Int.J.Curr.Microbiol.App.Sci (2019) Special Issue-9: 230-235

EXCELLENT PUBLISHERS

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 Special Issue-9 pp. 230-235
Journal homepage: http://www.ijcmas.com

Original Research Article

Soil Fertility Status of Available Micronutrients and Mapping in Beguru Microwatershed of Tarikere Taluk of Chikkmagaluru District, Karnataka, India

D. Ravi Kumar*, D. Balaji Naik, K.T. Gurumurthy, Ganapathi, A.N. Raghu, B.C. Dhanjaya, H.S. Sindhu and Anantakumar Patil

Department of Soil Science and Agricultural Chemistry, University of Agricultural and Horticultural Sciences, Shivamogga- 577204, India

**Corresponding author*

A B S T R A C T

To know the soil available micronutrients status of Beguru microwatershed of Tarikere taluk of Chikkmagaluru district. The investigation was conducted at college of Agriculture Shimoga. Surface (103) soil samples were collected grid-wise by using cadastral map of study area and were analyzed for their fertility status. The value of pH, electrical conductivity, and organic carbon was ranged from 5.21 to 9.27, 0.035 to 0.507 dS m^{-1} and 0.39 to 1.28 g kg^{-1} respectively. Available micronutrients iron, manganese, zincs and copper was ranged from 4.17 to 21.70 mg kg^{-1}, 2.74 to 17.50 mg kg^{-1}, 0.16 to 1.10 mg kg^{-1}, 0.41 to 2.49 mg kg^{-1} respectively. Available micronutrients such as Zinc are deficient but iron, manganese and copper were sufficient in these soils of micro-watershed.

Keywords

Toposheet, Cadastral maps, Grids and GPS

Introduction

Role of balanced plant nutrition is well-established for sustainable agricultural production. Present agricultural systems are exploitive of nutrients through intensive tillage, monocropping year after year, use of high yielding varieties, imbalanced use of nutrients coupled with limited use of organic manures, less recycling and burning of crop residues, soil erosion, undulated topography and indiscriminate use of irrigation water. Similarly, different cropping systems are suitable for different soil groups as regards to production and productivity. For understanding the reasons of deficiency of available nutrients in soils, correlation of physical chemical properties with available micronutrients was needed. Also, detailed study on status of micronutrients in different soil groups in Beguru village of Tariker taluk of Chikkmagaluru district of Karnataka had not been undertaken so far. Hence, present investigation was undertaken to study the status of micronutrients in Beguru microwatershed of Tariker taluk of Chikkmagaluru distric, Karnataka.

Materials and Methods

The study area is a Beguru microwatershed, covering an area of 757.24 ha. The district lies in the center of Karnataka between the latitudes 13° 45’ and 51° 92' N and between the longitudes 76° 6' and 57° 41' E. The average rainfall in study area is 797 mm. The survey of India toposheet (57 A/6) was used to prepare base maps covering village of Beguru, this microwatershed. The cadastral map having parcel boundaries and survey members are produced from KSRSAC Bangalore. The boundary of the micro watershed was obtained from the watershed Atlas prepared by KSRSAC. The survey of India toposheet (57A/6) with 1:50.000 scales was also used along with satellite imagery, google earth maps for updating the base map. A surface soil sample from 0 to 30 cm was collected at 320 m x 320 m grid samples in the study area. A total of 103 samples were collected from the fixed grid points. The processed samples were analyzed for physical chemical properties and available nutrients using standard procedure (Table 1).

Micronutrients (Fe, Zn, Cu and Mn) were extracted by DTPA reagent using the procedure outlined by Lindsay and Norvell (1978) and that of available zinc, iron, copper and manganese interpreted as deficient and sufficient by following the criteria given in Table 1.

Results and Discussion

Using the field survey, and laboratory analysis results, the soil heterogeneity units were determined using remote sensing and GIS by following the guidelines of Soil Survey Staff (1999). A dbf file consisting of data for X and Y co-ordinates in respect of sampling site location was created. A shape file (Vector data) showing the outline of Beguru village. The dbf file was opened in the project window and in X-field, X-coordinates were selected and in Y-field, Y-coordinates were selected. The Z field was used for different nutrients. The Beguru village shape file was also opened and from the surface menu of Arc view spatial analyst “Interpolate grid option” was selected. On the output “grid specification dialogue”, output grid extend chosen was same as Beguru village shape and the interpolation method employed was spline. Then map was reclassified based on ratings of respective nutrients.

The soil pH of the micro watershed ranged from slightly acidic to alkaline (Table 1) of Beguru micro watershed of Chikkamagaluru district. Soil reaction was acidic to alkaline in soils (range 5.21-9.27). The variation in soil pH was related to the parent material, and topography.. The relatively low pH in red soils was mainly due to iron hydroxide species which contributed for higher for higher H^+ concentration (Dasog and Patil, 2011). On area basis, 87 ha (11.52 %) was moderately alkaline, 149 ha (19.66 %) slightly acid 263 ha (34.79 %) neutral and 87 ha (11.33%) slightly alkaline nature in Micro-watershed area (Fig. 1).

Table.1 Soil fertility status of Beguru microwatershed of Tarikere taluk of Chikkamagluru district

Parameters	Range	Mean
pH	5.21-9.27	6.97
EC(dsm^{-1})	0.035-0.507	0.214
OC(g kg^{-1})	0.39-1.28	0.72
Iron (mg kg^{-1})	4.17-21.70	11.84
Manganese (mg kg^{-1})	2.74-17.50	9.85
Zinc (mg kg^{-1})	0.16-1.10	0.46
Copper (mg kg^{-1})	0.41-2.49	1.12

Fig.1 pH, EC and OC status of Beguru microwatershed of Tarikere taluk of Chikkamagluru District

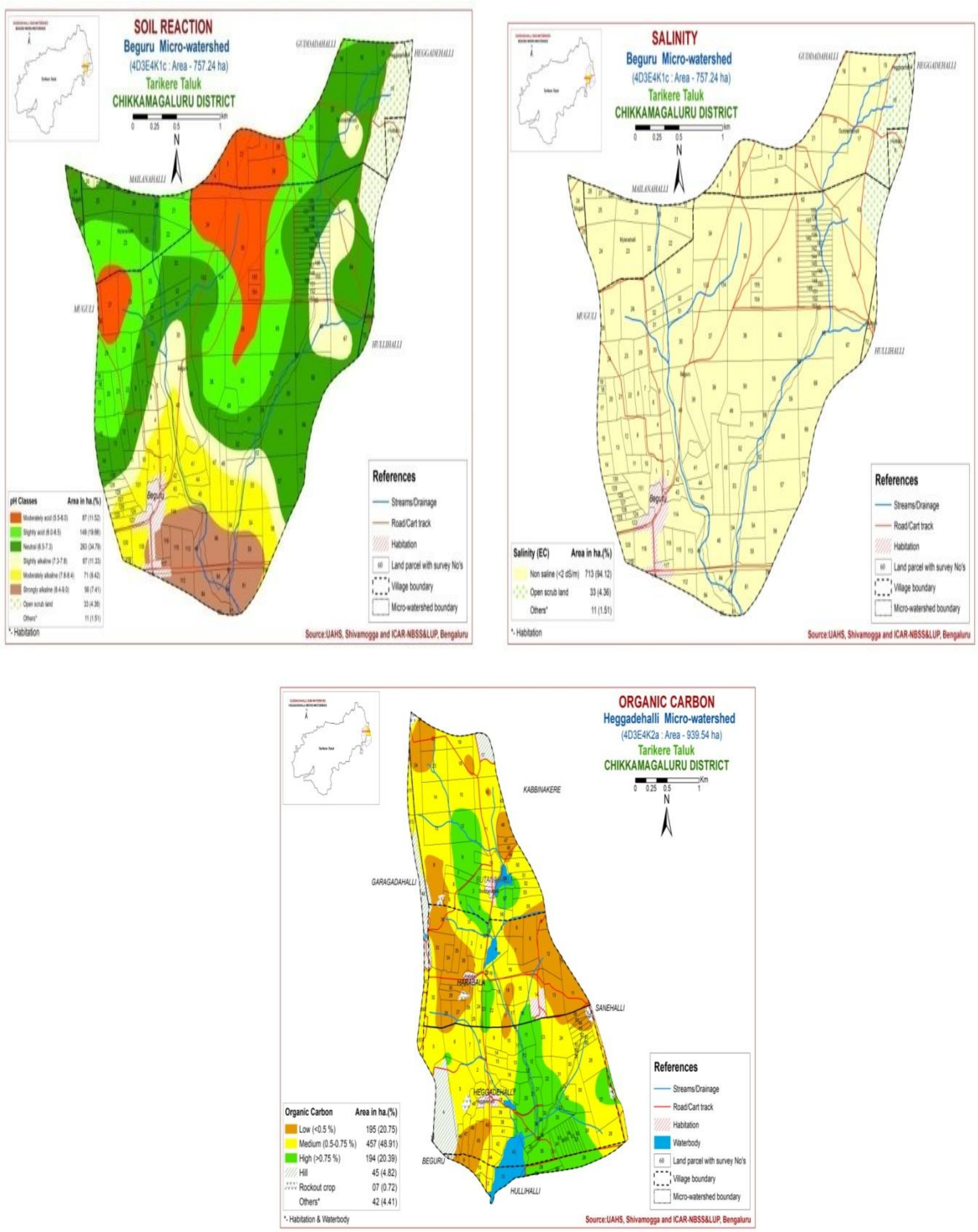
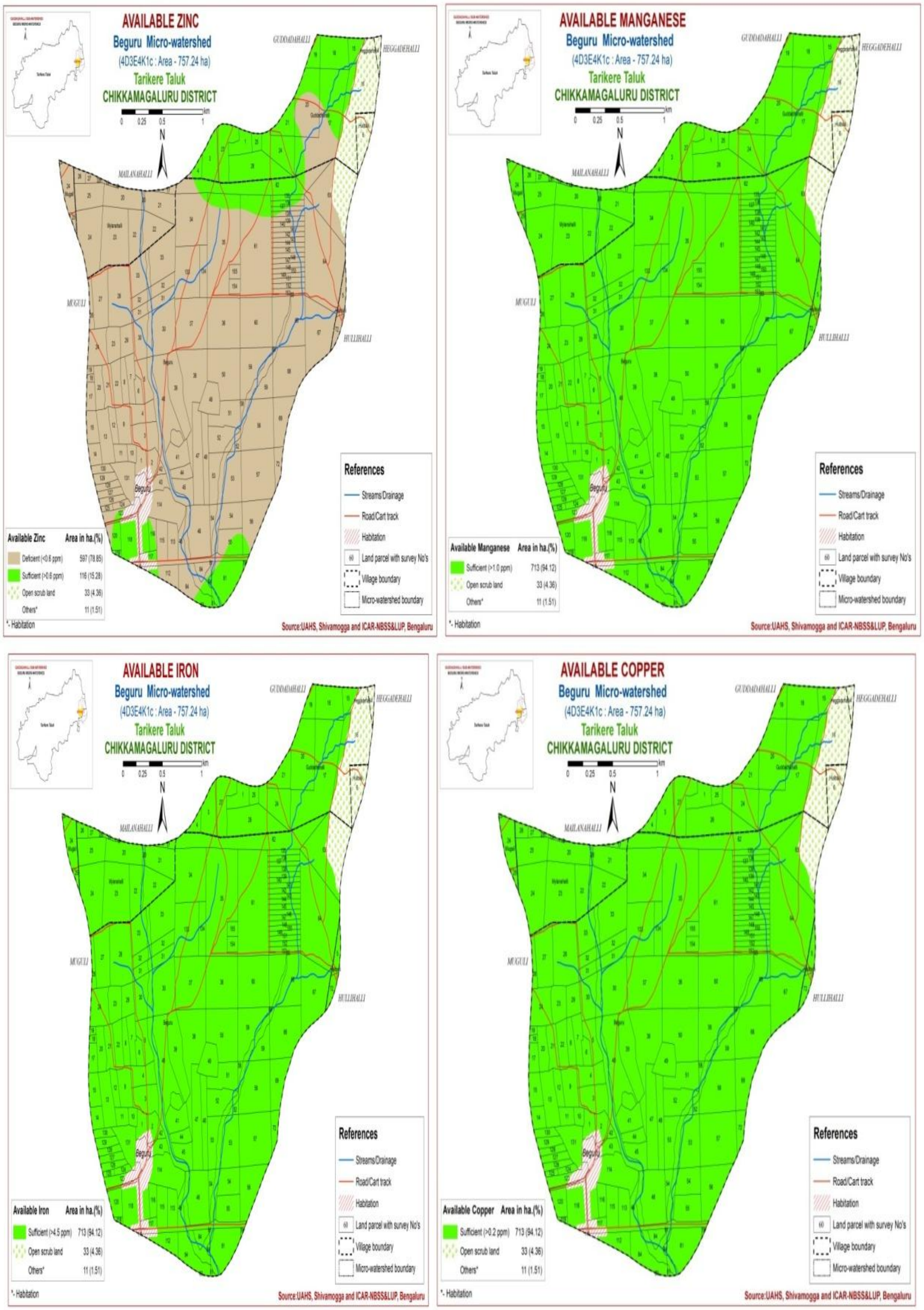


Fig.2 Available Fe, Mn, Cu and Zn status of Beguru micro watershed of Tarikere taluk of Chikkamagluru district



The electrical conductivity values were very low (0.035-0.507 dS m^{-1}) indicating that the soils of selected micro watershed were non saline in nature (Table 1). This may be due to undulating nature of the terrain coupled with fairly good drainage conditions, which favored the removal of released bases by the percolating drainage water. In all the soil samples electrical conductivity was lesser than 4 dS m^{-1} which was below the safe limit. This indicates non-saline in nature of the soils. This may be due to undulating nature of the terrain coupled with fairly good drainage conditions, which favored the removal of released bases by the percolating drainage water (Shivaprasad *et al.,* 1998). On area basis, total of 713 ha (94.12 %) are non- saline in nature (Fig. 2).

The soil organic carbon content (SOC) was medium in majority of soil samples and it ranged from accounting 100 per cent in micro- watershed area. Patil *et al.,* (2011) reported that soils of semi-arid type of climate with temperature prevailing in the area resulted in low to medium organic carbon content.

The low organic matter content in the soils was attributed to the prevalence of tropical condition, where the degradation of organic matter occurs at a faster rate coupled with low vegetation cover, thereby leaving less organic carbon in the soils (Sireesha and Naidu, 2013).

The available iron content in micro-watershed ranged from 4.17 to 21.70 mg kg^{-1} with the mean of 11.84 mg kg^{-1} these soil is high in iron content. About 713 ha (94.12 %) of the study area high while 33 ha (4.36 percent) had deficient in available iron status of study area (Fig. 2). This may be due to the granite gneiss parent material which is known to possess higher iron content. The low availability of iron in this soil (Rajkumar, 1994) was attributed to its precipitation by $CaCo_3$ and decreases the availability.

The available manganese content in microwatershed ranged from 2.74-17.50 mg kg^{-1} and was higher with 9.85 mg kg^{-1} in these soils (Table 1 and Fig. 2). The higher available manganese content in red soils attributed to its higher content in granite genesis parent material. Rajkumar *et al.,* (1994) relatively lower available manganese content in black soils coupled with semi-arid conditions resulting in conversions of Mn^{2+} to Mn^{3+} form. Srikanth *et al.,* (2008) reported that higher available manganese content in soils originated from granite genesis parent material with semi- arid climate. The available zinc content of micro watershed area ranged from 0.16-1.10 mg kg^{-1}. The available zinc was lower in this soil range of 0.46 mg kg^{-1}. The larger extent of zinc deficiency was attributed to the alkaline soil condition and richness of $CaCO_{3.}$ Which might due to high precipitation of zinc as hydroxide and carbonates (Table 1 and Fig. 2) Many researchers reported reduced solubility of majority of zinc and there by decreased availability of zinc under alkaline soil conditions. An area of 597 ha was deficient in zinc accounting for 78.85 per cent of total geographical area (TGA) and 116 ha (15.28 % of TGA) was sufficient. The available copper content ranged from 0.41-2.49 mg kg^{-1} in these soils found to be higher (1.12 mg kg^{-1}) in these micro watershed area (Table 1 and Fig. 2), $CaCO_3$ and clay content resulting in copper fixation. The overall higher copper content in the micro watershed area was due to the parent material (Rajkumar *et al.,* 1994).

In conclusion, soil pH ranged from acidic to alkaline in reaction (5.21-9.27), Salt content was very low indicates soils are non-saline in nature and organic carbon content was medium (0.39-1.28 mg kg^{-1}). The available iron content in micro-watershed ranged from 4.17 to 21.70 mg kg^{-1} with the mean of 11.84 mg kg^{-1} these soil is high in iron content. About 713 ha (94.12 %) of the study area high while 33 ha (4.36 percent) had deficient in available iron status of study area. The available manganese content in micro- watershed ranged from 2.74-17.50 mg kg^{-1} and was higher with 9.85 mg kg^{-1} in these soils. The available zinc content of micro watershed area ranged from 0.16-1.10 mg kg^{-1}. The available zinc was lower in this soil of 0.46 mg kg^{-1}. The available copper content ranged from 0.41-2.49 mg kg^{-1} in these soils found to be higher (1.12 mg kg^{-1}) in this micro watershed area. Available micronutrients such as Zinc are deficient but iron, manganese and copper were sufficient in these soils of micro-watershed.

Acknowledgement

Authors are thankful to World Bank for finding this project under KWDP-II, Sujala - III, WDD; Government of Karnataka, Bengaluru.

References

Black, C.A., 1965. Methods of soil Analysis, Part I and II. American Society of Agronomy, Inc, Madison, Wisconsin, USA.

Dasog, G.S., and Patil, P. L., 2011. Genesis and classification of black, red and lateritic soils of Karnataka. In: *Soil Science Research in North Karnataka*, Dharwad chapter of ISSS (Ed.), 76th annual convention of ISSS, p. 1- 10.

Jackson, M.L., 1973. Soil Chemical Analysis. Prentice Hall of India (Pvt.) Ltd., New Delhi.

Lindsay, W.L., and Norvell, W.A., 1978. Development of DTPA soil test for zinc, iron, manganese and copper, *Soil Science Society of American Journal*, 42,421-428.

Moradabad District, Uttar Pradesh. *J. Indian Soc. Soil Sci.*, 45:332- 335.

Rajkumar, G.R., 1994, Studies on forms and distribution of micronutrients in paddy soils of Tungabhadra project area, Karnataka. *M. Sc. (Agri.) Thesis* Univ. Agric. Sci., Dharwad

Shivaprasad, C.R., Reddy, R. S., Seghal, J. and Velayutaam, M., 1998. Soils of Karnataka for optimizing land use. NBPS & LUP, Nagpur, 47 p. 15.

Sireesha, P.V.G., and Naidu, M.V.S., 2013. Studies on genesis, characterization and classification of soils in semi-arid agro- ecological region: A case study in Banaganapalle mandal of Kurnool district in Andra Pradesh. *J. Indian Soc. Soil sci.,* 61(3): 161-178.

Srikanth, K.S., Patil. P. L., Dasog, G.S and Gali, S.K., 2008. Maping of available major nutrients of a micro-watershed in Northern dry Zone of Karnataka. *Karnataka J. Agric. Sci.*, 21(3): 391-395.

Subbaiah, B.U., and Asija, G.L., 1956. Rapid procedure for the estimation of the available nitrogen in soil. *Curr. Sci*., 25:259-260.

Walkley, A.J., and Black, C.A., 1934. Estimation of soil organic carbon by the chromic acid titration method. Soil Sci., 37: 29-38.