

Chemical Analysis of N, P, K, in Crop Land Area of Chitrakoot Region Satna (M.P.), India

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Abstract: *The Chitrakoot region is included in the District Chitrakoot of Uttar Pradesh and the District Satna of Madhya Pradesh. Chitrakoot Parvat Mala includes Kamad Giri, Hanumaan Dhara, Janki Kund, Lakshman pahari, and Devangana famous Religious Mountains. Soils of Chitrakoot region are following types- (1) Light black (2) Sandy loam soil. Geographical information of Chitrakoot district Satna in located at 24°48' to 25°12'N, and longitude at 80°58' to 81°34'E distance covered by district from east to west is 62 km and north to south is 57.5 km. Temperature, pH, Moisture Contents, N, P and K were analyzed in the soil samples during the sampling periods. Various soil quality parameters were analyzed by using standard procedures. The readings were taken with the help of Spectrophotometer. All the Soil samples were analyzed parameters like pH-(7.2 to 9.0), Temperature-(26 to 28°C), Moisture content-(1.06 to 3.25%), N-(4.30 to 34.13mg/kg), P-(0.28 to 3.07mg/kg), and K-(27 to 56mg/kg), are in normal range. These studies give information about nature of soil, present nutrient in soil; according to this information farmer arrange the amount fertilizers and nutrients needed to soil for increase the crop production.*

Keywords: *Soil Quality, N, P, K, Crop Land Area, Chitrakoot Region, Satna Distrist*

1. INTRODUCTION

Chitrakoot is a town and a nagar panchayat in Satna district in the state of Madhya Pradesh, India. Geographical information of Chitrakoot district Satna in located at 24°48' to 25°12'N, and longitude at 80°58' to 81°34'E distance covered by district from east to west is 62 km and north to south is 57.5 km. The town lies in the historical Chitrakoot region; it attracts crowds throughout the year including above occasions and for Free Eye Hospital Camps. Noted 'Ayurvedic' and 'Yoga' centres like 'Arogyadham' are located in Chitrakoot. Chitrakoot means the 'Hill of many wonders'. Chitrakoot falls in the northern Vindhya Range of mountains spread over the states of Uttar Pradesh and Madhya Pradesh. The Chitrakoot region is included in the District Chitrakoot of Uttar Pradesh and the District Satna of Madhya Pradesh. Chitrakoot Parvat Mala includes Kamad Giri, Hanumaan Dhara, Janki Kund, Lakshman pahari, and Devangana famous Religious Mountains. Soils of Chitrakoot region are following types- (1) Light black (2) Sandy loam soil.

The light black colour is attributed to the presence of tataniferous magnetite compound of iron and aluminium accumulated human and colloidal hydrate, double iron and aluminium silicate. In general these soils are rich in iron, lime, calcium, potash, aluminium and magnesium carbonate, but poor in nitrogen, phosphorus and organic matter. Light black soil it is thickness range between 30 cm. to 100 cm. It covers a corger area in Chitrakoot region of Madhya Pradesh. Loam is soil composed mostly of sand and silt and a smaller amount of clay (about 40% sand, 40% silt, 20% clay). Loam is considered ideal for gardening and agricultural used. A soil dominated by one or two of the three particle size group can behave like loam if it has a strong granular structure, Promoted by a high content of organic matter of loam. Sandy soil increases water retention capacity and crop productivity^[1]. Sandy soil increases crop yield and also reduces hydrophobicity by addition of clay content^[2]. Soil is a complex natural medium and intensive soil physico-chemical testing is required to understand the behaviour of each soil type. Physiochemical characteristics of different soils vary in space and time due to variations in topography, climate, physical weathering processes, vegetation cover, microbial activities, and several other biotic and abiotic variables^[3]. The properties of dry soil along with its type have a great importance in agriculture^[4]. Different variety of soil contains different properties, which support the organism of soil, which maintain fertility. In soil management practice, variety of

soil mixed so that all-important constitute and organism of all soil mixed and create a symbiotic relation to each and their sheltering plants and improve the soil quality and productivity^[5]. The aim of this study was to determine the physicochemical parameters of soil that not only responsible for soil diversity of Chitrakoot but also affect the microbiological community and vegetation^[6]. Soil types are a major factor in determining what types of plants will grow in a certain area as plants use inorganic elements from the soil such as nitrogen, potassium and phosphorus^[7]. Most of the farmers are using excessive chemical fertilizers and the too much dose of such fertilizers in few soils has rendered high values of P and K. The retention of K could also be due the clay minerals formed by chemical weathering of basalts which is the parent material for the soil^[7]. Soil formation is a constructive as well as destructive process. Destructive process predominates the physical and chemical breaking down of materials, plants and animal structures, which result in the partial loss of more soluble and volatile products. Constructive forces develop new chemical compounds, both mineral and organic that provides new distribution or association characteristics, structural properties as well as chemical compositions. These factors influence the plant growth in the soil^[8]. Soil texture is one of the most important soil properties governing most of the physical, chemical and hydrological properties of soils. Variability in soil texture may contribute to the variation in nutrient storage and availability, water retention and transport and binding and stability of soil aggregates. It can directly or indirectly influence many other soil functions and soil threats such as soil erosion^[9].

2. MATERIAL AND METHODS

2.1. Sample Collection

The N, P, K, analysis of soil during month of March 2014. The sampling stations were chosen at different site of the study area. For testing the soil sample were collected in different sterile plastic container cans from each station. After collection of the sample the containers were tightly capped and were immediately transported to the laboratory to avoid any unpredictable changes in the physico-chemical characteristics. Sample should be collected in clean and dry containers, and container should be rinsed thoroughly before collection of sample. Stopper the container after collections of the sample. Temperature, pH, Moisture Contents, N, P and K were analyzed in the soil samples during the sampling periods. Various soil quality parameters were analyzed by using standard procedures^[10-13]. The readings were taken with the help of Digital Spectrophotometer.

The sampling locations are presented in table- 1

Table1. List of sampling locations

S.No.	Depth In cm	Temperature °C	Sampling locations with code	Description of Sampling location
1.	15cm	27	Rajolla Farm (C1)	Rajolla farm of MGCGV
2.	15cm	28	Rajolla R.T.O (C2)	Behind Rajolla R.T.O.
3.	15cm	26	Rajolla Village (C3)	End Site of the Village
4.	15cm	26	Babupur (C4)	Semaria Mod
5.	15cm	27	Babupur (C5)	Near Kusdh Sewa Sadan
6.	15cm	28	Babupur (C6)	End Site of the Village
7.	15cm	26	Patthra (C7)	Godavari mod
8.	15cm	28	Paldev (C8)	Starting Border of the Village
9.	15cm	26	Manhai (C9)	Near Naala of Village
10.	15cm	26	Manhai (C10)	End Site of the Village

3. RESULTS AND DISCUSSION

In the present study ten soil samples were collected from Chitrakoot region of satna district. Various sampling station are chosen in the study area like Rajjola farm, Babupur, Patthra, Paldev, Manhai, etc. all the parameters were characterize and interpritate. Soil samples were analysed some physico-chemical parameter like pH, Temperature, Moisture Contents, N, P, K. and all the results are presented in Table-2 with Compared to SQGL Value.

Table2. Physico-chemical characteristic of Soil collected from Crop land area of Chitrakoot Region

Parameters Sample	pH	Temp. ⁰ C	Moisture Contents %	N mg/kg	P mg/kg	K mg/kg
C ₁	9.0	27	3.12	9.41	0.60	56
C ₂	8.8	28	1.31	19.16	0.82	49
C ₃	8.2	26	1.46	6.29	0.28	42
C ₄	8.6	26	2.24	34.13	0.79	46
C ₅	7.3	27	1.06	8.56	1.14	32
C ₆	7.7	28	3.25	22.47	3.07	38
C ₇	7.2	26	1.13	4.30	0.35	27
C ₈	7.5	28	2.17	23.16	0.47	34
C ₉	8.6	26	2.06	29.0	0.38	48
C ₁₀	8.0	26	2.55	25.30	0.96	41
Means	8.09	26.8	2.035	18.171	0.886	41.3
S.D.	0.648	0.918	0.789	10.380	0.817	8.807
C.V.	8.009	3.425	38.771	57.123	92.212	21.324

The Temperature is basically an important factor for its effect on chemical and biological reaction in soil. Minimum 26 °C and Maximum 28°C temperature were found in the crop land soil samples of Chitrakoot region. Temperature results of the all samples are given in table-2 and shown in fig.1.

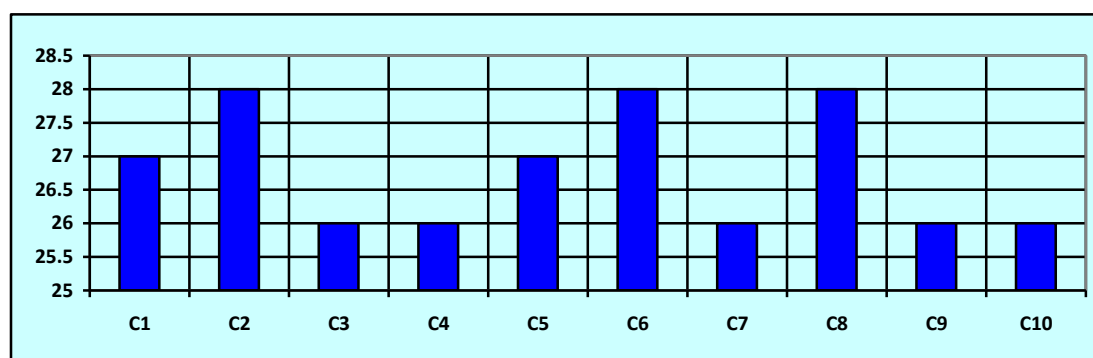


Fig1. Graphical representation of the temperature

3.1. pH

The hydrogen ion concentration is the indicator of acidity and alkalinity of any aqueous system. In the present study the sample C7 showed 7.2 of pH whereas sample C1 showed high percentage of pH 9.0. pH results of the all samples are given in table-2 and shown in fig.2.

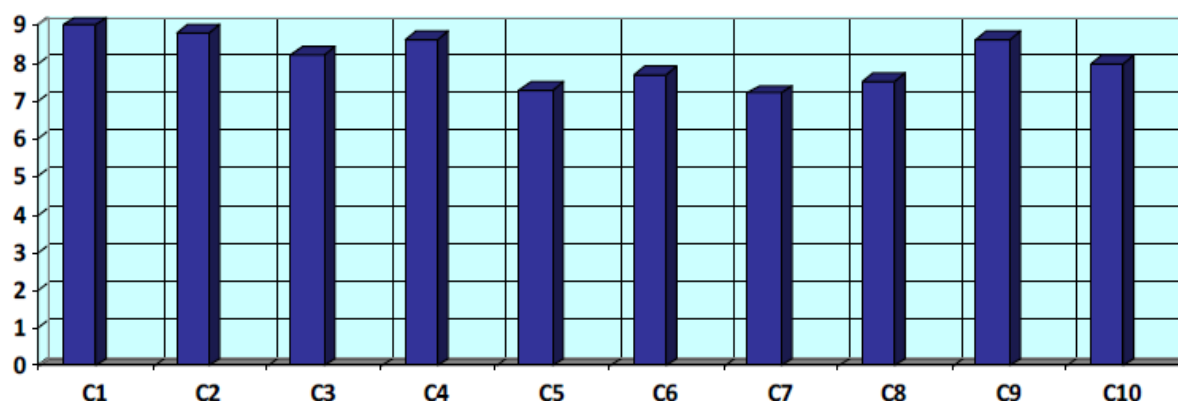


Fig2. Graphical representation of the pH

3.2. Moisture Contents

The texture of soil based on water holding capacity was found to be Loam sandy. In the study of different location of crop land area of Chitrakoot we have reported minimum moisture content in sample C5 (1.06) and maximum value found in sample C6 (3.25). Moisture contents results of the all samples are given in table-2 and shown in fig.3.

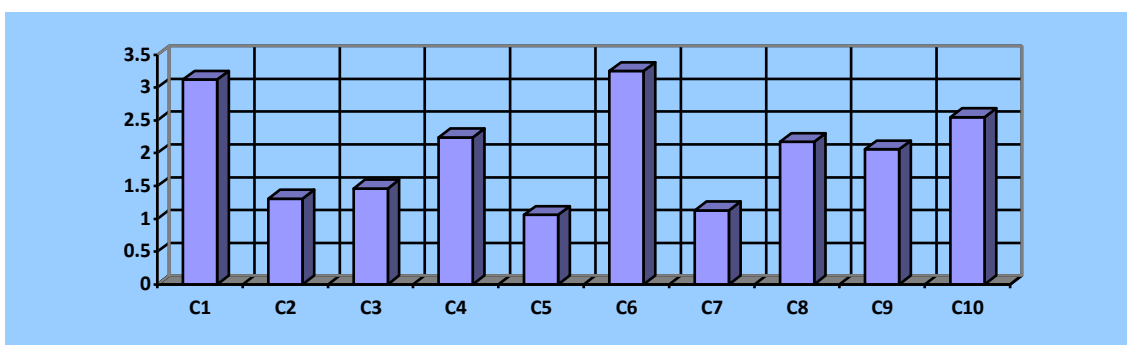


Fig3. Graphical representation of the moisture content

3.3. Nitrogen (N)

Nitrogen is the most important fertilizer element. Plants respond quickly to application of nitrogen salts. This element encourages above ground vegetative growth and gives a deep green colour to the leaves. In the present study the sample C4 showed 34.13 mg/kg of nitrogen whereas sample C7 showed less percentage of nitrogen 4.30 mg/kg. Nitrogen results of the all samples are given in table-2 and shown in fig.4.

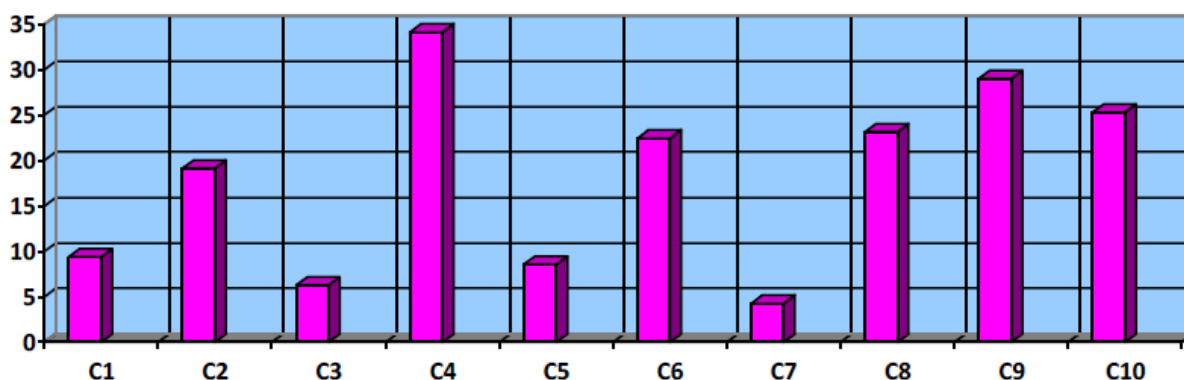


Fig4. Graphical representation of the nitrogen content

3.4. Phosphorus (P)

Phosphorus is a part of every living cell in crop. The every activity of plant such as growth, respiration and reproduction depends upon phosphorus levels of the soil in which the crop grows. In the present study the amount of available phosphorus at C6 and C5 are 3.07 and 1.14 mg/kg, whereas at C3 there is reduction in available phosphorous content i.e. 0.28 mg/kg. Phosphorus results of the all samples are given in table-2 and shown in fig.5.

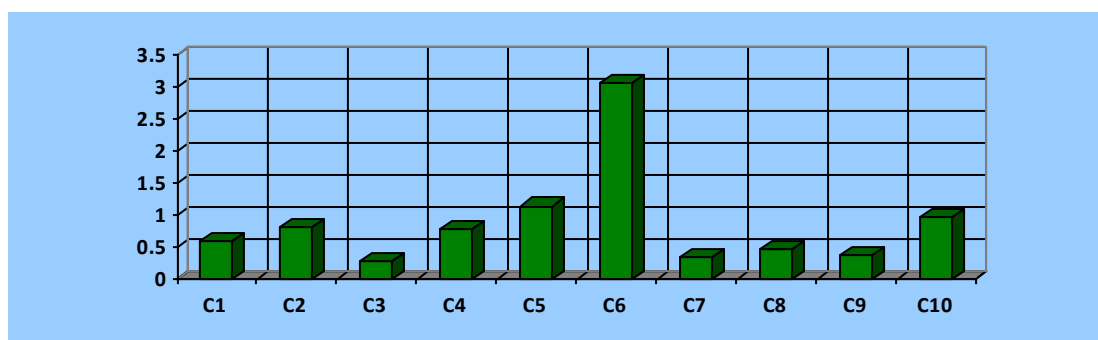


Fig5. Graphical representation of the phosphorus content

3.5. Potassium (K)

Potassium is not an integral part of any major plant component but it plays a key role in a vast array of physiological process vital to plant growth from protein synthesis to maintenance of plant – water balance. In the present study sample C7 showed 27 mg/kg of K whereas sample C1 showed 56 mg/kg. Potassium results of the all samples are given in table-2 and shown in fig.6.

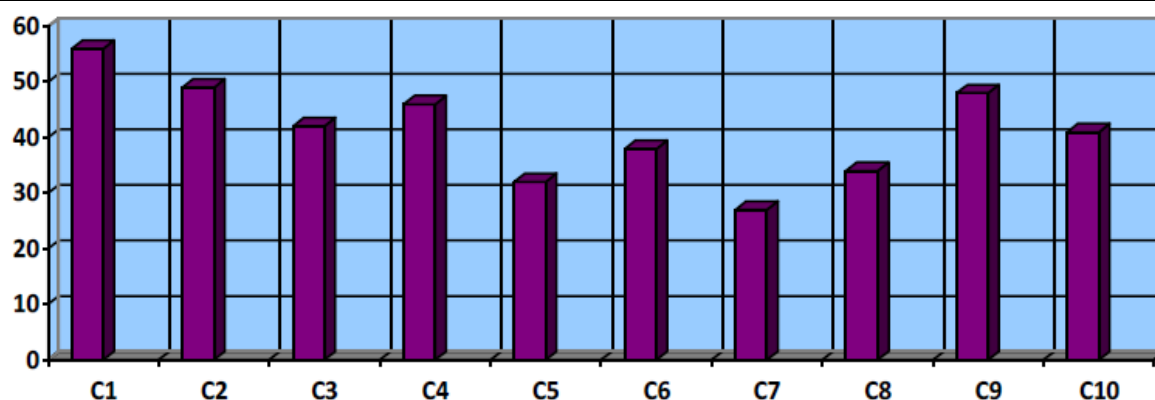


Fig6. Graphical representation of the temperature

4. DISCUSSION

In the Present Study soil Samples were collected from various locations of crop land area of Chitrakoot region and all the results of Physico-Chemical analysis are shown in **Table-2**. The pH of the soil taken from the depth of 15 cm at different sites ranged from 7.2 to 9.0 which indicate that the soil is alkaline .Pandeewari, N. et al, (2012)^[14], reported ranges of pH of soil were 5-8. Soil pH is an important consideration for farmers and gardeners for several reasons, including the fact that many plants and soil life forms prefer either alkaline or acidic conditions or the pH can affect the availability of nutrients in the soil

Moisture content of samples were found 1.06 to 0.28 %.In Chitrkoot region we have analyzed minimum moisture content in sample C5(1.06) and maximum value found in sample C6(3.25).

Jain Parul et al, (2014)^[15] suggested phosphorus (P) is necessary for maintaining a balance between the other plant nutrients and ensuring the normal growth of the crop. Phosphorus is a part of every living cell in crop. The every activity of plant such as growth, respiration and reproduction depends upon phosphorus levels of the soil in which the crop grows. In the present study the amount of available phosphorus at C6 and C5 are 3.07 and 1.14 mg/kg, whereas at C3 the phosphorous content is very less amount i.e. 0.28 mg/kg.

Nitrogen contents in Soil of Chitrakoot region were analysed and reported. Its concentration ranged between 4.30 to 34.13mg/kg. Tripathi et al. 2014^[16] studied concentration of Cr, Pb, Cd, Ni, Cu and Fe in soil of Umaria District, Vindhya Platue, India and reported N, P, K are found to be 8.86 to 41.50 mg/kg. Nitrogen is the most important fertilizer element. Plants respond quickly to application of nitrogen salts. This element encourages above ground vegetative growth and gives a deep green colour to the leaves. Plant roots take up nitrogen in the form of NO₃ and NH₄. The sample station C4 Showed maximum nitrogen concentration 34.13mg/kg and Sample station C7 showed minimum concentration of nitrogen 4.30 mg/kg (**Table 2**)

The Potassium values were ranging between 27mg/kg to 56mg/kg. In the Chitrakoot region, the lightest Potassium was found in (C7) as Show in (**Table 2**). Dwivedi A.P., et al, 2013, ^[17] carried out assessment of soil and ground water quality in rewa District of Vindhya platue and reported the potassium content ranged from 2.10 to 55.0mg/kg . Potassium is not an integral part of any major plant component but it plays a key role in a vast array of physiological process vital to plant growth from protein synthesis to maintenance of plant – water balance. All the values of N, P, and K were below the recommended level of SQGL Value^[18].

5. CONCLUSION

The present study of physicochemical parameters is important to agricultural Chemists for crop growth and soil management. A physico-chemical studies of soil samples from ten sampling station of crop land area of Chitrakoot region, All the Soil samples were analyzed parameters like pH-(7.2 to 9.0), Temperature-(26 to 28°C), Moisture content-(1.06 to 3.25%), N-(4.30 to 34.13mg/kg), P-(0.28 to 3.07mg/kg), and K-(27 to 56mg/kg), are in normal range. These studies give information about nature of soil, present nutrient in soil; according to this information farmer arrange the amount fertilizers and nutrients needed to soil for increase the crop production.

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