Asian Journal of Chemistry Vol. 12, No. 4 (2000), 1364–1366

NOTE

Studies on the Status of Available Micronutrients for Plant Growth in Different Soil Series of Pravara River Lower Basin in Ahmednagar District (Maharashtra)

J.N. NIGAL
Post-Graduate Department of Chemistry, Padmashri Vikhe Patil College Pravaranagar (Loni)-413 713, India

In eleven soil series of sugar cultivating area in Ahmednagar District of Maharastra, available micronutrients along with other physico-chemical parameters have been studied. All the soil series are free from salinity hazards. Most of the soil samples contain excess available micronutrients like iron and copper. The ratio between iron and other micronutrients has been worked out.

For plant growth sixteen elements are essential. These elements are grouped into macro and micronutrients. The deficiency or excess presence of micronutrients such as iron, manganese, zinc and copper may produce synergetic and antagonistic effects in the plants[1, 2]. In Ahmednagar district sugarcane, wheat and sorghum are cultivated as main crops but from last few years the crop yeilds per acre are found to be decreasing in many parts of the basin. The present study deals with the measurements of the pH, electrical conductance and estimation of available iron, zinc and copper in different soil samples.

Soil samples were collected from fifteen villages situated on the bank of Pravara river in Ahmednagar district where the first sugar factory on cooperative basis was started in India. The pH and electrical conductivity of the soil were determined with 1 : 2 soil water suspension (Instrument Elico Pvt. Ltd. P.E.-132). The available micronutrients like copper, zinc and iron were estimated for different soils using atomic absorption spectrophotometer. All the chemicals used were of AnalaR grade.

Soils with pH greater than 8.5 are generally called as sodic soils, hence only two soil samples are sodic in nature and remaining soil series are free from sodicity hazards. The increase in pH could be due to the increased amount of carbonates and bicarbonates. Conductivity is a measure of the total concentration of the ionised substances. The mobility of the ions, their valencies and their actual and relative concentrations affect conductivity[3]. The electrical conductances are in the range of 0.172 to 0.382 μmho/cm as aganst the critical limit of 4 μmho/cm for saline soils. Thus all the soil series can be considered as free from salinity hazards.

Iron is one of the micronutrients for plants and it is present as complexes in

plant tissues[3]. The status of available iron varies from 7.26 to 16.63 ppm (critical limit 2.00 ppm).

The experimental results are presented in Table-1

TABLE-1

S.N. of soil samples of representative region	pH	E.C. μmho	% Organic carbon	Available micronutrients (ppm)			Ratio Fe/Zn	Ratio Fe/Cu
				Copper	Zinc	Iron		
1.	8.45	0.293	0.49	5.26	1.38	9.75	7.065	1.853
2.	8.26	0.382	0.52	4.60	1.05	8.48	8.076	1.843
3.	8.40	0.324	0.69	3.87	0.82	8.43	10.330	2.178
4.	8.70	0.288	0.58	3.43	0.54	10.28	19.037	2.997
5.	8.26	0.227	0.84	3.60	0.60	7.69	12.816	2.136
6.	8.22	0.187	0.37	3.65	1.40	9.25	6.607	2.534
7.	8.39	0.287	0.28	4.06	0.92	9.25	10.054	2.276
8.	8.39	0.354	0.70	8.43	0.89	16.63	18.685	1.972
9.	8.90	.363	0.18	5.66	0.43	12.41	28.860	2.192
10.	8.26	0.243	0.49	5.86	0.91	7.26	7.978	1.238
11.	8.01	0.172	0.37	6.38	1.62	10.52	6.469	1.648

The status of available copper for different soil samples is in the range 3.43 to 8.43 ppm (critical limit 1.0 ppm). The result shows that all the soil samples are rich in available copper. Since it is very toxic to the plants, it may produce synergetic and antagonistic effects. The germination percentage of the seeds gradually decreases with the increase of copper concentration. The low critical value (1.0 ppm) for copper may be due to its incorporation in living systems when the atmosphere shifts from reducing to oxidizing state.[6]

Zinc deficiency leads to widespread nutritional disorder in various crops. The available zinc supply to the plant may be diluted by the increased concentration of phosporus[7]. The available zinc for the plants is found to vary from 0.54 to 1.62 ppm (critical limit 0.80 to 1.00 ppm). The soils from Ashvi (Kd), Mamdapur and Nimgaonjaly are found to contain excess zinc. It must be diluted by adding phsophatic fertilizers for the increased uptake by the plant roots[8]. Since other three soil samples have low zinc content they need zinc fertilisation for the growth of crops and better yield. Application of zinc significantly decreases the available iron content and vice-versa[9]. Available potassium is more at low levels of zinc and at higher levels zinc has an antagonistic effect on potassium availability.

Excess concentration of heavy metals is lethal to the plants[10]. In the physiology of plants, the relative amounts of iron, mangnese and zinc present are essential for photosynthesis and biochemical reactions. Hence the relative availability of the micronutrients is examined (Table 2).

The iron : zinc ratio varies from 6.460 to 19.037. The lower ratio affects the availability of iron to the plants, the higher ratio produces the mutual antagonistic effect of iron and zinc (critical limit 2.5 to 2 ppm).

TABLE-2
RELATION OF IRON TO OTHER MICRONUTRIENTS

Name of village	Iron : zinc	Iron : copper
Nimgaonjaly	6.469	1.648
Ashvi Kd	7.065	1.853
Pratoppur	8.076	1.843
Shiblapur	10.330	2.178
Umbri (B)	19.037	2.997
Hanumantgaon	12.816	2.136
Mamdapur	6.607	2.534
Rajuri	10.054	2.278
Loni (BK)	18.685	1.972
Dadh (BK)	8.860	2.192
Auragpur	7.978	1.238

ACKNOWLEDGEMENTS

The author is thankful to the authorities of Padmashri Vikhe Patil College, Pravaranagar for providing laboratory facilities and to the University Grants Commission for providing financial assistance for the project. He is also thankful to the Head of the Soil Analysis Laboratory, Sangli, belonging to the Agricultural Department, Government of Maharastra, for providing micronutrient analysis of soil samples.

REFERENCES

1. B.A. Jagodin, *Hort. Abst.*, **11**, 257 (1957).
2. G.N. Mhatre and S.B. Chaphekar, *J. Environ. Bull.*, **3**, 53 (1982).
3. C.S. Piper, Soil and Plant Analysis, Thomas Murphy & Co. London (1957).
4. T. Em Meyer and M.D. Kamen, *Adv. Protein Chem.*, **35**, 105 (1982).
5. S. Saravana, A. Subramani and A.S. Lakshmanachary, *Ecol. Env. and Conc.*, **2**, 163 (1996).
6. E. Broda, *J. Mol. Evol.*, **7**, 87 (1975).
7. I.U. Ahmed, S.M.S. Faiz, B. Faiz, M.A. Sayeed and J. Abdul Sathar, *Indian Soc. Soil Sci.*, **40**, 782 (1992).
8. M. Singh and S.C. Singh, *Soil Sci.*, **129**, 282 (1980).
9. F.Y. Tam, *Environ. Bull.*, **14**, 241 (1977).
10. D. Purves and E.J. Mackenzie, *Plant and Soil*, **39**, 361 (1973).

(*Received:* 30 May 2000; *Accepted:* 26 July 2000) AJC-2113