

Physico-Chemical Analysis of Soil during Summer Season Western Part of Achalpur Tahsil (Maharashtra State), India

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ABSTRACT: Maharashtra is one of the most fertile regions of India and agriculture is the main occupation of people here. Soil is a main component, which is differing in their morphology, chemical composition and biological characteristics. A study was conducted to analyze the physicochemical parameters of agricultural soils in different villages situated around rivers of Purna (Achalpur Tah. Amravati District, Maharashtra State). In the present study the physicochemical study of soil from five different villages nearby Achalpur Tah, (Amravati district, Maharashtra State) is based on various parameters like total Organic Carbon, Nitrogen (N), Phosphorus, Potassium, Boron, Magnesium, Manganese iron, calcium, pH, and electrical Conductivity. The studied soils were under Soybean, cotton and pulses plant cultivation. The soil samples were found slightly alkaline, with sandy, slit texture and variable amount of organic matter. It was found that there was a remarkable variation in physicochemical parameters of various soil samples.

KEYWORDS: Physico - chemical parameter, Soil nutrient, Achalpur Tahsil

I. INTRODUCTION

Maharashtra is one of the leading states in the crop production of cotton, pulses in India. In Vidarbha region soybean (*Glycine Max*) and cotton (*Gossypium L.*) are major crops of Kharif season. Soybean is a major fodder crop of kharif season. It is a high biomass producing plant with low nitrogen fertilizer requirements and high tolerance to various environmental conditions (Oh et al., 2015).

In the 21st century, in the agriculture science, soil fertility and plant nutrition have played important role in increasing crop yields. The importance of this field is still expanding due to limitation of natural resources, (Land and water) sustainable agriculture and concern about environmental pollution. In this context, the importance of chemical fertilizers in improving crop yields will be necessity. Further, optimum uses of chemical fertilizers along with use of organic manures (compost) maintain the genetic potential of crop species and nutrients.

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. The modern concept of soil quality is the ability to sustain plant and animal productivity, to increase water and air quality and to contribute plant and animal health [2-3].

The fertility soil depends on the parameter like biological, chemical and physical properties of soil. However, good farm practice aims to manage the above factors that make up each of these properties to optimize the yields of crops in environmentally friendly ways.

Soil analysis is an aid to managing soil nutrients efficiently to maintain soil fertility for those nutrients like phosphorus (P), potassium (K) and magnesium (Mg) that are retained in soil in plant available forms. Therefore, a study was conducted in cultivated areas around the Basin of Purna River to assess Physico-chemical properties of agricultural soils. This information will help for the farmer to maintain soil fertility as well as to increase crop yields.

II. MATERIALS AND METHOD

Study area

Achalpur city (Lat 21°, 15', 26" N and Long.77°, 30', 31" E) is municipal council of Amravati district of Maharashtra State. Five villages were selected for sampling which are situated on western part of city in the month of April. This region is well known for oranges and soybean crops.

Sampling and preparation

Soil sampling was done during the summer season (March-2020). Soil samples were collected from Chandur naka (CN), Mhasona (MH) Dhotra Kheda (DK) Walmikhpur (WA) and Shind (SH) villages of western part of Achalpur Tahsil. (Amravati District, Maharashtra State) For sampling V shapes holes were dug for collecting a uniform 2 cm thick slice of soil up to a depth of 22cm. From each site samples in triplicates were pooled from fields. Samples collected were thoroughly mixed on a piece of clean cloth, air dried and the lumps were broken using wooden pestle and mortar. Particles were separated, crushed and sieved with 2 mm mesh diameter. Stored in clean Polythene bags and were brought to laboratory.

Physico- chemical analysis of soil samples

All the chemicals and reagents were used for analysis of AR grade and procured from SD fine chemical limited Mumbai. The collected samples were analysed for major Physical and Chemical soil quality parameter. The mixture was shaken for 1.5 hours on magnetic stirrer and supernatant was filtered and used for further analysis The pH and Electrical Conductivity (EC) were determined in 1:5 soil water suspension using Systronics digital pH meter (Model No.335) and Equiptronics conductivity meter. (EQ-636). EDTA titration method was used for determination of calcium (Ca) and Magnesium (Mg). [4] Organic Carbon (OC) and Nitrogen (N) was measured by standard titration method. [5-7] Potassium was measured by using digital Flame photometer (Model No.S-932). The CaCO_3 present in the soil was measured by acid neutralization method, [8] soil moisture was measured by using weighing method.

III. RESULTS AND DISCUSSION

The physico-chemical properties of soils are given in Table 1. The studied soil samples from agriculture land of different villages were found to be slightly alkaline in nature.

pH

The pH of soils ranged from 7.86- 8.68. Under such condition the solubility of minerals decreases creating nutrient deficiencies of iron, copper, boron in the soils. It was recommended that, use of gypsum needful, sowing green crops, to dig drain for flow of stagnant water from farmland.

Electrical conductivity

The electrical conductivity value ranges from 0.41 to 0.80 (mS/cm). The sample from SH has highest value, shows the excess amount of soluble salt. This may be due to use of excess of fertilizer of N and K. The electrical conductivity of a soil solution increases with the increased concentration of ions.

Phosphorus

Phosphorus in the present soil ranges from 48.4 to 470.8 (Kg/hect.). The highest value for sample from SH village. It is necessary for the normal growth of crop plant.

CaCO_3

The calcium carbonate CaCO_3 (%) present in soil samples ranges from 4.0 to 15.8 %. The sample CN has highest value as compared to all other samples. The presence of excess of calcium carbonate caused significant decrease in dry matter and grain yield. Therefore it is recommended to use organic matter (Humus), ferrous sulphate to increase crop yield.

Ca

Calcium content in soil samples are ranges from 42.1 to 75.2 %. Table 1 shows Ca content for SH soil sample is highest. Calcium has a positive effect on soil properties. This nutrient improves soil structure thereby increasing water penetration, and providing a more favourable soil environment for growth of plant roots and soil microorganisms.

Mg

The Mg concentration in soil samples ranges from 3.64 to 9.57 %. The Mg concentration value is lowest for MH soil samples. As might be expected, plants that are deficient in Mg have an overall light green colour. So it is suggested to use magnesium sulphate (Epsom salt) fertilizer.

K

Potassium plays a major role in the regulation of water in plants (osmo-regulation). Both uptake of water through plant roots and its loss through the stomata are affected by potassium.

From the analysed sample potassium ranges from 115 Kg/hect. to 260 Kg/hect. The value indicated sufficient amount of Potassium in all samples.

S.N	Parameters	CN	MH	DK	WA	SH
1.	Colour	Black	Black	Brownish	Black	Black
2.	Moisture (%)	2.12	2.85	3.15	3.42	3.87
3.	pH	7.86	7.90	8.10	8.52	8.68
4.	Electrical Conductivity(mS/cm)	0.41	0.53	0.48	0.78	0.80
5.	Phosphorus(Kg/hectare)	11	15.1	17.2	19	21
6.	CaCO ₃ (%)	15.2	12.8	10.5	5.5	4.0
7.	Calcium (%)	42.1	55.8	62.2	68.1	75.2
8.	Magnesium (%)	5.72	3.64	7.57	8.12	9.57
9.	Potassium(Kg/hectare)	115	140	190	210	260
10.	Organic Carbon (%)	0.15	0.38	0.45	1.05	1.32
11.	Nitrogen (Kg/hectare)	210	350	410	450	480

Table 1: Showing the variation in different parameter of soil samples from western part of Achalpur Tahsil.

Organic Carbon

Soil organic matter is a primary indicator of soil quality. The soil organic matter refers to all decomposed, partly decomposed organic materials of plant and animal origin. Higher soil organic matter levels cause the soil to retain more water that results in better crop yields

From table 1 the organic Carbon (%) ranges from 0.15 to 1.32. Higher the organic carbons (%) create a more favourable soil environment, leading to increases in plant growth. [9]

Nitrogen

Nitrogen plays a key role in agriculture by increasing crop yield as well as food quality. The amount of nitrogen present in the soil samples was determined by using Kjeldahl method.[10] Nitrogen is necessary for cell division and enlargement. Shortage of this nutrient slows growth and development. The nitrogen ranges from 210 to 480 (Kg/hect). The value for CN sample is lower. So it is suggested to increase nitrogen content by adding composted manure to soil, planting nitrogen fixing plant such as peas or beans.

IV. CONCLUSION

It was concluded from the present study of physico-chemical parameter of soil from western part of Achalpur Tahsil. The studied soil samples were slightly alkaline with low infiltration capacity. It is suggested to use of gypsum, to dig drain for flow of water. The values of Ca, P and CaCO₃ are higher than normal range in most of the soil samples which could be due to poor drainage condition in this area. The moderate amount of K and organic carbon were present in the soil samples. This increases the crops yield.

The deficiency of nitrogen can be fulfilled by adding compost manure and planting green manure crop

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