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# Analysis of Soil Samples for its Physical and Chemical Parameters from Ahilyanagar District

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## Abstract

The earth's topmost crust layer which is mixed with dead, decay matter of plants and animals is known as the Soil. The properties of soil are an important role in influence pest development, affects agricultural production. The soils sample analysis is crucial for considerate soil health and fertility and valuable for sustainable land management. A complete examination was performed on soil sample from Ahilyanagar District to estimate their physical and chemical properties crucial for information about land use planning and agricultural applies. This study explores the chemical and physical characteristics of soil such as texture, pH, organic matter, Electrical Conductivity and Nitrogen percentage of soil sample collected from Imampur, Vambori, Newasa, Shrirampur, Rahata, Kopargaon, areas from district Ahilyanagar. In an observation most of soil from collected samples were little alkaline with pH ranged from 8.45-8.80 and Electrical Conductivity was observed in between 0.11-0.20 mmhos/cm which indicates normal landscape of soil. Also, the soils were augmented with Organic Carbon and water holding capacity which is in between 0.24%-0.63% and 4.50 to 19.00ml/g respectively. The results offer understandings into soil health, give knowledge of appropriate soil management and adjustment strategies to enhance productivity and sustainability, which depends on value of six representative soil samples were obtained and analyzed for its PH, Electrical conductivity, Temperature, water holding capacity, phosphates, chloride, alkalinity, carbonate, bicarbonate and organic content available in soil.

**Keywords:** EC, PH, phosphates, chloride, alkalinity, carbonate, bicarbonate and organic content etc.

## Introduction

Soil is earth uppermost visible lithospheric layer composed of death and deteriorated product with mixed organisms. Human activities affect formations of soil with climate, time, biodiversity and core material. Soil is natural resource that plays crucial role in agriculture, construction and environmental sustainability. Variations of soil patterns are studied in India with wide range of relief patterns, land types, climatic lands and vegetation. In India majority of farming depends on the texture and soil qualities. There are six major ingredients present in soil are organic matter, inorganic matter, moisture, solution, air and soil organisms (Bharti Pathak et. al 2021). According to Chatwal et al 2005, the soil contains mineral matter in 50-60%, water in 25-35% and air in 15-25% also contains slight concentration of organic matter (Chatwal et al, 2005). Studying the physical and chemical parameters of soil is essential for assessing its quality, fertility and overall health. The soil testing plays an important role in crop production and nutrient management. Selection of right fertilizer for soil can be very challenging because it depends on several factors like soil quality, minerals, nutrients, crop type, deficiency and environmental conditions and this issue can solve by using analysis of soil for its physico- chemical properties. When fertilizers are used by farmers it is must to take in consideration of about requirement of crop and pattern of soil out of its general ten categories which are categorized on the basis of morphology, nutrient, organic components, colour etc. (Keller, 1976).

Soil analysis is a comprehensive process that evaluates the chemical, physical and biological properties of soil to determine its fertility and overall health of soil. It helps to understand nutrient availability, concentration of pH, contents of organic matter and other life-threatening factors which can be effect on plants growth. Phosphorous ( $K_2O_5$ ), Potassium ( $K_2O$ ), Nitrogen (N), Lime stone availability, content of organic matter and trace elements are components of chemical in soil. Physical factors include for soil testing are texture, colour, pH, density, permeability (G. N. Ghumare et. al, 2020).

Sand particles are biggest particles in soil out of all different sized particles which give texture, porosity, colour, structure and temperature to the soil. (Arushi Makkar et. al. 2018). Present research focuses on soil sample analysis to assess physical and chemical characteristics of soil include nutrients from Ahilyanagar district of Maharashtra. The study aims to determine soil texture, pH levels, nutrient content, moisture retention capacity and presence of organic matter or contaminants if there any. On analysis of these parameters, it is easy to evaluate soil fertility, deficiency and can recommend appropriate soil management practice in relation to development of pest to increase soil productivity.

## Methodology

### Material:

Six Soil Samples were collected from Imampur, Vambori, Newasa, Shrirampur, Rahata, Kopargaon areas from district Ahilyanagar. Soil sampling locations were fixed and divided into uniform sections based on soil type, topography and use of land. Selected field were cleaned for herbs and plants if there any and about 2 to 10 cm deep four holes were prepared in four corners of field. Soil samples were collected in polythene bags from depth of all holes. Plant residues and pieces of stones were removed by hand and Soil sample were kept in air for dry and passed through a 2 mm braced sieve. Samples were stored in oven at 30°C Temperature until its use. Approximately 250g of soil sample was transferred to sample bags tagged with sampling date, Location, identification number and these six soil samples were brought to the laboratory to evaluate its physical and chemical characters.

### Methods:

Characters of soil sample acts very precious role in development of the pest, it impacts on survival, reproduction and spread with soil born pests including larval stages of insect, soil nematodes, development of fungi and type of bacteria. Soil analysis includes physical, chemical and biological testing. The procedure described by Jackson were used to identify pH of soil and electric conductivity. Mercury thermometer with metal cone were used to know temperature of a soil with addition of metal cone into the soil in 2 cm depth. The amount of maximum water which can saturate in soil is Water holding capacity of soil.

Soil pH is significant factor that can use to access plant growth and nutrient available for plants. Maintenance of soil health and improving crop productivity can be done by using regular pH testing because it influences nutrient availability, microbial activity and plant growth. If pH is exceeded than its optimum level it concludes to nutrient deficiencies or toxicity. Acidic pH of soil is less than 6, Neutral pH is normal form soil ranges from 6-8.5 and alkaline soil is with pH greater than 8.5. pH can be identified by pH meter, pH indicator strips or pH measurement using calcium chloride (CaCl<sub>2</sub>) solution.

The quality of the soil can be check by testing Electrical conductivity of soil, which measure of presence of ions in soil. The electrical conductivity can give sudden result, easy to perform and one of the cheapest methods in soil sample analysis, it shows higher Electrical conductivity when ion concentration being increase. Non saline soil sample shows marginal EC with below 0.4mS/cm and Higher saline soil sample gives result above 0.8 mS/cm.

Sulfur and Phosphorus are micronutrient act as essential minerals for plant growth as these are responsible to form necessary enzymes and plant proteins. Phosphorus is present in plant nucleic acid and store energy while sulfur useful for growth of plant. These both are necessary in very low quantity but if present in deficient shows plant health issues or affect viability.

All the physical and chemical characters were analyzed by using soil analysis kit in laboratory and observations and result were comparatively displayed in table and graphs to easy enterprises of data.

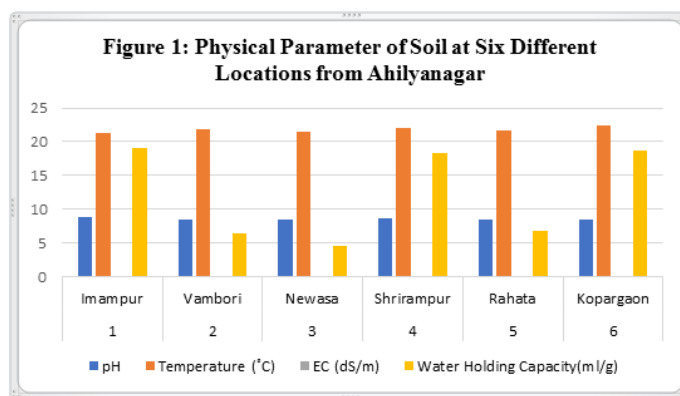
## Results and Discussions

### Physical parameters:

From six different locations six soil sample were collected and evaluated for their physical characters like Texture, Colour, Temperature, pH, Water holding capacity and Electric conductivity. The results were displayed in Table no.-1 and it were represented by graphical bar charts in Fig.1. The acidity or alkalinity of the soil can be study by soil reaction or pH. The pH values fluctuated less than 8.80. The pH value for soil if acidic then it is < 6.5, if it is Normal 6.5-7.8, Alkaline 7.8- 8.5, Alkali > 8.5. pH is one of the most important soil properties which directly effect on crop growth. The nutrients like iron (Fe), zinc (Zn), Copper (Cu), manganese (Mn) etc. are available more in acidic than in alkaline soils. In alkaline and calcareous soils, the availability of potassium (K), phosphorus (PO<sub>4</sub>), iron (Fe) and many minor elements is reduced and hence, the addition of fertilizers carrying these elements is necessary for such soils. Therefore, preserving soil fertility greatly depends on the pH of the soil. (S.S. Patil, et. al 2014)

**Table 1:** Physical Parameter of Soil at Six Different Locations from Ahilyanagar

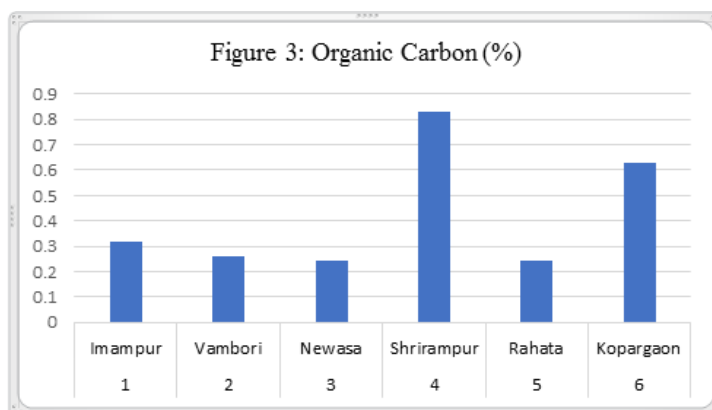
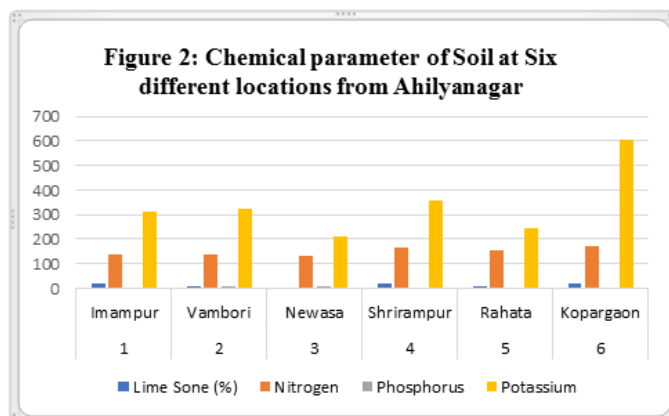
Sr. No.	Sample	pH	Temperature (°C)	EC (dS/m)	Water Holding Capacity(ml/ g)
1	Imampur	8.80	21.3	0.19	19.00
2	Vambori	8.50	21.8	0.12	6.50
3	Newasa	8.48	21.4	0.11	4.50
4	Shrirampur	8.60	22.1	0.17	18.25
5	Rahata	8.45	21.6	0.11	6.75
6	Kopargaon	8.52	22.4	0.20	18.75



Aqueous soil extracts are used to estimate the total soluble salts based on the Electrical Conductivity value of Electrical conductivity is frequently employed as a measure of salinity and is used to assess the soluble salt concentrations in soil. The values of six soil samples ranged from 0.11 dS/m to 0.20 dS/m (Table 1). A soil is deemed moderately or non-salty if its EC is less than 0.4 mS/cm, and extremely saline if it is greater than 0.8 mS/cm. The water-holding capacity of six distinct Ahilyanagr District locales varied from 4.50 ml/g to 19.00.

**Table 2:** Chemical Parameter of Soil at Six Different Locations from Ahilyanagar

Sr. No.	Sample	Lime Stone (%)	Organic carbon (%)	Macro Nutrients (kg/hectare)		
				Nitrogen	Phosphorus	Potassium
1	Imampur	19.00	0.32	140	04	314
2	Vambori	6.50	0.26	137	08	325
3	Newasa	4.50	0.24	132	06	213
4	Shrirampur	18.25	0.83	169	03	358
5	Rahata	6.75	0.24	154	03	246
6	Kopargaon	18.75	0.63	172	02	605



According to Table 2, the organic carbon ranges from 0.24 to 0.83 percent. All of the dead plant debris and any living or deceased animals are included in the organic soil matter. The majority of soil-dwelling organisms, such as bacteria, fungus, insects, and plants, rely on organic matter for energy and nutrients. Different organic substances in different states of decomposition can be found in soils. Organic matter may hold up to double its weight in water and keeps soils permeable, allowing water and air to enter. Plant development and metabolism depend on organic materials. When applied to the soil as fertilizer, inorganic phosphate quickly transforms into unavailable (Swanti A. Jain et. al. 2014). In the current investigation, six soil samples from the Ahilyanagar District had nitrogen contents ranging from 132 to 172 kg/hectare, phosphorus contents ranging from 2 to 8 kg/hectare, and potassium contents ranging from 213 to 605 kg/hectare. These results show that via influencing respiration, charge balance, photosynthesis, and phosphorylation controls, N, P, and K have an impact on energy metabolism. By disrupting energy, nutrient imbalances in the soil or in the plant might prevent growth and development. (Ma Jiaying et.al. 2022).

### **Conclusion:**

The soil is rich in organic materials and have a low soluble salt content. Soil samples are typically sandy loams, clay loams, and black soils with a subtle black, black, and ash color with an open character. The most visible and easily detected soil property is its color. The Ahilyanagar district's soil survey data unequivocally shows that the soils have a low soluble salt concentration and are somewhat neutral to moderately alkaline in reactivity. The soil from Ahilyanagar district had medium levels of accessible phosphorus, high levels of available potassium, and high levels of organic carbon and available nitrogen. The Ahilyanagar district's soils are medium in available nitrogen, potassium, and adequate in available phosphorus, according to the overall nutrient index.

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### **Conflicts of Interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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