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CRITICAL LEVEL OF ZINC IN SOILS AND RICE PLANT-LOWER BHAVANI PROJECT-AYACUT AREAS

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ABSTRACT

Surface soil samples were collected from different locations of lower Bhavani Project (LBP) avacut areas in Periyar district and analysed for DTPA extractable-Zn, Cu, Fe and Mn. The results showed that 28 per cent of the soils were different in available-Zn. In the second phase, A pot experiment was conducted with fifteen bulk soils from different location of LBP based on available-Zn status of the soils in first phase of the project with five levels of Zn and ADT.38 rice as test crop. The crop was grown for seven seeks only. The results showed that 1.61 ppm of DTPA-Zn in soils can be used as the critical level of Zn for delinneating the soils as Zn deficient areas from sufficient areas of LBP. In rice plant, 25.3 ppm of Zn can be used as critical level for diagnosing Zn deficiency in the well established ADT.38 rice plant of LBP ayacut areas.

Red non-calcaseous soils (Irugur Series) occupy an area of2 lakh heacteres in Periyar district of which nearly 24 per cent is under rice cultivation in Lower Bhavani Project (LBP) ayacut areas of Periyar district in Tamil Nadu state. Information on critical level of Zinc in soil and rice plant is however, not available for the LBP ayacut areas. Considering the need for judicious Zn application, the present investigation was undertaken to establish to critical level of Zn in soils of LBP and rice plant.

MATERIALS AND METHODS

During the first phase of the project, surface soil samples (131 in number) were collected from different locations of LBP ayacut areas in Periyar district and analysed for DTPA-extractable Zn, Cu, Fe and Mn following the procedure of Lindsay and Norvell (1978). The results showed that 28 per cent of the soils were deficient in available-Zn (Table-1).

In the second phase of the project, fifteen bulk soil samples, (0.15cm) representing different locations of LBP ayacut areas were collected and based on available-Zn status and used for the conduct of pot experiment with ADT.38 Rice as crop. of the 15 soils, 8 were deficient, 4 medium and 3 adequate in available-Zn status. The treatments consisted of five levels of Zn (0,1.25, 2.5, 5 and 10 ppm Zn as $ZnSo_4$ $7H_2O$) replicated thrice. The rice crop was harvested seven weeks

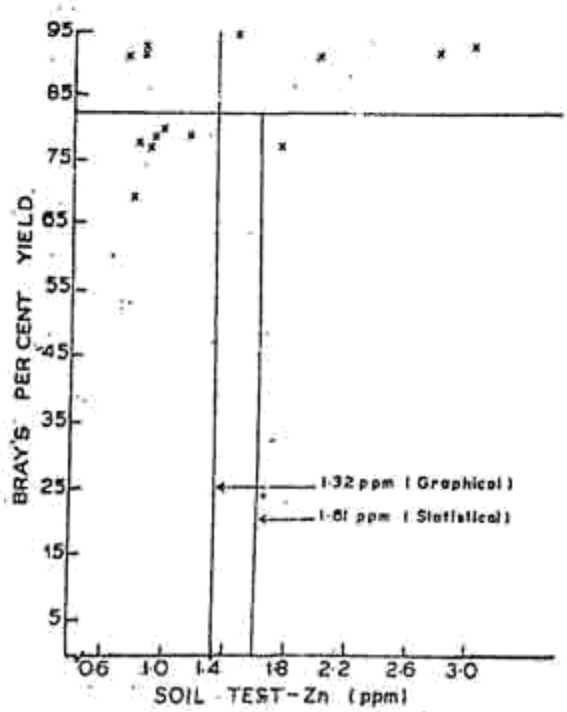

Fig.1 Critical Level of Zinc in soils of L.B.P Ayacut Area

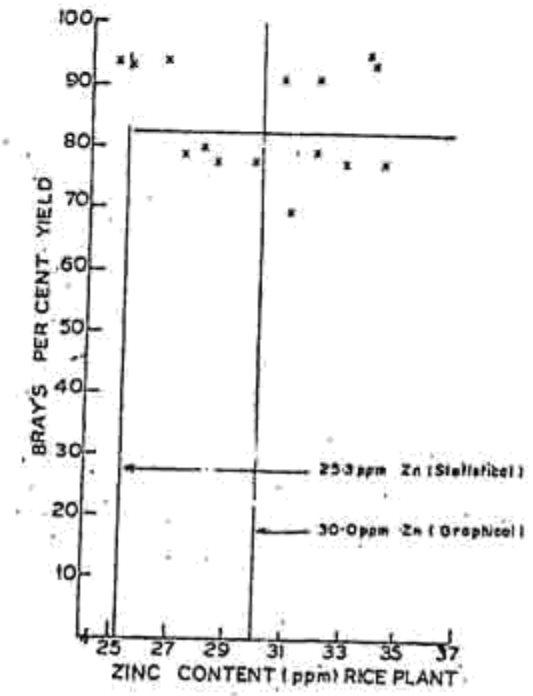

Fig.2 Zinc Content (ppm) Rice Plant

Table 1. Micro nutrient status of LBP ayacut area soils.

Details	Micro nutrients (ppm)				PH	ED ($d\text{-}sm^{-1}$)
	Zn	Cu	Fe	Mn		
Range	0.68 to 8.44	0.52 to 4.82	1.10 to 53.60	2.20 to 20.20	5.6 to 8.7	0.06 to 1.60
Mean	1.58	2.45	18.50	8.7		
Per cent deficiency	27.50	11.00	6.70	Nil		

after transplanting. The total dry matter yield was recorded (Table-2)

RESULTS AND DISCUSSION

Application of Zn at 2.5 ppm Zn as $ZnSO_4$ significantly increased the total dry matter yield of ADT.38 Rice ranged from 13.14 (Soil.S_5) to 27.55 g/pot (Soil.S_9). The yield in NPK treated control pots in all soils ranged from 11.51 to 25.86 g/pot.

Further an attempt was made to fix the critical level of Zn in both soil and rice plant by using graphical and statistical methods of Cate and Nelson (1965, 1971). A value of 1.32 and 1.61 ppm of DTPA-extractable Zn in soils was fixed as the critical levels for soil Zn by the graphical and statistical methods respectively (Fig.1).

Cate and Nelson (1965, 1971) techniques were also used to establish the critical level of Zn in rice plant tissue. The critical plant tissue concent ration of Zn for the above two methods in seven weeks old rice plant was fixed as 30 and 25.3 ppm Zn respectively (Fig.2)

The critical level of Zn in soil and plant determined from statistical method was considered for delincating the soils of LBP ayacut areas besides diagnosing Zn deficiency in the seven weeks old well established ADT.38 rice plant grown in such soils, as the statistical method of Cate and Nelson (1971) does not suffer any human bias while drawing partition line.

Thus, in critical level of Zn in Lower Bhavani Project, ayacut areas soils and ADT-38 rice plant are fixed as 1.61 and 25.3 ppm Zn respectively.

Table 2. Effect of Zinc on Total dry matter yield period of growth : 7 weeks old plants variety : ADT 38 Rice (Data are mean of 3 replications.

Soils	ZINC LEVELS (PPM)					Mean	DTPA Zn (ppm)	Bray's per cent yield
	0.0	1.25	2.5	5.0	10.0			
1	15.86	16.64	17.57	17.06	15.17	16.46	0.74	90.4
2	18.16	23.39	23.66	19.92	22.95	21.62	0.88	76.8
3	18.97	23.31	24.26	18.61	18.10	20.65	0.92	78.1
4	14.51	18.00	18.87	17.46	17.53	17.27	0.82	77.0
5	12.22	13.93	13.14	14.62	14.17	13.62	0.84	93.6
6	13.10	14.11	14.06	13.66	15.04	14.00	0.84	93.3
7	20.31	21.62	25.90	19.93	20.43	21.64	0.96	78.5
8	15.95	18.11	23.21	17.53	16.63	18.30	0.78	69.0
9	25.86	26.16	27.55	24.81	22.94	25.45	1.46	94.8
10	11.51	12.99	15.49	15.38	11.50	13.37	1.76	76.8
11	14.57	19.24	18.40	16.75	17.13	17.22	1.32	79.4
12	17.48	20.82	22.28	19.52	18.24	19.65	1.14	78.4
13	18.59	18.10	19.95	19.14	20.42	19.24	2.78	92.1
14	20.29	19.84	21.82	22.41	24.18	21.71	3.18	93.4
15	20.85	23.32	23.08	23.21	21.46	22.38	2.00	90.4
Mean	17.21	19.30	20.61	18.66	18.39			

soils 1-8 = Deficient in AV.Zn
Soils 9-12 = Medium in AV.Zn
Soils 13-15 = Adequate in AV.Zn

	SE	CD (P=0.05)
Zinc (Zn)	0.33	0.67
Soils (S)	0.58	1.16
Zn x S	2.26	4.46

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EFFECT OF FERTILIZER APPLICATION ON SOIL AVAILABLE NUTRIENTS, YIELD AND NUTRIENT UPTAKE OF GARLIC IN ACIDIC LATERITE SOILS OF KODAIKANAL

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ABSTRACT

Graded levels of N (0,50,100 and 150 kg ha^{-1}), P(0,25,50 and 75 kg ha^{-1}) and K(0,25,50 and 75 kg ha^{-1}) in selected combinations were tried as treatments besides application of zinc sulphate in the soil at 12.5 and 25 kg ha^{-1} and foliar spray at 0.5% in fractional factorial design. The two year results revealed that increased doses of application of N,P and K increased the garlic bulb yield and also the uptake of the respective nutrients. Graded levels of the major nutrients also increased the available nutrient content in the soil. A judicious combination of 100-75-50 kg NPK ha^{-1} and soil application of 100-75-50 kg NPK ha^{-1} and soil application of $ZnSO_4$ at 25 kg ha^{-1} was found to be the optimum to get high yield (upto 20%), nutrient uptake by the crop besides maintaining the soil fertility in terms of availables major nutrient contents under the conditions of acidic leteritic soils of Kodaikanal

Garlic (*Allium sativum* L.) is one of the bulb spice crops grown under wide agroclimatic conditions throughout India. It prefers a moderately cool mean temperature during the growing season. The upper Palani hills, a spur of the Western Ghats situated at 1500 m above MSL is suited for its cultivation. In the acidic laterite soils of this hill, the area under garlic crop is fast increasing. Although garlic can be grown on a variety of soils, proper nutrition management is considered essential. Standardising the fertilizer schedule to obtain economic returns was felt to be an urgent need. Field experiments were conducted in 1991 and 1992 at Kodaikanal.

Table 1. Initial soil analysis of the experimental field.

Properties	
Texture	Sandy loam
pH	5.3
E.C (m.mhos/cm)	0.12
CEC (me/100 g)	14.40
Available N (kg ha^{-1})	210
Available P (kg ha^{-1})	10.5
Available K (kg ha^{-1})	220
DTPA - Zn (ppm)	1.0

MATERIALS AND METHODS

The basic soil properties of the experimental field are furnished in Table 1. The treatments were 4 levels of N (0,50,100 and 150 kg ha^{-1}), 4 levels of P(0,25,50 and 75 kg ha^{-1}) and $ZnSO_4$ as basal soil application at 12.5 and 25 kg ha^{-1} besides foliar

Table 2. Effect of fertilizers on bulb yield of garlic (kg ha^{-1}).

Treatments	1991	1992	Mean
$N_0P_{50}K_{50}$	7625	8563	8094
$N_{50}P_{50}K_{50}$	8375	9000	8688
$N_{100}P_{50}K_{50}$	9188	9263	9225
$N_{150}P_{50}K_{50}$	9563	9813	9688
$N_{100}P_0K_{50}$	8520	9375	8813
$N_{100}P_{25}K_{50}$	8250	9500	8875
$N_{100}P_{50}K_{50}$	9438	9563	9500
$N_{100}P_{75}K_{50}$	9625	9875	9750
$N_{100}P_{50}K_0$	9625	9875	9750
$N_{100}P_{50}K_{25}$	8250	9813	9031
$N_{100}P_{50}K_{50}$	9313	9875	9594
$N_{100}P_{50}K_{75}$	9563	9875	9719
$N_{100}P_{50}K_{50}$ + 12.5 $ZnSO_4$	9438	9625	9531
$N_{100}P_{50}K_{50}$ + 25 $ZnSO_4$	9625	9875	9750
$N_{100}P_{50}K_{50}$ + $ZnSO_4$ spray	9000	9313	9156

CD at 5% : Year : 173. Treatment : 472 Year x Treatment : NS