Madras Agric. J., 84(9): 536 - 538 September 1997
https://doi.org/10.29321/MAJ.10.A00911

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON YIELD, QUALITY AND ECONOMIC RETURNS IN IRRIGATED GROUNDNUT

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ABSTRACT

Field experimentation on integrated nutrient management for irrigated groundnut was carried out during 1991-92. Results showed that application of FYM at 12.5 t/ha registered higher pod yield than EFYM and no manuring. Oil yield and crude protein content in the kernel were increased with FYM; addition of EFYM, however, increased these parameters compared to no munuring. Though 150 per cent NPK application increased the pod yield, it did not differ with recommended dose (17-34-54 kg/ha). Quality parameters were positively increased with higher rate of fertilizer application. Split application of NK at basal and 45 DAS enabled higher pod yield than all basal or individual nutrient application. More oil out-turn and crude protein content were realised with split application of NK.

KEY WORDS : Groundnut, FYM, EFYM, integrated nutrient management, quality parameters, B-C ratio

High and sustained crop yiels can be achieved through judicious and balanced NPK fertilization, combining organic amendments (Kang and Balasubramanian, 1990). Though the beneficial effect of FYM application has been well established, an alternate form of manure enriched farmyard manure (EFYM) is evolved for rainfed condition (Athmanabhan, 1988). The effect of EFYM under irrigated condition is to be test verified for varied situation. Normally nutrients are applied basally for groundnut ; however, a few experimental results indicate the favourable influence of split application of nitrogen (N) and potash (K) in groundnut. In the present context of edible oil scenario in India, it is important to study the effect of nutrient management on quality aspects of groundnut since oil content and oil yield bear direct concern on edible oil out-turn.

MATERIALS AND METHODS

Field experiments were conducted at the Regional Research Station, Vridhachalam, Tamil Nadu, during 1991-92. The site of the experiment was red sandy loam classified as Typic Paleustalfs. It was rated low in available N (142 kg/ha), medium P (19.5 kg/ha) low in available K (115 kg/ha) and organic carbon content (0.240 %) with a pH of 6.8. Two separate experiments were planned during the study. Experiment I was conducted in *Kharif* and *rabi* 1991-92 in which organics (no FYM. FYM at 12.5 t/ha), fertilizer rates of N, P_2O_5, K_2O at 17-34-54 and 150 per cent higher rate of 25.5-51-81 kg/ha and time of NK application viz., all basal, splits at basal + 25 days after sowing (DAS) (50% each) basal + 45 DAS (50% each) basal + 25 + 45 DAS (33.3% each) were compared with a control in a factorial randomised block design with three replications (Table 1). Split application was doen equally at different growth stages. Experiment II was conducted in subsequent season, *kharif* 1992. Organis (no manure, FYM at 12.5 t/ha, EFYM at 750 kg/ha), NK fertilization (N or K alone as basal or splits ; NK basal and splits and a control) were tested in a FRDD with three replications (Table 2). In this experiment, two equal splits at basal and 45 DAS and NPK rate of 17-34-54 kg/ha were commonly adopted. EFYM was prepared by mixing P_2O_5 and K_2O at 34-54 kg/ha in the form of superphosphate and muriate of potash respectively with 750 kg of well decomposed FYM and incubated for a month. After the period, N at 17 kg/ha as urea was mixed applied in the sowing line. Groundnut cultivar. VRI.2 (100-105 days) was used in both the experiments. Dry pod yield from the individual plot (20 m^2) was computed to one ha. Kernel oil content (%) was estimated using the instrument Oxford 4000 Nuclear Magnetic Resonance. Oil yield in kg/ha was calculated by multiplying the oil content in the kernel with kernel yield. N content in the kernel was estimated following routine procedure. Protein content (%) was calculated by multiplying the kernel N content with the factor 6.25. The benefit- cost ratio (B-C ratio) was worked out by dividing the gross income by expenditure incurred.

RESULTS AND DISCUSSION

Influence of organic manuring on yield, quality and economics of groundnut

Kernel oil content did not change but greater oil yield was recorded as a result of higher pod yield due to FYM application. Higher nutrient availability resulted in greater accumulation of N in the kernel and hence crude protein content increased due to FYM application. EFYM, however, resulted in more oil yield, higher crude protein content as well as increased pod production than no manuring. With greater yield difference between FYM and no FYM treatments, application of FYM resulted in hihger benefit-cost (B- C) ratio in *kharif* 1991. The B-C ratio due to EFYM addition did not vary statistically with FYM application (Table 1).

Fertilizer levels and their influence on yield, quality and economics of groundnut

Higher rate of fertilizer application did not produce any significant yield advantage. Pod yield was statistically similar at the recommended and 150 per cent fertilizer doses. This might be due to low efficiency of applied nutrients at higher rate of application. Inorganic fertilizer addition at 150 per cent increased the oil yield and protein content while oil percentage in the kernel remained unaltered.

Nijahawan (1962) reported that application of nitrogenous and phosphatic fertilizers alone or in combinations had no effect on the oil percentage of seed. Higher oil yield and protein content were recorded with the application of 20:40:40 kg N, P_2O_5, K_2O/ha on a sandy loam soil (pande *et al.*, 1971). Extra cost incurred with the application of higher dose of fertilizers did not give additional monetary benefit since only a marginal yield increase in B-C ratio was obtained with higher rate of fertilizer application (Table 1).

Effect of N and K application on yield, quality and economics of groundnut

Application of N and K increased the pod yield compared to applying them individually. N application slightly increased the yield over K application though both were on par but were superior to control (no NK) plots. In the sandy loam soil, it was reported that application of N alone was adequate but combined application of N and K was needed for higher pod yield of

Table 1. Organic and inorganic fertilization on yield, quality and economics of groundnut

Treatments	*Kharif*, 1991						*Rabi*, 1991-92					
	Pod yield (g/ha)	Oil content (%)	Oil yield (kg/ha)	N content (%)	Protein content (%)	B-C ratio	Pod yield (g/ha)	Oil content (%)	Oil yield (kg/ha)	N content (%)	Protein content (%)	B-C ratio
Manure												
No FYM	20.0	45.8	640	3.76	23.5	1.59	17.7	44.2	520	3.63	22.7	1.39
FYM	22.2	45.9	748	3.81	23.8	1.63	18.7	44.3	576	3.68	23.0	1.37
SEd	0.3	0.5	19	0.15	0.1	0.02	0.3	0.5	11	0.15	0.1	0.03
CD (P=0.05)	0.6	NS	38	0.38	0.2	0.05	0.7	NS	23	0.38	0.2	NS
NPK (kg/ha)												
17-34-54	20.8	45.6	668	3.78	23.6	1.62	17.8	44.3	528	3.62	22.6	1.38
25.5-51-81	21.4	46.2	718	3.81	23.8	1.60	18.5	44.1	567	3.68	23.0	1.37
SEd	0.3	0.5	19	0.15	0.1	0.02	0.3	0.5	11	0.15	0.1	0.03
CD (P=0.05)	NS	NS	38	0.38	0.2	NS	NS	NS	23	0.38	0.2	NS
N & K												
All basal (B)	20.2	46.2	635	3.73	23.3	1.55	17.4	44.5	508	3.55	22.2	1.32
B, 25 DAS	21.3	46.2	717	3.84	24.0	1.62	18.2	44.4	555	3.70	23.1	1.38
B, 45 DAS	21.9	46.2	754	3.81	23.8	1.67	19.0	44.2	590	3.68	23.0	1.44
B, 25, 45 DAS	21.0	45.0	671	3.79	23.7	1.60	18.1	43.9	538	3.66	22.9	1.07
SEd	0.4	0.7	26	0.30	0.2	0.03	0.5	0.7	16	0.25	0.1	0.04
CD (P=0.05)	0.9	NS	53	0.45	0.3	0.07	1.0	NS	33	0.40	0.3	0.08
Control	13.2	44.0	383	3.71	23.2	1.20	12.5	43.1	337	3.57	22.3	1.13

(Note : FYM at 12.5 t/ha ; N & K split applied eqyally at different stages and P basal applied)

Table 2. **Organic and inorganic fertilization on yield, quality and economics of groundnut, *Kharif*, 1992**

Treatments	Pod yield (q/ha)	Oil content (%)	Oil yield (kg/ha)	N content (%)	Protein content (%)	B-C ratio
Manure						
No FYM	21.9	45.1	686	3.65	22.8	1.81
FYM	23.8	43.7	743	3.89	24.3	1.82
EFYM	22.8	43.3	696	3.70	23.1	1.85
SEd	0.2	0.7	18	0.20	0.3	0.01
CD (P=0.05)	0.5	1.5	36	0.40	0.6	NS
N and K						
N basal	22.8	43.0	675	3.86	24.1	1.86
K basal	22.2	44.0	681	3.70	23.1	1.76
NK basal	23.3	43.8	720	3.89	24.3	1.84
N splits	23.7	44.7	732	3.78	23.6	1.86
K splits	23.5	45.0	745	3.62	22.6	1.85
NK splits	24.6	44.1	792	3.90	24.4	1.93
Control (No NPK)	18.9	43.6	561	3.54	22.1	1.66
SEd	0.4	1.2	29	0.33	0.5	0.06
CD (P=0.05)	0.9	NS	58	0.67	1.0	0.13

FYM - 12.5 t/ha, EFYM - 750 Kg/ha;
N, K doses common at 17 and 54 kg/ha respectively
Basal : Entire dose of N, K or NK combined
Splits : Equally at basal and 45 DAS

groundnut (Oyer and Touchton, 1988). Increase in pod yield due to NK applcation also resulted in higher oil yield than application of N or K alone. Fertilization with NK or N contributed to higher percentage of protein in the kernel.

Comparing the time of NK application, combined use of N and K in two equal splits was much advantageous by recording higher pod yield than all basal application or splits of N or K. Application of NK in two splits at basal and 45 DAS coinciding with peg formation enabled greater pod production. Regarding the quality parameters, kernel oil content did not vary due to split application. However, greater oil yield was recorded with the split application of N and K. Increase in N content in the kernel due to Nk splits favoured higher protein percentage in these treatments.

With respect to economics, split application of NK was found to be more beneficial. Split application of N resulted in more returns than split application of K. But split application of NK at basal and 45 DAS provided the highest B-C ratio. This was due to higher pod yields and lower cost involved in the adoption of split application (Table 2).

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(Received : February 1996 Revised : December 1996)