those reported by More *et al.* (2002) and Zaltate and Padmani (2009).

Yield attributes and yield:

Yield contributing parameters *viz.*, number of pods plant⁻¹, pod yield plant⁻¹, pod yield ha⁻¹, haulm yield and biological yield (kg ha⁻¹), seed index (g) and harvest index (%) of summer groundnut were influenced significantly with application of 37.5:75:0 kg NPK ha⁻¹ over 12.5:25:0 kg NPK ha⁻¹ whereas it was found at par with application of 25:50:0 kg NPK ha⁻¹ (Table 2). These observations are in conformity with the results of Bhalerao *et al.* (1993) and Tiwari and Dhakar (1997).

The highest number of pods plant⁻¹, pod yield plant⁻¹, haulm yield and biological yield (kg ha⁻¹), seed index (g) and harvest index (%) were obtained due to dual inoculation of *Rhizobium* spp. + PSB, which was significantly superior over individual inoculation of *Rhizobium* spp. and PSB. More *et al.* (2002) recorded the similar results.

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