

NUTRITIONAL STATUS OF KAUTHAL RURAL PERIPHERAL SOIL

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Abstract: Composite soil were collected from Peripheral area of Kauthal rural area of tehsil Shahada of district Nandurbar Maharashtra. Identification and status of nutrient from these peripheral soil samples were studied. There are variations in the soil nutrient status. Study includes pH, EC, major, minor and trace element present in the agricultural soil of the periphery. There are different concentration of different nutrients. pH and EC of the soil is slightly high and the Phosphorous deficiency is observed during this study.

Key Words: Nutrition, soil, NPK, pH, EC.

Introduction:

Day by day the soil nutrient degradation is increased gradually worldwide and for crop production point of view it serious treats to soil community. The soil fertility status should be maintain for long period of time for good soil health and its production. The essential element which present in soil, maintain the soil quality are N, P, K, Ca, Mg, Fe, Zn, Cu, B, Mn etc. Depending on the frequency of crops and its pattern there are continuous changes in nutrient status. As the crop production increases the soil fertility will be decrease [1]. Soil erosion leach out important major minor or micro nutrients with rain water every year. Continuous use soil land for grass, agricultural crops, cash crops and other horticulture crop considerable amount of nutrients and micro are lost steadily every year [2]. The changes in environment and management condition also much affect the soil health and the restoration of soil nutrients. Since ancient civilization time, soil is very important for human kind for their live [3]. Therefore to restore and maintain the soil nutrients, soil health cheque up is very essential parameter to attain maximum crop production.

Experimental:

Five representative locations around the Kauthal village are selected for the characterization of the soil samples. From these selected locations, topsoil samples were composed in polythene bags, According to the typical processes, Soil samples were first dried out in air, under the open shade then crushed lightly with wooden hammers and separated by using 2 mm sieves. This processed sample then kept in hygienic polythene bags for the examination of various soil parameters. Such as the physico-chemical parameters of selected and collected samples were determined by the devices recommended in the manuscripts [4, 5]. The pH, electrical conductivity, organic carbon, available nutrients such as Nitrogen, phosphorus and potassium, Calcium, magnesium, are also determined by described



procedures and techniques [6,7]. The micronutrients i.e. trace metals like Fe, Cu, Zn, B, Mn are determined by atomic absorption spectroscopy methods [8].

Results and Discussion:

Soil Sr.	Available Primary Nutrients (Kg/h)			Available Sec. Nutrient (meq/L)		Available Micronutrients (ppm)					Physico Chemical Parameter		
	N	P	K	Ca ₊₂	Mg ₂ ⁺	Fe	Cu	Mn	Zn	B	O.C. %	pH	EC Mhos
A	237.44	24.64	409.92	12.73	4.0	3.45	0.35	13.3	0.96	0.81	0.53	8.81	0.980
B	349.44	16.35	300.16	19.8	8.9	4.12	0.40	16.29	0.98	0.74	0.78	8.95	1.815
C	174.72	23.16	284.48	19.02	9.4	3.77	0.42	13.95	0.76	0.63	0.39	9.13	0.704
D	403.2	14.90	253.60	17.9	9.3	5.38	0.75	20.63	1.15	1.00	0.90	8.6	1.930
E	315.84	13.00	479.36	12.37	4.2	5.68	0.67	19.41	0.99	1.20	0.71	8.68	1.200

The surface soil samples were analyzed for characterization of physico - chemical parameters and essential nutrients present in salt affected soil of Kauthal village. These nutrients are primary, secondary and micro nutrients, primary nutrients such as nitrogen, phosphorous, potassium, secondary nutrients-calcium, magnesium and micro-nutrients such as iron, copper, manganese, zinc and boron are estimated and characterized by different analytical methods.

Primary nutrients :

Nitrogen: It is estimated that the available nitrogen ranges from 174.72 to 403.2 Kg/ha of Kauthal soil series. The result revealed that the soil of E3 location is low and E4 soil location has medium available nitrogen according to national soil rating of available nitrogen. Low nitrogen content could be attributed to leaching of nitrogen from soil due to rain water and running water. Another region of low nitrogen is relatively low compost addition, little FYM, and short use of nitrogenous fertilizers. The average available nitrogen contents of this soil

series is 296.128 Kg/ha. It is medium according to standard rating of available nitrogen. Usually the major resource of nitrogen to this soil series is FYM, compost, nitrogenous fertilizers, rain water, and types of nitrogenous minerals present in the soil.

Phosphorous: It is observed that the available phosphorous ranges from 13.00 to 24.64 Kg/ha at Kauthal (E) soil series. According to soil rating of available phosphorous the result revealed that the soil location E5 is medium and E1 soil location has high available phosphorous. E1 soil location has highest amount of available phosphorous among all the 14 soil series of this case study. Medium phosphorous content might be attributed to low discharge of phosphorous from mineral to soil; other basis of low phosphorous is relatively low use of phosphate fertilizers. The average available phosphorous content of this soil series is 18.41 Kg/ha. It is medium according to national standard rating of available phosphorous. As the soils are alkaline in nature and have calcareous materials, the contents of available phosphorus are predictable to be low because of its fixation.

Potassium: The assessed available potassium ranges from 253.6 to 479.36 Kg/ha at Kauthal (E) soil series. According to standard soil rating of available potassium, the result revealed that the soil location E4 is high and E5 soil locations has very high available potassium. High potassium content might be attributed to high expulsion of potassium from their soil mineral. Other reason of high potassium is most of the farmers are used potassic fertilizers unwantedly because they did not test their soil for nutrient status. The average available potassium content of this soil series is 345.504 Kg/ha. It is moreover very high according to national standard rating of available potassium. Usually the major resource of potassium to this soil series is soil minerals.

Exchangeable Calcium and Magnesium:

Calcium: It is observed that in the Kauthal soil series, exchangeable calcium ranges from 12.37 to 19.8 Meq/L of E5 and E2 sites respectively. It is reported low rating of exchangeable calcium. Average exchangeable calcium is 16.364 Meq / L. which is rated low. Thus exchangeable calcium of this soil series is low. The causes of low exchangeable calcium and high pH may due to the presence of chief soluble salt Na_2CO_3 which boosted the soil pH caused nearly all soluble and exchangeable Ca^{2+} and Mg^{2+} get precipitated. Dominance of soluble salts such as carbonate and bicarbonates nature is concern with increasing pH of soil [1]. It is also reported that such types of soil also had high pH (> 8.5), EC < 4 ds/m, and ESP > 15. It is pseudo-environment of alkali soil which causes precipitation of Ca^{2+} and Mg^{2+} ions. [9]. Hydrolysis of CaCO_3 , and MgCO_3 , takes place by following reaction:



Magnesium: It is observed that, in the Kauthal soil series E, exchangeable magnesium ranges from 4.0 to 9.4 Meq/L of E1 and E3 respectively. It is reported medium to moderately high range in rating of exchangeable magnesium. Average exchangeable magnesium is 7.16 Meq / L. which is rated medium.

Available Micronutrients Fe, Cu, Mn, Zn and B:



Micro-nutrient requires in extremely small amount for plant growth (< 50 ppm). This case study includes the quantitative data of micro-nutrients such as Fe, Cu, Mn Zn and B, the climate and weathering are extremely significant factors for available micronutrients. Especially noticed that the, physically and chemically active climate causes the soil to hold a lesser quantity of micronutrients [10]. The important factors which affect the concentration and distribution of trace elements in soil is the relations between various factors which affect geological weathering and soil forming processes are chemical and mineralogical nature of bedrock, texture of soil, temperature, the result of glaciation in eroding bedrock substance and in the moving and deposition surficial, soil parent materials, condition of local soil and hydrology which affects the process of soil formation, soil development and availability of micronutrient elements for plant uptake or concentration in soil surface [11].

Iron: The average extractable iron content of this soil series is 4.48 ppm. It is moreover very low according to standard rating of extractable iron. Usually the major resource of extractable iron to this soil series is soil minerals, which has low content of iron. The assessed extractable iron ranges from 3.45 to 5.68 ppm at E1 and E5 soil locations respectively of Kauthal (E) soil series. According to standard soil rating of extractable iron revealed that the soil location E1 has very low and E5 soil location has low extractable iron.

Copper: The assessed extractable copper ranges from 0.35 to 0.75 ppm at Kauthal (E) soil series. According to standard soil rating of extractable copper revealed that, the soil locations of both E1 and E4 has low extractable copper. The average extractable copper content of this soil series is 0.518 ppm. It is moreover very low according to standard rating of extractable copper. Usually the major source of extractable copper to this soil series is soil minerals.

Manganese: The assessed extractable manganese ranges from 13.3 to 20.63 ppm at Kauthal (E) soil series. The range of extractable manganese in this soil series is neither very broad nor very close. Average extractable manganese contents of this soil series is 14.584 ppm. It is very sufficient for proper plant growth and their maturity. There may some exceptional cases where amount of Mn is high at high pH of the soil.

Zinc: The average extractable zinc content of this soil series is 0.968 ppm. It is moreover very low according to normal rating of extractable zinc. The assessed extractable zinc ranges from 0.76 to 1.15 ppm at E3 and E4 soil location respectively of Kauthal (E) soil series. According to normal soil rating of extractable zinc revealed that the E3 soil location has low and E4 soil location has medium extractable zinc.

Boron: The assessed available boron ranges from 0.76 to 1.15 ppm at Kauthal (E) soil series. The range of available boron in this soil series is neither very broad nor very close. Average available boron contents of this soil series is 0.876 ppm. It is very sufficient for proper plant growth and their maturity but the soil location E4 has high amount of available boron and hence toxic for plants. Because of high pH value the presence of amount of boron exceed.

Physico chemical Parameters:

The surface soil was collected for characterization of different Physico chemical properties of salt affected soil of Shahada tehsil. These Physico-chemical properties are pH,



Organic carbon, electrical conductivity, are estimated and characterized by different analytical method. The estimated data are presented in the above table.

pH: Soil pH varies from lowest 8.6 to highest 9.13 of E4 and E3 locations respectively, are recorded from the soil series Kauthal agricultural soil area. It is observed to be strongly alkaline range of soil pH. E3 site of location observed very strong alkalinity than other four location of Kauthal series. This range of pH is not very broad.

Electrical Conductivity: Average electrical conductivity of Kauthal agricultural soil series is 1.3258 ds/m indicates that, the soil is saline in nature. Soil electrical conductivity of Kauthal ranges from 0.704 to 1.93 ds/m of E3 and E4 sites of locations respectively. It gives the signal that the soil is very slightly saline to [12]. This range of electrical conductivity is not very broad. Among all these soil locations E3 is very slightly saline, E1 and E5 locations under moderately saline and E2 and E4 are saline in character. Soil locations recorded saline due to presence of different types of inorganic cations and anions.

Organic Carbon: The content of organic carbon in Kauthal agricultural soil series ranges from 0.39 % at E3 location to 0.9 % at E4 location. It ranges from low to high percentage of organic carbon content status. Average organic carbon content is 0.662 % which is moderately high. High organic carbon content at E4 soil location might be due to the organic matter are or have been decomposed by soil organisms, with living organisms in the soil [45]. As well as releasing organically-bound nutrients, they also affect nutrient availability. Soil location E3 have low organic carbon content, E1, E2, and E5 soil locations have moderately high organic carbon content and E4 soil is high organic carbon content.

Conclusion:

For proper plant growth availability of all primary secondary and micronutrients are very necessary in soil structure. There are some disparity about nutrient availability in some location of Kauthal soil periphery.

Available NPK: The average available nitrogen contents of this soil series medium according to standard rating of available nitrogen. Medium nitrogen content could be attributed to leaching of nitrogen from soil due to rain water and running water. Another region of low nitrogen is relatively low compost addition, little FYM, and short use of nitrogenous fertilizers. Medium phosphorous content might be attributed to low discharge of phosphorous from mineral to soil; other basis of low phosphorous is relatively low use of phosphate fertilizers. The average potassium is high. It might be attributed to high expulsion of potassium from their soil mineral.

Exchangeable Ca and Mg: Thus exchangeable calcium and magnesium are low and medium respectively. The causes of low exchangeable Ca and Mg may due to the presence of chief soluble salt Na_2CO_3 which boosted the soil pH caused nearly all soluble and exchangeable Ca^{2+} and Mg^{2+} get precipitated.

Available Micronutrients Fe, Cu, Mn, Zn and B: According to standard rating of extractable copper the average extractable Cu, Fe content of this is very low and low



respectively. Usually the major source of extractable copper Iron to this soil series is their soil minerals. Average extractable manganese contents of this soil series is 14.584 ppm. It is very sufficient for proper plant growth and their maturity. There may some exceptional cases where amount of Mn is high at high pH of the soil. The average extractable zinc content of this soil series is 0.968 ppm. And according to normal rating of extractable zinc is low. Average available boron contents of this soil series is 0.876 ppm. It is very sufficient for proper plant growth and their maturity.

Physico chemical Parameters pH, EC OC: Soil pH varies from lowest 8.6 to highest 9.13 of E4 and E3 locations respectively. It is observed to be strongly alkaline range of soil pH. E3 site of location observed very strong alkalinity. Average electrical conductivity of Kauthal agricultural soil series is 1.3258 ds/m indicates that, the soil is saline in nature. Average organic carbon content is 0.662 % which is moderately high. High organic carbon content at E4 soil location might be due to the organic matter are or have been decomposed by soil organisms,

According data of all above nutrients the soil of Kauthal village periphery is moderately fertile in nature for the crops such as Cotton, Jawar, Bajara, Papaya, Moong, Udad cane sugar etc.

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