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EFFECT OF FYM, NITROGEN AND POTASH ON YIELD AND UPTAKE OF NUTRIENTS IN GROUNDNUT

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ABSTRACT

A study was taken up in the red lateritic soil of Vridhachalam to find out the effect of N, K, and FYM on the yield and uptake of nutrients in groundnut. The trial was conducted in three seasons in a randomised block design with 32 treatment combinations which consisted of 2 levels of FYM (0 and 6.25 tons/ha) four levels of N (0, 9, 18 and 27 kg N/ha), and four levels of K (0, 27, 54 and 81 kg K_2 0/ha). The results showed that application of 9 kg N, 54 kg K_2 0 and 6.25 tons FYM/ha significantly increased groundnut pod yield over the other levels tried. Oil content in kernel was enchnced by K application at 54 kg and 81 kg K_2 0/ha. N and P uptake were increased by application of FYM at 6.25 t/ha and K at 54 kg K_2 0/ha respectively.

KEY WORDS : Plant Nutrients, Nitrogen, Potassium, Yield, Uptake

True to the name "unpredictable legume" the response of groundnut to fertilizer application has always been highly varying in respect of locations, seasons and soils. Though it is a legume crop, N also has to be applied depending upon the soil and agroclimatic conditions and the variety of the crop along with P and K for maximising the yield.

Therefore, a study was taken up to investigate the effect of different levels of nitrogen, potassium and farm yard manure applied in combination on the yield and uptake of nutrients in groundnut in the red lateritic soils of Regional Research Station, Vriddhachalam, Tamil Nadu.

MATERIALS ABD METHODS

Under irrigated condition.

There were 32 treatment combinations of FYM, N and K as shown below;

FYM : 2 levels 0 and 6.25 t/ha

N : 4 levels 0, 9, 18 and 27 kg/ha

K : 4 levels 0, 27, 54 and 81 kg K_2 0/ha.

The trial was laid out in randomised block design with three replications. VRI 1 groundnut was grown as test crop. Phosphorus at 36 kg/ha and gypsum 200 kg/ha was common to all plots. After the harvest of each crop, the yield of pod and haulm were recorded. At post harvest stage, soil samples were collected and analysed for available nutrients and plant samples were analysed for total nutrient contents and calculating the uptake of nutrients.

RESULTS AND DISCUSSION

Yield of dry pod

The yield of dry pod (Table 1) obtained in summer 1988 was significantly higher than in summer 1989 season. Similarly the pod yield in

Table 1. Yield of dry pod (mean values) (kg/ha)

Treatments	Summer 88 vs Summer 89	*Kharif* 89 vs *Kharif* 89	Summer 88 vs Summer 89	*Kharif* 89 vs *Kharif* 89
First season	1886	2174	1886	1549
Second season	1549	1561	2174	1561
SE	9.99	16.66	14.99	12.49
CD	29.17	46.67	43.33	34.16
FYM o	1682	1792	1972	1501
FYM 2	1753	1943	2087	1609
SE	9.99	16.66	14.99	12.49
CD	29.16	45.83	43.33	34.17
N 0	1628	1752	1866	1513
N 1	1742	1862	2048	1556
N 2	1720	1948	2110	1560
N 3	1780	1907	2095	1591
SE	14.99	23.33	21.66	16.66
CD	41.67	65.83	6083	48.33
K 0	1619	1715	1833	1502
K 1	1699	1830	2035	1494
K 2	1797	2016	2156	1657
K 3	1754	1907	2095	1567
SE	NS	23.33	30.83	NS
CD		33.33	86.66	

Table 2. Data on analysis of soil and oil content in kernel

Treatments		Summer 88 Available K	Summer 88 oil content (%)	Summer 89		*Kharif* 89	
				Available P (kg/ha)	Available K (kg/ha)	Available N (kg/ha)	Available K (kg/ha)
N0	K0	105	43.8	27.8	82.2	105.8	104.2
	K1	115	44.5	30.0	96.7	110.7	118.7
	K2	98	43.4	31.3	111.0	107.8	123.5
	K3	108	43.9	30.8	122.8	108.0	132.3
	Mean	107	43.9	29.8	103.2	108.3	119.7
N1	K0	122	44.7	28.8	89.2	110.8	104.3
	K1	103	43.8	28.7	98.5	114.0	116.3
	K2	107	43.9	31.7	112.2	112.7	128.2
	K3	125	44.3	33.5	124.3	112.0	134.3
	Mean	114	44.2	30.7	106.0	112.3	120.8
N2	K0	112	43.7	27.5	89.2	114.7	107.5
	K1	108	45.4	27.5	101.7	108.5	117.5
	K2	98	43.5	29.3	108.2	113.8	125.3
	K3	92	43.9	29.7	121.5	113.5	131.3
	Mean	103	44.1	28.5	105.1	112.6	120.4
N3	K0	115	44.6	28.3	90.0	112.8	106.3
	K1	118	43.0	27.3	96.0	112.7	119.3
	K2	132	43.4	27.0	115.8	114.2	124.3
	K3	120	43.9	26.8	126.3	112.5	133.0
	Mean	121	43.7	27.4	107.1	113.0	120.8
F0	N0	113	43.8	31.2	103.4	106.4	117.8
	N1	112	44.5	32.4	105.3	109.2	123.3
	N2	107	44.2	28.3	104.3	110.2	119.8
	N3	129	43.8	26.0	104.1	110.0	119.4
	Mean	115	44.1	29.5	104.3	108.9	120.0
F1	N0	93	43.9	28.4	102.9	110.2	121.6
	N1	117	43.9	28.9	106.8	115.3	118.3
	N2	98	44.0	28.8	105.9	115.1	121.3
	N3	113	43.7	28.8	110.2	116.0	122.1
	Mean	105	43.9	28.7	106.4	114.2	120.8
F0	K0	110	44.5	27.3	85.3	108.5	105.6
	K1	120	44.4	27.9	98.3	108.7	116.8
	K2	114	42.9	30.7	110.8	109.8	125.1
	K3	116	44.5	31.9	122.8	108.9	132.7
	Mean	115	44.1	29.6	104.3	108.9	120.0
F1	K0	117	43.9	28.5	89.9	113.6	105.6
	K1	103	43.9	28.8	98.3	114.3	119.1
	K2	103	44.5	29.0	112.8	114.5	125.6
	K3	99	43.6	28.5	124.8	114.3	132.8
	Mean	105	43.9	28.7	106.4	114.2	120.8
SE N		5.0	NS	0.53		0.54	
CD N		15.0		1.50		1.52	
SE K				0.53	1.39		0.98
CD K				1.50	3.90		2.77
SE F						0.38	
CD F						1.07	

Table 3. Uptake of nutrient by groundnut crop (kg/ha)

Treatments		Summer 89			*Kharif* 89		
		N	P	K	N	P	K
N0	K0	102.1	26.9	33.2	102.8	27.1	31.5
	K1	108.9	27.3	33.8	100.6	26.9	33.9
	K2	107.2	28.0	36.6	100.6	27.1	35.8
	K3	103.9	27.6	34.9	101.3	27.3	33.9
	Mean	105.5	27.5	34.6	101.3	27.1	33.8
N1	K0	101.9	26.6	32.3	103.3	27.1	81.7
	K1	103.3	26.9	34.9	103.5	27.3	33.7
	K2	105.8	27.6	36.4	104.1	27.1	36.2
	K3	107.5	27.9	33.5	103.0	26.5	33.9
	Mean	104.7	27.2	34.3	103.5	27.0	33.9
N2	K0	102.2	26.8	32.7	104.8	27.1	32.6
	K1	104.3	27.6	34.8	104.8	27.1	33.9
	K2	104.5	27.4	36.9	104.6	26.5	36.1
	K3	108.2	27.8	34.2	104.5	26.7	34.2
	Mean	104.8	27.4	34.6	104.7	26.7	34.2
N3	K0	102.0	26.3	31.6	105.1	26.8	31.9
	K1	104.6	27.1	32.8	105.5	26.8	34.0
	K2	106.6	26.7	35.8	105.6	26.9	35.9
	K3	100.2	26.7	33.4	105.3	27.3	34.2
	Mean	102.4	26.7	34.4	105.4	26.9	33.9
F0	N0	102.5	26.9	34.0	100.9	26.8	33.9
	N1	105.4	27.5	35.0	103.3	27.1	34.0
	N2	104.7	27.6	34.9	104.4	26.9	34.1
	N3	101.2	26.4	33.0	105.2	27.1	33.9
	Mean	103.4	27.1	34.3	103.4	26.9	33.9
F1	N0	108.5	23.0	35.3	101.8	27.4	33.7
	N1	103.9	26.9	33.5	103.6	26.9	33.8
	N2	104.9	27.2	34.3	105.0	26.9	34.4
	N3	105.6	26.9	33.8	105.6	26.9	34.1
	Mean	105.7	27.3	34.3	103.9	27.0	33.9
F0	K0	104.1	26.6	32.4	103.8	26.8	31.9
	K1	104.7	26.9	34.5	103.2	27.1	33.9
	K2	105.1	27.3	36.2	103.5	26.8	36.1
	K3	102.4	27.6	33.9	103.2	27.2	34.0
	Mean	103.4	27.1	34.3	103.4	26.9	33.9
F1	K0	102.7	26.7	32.5	104.2	27.3	31.9
	K1	105.9	27.6	33.3	103.9	27.0	31.0
	K2	106.9	27.5	36.7	103.9	27.1	35.9
	K3	107.5	27.4	34.0	103.8	26.7	34.1
	Mean	103.7	27.3	34.2	103.9	27.0	33.9
SE N		NS	NS	0.16	0.12	NS	
CD N				0.44	0.35		
SE K				0.16			0.54
CD K				0.44			1.52
SE N x K				0.31			
CD N x K				0.87			
SE F					0.09		
CD F					0.25		

kharif '88 was higher than in *kharif 89*. The year 1988 has been found to be favourable in both the seasons compared to 1989. Likewise, when summer and *kharif* seasons of 1988 were compared, the yield in *kharif* was better. The rainfall received during *kharif* season may be a factor beneficial for the crop in controlling the pests in addition to chemical control of the pests. In all the four seasons, the application of FYM at 6.25 t/ha has resulted in significantly higher pod yield of groundnut compared to no application of FYM. This is in conformity with the findings of Jayachandran *et al.* (1975) who observed that application of FYM at 6.25 t/ha was associated with significantly higher yield over no FYM. Similar results were obtained by Loganathan and Krishnamurthy (1980) also.

Likewise in the four seasons of the study, the yield due to N application at three levels *viz.*, 9, 18 and 27 kg N/ha were on a par but superior to control. This indicated that 9 kg N/ha was adequate for irrigated groundnut. Jayachandran *et al.*, (1975) reported that under red loamy soil conditions of Tindivanam, higher does of N upto 33 kg/ha failed to bring about any favourable response over no nitrogen. In the present study, the lowest level of 9 kg N/ha is on par with higher levels of N.

Regarding K effect on pod yield, it was observed that application of 54 kg K_2 0/ha resulted significantly higher yield compared to other levels. The interaction between N and K was also significant. At all the four levels of N *viz.*, 0, 9, 18 and 27 kg N/ha potash at 54 kg $K_2$0/ha has significantly increased the pod yield. This was followed by 81 kg $K_2$0/ha. Therefore it is evident that K application is indispensable for groundnut irrespective of whether N is applied at lowest or higher level. It has been reported that FYM at 10 to 15 tons/ha every year along with the recommended dose of NPK produced higher groundnut yields than did the NPK treatment alone (Anon., 1986). The results of the present study are in corroboration with the above.

Oil content

In summer 88 as well as *kharif* 89 seasons, it was observed that K application at 81 kg/ha has shown significant improvement in oil content of kernel compared to other levels (Table 2).

Uptake of nutrients

Summer 1989 : The uptake of N and P by groundnut was not influenced by the treatments whereas K uptake was significantly higher in 9 and 18 kg N/ha application. K addition at 54 kg $K_2$0/ha has enhanced the uptake of K by groundnut.

kharif 1989 : N uptake by groundnut wa significantly higher in the treatments of 6.25 ton FYM/ha compared to No FYM. The total uptake o P was found to be higher in the treatment of 54 kg $K_2$0/ha compared to other levels applied. This was comparable with 81 and 27 kg $K_2$0/ha which were on par but superior to control (Ko)

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