

## RESIDUAL EFFECT OF MANURES AND ZINC ON MAIZE

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Two field experiments, one direct and one residual crop, were conducted using Zn deficient soil (DTPA-Zn = 1.1 ppm) to study the direct and Residual effect of different levels of ZnSO<sub>4</sub> (0, 12.5 and 25 kg/ha, and different sources and levels of organics viz : FYM (7.5 and 15 t/ha) poultry manure (10 and 20 t/ha) and pig manure (2.5 and 5 t/ha) either alone or in combination on maize yield.

The results indicated that the addition of ZnSO<sub>4</sub> plus organic manures to main crop, significantly increased the DTPA-Zn in the post-harvest soil of main crop and in the soil collected as vegetative stage of the residual crop. The combined application of pig manure at 5 tons along with 12.5 ZnSO<sub>4</sub>/ha increased the grain yield of the residual crop viz : Maize-Ganga-5 by 31 per cent over NPK treated control.

The continued use of high analysis of fertilizers to get maximum production from the soil had manifested the occurrence of wide spread deficiency of Zn particularly at high rates of N and P applications (Randhawa, 1976) while the combined application of organic manures and chemical fertilizer had economised the fertilizer nutrients by increasing the use efficiency of the added fertilizers by the crop (Srivastava and Khanna, 1974).

Informations of the effect of locally available organic manures such as FYM, poultry manure and pig manure on the availability of Zn in the soils of Tamil Nadu is scanty and as such the present investigation has been carried out to study the effect of different organic manures on the availability of soil as well as added micronutrients.

## MATERIALS AND METHODS

The field experiment was conducted in a black clay soil (Typic ustivert) with maize - Ganga.5 as the test crop for both direct and residual study. The treatments tried included three levels of ZnSO<sub>4</sub> (0, 12.5 and 25 kg/ha) and three sources of organic manures at the levels specified against each one of them viz : FYM (7.5 and 15 t/ha); poultry manure (10 and 20 t/ha) and pig manure (2.5 and 5 t/ha). Thus there were eighteen treatment combinations altogether and they were superimposed with NPK at 135:68:45 kg/ha. Besides these, two more treatment viz : NPK alone and NPK+ZnSO<sub>4</sub> at 25 kg/ha were also tried for comparing the results.

The data pertaining to the yield of main crop has not been presented and interpreted, as the crop

Table 1 - Residual Effect of Organic Manures+ZnSO<sub>4</sub> on DTPA- Zn and Fe in Soil, Yield and Zn and Fe Uptake by Grain  
Variety : Maize Ganga-5

Treatments Manures - t/ha ZnSO <sub>4</sub> - kg/ha	DTPA-Zn (ppm)		DTPA Fe (ppm)		Grain yield		Uptake (g/ha)	
	P.H.S*V.S**	V.S	V.S	q/ha	Zn	Fe		
NPK alone	0.48	1.50	3.06	36.1	119	239		
25 ZnSO <sub>4</sub>	1.00	2.17	4.50	36.0	164	119		
7.5 FYM	0.38	1.45	2.88	42.8	167	283		
15.0 FYM	0.41	1.91	3.96	51.3	154	99		
7.5 FYM+12.5 ZnSO <sub>4</sub>	1.17	2.22	3.60	39.7	131	196		
7.5 FYM+25 ZnSO <sub>4</sub>	1.75	2.10	2.88	40.3	153	104		
15.0 FYM+12.5 ZnSO <sub>4</sub>	1.87	2.32	2.61	41.6	125	164		
15.0 FYM+25 ZnSO <sub>4</sub>	1.68	1.50	3.24	40.0	125	185		
10.0 P. M	1.59	1.80	4.50	37.3	118	137		
20.0 P. M	1.74	2.00	4.50	41.6	137	150		
10.0 P. M+12.5 ZnSO <sub>4</sub>	0.88	1.88	10.39	36.2	123	188		
10.0 P. M+25 ZnSO <sub>4</sub>	1.62	1.85	3.78	32.4	115	349		
20.0 P. M+12.5 ZnSO <sub>4</sub>	1.75	2.15	2.88	42.3	138	293		
20.0 P. M+25.0 ZnSO <sub>4</sub>	1.18	2.13	3.06	39.3	106	285		
2.5 Pg. M	0.32	1.80	3.96	34.3	117	240		
5.0 Pg.M	1.02	2.02	5.04	36.4	127	227		
2.5 Pg.M+12.5 ZnSO <sub>4</sub>	1.34	1.97	3.78	34.4	74	239		
2.5 Pg.M+25.0 ZnSO <sub>4</sub>	1.66	1.87	3.96	36.3	91	239		
5.0 Pg.M+12.5 ZnSO <sub>4</sub>	1.78	2.32	3.24	47.3	123	239		
5.0 Pg.M+25.0 ZnSO <sub>4</sub>	0.74	1.70	3.79	39.1	139	196		
C.D at 5%	0.19	0.44	1.53	31.0	14	20		

P.M = Poultry manure

Pg.M Pig manure

\* P. H. S. = Post-harvest stage soil

\*\* V. S = Vegetative stage soil

growth was affected by severe drought as well as want of adequate number of irrigations. Hence post-harvest soil samples, alone, were collected-processed and analysed for the micro-nutrient cations as per the method enunciated by Lindsay and Norvell (1978).

Residual crop of maize Ganga 5, was grown in the plots by giving mammutty digging i. e. without disturbing the original lay out used for the direct study. Soil samples were collected at the vegetative stage (25DAS) of the residual crop and were analysed for DTPA - extractable

micronutrients. The residual crop was grown upto maturity. The yield of grain was recorded and samples were drawn for analysis of micronutrients cations, Viz : Zn and Fe, to work out their uptake by grain

## RESULTS AND DISCUSSION

The DTPA extractable Zn and Fe content in soil, the grain yield and the content and uptake of Zn and Fe by grain are presented in Table-1.

Zinc and Fe in soil : Zinc content of the soil at post-harvest stage of main crop was significantly influenced by the combined application of ZnSO<sub>4</sub> with any one of the organic manures. A more or less similar trend was also observed with regard to Zn content of the soil at vegetative stage of residual crop. In the case of Fe content, the combined application of poultry manure at 10 tons plus 12.5 kg ZnSO<sub>4</sub>/ha and individual application of pig manure at 5 t/ha significantly increased the DTPA-Fe content of soil at vegetative stage alone. Several Research workers (Mann *et al.*, 1978; Srivastava and Sethi, 1981 and Singhania *et al.*, 1983) have also reported an increase in the availability of native-Zn due to the addition of organic manure as soluble metal complexes were formed during their transformations.

Grain yield : There was considerable increase in the grain yield of residual crop of maize-Ganga. 5 owing

to ZnSO<sub>4</sub> and organic manure addition either individually or in combination (Table-1). The relative increase in grain yield was higher Viz : 42 per cent over NPK treated control, for the application of FYM alone at 15 t/ha. Similarly combined application of pig manure at 5 tons along with 12.5 kg ZnSO<sub>4</sub>/ha increased the grain yield by 31 per cent over NPK-tested control and was found to be the next best treatment. poultry manure at 20 tons plus 12.5 kg ZnSO<sub>4</sub>/ha also had a favourable effect (17.5 per cent over NPK control) in increasing the grain yield. These results were in conformity with the findings of Singhania *et al.* (1983) The uptake of Zinc by maize grain was also significantly influenced by the addition of organic manures along with ZnSO<sub>4</sub>

It may therefore be concluded from the present investigation that combined application of organic manures along with ZnSO<sub>4</sub> increase significantly the DTPA-Zn content of soil and Zn uptake by maize grain. Application of FYM at 15t/ha individually or application of Poultry/Pig manures along with ZnSO<sub>4</sub> increased the grain yield of maize-Ganga. 5 considerably.

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