

## ZINC NUTRITION OF GREENGRAM

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Three field experiments were conducted in Zn deficient soils of TNAU Farm at Aliyarnagar and Coimbatore with Co. 3, Co. 2 and Co. 4 greengrams as test crops to determine the best micronutrient fertilizer and method of application of Zn for greengram.

The results indicated that among different micronutrients used,  $ZnSO_4$  was able to increase the yield of greengram and influence the uptake of other micronutrients significantly. Among different methods of application of Zn, soil application of  $ZnSO_4$  at 25 or 50 kg/ha was found to be the better for increasing grain yield of Co.2 greengram. Soaking seed in 2 per cent  $ZnSO_4$  solution for four hours before sowing also significantly increased greengram grain yield. To alleviate Zn deficiency in the standing crop, two foliar sprays of 0.5 per cent  $ZnSO_4$  on 25 and 35 d. a. s. (days after sowing) have increased grain yield of Co. 4 green gram by 33 per cent over NP treated control.

According to F.A.O. estimate, a human being per day has to include 104 gram of pulses in diet to get balanced food. On the contrary, Indians consume only 45 gram of pulses per day per individual. To narrow down this gap, pulses production has to be maximised by using balanced amount of macro and micronutrient fertilisers.

Studies conducted in Punjab (Dwivedi and Randhawa, 1972) revealed that quality and quantity of pulses was appreciably increased as a result of Zn application. Experimental evidences of such effect on greengram in the soils of Tamil Nadu are wanting. Hence the present investigation was carried out to determine (i) the best micronutrient (ii) method of application and to study the effect of adequate number of foliar sprays on yield and other micronutrients uptake by green gram.

### MATERIALS AND METHODS

In the first experiment, a field trial (Table 1) was conducted during 1978-79 with Co.3 greengram as test crop in red sandy loam soils of Agricultural Research Station, Aliyarnagar. The soil pH was 8.2. Available N,  $P_2O_5$  and  $K_2O$  were 138, 11.2 and 146 kg/ha respectively. Organic Carbon was 0.54 per cent. Diethylene Triamine penta Acetic Acid (DTPA) extractable Zn, Cu, Fe and Mn were 0.9, 2.3, 8.0 and 3.8 ppm respectively. There were twelve treatments which were replicated thrice.

Table 1 Effect of Micronutrients on yield and uptake of Greengram variety Co. 3  
(Mean of three replications)

Treatments	Grain yield kg/ha		Micronutrients in grain					
	yield	Percent over control	Zn		Fe		Mn	
			Content (ppm)	Uptake (g/ha)	Content (ppm)	Uptake (g/ha)	Content (ppm)	Uptake (g/ha)
1 Control (NP alone) Na <sub>2</sub> MoO <sub>4</sub>	673	—	16	11	25	17	13	8
2 0.25 Kg/ha Na <sub>2</sub> MoO <sub>4</sub>	680	+1	14	10	22	15	15	10
3 25 .. ZnSO <sub>4</sub>	846	+26	17	14	20	17	14	11
4 50 .. ZnSO <sub>4</sub>	787	+17	19	14	33	25	13	10
5 12.5 .. CuSO <sub>4</sub>	641	-5	15	10	33	21	11	7
6 100 .. FeSO <sub>4</sub>	661	-2	18	12	30	20	15	10
7 50 .. MnSO <sub>4</sub>	566	-16	16	9	29	16	17	10
8 0.5 per cent ZnSO <sub>4</sub> FS	615	-9	29	18	20	12	12	9
9 0.5 .. CuSO <sub>4</sub> FS	591	-12	18	11	22	13	14	8
10 1.0 .. FeSO <sub>4</sub> FS	606	-10	18	11	25	15	14	9
11 1.0 .. MnSO <sub>4</sub> FS	678	+1	15	10	22	15	19	13
12 0.1 .. Na <sub>2</sub> MoO <sub>4</sub> FS	727	+9	15	11	33	24	15	11
C. D. at 5 per cent	70			2.3		2.2		3.0

FS=Foliar Spray

In the second experiment, a field trial (Table 2) was conducted on the red sandy loam soil of Agricultural Research Station, Aliyarnagar with Co. 2 greengram as test crop. There were ten treatments and three replications.

In the third experiment, a field experiment (Table 3) was conducted in Zn deficient (0.54 ppm Zn) red soil at, Millet Breeding Station, TNAU Farm, Coimbatore to determine optimum number of foliar sprays of ZnSO<sub>4</sub> for greengram Co. 4.

In all three field experiments, a basal dose of N:P at the rate of 25:50 kg/ha as urea and diammonium phosphate, were applied.

Grain samples were collected after the harvest of each crop and were washed successively with 0.1 N HCl solution, distilled water and deionised water and were oven dried at 70°C.

Grain samples were wet ashed with triacid mixture. Micronutrient cations viz., Zn, Cu, Fe and Mn were estimated in atomic absorption spectrophotometer. Soils were analysed for their DTPA-extractable micronutrients, (Lindsay and Norwell, 1978). Organic carbon was determined as per the method of Walkley and Black (1934). The soil reaction and Electrical conductivity were measured with pH meter and solubridge respectively.

Table 2 Effect of Different Methods of Application of Micronutrients on Greengram Variety Co 2. (Mean of three replication)

Treatments	Grain yield (kg/ha)		Micronutrients in grain			
	yield	Percent Over control	Zn		Mn	
			Control	Uptake	Control	Uptake
			(ppm)	(g/ha)	(ppm)	(g/ha)
1 Control (NP alone)	648	—	21	13	12	8
2 25 kg/ha ZnSO <sub>4</sub>	1045	+58	19	19	12	12
3 50 ..	1102	+70	23	25	10	11
4 75 ..	981	+51	30	30	15	15
5 0.5 per cent ZnSO <sub>4</sub> FS	933	+44	36	34	16	16
6 1.0 .. MnSO <sub>4</sub> FS	944	+46	22	21	66	63
7 0.1 .. Na <sub>2</sub> MoO <sub>4</sub> FS	1173	+81	22	26	10	12
8 2 per cent ZnSO <sub>4</sub> seed soaking	1109	+71	21	23	15	17
9 2 per cent MnSO <sub>4</sub> ..	983	+51	19	19	10	10
10 1 per cent Na <sub>2</sub> MoO <sub>4</sub> ..	1048	+61	22	23	12	12
C. D. at 5 per cent	131			4		4

FS = Foliar spray — thrice during crop growth

Table 3 Effect of Different Methods of Application of Zn Co. 4 Greengram (Mean of three replication)

Treatments	Grain yield (kg/ha)	
	yield	Percent over control
1 Control (N, P alone)	860	—
2 50 kg/ha ZnSO <sub>4</sub>	817	-5
3 75 ..	987	+15
4 2 per cent ZnSO <sub>4</sub> seed soaking 4 hr	795	-8
5 0.5 per cent ZnSO <sub>4</sub> FS 25 days	805	-7
6 0.5 per cent ZnSO <sub>4</sub> FS 25th and 35th day	1143	+33
7 0.5 per cent ZnSO <sub>4</sub> FS 35 day	844	-2
8 0.5 per cent ZnSO <sub>4</sub> FS 35th and 45th day	983	+14
9 25 kg N as Zincated urea / ha	893	+3
10 50 Kg P <sub>2</sub> O <sub>5</sub> as zincated super	785	-9
C. D. at 5 per cent	N.S	

ES = Foliar spray

DTPA Zn = 0.54 ppm; pH 7.7

## RESULTS AND DISCUSSION

Effect of different micronutrients on grain yield are presented in Table 1. Among the different micronutrients viz., Mo, Zn, Cu, Fe and Mn, soil application of Zn as ZnSO<sub>4</sub> especially at 25 kg/ha significantly increa-

sed grain yield of Co 3 greengram. Melton *et al.* (1970) obtained increased grain yield in pea beans grown on Michigan soils and he had attributed this to Zn. Higher level of ZnSO<sub>4</sub> at 50 kg also resulted significant increase in grain yield. •

The result, on different methods of application of  $ZnSO_4$  (Table 2), showed the superiority of all the methods on Co.2 greengram grain yield. Of the different levels of  $ZnSO_4$ , soil application at 25 and 50 kg/ha significantly increased grain yield. The yield was decreased at 75 kg/ha  $ZnSO_4$ . In the case of other methods of application, seed soaking in 2 per cent  $ZnSO_4$ , 1 per cent  $Na_2M_2O_4$ , and 0.5 per cent  $ZnSO_4$  as foliar spray thrice during crop growth were found to be significantly effective in increasing the grain Co.2 greengram. Recent Report (Anon, 1981) indicated similar results for the Zn application to the greengram.

In order to assess the effect of number of foliar sprays of  $ZnSO_4$ , third field experiment was conducted. The results of the experiment (Table 3) showed that two foliar sprays of 0.5 per cent  $ZnSO_4$  on 25 and 35 d.a.s increased grain yield by 1143 kg/ha over N P treated control (860 kg/ha). A similar finding was reported by Coimbatore centre of All India Coordinated Scheme of Micronutrients in Soils and Plants (Anon, 1982).

The results of micronutrients content (Tables 1 and 2) in grain also indicated distinct trend. Soil and Foliar application of respective nutrients recorded considerably higher contents (Table 2) in most of the cases. zinc fertilization exercised significant and favourable influence on Zn content and its uptake in the case of Co.2 greengram. Devarajan *et al.* (1980) obtained similar results in pulse crops.

From the study, it can be concluded that Zn application was found to be more effective than other micronutrients in resulting significant increase in grain yield of greengram variety Co.3. soil application of  $ZnSO_4$  at 25 and 50 kg/ha was found to be better method of application of Zn for enhancing grain yield and uptake of all other micronutrients in greengram, variety Co 2.

To alleviate Zn deficiency during the cropping period, foliar sprays of 0.5 per cent  $ZnSO_4$  on 25 and 35 d.a.s. was considered as an effective way besides to maximise the grain yield of greengram CV Co. 4.

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