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The Physicochemical Analysis of Soil from N. Solapur Region, Maharashtra

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Abstract-

Soil is one of natural body of mineral and organic material differentiated into horizons, also differs themselves from underlying materials in their morphology, physical constituents, chemical composition as well as biological characteristics. Solapur is the city which is famous for industrialization, forest areas etc. The plants generally depend on the soils for their nutrients, water and minerals supply, the soil type is a major factor for determining the growth of plants. The soil health and soil quality are both the same words but the soil quality it basically more focused on its physico-chemical, and biological characters. A study of soil quality may helpful to give set of parameters which may be the evidence of the soil ability to carry out its functions.

The present study based on the physico-chemical analysis of soil parameters from Solapur region. The good quality of soil depends on its different properties such as; soil P^H, Potassium, Nitrogen, Phosphorus, total organic compound etc. The present study focused on the availability of nutrient quality of soil. On seasonal basis soil of area shows great variation regarding the soil nutrients. The pH of soil is found to be neutral for all season. In summer season availability of P is medium compared to other season. Organic carbon and K are found to be excess in all seasons. In overall the present investigation provides information regarding the nutrient quality of soil which will provide great information for any problem related to soil and plants growth. It is concluded that variable concentrations of various parameters and irregular distributions of nutrients may be due to the added fertilizers during crop formation.

Key Words: Nutrients, Physico-chemical parameters, P^H, industrialization.

Introduction-

Every human being is closely related with the soil as it is essential for food, clean water, and cleans air and have important role in biodiversity (Katsuyuki, 2009; Keesstra *et al*, 2016). Soil forms most important part of any geographical areas which is closely associated with other components like climate, vegetation. For any kind of the soil analysis, the soil sampling becomes the most difficult task. From huge soil samples a very fraction of soil used for its analysis, and it becomes the representative for the field soil sample. Soil analysis becomes a key factor for the nutrient management of the soil. Soil analysis gives information for to increase the productivity and production of agriculture, soil is directly or indirectly very important. Soil forms basic body on which growth, development and productivity of agricultural products depends. A good quality soil with required mineral nutrient is basically needed for the agricultural crop production. The heterotrophic soil micro-organisms also helpful to enhance the availability of nutrients. It provides support for the productivity and for food web (Fenchel *et al*, 2012., Whitman *et al*, 1998). There are numerous external factors which play vital role in the growth and development of plant like air, temperature, light, mechanical support, water nutrients like K, N, P, H.C etc. on the basis of seasons, the different parameters of soil were studied from the study site.

Material and method

Collection of samples-

Soil samples upto 25 cm depth from areas rhizosphere were collected from the selected site of N. Solapur on the seasonal basis (summer, winter and Rainy season). The soil samples collected from site and brought into laboratory for further analysis of soil.

Analysis of soil samples-

Soil Temperature-

The soil temperature is one of the most important soil parameters which provide important information like the chemical, biochemical properties of soil.

Soil P^H:

Estimation of soil P^H was done according to Jackson (1973) method, by immersing the electrode in the water- soil suspension the reading was taken in the p^H meter.

Organic carbon:

SOC as well as SOM was determined by Walkley and Black method. For this titration method was used. At the end of the titration, the solution changes from blue-violet to green. Percentage of SOC and SOM was Calculated as:

$$SOC\ (\%) = \frac{(A - B) \times 0.003}{W} X\ 100$$

SOM (%) = % Carbon × 1.724

Where, A = Volume of $K_2Cr_2O_7$ (10 ml)

B = Volume of ferrous ammonium sulphate

W = Weight of the soil taken (g)

Available Nitrogen-

Available Nitrogen was calculated by alkaline permanganate method by using Kjeldhal tube (Subbiah and Asija, 1956).The availability of nitrogen was calculated by taking 20gm of soil in 800 ml of Kjeldahl flask.. The formula for calculation of available nitrogen was,

$$\%\ \text{of available N in soil} = \frac{(R - b) \times 0.00028}{\text{Weight of soil taken}} \times 100$$

Where,

R = Volume of 0.02 N H2SO4 required for titration (ml)

B = Volume of 0.02 N H2SO4 required for blank titration (without soil) (ml)

Weight of soil taken = 20 g

The factor 0.00028 was calculated as

1 ml of 0.02 N H2SO4 = 0.02 meq of N = 14 × 0.02 = 0.28 mg N =0.00028 g of N

Phosphorus (P):

Available Phosphorus in soil was determined by Olsen's method by using spectrophotometer (Olsen et al, 1954) and Bray & Kurtz (1945).

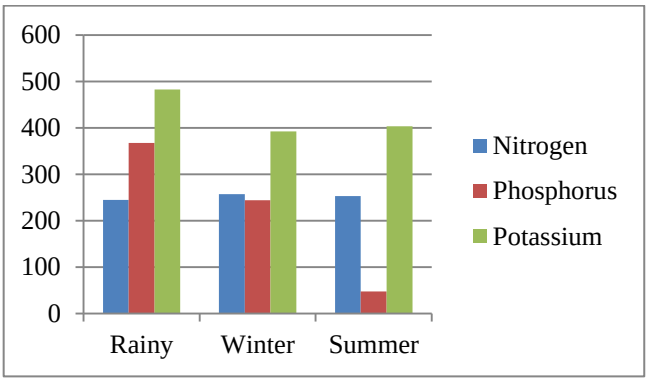
Determination of K, Ca and Mg:

Potassium was calculated by Ammonium acetate method of Hanway and Heidel (1952) using Flame photometer. Calcium and Magnesium were estimated by EDTA titration (GOI, 2011b).

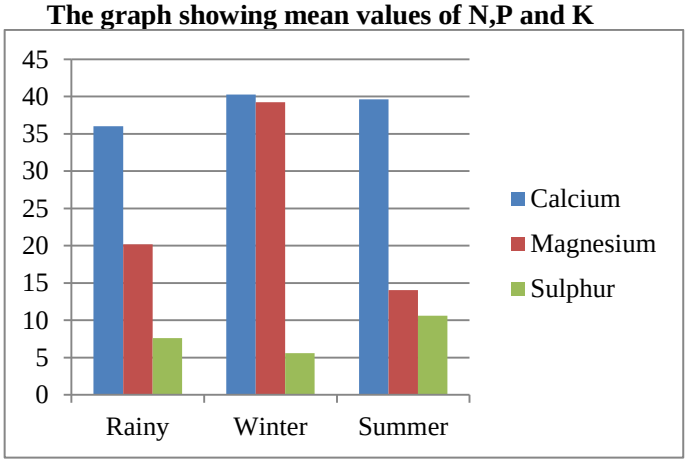
Result and Discussion-

Table 1: Physico-chemical properties of rhizospheric soil

Physico- chemical property		Summer	Rainy	Winter	P value
pH	Mean	**7.08**	6.76	6.74	P<0.01
	SD	0.08	0.05	0.05	
Alkalinity	Mean	**0.37**	0.31	0.19	P<0.01
	SD	0.01	0.01	0.01	
Moisture	Mean	22.36	**44.56**	30.46	P<0.01
	SD	0.05	0.05	0.05	
Temperature	Mean	**38.26**	27.86	30.14	P<0.01
	SD	0.05	0.05	0.05	
Organic carbon	Mean	**0.87**	0.66	0.59	P<0.01
	SD	0.01	0.01	0.01	
Nitrogen Kg/hec	Mean	253.40	244.60	**257.40**	P<0.01
	SD	0.55	0.55	0.55	
Phosphorous Kg/hec	Mean	47.86	**367.68**	244.06	P<0.01
	SD	0.05	0.64	2.65	
Potassium Kg/hec	Mean	403.40	**482.40**	392.40	P<0.01
	SD	0.55	0.55	0.55	
Ca Carbonate	Mean	**18.76**	1.26	4.86	P<0.01
	SD	0.05	0.05	0.05	
Calcium	Mean	39.64	36.00	**40.28**	P<0.01
	SD	0.05	0.48	0.29	
Magnesium	Mean	14.04	20.20	**39.24**	P<0.01
	SD	0.05	0.07	0.05	
Sulphur	Mean	**10.60**	7.60	5.60	P<0.01
	SD	0.55	0.55	0.55	



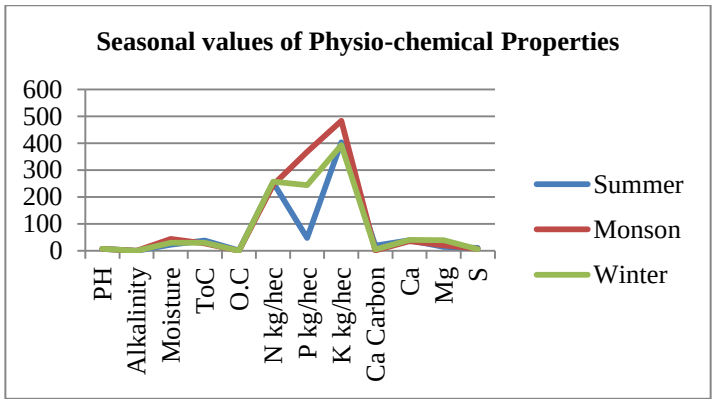
The graph showing mean values of N,P and K



The graph showing mean values of Ca,Mg and S

Table 2: Seasonal variations of the micro-nutrients of soil –

Ratings	pH	Salt	OC	N	Ava. P	Ava.K	S	Ca	Mg
Summer	Neutral	Normal	Excess	Less	Medium	Excess	Less	Excess	Less
Rainy	Neutral	Normal	Excess	Less	Excess	Exces	Highly less	Excess	Normal
winter	Neutral	normal	Medium	Less	Excess	Excess	Highly less	Excess	excess



Physico-chemical properties of rhizospheric soil

The quality of soil is generally the ability of soil to play its function on sustainable way. But, now days the quality of soil can be get degraded naturally as well as artificially. For ecosystem, edaphic factor plays an enormous role but still a little focus given on the maintains of soil quality. In order to make soil more suitable, more sustainable, everyone need to be aware for to improve the soil quality this one is not by adding the excess fertilizers. According to (Brady and Weil, 2008) good quality of soil is most important for plant growth but once soil lost its quality the it takes long period for to become good with its quality. The word soil quality basically focused on its physic-chemical and biological properties which is different from soil health (Doran and Zeiss, 2000). The soil solution is the primary source of nutrients for plant roots. Soil contain major elements like N,P,K,Ca, S, Mg and minor element like Fe, Mn, Al, B etc. These elements are important as mineral nutrition.

The quantitative analysis of soil parameters were studied by different methods and It shows all soil parameters on seasonal basis, in which soil P^H ranges from 6.7 to 7.08 which is almost neutral for

all season. The most important element N is found to be less in all seasons while the availability of K is high (392-482) in all seasons. Variation in soil P^H and organic carbon on seasonal basis is shown in figure 1.

The result shows that the soil deficient from the presence of important nutrients like P, and K, Organic Compound etc. recommended rich fertilizers. The result shows significant variation in availability of nutrients. In rainy season the availability of Nitrogen, Phosphorous and Potassium was generally maximum. So, such kind of physico-chemical analysis of soil will provide any difficulties related to soil, salinity, and alkanity and gives idea related to solve the problem. The present study provides an idea about the presence of the entire soil nutrient in their neutral and normal range which is much good for vegetation developmentin table 2.The variations in physico-chemical properties site were studied during summer, rainy and winter season. Statistically highly significant difference observed in each physico-chemical property ($P<0.01$).

Represents the seasonal variation in physico-chemical properties of soil samples. pH of soil was found neutral to less acidic, availability of Phosphorus found high in rainy, followed by winter and less in summer season.Potassium found maximum in rainy season, the availability of calcium, magnecium and sulpher shows great variation in respect to seasons which does not shows any impact on percentage of root colonization and spore density. In present investigation maximum number of spore count correlated with slightly lower to neutral pH, Sidhu and Behl, (1997), observed increased pH favors fungal spore formation. High organic matter also adds important value for increased spore population (Verma and Arya, 1998).

The study of physico-chemical analysis of soil is important for the normal growth of plants and for proper management of soil. (Borkar A.D., 2015) According to the (Carr,1982), the site is with highest calcium levels indicates that it was refuse the dumping ground that is why area should be kept clean. The soil where organic matter like carbon and nitrogen deficiency, in that soil vegetation were not developed.

Discussion-

Soil is a basic life supporterfor living organism. By reducing the unnecessary use of fertilizer during the cultivation of lands and for to enhance the soil vitality, we can improve the growth, development and productivity (B.V.RamaKrishna *et al*, 2016). The different soil parameters shows variation in their values due to the different different sites shows difference in soil quality (Borkar A.D., 2015). Such variation is observed during the present work. Limitation in nutrient availability have impact on plants growth and in turn food web and also the process of succession of plants and animals also get checked. The P^H of soil is one of most important factor of soil, basic or neutral P^H is usually important for cultivation of rice (Chandra Sharma,2015). Increased soluble salt level becomes difficult for plants for to extract the water from soil, in present work salt level is normal in all season. Use of fertilizers in farm without its proper knowledge may results in adverse effects on fertility of soil (Sharma,2004). According to (kiran G.Chaudhari, 2013) nutrient quality of soil of Yawal,Dist. Jalgaon shows the presence of nutrients in soil in medium to excess contents, this information will be helpful for farmers to solve the problem related to soil nutrients. Same observation was found in present work.

Conclusion-

The study of physicochemical properties of soil is important as it provides information for plant growth and management of soil. The increased organic matter content in soil always results in fertility of soil and hence useful for improving the output of plnts.From above investigation , it is concluded that soil samples does not shows much variation on seasonal basis but generally some nutrient found to be excess while some nutrients to be less. N is an important elements which is in lower amount in all seasons Soil. So, such fertilizers which contain N rich are added to soil for its proper growth and development of plants.

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