



## Analysis of Physicochemical parameters of soil sample of seasonal crop from Sangamner tehsil, Maharashtra

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### Abstract

Soil is the important abiotic component on the earth which shows the relationship with biotic components. The soil samples were collected by standard procedure in polythene bags. The soil samples were collected in zigzag manner in crop field. The standard instrumental and non-instrumental methods were used for estimation of soil samples and their parameters. The soil parameters include texture, color, pH, temperature, Chloride, Nitrogen, Carbon, Calcium, total hardness and Magnesium etc. The pH and temperature of soil sample measured by ph meter and thermometer respectively. The temperature affects the plant growth. Chloride, Nitrogen (N), Carbon, Calcium, Total Hardness and Magnesium is measured by volumetric method with standard protocol. Chloride is mobile nutrients essential for plant growth and to improved soil fertility. In agriculture calcium is essential for soil porosity, plant cell growth, neutralized the excess acid of alkaline. These studies give information about nature of soil, present nutrient in soil, according to these information farmers arrange the amount of which fertilizers and nutrient needed to soil for increase the percentage yield of crop.

**Keywords:** Physico-chemical parameter, abiotic component, agriculture, fertilizer etc

### Introduction

The soil forms the intermediate zone between the atmosphere and the rock cover of the earth, the lithosphere. It also forms the interface between water bodies (hydrosphere) and the lithosphere and thus forming a part of biosphere. The soil may be defined as the uppermost weathered layer of the earth's crust in which are mixed organisms and products of their death and decay <sup>[1]</sup>. It may also be defined as the part of the earth's crust in which plants are anchored. Soil is mixture of minerals, organic matter gases, liquids and myriad of micro and macro organisms, that can support plant life. Soil as a general term usually denotes the unconsolidated thin, variable layer of mineral and organic material usually biologically active that covers rest of the earth land surface. Soil properties that are sensitive to changes in the management can be used as indicators. In India, now a day's large numbers of fertilizers are used instead of manures. Deficiencies of primary, secondary and micronutrients have been observed in intensive cultivated areas <sup>[1]</sup>.

Due to this the crop productivity is increases speedily but the quality of soil support decreases. So, it becomes essential to analysis the soil parameters. It is a real time to carry out the physicochemical analysis of soil because as with the increasing use of chemical fertilizer to the soil, it is difficult to control the adverse effects of the chemical's fertilizer to the soil, plants, animals and human being.

Soil as a general term usually denotes the unconsolidated thin, variable layer of mineral and organic material usually biologically active that covers rest of the earth land surface. Soil properties that are sensitive to changes in the management can be used as indicators. These soil samples were analyzed in laboratory to measure various physical and chemical parameters by standard methods. Analysis of soil is carried out for the studies of various parameters like Texture, Colour, Moisture, pH, Temperature, E.C.,

Alkalinity, Nitrogen, Phosphorous, Potassium, Organic Carbon, Calcium, Magnesium, etc. The fertility of the soil depends on the concentration of N, P, K, Organic and inorganic materials and water conductivity. The Physico-chemical properties such as Moisture content, Specific gravity, Nitrogen as a fertilizer required for the growth of plant, Potassium is used for growth of roots in plants. Plants had elements for their growth and completion of life cycle. They are carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, etc <sup>[2]</sup>.

### Material and Methods

A soil sample collected from seasonal crops of Sangamner tahsil, (MS) India from December 2025 to March 2025 which represents soil of that region. The soil samples were collected monthly by standard procedure in polythene bags. The entire samples were collected in different season.

### Methodology for Soil analysis

**Collection of soil sample:** The soil samples were collected in the depth of 5 cm to 30cm from the surface of soil from the different places of Sangamner tahsil from December 2024 – march 2025. The instrument used for soil collection is spade. The soil sample was collected in the polythene bag about 1 kg. The soil samples were collected in zigzag manner in crop field. This soil samples were preserved in polythene bag for further analysis.

**Soil analysis:** The standard instrumental and non-instrumental methods were used for estimation of soil samples and they're of the parameters. It includes texture, color, pH, temperature, Chloride, Nitrogen, Carbon, Calcium, total hardness and Magnesium using by standard protocols (Dalwadi M.R., Bhatt V. R2008, Gupta P. K 2000) <sup>[1, 2]</sup>. The given soil parameter was estimated by following methods:

**Table 1:** Methods used for estimation of soil parameter

Sr. No.	Parameter	Methods
1	Texture	0-----
2	Color	By viewing
3	pH	pH meter
4	Temperature	thermometer
5	Chloride	Volumetric method
6	Nitrogen (N)	Volumetric method
9	Carbon	Volumetric method
10	Calcium	Volumetric method
11	Total Hardness	Volumetric method
12	Magnesium	Volumetric method

**Results and Discussion**

**1. Soil Analysis**

For assessment of the soil richness status of the study area texture, colour, pH, temperature, Chloride, nitrogen, Carbon, Calcium, total hardness magnesium from the soils were determined and the values of physicochemical parameters are presented in table 2 to 5.

**2. Color and Texture**

The color of given all soil samples are the light in color and the texture of all soil samples are sandy loam except the soil sample no -2 is silt loam in texture.

**3. Soil Temperature**

Soil temperature is one of the most important soil properties that effect crop growth. The major source of heat is sun and heat generated by the chemical and biological activity of the soil is negligible. The temperature of soil in study area is ranged between 24.10C to 280C. It is a normal range to increase crop productivity. Soil temperature fluctuates with season, time of day and local climatic conditions. The major source of soil heating is solar radiation and heat generated by the biochemical activities of the soil [3]. A rise in temperature of soil accelerates chemical reaction, reduces solubility of gases and decrease pH of soil. Soil temperature varies in response to exchange processes that take place primarily through the soil surface [4]. Temperature plays an important role in germination of seeds, an impact on the growth of plants and the activity of the microorganisms [5].

**4. PH**

The soil reaction or PH is meant to express the acidity or alkalinity of the soil. The lowest value of PH is 7.18 and highest value of pH in result is 8.44. The limit of PH value

for soil Acidic < 6.5, Normal 6.5-7.8, Alkaline 7.8- 8.5, Alkali > 8.5. It indicted the soil is neutral. PH is a most important physical property of soil and encouraging the plant nutrient accessibility. It has great effects on solute concentration and absorption in soil [6].

**5. Chloride**

Chloride is mobile nutrients essential for plant growth and to improved soil fertility. In the present study the value of nitrogen level in soil of sangamner tehsil and around region is between 0.029% to 0.072%.

**6. Soil Nitrogen**

Nitrogen is a mobile nutrient in the soil. In the present study the value of nitrogen level in soil of sangamner tahsil and around region is between 0.029% to 0.072%. The sewage water significantly increased the nitrogen in the soil (Baddesha *et al.*, 1997) [7].

Nitrogen as a fertilizer required for the growth of plant.

**7. Organic Carbon**

Organic carbon is the index for nitrogen content in the soil. In present investigation organic carbon values are ranges from 0.25% to 0.37%. The source of organic carbon in the cultivated soil included crop residue, animal manure, cover crops, green manure and organic fertilizer etc [8].

**8. Calcium**

Calcium ranges from 42.08 ml/100gm to 50.5 ml/100gm. Soil Calcium (Ca) is present in adequate amount in most of the soil. Calcium is a component of several primary and secondary minerals in the soil. These minerals are the original source of available forms of calcium. Calcium is not considered as leachable nutrient. In agriculture Ca is essential for soil porosity, plant cell growth, neutralized the excess acid of alkaline, amphoteric, stringent cell wall structure (9).

**9. Magnesium**

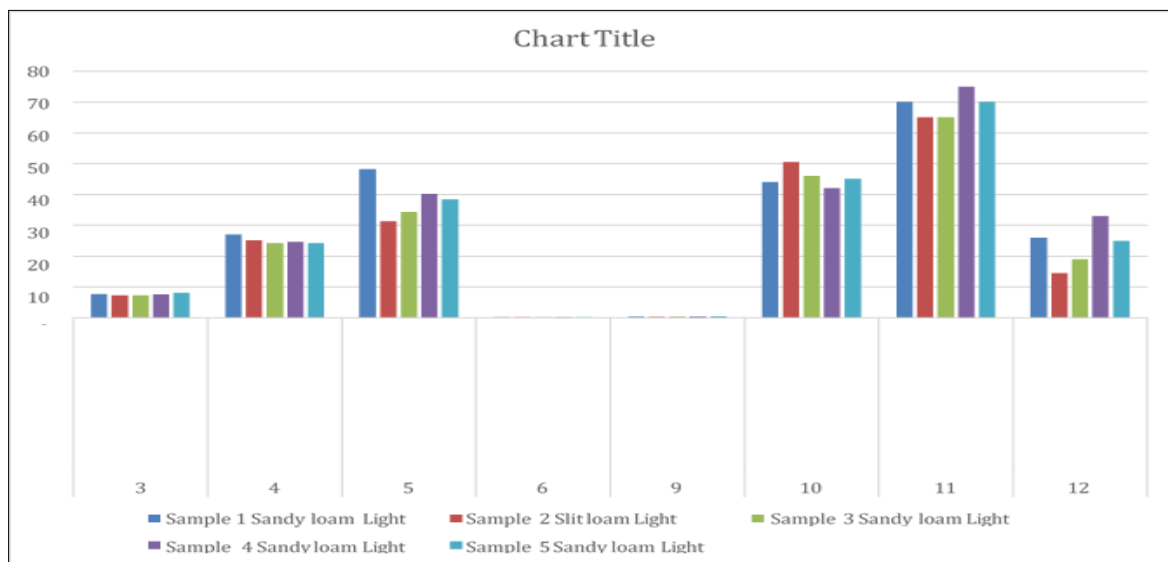
Magnesium available to plants as the ions Mg. Magnesium content in the soil samples ranges from 14.05 mg/ml to 32.92 mg/ml.

**10. Total hardness**

Total hardness depends on the calcium and magnesium hardness. The total hardness of soil sample ranged from 65 mg/ml to 75 mg/ml.

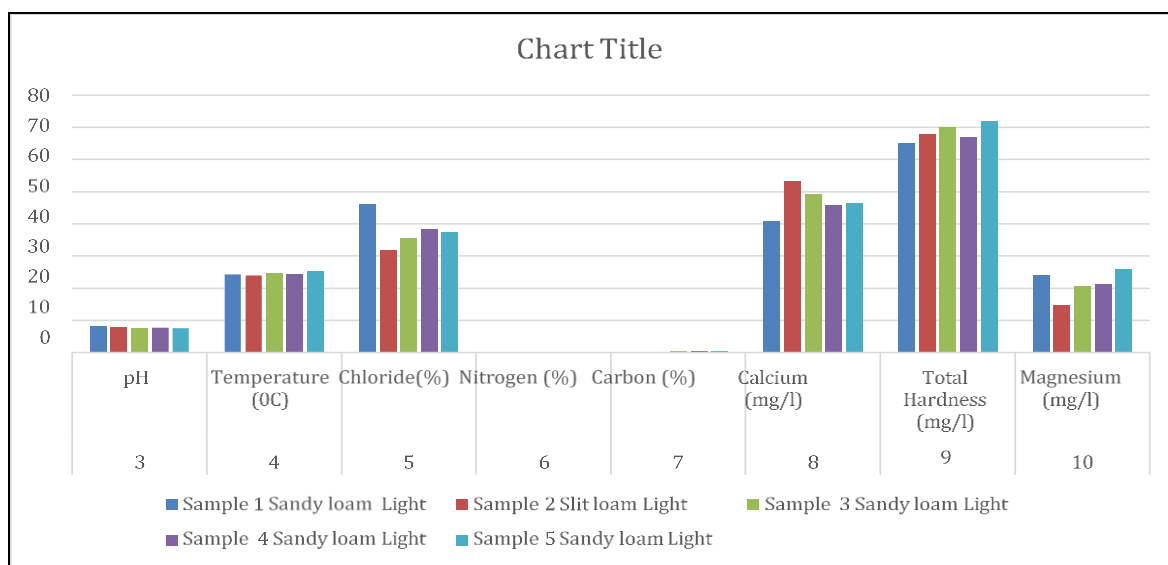
**Table 2:** Physico-chemical analysis of soil sample in December 2024

Sr. No.	Parameter	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1	Texture	Sandy loam	Slit loam	Sandy loam	Sandy loam	Sandy loam
2	Colour	Light	Light	Light	Light	Light
3	pH	7.76	7.18	7.20	7.60	8.12
4	Temperature (°C)	27	25.2	24.2	24.7	24.1
5	Chloride (%)	48.28	31.24	34.30	40.22	38.40
6	Nitrogen (%)	0.034	0.029	0.031	0.042	0.039
9	Carbon (%)	0.315	0.256	0.368	0.375	0.51
10	Calcium (mg/l)	44.08	50.5	46.09	42.08	45.08
11	Total Hardness (mg/l)	70	65	65	75	70
12	Magnesium (mg/l)	25.92	14.5	18.91	32.92	24.92



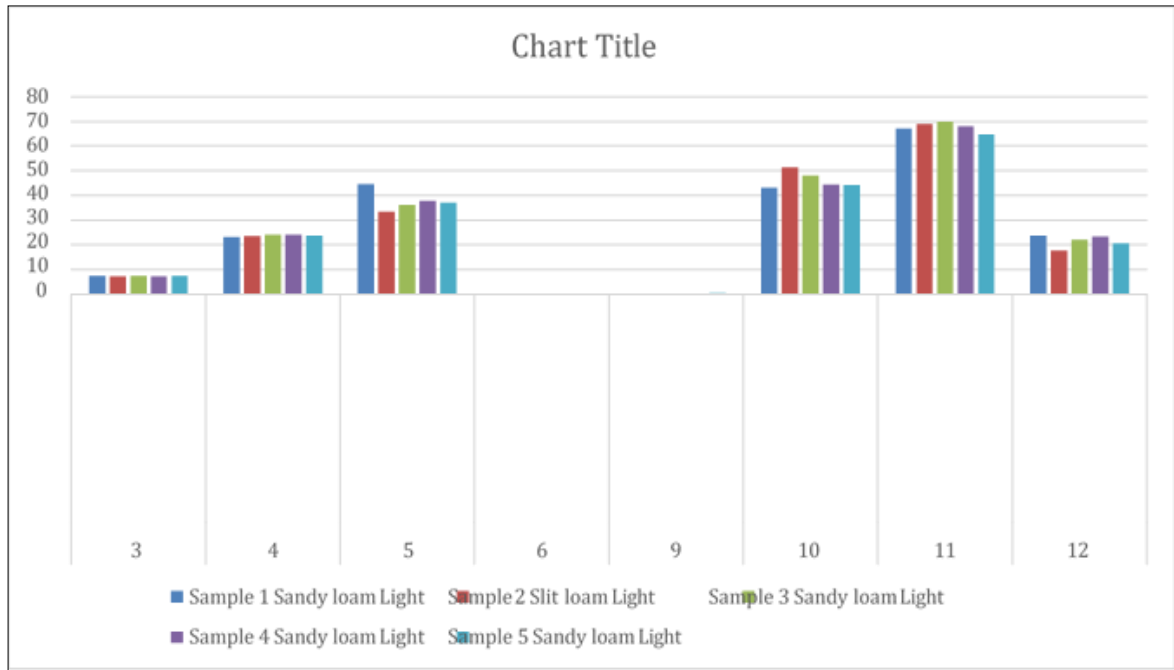
**Table 3:** Physico-chemical analysis of soil sample in January 2025

Sr. No.	Parameter	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1	Texture	Sandy loam	Slit loam	Sandy loam	Sandy loam	Sandy loam
2	Colour	Light	Light	Light	Light	Light
3	pH	8.12	7.98	7.57	7.68	7.52
4	Temperature (°C)	24.2	23.9	24.6	24.3	25.2
5	Chloride (%)	46.30	31.80	35.70	38.30	37.30
6	Nitrogen (%)	0.044	0.036	0.039	0.052	0.047
7	Carbon (%)	0.280	0.295	0.324	0.360	0.350
8	Calcium (mg/l)	41.08	53.3	49.2	45.8	46.32
9	Total Hardness (mg/l)	65	68	70	67	72
10	Magnesium (mg/l)	23.92	14.7	20.8	21.2	25.68



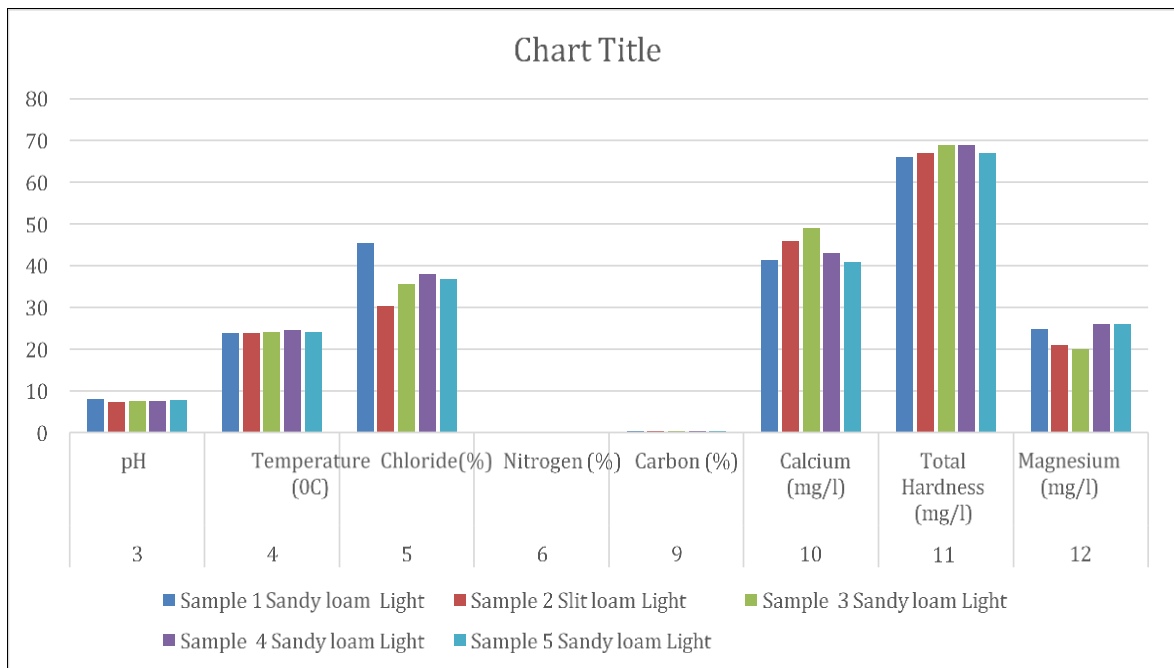
**Table 4:** Physico-chemical analysis of soil sample in February 2025

Sr. No.	Parameter	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1	Texture	Sandy loam	Slit loam	Sandy loam	Sandy loam	Sandy loam
2	Colour	Light	Light	Light	Light	Light
3	pH	7.31	7.39	7.47	7.41	7.51
4	Temperature(°C)	23.2	23.6	24.3	24.1	23.8
5	Chloride (%)	44.46	33.44	36.20	37.75	37.12
6	Nitrogen (%)	0.040	0.042	0.041	0.049	0.053
9	Carbon (%)	0.310	0.308	0.339	0.354	0.366
10	Calcium (mg/l)	43.20	51.4	48.08	44.5	44.32
11	Total Hardness (mg/l)	67	69	70	68	65
12	Magnesium (mg/l)	23.8	17.6	21.92	23.5	20.68



**Table 5:** Physico-chemical analysis of soil sample in March 2025

Sr. No.	Parameter	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1	Texture	Sandy loam	Slit loam	Sandy loam	Sandy loam	Sandy loam
2	Colour	Light	Light	Light	Light	Light
3	pH	8.02	7.43	7.46	7.49	7.68
4	Temperature (°C)	23.87	23.92	24.1	24.5	24.2
5	Chloride (%)	45.50	30.38	35.45	38.10	36.88
6	Nitrogen (%)	0.052	0.049	0.047	0.042	0.052
9	Carbon (%)	0.344	0.329	0.356	0.377	0.371
10	Calcium (mg/l)	41.22	46.00	49.08	43.02	41.00
11	Total Hardness (mg/l)	66	67	69	69	67
12	Magnesium (mg/l)	24.78	21.00	19.92	25.98	26.00



**Conclusion and Summary**

A physico-chemical study of sample for seasonal crops from Sangamner region, show that all the soil parameter such as

EC, pH, and percentage of N, P, K, C, Ca, Mg are normal range. These studies give information about nature of soil, present nutrient in soil, according to these information

farmers arrange the amount of which fertilizers and nutrient needed to soil for increase the percentage yield of crop.

### Objectives of Studie

- This study determines the nutrient status of soil.
- It is useful to know which type of fertilizers apply to crop and their quantity.
- It gives the basic knowledge regarding about cultivation of specific crop in that soil.
- The present study indicates that the given soil is more suitable for crops like sugarcane, wheat, cotton, soybeans, onion, and tomato and fruit plant.

### References

1. Dalwadi MR, Bhatt VR. Soil and water testing. Anand, Gujarat India, 2008.
2. Guptap PK. Methods in environmental analysis. 2nd ed. Agrobios, Kota, India, 2000, 101.
3. Jain SA, Jagtap MS, Patel KP. Assessment of soil quality near industrial area. International Journal of Scientific Research,2014;4(3):1–5.
4. Naranjo NM, Rosales E, Pazos M, Sanromán MA, Longo MA. Soil remediation using electrokinetic-fenton processes. Waste Management,2004;24:763–773.
5. Akpoveta OV, Osakwe SA, Okoh BE, Otuya BO. Physicochemical characteristics of soil and heavy metal pollution in Warri, Nigeria. Journal of Applied Sciences and Environmental Management,2010;14(4):57–60.
6. Dutta M, Ram M. Effect of sewage irrigation on chemical properties of soils. Journal of the Indian Society of Soil Science,1993;41(4):776–777.
7. Baddesha HS, Chhabra R, Ghuman BS. Influence of sewage water irrigation on the composition of soils. Journal of the Indian Society of Soil Science,1997;45(2):358–362.
8. Gupta AK, Varsshaney ML. Practical manual for agricultural chemistry. Kalyani Publisher, 1994.
9. Chaudhari KG. Studies of the physicochemical parameters of soil samples. Advances in Applied Science Research,2013;4(6):246–248.