The result of the contribution of various characters towards the expression of genetic divergence (Table 4) indicated that boll weight (41.34%) followed by number of bolls per plant (34.64%) and 2.5 span length (12.32%) contributed more to the total genetic divergence in the 40 genotypes of cotton. From the present study, it was clear that these are the three basic attributes of plant architecture which need greater attention.

The higher inter cluster distances were recorded between III and VI (23.31), IV and VI (19.65), II and VI (18.89) and I and VI (17.22). This indicated that the clusters I, II, III and IV had higher inter cluster distances with cluster VI. But the most diverse genotype of cluster VI (McNamara wine sap) had lower mean values for all the economic characters studied. Hence, all these inter cluster distances from 17.22 to 23.31 need not be considered. The next higher inter cluster distance was recorded between clusters III and V(15.59). Thus, hybridization of the genotypes between these clusters would result in maximum hybrid vigour and throw useful recombinants.

The genetically diverse genotype of cluster V (153 E) could be utilized for the improvement of ginning outturn which recorded a maxium of 38.2 per cent and boll weight which recorded a maxium of 5.10 g. The genotypes included in cluster III had maximum number of bolls per plant (12.72) and seed cotton yield (50.62g). Thus, it could be possible to generate a gene pool possessing immense variability by appropriate intercrossing.

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EFFECT OF FERTILIZER APPLICATION ON GROUNDNUT

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ABSTRACT

In order to study the effect of fertilizer nutrients on groundnut (*Arachis hypogaea L.*), field trials were conducted during *kharif* with five, treatments i.e. control, 50, 75, 100 and 150 per cent of recommended doses of fertilizers in randomised block design. Application of 20:80:20 NP_2O_5, K_2O kg/ha (100 % of recomended dose) resulted in 21, 10, 23 and 98 per cent increase in pod yield over 150,75, 50% of recommended dose and control respectively. The haulm, oil yield kg/ha, shelling per cent, 100 kernel weight (g) and SMK % were also higher with this dose. In higher dose of NPK (150% of recommendation) a decline in pod, haulm, oil yield and in all studied characters was observed.

From 1930-31 to 1980-81 the area under groundnut in India has increased by 134% (from 2.9 to 7.6 million hactare) which resulted in increase in the production by 72 per cent (from 2.9 million tonnes to 5.0 million tonnes). The productivity during this period has, however declined by 27 per cent i.e. from 1003 kg/ha to 736 kg/ha The present productivity of 953 kg/ha is less than the world average (978 kg/ha). The scope for further increase in area is limited, the only alternative left for meeting the domestic demand is by increasing productivity. Therefore, it is very essential to find out the suitable dose of fertilizers for maximitation the yield of *kharif* groundnut.

MATERIALS AND METHODS

A field trial was conducted at Zonal Agricultural Research Station, Khargone, (M.P.) during *kharif* seasons of 1988, 1989 and 1990. The soil was medium black in texture having available N, P_2O_5, and K_2O content of 143, 25.32 and 62 kg/ha respectively. The soil pH was 8.0. The five treatments (Table 1 and 2) were replicated four times in a randomised block design. Test variety was Jyoti. The net plot size and spacing were 2.4 x 4.8 m. and 30 x 30 cm. respectively. Nitrogen, phosphorus and potash were applied in the form of Urea, SSP and MOP below the seed row. The

recommended fertilizer dose was 20 : 80 : 20 N, P_2O_5 and K_2O kg/ha respectively.

The experimental crop of groundnut was sown using the two seed rate of 100 kg/ha on 28th, 27th June and 19th July in respective years. Two weeding (20 and 35 DAS) and three interculture operations (15, 30 and 45 DAS) were done in all the years.

Fertilizer response were worked out using the equation $Y = a + bx + cx^2$, where Y is the expected yield (kg/ha) for a given, N, P_2O_5 and K_2O rate, X = 1 unit of N, P_2O_5 and K_2O, a is constant and a, b and c are regression coefficients denoting linear and quadratic terms respectively. The optimum dose of nitrogen, phosphorus and potassium was worked out using the formula:

$$Xopt = \frac{c - pb}{2\,pc} \text{ where}$$

Xopt = is the optimum dose of N, P_2O_5 and K_2O

p = price of one kg of groundnut pod.

q = cost of one kg of N or P_2O_5 or K_2O.

RESULTS AND DISCUSSION

Yield and yield attributes

Three year data and pooled analysis indicated significant differences among the treatments for shelling %, 100 kernel weight and SMK %, There was a conspicuous and significant increase in shelling %, 100 kernel weight and SMK % with increasing fertilizer dose upto 100% of recommended dose (20 : 80 : 20 kg N, P_2O_5, K_2O/ha) there after a decline was observed in these characters.

Pooled analysis and three years data showed 100% of recommended fertilizer dose produced

Table 1. Response of fertilizers on shelling %, 100 kernel weight (g) and SMK %.

Treatments	Shelling %				100 kernel weight (g)				SMK %			
	1988	1989	1990	Pooled	1988	1989	1990	Pooled	1988	1989	1990	Pooled
N : P_2O_5 : K_2O kg/ha												
0 0 0 (Control)	64.50	61.50	69.00	65.00	22.25	24.50	29.75	25.50	95.25	91.00	88.75	91.67
10 40 10 (50% of recommendation)	66.00	63.50	73.50	67.70	23.50	25.50	30.75	26.50	96.00	93.25	90.00	93.08
15 60 15 (75% of recommendation)	68.00	65.00	73.25	69.00	23.75	27.50	32.00	27.75	96.00	94.25	92.50	94.25
20 80 20 (100% of recommendation)	70.25	69.75	76.00	72.00	25.50	30.00	33.00	29.50	97.50	96.00	95.00	96.17
30 120 30 (150% of recommendation)	68.00	69.25	72.50	69.92	23.00	28.00	30.75	27.25	94.50	93.00	93.25	93.58
C.D. at 5%	1.30	1.24	1.45	1.22	0.96	1.02	1.10	0.98	1.21	1.13	1.22	1.19

Table 2. Response of fertilizers on pod yield, haulm yield and oil yield kg/ha.

Treatments	Pod yield kg/ha				Haulm kg/ha				Oil yield kg/ha			
	1988	1989	1990	Pooled	1988	1989	1990	Pooled	1988	1989	1990	Pooled
N : P_2O_5 : K_2O kg/ha												
0 0 0 (Control)	374	760	764	670	3993	3906	4192	4028	156	226	265	213
10 40 10 (50% of recommendation)	934	1059	961	1079	4166	4366	4036	4192	386	330	358	358
15 60 15 (75% of recommendation)	1016	1194	1092	1203	4401	4626	4340	4453	443	388	423	419
20 80 20 (100% of recommendation)	1090	1324	1237	1327	4991	5078	4670	4913	510	480	495	495
30 120 30 (150% of recommendation)	894	1096	1020	1094	4626	4496	4496	4540	393	380	380	384
C.D. at 5%	57	96	42	68	190	278	658	290	30	32	22	35

Table 3. Functional relationship between the levels of inputs (nitrogen, phosphorus, potassium) and pod yield of Groundnut

Treatments	Year	Regression equation	Optimum dose (Kg/ha)	Response of per Kg N, P_2O_5 K_2O applied (Kg grain/KgN, P_2O_5, K_2O(Kg/ha)	Increase in yield over control at Xopt (Kg/ha)	Net return at Xopt (Rs./ha)
Nitrogen levels	1988	$Y=893.048+37.069x-1.808x^2$	10.11	18.80	190.00	1847
	1989	$Y=1306.509+25.058x-1.259x^2$	9.74	12.79	124.56	1194
	1990	$Y=1121.652+18.731x-0.972x^2$	9.36	9.63	90.14	852
	Pooled	$Y=1111.537+30.650x-1.528x^2$	9.85	15.59	153.61	1484
Phosphorus levels	1988	$Y=893.048+9.267x-0.113x^2$	38.36	4.93	189.21	1662
	1989	$Y=1053.093+6.264x-0.079x^2$	35.98	3.43	123.49	1019
	1990	$Y=1049.852+4.683x-0.061x^2$	33.59	2.64	88.81	687
	Pooled	$Y=1111.529+7.664x-0.095x^2$	36.99	4.13	152.83	1306
Potassium levels	1988	$Y=893.048+37.069x-1.808x^2$	10.19	18.65	190.03	1877
	1989	$Y=1306.509+25.058x-1.259x^2$	9.86	12.65	124.60	1476
	1990	$Y=1121.652+18.731x-0.972x^2$	9.52	9.48	90.19	861
	Pooled	$Y=1111.537+30.650x-1.528x^2$	9.52	16.10	153.26	1511

Price of 1 Kg N = Rs. 5.25 Price of 1 Kg P_2O_5 = Rs. 6.00 Price of 1 Kg K_2O_5 = Rs. 2.25 Price of Groundnut pod 1 Kg = Rs. 10.00

significantly higher pod and haulm yield kg/ha than 150%, 75% and 50% of recommended fertilizer doses and control. This application increased the pod yield by 21, 10, 23 and 98 per cent over 150, 75, 50 per cent recommended dose and control respectively in pooled analysis. Similar trend in increase of haulm yield was also observed. Crop fertilized with 100% fertilizers significantly out yielded, the higher level 150% and other 75% 50% of recommended dose and control. This could be ascribed to the favourable effects of fertilizers on pod yield of groundnut which might be due to its stimulating effects on different yield attributing characters. Shelling % (0.940), 100 kernel weight (0.912) and SMK % (0.925) were positively associated with the pod yield (pooled analysis). The results corroborate with the findings of Devarajan (1982).

Oil yield kg/ha was also higher with the treatment, 100 per cent recommended fertilizer dose, and this dose was significantly superior over other test doses. The oil yield kg/ha increased 29, 18, 38 and 132 per cent (pooled data) by 20 : 80 : 20 N,P_2O_5, K_2O Kg/ha (100%) over 150, 75 and 50 per cent fertilizer doses and control respectively. Bhuiya and Choudhary (1970) were also reported the similar response of NPK fertilizers on oil yield of groundnut.

Response to Fertilizer application

Production function between levels of nitrogen, phosphorus, potassium and pod yield of groundnut for three years and in pooled analysis was characterised by the quadratic relationship (Table 3). In pooled analysis the optimum doses of nitrogen, phosphorus and potassium were 9.85, 36.99 and 9.52 kg/ha with an increase of 153.61, 152.83 and 153.26 yield kg/ha over control respectively. The response of per kg of N, P_2O_5 and K_2O/ha observed in pooled analysis. These optimum doses of nitrogen, phosphorus and potassium recorded net returns Rs/ha 1484, 1306 and 1511 respectively in pooled analysis.

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