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FERTILISER PRESCRIPTION FOR THE CROPPING SEQUENCE OF GROUNDNUT - SORGHUM - UDIC HAPLUSTALF

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ABSTRACT

Soil test crop response field experiment was conducted on red- calcareous - Somayanur series (Udic Haplustalf) with groundnut Co.1 as test crop. Fertiliser prescription equations have been developed for desired yield targets and fertiliser tailoring has been given for cropping sequence of groundnut - sorghum under irrigated condition.

Groundnut (*Arachis hypogaea* L.) a large seeded legume plant occupies an important place in Indian economy. Since India accounts for 41 and 31 per cent of the world's output and area respectively, the potentialities of groundnut as a valuable earner of foreign exchange, cannot be over emphasised. The importance of fertiliser economy through judicial use of optimum quantity and by increasing the use efficiency have drawn the attention of the scientists to the soil test based fertiliser prescription which not only increases the yield but also maintains the soil fertility by checking the depletion of soil nutrients, which otherwise results in poor condition of the crop growth.

The fertiliser tailoring for the cropping system is done in an unique way by developing mathematical model without analysing the soil after each crop. This study was undertaken for making fertiliser prescription for the cropping sequence of groundnut - sorghum by prescription procedure with appropriate recommendation of fertilisers.

Table 1. Physico-chemical properties of soil

I	MECHANICAL COMPOSITION	
	Coarse sand (%)	51.8
	Fine sand (%)	39.2
	Silt(%)	3.3
	Clay(%)	5.0
	Texture	Loamy sand
II	CHEMICAL ANALYSIS	
	Ec (dS m^{-1})	0.21
	pH	7.4
	CEC (C.mole (P^+) kg^{-1})	14.81
	$KMnO_4$ -N (kg ha^{-1})	196.0
	Olsen - P (kg ha^{-1})	14.8
	NH_4OAC-K (kg ha^{-1})	264.2
	Organic carbon (%)	0.49

MATERIALS AND METHODS

Soil test crop response field trial was conducted at Chinnathadagam, Coimbatore with test crop of groundnut Co.1 over four fertility gradient levels. From the test crop experiment the basic informations viz. nutrient requirement to produce one quintal of economic produce, per cent contribution from soil and fertiliser were calculated using the data on yield, uptake and soil test values. The prescription equations were derived from the above parameters. The physico-chemical characteristics of the soils were presented in Table 1 and the basic data with the fertiliser prescription equations were furnished (Table 2).

The soil of the experimental site was red-calcareous (Udic Haplustalf) loamy sand. The post-harvest soil fertility status was assessed with $KMnO_4$-N (Subbiah and Asija, 1956), Olsen - P (Olsen *et al*, 1954) and Neutral - N NH_4OAc - K (Hanway and Heidal, 1952). The plant samples collected at post-harvest stage were analysed for different nutrients by following the standard analytical procedures. Nitrogen was estimated by the micro-kjeldahl method (A.O.A.C., 1975) and phosphorus by the phospho-Vanadomolybdate method (Jackson, 1973). Flame photometer was used for the estimation of potassium (Jackson, 1973).

RESULTS AND DISCUSSION

Fertiliser prescriptions based on the equations have been worked out with/without farm compost for groundnut yield targets of 25 and 30 g ha^{-1} (Table 3).

i) Fertiliser prescription for desired yield targets - Groundnut.

From the table 3 it was evident that the application of farm compost reduced the quantity

Table 2. Basic Data

Particulars	N	P_2O_5	K_2O
Nutrient requirement (NR) kg q-1	3.40	0.96	1.76
Percent contribution from soil (Cs)	34.5	29.5	10.5
Percent contribution from fertilizer (Cf)	48.3	42.9	38.9
Percent contribution from FC (Co)	28.0	14.3	27.8

1. Fertiliser prescription equations without farm compost

FN = 7.158 T - 0.714 SN
FP_2O_5 = 2.238 T - 1.577 SP
FK_2O = 5.47 T - 0.328 SK

2. Fertiliser prescription equations with farm compost

FN = 7.158 T - 0.714 SN - 0.579 ON
FP_2O_5 = 2.238 T - 1.577 SP - 0.762 OP
FK_2O = 5.47 T - 0.328 SK - 0.864 OK

(Where F, S and O represent fertiliser, soil and organic source of nutrients in Kg ha^{-1} T - targetted yield in q ha^{-1}. FC - farm compost t ha^{-1})

of inorganic fertilisers. By applying farm compost at 6 and 12 t ha^{-1}, the fertilisers may be reduced to the level of 21, 18, 36 and 42, 36, O kg ha^{-1} of N, P_2O_5 and K_2O respectively. The decrease in fertiliser dose due to the incorporation of organic manure was reported by Rani Perumal *et al* (1982) in rice, Altaf Ahmed (1985) and Selvaraj (1988) in Sorghum - black and red soils, respectively, and Sumam (1988) for red soil in maize.

ii) Fertiliser prescriptions for cropping sequence Groundnut - Sorghum.

Using the prescription equations developed for groundnut and sorghum for Somayanur soil series, fertiliser tailoring for specific yield targets for goundnut - sorghum cropping sequence were worked out. (Table.4).

It was observed that at lower yield targets upto 20 q ha^{-1} the inorganic fertiliser application was not needed as the fertility of the soil itself was sufficient to meet the nutrient requirement of groundnut crop. (Table 4). However, at higher yield targets, the fertiliser additions were needed so as to get the desired yield and also to maintain the fertility status. In this study a build up in nitrogen and potassium status was also observed with a mild reduction in phosphorus fertility, which could be explained on the basis of legume-soil interaction.

Regression Studies

Nitrogen

KM-N (P/H) = 38.54** + 0.1815** (IS) + 0.507** FN + 0.0043 Yield ($R^2 = 0.71$) Eqn.1.

KM-N (P/H) = 35.781** + 0.872** (IS) + 0.586** FN + 0.0456 UN ($R^2 = 0.71$**) Eqn.2.

Phosphorus

OL-P (P/H) = 9.391** + 0.872** (IS) + 0.004 FP - 0.0008 Yield ($R^2 = 0.87$**) Eqn.3.

OL-P (P/H) = 8.198** + 0.877** (IS) + 0.001 FP- 0.111 UP ($R^2 = 0.86$**) Eqn.4.

Potassium

AA-K (P/H) = 15.775** + 0.965** (IS) + 0.072** FK- 0.0008 Yield ($R^2 = 0.99$**) Eqn.5.

AA-K (P/H) = 15.361** + 0.969** (IS) + 0.083** FK- 0.090 UK ($R^2 = 0.99$**) Eqn.6.

(Where P/H and I/S represent post-harvest and initial soil test values)

Using the above equations post - harvest soil test values for available N, P and K with yield and uptake, the expected and observed values were

Table 3. Fertilizer recommendation based on soil test for desired yield targets or groundnut Co. 1

Available soil nutrient (soil test values)		Without PC	Target 25 q ha^{-1} with Fc 6t ha^{-1}	12 t ha^{-1}	Without FC	Target 30 q ha^{-1} with FC 6 t ha^{-1}	12 t ha^{-1}
N	150	72	51	30	108	87	66
	175	54	33	12	90	69	48
	200	36	15	-	72	51	30
P	10	40	22	4	51	33	15
	15	32	14	-	43	25	7
	20	24	6	-	36	17	-
K	200	71	35	-	99	62	26
	225	63	27	-	90	54	18
	250	55	18	-	82	46	10

Table 4. Fertilizer recommendation for yield targets in groundnut - sorghum sequence based on initial soil test values of N, P and K

Yield targest	Fertilizer dose kg ha^{-1}			Post harvest soil analysis kg ha^{-1}			Output / input
q ha^{-1}	N	P_2O_5	K_2O	N	P	K	ratio
i) Groundnut - first season without FC							
20	-	-	-	289	17	292	-
25	37	13	49	327	13	298	31.2
30	73	25	76	366	5	304	20.4
ii) Sorghum - second season							
45	50	22	116	319	21	302	14.5
50	65	25	143	329	20	304	13.0
55	80	29	170	338	20	305	11.9

(Initial fertility : $KMnO_4$ - N 199, Olsen - p 27, NH_4OAc - K 268 Kg ha^{-1})

tested for difference. From the t.test values, it was confirmed that the variations were not significant, so the derived multiple linear regression equations can be utilised for predicting the post - harvest soil test value or the presowing soil test value for the next crop of sorghum in the sequence.

Thus by following the fertiliser prescription procedure appropriate fertiliser recommendations for specific yield targets in the cropping sequence of groundnut - sorghum could be prescribed.

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RELATIVE VIABILITY AND VIGOUR OF DIFFERENT GENOTYPES OF SOYBEAN (*Glycine max* (L.) Merril) DURING STORAGE.

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ABSTRACT

Seed viability and vigour studies with the twenty seven genotypes of soybean brought out the genotypic differences for germination potential, root and shoot length and dry matter production of the seedlings in storage. Large seeds retained by 15/64" (aperture width 6.00 mm) sieve maintained the viability and vigour during eight months storage period with minimum loss compared to medium and small seeds retained by 14/64" (aperture width 5.60 mm) and 13/64" (aperture width 5.20 mm) sieves.

Variation in loss of viability and vigour during storage among species (Agrawal, 1976) and varieties within the species (Agarwal, 1978) has been reported in several crops including soy bean (Sharma *et al.*, 1980: Banumurthy and Gupta, 1981: Minor and Paschal, 1982). Studies were carried out to determine the relative viability and vigour with different soybean genotypes in a