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Soil Micronutrient Variations in Paddy Fields of Honnali Taluk, Davanagere District, Karnataka

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ARTICLE DETAILS

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ABSTRACT

An investigation was carried out to know the micro nutrients variations of Honnali Taluk soil samples. During the study periodic trips were made for sample collection. The soil samples were collected from different villages of Honnali Taluk viz., Ujjainipura, Chikkabasur, Beeragondana halli, Sadashivapura, Hotyapura, Rampura, Benakanahalli and Kambaraghatte. Collected soil samples were subjected for estimation of micronutrients and physico-chemical properties. The results revealed that micronutrients were observed in Benakanahalli followed by Chikkabasur, Hotyapura and least were observed in Beeragondanahalli. And highest organic matter content was recorded in Kambaraghatte soil samples.

1. Introduction

Indian economy is agriculture. Supply of food is the major concern due to increasing population and low per capita income. To fulfill the food need of the population more and more efforts are put in to increase the productivity. Maximum land is brought under agriculture, improved irrigation systems are being developed and use of chemical fertilizer sand pesticides is a common practice. It is being observed that over use of these chemicals reduce the soil fertility and productivity. There are many ways to resolve soil fertility problems and improve soil fertility. Use of Blue Green Algae (BGA) is a common practice. The agricultural importance of BGA in rice cultivation is directly related with their ability to fix Nitrogen and other positive effects for plants and soil (Saadatnia and Riahi, 2009). BGA are known to induce early germination and production of healthy plantlets. It was also observed that the presence of BGA is soil increases the total organic carbon and facilitated microbial growth in the rhizosphere area that supports better plant growth (Rao and Burns, 1990). Blue-green algae (BGA) are photosynthetic prokaryotic microorganisms some of which are capable of nitrogen fixation. Such trophic independence with regard to nitrogen and carbon, together with a great adaptability to variations of environmental factors enables BGA to be ubiquitous (Fogg *et al* 1973). The paddy field ecosystem provides an environment favorable for the growth of BGA with respect to their requirements for light, water, high temperature and nutrient availability. This may account for the higher abundance of BGA in paddy soils compared to other cultivated soils. The agricultural importance of BGA in rice cultivation is directly related with the ability of certain forms to fix nitrogen.

2. Materials and Methods

For the investigation of variation in micro-nutrients and other physico-chemical properties of soil in Honnali Taluk 120 soil samples were collected across the different villages. Soil sampling for all sites was carried out according to a standard protocol. Soil samples were analyzed for micro- nutrients and various physico-chemical properties of soil samples using standard procedures. The pH of the soil samples was determined following Jackson(1973). The oven dried soil sample weighing 12.5g was suspended in 25 ml of distilled water and stirred continuously. The pH was measured using calibrated pH meter. It was determined in soil water suspension using digital conductivity meter as described by Jackson, 1973.The Organic carbon estimated by using the Walkley-Black (1934) Rapid Titration method *i.e.* wet combustion method.

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DTPA offers the most favorable combination of stability constants for the simultaneous complexing of Zn, Cu, Fe and Mn (Lindsay and Norvell, 1978).And Determination of these micronutrients in soil samples done using Atomic Absorption Spectrophotometer method. The Boran was analyzed by Azomethan H Method (John *et al.*,1975).

3. Results and Discussion

Table1. Variation in micronutrient sin soils of different villages of Honnali Taluk

Villages of Honnali Taluk	pH	Electrical conductivity (d Sm^{-1})	Organic carbon (%)	Zinc (ppm)	Copper (ppm)	Iron (ppm)	Mn (ppm)	Boran (ppm)
Ujjainipura	5.37	0.231	0.23	1.205	0.546	30.13	12.55	0.933
Chikkabasur	6.18	0.253	0.25	1.787	0.469	42.05	12.86	1.119
Beeragondanahalli	7.28	0.140	0.14	0.887	0.357	13.29	5.37	0.749
Sadashivapura	6.58	0.266	0.27	1.441	0.389	16.02	10.91	0.766
Hotyapura	7.22	0.160	0.16	1.015	0.307	15.66	4.16	0.762
Rampura	6.39	0.209	0.21	1.311	0.331	40.02	9.73	1.220
Benakanahalli	5.91	0.278	0.28	1.908	0.397	33.52	13.75	1.419
Kambaraghatte	5.65	0.317	0.32	1.541	0.523	51.92	14.07	1.435

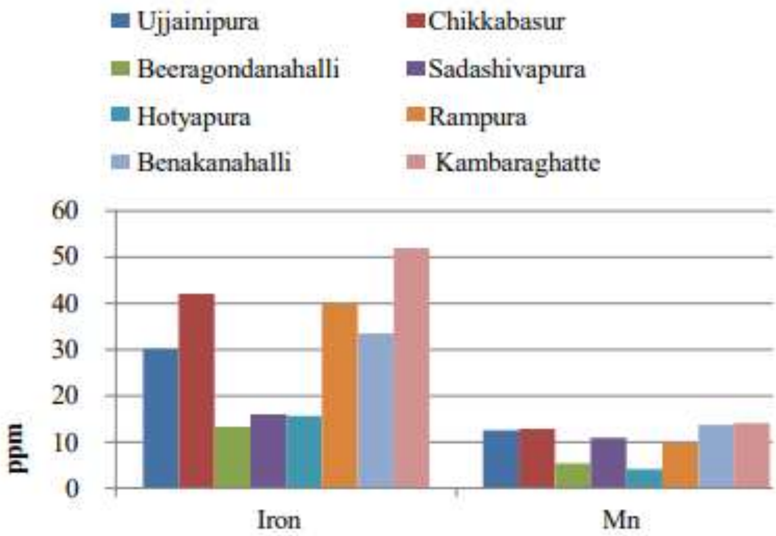

Fig.1 Iron and Manganese variation different villages of Honnali Taluk

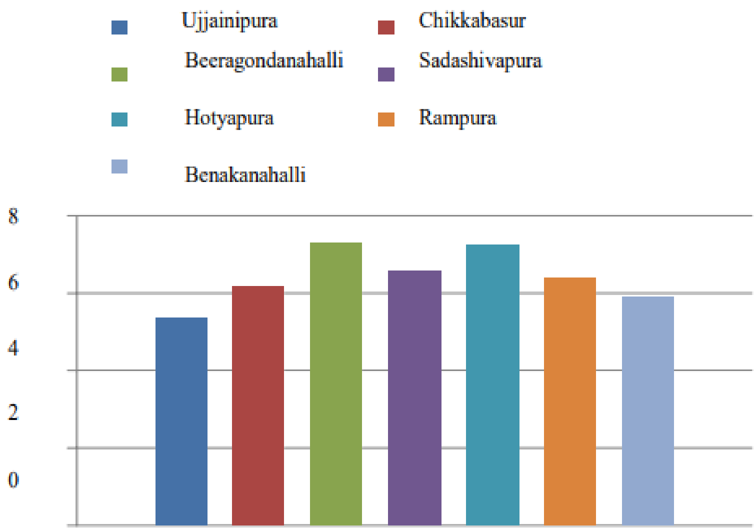

Fig.2 Zinc, copper and Boron variation different villages of Honnali Taluk

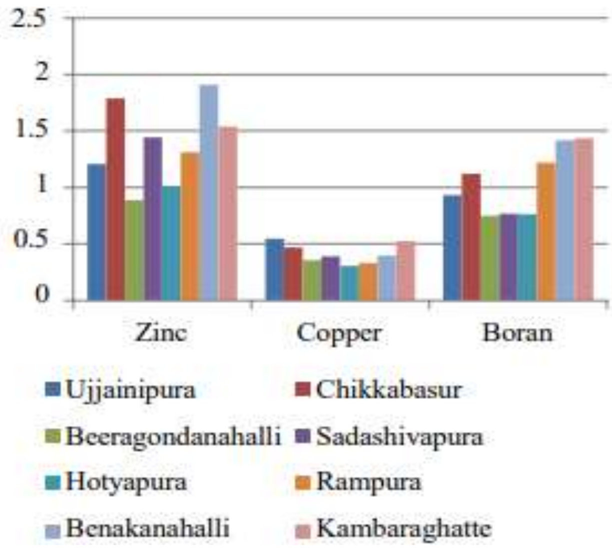

Fig.3 Soil reaction variation in different villages of Honnali Taluk

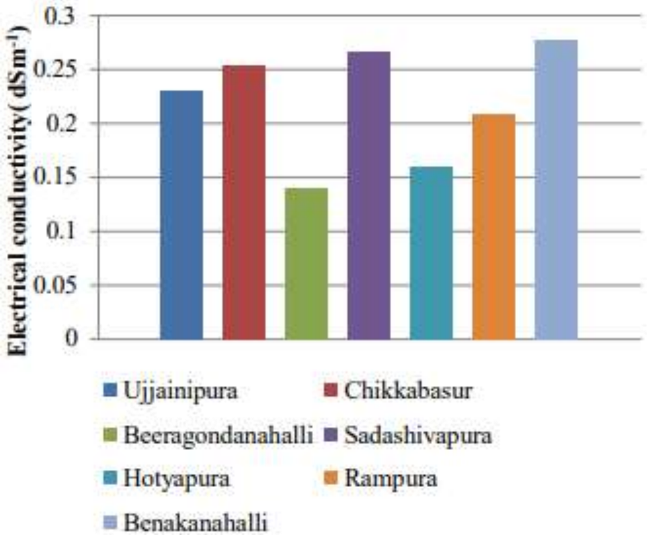

Fig. 4 Electrical conductivity (dSm^{-1}) variation different villages of Honnali Taluk

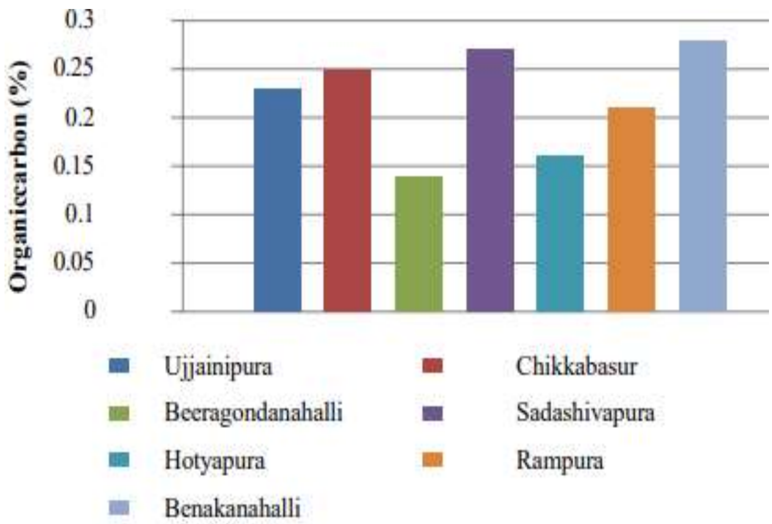

Fig.5 Organic carbon variation different villages of Honnali Taluk

Fe concentration in soil was attributed to accumulation of Fe and Al through laterization process under high rainfall region. Significant results were observed through the study with respect to the micro- nutrient and soil properties and data were presented in Table 1 and Fig. 1,2,3,4 & 5. Status of micro-nutrient in Ujjainipra soil sample varied significantly, the available Zinc content ranges from 0.68 to 3.10ppm with a mean of 1.2 ppm which is high in range. The available Fe content recorded maximum of 70ppm with a mean of 30.13 ppm followed by Mn (12.55 ppm), boron (0.93 ppm) and copper (0.55 ppm). The concentration of Manganese ranges from 7.26 ppm to 16.69 ppm, whereas low concentration of copper recorded among micro-nutrients which range from 021 ppm to 0.78 ppm. It is interesting to note that concentration of boron is higher in soils and ranges from 0.42ppm to 1.92 ppm which is considered as higher in range. The higher levels of Zinc and boron in soils maybe due to application of Zinc sulphate and boron to rice field where more adsorption of boron on surfaces of Fe and Al oxides. The higher available micro-nutrient (DTPA Extractable) status of high in the soils of Chikkabasur. However, among the micronutrients concentration of Fe and Mn recorded maximum (42.05ppm &12.86ppm) followed by Zinc (1.79ppm), Boron (1.12ppm) and Copper (0.47ppm). It clearly indicates that as the organic carbon contents high the availability of micronutrient in soil increased in the soil irrespective of soil pH. However there is no correlation found between soil pH with available micronutrients in soil. The DTPA Extractable micro-nutrients like Cu(0.21-0.69ppm),Mn(1.10-14.30 ppm), Zinc(0.39-1.72 ppm) and Boron(0.34-1.02ppm) are medium in range except Fe(5.18-28.18ppm) which recorded high in range. From the data of soil samples of Beeragondanahalli revealed that Organic carbon positively correlated with Nitrogen, Zinc Iron and Manganese. Availability of DTPA extractable Zinc (0.28-1.94ppm),Cu(0.13-0.62ppm), Mn (0.5-15.5ppm) and Boron (0.14-1.61 ppm) are medium in range except Fe which recorded higher in concentration (6.48-37.44 ppm) with mean of 15.66 ppm in soil samples of Hotyapura. The higher concentration of Fe is due to parent material rich in Iron from which soils formed are red sandy loam soils.

The DTPA extractable Zinc, Cu, Mn and Boron ranges from medium to high in samples of Benakanahalli. However the available Iron and Manganese concentration recorded higher in range with mean of33.52 ppm and 13.75 ppm respectively. Availability of Zinc Cu and Boron with mean values of 1.91 ppm, 0.40 ppm, 1.42 ppm respectively. As regard to micro-nutrients of Kambaraghatte soil samples is concern the DTPA extractable Zn,Cu Fe, Mn and Boron recorded higher concentrations. However among the micro-nutrients mean value of Iron and manganese recorded higher concentration (51.92&14.07ppm) followed by Zinc, boron and copper (1.54 ppm,1.43 ppm & 0.52 ppm).

The concentration of DTPA extractable Zinc, Iron, Manganese, Copper and Boron content is high in Sadashivapura soil. However among the micro-nutrients concentration of Fe and Mn recorded higher concentration than other. The DTPA extractable Fe recorded higher concentration and ranges from 10.36 to 74.30 ppm with mean of 40.02 ppm followed by Manganese which recorded 4.90 to 16.38 ppm with mean of 9.73 ppm in Rampura soil. The concentration of Boron and Zinc recorded medium in range with mean of 1.31 and 1.22 ppm. The lowest concentration of Copper recorded in range of 0.1 to 0.75 ppm with mean of 0.33 ppm.

4. Conclusion

Micronutrient refers to the relative quantity of a nutrient that is required for plant growth. It takes part in metabolic activities, enzymatic process/catalysts etc. Thus these all directly and indirectly help in plant growth and development. There are 8 essential plant nutrient elements defined as micronutrients like boron (B), zinc (Zn), manganese (Mn), iron (Fe), copper (Cu), molybdenum (Mo), chlorine (Cl) and silicon (Si). They constitute in total less than 1% of the dry weight of most plants. Organic sources like farm yard manure, compost, vermicompost etc. Micronutrients for different soils and the effect of manipulating the soil physical environment and its moisture regimes on plant available micronutrients need to be generated. Continuous use of farmyard manure or of other organic sources arrests the depletion of available micronutrient pools from soils. Development of integrated micronutrient technology using available organic materials is needed not only to increase micronutrient use efficiency but also to decrease the pressure on the use of costly inorganic micronutrient carriers. Field experiments have proved the superiority of zinc sulfate as a zinc carrier. Increasing costs coupled with a shortfall in supply of zinc sulfate have necessitated investigations on evaluating sparingly soluble zinc sources or ores combined with zinc mobilizers. The residual availability of various sources of micronutrients for a cropping system needs to be worked out.

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