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Status of Agricultural Soil of Tribal Shahada Tehsil of Nandurbar District, Maharashtra, India: A Case Study

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ABSTRACT

The present paper reveals that there is wide variation in soil fertility status of the soils developed on various land forms in Shahada Tehsil of Nandurbar district of Maharashtra, India. The results of total and available N, P and K contents as well as total Fe, Mn, Cu and Zn contents in the soils were reported. With the information from nutrient status, the soils were rated as fertile with reasonably high production potential under balanced fertilization. The nutrient contents analysis is to be renewed every year by fresh siltation during the monsoon session.

Keywords: Fertility, Shahada Tehsil, Nitrogen, Phosphorous, Potassium, pH, Electrical conductivity.

INTRODUCTION

Soil is a thin layer on the surface of the earth but performs important role in many processes essential to life. It serves as a substrate supporting plant growth, as a nutrient reservoir, and as the site for many biological processes involved in decomposition and recycling of plant and animal products[1]. Soil affect the air quality through interactions with the atmosphere and as a storage and purification medium for water as it passes through the soil. Soil integrates, transforms, stores and filters material relevant to its environmental and management conditions in the spatial context[2]. It is also a medium that is challenged by changing environmental and management conditions [3]. Soil resource is non renewable thing in human time scales[4]. The importance of soils to humankind is documented by the many ancient and old civilizations, some of which vanished because mismanagement destroyed the soils on which they depended [5]. Hence, soils must be managed so that they remain helpful to environmental forces and stresses that are a result of farming itself, and this can only be achieved by balancing outputs from the soils with input to it [6]. Acid soils (with a pH of 5.5 or lower) are among the most important limitations to agricultural production. The production of staple food crops, in particular grain crops, is negatively influenced by acid soils [7]So in this investigation the soil fertility status of soil sample collected from Shahada Tehsil of Nandurbar district of Maharashtra in India studied.

MATERIALS AND METHODS

An irrigated area of Shahada Tehsil of Nandurbar district was selected for the study. The area under study is irrigated and intensively cultivated with commercial crops such as sugarcane, maize, wheat, cotton and banana grown alternatively. The climate of the area is characterized by mean annual rainfall of about 550 mm most of rainfall is received during the month June to September. Surface soil samples were collected randomly from the different physiographic units of the area. The random sampling was done because of difficulties arises due to grid sampling in an area predominantly planted by different crops. Soil samples were first dried in air under the shade, then powdered gently with wooden mallets and sieved through 2 mm sieves then stored in clean polythene bags for the analysis. The samples were analysed for pH, Electrical conductance (EC), Organocarbon (OC), Major nutrient N, P and K and micronutrients Fe, Cu, Mg, Zn.by reported methods [8]. The soil pH and EC were measured. The available nitrogen was estimated from organic content of the soil. The values of available nutrients (N,P,K) after rating them were low, medium, and high as shown in the table1.

Table 1: Physico-chemical properties, available major & micronutrients in the soil samples.

S. No.	Sample Name	pH	EC	OC (%)	N Kg/ha	P Kg/ha	K Kg/ha	Fe ppm	Cu ppm	Mn ppm	Zn ppm
1	Mohida	7.98	0.797	0.23	103	15.23	218	9.27	3.92	10.12	0.77
2	Nandarkheda	8.12	0.649	0.28	125.44	15.23	315.84	9.32	2.4	6.3	0.61
3	Dondwade	7.71	1.20	0.17	76.16	11.20	244.16	9.48	1.12	9.83	0.52
4	Kavthal	8.16	0.839	0.25	109.76	12.09	482.72	8.69	3.37	13.25	1.18
5	Takarkheda	8.70	0.762	0.24	105.28	26.20	406.88	7.16	2.82	14.94	0.87
6	Temba	8.74	0.628	0.28	123.2	20.38	449.44	10.91	2.79	12.92	0.42
7	Kurhawad	8.22	0.934	0.42	188.16	10.75	333.52	11	2.44	11.16	0.47
8	Aasane	8.36	0.756	0.22	98.56	17.08	423.36	6.9	1.65	8.85	0.53
9	Tarhadi	7.80	0.662	0.16	71.68	12.92	537.60	10.08	1.61	13.67	0.94
10	Pariwarda	7.96	0.444	0.33	112.2	29.12	450.24	10.55	2.97	12.27	0.9

Main crop yields: Major crops grown in the area were maize, wheat, cotton and banana. However, soyabeans were also grown in some areas as minor crops. Vegetables were grown only for home consumption but a some farmers started growing vegetable for selling. Household survey to characterize socioeconomic conditions of the local people and a soil survey were carried out covering both land-use systems (*Shahada Tehsil)*. Ten soil samples, one from each land use system were analyzed for plant nutrients. Topsoil samples (0 – 20 cm) were collected and analyzed.

RESULTS AND DISCUSSION

Parameters: Some selected chemical and physical soil properties and micronutrients have been used as indicators for the soil-fertility status of *Shahada* Tehsil lands in the study area.

Soil pH: The soil pH varied from 7.71 to 8.74 in the sampled soil. The medium pH was found on *Shahada* Tehsil land. The reasons for the medium pH-levels in Shahada Tehsil land are most likely to be the higher

chemical fertilizer use and the effect of leaching induced by the irrigation of Shahada Tehsil land, contributing to the more acid conditions. This was not the case with the rainfed Shahada Tehsil land.

Electrical conductivity (EC): EC is a good indicator parameter on the total dissolved ions in aquatic ecosystem. The EC values were ranged between 0.44 to 1.20 mhos cm^{-1}, µmohs cm^{-1} during the investigation period. The maximum values 1.12 and 9.34 µmohs cm^{-1} were recorded.

Organic Carbon: The organic matter content of the topsoil on Shahada Tehsil land was medium and found in the range 0.16 to 0.42%. Generally, however, most of the soil samples were in the lower range of acceptable organic matter level, only a few samples could be classified as medium. The field survey shows that the use of farmyard manure, compost and the level of *in situ* manuring were higher in sample-7 and lower in sample-3 and 9 on Shahada Tehsil land. This explains the more favourable organic matter conditions on Shahada Tehsil land.

Nitrogen: Nitrogen (N) is the key major-nutrient for the crops. The soil analysis has shown that N level in all the soil samples was low. The range of total nitrogen in the sampled soils was between 71.68 to 188.16 kg/ha. The sample 7 shows highest percentage of Nitrogen and sample 9 shows lowest percentage of Nitrogen among all the ten samples. The reason for this is the higher FYM (farmyard manure) and compost use, which contributed to the increase in N. *Shahada* Tehsil lands are irrigated, with high N losses through leaching and runoff. In the rain fed *land* the level of leaching is much lower.

Phosphorous: Phosphorous (P) has great importance for crop production. Phosphorus is essential for the maturity of crops and for growth of root. Especially small seedlings benefit from a good phosphorus supply. The available phosphorous in the soil was not very high or low. The soil conditions that made phosphorus available to plants varied greatly in the area. Soil pH plays very crucial role in P availability. The available phosphorous was in the range of 10.75 to 29.12 kg/ha. The sample 10 shows highest percentage of Phosphorous i.e. 29.12 kg/ha and sample 7 shows lowest percentage of Phosphorous i.e. 10.75 kg/ha among all the ten samples. The reason for the higher P content on Shahada Tehsil land could be due to the suitable levels of pH and the high soil organic matter content that improved the general soil condition and provided some P to the soils.

Potassium: Most potassium (K) in plants is found in the above-ground portion. Therefore, if crop residues are returned to the soil, a good proportion of the potassium is conserved. In soils, potassium is found as part of the mineral structure of many clay minerals particularly micas. In this form, however, K is locked up from plant roots. The available potassium was in the range of 218 to 537.60 kg/ha. Sample 9 shows highest value of potassium content. The soil tests have also revealed that all the samples show highest Potassium content. This is due to the returning of crop residues into the soil and the higher rate of organic fertilizer use on Shahada Tehsil land.

Iron: Though it is not constitute of chlorophyll but it helps in its formation. The Iron content in the soil of Shahada Tehsil ranges from 6.9 to 11.00 ppm. Lowest value of Iron is in the sample no.8. and highest value found in the sample no.7.

Copper: Cu is also essential in plant growth, because it form many compounds with amino acids & proteins in the plants. It ranges from1.12 to3.92 ppm. Lowest value of Cu found in sample no.3 and highest in sample no.1.in Shahada Tehsil.

Mn: Generaly, distribution of Mn with soil depth did not indicate any specific trend. Lime ($CaCO_3$) and clay contents were the major factors determining Mn distribution in soils Mn in Shahada Tehsil found to be 6.3 to 14.94 ppm. Lowest value of Mn found in sample no.2 and highest value in sample no.5.

Zn: it is essential constituents of several plant enzymes and water uptake in the plants. The range of Zn is in between 0.42 to 1.18 ppm. The lower value of Zn found in sample no.6 and higher value in sample no.4.

APPLICATIONS

This information from nutrient status of results, the soils was rated as fertile with reasonably high production potential under balanced fertilization. The nutrient contents analysis is to be renewed every year by fresh siltation during the monsoon session.

CONCLUSIONS

All the ten soil samples of the study are alkaline. The soil pH varied from 7.71 to 8.74. The total soluble salt content of the soils was expressed as electrical conductivity (EC) which varied from 0.44 to 1.20 mhos cm^{-1}. The organic carbon content of the soil was in the range of 0.16 to 0.42%. In sample 3 and 9 organic carbon content was less. The low organic carbon content status in the soil can be attributed to not good vegetable growth and the consequent addition of the organic matter to the soil in this area. The available nitrogen content varied from 71.68 to 188.16 kg $hectare^{-1}$. The sample 7 shows highest percentage of Nitrogen and sample 9 shows lowest percentage of Nitrogen among all the ten samples. The available phosphorous was in the range of 10.75 to 29.12 kg $hectare^{-1}$. The sample 10 shows highest percentage of Phosphorous i.e. 29.12 kg $hectare^{-1}$ and sample 7 shows lowest percentage of Phosphorous i.e. 10.75 kg $hectare^{-1}$ among all the ten samples. The data indicate that majority of the soil samples from Shahada Tehsil of Nandurbar District are medium in available phosphorous content while the sample no. 5,6 and 10 are high in available phosphorous content. The high phosphorous content is may be due to the regular application of the phosphatic fertilizers and the immobile nature of the phosphate ions in soil which must have resulted in accumulation of phosphorous in soil. In soil where available phosphorous content is high there are much chances of zinc deficiency and it is extremely important to use requisite amount of phosphatic fertilizers. The available potassium was in the range of 218 to 537.60 kg $hectare^{-1}$. Sample 9 shows highest value of potassium content. While the micronutrients Fe, Cu, Mg and Zn available in the range of 6.9-11.00, 1.12-3.92, 6.3-14.94 and 0.42-1.18 ppm respectively.

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