



Studies on Physicochemical Parameters of Soil Samples from Lakhandur Region, Dist. Bhandara, Maharashtra

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Abstract

The aim of the present investigation is to analysis of soil samples for its physical and chemical parameters from lakhandur. The soil samples were collected from lakhandur region including villages lakhandur, Asola, Zerobar, Chaprad and Pimpalgaon. To avoid soil contamination of the Soil sample has collected by preparing V shape holes on the soil surface. These soil samples have physical and chemical analysis. Physical analysis Soil Sample are includes testing of soils for other properties like water holding capacity, Soil moisture, Soil bulk density, pH and electrical conductivity Chemical analysis Soil Sample are includes testing of soils for other properties like Organic Carbon, Nitrogen, potassium and Phosphorus. Experimental finding of present research work are the water holding capacity, Moisture Content and The bulk density, for all sample are normal range. Organic carbon is safe limit and nitrogen are medium range but phosphorus and potassium are very low rage therefore all agricultural soil required NPK fertilizer.

Keywords: Physico-chemical analysis, Soil Sample, Lakhandur region, Soil Surface, NPK Fertilizer.

1. Introduction

Soil is the uppermost layer of the land surface, usually composed of mineral's, organic matter, living organisms, air and water. Soil may be defined as "Soil is the loose surface material that covers most land. It consists of inorganic particles and organic matter. Soil provides the structural support for plants used in agriculture and is also their source of water and nutrients. Soils vary greatly in their chemical and physical properties." Soil differs from the parent material in the morphological, physical, chemical and biological properties. Also, soils differ among environmental factors. Thus some soils are red, some are black; some are deep and some are shallow; some are coarse-textured and some are fine-textured. They serve in varying degree as a reservoir of as a reservoir of nutrients and water of crops, provide mechanical anchorage and favorable tilth. The components of soil are mineral material, organic matter water and air, the proportions of which vary and which together form a system plant growth; hence the need to study the soils in perspective [1, 2]. Ganorkar R.P. et.al The Nutrients and physicochemical parameters of the soil like soil moisture, pH, organic carbon, Nitrogen, Phosphorous, Potassium, Copper, Magnesium, Electric Conductivity, Calcium, Alkalinity, CaCO₃, and zinc were analyzed in the month of February 2016. It was found

that there was a marked variation in physicochemical parameters of various Soil samples in different farmer's field [3]. Dwived A.P. Various Soil quality parameters were analyzed by using standard procedures. Fifteen Soil sample were collected from two different areas of Chitrakoot region [4]. Shirsath W.B. [Investigations were undertaken on the soil quality in, a region of Satana Tahasil in Nashik district The Physico-chemical parameters considered for analysis of soil samples were density, WHC, pH, Electrical Conductivity (E.C), organic carbon, calcium carbonate, nitrogen, Phosphorous Potassium, Sodium. Calcium, magnesium, iron sulphur Manganese, Zinc and Copper [5]. Das B. *et al.* The study was conducted on the physicochemical analysis of soil of Jaisamand lake area. The physical and chemical parameters like pH, EC, moisture content, organic matter, nitrogen, potassium and phosphorous were studied, tabulated and briefly discussed [6]. Wankhede R.R. in the present study is undertaken to determine the physico-chemical characteristics of some samples of soil from some farms of nearby villages of Digras region, Dist. Yavatmal [7]. Sunil *et al.* The soil is the most important constituent to fulfillment of all the basic needs of human beings as well as plant Soil is an important component of our agriculture [8]. Utale P.S. A soil test determines the soil's nutrient supplying capacity by mixing

soil during the analysis with a very strong extracting solution (often an acid or a combination of acids) [9]. Karande S. *et al.* In present study it was preferred to investigate the soil sample for its chemical analysis and physical analysis. The seven soil samples were collected from Mehesana and Patan district in different area [10]. Surface and the sub-surface characteristic and qualities namely, depth, texture, structure, drainage conditions and soil moisture relationship which directly affect the plant growth. A study of soil profile supplemented by physical, chemical and biological properties of the soil will give full picture of soil fertility and productivity.

1.1. Physico-chemical Analysis Soil Sample

Physico-chemical analysis Soil Sample is well recognized as a sound scientific tool to assess inherent power of soil to supply plant nutrients. The benefits of soil testing have been established through scientific research, extensive field demonstrations, and on the basis fertilizer use recommendations. Soil testing helps in understanding the inherent fertility status of the soil. This information is important for determining whether the soils could supply adequate nutrients for optimum crop production or not.

A study of the soil profile is important from crop husbandry point of view, since it reveals the Physico-chemical analysis Soil Sample are includes testing of soils for other properties like water holding capacity, Soil moisture, Soil bulk density, pH, electrical conductivity, Organic Carbon, Nitrogen, potassium and Phosphorus [11, 12].

- i). **Water Holding Capacity:** The determination of water holding capacity in soils is important as it gives an idea of the capacity of soil to hold water for the use by crops.. Water holding capacity of soil is useful for selection of soils for irrigability classification. It also helps for comparing other properties of soil.
- ii). **Soil Moisture:** There are numerous methods available for the determination of soil water content. Gravimetric method is the simplest and most widely used direct method to determine soil moisture.
- iii). **Soil Bulk Density:** Soil bulk density is defined as the ratio of the mass of the oven dry soil to its bulk volume. The bulk density varies indirectly with total pore space present in the soil and gives a good estimate of porosity of soil.
- iv). **pH:** The soil pH is the negative logarithm of the active hydrogen ion (H^+) conc. in the soil solution. It is the measure of soil sodality, acidity or neutrality. The determination of pH in soil is important as it plays a great role in availability of nutrients to plants.
- v). **Electrical Conductivity in Soil:** The electrical conductivity of water extract of soil gives a measure of soluble salt content of the soil.
- vi). **Organic Carbon in Soil:** Carbon is major nutrient of soil. A soil organic carbon (SOC) is simultaneously a source and sinks for nutrients and plays a vital role in soil fertility maintenance. About 58% of mass of organic matter exists as carbon. Besides its value as a source of plant nutrients, organic matter has a favourable effect upon soil physical properties. % Of Organic Carbon in soil is determined by UV-spectrophotometer method.
- vii). **Nitrogen:** In soil atmospheric nitrogen is a major source of nitrogen. In the atmosphere, it exists in N_2 form and must be converted before it becomes useful in the soil. Nitrogen contain in soil is determined nitrogen analyzer by titration method

viii). **Phosphorus:** Phosphorus is one of the major plant nutrients in the soil. It is a constituent of plant cells, essential for cell division and development of the growing tip of the plant. For this reason it is vital for seedlings and young plants. Soil phosphorus is found in two forms, namely organic and inorganic these two forms together make up the total soil phosphorus. Although total soil phosphorus is generally high, with concentrations ranging from 200 to 6,000 pounds per acre, 80 percent of this phosphorus is immobile and not available for uptake by the plant. Phosphorus contain in soil is determined by UV-spectrophotometer method

ix). **Potassium:** Potassium in soil can be thought of as existing in four pools according to their availability of K for uptake by plant roots. It is present dissolved in the soil water, adsorbed onto particles of clay and organic matter and held within the layers of clay particles. Potassium contain in soil is determined by Flame-photometer method. The soil testing was investigated in rural area to ensure the health of soil about crop productivity. Present research work carried out a detailed physical and chemical analysis of some soil samples was carried out in Lakhandur region.

2. Experimental Methods

2.1. Soil Sampling:

The method and procedure for obtaining soil samples vary according to the purpose of sampling. Analysis of soil samples may be needed for engineering and agricultural purposes. Soil sampling for agricultural purpose is described which is done for soil fertility evaluation and fertilizer recommendations for crops.

The results of even very carefully conducted soil analysis as good as the soil sample itself. Thus, the efficiency of soil testing service depends upon the care and skill with which soil samples are collected. Non-representative samples constitute the largest single source of error in a soil fertility programmed. It is to be noted that the field where soils are sampled [13].

The five soil samples fig.2 were collected from lakhandur region. To avoid soil contamination of the Soil sample has collected by preparing V shape holes on the soil surface. Sample has collecting in well sterilized polyethylene bags. Details of Soil Sampling Locations are given Table 1.

2.2. Methods

i). Determination of saturation moisture percentage (Water Holding Capacity):

Procedure

- a) Crush air-dry soil and pass through 2mm sieve.
- b) Place round filter paper and fix it to the internal perforated floor of the dish. The weight of the dish and filter paper is noted. The dish is then filled with soil by tapping the dish briskly & making plane the top of soil find out its weight.
- c) Place the set of perforated dishes in enamel tray. Pour the water in enamel tray at half of height of dish. Water may rise dish through perforated bottom and moist the soil to its capacity. Keep it for 5 to 6 hours in water.
- d) Take the dishes and place it on a filter paper sheet, so that the excess of water may drain away from the pores within half an hour. The dish containing moist soil is weighted and the weight is noted.

ii). Determination of Soil Moisture Content:

Procedure:

- Place the moist soil sample in moisture box and weight it immediately.
- Place the box with lid off in an oven (105 °C) and dry the soil to a constant weight.
- Remove the sample from the oven, replacing the lid, and place the box in the desiccators until it is cool.
- Weight it and also determine the mass of the empty moisture box. Determination the mass of the moisture.

iii). Determination of Bulk Density by Weighing Bottle

Method: Weight an empty 25 ml bottle. Fill the bottle with oven dry soil up to the brim by tapping and weight it. Empty the bottle and determine its exact volume using burette.

iv). Determination of pH: pH determination is useful for soil classification on the basis of acidity or alkalinity. pH was determining using Digital pH Meter.

v). Measurement of Electrical Conductivity (EC) in Soil: The electrical conductivity of water extract of soil gives a measure of soluble salt content of the soil. Electrical conductivity was determine using digital conductometer.

vi). Organic Carbon in Soil: Take 1 gm soil in 100 ml volumetric flask. Add this 10ml $K_2Cr_2O_7$ and 20 ml $Con.H_2SO_4$ into it and shack regularly. Cool this in 30 min and add 100ml distilled water into it. Take this overnight and determining Percentage of Organic Carbon in soil is determined by UV-spectrophotometer method.

vii). Nitrogen: Take 5 gm soil sample in sample tube and add 25 ml $KMnO_4$ fit this sample tube in machine stand. Take 30 ml boric acid into 250 ml conical flask add 4 to 5 drop methyl red indicator keep this conical flask in right side of sample tube. Adjust 5 min before run the sample. Nitrogen contain in soil is determined nitrogen analyzer by titration method.

viii). Phosphorus: Take 2.5 gram soil sample in conical flask add 1 gm charcoal powder then add 50 ml sodium bicarbonate solution sheck it 30 min and fitter it. Used 5 ml filtrate in 25 ml volumetric flask add 5 N H_2SO_4 add it 2 to 3 drop paranitrophenol. Add 5N H_2SO_4 up to disappear yellow colours take 5 ml solution a volume make up to 25 volumetric flask. Used this by UV-spectrophotometer method determined Phosphorus contain in soil is

ix). Potassium: Take 5 gm soil in 25 ml ammonium acetate solution shake it 5 min. Filter this reaction mixture into Whatmann fitter paper no 41. Filtrate used Flame – photometer to determine Potassium contain in soil.

3. Results and Discussion

i). Physical Parameters: Details of all Chemical parameters is shown in table no.2 and their graphical representation shown in fig-3

ii). Chemical Parameters: Details of all Chemical parameters is shown in table no.3 and their graphical representation shown in fig-4

Table 1: Location of Soil Sample

Sample No.	Sample Location	Latitude N	Longitude E
S-1	Lakhandur	20.755634°	79.885157°
S-2	Asola	20.804551°	79.706884°
S-3	Zerobar	20.759288°	79.890609
S-4	Chaprad	20.721205°	79.898496°
S-5	Pimpalgaon/ko	20.766271°	79.925342°

Table 2: Physical parameter of five soil sample.

Sample No.	Sample Location	Water Holding Capacity %	Moisture Content %	Bulk Density (g/cm^3)	pH	EC (dS/m)
S-1	Lakhandur	23.07%	4.80%	1.0941	5.84	0.52
S-2	Asola	50.36%	5.17%	1.0518	7.50	0.33
S-3	Zerobar	35.68%	2.94%	1.0838	6.19	0.90
S-4	Chaprad	28.78%	1.61%	1.0806	6.37	0.27
S-5	Pimpalgaon	56.60%	3.96%	1.0085	6.15	0.50

Table 3: Chemical parameter of five soil sample.

Sample No.	Sample Location	Organic Carbon %	Nitrogen (kg/ha)	Phosphorus (kg/ha)	Potassium (kg/ha)
Standard range		0.40 to 0. 60	2.0 to 6.0	0.035 to 0.1	11.0 to 15.5
S-1	Lakhandur	0.051	2.21	0.046	13.2
S-2	Asola	0.040	1.73	0.094	12.6
S-3	Zerobar	0.025	2.30	0.004	10.6
S-4	Chaprad	0.141	2.18	0.012	9.2
S-5	Pimpalgaon	0.012	2.03	0.011	7.0

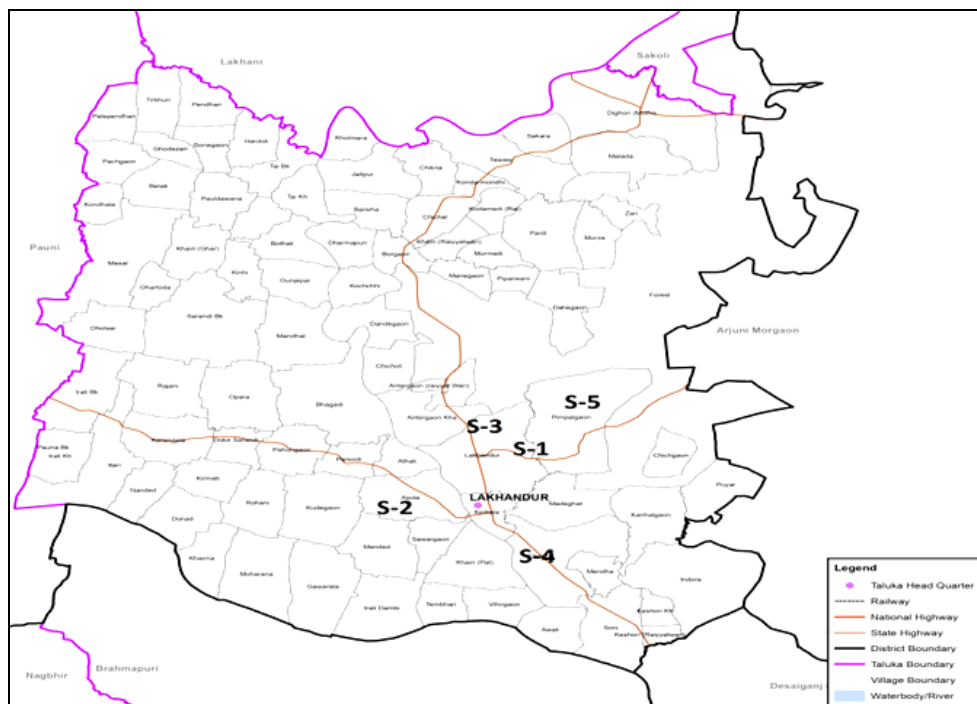
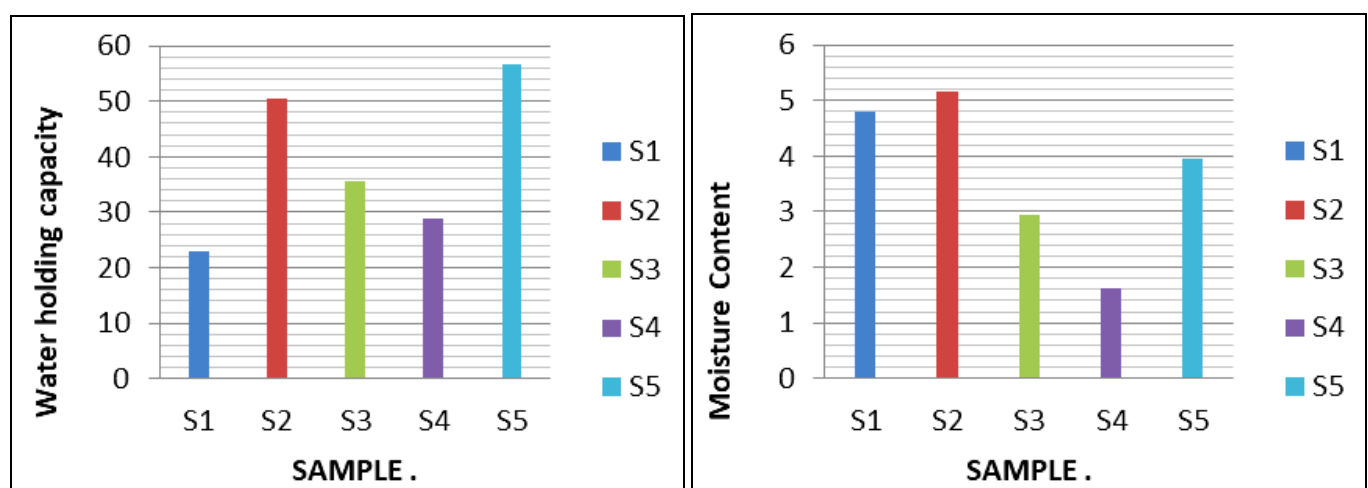


Fig 1: Map of soil sampling in Lakhandur Taluka



Fig 2: Five soil sample S-1, S-2, S-3, S-4 and S-5 in Lakhandur region



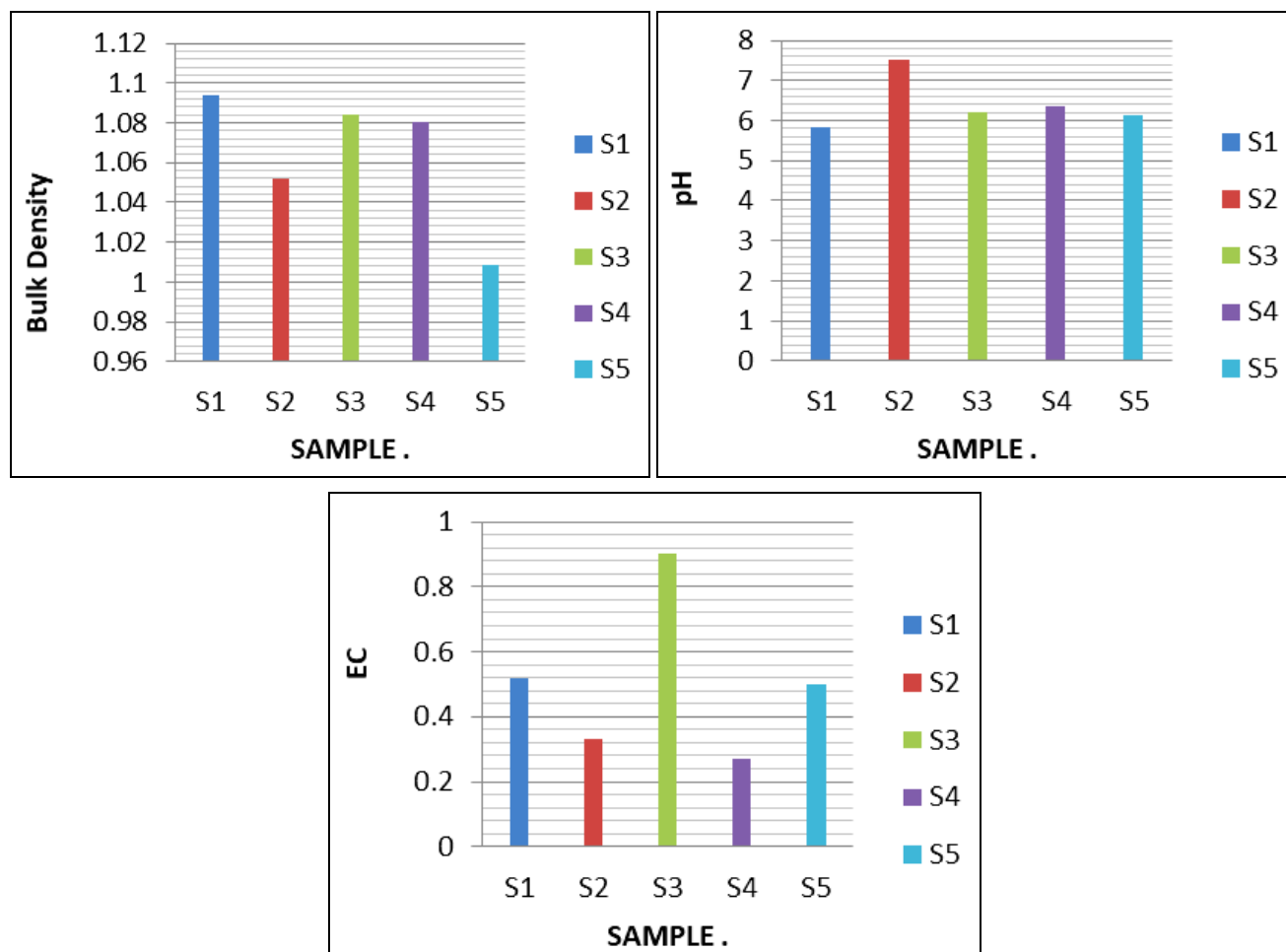


Fig 3: Water holding capacity, Soil moisture, Soil bulk density, pH and electrical conductivity of sample S-1, S-2, S-3, S-4 and S-5.

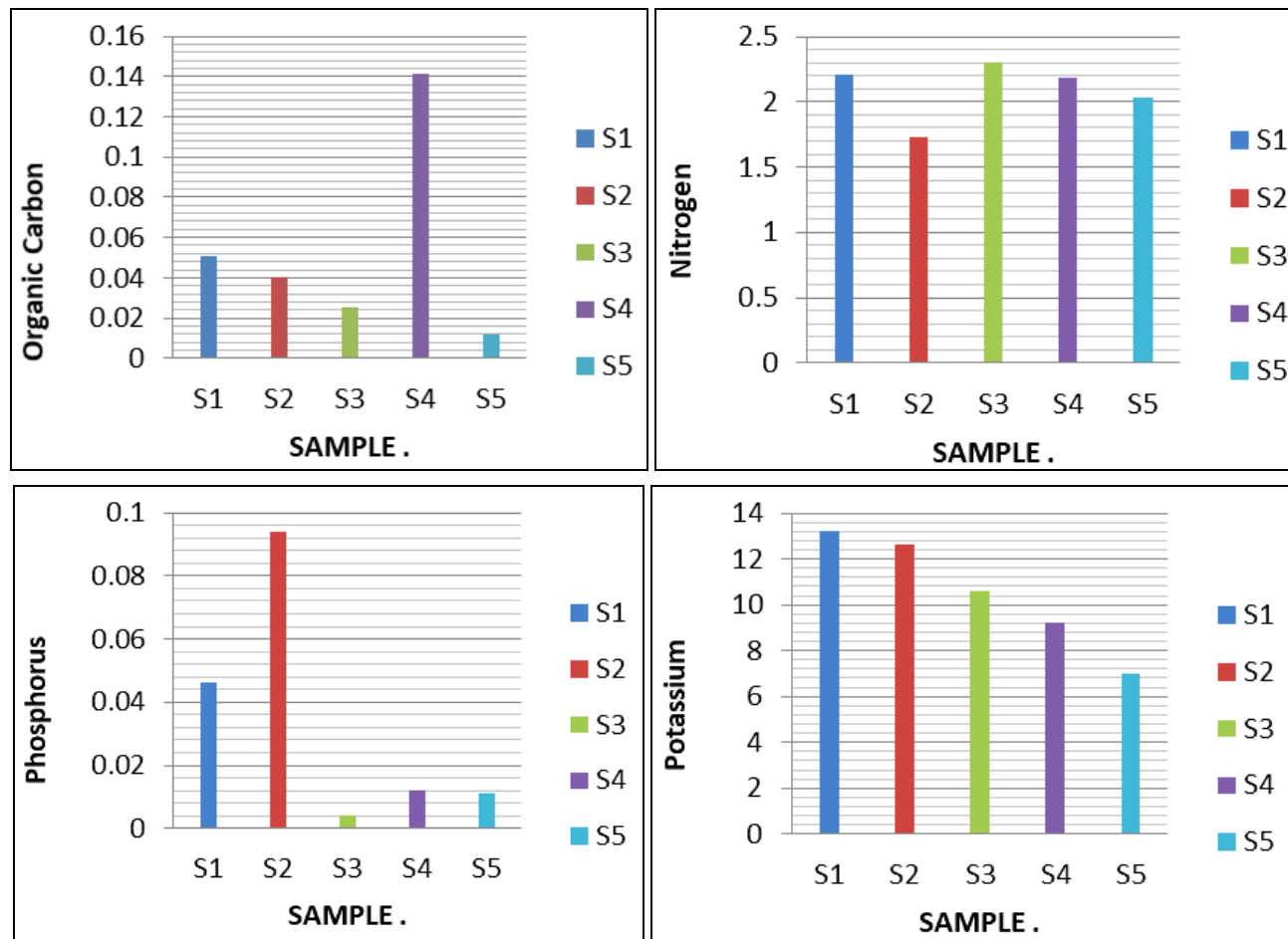


Fig 4: Organic Carbon, Nitrogen, Phosphorus and potassium of sample S-1, S-2, S-3, S-4 and S-5.

4. Conclusion

In Present research project have studies five soil sample present in lakhandur region including villages lakhandur, Asola, Zerobar, Chaprad, Pimpalgaon, Dist Bhandara These soil sample have physical and chemical analysis. Physical analysis Soil Sample are includes testing of soils for other properties like water holding capacity, Soil moisture, Soil bulk density, pH and electrical conductivity Chemical analysis Soil Sample are includes testing of soils for other properties like Organic Carbon, Nitrogen, potassium and Phosphorus. Experimental finding of project work following conclusions have been drawn from the present research work

- The water holding capacity of all soil sample from 23.07% to 56.60% have good water holding capacity
- The Moisture Content of all soil samples from 4.80% to 5.17% (Average 3.69%). This moisture contain is very dry and near normal.
- The bulk density of all soil sample from 1.0085 to 1.0941 (average 1.06376). This bulk density is Normal.
- The pH value ranges from 5.84 to 7.50 (average 6.41) the entire sample has slightly acidic. All collected sample show the value of pH are well within the safe limit as prescribed.
- All samples EC are very low, Non Saline present in all sample.
- Organic carbon ranges from 0.012% to 0.141% all sample are normal range of organic carbon except S-5 have very low range.
- Nitrogen ranges from 1.73 kg/ha to 2.30 kg/ha. all sample are medium range of nitrogen therefore all agricultural land required urea as fertilizer.
- Phosphorus ranges from 0.004 kg/ha to 0.094 kg/ha. Sample S-3, S-4 and S-5 have very low ranges of phosphorus.
- Potassium ranges from 3.2 kg/ha to 10.6 kg/ha. Sample S-3, S-4 and S-5 have low ranges of Potassium.

5. Acknowledgement

The authors greatly appreciate Principals, Yashwantrao Chawhan Art, Commerce and Science College, Lakhandur, NKS Model College, Karanja Ghadge, Dist-Wardha, Maharashtra, India, S.S. Jaiswal College, Arjuni/Morgoan and Late. N.P. Whagaye College, lakhani for facilitating lab during the research. Moreover, we would like to acknowledge the farmers lives in villages lakhandur, Asola, Zerobar, Chaprad, Pimpalgaon Dist Bhandara, Maharashtra for providing all soil samples.

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