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ROLE OF PHYSICO-CHEMICAL ANALYSIS IN SOIL QUALITY AND MANAGEMENT
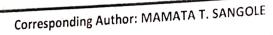
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Abstract: The economies for most developing countries primarily depend on agriculture. Studying the physicochemical properties of soil is important for sustainable management of the agricultural resources and economic growth. In the present study it was preferred to investigate the soil sample for its physico-chemical analysis of some parameters. The sample was analyzed for its soil texture soil temperature, bulk density, pH, Electrical conductivity (EC), Total organic carbon, Available nitrogen (N), Available phosphorus (P), Available Potassium (K) and Calcium carbonate CaCO₃). Characterization also helps in determining the soil potentials and identifying the constraint in crop production besides giving detailed information about different soil properties. Thus the systematic study of physico-chemical properties of the soils could help in understanding the basic characteristics of the soils and the constraints associated with the management of soils.

Keywords: Economies, Analysis

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INTRODUCTION

A growing interest in soil health and conservation agriculture, as well as criticism of unsustainable farming practices, have increased the need for soil testing techniques that provide a more holistic assessment of soil health. Soil management worldwide is under threat because of practices such as high-intensity agriculture. This approach to farming largely ignores soil's biological function and relies solely on chemical inputs. This has led to soil depletion reaching critical levels in many countries. Soil testing services overlooked the importance of biological soil health. Soil analyses have always focused on total soil organic matter and chemical indicators of inorganic nutrients such as nitrogen, potassium and phosphorus. Soil health has to be determined on a chemical, physical and biological level. Soil is the farmer's most important asset and the engine driving productivity. There is tremendous value in using this soil testing technique. This paper examines the principal physical and chemical attributes that can serve as indicators of a change in soil quality under particular agro climatic conditions.

Materials and Methods

The studied area is located in the province of Lonar , Dist Buldana between Latitude 022°43N, Longitudes 077°00E. Representative soil sample was collected involves procedures of drying, grinding, sieving, mixing, partitioning, weighing and storing. In laboratory this sample was analyzed for different chemical parameters following standard methods. All the chemicals and reagents used for analysis are AR grade. Analysis of physicochemical parameters of the soil samples were suspended in distilled water and allowed to settle down the particles. The pH of the suspension was determined using pH meter. Electrical conductivity of the soil was determined in the filtrate of the water extract using Conductivity meter. % Organic carbon content was determined by adopting chromic acid wet digestion method as standard procedure of Walkley and Black method using diphenylamine indicator, available nitrogen was estimated by alkaline permanganate method, available phosphorus determined by volumetric method [1-8]. Available potassium content in the soil was determined by using turbiditimetric methods, calcium can be determined by titration with standard $KMnO_4$ solution. Carbonate in soil was determined by rapid titration method using bromothymol blue indicator . All apparatus are Systronic make.

Result and discussion

Experiments were performed for the determination of chemical constituents of soil and some of its physical properties for the assessment of type and quality of soil. A soil texture soil temperature, bulk density, pH, Electrical conductivity (EC), Total organic carbon, Available nitrogen (N), Available phosphorus (P), Available Potassium (K) and Calcium carbonate $CaCO_3$) in soil were determined experimentally. Investigation demonstrate that black colour soil was found in the Lonar region. Soil texture in the different soil is differing according to soil diversity. Soil texture also affects the nutrient supply of the soil [9]. Soil texture is one of the most important soil properties governing most of the physical, chemical and hydrological properties of soils. Variability in soil texture may contribute to the variation in nutrient storage and availability, water retention and transport and binding and stability of soil aggregates. It can directly or indirectly influence many other soil functions and soil threats such as soil erosion. The soil water holding capacity is essential to the evaluation of regional soil water balance. The bulk density of soil sample was found 0.886 kg/lit. indicating that soil has a better water holding capacity. The analysis of chemical properties indicates that the black soils of Lonar was slightly acidic. The range of pH of soil is 6.46. Soil pH is an important consideration for farmers and gardeners for several reasons, including the fact that many plants and soil life forms prefer either alkaline or acidic conditions or the pH can affect the availability of nutrients in the

soil . Electrical Conductivity (EC) estimates the concentration of soluble salts in the soil .The electrical conductance of soil by EC meter was found 0.795 dS m^{-1}. Generally it is believed that higher the concentration of ions in the soil solution more is its electrical conductance. Organic carbon content decreases with depth of profile .It may be due to its mineralization under existing climatic conditions on the surface or may be due to low leaching from surface layers or may be due to low leaching from surface layers or absorption by clay particles. The percentage of organic carbon content was found 0.66 % which is in good health or in required range i.e. 170 – 225 kg/ha. The percentage of free calcium carbonate present in soil sample was found to be 4%. The available nitrogen present in soil sample was found to be 188.16 kg/ha. Available P in the present investigation was found to be 70.24 kg/ha. Application of phosphorus (P) is necessary for maintaining a balance between the other plant nutrients and ensuring the normal growth of the crop. Available potassium present in soil sample was found to be 280.56 kg/ha. Results of all the parameters of a soil sample are given as follows. The soil physical and chemical data are presented in Table 1.

Table 1 : Some Physical and Chemical properties of soil

Parameters	Observed Value
Color	Black
pH	6.46
Bulk density	0.886 kg lit
EC (dS m^{-1})	0.14 dS m^{-1}
Organic carbon (%)	0.842 %
Calcium carbonate (%)	40 %
Available nitrogen (kg ha^{-1})	215.04 kg/ha
Available phosphorus (kg ha^{-1})	138.70 kg/ha
Available potassium (kg ha^{-1})	280.42 kg/ha

Conclusion and Remediation

After studying all the parameters and their ranges it is concluded that, the soil sample collected from farm is rich with the entire nutrient, slightly acidic i.e. it is good for all the agricultural crops. Electrical conductivity (EC) indicates the good quality soil. From the study of CaCO$_3$ it is indicated that soil is slightly calcareous and from the percentage of calcium carbonate it is concluded that the CaCO$_3$ is present in less amount which is good for soil. If it is present in excess it may affect the crop. Organic carbon determination shows the carbon content is moderate. It is beneficial for supplying water to plants and also by providing good physical condition to the soil. Farmers are requested to use the right fertilizer to increase the fertility of soil. From NPK study i.e. Nitrogen, Phosphorous, Potassium it is observed that all the parameters are in required range which indicated that the soil is in good health. From all the parameters it is concluded that this soil is good for Soyabean, Chickpea and Pigeon Pea

cultivation. Farmers are suggested that do not use much fertilizer because farm is rich with all the nutrient and excess use of fertilizer may decrease the crop yield.

Acknowledgement

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