

Soil Nutrient Analysis And Their Relationship With Special Reference To Ph In Pravaranagar Area, District Ahmednagar, Maharashtra, India

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Abstract: - The study of the macro and micronutrient status of soil of Pravaranagar area, District Ahmednagar was undertaken at 15 different locations to know their quantity and relationship with pH. soil samples were collected at 0-15 cm depth and used for determination of pH, Phosphorus (PO_4), Potassium (K), Sodium (Na), Chloride (Cl) and micronutrient like Iron (Fe), Manganese (Mn), Zinc (Zn) and Copper (Cu). It was observed that all soils were alkaline in nature. PO_4 , Mn, Zn, Cl, Cu and Na and K had shown no significant relationship with pH while, only Fe had shown significant relationship with pH. This indicates that pH has influence on nutrient status of soil. However, it was observed that all nutrients were available in sufficient amount for Plant and other organism growth in Pravaranagar area.

Key Words: - Nutrient, Relationship, Influence, pH

1 INTRODUCTION

Soil is a multipart of physical and biological schemes, which gives support to the plants and supplies essential nutrient to them. The weathering processes disintegrate rock and convert it into nutrients soil. It forms a thin layer on surface. It contains minerals particles, organic matter, water and air [1]. This becomes a fundamental resource of life which support the growth of plants and hence human and other living organisms. In recent decade to increase the yield and production cultivable plants more and more organic and inorganic fertilizers have been added to natural soil. But due to continuous and excess use of such fertilizers, the primary constituent's status in soil is being changed. The mineral nutrients like macro and micro has unique importance in plants such as cell elongation, metabolism, O_2 evolution, N_2 fixation, respiration to constitute chlorophyll contain [2]. Williams, 1990 [3] has studied effect of pH on nutrient balance and observed that high pH of soil can affect the micronutrient content present in soil. Manganese and Iron level decline with increase in soil pH. However, pH is good sign for maintain equilibrium between nutrients in the soil. It is also an indicator of plant and other living organisms, available nutrients, cation exchange capacity and organic matter content [4]. The mobility of nutrients in the soil is largely depended on soil pH. Different studies have shown that the most of the plant nutrients are optimally available to plants at pH range between 6.5 to 7.5 ranges [5-7]. There are 17 essential nutrients which are required for plant growth. However, micronutrients like Fe, Mn, Zn, Cu are only easily accessible in acidic situation.

Sometimes these nutrients also cross the toxic limit and high concentrations leads to toxic effects on plants [8]. Sometimes the micronutrient status also changes due to cropping pattern and fertilizer practices [9]. The Pravara area is located between $19^{\circ}30'$ to $19^{\circ}34'$ N latitude to $74^{\circ}20'$ to $74^{\circ}25'E$ longitude. The area has a well-developed agriculture sector due to availability of water from dam and dug well during the last several decades. Therefore, intensive cropping has been practiced in the area, which has led to a burden on soil quality, e.g. through too much irrigation. The over-irrigation practices have disturbed the quality of nutrients in the soil and have increased soil salinity [10]. Use of spent wash as a liquid fertilizer by various farmers also leads to saturation of certain nutrients in the soil. Furthermore, to obtain high yield and to reduce the duration of harvesting many farmers are using artificial and organic fertilizers, as well as pesticides. The nutrients from these fertilizers are not taken up directly by the plants and hence they may remain in the soil for several years. This will also change the quality of the soil. The amount and availability of soil mineral nutrients are largely influenced by the addition of chemical fertilizers, manure, compost, mulch, and lime or sulfur, in addition to leaching. Furthermore, large amount of mineral nutrients are removed from soils as a result of plant growth, development and the harvesting of crops. Changes also occur in the soil pH along with nutrients. Therefore in present investigation an attempt has been made to study the relation between soil nutrients and pH in the Pravara area to elucidate the nutrient status of these soils.

2 MATERIAL AND METHODS

In all 15 different (one Kg each) soil samples were collected from selected sites at depth of 0-15 cm in the Pravara area. The soil samples were brought to laboratory, dried at room temperature and passed through a 2 mm sieve. Then 1:5 soil suspensions were prepared and analysis of pH, macronutrients like Phosphorus (as phosphate PO_4), Potassium (K), Sodium (Na) and Chloride (Cl) was carried out [11]. For determination of available micronutrients like Iron (Fe), Manganese (Mn), Copper (Cu) and Zinc (Zn) soils were extracted with a DTPA solution [12] and the concentration of micronutrients was determined by atomic absorption spectrophotometry.

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3 RESULTS AND DISCUSSION

3.1 SOIL ANALYSIS

The soil pH from Pravara area ranged from 8.04 to 9.10. Thus, all soil samples were alkaline pH. This may be due to excess and unplanned use of ground water and fertilizers for irrigation and crop production [13]. PO_4 ranged between 0.45 to 3.60 mg/kg. The critical limit of PO_4 is 25–30 mg/kg [5]. Hence PO_4 concentration found in the area was very low. Potassium present in the soil varied between 6 to 25 mg/kg. Micronutrient like Fe was ranged between 12 to 22 mg/kg. The normal limit of Fe required for plant growth is 4.5 mg/kg [12; 14]. Hence present soil had enough Fe for plant growth. The critical limit for available Mn is 3.0 to 4.7 mg/kg [14]. In present case Mn ranged between 5.2 to 12.5 mg/kg. The Zn concentration ranged between 0.19 to 2.2. The critical limit for Zn is 0.5 to 1.0 mg/kg. However in present soil Zn was available in sufficient amount (Table 1). The Cu value ranged between 2.2 to 13 mg/kg. In the Pravara area sufficient amount of Cu was present as compare with critical limit of Cu i.e. 0.66 mg/kg [14]. Na value ranged between 51 to 100 mg/kg. The limit is 62 mg/kg in soil [6]. It is observed that some soil samples have exceeded the limit of 62. The Cl values ranged between 6.0 to 25.0 mg/kg. The critical range of Cl in soil is between 4-8 mg/kg. Thus sodium and chloride concentration in some samples is very high with salinity in the soil of the areas due to excess use of ground water and over irrigation [13; 8; 15]. Thus, it is observed that even at alkaline pH the nutrients are available in the study area.

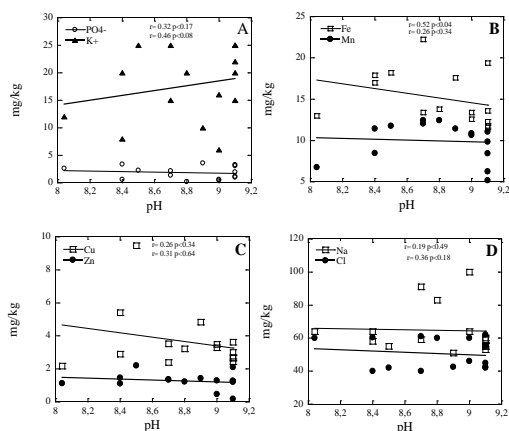


Fig 1: Showing relationship between pH of soil and nutrient concentration.

3.2 Relationship between soil pH and macro and micronutrient concentration in soil

There was no effect significant effect of pH on PO_4^- , ($r=0.32$, $p<0.17$) and K^+ ($r=0.46$, $p<0.08$) was observed. Mn ($r=0.26$, $p<0.34$), Zn ($r=0.31$, $p<0.64$), Cu ($r=0.26$, $p<0.19$), Na^+ ($r=0.19$, $p<0.49$) and Cl ($r=0.36$, $p<0.18$) also had no significant relationship with soil pH. However, only Fe ($r=0.52$, $p<0.04$), was significantly influenced by pH of soil and shown decreased in concentration with increasing pH. This relation between nutrient and pH indicate that the availability of most micronutrients is largely pH-dependent and their availability decreases as pH increases [5]. This in terms informed that at low pH values solubility of

micronutrient is high while at high pH solubility and availability of micronutrient to plants is declined [8].

4. CONCLUSION

The negative relation has been observed between Fe and pH. All micronutrient concentrations were available in sufficient amount for growth of plant and soil organisms. Soil is fertile but also it is alkaline in nature. The restoration of alkaline soil should undertake by applying advance scientific applications.

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TABLE NO. 1
NUTRIENT CONCENTRATIONS OF SOILS ALONG WITH PH IN PRAVARANAGAR AREA.

Sample No.	pH	Macronutrient (mg/kg)		Micronutrient (mg/kg)					
		PO ₄	K	Fe	Mn	Zn	Cu	Na	Cl
1	9.1	2.0	25.0	11.6	5.2	1.2	2.6	55	42.6
2	9.0	0.4	6.0	13.3	10.8	1.3	3.2	100	46.1
3	9.1	1.0	15.0	19.3	9.8	1.2	2.7	59	55.1
4	8.8	0.2	20.0	13.7	12.4	1.2	3.2	83	60.1
5	8.7	1.4	15.0	13.3	12.0	1.3	3.5	91	61.1
6	8.7	2.2	25.0	22.2	12.4	1.3	2.3	59	40.0
7	8.9	3.6	10.0	17.5	11.4	1.4	4.8	51	42.6
8	8.4	0.6	20.0	16.9	11.4	1.4	5.4	64	60.3
9	8.5	2.3	25.0	18.1	11.7	2.2	9.4	55	42.1
10	8.4	3.4	8.0	17.8	8.4	1.1	2.9	58	40.1
11	9.1	3.3	22.0	12.2	8.4	1.2	3.6	60	45.0
12	8.0	2.6	12.0	12.9	6.7	1.1	2.1	64	60.0
13	9.1	1.2	25.0	13.5	6.2	0.1	2.4	53	42.1
14	9.1	3.1	20.0	11.7	11.0	2.1	3.0	55	62.1
15	9.0	0.6	16.0	12.5	10.6	0.4	3.4	64	60.1