



Effect of integrated nutrient management on growth, yield and quality of summer groundnut (*Aarchis hypogaea* L.)

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Abstract : A field experiment was conducted during 2009 and 2010 to study the effect of integrated nutrient management on growth, yield and quality of groundnut under irrigated condition. Application of 75 % RDF + 25 % N through FYM + *Rhizium* + PSB significantly increased plant height, spread, number of branches, leaf area, and dry matter accumulation and there by yield and quality of groundnut. Application of 75 % RDF + 25 % N through FYM + *Rhizium* + PSB significantly increased growth, yield and quality parameters compared to rest of integrated nutrient management levels. 100 % N through organic manure (50 % N through FYM + 25 % N through vermicompost + 25 % N through neem cake + *Rhizium* + PSB) treatment significantly increased oil content of groundnut kernels.

Key Words : Integrated nutrient management, Organic manure, Groundnut, Growth

View Point Article : Dhadge, S.M. and Satpute, N.R. (2014). Effect of integrated nutrient management on growth, yield and quality of summer groundnut (*Aarchis hypogaea* L.). *Internat. J. agric. Sci.*, **10** (1): 314-316.

Article History : Received : 13.08.2013; Revised : 30.10.2013; Accepted : 26.11.2013

INTRODUCTION

Groundnut (*Aarchis hypogaea* L.) is the premier oilseed crop of India and contributed nearly 40 per cent of the total oilseed production. But the average yield of the crop in India is as low as 900 kg ha⁻¹ (Bandopadhyaya *et al.*, 2000). Among the several constraints, improper nutrient management is important for low productivity. Groundnut being a legume-oilseed crop, its P, S and Ca requirement is quite high. Kanwar *et al.* (1983) reviewed the work done in India on the nutrient and fertilizer response of groundnut and concluded that with balance use of fertilizer for groundnut production can be increased considerably. However, a wide inconsistency in response of groundnut to fertilizer application is noticed (Reddy, 1988) and the conclusive evidences on balance nutrition of groundnut are still meagre and fragmentary in coverage. There is need to work out nutrient management strategy specific to each agro-climatic region to increase the production level. Hence, an attempt has been made to find a solution to this problem in an

integrated manner involving organic manure and inorganic fertilizer with biofertilizers application to achieve potential crop production.

MATERIAL AND METHODS

A field experiment was conducted for two year at Central campus MPKV, Rahuri during 2009 and 2010. The soil was sandy clay loam in texture with pH 8.2, low in available N (238 kg ha⁻¹), medium in available P (24 kg ha⁻¹) and high in available K (358 kg ha⁻¹) content. The experiment was laid out in Randomized Block Design with 4 replications. Treatment consisted of 5 integrated nutrient management levels *viz.*, F₁ = 100 % RDF (25 kg N + 50 kg P₂O₅ ha⁻¹), F₂ = 75 % RDF + 25 % N through FYM + Rhizobium + PSB, F₃ = 50 % RDF + 50 % N through FYM + Rhizobium + PSB, F₄ = 25 % RDF + 75 % N through FYM + Rhizobium + PSB and F₅ = 100 % N through organic (50 % N through FYM + 25 % N through vermicompost + 25 % N through neem cake + Rhizobium + PSB). Organic manures were applied before

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sowing. N and P was applied through urea and DAP at sowing. The sowing of groundnut crop was done on February 23th 2009 and February 12th 2010. A seed rate of 100 kg kernel ha⁻¹ of variety TAG-24 was used at a spacing of 30 x 10 cm. Growth observation were recorded at 28 DAS interval. The pooled analysis of yield and other data were carried out as described by Gomez and Gomez (1984). Oil content were determined by Soxhlet ether extraction method. Protein content were estimated by N content x 5.76 (Reddy, 1988).

RESULTS AND DISCUSSION

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

Growth attributes:

Application of 75 % RDF + 25 % N through FYM + *Rhizobium* + PSB significantly increased plant height, plant spread, number of branches per plant, leaf area per plant and dry matter per plant as compared to other treatments during

both the years (Table 1). The magnitude of increase in plant height (14.80 and 15.60 cm), plant spread (35.60 and 37.71 cm), number of branches per plant (8.54 and 9.63), leaf area per plant (2.63 and 2.90 dm²) and dry matter per plant (38.12 and 39.32 g), respectively during first and second year. The application of chemical fertilizer in combination with organic fertilizer increased the fertilizer use efficiency of added chemical fertilizers, which helped in increasing nutrient availability and improved the physical and biological health of soil. Apart from that the organic manure also contains almost all the essential elements in variable quantities, which has synergistic effect with other essential elements for their availability. This effect might be reflected in increased in plant height, spread, number of branches and leaf area in groundnut (Rayer, 1984).

Effect on yield:

Application of 75 % RDF + 25 % N through FYM + *Rhizobium* + PSB significantly increased the pod yield (35.46, 37.23 and 36.34 q ha⁻¹), dry haulm yield (50.97, 51.18 and 51.07 q ha⁻¹), biological yield (86.43, 88.41 and

Table 1 : Effect of integrated nutrient management treatments on growth attributing characters of summer groundnut at harvest

Treatments	Plant height(cm)		Plant spread (cm)		No. of branches/plant		Leaf area/plant(dm ²)	
	2009	2010	2009	2010	2009	2010	2009	2010
Fertilizer to groundnut								
F ₁ = 100 % RDF (25:50:00 NPK kg ha ⁻¹)	13.60	15.00	34.70	37.14	8.37	9.32	2.19	2.72
F ₂ = 75 % RDF + 25 % N through FYM + <i>Rhizium</i> + PSB	14.80	15.60	35.60	37.71	8.54	9.63	2.63	2.90
F ₃ = 50 % RDF + 50 % N through FYM + <i>Rhizium</i> + PSB	14.20	15.25	35.20	37.42	8.43	9.47	2.41	2.77
F ₄ =25 % RDF + 75 % N through FYM + <i>Rhizium</i> + PSB	12.82	14.50	34.10	36.35	8.16	8.83	1.93	2.54
F ₅ = 100 % N through organic manure	12.28	14.10	33.70	35.97	7.78	8.42	1.80	2.23
S.E. ±	0.49	0.30	0.41	0.22	0.17	0.31	0.18	0.11
C.D. (P=0.05)	1.53	0.93	1.24	0.68	0.51	0.96	0.54	0.34

*100 % N through organic manure (50% N through 0.33FYM + 25 % N through vermicompost + 25 % N through neemcake + *Rhizium* + PSB)

Table 2 : Effect of integrated nutrient management treatments on yields of summer groundnut

Treatments	Dry pod yield (q ha ⁻¹)			Dryhaulmyield (q ha ⁻¹)			Biological yield(q ha ⁻¹)			Harvest index (%)		
	2009	2010	Pooled mean	2009	2010	Pooled mean	2009	2010	Pooled mean	2009	2010	Pooled mean
Fertilizer to groundnut												
F ₁ = 100 % RDF (25:50:00 NPK kg ha ⁻¹)	33.94	36.16	35.05	49.45	50.12	49.78	83.39	86.28	84.83	40.69	41.91	41.30
F ₂ = 75 % RDF + 25 % N through FYM+ <i>Rhizium</i> + PSB	35.46	37.23	36.34	50.97	51.18	51.07	86.43	88.41	87.42	41.02	42.11	41.56
F ₃ = 50 % RDF + 50 % N through FYM+ <i>Rhizium</i> + PSB	34.56	36.47	35.52	50.06	50.62	50.34	84.62	87.09	85.85	40.84	41.88	41.36
F ₄ =25 % RDF + 75 % N through FYM+ <i>Rhizium</i> + PSB	32.14	34.26	33.20	47.67	48.32	47.99	79.81	82.58	81.19	40.26	41.48	40.87
F ₅ = 100 % N through organic manure	31.22	33.28	32.25	46.72	47.27	47.00	77.94	80.55	79.24	40.05	41.32	40.68
S.E. ±	0.40	0.32	0.27	0.46	0.41	0.32	0.70	0.60	0.46	0.30	0.25	0.20
C.D. (P=0.05)	1.24	1.00	0.82	1.39	1.25	0.96	2.17	1.84	1.40	0.91	NS	0.62

* 100 % N through organic manure (50% N through 0.33FYM + 25 % N through vermicompost + 25 % N through neemcake + *Rhiz.* + PSB)

Table 3 : Effect of integrated nutrient management on protein and oil content in summer groundnut

Treatments	Protein content (%)			Oil content (%)			Protein yield (q ha ⁻¹)			Oil yield (q ha ⁻¹)		
	2009	2010	Mean	2009	2010	Mean	2009	2010	Mean	2009	2010	Mean
Fertilizer to groundnut												
F ₁ = 100 % RDF (25:50:00 NPK kg ha ⁻¹)	19.16	19.25	19.20	47.28	48.26	47.77	4.67	5.07	4.87	10.16	10.95	10.55
F ₂ = 75 % RDF + 25 % N through FYM + Rhiz. + PSB	20.28	20.41	20.34	47.83	49.03	48.43	5.22	5.58	5.40	10.72	11.68	11.20
F ₃ = 50 % RDF + 50 % N through FYM + Rhiz. + PSB	19.68	19.72	19.70	48.18	49.45	48.81	4.91	5.26	5.08	11.75	13.02	12.38
F ₄ =25 % RDF + 75 % N through FYM + Rhiz. + PSB	18.39	18.43	18.41	48.31	49.52	48.91	4.12	4.39	4.25	12.05	13.21	12.63
F ₅ = 100 % N through organic manure	17.66	17.75	17.70	48.63	49.82	49.22	3.79	4.02	3.90	12.52	13.64	13.08
S.E. ±	0.50	0.18	-	0.18	0.30	-	0.14	0.06	-	0.14	0.16	-
C.D. (P=0.05)	1.52	0.56	-	0.58	0.92	-	0.46	0.18	-	0.44	0.50	-

* 100 % N through organic manure (50% N through 0.33FYM + 25 % N through vermicompost + 25 % N through neemcake + Rhiz. + PSB)

87.42 q ha⁻¹) and harvest index (41.02, 42.11 and 41.56 %), respectively during both the years and on pooled mean basis (Table 2). The significant increase in crop growth and yield through improvement in physical and biological health of soil coupled with enhanced supply of nutrients (Ismail *et al.*, 1998, Dosani *et al.*, 1999).

Effect on quality:

Application of 75 % RDF + 25 % N through FYM + *Rhizobium* + PSB significantly increased the protein content (20.28, 20.41 and 20.34) and protein yield (5.22, 5.58 and 5.40 q ha⁻¹), respectively during both the years and on average mean basis. Increase in protein content might be due to absorption of more nitrogen by groundnut crop through kernel which might have accumulated more nitrogen and consequently increased protein content. However, the application of 100 % N through organic manure (50 % N through FYM + 25 % N through vermicompost + 25 % N through neemcake + *Rhizobium* + PSB) recorded significantly higher oil content (48.63, 49.82 and 49.22) and oil yield (12.52, 13.64 and 13.08 q ha⁻¹) during first, second year and on average mean basis, respectively (Table 3). This increase in oil content under organic manure application can be assigned to the availability of all the essential nutrients in organic matter due to its continuous mineralization (Survase *et al.*, 1986).

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