Table 2. Response of maize to Zn application in relation to critical Zn content in soils

Zn status of Soils (ppm)	DTPA Zn (ppm)	No of soils	Average dry matter yield of shoot (g/pot) Levels of applied Zn (ppm) 0	2.5	5.0	7.5	Percentage of soils responding to Zn	Per cent response on dry matter yield at 2.5 ppm Zn Range	Mean	5.0 ppm Zn Range	Mean	7.5 ppm Zn Range	Mean
< 1.00 Deficient	0.26 to 0.86	16	7.80	9.73	11.75	9.13	100	9 to 86	28	21 to 80	54	2 to 78	24
>1.00 (Adequate)	1.12 to 3.90	4	26.10	26.08	28.20	22.77	50	4 to 6 -3 to -8	5.0* -6	1 to 22 -7	-8*	-10 to -22	-17

A soil was classified responsive to Zn application where per cent response in dry matter yield was more than 24 per cent.
* Two soils, (S13 and S19) containing available Zn above critical level (1.00 ppm), have resulted in positive response but not attained the minimum per cent response (24%) on dry matter yield.

of plant in diagnosing Zn deficiency in the above parts of maize plant.

Thus the present study lays emphasis on Zn fertilizations of maize on the basis of critical levels of Zn in soils and maize plants.

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SOIL TEST BASED FERTILIZER PRESCRIPTION FOR SORGHUM

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ABSTRACT

The nutrient requirement in kg per quintal of grain, per cent contribution of a particular nutrient from soil, fertilizer and organics have been worked out and given for sorghum along with fertilizer prescription equation. The validity of these equation was test verified at different locations in the farmers' fields. The results of these experiments indicate that it is possible to target the yield upto 50 Q ha^{-1} in sorghum.

Increased utilization of high yielding varieties demand higher fertilizer requirement. The general blanket recommendation could not account for the effect of soil nutrients in meeting palnt need. The fertilizer recommendation based on the soil test is well recognised in agricultural production (Velayutham *et al.*, 1985), which gives prescription for a yield target through fertilizer adjustment equation. Hence, an attempt was made to summarize the basis information obtained for prescription based fertilizer recommendation for sorghum.

MATERIALS AND METHODS

Soil test crop response field experiment was conducted with Sorghum Co-25 as a test crop at Agricultural Research Station, Bhavanisagar in a red, non-calcareous soil of Irugur series. The experiment comprised four equal "strips" in which a gradient crop of maize - UMC 5 was grown by applying a graded doses of N,P and K fertilizers so as to get a wide range in soil fertility (Ramamoorthy *et al* ., 1967). After the harvest of the gradient crop, the test crop of sorghum CO-25 was raised in the same field by dividing each strip

Table 1(a).Nutrient requirement and contribution for Sorghum

Particulars	N	P_2O_5	K_2O
Nutrient requirement kg Q-1 grain	2.892	0.903	4.190
Nutrient contribution from soil (%)	36.29	90.30	64.57
Nutrient contribution from fertilizer (%)	35.37	41.88	48.54
Nutrient contribution from organics (%)	59.60	32.82	35.91

into 24 sub-plots in which different levels of N,P and K along with organic manure was tried. The design of the experiment was fractional factorial design followed in the All India Coordinated Soil Test Crop Response Correlation Project. The soil samples (96 No.) were collected before the application of fertilizer and sowing of crop and analysed for alkaline - $KMnO_4$-N, Olsen-P and NH_4OAC-K. The grain yield was recorded plotwise and the plant and grain samples were analysed for N,P and K for computing uptake values.

From the experimental data, the basic data recommendation for different crop production levels were calculated as per the procedure of

Table 1(b).Fertilizer prescription equation for sorghum

$FN = 8.177T - 1.026\ SN - 1.685\ ON$
$FP_2O_5 = 2.157T\ 4.940\ SP - 1.796\ OP$
$FK_{20} = 8.632T - 1.611\ SK - 0.896\ OK$

Where,

SN, SP and SK are the soil test values for N,P andK. FN, FP_2O_5 and FK_2O are fertilizer N, P_2O_5 and K_2O.
ON, OP and OK are organic N,P and K.
T is the crop yield target in Q ha^{-1}

Ramamoorthy *et al.*, (1967). The basic data were transformed to targetted yield equations for calculating the fertilizer doses of desired yield based on the fertility status of the soil (Randhawa and Velayutham, 1982).

Each experiment comprised of treatments - absolute control ($N_0P_0K_0$), general blanket recommendation, soil test recommendation based on Mitscherlich-Bray approach, and the fertilizer needed to attain yield targets of 45, 50 and 55 q ha^{-1} grain in sorghum, based on the area potential of the crop. After the harvest the grain yield of sorghum was recorded for each treatment and economic aspect of each treatment was worked out and reported.

Table 2. Sorghum grain yield and value cost ratio (VCR) (Mean of 2 location)

Location : Farmer's holding
Chinnathadagam

Soil : Red
Series : Somayanur;
var. : Co26

Treatments	Fertilizer dose kg, ha^{-1}			FYM t ha^{-1}	Grain yield Q. ha^{-1}	Straw yield Q. ha^{-1}	Yield response Q. ha^{-1}	Deviation (%)	VCR
	N	P_2O_5	K_2O						
Control	0	0	0	0	18.67	29.00	-	-	-
FYM alone	0	0	0	12.5	21.18	33.81	2.51	-	-
Azospirillum alone*	0	0	0	0	21.00	31.85	2.33	-	-
FYM + Azospirillum	0	0	0	12.5	25.67	44.24	7.00	-	-
Blanket + Azospirillum	90	45	45	12.5	43.23	82.27	24.56	-	4.7
Soil Tests recommendation + Azospirillum (Mitscherlich - Bray approach)	100	66	91	12.5	43.80	88.25	25.13	-	4.1
40 Q ha^{-1} yield + Azospirillum	60	0	0	12.5	42.72	81.65	24.05	+6.8	7.0
45 Q ha^{-1} yield + Azospirillum	101	0	8	12.5	45.48	90.88	26.81	+1.0	6.3
50 Q ha^{-1} yield + Azospirillum	142	5	50	12.5	46.63	102.07	27.96	-7.0	5.1

Soil fertility status (Kg ha^{-1})
$Kmno_4$-N : 158
Olsen-P : 14.7
NH_4OAAC-K :206

Table 3. Verification of fertlizer prescription equation of Sorghum (Co.20) (Mean of 2 locations)

Location : Farmer's holding
Salem District

Soil : Red
Series : Irugur

Treatments	Fertilizer dose kg, ha^{-1}			FYM t ha^{-1}	Composted coirpith t ha^{-1}	Grain yield Q ha^{-1}	Straw yield Q. ha^{-1}	Yield response Q. ha^{-1}	Deviation (%)	VCR
	N	P_2O_5	K_2O							
Control	0	0	0	0	0	21.97	40.25	-	-	-
Blanket + FYM	90	45	45	12.5	0	46.56	111.48	24.59	-	5.1
45 Q ha^{-1} Yield + FYM	20	0	0	12.5	0	46.72	99.07	24.75	+3.8	9.8
50 Q ha^{-1} Yield + FYM	47	0	5	12.5	0	50.18	116.91	28.21	+1.0	9.6
55 Q ha^{-1} Yield + FYM	87	0	26	12.5	0	51.61	129.94	29.64	-6.0	8.1
Blanket + Coirpith	90	45	45	0	12.5	48.28	116.54	26.31	-	6.5
55 Q ha^{-1} Yield + Coirpith	38	0	5	0	12.5	52.50	107.80	30.53	-5.0	12.2

Soil fertility status (Kg ha^{-1})
$Kmno_4$-N : 265
Olsen-P : 24.5
NH_4OAAC-K :549

RESULTS AND DISCUSSION

Prescription of fertilizer for sorghum

The basic data (nutrient requirement per quintal of grain production, per cent contribution of individual nutrients from soil, applied inorganic and organics) were calculated and presented in Table-1a. The mean values of nutrient requirement (NR) to produce one quintal of grain for N, P_2O_5 and K_2O were 2.892, 0.903 and 4.19 respectively. The per cent contributions from soil available-nutrient as determined from control plots were 36.29 for $KMnO_4$-N, 9.30 for Olsen-P and 64.57 for NH_4OAC-K, while the per cent contributions from fertilizer nutrients were 35.37 for N, 41.88 for P_2O_5 and 48.54 for K_2O, respectively The efficiencies of applied nutrients through fertilizers were found to be normal, high and low with respect to nitrogen, phosphorus and potassium, while the soil efficiency of N and K being low, require improvement. Similar results were reported in sorghum by Altaf Ahmed (1985). The efficiency of added organic nutrients was more for organic N, followed by organic K and organic P.

The above basis data were transformed into fertilizer prescription equation and is presented in Table-1b. From this, the nomograms are prepared for making fertilizer recommendations either as inorganic alone or in combination with organic for

Table 4. Verification of fertlizer prescription of Sorghum (Co.26) (Mean of 2 locations)

Location : Farmer's holding
Thennamanallur

Treatments	Fertilizer dose kg, ha^{-1}			FYM t ha^{-1}	Grain yield Q ha^{-1}	Straw yield Q. ha^{-1}	Yield response Q. ha^{-1}	Deviation (%)	VCR
	N	P_2O_5	K_2O						
Control	0	0	0	0	20.63	33.54	-	-	-
FYM alone	0	0	0	12.5	22.55	44.42	1.92	-	-
Blanket rec. + FYM	90	45	45	12.5	43.65	100.05	23.02	-	4.7
45 Q ha^{-1} + FYM	66	0	0	12.5	47.17	107.60	26.54	+1.0	8.1
50 Q ha^{-1} + FYM	106	3	15	12.5	48.56	119.97	27.93	-3.0	6.9
55 Q ha^{-1} + FYM	147	10	50	12.5	51.55	124.18	30.92	-7.0	6.0
Soil Test Rec. + FYM (Mitscherlich - Bray approach)	90	69	86	12.5	47.18	110.92	26.55	-	4.5

Soil fertility status (Kg ha^{-1})
$Kmno_4$-N : 203
Olsen-P : 18
NH_4OAAC-K :240

the specified yield targets based on the fertility status of the soil.

Verification of fertilizer Prescription equation

The mean sorghum grain yield and the initial fertility status of the soil are reported in Table 2. The results indicated that the highest grain yield of 46.63 Q ha^{-1} for 50 Q ha^{-1} yield target treatment and control (no manure) plot recorded the lowest yield of 18.67 Q ha^{-1}. The blanket recommendation treatment recorded a grain yield of 43.23 Q ha^{-1}. The value cost ratio (VCR) was worked out for the treatments and the 40 Q ha^{-1} yield target treatment recorded a highest VCR of 7.0 followed by 6.3 in 45 Q ha^{-1} yield level treatment. In sorghum reasonable agreement between targetted and achieved yield was recorded. The per cent deviation also worked out for three yield targetting treatments and it ranges from -7.0 to +6.8.

*Two more verification trials were also conducted in farmer's holdings in Salem district in red non-calcareous soils of Irugur series. The results of the experiment are presented in Table 3. The mean initial fertility status of the fields were 265 kg $KMnO_4$- N(low), 24.5 kg Olsen-P(high) and 549 kg NH_4OAC-K(high). The highest grain yield of 52.5 q ha^{-1} was recorded in 55 Q ha^{-1} yield level + composted coir pith treatment followed by 55 qha^{-1} with FYM treatment. The beneficial effect of composed coirpith which supplies more nutrients than FYM would have contributed for the highest yield.

*Two more verification trials were conducted in farmer's holdings in Thennamanallur, Coimbatore district in a red soil - Irugur series with sorghum Co.26 as a test crop. The initial fertility staus of the soil indicated that the soil is low in $KMnO_4$-N/ medium in both Olsen-P and NH_4OACK. The results of the experiment are presented in Table 4. The grain yield ranged from 20.63 Q ha^{-1} to 51.55 Q ha^{-1}. The yield obtained in the three yield targetting treatments were higher than the blanket recommendation as well as soil test recommendation (Mitscherlich - Bray approach). The yield response was 23.02 in the blanket recommendation to 30.92 Q ha^{-1} in the 55 Q ha^{-1} yield target treatments. The value Cost Ratio (VCR) of 8.1 was recorded in the 45 Q ha^{-1} yield target treatment which was higher than the blanket recommendation (4.7).

From the results, the fertilizer recommendation can be given for 50 q ha^{-1} yield in sorghum based on soil test values for the red soils of Irugur series in the western as well as in the north western zone.

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MANAGEMENT OF ATRAZINE RESIDUES IN SOIL

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ABSTRACT

Green house studies and field experiments were conducted at Tamil Nadu Agricultural University farms during 1991 and 1992 to screen the amendments to reduce atrazine toxicity and to test verify the effective amendments in the field. FYM, compost, phosphoric acid and poultry manure were screened in green house studies and under field conditions application of FYM at 12.5 t/ha or charcoal at 5.0 kg/ha along the seed line found to mitigate the atrazine residual toxicity in the sensitive crop soybean.

Atrazine (2-Chloro - 4 - ethylamino - 6 - isopropyl amino - 1,3,5 triazine) ia a persistent herbicide widely used for weed control in sorghum, maize and sugarcane (Sankaran and Mani, 1974). Ideally a given herbicide should persist just long enough to control the target weeds and then be