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Evaluation of suitable varieties of groundnut with fertility levels for potato-groundnut system in North Gujarat

S.K. CHONGTHAM[1]*, R.N. PATEL[2], J.K. PATEL[3] AND D.M. ZAPADIYA[4]

Potato Research Station, S. D. Agricultural University,
Deesa, Gujarat- 385 535

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ABSTRACT

A field experiment was conducted at Potato Research Station, S. D. Agricultural University, Deesa during summer 2017 to study the effect of varieties and fertility levels on yield, productivity and economics of groundnut. The results showed that variety TAG had significantly higher pod and kernel yields, and harvest index. Highest haulm yield and shelling % were recorded under DH 86. Highest crop productivity, gross and net returns and BCR were observed under TAG 24 which was closely followed by DH 86. Increase in fertilizer levels significantly enhanced 100 pod weight and 100 kernel weight significantly up to 50% recommended dose of fertilizer. However, highest pod yield and kernel yield were observed under 100% recommended dose of fertilizer which was statistically at par with 75% recommended dose of fertilizer. Maximum crop productivity, gross and net returns and BCR were registered under application of 100% recommended dose of fertilizer (12.5-25-0 kg $N:P_2O_5:K_2O$/ha) which was closely followed by 75% recommended dose of fertilizer.

Key words: Economics, Fertility levels, Groundnut, Kernel yield, Pod yield, Varieties

Groundnut (*Arachis hypogaea* L.) is the fourth most important source of edible oil and third most important source of vegetable protein in the world (Anonymous, 2017). Gujarat is the leading groundnut producer in India, occupying about 50 per cent of the total production. Recently, farmers are growing groundnut in summer season, especially in the northern Gujarat region after potato crop. It is a well-known fact that unsustainable agronomic practices such as excess or inadequate fertilizer use in the absence of standard soil test is a major abiotic factor affecting soil productivity, crop yield and subsequently farmers income at household level (Semoka, 2002). Identification of right amount of fertilizers considering the residual fertility level of the previous crop in a particular cropping system is required for realizing higher yield and income, without impairing environmental quality. Selection of appropriate variety for a particular region is essential for obtaining higher yield and remuneration. Hence, an experiment was planned to evaluate the effect of varieties and fertility levels on yield, productivity and economics of groundnut.

[1]Assistant Research Scientist (Agronomy), [2]Associate Research Scientist (Plant Breeding), [3]Assistant Research Scientist (Plant Pathology), [4]Agriculture Officer, Potato Research Station, S. D. Agricultural University, Deesa, Gujarat- 385 535
*Email: sunil.sunil.ch@gmail.com

MATERIALS AND METHODS

A field experiment was conducted at Potato Research Station, SDAU, Deesa (Gujarat) during summer season of 2017 to study the effect of varieties and fertility levels on yield, productivity and economics of groundnut. The soil was loamy sand in texture, low in organic carbon (0.32%), available nitrogen (173.52 kg/ha), medium in available phosphorus (23.10 kg P/ha) and available potassium (260.35 kg K_2O/ha). Treatments consisted of four varieties *i.e*., DH 86, TAG 24, TG 37A and GG 20 (Local check) in main plots and five fertility levels *viz.,*

No fertilizers, 25% RDF, 50% RDF, 75% RDF and 100% RDF in sub-plots and treatment combinations were laid out in split plot design and replicated thrice. The RDF of groundnut was 25 : 50 : 0 kg N : P_2O_5 : K_2O/ha. Sources of nitrogen and phosphorus were urea and single superphosphate, respectively. The crop was sown on 18th March with seed rate of 100 kg/ha at a spacing of 30 cm x 10 cm. Previous crop was potato (RDF: 275 : 138 : 275 NPK kg/ha) in the field. Recommended package of practice was followed for groundnut crop during the experiment. Yield attributes namely 100 pod weight (g) and 100 kernel weight (g) were recorded after harvest. Pod and haulm yield at harvest from each net plot of size 4.0 m x 2.4 m were recorded and later expressed in q/ha. Shelling per cent was worked out by dividing kernel weight by pod weight and expressed in percentage. Kernel yield was calculated by using formula.

$$\text{Kernel yield (q/ha)} = \frac{\text{Dry pod yield (q/ha)} \times \text{Shelling percentage}}{100}$$

Harvest index (%) was calculated by using formula

$$\text{Harvest index (\%)} = \frac{\text{Pod yield (q/ha)} \times 100}{\text{Pod yield (q/ha) x Haulm yield (q/ha)}}$$

Crop productivity was calculated by using formula

$$\text{Crop productivity (kg/ha/day)} = \frac{\text{Pod yield (kg/ha)}}{\text{Total crop duration (days)}}$$

Total duration of crop was 106 days during the experimentation. Net returns and benefit: cost ratio were calculated by

Net return (₹/ha) = Gross return (₹/ha) - Total cost of cultivation (₹/ha)

Benefit cost ratio (BCR) = Gross return (₹/ha) / Total cost of cultivation (₹/ha)

Return per day was calculated by using formula:

$$\text{Return per day (₹/ha/day)} = \frac{\text{Net return (₹/ha)}}{\text{Total crop duration (days)}}$$

Data were statistically analysed using OPSTAT of CCSHAU, Hisar and interpreted accordingly.

RESULTS AND DISCUSSION

Yield attributes and yields

Perusal of the data (Table 1) revealed that yield attributes *i.e.*, 100 pod weight, 100 kernel weight and shelling percentage, pod, haulm and kernel yields and harvest index were influenced by different varieties of groundnut. Variety GG-20 recorded significantly the highest 100 pod weight (157.64 g) among all varieties. Similarly, the highest 100 kernel weight (57.56 g) was observed under GG-20, which was statistically higher than rest of varieties, except DH 86 (56.47 g). In case of shelling percentage, DH 86 noted statistically the highest value (76.26%) among all treatments. TAG 24 registered the highest pod yield (28.21 q/ha), which was significantly higher than rest of treatments, except DH 86 (26.30 q/ha). Significantly the highest haulm yield (33.45 q/ha) was noted under DH 86 among all varieties. TAG 24 recorded the highest kernel yield (20.39 q/ha) which was statistically at par

with DH 86 (20.09 q/ha), and both were significantly higher than rest of varieties. Despite lower 100 pod and 100 kernel weight, variety TAG 24 recorded higher pod and kernel yields. Priya *et al.*, (2014) also observed similar findings and reported that higher pod yield in TAG-24 was due to its higher number of pegs per plant and total pods per plant. Similarly, TAG 24 had the highest harvest index (32.33%) which was statistically at par with DH 86 (31.80%), and both were significantly higher than rest of varieties. The highest harvest index observed in variety TAG-24 might be due to its compact growth habit and reduced plant height which resulted in lower above ground dry matter production. This result is corroborated by findings of Priya *et al.,* (2016).

A thorough analysis of the data (Table 1) indicated that yield attributes *i.e.,* 100 pod weight and 100 kernel weight, pod, haulm and kernel yields and harvest index varied significant due to different fertility levels. Increase in fertility from to 50% RDF markedly enhanced 100 pod weight and 100 kernel weight. However, the highest values of these characters were noted fewer than 100% RDF. Although shelling percentage was not significantly influenced by different fertility levels, its highest value (74.30%) was recorded fewer than 75% RDF. Increasing dose of fertilizer up to 75% RDF statistically enhanced pod yield, its highest value (26.33 q/ha) was registered under 100% RDF_{NPK}. However, haulm yield responded significantly up to 25% RDF, maximum value (31.83 q/ha) was noted under 75% RDF. In case of kernel yield, subsequent increase in fertility levels up to 75% RDF significantly enhanced kernel yield, its highest value was registered under 100% RDF. Similar trend was also observed in case of harvest index. Application of 100% RDF could have ensured early and plentiful availability of nutrients namely nitrogen and phosphorus to plants which favorably influenced the pod and kernel development, thus improving yield attributes and ultimately realized into higher pod and kernel yields. Similar findings were also reported by Bala *et al.,* (2011).

Crop productivity and Economics

It was evident from Table 2 that crop productivity, gross and net returns, return per day and BCR were markedly influenced by different varieties of groundnut. The highest crop productivity (26.62 kg/ha/day) was noted under TAG 24, which was closely followed by DH 86 (24.80 kg/ha/day) and significantly better than the rest of varieties. The highest gross return (₹ 118.56 x 10^3/ha) and net return (₹ 73.68 x 10^3/ha) were recorded under TAG 24, which was closely followed by DH 86 (₹ 110.40 x 10^3/ha and ₹ 65.51 x 10^3/ha, respectively). Similarly, highest return per day (₹ 695.08/ha/day) and BCR (1.64) were registered with TAG 24, which was closely followed by DH 86 (₹ 618.04/ha/day and 1.46, respectively). Enhanced economic returns and BCR in TAG 24 might be attributed to higher pod and kernel yields with same cost of cultivation as compared to other varieties.

Increasing fertility levels up to 75% RDF markedly increased crop productivity, gross and net return, the highest values were recorded under 100% RDF (24.84 kg/ha/day, ₹ 110.65 x 10^3/ha and ₹ 65.07 x 10^3/ha, respectively) as indicated in Table 2. The highest return per day (₹613.91/ha/day) and BCR (1.43) were observed under 100% RDF which was closely followed by 75% RDF (₹ 557.32/ha/day and 1.31, respectively). Maximum crop productivity and profitability under application of 100% RDF might be due to its significantly higher pod and kernel yields.

CONCLUSION

Based on above findings, it can be concluded that cultivation of TAG 24 and DH 86 with full dose of fertilizers (12.5-25-0 kg N:P_2O_5:K_2O/ha) should be followed during summer season in potato-groundnut cropping system to achieve higher pod and kernel yields along with better crop productivity and economic remuneration. However, there is still scope for reduction in fertilizers dose up to 75% without significantly

affecting yield and economics of summer groundnut in potato-groundnut cropping system. Further, more detailed studies on varieties of groundnut and fertility levels required for drawing a more concrete conclusion and analyze statistically.

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REFERENCES

Anonymous. 2017. IOPEPC *Kharif*-2017 Survey of Groundnut Crop, Indian Oilseeds and Produce Export Promotion Council (Under Ministry of Commerce, Govt. of India) 78-79, Bajaj Bhawan, Nariman Point, Mumbai – 400 021. P. 30.

Bala ,H. M. B., Ogunlela ,V. B., Kuchinda, N. C. and Tanimu ,B. 2011. Response of two groundnut (*Arachis hypogaea*) varieties to sowing date and NPK fertilizer rate in a sami-arid environment: yield and yield attributes. *Asian Journal of Crop Science* ,**3** (3):130-134.

Priya , T. Bhagavatha, Subramanyam , D., Sumathi, V. and Naidu ,M. V. S. 2016. Growth characters and yield of early *kharif* groundnut as influenced by varieties and plant populations. *IOSR Journal of Agriculture and Veterinary Science* ,**9** (5): 81-83 .

Priya , T. Bhagavatha. 2014. Performance of groundnut varieties under different plant populations during early *kharif*. M.Sc. (Ag.) thesis, Department of Agronomy, Sri Venkateswara Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad – 500 030. P. 126.

Semoka, J. M. R. 2002. Progress Report for 2001 for the Research on Rock Phosphate Utilization Project. Agricultural Sector Programme Support. Ministry of Agriculture and Food Security, Dar es Salaam, Tanzania. P.22 .

Table 1 Yield attributes, yields and harvest index of groundnut as influenced by different treatments

Treatments	100 pod weight (g)	100 kernel weight (g)	Shelling (%)	Pod yield (q/ha)	Haulm yield (q/ha)	Kernel yield (q/ha)	Harvest index (%)
Varieties							
DH 86	152.13	56.47	76.26	26.30	33.45	20.09	31.80
TAG 24	151.75	53.26	72.08	28.21	31.43	20.39	32.33
TG 37A	141.72	52.93	71.30	22.17	31.10	15.81	28.11
GG 20	157.64	57.56	73.12	16.60	27.60	12.15	25.84
SEm ±	1.48	0.80	0.77	0.71	0.51	0.65	0.62
CD (P=0.05)	5.24	2.83	2.72	2.50	1.80	2.29	2.17
Fertility levels							
No fertilizer	145.71	52.82	71.86	20.32	28.52	14.61	28.00
25% RDF	147.35	53.86	72.72	21.70	30.83	15.83	28.11

50% RDF	151.81	55.49	72.88	23.42	31.50	17.11	29.15
75% RDF	152.63	55.74	74.30	24.83	31.83	18.45	30.64
100% RDF	156.54	57.37	74.20	26.33	31.80	19.55	31.71
SEm ±	2.11	0.79	0.79	0.77	0.50	0.61	0.71
CD (P=0.05)	6.11	2.30	NS	2.22	1.45	1.77	2.06

Table 2 Crop productivity and economics of groundnut as influenced by different treatments

Treatments	Crop productivity (kg/ha/day)	Total cost of cultivation (₹ x 10^3/ha)	Gross return (₹ x 10^3/ha)	Net return (₹ x 10^3/ha)	Return per day (₹/ha/day)	BCR
Varieties						
DH 86	24.80	44.88	110.40	65.51	618.04	1.46
TAG 24	26.62	44.88	118.56	73.70	695.08	1.64
TG 37A	20.91	44.88	93.13	48.25	455.14	1.07
GG 20	15.66	44.88	69.71	24.83	234.19	0.55
SEm ±	0.67		2.98	2.98	28.14	0.07
CD (P=0.05)	2.36		10.52	10.52	99.26	0.23
Fertility levels						
No fertilizer	19.17	44.19	85.35	41.16	388.29	0.93
25% RDF_{NPK}	20.47	44.54	91.07	46.54	439.02	1.04
50% RDF_{NPK}	22.09	44.88	98.36	53.48	504.53	1.19
75% RDF_{NPK}	23.43	45.23	104.31	59.08	557.32	1.31
100% RDF_{NPK}	24.84	45.58	110.65	65.07	613.91	1.43
SEm ±	0.72		3.22	3.22	30.42	0.07
CD (P=0.05)	2.10		9.33	9.33	88.03	0.21