SHORT COMMUNICATION

EVALUATION OF AVAILABLE MICRONUTRIENTS (Fe & Cu) STATUS IN BLACK SOILS OF BAMBHANIDIH BLOCK IN DISTRICT JANJGIR-CHAMPA OF CHHATTISGARH

Sunil Kumar Bhagat, Kumar Dhar Sahu* and Harish Kumar Mahla

Department of Soil Science and Agricultural Chemistry, IGKV, Raipur (C.G.) India
Email: kumardsahu111@gmail.com

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Abstract: A Study was undertaken to evaluate the micronutrients status of Bambhanidih block in Janjgir- Champa district, Chhattisgarh covering 32 villages during 2011-2012. The systematic collection of samples was carried out in geo–referenced surface (0-0.15m) soils samples from 575 sites representing *Alfisols* and *Vertisols* using Global Positioning System. The samples were analyzed for DTPA-extractable iron and copper content. The statistical description of soil characteristics indicated the available Cu and Fe content ranged from 0.2 to 12 and 4.1 to 57.1 mg kg^{-1} with mean 1.7 and 23.1 respectively. The available copper and iron content showed high level in soils of Bambhanidih block

Keywords: Micronutrients, Iron, Copper, *Alfisols*, *Vertisols*

INTRODUCTION

Soil fertility management will ultimately consider all aspects of soil – plant relationship and pollution of the environment as well. Soil fertility may be defined as the soil system's nutrient supplying capacity. It helps in adopting appropriate measures for overcoming various limitations and at the same time ensures optimum crop production. All plant needs certain mineral elements for proper growth, development, and maintenance. Micronutrients are important soil elements that control its fertility. Soil fertility is one of the important factors in relation to evaluation of productivity status of the soils of an area and region. It is an important aspect in context of sustainable agriculture production. Soil fertility is an important factor, which determines the growth of plants. Soil fertility is related to the amount of available nutrients which is measured by yield capacity. There are some other factors like organic matter or even soil texture which influence the availability of nutrients and the productivity. Soil micro nutrients are an essential as primary and secondary nutrients for the development of crop growth. The addition of micro nutrients to fertilizers in the optimum amounts and in degraded soils ensures the sustainability of cropping through balanced nutrition and ultimately sustainable development of the fertilizer industry. Soil test-based fertility management is an effective tool for increasing productivity of agricultural soils that have high degree of spatial variability resulting from the combined effects of physical, chemical or biological processes (Goovaerts, 1998). However, major constraints impede wide scale adoption of soil testing in most developing countries. In India, these include the prevalence of small holding systems of farming as well as lack of infrastructural facilities for extensive soil testing (Sen. *et al.*, 2008). The advent of information technology have provided tools like Global Positioning System (GPS), Remote sensing, Simulation modeling and Geographical Information System (GIS), which help in collecting a systematic set of georeferenced samples and generating the spatial data about the distribution of nutrients (Sharma, 2008). This will also helps to monitor the changes in micronutrients status over a period of time as sampling sites can be revisited with the help of GPS which is otherwise difficult in the random sampling (Sood *et al.*, 2003).

Study area

Bambhanidih is located at Janjgir district lying between $21^0$51'956"N latitude to $82^0$44'989"E longitude. It has average elevation of 792 feet.The District Janjgir- Champa is situated in the center of the Indian state of Chhattisgarh and so it is considered as the "Heart of Chhattisgarh". The Janjgir-Champa district is a major producer of food grains in the state of Chhattisgarh. The Hasdeobango project has been considered as life supporting canal for the District Janjgir-Champa. Under this project 75% area of the District will be covered for irrigation. The District head quarter of Janjgir-Champa is in Janjgir-Champa, which is situated on national highway no.- 200. Janjgir-Champa is 65 Km away from Bilaspur and 175 Km from state capital Raipur through road route.

MATERIAL AND METHOD

The micronutrients Fe were extracted by using 0.005M DTPA (Diethyl triamine penta acetic acid), 0.01M calcium chloride dehydrate and 0.1M triethanol amine buffered at 7.3 pH Lindsay and Novell (1978) and concentrations were analyzed by atomic absorption spectrophotometer 4129.

*Corresponding Author

RESULT AND DISCUSSION

Available Cu status

Table 1. Range and Mean values of different nutrients in study area according to soil type

SOIL PARAMETERS	ALFISOLS		VERTISOLS	
	RANGES	MEAN	RANGES	MEAN
Available Cu mg kg^{-1}	0.2-12.0	1.7	0.2-5.3	1.9
Available Fe mg kg^{-1}	4.1-57.1	23.0	5.9-48.3	25.3

Table 2. Distribution of available copper status in surface soils of Bambhanidih block

Available Cu (mg kg^{-1})		Alfisols		Vertisols		Total (%)
		No. of Samples	% Samples	No .of Samples	% Samples	
Deficient	<0.2	5	0.9	1	2.9	1.0
Sufficient	0.2-0.4	20	3.7	6	17.6	4.5
High level	>0.4	516	95.4	27	79.4	94.4

The DTPA-extractable Cu content of soils under study varied from 0.2 to 12.0 mg kg^{-1} in *Alfisols* and *Vertisols* with an average content of available Cu recorded as 1.7 mg kg^{-1} (Table 1). The results were in conformity with the findings of Singh and Raj, (1996) in soils of Himachal Pradesh and similar results were also reported by Singh and Jain, (1971), Meena *et al.*, (2006), Yadav and Meena, (2009) and Singh *et al.*, (2009).

The available Cu ranged from 0.2 to 12.0 and 0.2 to 5.3 mg kg^{-1}with an average value of 1.7 and 1.9 mg kg^{-1} in *Alfisols and Vertisols*, respectively of study area (Table 2). Considering deficient (<0.2), sufficient (0.2-0.4) and high (>0.4 mg kg^{-1}) level of DTPA-extractable Cu as critical limit (Follett and Lindsay, 1970) in table 4.2, 94.4% soil samples were found to be in higher level, 4.5% soil samples were found to be in sufficient level and only 1.0% in deficient available content of Cu, in soils of Bambhanidih block (Table 2). A major group of soils fell under higher level of available copper (>0.4 mg kg^{-1}) having 95.4% and 79.4%, in *Alfisols and Vertisols*, respectively of Bambhanidih block.

Most of the soil samples were found under high level in available Cu content with a model class of >0.4 mg kg^{-1} DTPA-extractable Cu (Table 2). Kumar *et al.*, (2009), Rajeshwar *et al*., (2009), Meena *et al.*, (2006), Jatav (2010), Shukla (2011) and several other workers reported available copper in similar range.

Available Fe status

Table 3. Distribution of available iron status in surface soils of Bambhanidih block

Available Fe (mg kg^{-1})		Alfisols		Vertisols		Total (%)
		No. of Samples	% Samples	No. of Samples	% Samples	
Deficient	<4.5	4	0.7	0	0	0.7
Sufficient	4.5-9	58	10.7	5	14.7	10.95
High level	>9	479	88.5	29	85.3	88.3

The available Fe content ranged from 4.1 to 57.1 and 5.9 to 48.3 mg kg^{-1} with an average of 23.1 and 25.3 mg kg^{-1} in *Alfisols and Vertisols*, respectively of study area (Table 1). These findings corroborate with results as reported by Rajeshwar *et al.* (2009) in soils of Krishna district of Andhra Pradesh and also confirm the findings of Singh *et al.* (2009) in the DTPA-extractable Fe in the soils of district Gajipur, Uttar Pradesh.

Similar results were also reported by Jatav (2010) in the soils of *Inceptisols* group of Baloda block of Janjgir-Champa district of Chhattisgarh and Shukla (2011) in the *Inceptisols, Alfisols* and *Vertisols* orders of Pamgarh block in Janjgir-Champa district (C.G.).

Considering 4.5 mg kg^{-1} DTPA-extractable Fe as critical limit (Table 3) (Lindsay and Norvell, 1978), 0.7% soil samples were found deficient, and 10.95% found sufficient however, 88.3% samples recorded higher level of available Fe content (Table 3). High available Fe content in soils of Bambhanidih block might be due to its topography and cultivation of rice, which induced prolonged submergence coupled with reducing conditions. Majority of the soils were not deficient in Fe as the amount of iron required by crops is being released by iron bearing minerals in these soils. The soil pH had reverse effect on the availability of Fe content in soil. It was concluded from the table 3 that 88.5% and 85.3% samples recorded higher level of Fe and 0.7% and 0% samples observed deficient level of Fe, where as 10.7 and 14.7% samples recorded sufficient Fe in *Alfisols and Vertisols*, respectively.

CONCLUSION

It can be concluded from the above results that most of the *Alfisols* and *Vertisols* of Bambhanidih block in Janjgir-Champa district of Chhattisgarh showed most of soil samples tested observed high level of DTPA-extractable Fe and Cu observed in study area (Table 2-3). Hence, the soils require attention regarding nutrient management practices and regular monitoring of soil health for better crop production, in future.

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