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VALUATION OF SOIL FERTILITY ALONG THE BANK OF DUDHGANGA RIVER FROM KAGAL TAHSIL WITH REFERENCE TO SUGAR CANE FIELD

***Jadhav S.D**
Department of Chemistry
Dr. Ghali College, Gadhinglaj, 416502 Dist. Kolhapur, (M.S.), INDIA
E-mail: Shobhajdhv120@gmail.com (**Corresponding Author*)

Abstract: The present evaluation deals with the soil fertility status of sugarcane field soil from bank of Dudhganga River from Kagal Tahsil. Six soil samples were evaluated for various soil fertility parameters like P^H E.C. available n. P.K. sulphur, magnesium copper, Ferrous, Zinc, TDS, WHC, nitrate nitrogen and ammonium nitrogen. During this study it has been found that there was a marked variation in nutrients levels at six sites. It has also found that the all soil samples are slightly alkaline in nature.
All macro and micronutrients are within normal range
Keywords: Soil Parameter, Sugar Cane field, Soil Quality and Nutrients.

Introduction

Soil evolution plays an important role in crop production and nutrient management. An element is considered essential for plant growth when plants are unable to complete their life cycles without it. Essential elements are carbon, hydrogen oxygen nitrogen phosphorus potassium calcium magnesium iron. Some nutrients required less concentrations less than 100 milligrams/kilogram called as micronutrients good soil and climate for more crop production are valuable things for any nation Soil generally refers to the loose minerals composed of weathered rock and others minerals and the partly decayed organic matter that covers large part of earth. The mineral fraction of soils is derived from rocks and minerals and composed larges of oxygen, silicon and aluminum after these elements the most abundant in soil are iron carbon calcium potassium sodium and magnesium. Soil testing is considered a useful tool for making fertilizer recommendation for various crop and crop sequence soil commonly suffered from multiple nutrients deficiencies and nutrient imbalances. Hence the need for an urgent means of assessing the fertility status of these soils is necessary and the way to do so is by laboratory analysis of these soils (Sanda Ahmad R. et al 2012)

Study Area: Along the bank of Dudhganga River, Kagal Tahsil.

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Experimental

Soil samples were collected from different location of sugar cane fields in and around the bank of Dudhganga river from the selective sites samples water of Kagal MH collected in the depth of 20cm from the surface of land which was taken in polythene bag as per the standard procedure (U.S. Salinity laboratory staff 1954, P. R. Hesse (1971) The samples were dried in air and passed through 2mm sieve. The soil P^H was carried out by flame photometer. The micronutrients were determined by photometer in the laboratory of Hamidwada Kagal Tahsil (M.S.).The dissolved elements in the soil extract was measured by Atomic Absorption spectrometer. Reagents used for the analysis were L.R. grade manufactured by S.D. Fine, Loba and Merch fisher.

Result and Discussion

For evaluation of soil fertility status of the study area P^H E.C. Available NPK organic carbon phosphorous, copper, Ferrous, Magnesium and Zinc were shown in table no.1.

P^H :- Soil P^H is an important property that influences many chemical and biological processes occurring in soils. Acidification of soils is a natural geologic process. Rainwater contains carbolic acid produced when atmospheric carbondioxide dissolve in the rain In addition plants may acidify the soil around their roots by releasing hydrogen ions. Human processes such as combustion of fossils via precipitation (acid rain) and deposition of dry particles. Although many soils have a large capacity to neutralize incoming acidity without changes in their P^H values over geologic time soil P^H values decrease.

The solubility of most nutrients varies in response to P^H. As acidity increases the losses of these nutrients by leaching increases and their availability to plants decreases. The quantity of some nutrients may rise so greatly under acidic and alkaline conditions that they become toxic to plants (D. Briggs 1977). So soil P^H is essential to control between 6.5 to 7.5.

In the present study P^H ranges from 7.5 to 8.7 the lower value of P^H is recorded in the sample S_1 while it was higher in the remaining samples. These higher values are possibly due to presence of soluble and exchangeable sodium along with HCO_3 many micronutrients become more soluble at lower P^H values including manganese. Manganese is abundant enough to be toxic to plants in some low - P^H soils.

Electrical Conductivity

Electrical conductivity is one of the important parameter of the soil sample because it shows the salinity of the soil. In the present emulation The higher value of E.C.

have been seen in the sample S_3, S_4 and S_6 While remaining samples shows lower values of electrical conductivity.

Total dissolved solids

TDS for soil samples were ranges from 0.33 to 0.68. The higher value of TDS has been recorded in the sample S_1 TO S_2 while lowest values of TDS were recorded for sample S_3,S_4,S_5 and S_6.

Water Holding Capacity

Sandy soil has lower water holding capacity as compared to clay soil. In present evaluation water holding capacity values ranges from 0.35 to 0.89 The sample S_3,S_4 and S_6 has higher whc value ranges from S_1, S_2 and S_5.

Potassium

Potassium is an enzyme activator that promotes metabolism and improve disease resistance in plant. It improves the quality of fruits and vegetables. It available to plant as the ion K^+. It assist in regulating the palnts use of water by controlling the opening and closing of leaf stomates where water is released to cool the plant. Lack of potassium decreased the size of fruits and seeds and the quantity of their production. Due to the deficiency of K some crop stems are weak and lodging is common. The normal range for K IS 150-340 kg/ha is common.

The available potassium value in the soil ranges from 192.18 to 404.65 kg/ha. It was high at sample S_1, S_2 S_3 and S_4 while soil sample S_5 and S_6 was lower potassium value.

Phosphorus

Phosphorus provides plants with means of using the energy harnessed by photosynthesis to drive it's metabolism. The normal range for phosphate is 22.5 kg/ha to 56 kg/ha. Phosphate ion enters the soil solution either as a result of mineralization of organophosphate or the application of fertilizers. The plant takes available P mostly in the form of $H_2PO_4^-$ from soil solution chemisorptions of P occurs due to interaction of phosphate ion with the atoms like Al , Fe and Ca depending upon soil P^H (D.S.Orlov 1992).

A phosphorus value ranges from 25.08 kg/ha to 34.46 kg/ha. Sample S_2, S_3, S_4,S_5 and S_6 showed high P content.

Magnesium

Magnesium is as a major constituent of chlorophyll molecule. So activity involved in photosynthesis and it also consists movement of sugars within a plant (J.A. Silva and R.Uchida 2000) .It is available to plants as the ions Mg^{2+}. Deficiency symptoms may occurs

in many plants when the leaf level is less than 0.10 to 0.15%. Small grains may exhibit deficiency when the mg level is less than 0.10%. When the soil P^H is less than 5.4mg availability and uptake by plant is greatly reduced. Supplemental applications of fertilizers mg may be needed in some cases to supply. Some of the mg crop requirement (AE-SL plant analysis Handbook)

In present study Mg content in the soil sample ranged from 5.12 to 10.19 ml/100gm. Sample S_4 have high mg content (above standard value) Remaining samples lies within the normal range. In this study of soil various elements obtained from the analysis of soil sample. e.g. Cu, Fe, Zn are present micronutrients also called trace elements, are those elements usually obtained in concentrations' less than 100 milligrams/kilogram plant tissue.

Nitrate Nitrogen

The nutrients most commonly limiting for plant growth in both terrestrial and aquatic systems are nitrogen and phosphorus. Both are often added as fertilizer. Nitrogen is generally readily soluble and leaches from soils to surface and ground waters. Nitrogen is essential to nearby every aspect of plant growth. Nitrogen is absorbed from the soil as nitrate (No_3) and ammonium (NH^{4+}) this soil parameter evaluate there current levels (L.G. Bundy and S.J. Sturgul). Nitrogen should be present in the soil in appropriate proportion for growth of plants. The transformation of the nitrogen compound in the soils involves the process such as fixation of atmospheric nitrogen by free leaving and nodule forming bacteria considering unique importance of Nitrogen for the growth of plants attempts has been made to estimate available Nitrate Nitrogen and Ammonium nitrogen from the soils in the study area.

Lack of nitrogen is almost universal in Indian soil, so Nitrogen applications is a must for canopy development and high yields. Reduced nitrogen to decrease the protein content of seeds and vegetative parts. In several cases flowering is greatly reduced nitrogen deficiency causes early maturity in some crops which results in significant reduction in yield and quantity (J.A. Silver et.al 2000).

Available Nitrate Nitrogen in the soil sample ranged from 272kg/ha to 409.6kg/ha. Samples S_2, S_3, S_4,S_5 have higher Ammonium Nitrate values than the other.

Sulphur

Standard value for sulphur in soil sample is 5.20kg/ha Sulphur is an essential component in the synthesis of amino acids required to manufacture proteins. It is also required for phosphorus and other essential nutrients. It increases the size and weight of grain

crops and enhances the efficiency of nitrogen for protein manufacture. It also increases quality of fibre crops.

Sulphur is the secondary nutrients it requires in the smaller amount than the primary nutrient It is available in fertilizers such potassium and magnesium sulphate. Sulphur deficiency causes the entire plant to turn yellow. In corn and small grains however yellow strips that turn parallel to the leaf blade are common. Sulphur deficiency is most frequently observed on very sandy soils with low organic matter content during seasons of excessive rainfall (M. Ray Tucker 1999).

In present evolution sulphur content values ranges from 5.9kg/ha to 19.5kg/ha. Soil sample S_2, S_4, S_5 has high sulphur content as compared to remaining soil samples.

Table 1: Micronutrient and Micronutrients analysis of soil from sugar cane field

Soil Content	S_1	S_2	S_3	S_4	S_5	S_6
P^H	7.5	7.7	8.0	8.5	8.2	8.7
EC	0.095	0.080	0.133	0.105	0.062	0.302
TDS	0.62	0.68	0.38	0.41	0.49	0.33
WHC	0.35	0.48	0.65	0.89	0.40	0.51
Potassium (kg/ha)	404.65	226.01	244.04	303.5	191.18	164.3
Phosphorus (kg/ha)	34.46	26.08	25.08	27.12	26.25	29.09
Magnesium (ml/100kg)	8.26	9.21	5.12	10.19	07.18	08.78
Nitrate Nitrogen (kg/ha)	255.8	217.6	223.72	218.9	240.95	217.6
Ammonium nitrogen (kg/ha)	409.6	272	303.64	338	407.8	272
Sulphur (kg/ha)	5.9	14.38	6.8	12.4	19.5	7.3
Copper	3.03	3.19	3.24	2.50	3.26	3.31
Fe	2.74	4.08	5.58	4.62	4.98	7.20
Zn	0.35	0.68	0.47	0.70	0.74	0.07

Conclusion

In the present evolution, all macronutrients and Micronutrients are within normal range. The value of P^H for all soil samples are slightly alkaline in nature. All soil samples having Electrical conductivity values below one.

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