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Micronutrients Status of Mahi-Kadana Command Area of Gujarat

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The Mahi-Kadana irrigation project has been a major source of irrigation in the command area which belongs to South-West part of Kheda district mainly falling in the Middle Gujarat region. The information on micronutrients status in this command area is practically required in view of the intensive cultivation of paddy – paddy, paddy – wheat, tabacco – groundnut, *bajri* – mustard – *jowar*, *bajri* – wheat – *bajri* and banana based cropping sequences. With a view to knowing the available status and vertical distribution of micronutrient cations within the major soil profiles in this command area, the present study was undertaken.

Total 2772 profile soil samples in the command area were collected soil serieswise by a comprehensive reconnaissance soil survey in collaboration with soil survey division, Nadiad. The soil samples were analysed for important physico-chemical properties by using standard analytical methods (Jackson, 1967). The surface (0-25 cm) soils had pH 6.0 to 9.7, EC 0.03 to 9.00 dS m^{-1}, organic C 0.08 – 0.8%, available P_2O_5 7.4 to 212.4 kg ha^{-1} and available K_2O 92 to 2097 kg ha^{-1} with respective mean values of 8.2, 0.56, 0.28, 58.7 and 553. The soils were classified as, mainly Inceptisols and Entisols. Available micronutrients (Fe, Mn, Zn and Cu) were extracted with DTPA extractant from the soil samples and determined with the help of atomic absorption spectrophotometer (Lindsay and Norvell, 1978).

The serieswise data on available micronutrient status in surface soils (Table 1) revealed that the availability of all the micronutrients was sufficient except that of Zn which represented about 21 per cent of overall deficiency. All the series had shown Zn deficiency where the highest per cent deficiency was observed in *Mahelaj* series (46.6%) followed by *Khadiyalpura* (41.7%) and *Sokhada* (38.5%) series. In general, the soils of the different series were sufficient in available Fe except that of *Khadiyalpura* (8.3%), whereas *Ankhi* and *Chaklashi* series had shown slight deficiency of only 1.0 per cent. The overall deficiency of Fe was also negligible (1.0%). Similarly, the soils were sufficient in available Mn except those of *Ratanpur* and *Tarakpur* series with 2.4 and 8.3 per cent deficiency, respectively. Similar was the case of available Cu where only *Mahelaj* series had shown a deficiency of only 2.3 per cent.

TABLE 1

Available micronutrients (ppm) in surface soils of different soil series in Mahi-Kadana Command Area.

Sr. No.	Soil Series	No.of samples	Iron	PSD*	Manganese	PSD	Zinc	PSD	Copper	PSD
1.	Ankhi (Ank)	290	4.3-41.3 (15.3)	1.0	2.7-92.3 (27.4)	0.0	0.05-7.34 (1.39)	11.4	0.9-10.0 (2.6)	0.0
2.	Ratanpur (Rtp)	41	7.6-42.4 (25.6)	0.0	8.7-90.6 (28.6)	2.4	0.26-4.30 (1.40)	12.2	0.4-8.6 (4.1)	0.0
3.	Khadiyalpura (Kdp)	24	4.0-19.2 (8.6)	8.3	5.7-93.8 (21.8)	0.0	0.29-3.89 (0.78)	41.7	0.4-2.8 (1.5)	0.0
4.	Sokhda (Skd)	13	7.5-34.0 (13.2)	0.0	12.1-73.4 (32.7)	0.0	0.24-5.09 (1.16)	38.5	1.2-4.0 (2.5)	0.0
5.	Mahelaj (Mhj)	88	10.5-34.5 (17.3)	0.0	5.7-59.0 (14.0)	0.0	0.20-5.18 (0.91)	46.6	0.1-7.0 (2.3)	2.3
6.	Tarakpur (Tkr)	11	9.4-15.2 (12.1)	0.0	3.8-24.5 (13.5)	8.3	0.29-3.09 (1.44)	8.3	0.3-3.9 (1.9)	0.0
7.	Matar (Mtr)	04	4.8-9.1 (7.0)	0.0	11.2-60.8 (25.3)	0.0	0.34-4.59 (1.10)	25.0	1.0-4.0 (1.4)	0.0
8.	Chaklasi (Cks)	112	4.7-40.5 (16.0)	1.0	6.5-69.5 (23.5)	0.0	0.11-4.49 (0.97)	22.3	0.8-4.0 (1.9)	0.0
		583	4.0-42.4 (14.4)	1.0	2.7-93.8 (23.4)	0.3	0.05-7.34 (1.15)	20.8	0.1-10.0 (2.3)	0.3

Figures in parentheses indicate mean value, * PSD - Per cent soil deficient

Soil deficient in Fe, Mn, Zn and Cu : Less than 5, 5, 0.5 and 0.2 ppm, respectively.

TABLE 2

DTPA-extractable Fe2, Mn, Zn and Cu contents(ppm) in soil profile samples from Mahi-Kadana Command area.

Sr. No.	Soil depth (cm)	No. of Samples	Iron	PSD	Manganese	PSD	Zinc	PSD	Copper	PSD
1.	0-25	583	4.0-42.4 (14.4)	1.0	2.7-93.8 (23.4)	0.3	0.05-7.34 (1.15)	20.8	0.1-10.0 (2.3)	0.3
2.	25-50	583	3.8-38.6 (12.8)	0.9	3.4-79.6 (20.3)	1.2	0.09-6.44 (1.12)	37.5	0.1-10.9 (2.0)	0.5
3.	50-75	583	3.3-34.2 (11.7)	0.5	2.0-84.5 (20.2)	1.2	0.06-6.55 (1.06)	39.7	0.1-8.4 (1.8)	3.1
4.	75-100	583	3.3-44.3 (11.2)	0.5	2.5-96.0 (19.6)	4.8	0.09-6.11 (1.19)	35.9	0.1-6.1 (1.8)	0.3
5.	100-150	440	3.3-37.1 (11.4)	1.1	2.0-88.7 (18.9)	3.7	0.11-5.53 (1.14)	33.2	0.1-8.3 (1.5)	1.6
	Overall	2772	3.3-44.3 (12.3)	0.8	2.0-96.0 (20.5)	2.2	0.05-7.34 (1.13)	33.4	0.1-10.9 (1.9)	1.2

* PSD - Per cent soil dificient

Figures in parentheses indicate mean value; Soil deficient in Fe, Mn, Zn and Cu : less than 5, 5, 0.5 and 0.2 ppm, respectively.

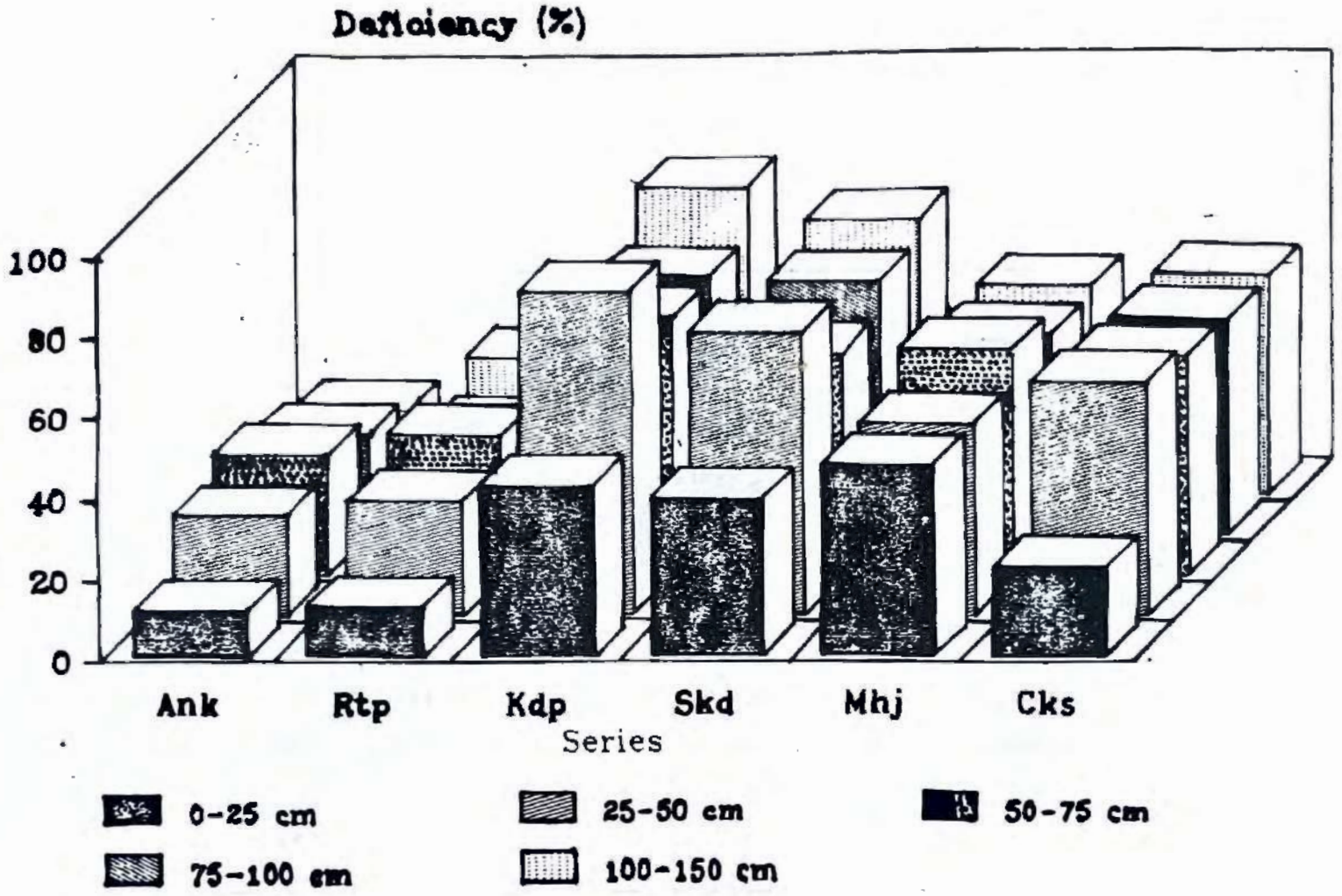

Fig. 1 : Distribution of Zn deficiency in soil series

The results of DTPA – extractable micronutrient cations in soil profiles are given in Table 2. The Fe content in the soils ranged between 3.3 and 44.3 ppm with an average of 12.3 ppm. Mean Fe content showed a decreasing trend with the increase in depth of the profile.

DTPA – extractable Mn varied from 2.0 to 96.0 ppm with a mean of 20.5 ppm. A decreasing trend in Mn content was observed with depth. The overall percentage deficiency was Fe 0.8 and Mn 2.2, whereas that for surface soils was 1.0 and 0.3, respectively.

The availability of Zn varied between 0.05 and 7.3 ppm with a mean of 1.13 ppm (Table 2). With increase in depth of the profile, the available Zn content did not maintain a regular trend. In about 21.0 per cent of the surface soil samples, the DTPA – extractable Zn was below the critical level of 0.5 ppm, whereas in sub-soils the overall deficiency was of 33 per cent.

Surface soils belonging to defferent series had relatively lower magnitude of Zn deficiency than their corresponding sub-surface layers (Fig. 1). The top soils belonging to *Mahelaj* series (Vertic Ustochrepts) had the maximum Zn deficiency to the tune of 47 per cent, followed by 22 per cent in *Chaklashi* series (Fluventic Ustochrepts), whereas *Ratanpur* and *Ankhi* series (Vertic and Fluventic Ustochrepts) had deficiency of about 12 and 11 per cent, respectively. However, the overall mean per cent of deficiency for sub-soils of these series were not much different. Further, it was observed that the soils belonging to great group of Ustochrepts were more prone to Zn deficiency as compared to Ustorthents irrespective of their further classification into fluventic or vertic sub-groups.

The Cu – availability could be rated as quite adequate in majority of the soil samples from the command area. The mean Cu content of different profile layers was around 2.0 ppm. About 97 per cent of soils were adequate in available Cu.

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