An Analysis of Soil Chemical Characteristics in Satara District, Maharashtra

Ms. Kavita S. Mashe
Research scholar, Department of Geography,
University of Mumbai

Abstract

The present investigation was carried out in the Satara District, Maharashtra for the chemical characterization of soils. Six sites were studied for the chemical characterization of soils. It has been observed that Soil is one of the most important essential natural resources so people must know how the proper use and protect it. The objective of this paper to analyze the soil chemical characteristics in Satara District, Maharashtra. The study will help in understanding the degree of areal strengths and the significance of some strategies for well defining the production of a particular crop. Satara district is an agricultural dominated area of Maharashtra and most of the people of this district are engaged in agriculture activity for a livelihood. The study will help in understanding the degree of areal strengths and the significance of some strategies for well defining the production of a particular crop.

Keywords: soil degradation, soil chemical characteristics,

Introduction

Plant growth and yield are largely dependent upon the quantities of nutrients that are available in the soil. Intensive crop production demands adequate levels of fertilization. Improper fertilization, could it be over-fertilization or under fertilization can potentially reduce the productivity of crops turning into an uneconomic venture. Data on site-specific nutrient status plays a key role in deciding the adequate levels of fertilization. Keeping these points in view, the present study was conducted for generating the soil nutrient status data of farmlands under crops in selected villages of the Satara district of Maharashtra.

Soils are a very complex natural resource more than water and soil. Soil Classification concern the grouping of soils with a similar range of chemical, physical and biological properties into units that can be geo-referenced and mapped FAO, 2020). In Indian conditions, there is wide diversity as regards its geological setting, physiographic, climate, and vegetation; therefore, it is least surprising that the soils to display wide diversity (Siddhartha, K., 2004).

Most soils having developed from basalt in Maharashtra. Climate and topography are important in initiating the process of soil formation. The soils of Maharashtra are grouped into the coarse shallow soils, medium black soils, deep black soils, clay loam, laterite, coastal alluvium, reddish, yellowish, and brown soils, and brown-gray soils. The classification adopted by the department of agriculture, Government of Maharashtra, has neither a genetic basis nor follows an accepted international soil classification. (Dikshit, K. 1996). Agriculture is an important activity in the Satara district. More than 65% population of the district depends directly or indirectly on agriculture. The agriculture sector plays a significant role in the overall Socio-Economic development of the Satara District.

The findings of this study will be beneficial for government agencies, research institutions, policymakers, administrators, field level functionaries, NGOs, and civil society

Objective:

The main objective of this paper to analyze the soil chemical characteristics in Satara District, Maharashtra to create responsibility among peoples to protect this valuable resource for future use.

Data Sources and Methodology:

The studies were conducted in the Satara district of Maharashtra. The present study based on the primary data and information is collected through village revenue offices, tehsils revenue offices, Satara district statistical office,

The following method has been adopted for the selection of sample villages. Six villages were randomly selected basis their altitude, which was further bucketed into three groups as (450-600m) Group I, (600-900m) Group II and above 900m Group III basis the altitude range and proximity of their tehsils. Each group selects two villages. In (Group I) there are two different villages with two different tehsils because of its altitude range (450-600m) they are Korivale which is in Patan tehsil and village Thoratmala in Karad tehsil. In (Group II) village Jawali and Borgaon with their district Phalton and Satara respectively which lie between the altitude range of (600-900m). In group III villages Metgutad and Shikhar Shinganapur with altitude more than 900m. above villages collected soil sample and testing chemical characteristics i.e pH, Electrical Conductivity (dSm^{-1}), Organic Carbon (%), Nitrogen (Kg ha^{-1}), Phosphorous (Kg ha^{-1}) and Potassium (Kg ha^{-1}) The data were represented (Table 1 and 2).

Table 1. Location of sampling sites

Location	Height	Altitude in (Meters)	Tehsils	Village	Area in Hector
1	High Above 900m	1439	Mahabaleshwar	Metgutad	175.22
2		1438	Man	Shikhar Shingnapur	1483
3	Moderate 600-900m	610	Patan	Koriwale	395.03
4		637	Satara	Boregaon	640.00
5	Low 450 - 600m	550	Phaltan	Jawali	2936.48
6		592	Karad	Thorat mala	241.40

(Compiled by Author)

The Study Area:

Satara district lies at the Western limit of the Deccan plateau in southern Maharashtra state. The district lies between 17° 05' and 18° 11' north latitudes and 73° 33' and 74° 54' east longitudes. It is surrounded by Pune district to the north, Solapur district to the east, Sangli district to the south and Ratnagiri district to the west. It also has a small boundary of about 24 km. with Raigarh district in the north-west. In 2011 census the district had 11 tehsils, 22 towns and 1745 inhabited villages (including 26 uninhabited villages) occupying an area of 10,480. sq.km. (Source: Satara district census handbook Satara, district 2011)

Result and Discussion:

1. **Soil pH**

Soil pH is a measure of the reactivity of a soil. Soil pH thus gives us an idea of the availability of a particular nutrient to crops. The data for the soil pH is presented in table 1 under the sampling sites in Satara district recorded alkaline in nature except for the result at Borgaon where it recorded (pH 6.9) neutral soil reaction. Thus this is an indication of soils were varying in soil reaction at the various location the nutrient supplying capacity get

Table 1 Soil properties in different locations

Sr. No.	Soil Properties	Details of soil sampling sites						Critical Limits
		Location (1)	Location (2)	Location (3)	Location (4)	Location (5)	Location (6)	
1	pH	8.4	8.3	8.2	7.9	8.2	8.7	6.5-8.5
2	Electrical Conductivity (dSm^{-1})	0.2	0.4	0.7	0.4	0.9	1.4	<1.0
3	Organic Carbon (%)	0.7	0.4	0.8	0.5	0.6	0.6	0.4-0.8
4	Nitrogen ($Kg\ ha^{-1}$)	190.3	160.8	116.5	171.5	66.2	90.4	100-200
5	Phosphorous ($Kg\ ha^{-1}$)	30.2	34.7	32.8	31.4	33.4	27.5	30-40
6	Potassium ($Kg\ ha^{-1}$)	222.2	210.0	250.2	299.5	371.6	260.9	200-330

(Compiled by Author)

2 The electrical conductivity of soils

Electrical conductivity is a measure of soluble salt concentration in soil. A higher amount of salt in the soil restricts the nutrient uptake and thus affect the plant growth. The data concerning electrical conductivity is presented in table 1. The electrical conductivity was found to be increased at 6th location (1.4 dSm^{-1}), which is an indication that soils are getting affected by increasing salt concentration which further resulted in soil degradation. The higher EC value suggests that salts would be added to these soils during irrigation and/or fertilizer application. The higher EC values at surface layers might also be due to movement of water from the shallow water table to surface layers through capillary force and due to diurnal temperature variations water evaporates leaving behind the salts, which accumulate as encrustations on the soil surface (Deshmukh, 2012). While the soils from other locations are having optimum electrical conductivity and hence suitable for agriculture.

3 Organic carbon status

Soils understudy areas have low organic matter due to low prevailing rainfall or aridity. The absence of luxuriant vegetation decreases the level of organic matter in these soils. The significance of nature and content of clay as a substrate has been stressed as the most important factor influencing organic carbon dynamics. Soil organic matter is the major pool of nutrient elements for plant growth. The organic carbon is an indicator of chemical and biological changes taking place in soil and also plays a major role in mineralization and transformation of nutrients in the soil (Stevenson et al., 1992).

The organic carbon percent under the sampling sites recorded lower and thus resulted in reducing the fertility of soils, the soil organic carbon ranging from 0.45-0.65 percent. The lower organic matter content in the soils might be attributed to lesser addition of organic residues to soil and also to the prevalence of tropical conditions, where the degradation of organic matter occurs at a faster rate coupled with low vegetation cover, thereby leaving less organic C in the soils. Similar observations were noticed by Nayak et al., (2002).

4 Available nutrient status of soils

The available nutrient status of soils from various sampling sites is presented in the table. 1. The available nitrogen recorded from very low to medium in range (64.81-169.83 Kg ha^{-1}) reveals that the soils are poor in nitrogen content. The lower value was recorded at location 5th (Jawali). Since continuous cropping, the available nitrogen might have been utilized by the standing crop continuously to support further growth and production. This rapid and continuous removal of available nitrogen by the crop coupled with other possible nitrogen losses like leaching and volatilization might have resulted in lower available nitrogen status of these soils. Lower available nitrogen in soils might also be due to lower organic carbon status and poor physical conditions of the soil which might have accentuated the losses of soil nitrogen due to denitrification and volatilization losses Shilpa Shree et al., (2017). Similarly the phosphorous content of the soils from sampling sites recorded in medium to a high range which indicates that soils are having a good supply of phosphorous to the crop plants. The higher phosphorus content of soil could be due to lesser precipitation of added phosphorus as calcium and magnesium phosphate and due to acidulation and solubility of fixed phosphorus Shilpa Shree et al., (2017).

Conclusion: Through the study of soil, people can learn how to manage practices to the specific needs of each kind of soil, people must enhance their understanding about the soil so they can learn how to protect it for future use and also learn about its properties and behavior, so they can control it sensibly.

Good soil is abundant on this planet as long as people care for it appropriately. If people manage the soil properly, it will continue to support the human race for generations to come. If people do not care for it, culture is endangered.

Recommendation:

The data recorded based on soil testing reports it is concluded that from all the locations the pH was alkaline except the pH of location1 Borgaon, hence the soils except Borgaon needs critical management regarding the application of fertilizers the fertilizers with acidic pH needs to be applied for maintaining the pH of rhizosphere soil as well as also needs to observe critically about the available water sources and checked for pH regularly if groundwater supply is also from hard water then it will increase the salinity and sodicity in the soils.

The electrical conductivity is not found any significant for the soils as it is below the critical limits except the samples from (Thorat mala) location 6, which needs to be taken under consideration use of bulk fertilizers.

The available nutrient status considering the data soil nitrogen not found many variations although considering the losses of nitrogen through immobilization, mineralization, and leaching the balanced nutrient approach should be taken under consideration. The analysis data showed higher content of potassium although the crop response to the potassium mainly depends upon the sources of potassium and forms of potassium plants can only take the potassium from water-soluble potassium and available potassium rest the non-exchangeable and lattice potassium are not available for plants hence from the present data is suggested for the judicial management for the potassium.

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