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Analysis of Soil Samples for Its Physicochemical Parameters from Hilly Area of Patan Tehsil Satara District M.S. (India)

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Abstract

The hilly area in the Patan Tehsil District Satara is located in the Western Ghats. The study area is surrounded by forest and paddy fields. The soil is the most important constituent which fulfills all the basic needs of human beings. Soil is an essential component to flourishing plant growth. Thus the physico-chemical study of territory is very significant because both physical and chemical properties are responsible for soil productivity. In the present investigation the physicochemical study of soil is based on various parameters like pH, moisture, density, texture, water holding capacity, organic matter, chloride, nitrate, phosphorus. This knowledge provides baseline information about quality status of soil for proper implementation of the other management practices.

Keywords: *Soil composition, physico-chemical parameters, quality status.*

Introduction

Soil is an extremely important component of terrestrial ecosystem. It is essential to humanly because, it is the top layer of the earth in which plants grow. This makes it to play a vital role in food chain. People in the recent years have engaged in the habit of planting crops on abandoned domestic dumpsites of soil taken from the existing ones because of their fertility (Oluyemi and Eyitayo, 2013).

The forest and hilly soil vary physical and chemical changes with time and space resulting in variation among topography, climate, weathering processes, vegetation cover and microbial activities and also biotic and abiotic factors.

Our study area is related to this type of land and some traditional farming area. Sixty percent of land in Patan Tehsil comes under hilly area economy of farmers is depends on productivity of crops and fertility of soil. So our work is very useful to the needy farmers.

Methodology:

Collection of soil samples

Soil samples were collected from Patan Tehsil from three different sampling stations by random sampling during July 2018 to December 2018. Soil samples were collected at a depth of 0-10cm in polythene bags and were labelled carefully. Physico-chemical analysis of soil Soil samples were analyzed for the chemical parameters such as pH, organic matter, chloride, phosphorus and nitrite & physical parameters like soil texture, moisture, water holding capacity and density.

Table 1: Methods used for analysis of soil

Sr.No.	Parameter	Method
1.	**pH**	**Electrometric Method**
2.	**Moisture**	**Gravimetric Method**
3.	**Density**	**Laboratory Method**
4.	**Texture**	**International Pipette Method**
5.	**Water Holding Capacity**	**Soak and Drain Method**
6.	**Organic Matter**	**Walkley and Black Method**
7.	**Nitrite**	**Modified Spectrophotometric Method**
8.	**Chloride**	**Titrimetric Method**
9.	**Phosphorus**	**Vanadomolybdophosphoric acid Colorimetric Method**

Result and discussion:

The most significant property of soil is its pH level. Its effects on all other parameters of soil. Therefore, pH is considered while analysing any kind of soil. If the pH is less than 6 then it is said to be an acidic soil, the pH range from 6-8.5 it's a normal soil and greater than 8.5 then it is said to be alkaline soil. In present investigation pH ranges between 6.2 to 7.6. This result indicate that the pH of the soil is normal.

A good physical condition of soil is reflected by its good water holding capacity (Soffe, 1995). Results revealed that soil samples of Patan hilly area had ability to absorb more water.

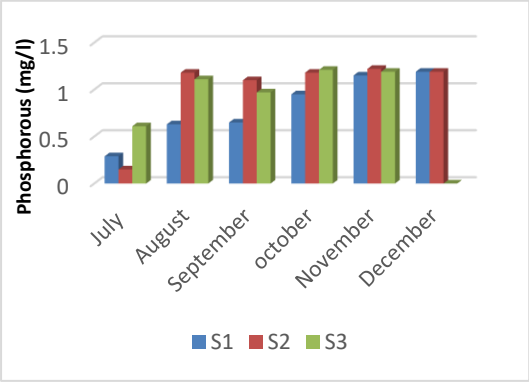
The texture of soil samples is given in Table. Usually, clay loam soil is considered as more preferable for agricultural crops (R. E. White 1987)

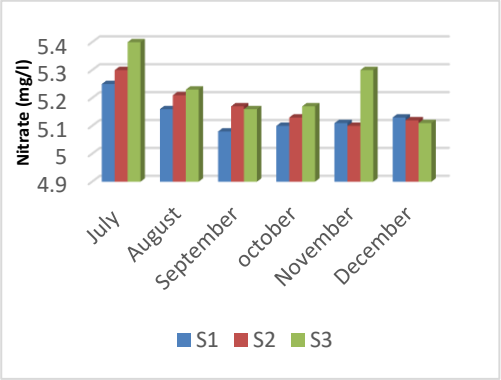
Density of soil is important parameter for the growth of plants as high bulk density can reduce the root penetration in soil (A.K.Rai 2010). In present study the density of soil samples are in between 1.23 to 1.74 gm/cm^3.

Water content or moisture content is the quantity of water contained in a material, such as soil called soil moisture. Moisture is one of the most important properties of soil. Absorption of the nutrient by soil is largely depends on moisture content of the soil moisture

of soil also shows its effect on the texture of soil. Moisture content observed in between 12.15 to 27.32% during the study.

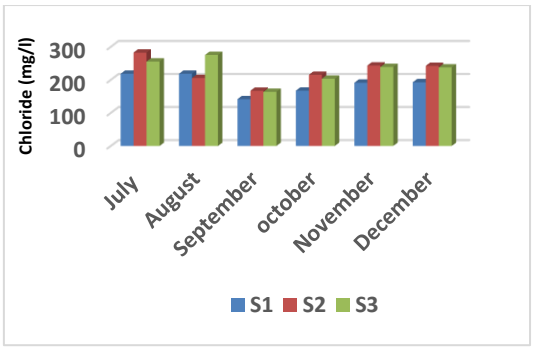
Phosphorus is a most important element present in every living cell. It is one of the most important micronutrient essential for plant growth. Phosphorus most often limits nutrients remains present in plant nuclei and act as energy storage. Phosphorous acts as a limiting nutrient present in plant nuclei & serves as storage for energy (Jain et al; 2014). Its high concentration in the soil leads to good growth of plants (Tautua et al;2014). During the study, phosphorus content observed in between 0.01 mg/l to 1.20 mg/l

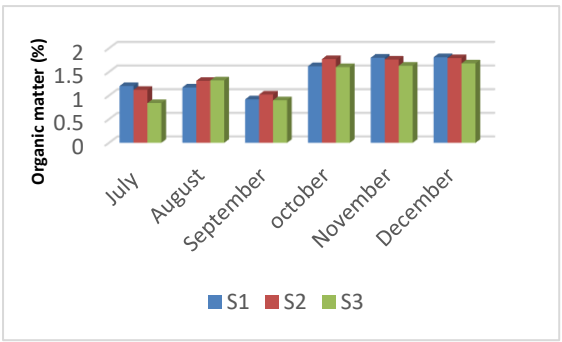




Nitrate (NO_3) is naturally occurring form of nitrogen in soil. This form of nitrogen is created when nitrification, the conversion of ammonium into nitrate, occurs. Nitrate is used to food by plants for growth and production. The level of nitrate in soil varies widely, depending upon the type of soil, climate conditions, rainfall and fertilizing practices. During present investigation the nitrate content present in soil is in between 5.05 mg/l to 5.55 mg/l

Chlorine exists in the form of soluble chlorides in the soil and is strongly associated with minerals or organic matter. It is always in dissolved form in the soil solution and has the tendency to accumulate in saline salts because it readily forms compounds with sodium, calcium and magnesium. The availability of chlorides to plants is affected by soil acidity, aeration and organic matter (Schulte EE 1999). High levels of chloride ions lead to increased concentrations in its uptake by plants and so results in toxicity problems in crops and consequent reduction in the yield. However, it is very important in photosynthesis (Chukwu UJ, Anuchi SO 2016). In present study the chloride concentration measures between 128.51 mg/l to 333.65 mg/l.





Soil organic matter or soil organic carbon is one of the significant chemical parameter of soil quality. It affects soil porosity & promotes gas exchange reactions & water relations. It has an important role to play in carbon cycle, nutrient availability & its release, affecting

biological & chemical processes (Johnson 1985; Henderson, 1995; Nambiar, 1997). Our results showed that amount of Organic matter ranges between 0.74 % to 1.82%.

Months/ Parameters	Stations	July		August		September		October		November		December	
pH	S1	7.01	7.10	7.32	7	6.44	6.20	6.38	6.71	6.30	6.35	6.40	6.50
	S2	6.44	6.62	7.60	7.17	6.33	6.83	6.65	6.79	6.55	6.65	6.58	6.60
	S3	6.80	6.89	7.5	7.20	6.9	6.40	6.73	6.89	6.60	6.70	6.68	6.70
Moisture (%)	S1	12.85	16.86	12.36	24.42	22.42	17.42	17	17.38	17.5	17.55	17.40	17.45
	S2	12.15	27.32	26.60	19.93	19.35	20.91	16.92	17.12	17.34	17.80	17.30	17.40
	S3	15.20	20.50	28.40	24.33	26.35	24.55	23.23	22.30	18.5	17.60	17.40	17.50
Density (g/cm^3)	S1	1.55	1.54	1.53	1.34	1.31	1.28	1.47	1.45	1.45	1.47	1.45	1.48
	S2	1.62	1.56	1.23	1.40	1.31	1.29	1.44	1.48	1.48	1.41	1.47	1.40
	S3	1.74	1.60	1.30	1.12	1.34	1.28	1.35	1.40	1.40	1.45	1.48	1.50
Texture (%)	S1Sand	50	51.5	52.69	51	59	57	69	67	65	68	65	63
	Clay	25	13.5	16.86	34	16	18	16	17	15	15	15	17
	Slit	25	35	30.44	15	25	25	15	16	20	17	20	20
	S2Sand	60	52.5	61.54	51	56	55	67	65	67	69	65	65
	Clay	30	17.5	18.46	20	28	20	16	18	16	15	18	20
	Slit	10	30	20	29	16	26	17	17	17	16	17	15
	S3Sand	55	60	54	54	56	56.5	61	60	65	64	60	62
	Clay	20	15	21	22	25	24.5	19	20	20	20	20	20
	Slit	25	25	25	24	24	24	20	20	15	16	20	18
Water holding capacity (%)	S1	55.73	61.99	52.81	45.28	27.57	45.28	65.16	60.30	62.5	64.30	63.40	64.80
	S2	74.14	54.57	69.30	48.04	32.07	33.68	69.23	65.80	68.45	69.40	65.45	70.40
	S3	60.59	70.80	65.40	50.10	32.09	34.58	81.94	80.80	76.30	78.50	75.60	78.70
Organic Matter (%)	S1	0.74	1.66	1.10	1.24	0.88	0.96	1.84	1.40	1.82	1.79	1.81	1.82
	S2	1.40	0.84	1.28	1.34	0.90	1.14	1.81	1.73	1.78	1.74	1.78	1.80
	S3	0.80	0.88	1.30	1.34	0.86	0.98	1.64	1.55	1.61	1.65	1.70	1.66
Chloride as Cl (mg/L)	S1	205.61	231.26	282.66	154.18	128.51	154.21	143.57	191.24	196.26	186.40	190.50	195.10
	S2	231.31	333.65	205.53	205.61	154.21	179.91	191.43	238.93	240.99	245.60	240.60	244.20
	S3	240.65	270.26	280.54	270.20	139.52	188.21	167.50	239.29	236.93	240.98	240.10	235.20

Nitrate as NO_3 (mg/L)	S1	5.40	5.10	5.15	5.16	5.10	5.05	5.10	5.09	5.12	5.10	5.12	5.14
	S2	5.45	5.15	5.20	5.22	5.15	5.18	5.21	5.05	5.08	5.10	5.12	5.12
	S3	5.55	5.25	5.22	5.24	5.12	5.20	5.23	5.10	5.14	5.12	5.10	5.12
Phosphorous as P (mg/L)	S1	0.01	0.57	0.60	0.65	0.62	0.68	0.70	1.20	1.12	1.18	1.20	1.19
	S2	0.15	1.14	1.15	1.20	1.10	1.10	1.13	1.22	1.24	1.20	1.18	1.20
	S3	0.12	1.10	1.10	1.12	0.96	0.98	1.19	1.23	1.22	1.16	1.18	1.19

Table 2: Analysis of soil sample during July 2018 to December 2018

Conclusion:

In present study we observed that physicochemical characteristics of the soils are present in sufficient amount. This soil is very rich in nutrients. Hence, it is beneficial to farmers.

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