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Analysis of Soil Samples to Derive Different Physico-Chemical Parameters from Various Places in Ralegaon Taluka, District – Yavatmal, Maharashtra

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Abstract:
Soil quality is an important factor influencing agricultural productivity and environmental sustainability. The present study evaluated the physicochemical properties of agricultural soil collected from various part of the Panchwati katol, Ridhora , Gadeghat, Kinhi (Jawade) in pandharkawada Taluka, Yavatmal District. Soil samples were collected from five different locations at a depth of 0–15 cm using a random sampling technique. Standard laboratory procedures were employed to determine electrical conductivity (EC), moisture content, organic carbon (OC), organic matter (OM), available nitrogen (N), phosphorus (P), potassium (K), and soil texture. This study provides baseline information for soil fertility management and sustainable agricultural practices.

Keywords: Soil analysis, Electrical conductivity, Physicochemical properties, organic carbon, nutrients, Potassium.

1. Introduction :

Soil is a fundamental natural resource that supports plant growth by supplying water, nutrients, and physical support. Soil testing can also help farmers prevent unnecessary nutrient applications if their soil is already sufficient in that specific nutrients. Physical indicators are related to the arrangement of solid particles and pores. Example include topsoil depth bulk density, porosity, aggregate stability, texture, crusting and compaction[1]. The physicochemical characteristics of soil determine its fertility, productivity, and suitability for agricultural purposes. Chemical indicators include measurements of pH, salinity, organic matter, phosphorus concentrations, cation- exchange capacity, nutrient cycling, and concentrations of elements that may be potential contaminants (heavy metals, radioactive compounds, etc.) or those that are needed for plant growth and development[2]. The soil's chemical condition affects soil-plant relations, water quality, buffering capacities, availability of nutrients and water to plants and other organisms, mobility of contaminants, and some physical conditions, such as the tendency for crust to form. Parameters such as soil pH, electrical conductivity, organic carbon, nitrogen, phosphorus, potassium, and moisture content directly influence nutrient availability and crop performance[3]. Regular soil analysis is essential for assessing soil health and developing appropriate nutrient management strategies. Physicochemical

evaluation also helps identify nutrient deficiencies, salinity problems, and changes in soil quality caused by agricultural activities.

The objective of the present study was to evaluate the physicochemical characteristics of agricultural soil collected from different sampling locations and assess its fertility status.

2. Materials and Methods :

2.1 Study Area

The study was conducted in Ralegaon Taluka, located in District Yavatmal, Maharashtra The region experiences a tropical climate with an average annual rainfall. Agriculture is the primary land use, with major crops including wheat, soybean, maize, and cotton.

2.2 Soil Sampling

Five soil samples were collected randomly from agricultural fields at a depth of 0–15 cm using a stainless-steel auger. The samples were placed in labeled polyethylene bags, transported to the laboratory, air-dried, and passed through a 2-mm sieve before analysis. The soil samples were analyzed at Agricultural Departments District water and soil analysis laboratory in Chandrapur.

Sr.No.	Sample place	Depth in cm	Latitude	Longitude
1	Panchwati katol	0-15 cm	20.233843°	78.706484°
2	Kinhi Jawade	0-15 cm	20.237512°	78.7026665°
3	Ridhora	0-15 cm	20.231485°	78.686703°
4	Kinhi Jawade	0-15 cm	20.239323°	78.692014°
5	Gadeghat	0-15 cm	20.248431°	78.686961°

3. Physicochemical Analysis :

The measured values of physicochemical parameters are given in the following table,

Sr . No.	Parameters	Limits	Sample 1 Panchwati katol	Sample 2 Kinhi Jawade	Sample 3 Ridhora	Sample 4 Kinhi jawade	Sample 5 Gadeghat
1	Electric Conductivity(dsm-1)	<1000	0.642	0.712	O.413	0.443	0.542
2	Organic fertilizer (%)	0.50-0.75	0.48	0.29	0.30	0.49	0.45
3	Nitrogen (Kg/Ha)	250 to 500 kg/ha	336	203	210	343	315
4	Phosphorus Pentoxide (Kg/Ha)	10-25	14.5	17.2	17.6	16.5	14.2
5	Potassium Oxide kg/ha	150 to 300	270	254	279	271	299
6	Calcium **(%)**	20% to 65%	12.50	12.50	11.25	11.25	12.50
7	Magnesium (Kg/Ha)	0.5–5.0	8.75	7.50	7.50	7.50	5.00
8	Calcium carbonate	0.5 – 20 %	3.12	1.25	4.12	3.62	2.60
9	Sodium	0.5 – 5%	4.20	6.60	5.10	4.90	4.60
12	Sand %		50.94	43.49	45.46	48.49	45.98

13	Silt %		27.00	30.00	29.00	28.00	24.00
14	Clay %		19.5	25.5	23.5	22.5	20.5
17	Particles Density kg/m3		1.79	2.26	1.80	1.97	1.78
18	Apprent Density kg/m3		1.24	1.19	1.15	1.24	1.01
19	Porosity %		40.64	53.94	44.24	46.13	35.63
21	Temperature		32°C	31°C	33°C	32°C	33°C

4. Results and Discussion :

The basic chemical and physical soil properties are given in above Table. The analyzed values of physicochemical properties show the wide variation range, as can be seen in the results[4]. Total values of soluble salts are estimated from electrical conductivity (EC) of aqueous soil extracts[5]. Standard value of EC in soil- Normal < 0.8 dsm-1, The values of all soil samples are in good agreement with normal range. Available nitrogen showed moderate variation among sites. Higher nitrogen levels observed in Site 1, 4 and 5 may be attributed to greater organic matter accumulation and improved mineralization processes. Phosphorus and potassium were within the medium fertility range and could support moderate crop productivity with balanced fertilizer application. As per the standards, almost all the soil samples showed medium to high potassium content. The maximum value of potassium content was observed in sample 5. Abundance of organic matter, excessive application of fertilizers or weathering of minerals in soil for example feldspar and mica causes increase in potassium content[6].

The high level of phosphorous content in sample 2 could be due to application of fertilizers or due to runoff. The best way to increase the phosphate content is to increase the organic and humus[7]. Soil texture significantly influences moisture retention and nutrient availability. Clay loam soil at Site 2 exhibited higher moisture content than sandy loam soil due to greater water-holding capacity.

Organic carbon levels were within the low to moderate range, indicating that the addition of farmyard manure, compost, or crop residues could further improve soil fertility. Nitrogen, phosphorus, and potassium concentrations showed moderate fertility status, although some locations may require balanced fertilizer application to achieve optimal crop yields. Organic matter improves aggregation, increases water-holding capacity, and enhances nutrient retention. The variation among sampling sites may be attributed to differences in fertilizer application, cropping practices, irrigation, and organic matter management. Organic carbon was comparatively higher in Site C, suggesting improved soil structure and enhanced microbial activity. Organic matter improves aggregation, increases water-holding capacity, and enhances nutrient retention.

Soil texture significantly influences moisture retention and nutrient availability. Clay loam soil at Site C exhibited higher moisture content than sandy loam soil due to greater water-holding capacity.

Overall, the observed soil properties indicate that regular soil testing can guide efficient fertilizer management, reduce excessive nutrient application, and improve sustainable agricultural productivity.

5. Conclusion

Physicochemical analysis revealed measurable variation among the five agricultural soil samples. Soil parameters like electrical conductivity were within acceptable limits, indicating favorable conditions for crop production. Organic carbon and available nutrients varied depending on soil texture and management

practices. Regular monitoring of soil quality is recommended to optimize fertilizer use, improve soil fertility, and promote sustainable agriculture. Adoption of integrated nutrient management practices can further enhance soil health and long-term productivity.

Photos Of Evidence of the Sample Collection:

Sample No. 1

Sample No. 2

Sample No. 3

Sample No. 4

Sample No. 5

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