respectively. With regard to the fertilizer levels, 75% recommended N + Azospirillum + 100% PK required less specific energy. Irrespective of the cropping systems, the treatment biogas slurry with 75% of recommended N + Azospirillum inoculation to each crop needed less energy. Thus considerable amount of energy can be saved by combined application of bio digested slurry with Azospirillum.

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Madras Agric. J., 81(7): 376-378 July, 1994 https://doi.org/10.29321/MAJ.10.A01538

NUTRIENT MANAGEMENT IN GROUNDNUT-SORGHUM CROP ROTATION

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ABSTRACT

A field experiment was conducted at Aliyarnagar involving groundnut-sorghum crop rotation to study the effect of nutrients applied to groundnut on the succeeding sorghum crop. The results revealed that application of 45 kg/ha phosphorus along with the recommended doses of other nutrients to groundnut, minimised the fertiliser requirement of sorghum to the tune of 1/3rd of the recommended dose.

The beneficial effects phosphorus application to groundnut are well established. Besides increasing the yield, P fertilisation also improves the synthesis of oil and its quality in groundnut (Pasricha *et al.* 1988). Usually the fertiliser requirements of crops in a crop rotation are worked out on the basis of individual crops without taking into effect the direct, residual and cumulative effects of fertilisers applied to the crops in the rotation. Smartt (1976) reported that groundnut is capable of making good use of residual phosphorus and potassium from fertilisers applied to other crops. Hence a field experiment was conducted to study the nutrient requirements in a groundnut-sorghum crop rotation.

MATERIALS AND METHODS

An experiment was conducted at the Agricultural Research Station, Aliyarnagar on sandy loam soil with a soil p^H of 8.1 and available N, P_2O_5 and K_2O as 172.2 (low), 16.4 (medium) and 340.0 (high) respectively. Groundnut crop was raised in Kharif (June), followed by a sorghum crop in summer season (January). Groundnut-Sorghum rotation was followed in succession for three times in the same field from 1987 to 1990. The trial was laid out in split plot design with four replications. The main plot treatments consist of O, 50, 75, 100 and 150 Per cent of the recommended dose of P_2O_5. The sub plot treatments consist of control (no fertilisers),

Table 1. Effect of levels of phosphorus on groundnut

Treatments	Dry Pod yield (Kg/ha)	No.of pods per plant	Shelling per cent	100 kernel weight (gm)	Sound matured kernel (per cent)	Net return (Rs/ha)	Benefit-Cost ratio
No P_2O_5	722	8.3	65.7	28.7	60.3	1337	1.32
15 kg P_2O_5/ha	946	10.3	67.3	29.4	62.3	2833	1.67
22.5 kg P_2O_5/ha	1043	11.2	70.3	29.6	64.9	3396	1.77
30 kg P_2O_5/ha	1159	11.8	72.6	30.1	66.8	4132	1.91
45 kg P_2O_5/ha	1315	13.2	74.2	30.4	69.5	5092	2.08
SE D	28.3	0.78	0.92	0.35	1.21	343.9	0.05
CD	61.7	1.70	2.00	0.77	2.64	749.6	0.11

Table 2. Effect of Phosphorus on succeeding sorghum crop

Treatments	Grain yield (Kg/ha)	Straw yield (Kg/ha)	Net return (Rs/ha)	Benefit-Cost ratio
N0 P_2O_5	2709	4509	5334	2.81
15 Kg P_2O_5/ha	3136	4902	6857	3.24
22.5 Kg P_2O_5/ha	3386	4996	7619	3.54
30 Kg P_2O_5/ha	3656	5145	8507	3.75
45 Kg P_2O_5/ha	4103	5321	9900	4.00
SE	188	161	419	0.16
CD	613	525	1365	0.52
No fertiliser	2952	4673	6437	3.58
1/3rd recommended dose of fertilisers	3305	4893	7448	3.70
2/3rd the recommended dose	3522	5074	7972	3.60
Full dose of fertilisers	3819	5248	8705	3.81
SE	186	140	588	0.13
CD	538	405	1526	0.39

1/3rd the recommended dose of fertilisers, 2/3rd the recommended dose of fertilisers and full dose of fertilisers. In Kharif main plot treatments alone were imposed on groundnut and for sorghum, the subplot treatments were super imposed during summer season. The fertiliser schedules followed for groundnut and sorghum were 15:30:45 and 90:45:45 kg NPK/ha respectively. In groundnut, only P levels varied according to different treatments while N and K doses were constant. In the succeeding sorghum crop, levels of all the three nutrients varied according to the different treatments. Groundnut variety Co 2 and sorghum variety Co 25 were used in the trial.

RESULTS AND DISCUSSION

Groundnut:

The results of pooled analysis of three years on the effect of fertiliser treatments on groundnut are presented in table 1. The data on shelling per cent, 100 kernel weight, number of pods per plant and sound matured kernel revealed that these characters were significantly influenced by various levels of phosphorus, higher levels of P application recording higher values for these characters. The dry pod showed a linear response to different levels of Phosphorus tried and application of 150 per cent of recommended P_2O_5 (45 kg/ha) and recommended dose of N and K, recorded the highest pod yield. This treatment recorded 82% increase in pod yield compared to control. Chauvan *et al.* (1987) have also reported that for a soil, medium in P content there was yield response to phosphorus application upto 60 kg P_2O_5/ha. The monetary benefits of phosphorus application to groundnut were clearly discernible. Application of 150 per cent of recommended P_2O_5 recorded the highest net returns of Rs.5,092/ha and a benefit-cost ratio of 2.08.

Sorghum :

The results of pooled analysis of data on the effect of different treatment on sorghum are presented in table 2.

The statistical analysis of yield attributes, yield and economics revealed that the main plot treatments significantly affected these characters, bringing out the residual effect of different Phosphorus levels applied to the previous groundnut crop. Highest yield of sorghum and higher net returns were obtained in the main plot where 45 kg P_2O_5/ha was applied to preceeding ground nut crop. Application of the full recommended dose of fertilisers to sorghum recorded the highest grain yield of 3819 kg/ha and net returns of Rs.5,248/ha. However this treatment was statistically on par with application of 2/3rd and 1/3rd the recommended dose of fertilisers to sorghum. This, probably only a part of phosphorus and other nutrients applied to the preceeding groundnut crop was actually utilised by that crop, the remaining nutrients being stored in the soil after losses. These nutrients must have been released and utilised by the succeeding sorghum crop. This explains why even with one third of the recommended quantity of nutrients, high yield and net returns could be obtained in sorghum crop.

From the above results it may be concluded that in a groundnut- sorghum crop rotation, application of 1 1/2 times the recommended quantity of phosphorus (45 kg/ha) and recommended dose of other nutrients to groundnut, followed by application of one third the recommended dose of nutrients to sorghum is sufficient for getting satisfactory crop yields and net returns.

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Madras Agric. J., 81(7): 378-381 July, 1994

CRITICAL LEVEL OF ZINC IN SEMIARID SOILS OF COIMBATORE DISTRICT AND MAIZE PLANT

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Abstract

A greenhouse experiment results showed that Zn fertilisation at 5 ppm Zn was found to be effective in increasing the total dry matter production of maize crop. Evaluation of soil tests for available Zn with six extractants showed that 1.00 ppm of DTPA extractable - Zn can be used as a critical level for Zn in soils for delineating the soils of Coimbatore district. The DTPA method has significant correlation not only with Bray's per cent yield but also with actual yield, Zn content in leavs, and Zn content in leaf sheath and stem. Diagnostic criteria for Zn in plant revealed that 21 ppm Zn can be used as critical level for Zn in leaf of seven weeks old well established maize plant.

There is ever increasing demand for maize grain which is consumed directly as human food as well as used as a raw material for industrial needs like Glucose preparation and cattle feed etc. No systematic investigation has been done in establishing critical level of Zn in soils of Coimbatore district and maize plant. The present study was formulated in order to establish the critical level of Zn in soils and maize plant parts.

MATERIALS AND METHODS

Twenty surface soil samples (0-15 cm) representing a wide range in DTPA extractable Zn (0.26 to 3.90 ppm) were collected from the soils of Coimbatore district. p^H varying from 7.9 to 8.7 EC from 0.08 to 2.4 dSm^{-1}, organic matter from 1.4 to 2.84 per cent and available Zn from 0.26 to 3.9 ppm.

Four Kg of each soil was filled in polythene lined pots and treated with $ZnSO_4$ solution @ 0,2.5, 5.0 and 7.5 ppm.Zn. The treatments were replicated twice in a CRD. A basal dose of 120 ppm N (as urea), 80 ppm P_2O_5 (as diammonium phosphate) and 60 ppm K_2O (as muriate of potash) was applied in each pot. Four seeds of maize were sown in each pot and thinned to three plants after two weeks. For irrigating the pots, deionized water was used as and when required. The crop was harvested 49 days after sowing. The plants were separated into leaves, leaf sheath and stem (LSS) and the remaining parts such as whorl-cut and root. The dry matter of each plant part was weighed and added together to compute total dry matter of the plant.

The plant samples were washed in 0.1 N HCI to decontaminate metals on the surface of samples, dried, weighed, ground in a stainless steel mill and digested in a triacid mixture. Total Zn in the plant samples was determined by atomic absorption spectro photometry. Available Zn, in the soil samples, was determined by DTPA method (Lindsay and Norvell, 1978). The Bray's per cent yield was worked out at 5 ppm Zn level. The critical level of available Zn, in soils and plant parts, was determined by using graphical and statistical methods of cate and Nelson (1965 and 1971).

RESULTS AND DISCUSSION

Data in Table.1 show that application of Zn significantly increased the dry matter yield of maize. The dry matter yield in the control ranged from 2.02 to 39.52 g per pot as compared with 3.02 to 46.59 g per pot in the 5 ppm Zn treated pots. The Bray's per cent yield varied from 55.4 to 107.6. Zinc concentration of leaves and LSS ranged from 12 to 28 and 11 to 20 ppm respectively. The Zn uptake at optimum Zn (5 ppm) application in leaves and LSS varied from 16 to 244 and 22 to 329 µg per pot respectively. Simple correlation coefficients between DTPA-Zn and other variables showed significant positive correlation of DTPA-Zn with