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DETERMINATION OF SOME MINERAL CONTENTS IN SOIL

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ABSTRACT

The soil analysis in relation to some of the minerals were carried out in different regions of the campus of institute. It was found that the phosphorus content ranged from 10 kg/hectare to 15 kg/hectare. Lowest phosphorus value (10 kg/hectare) was noted in soil sample of the surrounding area of Bhosle hall, while soil surrounding to the Yog bhavan showed highest phosphorus content (15 kg/hectares). The Potassium content in the campus was noted from 100 kg/hectare to 120 kg/hectare. The Lowest potassium content (100kg/hectares) was noted around the Bhosle hall area. The soil of departmental garden has shown medium range of potassium (120kg/hectares). The Percentage of boron in different soil samples ranged between 0.1% to 0.2%. Minimum boron content (0.1%) was noted in surrounding area of Bhosle hall. The area of physical education play ground showed highest boron content (0.2%).

KEYWORDS: Non Agricultural Soil, Phosphorus, Potassium, Boron.

INTRODUCTION

Soil is the most valuable abiotic environmental factor and a natural resource on earth planet. Soil analysis plays a key role in increasing crop production in almost all types of soil of the world, soil management as an optimal use of farm soil resources for improving production management and achieving sustainable goals(Parvizi 2005).[1] Yadav et al.(2006)[2] stated that soil analyzing has exposed some information about the accurate amount of nutrients of special kinds of plant and also other information such as acid and saline - alkali soil. Analysing the soil is a scientific method which is done to do calculate the approximate amount of nutrients present in plant or crops or the amount of nutrients we need to provide. Agriculture is the backbone of Indian economy. The increased agriculture production depends upon number of factor of which soil fertility plays an important role. Soil fertility shows the nutrient status of the soil. Certain nutrients present in the soil are essential for plant growth. Soil analysis has been used by soil scientists as an aid in determining soil fertility level. Soil analysing is known as precise management method for determining and assessing soil fertility that enables farmers to assess the impact of management method and identify what changes needed each year. Soil chemical analysis is made to assess the available amount of major nutrients viz Nitrogen, Phosphorus, Potasium and to assess a few other determination which are correlated to soil fertility such as soil texture, soil reaction (pH) and salinity etc.

MATERIALS AND METHODS

Selection of site

Government Vidarbha Institutes of Science and Humanities, Amravati is a premier institute in Vidarbha region of Maharashtra state of India. The campus of institute is lush with greenery having vegetation of all types. The land of campus is non –agricultural and fallow and was selected as the study area. Soil analysis was conducted for totally six samples. All the soil samples taken for analysis were collected from the campus of institute itself. Sample – A constituted surrounding area of Bhosle Hall, Sample-B collected fron Apsara garden area, Sample – C from Botany departmental research field, Sample – D from play ground of Physical education, Sample – E from Botany departmental garden area and Sample – F constituted of surrounding area of Yog Bhavan.

Collection of soil sample

The replicates of soil samples were collected from different areas of the campus of institute. The humus overlying the land surface were removed carefully and soil was digged with the help of trowel upto 5 inch below. The samples were brought to the laboratory. It was then shade dried. The unwanted solids and debris such as stones and pieces of woods were removed from the samples. The samples was then made particulate with the help of wooden hammer and was sieved through 2 mm size sieve to remove any foreign material. The packets of samples were made with the help of thick

polythene bags and kept safe for further chemical analysis.

Soil analysis

The soil analysis was done with the help of soil analysis kit. The make of soil test kit was Plasti Surge Industries Pvt. Ltd. PSI Model, PSI-503. Different parameters of soil was tested in research laboratory of Department of Chemistry, Matoshree Nanibai Gharphalkar science college, Babhulgaon, dist. Yavatmal. The soil samples collected from different locations of campus of institute was used for the analysis of the mineral nutrients. Soil analysis kit constituted of phosphorus reagent A and B, Potash reagent, organic Carbon, Nitrogen reagent, Hydrochloric acid, Sodium hydroxide, Boron reagent A and B, Ammonia reagent. Beakers, funnels, test tubes, test manual chart of N,P,K, pH, organic carbon, boron and ammonia.

Determination of Phosphorus

2.5gm. of soil sample was taken in10 ml phosphorus extracted solution, It was then added in a test tube. Then shaken it for 1 minute and filtered immediately. 5 ml of soil extract was taken in a clean test tube and then added one drop of phosphorus reagent A and phosphorus reagent B. Then solution became faint and dark blue, It was then compared with phosphorus color chart and readings were noted in observation table.

Determination of Potassium

5 gm. of soil sample were taken in a clean test tube. It was then added 10 ml Potash extraction solution. It was then shakened for 5 minutes and filtered. 5 ml of soil extract was taken in a clean test tube, then added 4 drops of dil. NaOH solution, after that added two drops of potassium reagent A. The mixture was shaken and kept standstill for 15 minutes. The end point developed was compared with standard potassium color chart and observations were noted.

Detrmination of Boron

5 gm. of air dried soil sample were taken in a clean glass test tube. Then added 2 ml Boron reagent A and 4 drops of Boron reagent-B. The mixture was then kept standstill for 5 minutes and end point was compared with standard Boron colour chart and observations were noted.

RESULT AND DISCUSSION

The soil mineral nutrient availability to be an important chemical factor controlling the net primary productivity. Nitrogen, Phosphorus and Potassium are very important mineral nutrients required for normal growth of plant and for increasing agricultural crop yield. These nutrients are also added manually in agricultural lands to gain maximum yield. The macronutrients are required by the plant to a high quantity. Likewise other micro mineral nutrients *viz* Iron, Manganese, Boron, Magnesium, Sulfur etc. are required in small quantity for better growth and yield of crops. Soil chemical analysis is made to assess the availability of amount of mineral nutrients in the soil. Determination of phosphorus content in six different soil samples were carried out in the soil of campus of institute (Table 1).

Table 1: Determination of Phosphorus content in different soil samples.

Sr. No.	Soil Samples	Phosphorus (kg./hectare)	Normal range of Phosphorus (kg. / hectare)	Inference
1	A	10	15 to35	Phosphorus is low
2	B	10	15 to 35	Phosphorus is low
3	C	10	15 to 35	Phosphorus is low
4	D	11	15 to 35	Phosphorus is low
5	E	10	15 to 35	Phosphorus is low
6	F	15	15 to 35	Phosphorus is medium

By analyzing different soil samples it was found that the Phosphorus amount ranged from 10 kg /hectare to 15 kg /hectare. Lowest phosphorus content (10kg/hectare) was noted in sample A, similar amount was also noted in sample B, C and E. The sample F showed highest phosphorus content (15kg/hectares). Similar type of results were reported by Janaki Rani and Manoharchary (1994). Phosphorus (P) is an essential nutrient for plant growth and crop production and is especially critical during vegetative development (Jeshke et al., 1996).[3] Research on eggplant growth showed that an increase of nitrogen fertilizer when combined with Phosphorus may cause the plants to be able to change inorganic Phosphate to organic Phosphate at higher rates, leading to higher yields (Lopez - Cantarero et al., 1998).[4] They also showed a linear increase in rice (*Oryza sativa L.*), wheat (*Triticum aestivum* L.) and soybean (*Glycine max* L. Merr.) yield with increasing amounts of soil Phosphorus up to an application of 26 kg Phosphorus / ha-1. Increasing rate of application above this amount did not result in significantly higher yields. Of course, this numerical value for added P is site specific and would change if factors of the experiment changed, such as soil type, texture, and crop. However, over fertilization is unnecessary, uneconomical and possibly even detrimental to plant growth (Srivastava et al., 2006).[5] Although the fertilizer is most important factor impacting P availability for plant growth, the soil pH. Phosphorus is most available at moderate pH approximately 6-7 (Brady and Weil, 2002).[6]

Table 2: Determination of Potassium content in different soil samples.

Sr. No.	Soil Samples	Potassium (kg/hectare)	Normal Range (kg/hectare)	Inference
1	A	100	100 (low)	Potassium is low
2	B	100	200 (medium)	Potassium is low
3	C	100	300 (medium)	Potassium is low
4	D	100	400 (high)	Potassium is low
5	E	120		Potassium is Medium
6	F	110		Potassium is Medium

Potassium (K) is the third important mineral nutrient vital for the growth and development of plant. It is the most abundant cationic component of plant cell. It can compose up to 10% of the total plant dry weight (Martinez Cordero et al., 2005).[7] Potassium is known to be linked to N uptake and is also important for protein synthesis in plants (Marschner, 1995).[8] Low levels of K may cause bronzing, necrosis and leaf drop in Pepper plant (Ozaki and Hamilton, 1954).[9] Potassium contents in different soil samples of the campus of institute were noted (Table 2). It was observed that Potassium contents were ranged from 100kg/hectare to 120kg/hectare. Lowest amount of Potassium was noted in soil sample A (100kg/hectares) and sample B, C, D. In the sample E it was found 120 kg/hectare which is in medium range. Many studies have identified soil nutrient availability to be an important factor controlling net primary productivity. Nitrogen, Phosphorus and Potassium are very important nutrient required for normal growth of plant and for increasing yield.

Table 3: Determination of Boron content in different soil samples.

Sr. No.	Soil Samples	Boron in soil (in Percent)	Normal range	Inference
1	A	0.1	0.2 to 0.4	Boron is low
2	B	0.2	0.2 to 0.4	Boron is medium
3	C	0.1	0.2 to 0.4	Boron is low
4	D	0.2	0.2 to 0.4	Boron is medium
5	E	0.1	0.2 to 0.4	Boron is low
6	F	0.1	0.2 to 0.4	Boron is low

Boron (B) plays a significant role in root growth and development of plant. Research shows that plant uptake Boron in the form of boric acid (H_3BO_3). At high pH, boron will also be present in the soil solution in its anionic form (H_2BO_3) (Brady and Weil, 2002). Factors such as soil texture, pH, and irrigation water quality all affect B uptake (Sims and Johnson, 1991).[10] The six different soil samples were analysed for boron content and results were noted (Table 3). The Percentage of Boron ranged from 0.1 % to 0.2%. Lowest Boron content was recorded (0.1%) in sample A, C, E and F. The sample B and D showed highest Boron content (0.2%) as compared to remaining soil samples of the campus area.

CONCLUSION

The soil samples analysed for presence of amount of some mineral nutrient contents especially Phosphorus, Potassium and Boron, It can be concluded that the campus soil possess these mineral nutrients, though the area of campus is consisted of fallow and non agriculrtural land. The variation regarding the mineral contents were observed in different regions.The mineral contents in the soil may be affected by various other parameters of the soil such as total organic carbon, nitrogen, pH and soil conductivity. The study lead to the conclusion of the nutrients presence in soil of different region.

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