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Analysis of Micronutrients in Soils from Bagalkot

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Abstract: *Micronutrients are vital for plant growth and human health. Soil and foliar applications are the most prevalent methods of micronutrient addition but the cost involved and difficulty in obtaining high quality micronutrient fertilizers are major concerns with these in developing countries. Although required in minute quantities however, micronutrients have the same agronomic importance as macronutrients and play vital roles in the growth of plants. The transformation from the fallow and shifting cultivation practices prevalent among farmers to intensive continuous cultivation of soils and the use of improved crop varieties which take up many nutrients from the soil are major causes of deficiency of these micronutrients. A total of 36 composite soil samples were collected at 0-15 and 15-30 cm depths from different taluka, purposively selected representative locations of Badami,Bilagi,Hunagund,Jamakhandi,Mudhol and Bagalkot of Karnataka State, Standard laboratory methods were used to determine the micronutrients of the soil samples.*

Keywords: *Micronutrients, Soil properties, zinc,iron, Copper, manganese, etc.*

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I. Introduction

Micronutrients are metallic chemical elements necessary for plant growth in only extremely small amounts. Although required in minute quantities however, micronutrients have the same agronomic importance as macronutrients and play vital roles in the growth of plants [1]. Macronutrients (N, P and K) and Micronutrients (Fe, Mn, Zn, and Cu) are important soil elements that control its fertility. Top soil confine humus, an important food resource for plants, which increase biological activity, soil fertility and control the air and water content of soil [2]. The importance of soil fertility and plant nutrition to the health and survival of all life is well understated. As human population continue to increase, human disturbance of earth's ecosystem to produce food and fiber will place greater demand on soils to supply essential nutrients. Agriculture refers to an art of raising plants from the soils and is one of the most economical factors for human beings. Agriculture is largely influenced by controlling factors like climate, soil topography while soil erosion is a serious problem for agricultural productivity. Soil fertility is only one of the determinant components of soil quality. Fertile soils are able to provide the nutrients required for the growth of the plant. They are the chemical components of soil. Some plants need certain nutrients in large amounts, such as nitrogen, phosphorous, and potassium, which are called macronutrients. Other nutrients, such as boron and manganese, are needed in minute quantities. In high - quality soil, nutrients are available at rates high enough to supply plants needs, but low enough that excess nutrients are not leached into groundwater or present at high levels toxic to plants and animals. There is a growing concern about the possibility of soil contamination resulting in uptake by plants and the introduction of the elements in the vital food chain which affect the food safety. Thus, the knowledge of built up of nutrients in the soil of cultivated areas is an important criterion to recognize potential ecological problems. The situation is even more worrisome in the developing countries where research efforts toward monitoring the environment have not been given desired attention by the stakeholders. The transformation from the fallow and shifting cultivation practices prevalent among farmers to intensive continuous cultivation of soils and the use of improved crop varieties which take up many nutrients from the soil are major causes of deficiency of these micronutrients. In general Soil chemical fertility and in particular lack of nutrient inputs is a major factor in soil degradation [3] and hence tropical soils often have negative soil nutrient balances[4] because of inherent low fertility status, inappropriate land use, poor management, erosion and salinization [5] To boost and sustain rice yield [6] suggested soil management practices defined for identified units instead of a common management for all units. This study aimed to determine the status of micronutrients in soils of different parent materials and relate the extractable micronutrients with some soil properties of Bagalot district of Karnataka State. This is with a view to optimizing the productivity of these soils for agricultural production. Estimation of the nutrient contents and their forms is important in assessing the nutrient supply of the soils to the crops which largely helps in the scientific nutrient management. Analysis of Macronutrients, Micronutrients from the rice field soils has been done by Atomic absorption Spectroscopy and other conventional chemical methods.

II. Materials And Methods

The soil sample collected is good representative soil samples is first criteria applied. The analytical results are expected to be representative for the entire field. With the help spade contaminated surface soil material was removed [7] and by digging V shaped holes, up to a depth of 22cm, a uniform 2cm thick slice of soil samples were collected in a plastic bucket. These collected samples were air dried and thoroughly mixed on a piece of clean cloth and the bigger lumps were broken using wooden pestle and mortar [8]. The soil particles were disaggregated, crushed and sieved with 10 mesh diameters, stored in glass bottles and labeled.

Table.NO 1. Micronutrients in Bagalkot district

Sr no	Taluk	villages	Cu in ppm	Fe in ppm	Zn in ppm	Mn in ppm
1	Bilagi	Herakal	2.50	5.94	3.16	13.62
2		Tumbarmatti	2.10	3.96	1,52	20.82
3		Sunaga	1.32	3.50	3.12	17.00
4		Anagawadi	5.26	5.54	1.10	27.22
5		Rolli	0.88	3.00	0.84	11.84
6		Girisagar	1.24	4.52	2.74	14.22
7	Badami	Hosur	1.78	6.88	1.32	23.10
8		Jalihal	1.64	11.6	1.30	15.94
9		Mangalore	1.02	6.28	2.46	19.82
10		Katarki	1.80	6.14	3.10	24.48
11		Shirur(Danak)	1.00	0.04	0.78	10.70
12		Yankanchi	2.26	7.88	1.14	21.02
13	Hunagund	Chikkamagi	1.98	10,48	1.08	24.56
14		Kairwadagi	1.94	11.10	0.06	23.18
15		Hirebadawadgi	2.96	6.94	1.02	16.14
16		Ganjihal	1.82	8.46	1.28	19.56
17		Hunagund	2.40	0.92	1.54	24.2
18		Bannikatti	0.72	10.94	1.48	18.68
19	Mudhol	Ingalagi	4.52	13.90	3.32	25.72
20		Malali	6.18	12.36	5.22	30.2
21		Akkimardi	7.98	17.06	3.94	30.78
22		Malapur	3.00	11.32	0.07	20.04
23		Ontagodi	5.88	13.42	2.70	31.82
24		Jiragal	4.72	9.60	2.22	31.64
25	Jamakhandi	Jambagi	6.96	11.96	0.08	31.84
26		Chikkapadasalagi	8.16	11.4	5.42	32.08
27		Surapali	9.76	8.14	5.16	32.02
28		Kadakol	8.36	10.1	4.28	31.82
29		Nagur	4.08	4.78	5.32	31.90
30		Sannal	4.96	5.68	5.76	31.86
31	Bagalkot	Bevur	2.34	7.72	1.68	31.04
32		Bodanyakdinni	1.80	7.12	0.98	30.82
33		Achanur	2.74	7.10	1.88	31.44
34		Bagalkot	2.45	7.78	1.78	31.24
35		Bevinmatti	3.82	7.86	6.78	31.90
36		Choudapur	3.92	11.28	1.54	15.64

The extractable micro nutrients: Cu, Fe, Zn and Mn were extracted using 0.1M HCL solution. Osiname et.al. [9] determined on an atomic absorption spectrophotometer (Model 210) at appropriate wave length.

III. Results And Discussion

The micronutrient distributions of the soils of Bagalkot district are shown in table 1 and Fig.1 &2

Fig.1 Bilagi,Badami,Hunagund and Mudhol taluka micronutrient distribution

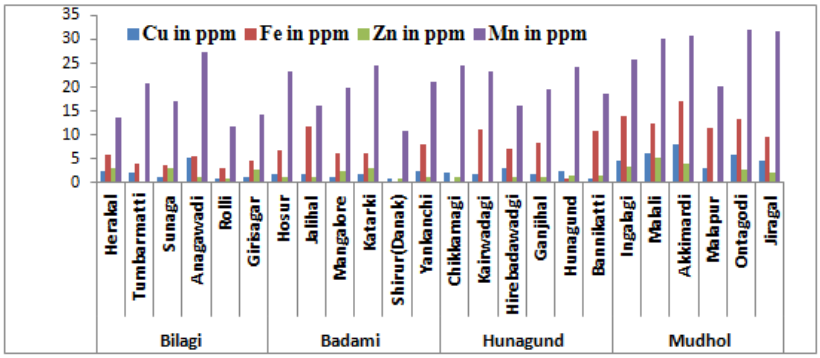
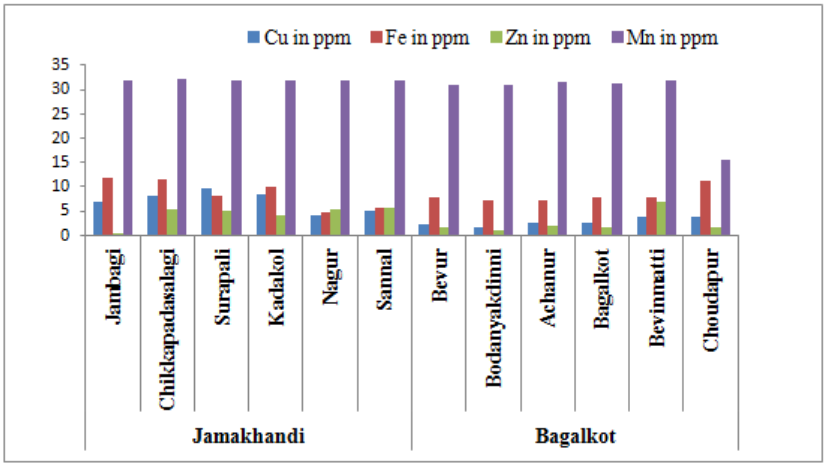


Fig.2 Jamakhandi and Bagalkot taluka micronutrient distribution



Cupper: The contents of available copper ranged from 0.88 ppm in Rolli to 5.26 ppm in Anagawadi of Bilagi taluka, from 1.00 ppm in Shirur to 2.26 ppm in Yankanchi of Badami taluka, from 0.72ppm in Bannikatti to 2.96 ppm in Hirebadawadgi of Hunagnd taluka, from 3.0ppm in Malapur to 7.98 ppm in Akimaradi of Mudhol taluka, from 4.08 in Nagur to 9.76 ppm in Surpali of Jamakhandi taluka and from 1.80 ppm in Bodanyakdinni to 3.92 ppm in Choudapur of Bagalkot taluka respectively. Based on Esu [10] nutrients fertility ratings the values fell within the "high" categories.

Iron: Iron varied widely from 3.00 in Rolli to 5.94ppm in Herkal of Bilagi taluka, in Badami taluka iron ranged from 0.04 ppm n Shirur to 7.88ppm in Herkal of Badami taluka, In Hunagund taluka from 0.94 ppm in Hunagund to 10.94 ppm in Bannikatti, in Mudhol taluka from 9.60 ppm in Jirgal to 17.06ppm in Akkimardi, In Jamakhandi taluka from 4.78ppm in Nagur to 11.96 ppm in Jambagi and in Bagalkot taluka from 1.80ppm in Bodanyakdinni to 3.92ppm in Choudapur respectively which are also very high as the normal range for Fe is 2.5 to 4.5 ppm. Fe in the soils are relatively above the critical available levels of 2.09-3.77 $mgkg^{-1}$ available Fe reported by Adiloglu [11], and a range 3.0-4.5 $mgkg^{-1}$ Fe reported previously by Sillanpaa[12], Osiname[13,14] reported higher values of extractable Fe in soils of highly ferruginized Nupe sandstones and shale in Benue Valley, Nigeria.

Zinc: Zn varied widely from 0.84 ppm in Rolli to 3.16 ppm in Herakal of Bilagi taluka, Badami taluka from 0.78 ppm in Shirur to 3.10 ppm in Katarki, Hunagund taluka from 0.06 ppm in Kairwadagi to 1.54 ppm in Hunagund, Mudhol taluka from 0.07 ppm in Malapur to 5.22 ppm in Malali, Jamakhandi taluka from 0.08 ppm in Jambagi to 5.76 ppm in Sannal and Bagalkot taluka from 0.98 ppm in Bodanyakdinni to 6.78 ppm in Bevinmatti respectively. But, these are within the critical range of 1.0-5.0 $mgkg^{-1}$ reported by Deb and Sakal [15]. The result obtained in this study suggests that, most of the Bagalkot soils are rated low. In the deficiency of zinc upper leaves will show chlorosis on midrib. The excess of zinc shows the Fe deficiency will develop.

Mangnese: The deficiency of manganese shows interveinal yellowing of young leaves but not tending towards whiteness whereas the excess manganese older leaves will show brown spots surrounded by a chlorotic zone and circle. Manganese content in the normal soils range from 1.02 to 2.5ppm and since the soils samples from the study area show the value of manganese content in Bilagi taluka was found to be ranged from 11.84 pp in Rolli to 27.22 ppm in Anagawadi in different soil samples, the soils are highly enriched in Mn. In Badami taluka manganese ranged from 10.70 ppm in Shirur(Danak) to 24.48 ppm in Katarki village. In Hunagund taluka varied from 11.14 ppm in Hirebadawadgi to 24.56 ppm in Chikkamagi. Mudhol taluka manganese content is rich compared to other taluka and ranged from 20.14 ppm in Malapur to 31.82 ppm in Ontagodi. Jamakhandi taluka manganese ranged from 31.82 ppm in Kadakol to 32.08 ppm in Chikkapadasalagi, the soils are still highly enriched in Mn.Bagalkot taluka contnt varied from 15.64 ppm in Choudapur to 31.90 ppm in Bevinmatti village.These values are rated "High" according to Esu[16] fertility rating. This implies that the soils contain sufficient Mn for successful agriculture in the area studied as they are above the critical limits of 1- 4 mg kg^{-1} [17] and 1-5 mg kg^{-1} reported by Esu. The values obtained are higher than the 7.89-12.00; means= 9.10 mg kg-1 obtained by Mustapha [18] for the Ustults in Bauchi state, Nigeria.

IV. Conclusions

It is concluded that the soils from the study area are enriched in micronutrients like Zn, Mn, Cu, Fe although they show varying range. Generally, Cu was found to be in the medium category while Zn was generally high in all Taluka. However, the soils contained Fe and Mn above the critical limits for crop production and categorized as "high". This might be a potential environmental problem as they may, upon

complex reactions, result in the formation of plinthite / petroplinthite leading to hard pan formation; restricting rooting depth and causing infiltration and drainage problem in the soils of Bagalkot district.

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