

Assessment of Soil Fertility from Various Areas of Chandrapur District (M. S.) India

Vikas D. Umare

Department of Chemistry, Janata Mahavidyalaya, Chandrapur, Maharashtra, India-442401

Abstract The present study aims to analyse certain physicochemical properties of soil at different agricultural areas of Chandrapur District to assess soil quality and the make action plan before planting to manage soil nutrients for maximum crop production. The soil parameters like colour, pH, EC, organic carbon, nitrogen, potassium and phosphorous, copper, iron, manganese and zinc were analysed. The chemical analysis reveals that there was a variation in parameters and nutrients of soil samples. The results of the study confirms the low to medium levels of phosphorous, potassium, copper, iron, manganese and zinc and required treatment before planting.

Keyword: Soil parameters, Crop yield, physicochemical analysis

INTRODUCTION

The soil is universal medium for growing the plant. It nourishes soil nutrients as well as water to the plant for optimum growth and consequently crop yield¹⁻⁴. The fertility of agricultural land is depends mostly on its physicochemical properties of soil. The soils fertility can be declined by several manmade activities, overuse of fertilizers and pesticides or industrial effluent drained from different industries⁵⁻⁶. Thus polluted soil is a global concern and creating several health hazard to people, livestock and plants. Therefore to ascertain the quality of soil, its chemical analysis is most important for plants growth and soil management. So, In view of this, soil samples was collected and analysed for some physicochemical parameters like colour, pH, electrical conductivity, organic carbon, organic matter, nitrogen, phosphorous, potassium, copper, iron, manganese and zinc.

MATERIALS AND METHODS

Study Area The soil samples were collected from Pardi, Nandgaon and Sakharwahi village of Chandrapur District. This area is well known for soyabean, cotton and wheat crops

Soil sampling

The samples were collected at 0 to 20 cm depths from the surface of soil. Then they were dried and grinded using mortar and passed through 2 mm sieved to get uniform particle size. The sieved samples were packed in clean polythene bag for subsequent physical, chemical analysis. The Analytical Grade chemicals (SD fine) were used for the chemical analysis. The standard methods⁷⁻⁸ was used for determination of different quality parameters of soil samples which is described in table 1

Table 1 Methods use for estimation of soil parameters	
Colour	By viewing
pH	pH Meter
EC	Conductometry
Organic carbon	Wet oxidation
Organic Matter	% Soil organic matter = % organic carbon x 1.72
Nitrogen	Kjeldhal Method
Potassium	Flame photometry
Phosphorous	Colorimetry
Copper	Atomic absorption spectroscopy
Magnese	Atomic absorption spectroscopy
Iron	Atomic absorption spectroscopy
Zinc	Atomic absorption spectroscopy

RESULTS AND DISCUSSION

The analytical values obtained during physicochemical analysis of various soil samples is shown in table 2 and result is discussed as follows

Table 2 The analytical values obtained during physicochemical analysis of soil samples						
Sr. No.	Soil parameters	Unit	observed value at different areas			Standard for soil analysis
			Pardi	Nandgaon	Sakharwahi	
1.	Colour	--				
2.	pH	--	6.87	6.82	6.78	6.5-7.0
3.	Electrical Conductivity	dS/m	1.65	2.51	0.99	0.0-1.0
4.	Organic Carbon	%	0.59	0.72	0.59	0.41-0.60
5.	Organic Matter	%	1.014	1.23	1.014	0.71-1.03
6.	Nitrogen (N)	Kg/H	413.01	504.01	413.02	280-420
7.	Phosphorus (P)	Kg/H	12.35	11.01	29.02	14.0-21.0
8.	Potassium (K)	Kg/H	178.25	180.52	132.02	150-200
9.	Copper (Cu)	PPM	0.23	0.14	0.23	0.20-5.0
10.	Iron (Fe)	PPM	4.52	4.51	2.52	2.5-4.5
11.	Manganese (Mn)	PPM	1.59	2.06	2.14	2.0-4.0
12.	Zinc (Zn)	PPM	0.25	0.67	0.68	0.6-1.5

Colour: The soil of Pardi and Nandgaon village were black in the colour whereas Sakharwahi sample was brownish in colour.

pH: The pH of soil is one of most important physicochemical parameter of soil. It determines hydrogen ion concentration in soil samples. Its value affects absorption of nutrients, minerals and microbial activity present in the soil and consequently affect soil quality. The pH value of all samples are close to neutral range (**Table 2**) and lie in the range prescribed by standard agency.

Electric conductivity (EC): The conductivity measurement gives a clear idea of water soluble ionic content present in the soil. The electric conductance values of soil at Sakharwahi village lies in the prescribed range whereas Pardi and Nandgaon village samples showed electrical conductivity value beyond prescribed range (**Table 2**).

Organic Carbon (OC) and Organic matter: Organic carbon is the index for nitrogen content in the soil. The source of organic carbon in the soil are crop residue, animal manure and organic fertilizers etc. The organic carbon contents of soil at Pardi and Sakharwahi village were found in standard range except Nandgaon village. The organic matter is useful in supplying nutrients and water to the plants and also provides good physical strength to the plants. Organic matter cannot be estimated directly in laboratory. It is calculated by multiplying carbon content by 1.72 factor. The organic carbon and organic matter affects soil fertility as well as holding capacity of CO₂ in the atmosphere. The organic matter is primary source of microorganism in soil. The organic matter of soil at all sites was observed in standard range except Nandgaon village.

Available Nitrogen: It is key nutrient for plant growth. It forms chlorophyll, amino acids, proteins, alkaloids and protoplasm. When soil have sufficient quantities of nitrogen, plant absorbs nitrogen and leaves become dark green indicating high chlorophyll in the plant. When nitrogen level is deprived, leaves remain small and pale-yellow. It play important role in photosynthesis, helps in seed formation and increases crop production. The nitrogen content in the soil sample at all sites have sufficient level except Nandgaon village (**Table 2**).

Phosphorous: It is key nutrients of soil. It plays key role in plant growth, cell division, root growth and elongation seed and fruit development and early ripening. Also it helps in energy storage and transfer. In present study, soil at Pardi and Nandgaon village found to have low phosphorous content. However soil at Sakhawahi village have excessive phosphorous content may be due to overuse of chemical fertiliser.

Potassium: It is a water soluble cation and its mobility in soil is very slow. The potassium ions, on being absorbed by the colloids displaces other ions such as Ca, Mg or Na. Soils ability to absorb and hold potassium is great importance as it serves to decrease leaching and provides more continuous supply of available potassium. In present study, soil at Pardi and Nandgaon village shows average quantity of potassium. The soil at sakhawahi village have low potassium content (**Table2**). Therefore it is advised to use fertiliser rich with potassium.

Copper: In the chloroplasts of leaves there is an enzyme which is concerned with the. The copper is micronutrients essential for enzyme activity in oxidation-reduction processes. It plays an important role in the process of photosynthesis. In present study, soil at Pardi and sakhawahi village shows sufficient quantity of copper. The soil at Nandgaon village

have low copper content (Table 2). Therefore it is advised to use requisite quantity of copper sulphate along with organic manure at the time of planting.

Iron: Its deficiency leads loss of green colour of leaves (chlorosis) and turn to yellowing or whitening of leaves. The concentration of iron ions plays important role in the oxidation process in leaf cells. Inadequate concentration of iron in soil decreases plant growth and consequently improper growth of seed and fruit. Its sever deficiency results in chlorosis. In present study, soil at Pardi and Nandgaon village shows sufficient quantity of Iron. The soil at Sakharwahi village shows insufficient level of iron (Table 2). Therefore in that case, it is advised to use requisite quantity of ferrous sulphate along with organic manure at the time of planting.

Manganese: It is one of essential micronutrient and have a key role in the chlorophyll synthesis. Its deficiency interrupts carbohydrate synthesis, resulting in retarded growth. Along with iron it is a constituent of some respiratory enzymes and enzymes of protein synthesis. In present study, soil at all the sites shows sufficient quantity of manganese.

Zinc: It is associated with the development of chlorophyll in leaves and a high content of zinc is correlated with a high amount of chlorophyll. Its deficiency retard plant growth, buds fall off and decreases seed formation. The soil at Sakharwahi and Nandgaon village have sufficient level of zinc. But soil at Pardi village shows significant low level of zinc. Therefore in that case, it is advised to use requisite quantity of zinc sulphate along with organic manure at the time of planting.

CONCLUSION:

The analytical reports of soil samples showed frequent variation in physicochemical parameters of soil. From the data, it is observed that conductivity of some soil samples is found to be cross prescribed limit. Phosphorous, potassium, copper, manganese and zinc is insufficient in soil samples. So organic manure and fertilizers containing phosphorous, potassium, copper, manganese and zinc are added for proper growth and development of the crops on or before one to two weeks of planting.

ACKNOWLEDGEMENT:

Author is thankful to Principal, Janata Mahavidyalaya, Chandrapur for providing necessary facilities during this work.

REFERENCES

1. Thakre Y.G., Choudhary M. D. and Raut R. D.; Physicochemical Characterization of Red and Black Soils of Wardha Region. *Int. J. Chem. and Phys. Sci.* 1(2): 60-66, 2012
2. Wagh G. S., Chavhan D. M. and Sayyed M. R. G.; Physicochemical Analysis of Soils from Eastern Part of Pune City; *Universal J. of Environmental Research and Tech.* Vol. 3, Issue 1: 93-99
3. Borkar, A.D.; Study on some physicochemical parameters of soil samples in Katol Taluka District Nagpur (MS), India, *Research J. of Agriculture and Forestry Sci.*, 3(1): 16-8, 2015.
4. Moor, C., Lymberopoulou T. and Dietrich V. J., Determination of heavy metals in soils, sediments and geological materials by ICP-AES and ICP-MS. *Microchimica Acta.*, 136, (3-4), 2001.
5. Muniafu, M. and Otiato E.; Solid Waste Management in Nairobi, Kenya. A case for emerging economies. *Journal of Language, Technology & Entrepreneurship in Africa*, 2(1): 342-350, 2010
6. Vrseas B., Soil Protection Activities and Soil Quality Monitoring in South-Eastern Europe. P. Panagos, V. Toma , & H. ustovi (Eds.). Publications Office, 2011.
7. Ganorkar R. P. and Chinchmaipure P. G.; Physicochemical Assessment of Soil in Rajura Bazar in Amravati District (MS), India, *Int. Journal Che. Env. and Phar. Res.*, 4 (2-3), 46-49 (2013)
8. Chaudhari U. E. and Jichkar P. S., Investigation of Nutrients and some Parameters from Soil in Warud Taluka, District Amravati, *Rasayan J. Chem.*, 5(2), 142- 144 (2012)