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Study on Soil Parameters of Selected Sites in Mukundara Hills National Park, Kota, Rajasthan

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ABSTRACT

Physical and chemical parameters of soil like pH, conductivity, total organic carbon, Nitrogen (N), Phosphorus (P) and Potassium (K) based study was carried out in Mukundara National Park, Kota (Rajasthan). This investigation leads to the conclusion of the nutrient's quality present in soil substrata of the forest land. The criteria of seasonal variation were selected to study to verifying the levels of physico-chemical attributes. Result reveals that all the selected sites of MNP have medium or high minerals contents. This study will also help farmers to solve the problems related to soil nutrients, i.e. amount of which fertilizer to be used to increase the yield of crops in their fields as well as the forest department in plantation programs.

Key words: *Hadauti region, Mukundara National Park, Soil Samples, Physico-chemical parameters, Minerals.*

INTRODUCTION

Soil is even more important for the human beings as they depend upon it for food production, industrial waste disposal as well as cultural requirement[1]. Soil is a vital component, medium of unconsolidated nutrients and materials, forms the life layer of plants. It is a basic life support components of biosphere. The physicochemical study of parameters is important to agricultural chemists for plants growth and soil management[2,3].

Soil is natural body on which agricultural product grow and it has fragile ecosystem[4,5]. Soil is medium in which crop grows food and cloth for the world. Certain external factors control plant growth like air, temperature, light mechanical support, nutrients and water. Plants have elements for their growth and completion of life cycle. They are carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, etc[6]. Soil analysis can improve crop productivity and minimize wastage of these nutrients thus minimizing impact an environmental leading to bias through optimal production.

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Deficiencies of primary, secondary and micronutrients have been observed in intensive cultivated areas[7].

The fertility of the soil depends on the concentration of N, P, K, organic and inorganic materials, conductivity. The physicochemical properties such as moisture content, specific gravity Nitrogen as a fertilizer required for the growth of plant. Potassium is used for flowering purpose, it is also required for building of protein, photosynthesis, fruit quality and reduction of diseases and phosphate is used for growth of roots in plants. Calcium is an essential part of plant cell wall, which provides normal transport and retention of other elements[8-11].

In present study all the samples were collected in summer and monsoon seasons. In laboratory these samples were analyzed to measure various chemical parameters by standard methods. Analysis of soil is carried out for the studies of various parameters like total Organic Carbon, Electrical conductivity, Phosphorus (P_2O_5) and Potassium (K_2O).

Study Area:

Rajasthan is located in north-west zone in India. Its climate is hot and dry and a big part of this is in the form of desert. But because of Chambal river, Hadoti is biodiversifying region.

Darah Sanctuary covers major portion of Mukundara Hills (Vindhyan Mountain Range), so that the National Park named as Mukundara National Park.Figure-1 is showing satellite view of Mukundara National Park (MNP) demarcated by red line. Darrah Sanctuary is situated on National Highway Number-12. There are 13 villages in the sanctuary. The total area of the sanctuary is about 265.80 Sq. Km. It lies between 24°35’ N latitude and 76°09’ E longitude.

Fig.1: Satellite view of Mukundara National Park (MNP)

The total area of the National park is 239.76 Sq.km. There are 26 Forest Blocks in the sanctuary comprising over all area of 213.18 Sq.Km. out of which 190.10 Sq. Km. is Reserve Forest (RF) and 23.08 Sq.Km. is Protected Forests (PF). Six specific sites viz.

1. Kolipura Outer; **2.** Kolipura Inner; **3.** Laxmipura; **4.** Darrah Outer; **5.** MNP Inner;

6. Girdharpura, representing the core and buffer area of MNP was selected to conduct the study.

MATERIALS AND METHODS

Seasonally five major sites of MNP were selected to collect soil samples. All samples were sundried, powdered and there after used for chemical analysis.100g of soil was taken in conical flask and 300 ml of distilled water added to prepare 1:3 soil water suspensions. The suspension was thoroughly shaken and kept overnight. The solution was filtered. Further examination of filtrate of soil done by Chemical Research Lab. DCM Kota, Rajasthan.

The collected samples were analyzed for major Physical and Chemical soil quality parameter like pH, Electrical Conductivity (EC), Organic Carbon (OC), Nitrogen (N)[12,13]. Organic matter is oxidized with chromic acid (Potassium Di-chromate + H_2So_4). This method is widely used in Indian Laboratories. Among the several methods, the satisfactory and simple estimation of Potassium ion is by flame photometer. The method given by APHA (1985) was used for assessment of Phosphorus[14].

pH was measured using pH meter, EC was measured using a conductivity meter, OC was measured using colorimeter, Potassium was measured using Flame photometer, Phosphorus was measured using Spectrophotometer.

OBSERVATION:

Physical and chemical properties of soil samples were studied separately. All the samples are black grey in color and have unpleasant smell. The pH of soil affects mineral nutrient soil quality and much microorganism activity. The pH range of 6.8 to 8.0 has been recommended optimum for plants growth, the pH of soil samples shows variation 6.9 to 8.5, the above 7.5 value of pH shows basic nature.

Table-1: Chemical Analysis of soil in rainy season

S.No.	Parameter	Ref. Value	Kolipura Outer	Kolipura Inner	Laxmipura	Darrah Outer	MNP Inner	Giridharpura
1.	pH	7-8.5	7.23	7.46	7.93	7.84	7.80	7.42
2.	E.C. (dS/m)	0-1.5	0.33	0.24	0.68	0.26	0.30	0.51
3.	Organic Carbon (%)	0.5-0.75	0.68	0.40	0.92	0.47	1.10	1.07
4.	Available Phosphorus (Kg/Hect)	23-56	9.0	12.7	21.4	19.0	42.0	27.0
5.	Available Potash (Kg/Hect)	144-336	592	470	720	367	690	576

Table-2: Chemical Analysis of soil in winter season

S.No.	Parameter	Ref. Value	Kolipura Outer	Kolipura Inner	Laxmipura	Darrah Outer	MNP Inner	Giridharpura
1.	pH	7-8.5	7.36	8.01	8.24	8.09	8.00	7.92
2.	E.C. (dS/m)	0-1.5	0.42	0.29	0.74	0.38	0.35	0.58
3.	Organic Carbon (%)	0.5-0.75	0.76	0.43	0.98	0.51	1.15	1.11
4.	Available Phosphorus (Kg/Hect)	23-56	10.5	13.6	25.2	19.6	47.0	32.3
5.	Available Potash (Kg/Hec)	144-336	648	516	732	394	748	632

RESULTS

pH :-

pH of MNP varies between 7.23-7.93 in rainy season. The maximum pH value was reported 7.93 of soil samples collected from Laxmipura; followed by Darrah outer (7.84); MNP inner (7.80); Kolipura inner (7.46) and Girdharpura (7.42). The minimum pH value is observed 7.23 of soil samples of Kolipura outer.

On the other hand soil in winter season has shown variation in pH from 7.36-8.24. The maximum pH value was reported 8.24 of soil samples collected from

Laxmipura; followed by Darrah outer (8.09); Kolipura inner (8.01); MNP inner (8.00) and Girdharpura (7.92). The minimum pH value is observed 7.36 of soil samples of Kolipura outer.

Electrical Conductivity

Total soluble salts are estimated through electrical conductivity (EC) of aqueous soil extracts. The Conductivity study of soil samples shows variation in conductivity values between 0-1.5 dS/m. This value suggests normal type nature of soil**.** EC of all soil samples were ranged from 0.24-0.68 in Monsoon season. EC decreased in order of 0.68 dS/m at Laxmipura; 0.51 dS/m at Girdharpura; 0.33 dS/m at Kolipura outer; 0.30 dS/m at MNP inner and 0.26 dS/m Darrah outer.

The same pattern of EC value was followed by soil samples during winter season which varied from 0.29-0.74. EC decreased in order of 0.74 dS/m at Laxmipura; 0.58 dS/m at Girdharpura; 0.42 dS/m at Kolipura outer; 0.38 dS/m Darrah outer and 0.35 dS/m at MNP inner.

Organic Carbon:

Soil organic carbon is the seat of nitrogen in the soil and its determination is often carried out as an index of nitrogen in availability [12]. Percentage of carbon varies from 0.40% to 1.10% in rainy season of collected soil samples. Maximum Organic C was found in MNP inner (1.10%) which is followed by Girdharpura (1.07%); Laxmipura (0.92%); Kolipura outer (0.68%); Darrah outer (0.47%) and Kolipura inner (0.40%) respectively. On behalf of standard value (low< 0.50, medium 0.50-0.75 and high > 0.75) it exhibits the normal type nature of soil.

Percentage of carbon varies from 0.43% to 1.15% in winter season of collected soil samples. Maximum Organic C was found in MNP inner (1.10%) which is followed by Girdharpura (1.11%); Laxmipura (0.98%); Kolipura outer (0.76%); Darrah outer (0.51%) and Kolipura inner (0.43%) respectively.

Phosphorus:

Phosphorus, the most important micro nutrient is utilized by plant in the form. Of H_2PO_4-HPO_4^{2-} species [13]. In present study high level of Phosphorus is 42.0 Kg/hect MNP inner and minimum 9.0 Kg/hect at Kolipura outer in rainy season having median values 27.0 Kg/hect. at Girdharpura; 21.4 Kg/hect at Laxmipura; 19.0 Kg/hect Darrah outer and 12.7 Kg/hect at Kolipura inner. Whereas maximum 47.0 Kg/hect MNP inner and minimum 10.5kg/hectare Kolipura during winter season were recorded having median values 32.3 Kg/hect at Girdharpura; 25.2 Kg/hect at Laxmipura; 19.6 Kg/hect Darrah outer and 13.6 Kg/hect at Kolipura inner..

Potassium:

Potassium though present in soil as micronutrient, plays a vital role in the metabolism of fresh water. During rainy season maximum 720 Kg/hect Potash is reported in Laxmipura outer and minimum 367 Kg/hect in Darrah outer, followed by MNP inner (690 Kg/hect); Kolipura outer (592 Kg/hect); Girdharpura (576 Kg/hect) and Kolipura inner (470 Kg/hect) respectively.

Whereas maximum value of potash reported 748 Kg/hect in MNP inner and minimum 394 kg/hectare of Darrah outer during winter which is followed by Laxmipura (732 Kg/hect); Kolipura outer (648 Kg/hect); Girdharpura (632 Kg/hect); and Kolipura inner (516 Kg/hect) respectively.

All studied samples are black gray in color and have unpleasant smell. Soil test based nutrient management has emerged as a key issue in efforts to increase agricultural productivity and production since optimal use of nutrients, based on soil analysis can improve crop productivity and minimize wastage of these nutrients, thus minimizing impact on environmental leading to bias through optimal production. Deficiencies of primary, secondary and micronutrients have been observed in intensive cultivated areas.

There may be considerable variation in the soil pH from one spot to another. The effect of soil pH is great on the solubility of minerals or nutrients. 14 of the 17 essential plant nutrients are obtained from the soil before a nutrient can be used by plants it must be dissolved in the soil solution. Most minerals

and nutrients are more soluble and available in acid soils than in neutral or slightly alkaline soils.

The result of the chemical analysis of soil in the present study in table 1 and 2. The pH of soil shows variation in its ranges. It indicates that they are in range of soli quality parameter permissible limits. The EC of soil sample shows wide variation in all blocks. It must be noted that a regular chemical analysis must be done to insure that the quality of soil in this area is not contaminated.

CONCLUSION

Present study is an effort to find out the nutrient's quantity in soil Mukundara National Park, Rajasthan. This investigation will helpful in order to increase the fertility of soil as well as in raising the percentage yield. On the basis of analysis based on the trend in pH, EC, OC, P, K status of soils this can be concluded that soil profile of the study area is nutrient efficient. To predict the portable crop response no application of outside nutrients is required for the area. This study is also helpful to predict the soil related problems such as salinity, alkalinity, and acidity of an area specific and also about appropriate reclamation measure for a specific soil type. Experiments conducted on various soil samples collected from MNP are obliging in manners:-

1. To find out suitability for growing crops.
2. To identify the ecosystem services of plants.
3. To find out suitability for irrigation.
4. To study the soil genesis.

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