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SHORT COMMUNICATION

Distribution of micronutrient cataions in arid irrigated ber orchards in Sikar district of Rajasthan

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In Rajasthan, fruit cultivation is practised over an area 19795 ha and total production is 238475 tonnes (Anonymous 2005).The area of Sikar district forms a part of Thar desert which covers an area of 774244 square kilometres situated in the North Eastern Rajasthan. The district has moderate climate with seasonal temperature variation with scanty rainfall to the magnitude of 450-500 mm per annum during normal rainfall years. Increasing the production of fruits thus has sufficient scope in arid region of Rajasthan. In Sikar district, the area under fruit crops is 200 ha with production of 0.02 lakh metric tonnes (Anonymous 2005). There is a vast potential of increasing area under fruit cultivation in arid region of Rajasthan provided irrigation facilities are available. These areas are suitable for cultivation of fruit crops such as aonla, ber, beal citrus, pomegranate etc. Presently Sikar district has nearly 2,12,096 lac hectares irrigated area through tube wells/wells. Irrigation facilities has opened great avenues for cultivation of fruit crops likes ber, aonla, bael, lime, pomegranate, datepalm, guava, jamun, karonda, phalsa etc, besides traditionally grown fruits such as Ker (*Capparis decidua*), Gonda (*Cordia myxa*), Pilu (*Salvadora oleiodes*), Khejri (*Prosopis cineraria*) etc. Ber is an important fruit crop of arid and semi arid regions of north india. It can be successfully grown even on the marginal land where the most of the other fruit crops fail to give best economic returns. In Indian fruit industry, poor nutrition is the major cause of low orchard efficiency resulting poor productivity and poor fruit quality. Balanced nutrition of fruit crops is paramount importance particularly in arid areas having largely sandy soils of poor fertility status. For knowing the exact status of mineral nutrition in the fruit trees, survey of the orchards for their fertility status is done. Studies on nutritional survey of arid fruits in Rajasthan are meagre inspite of their great importance and relevance. With this aim, the present study was undertaken to evaluate the micronutrient fertility status of different orchards in Sikar district. A soil survey during the year 2007-2008 was conducted in Sikar district of Rajasthan. Eight orchards were selected covering different tehsils viz. Fatehpur, Danta Ramgarh, Piparali, Laxmangarh and Reengus.The details of locations and name of the fruit growers are given in table 1.

Soil samples were collected from eight fruit orchards, on the basis of variability and orchard performance at different locations of Sikar district. Thereafter, from each selected orchards, three soil profiles, based on soil fertility variation and plant performance were taken up. One hundred ninety two representative composite soil samples at different soil depths viz., 0-15, 15-30, 30-45, 45-60, 60-75, 75-90, 90-105 and 105-120 cm. were collected. The soil samples were analyzed for available Fe, Cu, Zn, and Mn were extracted with DTPA solution (Lindsay and Norvell, 1978) and were determined by atomic absorption spectrophotometry. As per the ratings given by Tandon (1992a), the soils having <4.5 mg kg^{-1}, < 0.6 mg kg^{-1}, < 0.2 mg kg^{-1}, < 2.0 mg kg^{-1} of iron, zinc, copper and manganese, respectively falls under deficient category.

The distribution of DTPA extractable micronutrients as depth wise in 8 ber fruit orchards in Sikar district of Rajasthan was studied.

The extractable iron in soils ranged from 2.11 to 6.33 mg kg^{-1} which showed a regular decreasing trend with increasing depths. It is evident that 30 per cent soil samples drawn from surface soil depth of ber orchards were deficient and 62 per cent were sufficient in DTPA

Table 1. Locations and name of fruit growers

S.No.	Name of fruit grower	Village	Location
1.	Shri Ummed Kumar	Raghunathpura	Raghunathpura
2.	Shri Roopchand Peepaliwal	Pachar	Pachar-III
3.	Shri Pokharmal	Purohit Ka Bas	Purohit Ka Bas-I
4.	Govt. Nursery	Palsana	Palsana-II
5.	Shri Iqbal Khan	Fatehpur	Fatehpur-I
6.	Shri Kesha Ram	Pratappura	Pratappura
7.	Shri Moolchand Meena	Lakhani	Lakhani
8.	Shri Ishaq Yashin	Fatehpur	Fatehpur-II

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extractable iron in the present study. The deficient to sufficient status of iron found in the soil might be due to calcareousness, low organic carbon content, light textured coarse sandy soils. Lal and Biswas (1973) observed that available iron content ranged from 0.3 to 5.6 ppm in Rajasthan soils and it was low i.e. 2 ppm in the desert soils, whereas, similar observations were reported by Bhatnagar and Chandra (2003) and Kumawat (2005).

The DTPA extractable zinc content in the soils ranged from 0.147 to 0.983 with the mean value of 0.574 of all the soil depths. Taking 0.60 mg kg^{-1} as critical limit given by Tandon, 1992, 50 per cent soil samples drawn from surface soil depth of ber orchards were deficient and remaining 50 per cent were sufficient in with respect to available zinc content, and also showed a regular decreasing trend with increase in depth. The deficiency of zinc in soils might be due to the presence of quartz, feldspar or the exchange complex being such as to have sites saturated with Ca/ Mg under alkaline soil reaction. Calcareous nature and low organic matter are some of the other properties where low levels of zinc are anticipated. These results are in accordance with the findings of Bhatnagar and Chandra (2003) and Kumawat (2005).

From the data presented in the table, it is evident that the DTPA extractable copper content of soil depths ranged from 0.100 to 0.467 mg kg^{-1} with their mean value 0.223 mg kg^{-1}. The copper content showed a regular decreasing trend with increase in depth. The 50 per cent soil samples drawn from surface soil depth of ber orchards were deficient and remaining 50 per cent were sufficient in with

Table 1. DTPA Extractable Iron (mg kg^{-1}) in Ber Orchards at Different Soil Depths in Sikar District

Location of orchards	Soil depths (cm)								
	0-15	15-30	30-45	45-60	60-75	75-90	90-105	105-120	Mean
Raghunathpura	2.96	2.93	2.90	2.84	2.82	2.78	2.74	2.71	2.83
Pachar-III	4.92	4.89	4.86	4.80	4.77	4.74	4.69	4.63	4.79
Purohit Ka Bas-I	6.25	6.22	6.19	6.14	6.11	6.07	6.02	5.96	6.12
Palsana-II	6.33	6.31	6.24	6.21	6.16	6.13	6.08	5.80	6.16
Fatehpur-I	2.43	2.40	2.36	2.34	2.28	2.21	2.15	2.11	2.28
Pratap Pura	3.65	3.62	3.52	3.50	3.46	3.41	3.37	3.33	3.48
Lakhani	5.35	5.32	5.32	5.28	5.25	5.21	5.17	5.15	5.26
Fatehpur-II	4.91	4.89	4.85	4.79	4.75	4.72	4.67	4.63	4.78
Mean	4.60	4.57	4.53	4.49	4.45	4.41	4.36	4.29	

Deficient – 37%
Sufficient – 63%

Table 2. DTPA Extractable Zinc (mg kg^{-1}) in Ber Orchards at Different Soil Depths in Sikar District

Location of orchards	Soil depths (cm)								
	0-15	15-30	30-45	45-60	60-75	75-90	90-105	105-120	Mean
Raghunathpura	0.297	0.273	0.253	0.230	0.203	0.190	0.170	0.147	0.220
Pachar-III	0.860	0.837	0.820	0.800	0.787	0.770	0.750	0.647	0.784
Purohit Ka Bas-I	0.670	0.647	0.627	0.600	0.580	0.567	0.543	0.407	0.580
Palsana-II	0.867	0.847	0.820	0.800	0.783	0.760	0.740	0.593	0.776
Fatehpur-I	0.463	0.443	0.427	0.407	0.387	0.367	0.343	0.353	0.399
Pratap Pura	0.567	0.547	0.527	0.507	0.480	0.450	0.430	0.403	0.489
Lakhani	0.983	0.953	0.927	0.900	0.873	0.853	0.823	0.650	0.870
Fatehpur-II	0.547	0.527	0.510	0.483	0.453	0.437	0.417	0.467	0.480
Mean	0.657	0.634	0.614	0.591	0.568	0.549	0.527	0.458	

Deficient 50%
Sufficient 50%

Table 3. DTPA Extractable Copper (mg kg^{-1}) in Ber Orchards at Different Soil Depths in Sikar District

Location of orchards	Soil depths (cm)								
	0-15	15-30	30-45	45-60	60-75	75-90	90-105	105-120	Mean
Raghunathpura	0.147	0.140	0.133	0.130	0.123	0.117	0.120	0.110	0.128
Pachar-III	0.373	0.353	0.330	0.310	0.287	0.267	0.243	0.210	0.297
Purohit Ka Bas-I	0.467	0.440	0.410	0.390	0.373	0.347	0.317	0.283	0.378
Palsana-II	0.360	0.347	0.327	0.307	0.290	0.273	0.240	0.217	0.295
Fatehpur-I	0.160	0.147	0.127	0.127	0.120	0.117	0.107	0.100	0.125
Pratap Pura	0.370	0.343	0.320	0.293	0.277	0.257	0.227	0.207	0.287
Lakhani	0.193	0.167	0.163	0.153	0.140	0.130	0.127	0.117	0.149
Fatehpur-II	0.160	0.140	0.140	0.133	0.130	0.127	0.117	0.107	0.132
Mean	0.279	0.260	0.244	0.230	0.218	0.204	0.187	0.169	

Deficient 50%
Sufficient 50%

Table 4. DTPA Extractable Manganese (mg kg^{-1}) in Ber Orchards at Different Soil Depths in Sikar District

Location of orchards	Soil depths (cm)								
	0-15	15-30	30-45	45-60	60-75	75-90	90-105	105-120	Mean
Raghunathpura	1.82	1.68	1.63	1.57	1.51	1.46	1.40	1.36	1.56
Pachar-III	3.87	3.80	3.73	3.66	3.62	3.55	3.51	3.47	3.65
Purohit Ka Bas-I	5.40	5.34	5.27	4.55	4.48	4.43	4.37	4.32	4.77
Palsana-II	3.45	3.37	3.30	3.26	3.21	3.14	3.08	3.03	3.23
Fatehpur-I	2.21	2.17	2.10	2.03	1.99	1.93	1.86	1.83	2.01
Pratap Pura	2.91	2.81	2.75	2.69	2.63	2.60	2.52	2.48	2.67
Lakhani	4.83	4.74	4.70	4.64	4.59	4.54	4.48	4.43	4.62
Fatehpur-II	1.91	1.81	1.76	1.70	1.66	1.62	1.57	1.52	1.69
Mean	3.30	3.22	3.15	3.01	2.96	2.91	2.85	2.80	

Deficient 25%
Sufficient 75%

respect to available copper content. The deficient to sufficient available copper status of orchard soil might be due to high pH, calcareousness, lower organic carbon and light textured coarse sandy soils. The present results are in accordance with those reported by Baser and Lodha (1971) who reported that available copper status in sandy soils of Rajasthan varied from 0.05 to 2.38 ppm. Similar types of results have also been reported by Bhatnagar and Chandra (2003) who reported available copper status in sandy soils of Rajasthan varied from 0.0.08 to 0.51 ppm.

The data presented on DTPA extractable manganese content of orchard soils showed a regular decreasing trend with increase in depths. The DTPA extractable manganese content in the soils ranged from 1.36 to 5.40 mg kg^{-1} with their mean value of 3.02 of all the soil depths. Twenty five per cent soil samples of ber were found deficient and remaining 75 per cent were sufficient in respect to DTPA extractable manganese. Results of DTPA extractable manganese in all the orchards clearly indicate that deficiency of manganese in the ber orchards is now coming. The deficiency of DTPA extractable manganese might be due to the presence of high $CaCO_3$ content and low organic carbon content. These results are in accordance with those reported by Bhatnagar and Chandra (2003) and Kumawat (2005).

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