

Quantitatively Physico-Chemical Analysis of Some Soil Samples of Satana (Baglan)Tahsil, District Nashik, Maharashtra (India)

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Abstract: Soil is an important abiotic factor in the nature which provide natural habitat for plants and animals. Soil can hold water and acts as an important source of nutrients to the plants. It is formed by the combine action of climates factors like water, light, temperature and birth factors like microbes, plants and animals. Nutrient's content of the soil is affected by several factors. Keeping in mind the problems associated with rural area about soil testing for suitable crops. Investigations were undertaken on the soil quality in a region of Satana Tahasil in Nashik district. The soil testing was investigated in rural area to ensure the health of soil about crop productivity. In this regard, a detailed physical and chemical analysis of some soil samples was carried out in different village areas nearest to Satana. The soil samples were collected from some fields. The Physico-chemical parameters considered for analysis of soil samples were density, WHC, pH, Electrical Conductivity (E.C), organic carbon, calcium carbonate, nitrogen, Phosphorous Potassium, Sodium. Calcium, magnesium, iron sulphur Manganese, Zinc and Copper. Results showed that in all the selected sites of Satana region most of the parameter there is no considerable variations in concentration of nutrients. It is appropriate or adequate for crop yield. Analyses of soil samples are always beneficial to know the concentration of various parameters present in the soil. The values of each parameter were found to be within the normal and safe range overall, the soil quality from all the locations was found to be healthy for better crop. This study has provided baseline information about soil by using physico-chemical properties of soil

Index Terms: Satana (Baglan), Soil, Physico-chemical analysis, nutrients, pH

I. INTRODUCTION

The term solum is Latin word meaning and earthly materials which plant grow and develop. The study of soil or solum is known as pedology. Soils serve as natural habit for both plants and animals. It provides water and reservoir of various nutrients

to the plant body. Soil is defined as the weathered super facial layer of earth crust which is capable of supporting life. It is formed by combined action of climate factors such as water, light temperature and biotic factors such as plants, animals and microbes (Mishra, Bhushan and Sharma, Laboratory manual in Chemistry by Arya book Depot Delhi.). Soil consists of some of the components say as inorganic, organic materials living organism present in the soil. In additional to water and air which depend upon natural condition and type of soil. Physically soil is mixture of minerals particles with varying sizes. According to this course particles 2 to 0.2 mm which form coarse sand, smaller particles 0.2 to 0.02 mm form sand. Finer particles 0.02 to 0.002 mm form slit very fine particles less than 0.002 mm form clay. On the basis of properties of soil, soil is divided into various types say as sandy soil clay and loamy soil calcareous laterite and peat soil (Wikipedia free encyclopedia)

The physical properties of soil largely depend on the size of particles that soil is composed the properties are porosity, soil water, soil air and capillary. Acidity and alkalinity of the soil are more importance for growth and distribution of plants various kinds of bacteria and fungi are present in soil for maintaining fertility dark colour substance that is humus is present in the soil. This is formed by decomposition of dead animals' plants and microorganism. It is more importance to plant, crops both chemically and physically. It increases soil fertility and provide nutrients for growth of plants and other microorganisms including nitrogen fixing bacteria which also increase the availability of minerals in dissolved state to the plants. It can retain high amount of water and also increases the aeration and percolation of water (Gupta P.K.et al.,2007).

Bell and Dell in 2008 have showed that deficiency of nutrients has become measure restrictions to productivity and stability of soil. In the Satana (Baglan) Tahasil main crops are wheat, Bajara,

Maiz, Onion, vegetables etc. The certain external factors effect on plant growth like air temperature, light, mechanical support, nutrients and water. A plant requires elements for their growth and completion of life cycle. These elements include carbon, hydrogen, oxygen, nitrogen, Phosphorous, potassium etc. (Gupta, P.K., et al.,2000). The fertility of the soil depends upon concentration of N, P, K, organic and inorganic material.

The study of physicochemical parameters of soil is important to agriculture chemist for crops, plants growth and soil management. Soil testing is only way to determine available nutrient status in soil and only way we can develop specific fertilizers recommendation. Result of Physicochemical test analysis provide information about the capacity of soil to supply minerals nutrients (Ganorkar, R.P. et al.,2013) Man is dependent on soils and to a great extent soil are dependent upon man taking into consideration the use he makes of them.

Aim and objective:

1. To know the different parameters, present in the soil.
2. To find out any deficiency of minerals from the soil.
3. To find out the specific additives needed for the soil.
4. To improve the soil texture.

II. MATERIAL AND METHOD

A. Selection of sampling sites and Collection of samples

The physical and chemical characteristics of soil determine its usefulness for agricultural purpose. In order to get an idea about soil quality the methodology used for obtaining reliable and useful data includes selection of sampling sites, collection of soil samples and analytical method. The soil samples from different villages of Satan Tahasil were collected from agricultural fields. To avoid the surface contamination of the soil was collected by preparing V shaped holes on the soil surface then 2 cm thick slice of soil from the depth of around 22 cm was collected and brought to the laboratory and samples were air dried and sieved into coarse and fine fractions (Gupta, P. K., et al.,2007).

The samples were collected in polyethylene bags/plastic bucket The samples were numbered from 1 to 6 against their locations and sources (Table I).

Table 1. Location of soil samples

Sample No.	Location/Place
1	Chundane
2	Bijote
3	Pimpaleshwar
4	Thengode
5	Ladud
6	Lakhmapur

The collected samples were brought to the Shejmi laboratory Tahasil Satana (Nashik) for analysis. The analysis was carried out by adopting suitable analytical or instrumental method Rodger, Andrew and Engene 22 edition 2012).

III. RESULT AND DISCUSSION

The physico-chemical characteristics and other parameters of the studied soil samples of six (6) sites near the 6 villages from Satana Tahasil district Nashik have been analyzed and the data were summarized in the Table II, and the interpretation of data has been made with the help of analysis result are given in Table II and also shown in fig.1.

A. pH:

The most significant property of soil is its pH level; it effects on all other parameters of soil. The pH range of 6.0 to 7.5 has been recommended optimum for crop growth, the pH of soil samples shows variation 7.2 to 8.70, the above 7.5 value of pH shows slightly alkaline nature/basic nature. Sample 2, 3, 4 and 5 showed maximum pH in soil as the solubility of minerals decreases creating nutrient deficiencies in the soils. These values are shown in table no-2, pH was found to vary from neutrality to slightly alkaline. But pH of sample-1 and 6 were within 6.0 to 7.5 ranges and was optimum for crop growth.

B. EC:

Electrical conductivity is also a very important property of the soil. It is used to assess the quality of the soil. It is a measure of ions present in solution (Mahrer, Y., and Shilo, E.,2012). Electrical conductivity (EC) expresses ion contents of solution which determine the current carrying capacity thus giving a clear idea of the soluble salts present in the soil. The electrical conductivity of a soil solution increases with the increased concentration of ions. EC is used to find out the soluble salt concentration of the soil. Electrical conductivity (EC) of soil samples understudy shows variation in conductivity values between 0.12 mhos to 0.53 mhos this value suggests normal soil. All these values below and nearly to the 0.4 m. mhos/cm except sample 6 which is less saline in nature (Wagh, G. S., et al.2013).

C. WHC (%):

One of the main functions of soil is to retain water and make it available for the plant, crops to access. WHC depends upon number, capillary spaces of the soil and size of the soil's pore spaces. The percentage of WHC varies from 40 to 74 by weight, the normal percentage of WHC observed in sample 2,3,4 suggest normal soil and 1, 5, 6 which shows abnormal values hence they are not normal.

D. Organic Carbon (%):

Organic carbon is another influential factor which increases the availability of iron but decreases the availability of manganese, zinc and copper to the crops and plants. The present study shows that organic carbon presents in all soil

samples understudy are closed to range of normal value from 0.40% to 1.00 %,

E. CaCo₃ %:

Calcium carbonate is one of the cementing agents participate in the binding of soil particles together through physico-chemical mechanisms and presumably create a stable soil structure. Carbonates are necessary to control the pH in an acid soil, but maintaining a nutrient balance requires calcium. There was a more percentage of carbonate seen in the all samples except sample-5 which has appropriate amount in sample.

F. Na (ppm):

The available Na was found to be in the range 100 ppm to 400 ppm. The medium range was in 2,3 and 4, low concentration in sample 1 and sample, 5 and 6 having higher concentrations than expected.

G. Nitrogen (kg/ha):

Nitrogen of soil is mainly present in organic form together with small quantities of ammonium and nitrates. It is one of the most important macronutrients essential for plant growth. The Nitrogen of all field's sampling soil was found in normal range Total nitrogen content determined using of the Kjeldal methods (Jackson, M. L., 1973).

H. Phosphorous (kg/ha):

It is one of the most important micronutrients essential for plant growth every living cell. (Ku Smita et al., 2015). The available phosphorous values range in between 16 Kg/ha to 20 Kg/ha. It indicates that all samples have the moderate range phosphorous contents.

I. Potassium (kg/ha):

Potassium plays an important role in different physiological processes of plants. It is one of the important elements for the development of the crops, plants which determined by Ammonium acetate method of (Hanway, J. J., et al., 1952). The variation in Potassium (K) in all soil samples which are low in sample 1, 2 and 3 and more in sample 6 which are abnormal value, and normal range was found in sample number 4 and 5(Yellamanda, R. et al., 2002).

J. Ca (%):

Calcium plays predominant role in the composition of cell wall and protoplasm. It has been associated with carbohydrates and various organic acids (Majan and Billore, in 2014). The almost same percentage of Calcium were found in all samples in normal range There were no significant differences in Ca contents in all soils understudy.

K. Mg (%):

Magnesium also plays a major part in the process of photosynthesis due to it being a component part of the chlorophyll molecule (Brady, N.C.and Well, R.R., ;2004). Magnesium value in the studied area varied between the 0.12 to 0.20 % sampling sites showed suitable value within the prescribed limit i.e., normal range There were also no significant differences regarding the Mg concentrations among these soils.

L. Sulphur:

Sulphur in agricultural soil occurs in organic and organic forms. It is important plant nutrient to produce bountiful crops, grains, fruits and vegetables. Concentration of Sulphur is almost same range is suitable as per expected value.

M. Iron:

It is most abundant elements found in soil. It is important for the development of chlorophyll and energy transfer mechanism Iron plays an active role in the regulation of critical functions in crops and plants, such as mitochondrial respiration, biosynthesis of nucleotides, photosynthesis, nitrogen assimilation, hormonal regulation, transport of nutrients, etc. (Karhu, K., et al., 2010). The available iron values range in between 0.99 ppm to 2.9 pp. It indicates that all samples have value below the moderate range except sample number 6 but it is in the permissible limit.

N. Mn (ppm):

Manganese is important in nitrogen assimilation, nitrogen metabolism, and in the process of photosynthesis. The available Mn was found to be in the range 3.9 ppm to 8.6 ppm. It was found that significant difference in the Mn concentration is reported in the collected samples. Higher concentrations of Mn were found in the sample-5 as compared to others.

O. Zn (ppm):

Zn is important in the promotion of seed maturation and production as well as in the promotion of growth hormones and starch production (Brady and Weil, 2004). This study showed have slight differences among the samples Soil sample-1 has slightly below the normal value.

P. Cu (ppm):

Copper plays an important role in photosynthesis, nitrogen fixation, and protein and carbohydrate metabolism (Brady, N.C.and Well, R.R.;2004) The study showed slightly difference among the all samples. The values are higher than expected concentrations of Cu except sample number 3 but more exceed in sample number 6.

Table 2. Show Physicochemical characteristics of soil samples from some villages of Tahsil Satana, District Nashik, Maharashtra (India)

Sr. No.	Characteristics properties of soil sample	Sample No-1	Sample No-2	Sample No-3	Sample No-4	Sample No-5	Sample No-6	Appropriate proportion
1	Density (gm/ml)	1.10	1.38	1.20	1.19	1.15	1.05	0.8-1.0
2	WHC (%)	74	48	51	50	72	68	40-50
3	PH	7.2	8.66	8.0	8.70	8.1	7.66	6-7.5
4	EC (Mmohs/cm)	0.12	0.38	0.30	0.36	0.42	0.53	< 0.4
5	Organic Carbon %	0.49	0.44	0.59	0.58	0.56	0.60	0.4-1.0
6	Caco ₃ %	10.0	11.0	11.0	10.5	4.6	7.60	2 - 5
7	Na (PPM)	100	280	280	280	380	400	< 250
8	Nitrogen (kg/ha)	280	280	310	290	290	290	280-420
9	Phosphorous(kg/ha)	16	16	18	18	18	18	14-24
10	Potassium(kg/ha)	179	201	201	224	268	448	250-450
11	Ca (%)	0.36	0.38	0.36	0.38	0.31	0.36	0.20-0.50
12	Mg (%)	0.12	0.18	0.18	0.18	0.18	0.20	0.1-0.20
13	S (PPM)	22	22	25	25	22	26	10-50
14	Fe (PPM)	0.99	2.0	2.0	1.0	1.9	2.9	2.5-4.5
15	Mn (PPM)	3.9	5.9	5.8	6.8	8.6	5.30	2.0-5.0
16	Zn (PPM)	0.66	0.96	0.89	1.0	0.91	1.14	1.0-2.0
17	Cu (PPM)	0.81	0.89	0.50	0.81	0.59	2.23	0.2-0.5

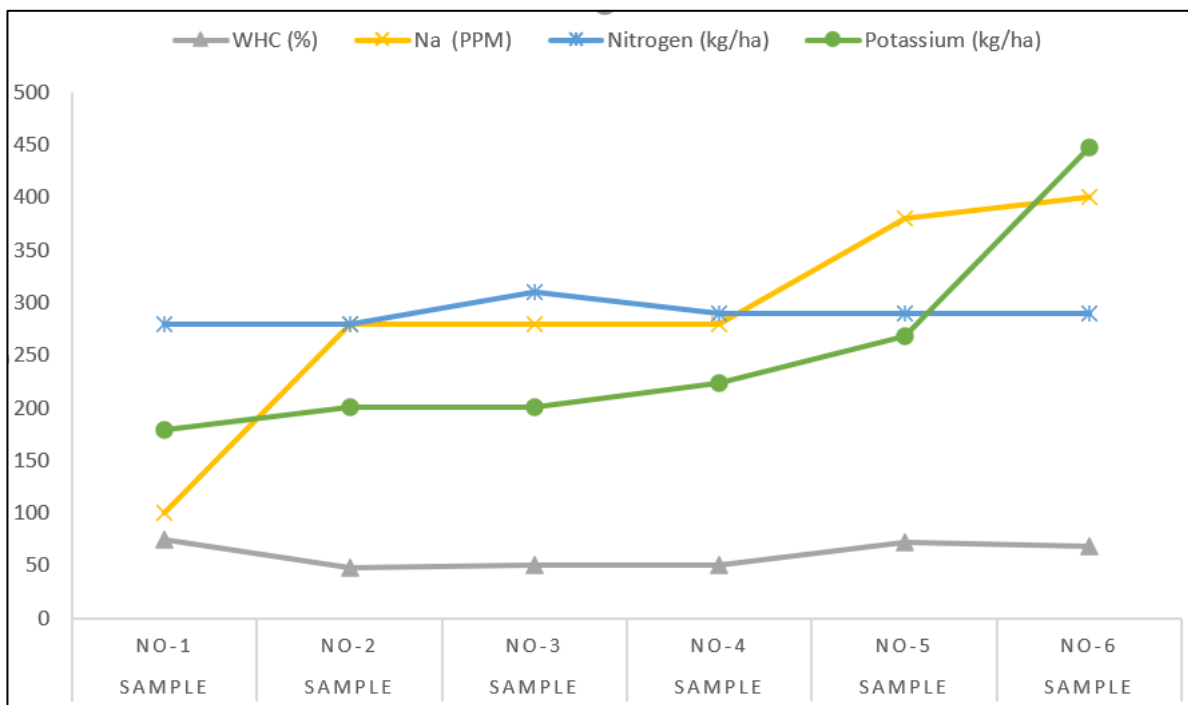


Fig.1. (a)

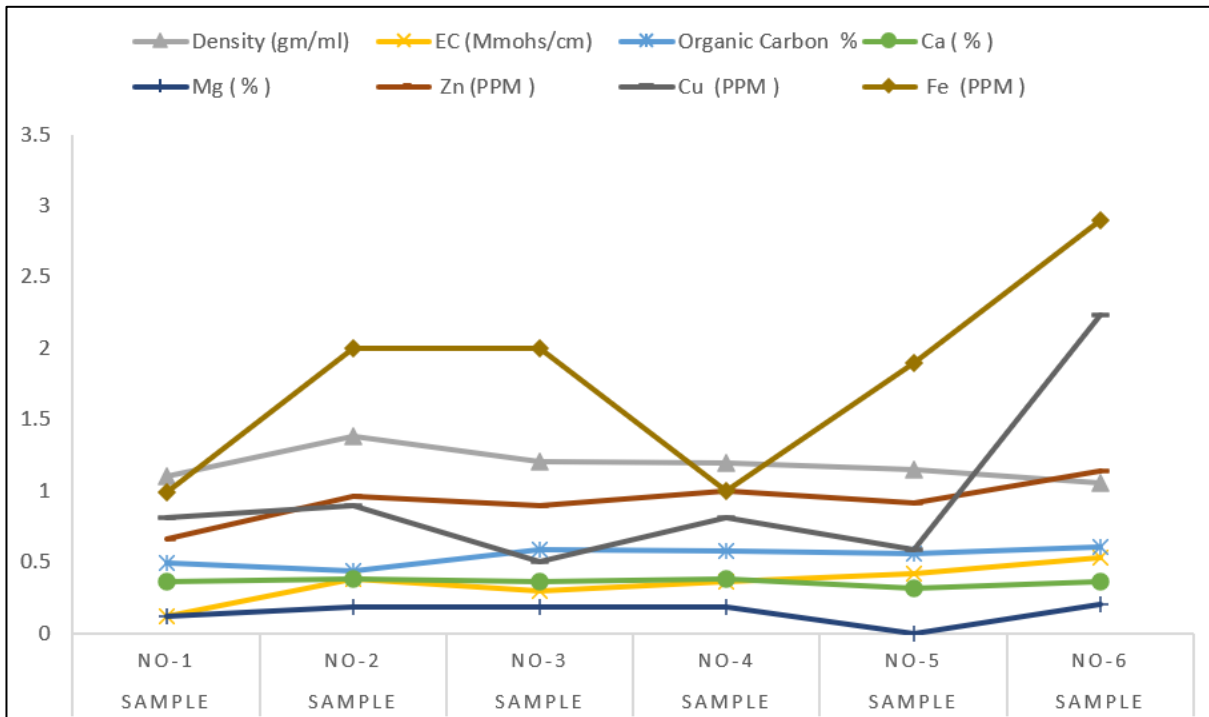


Fig.1. (b)

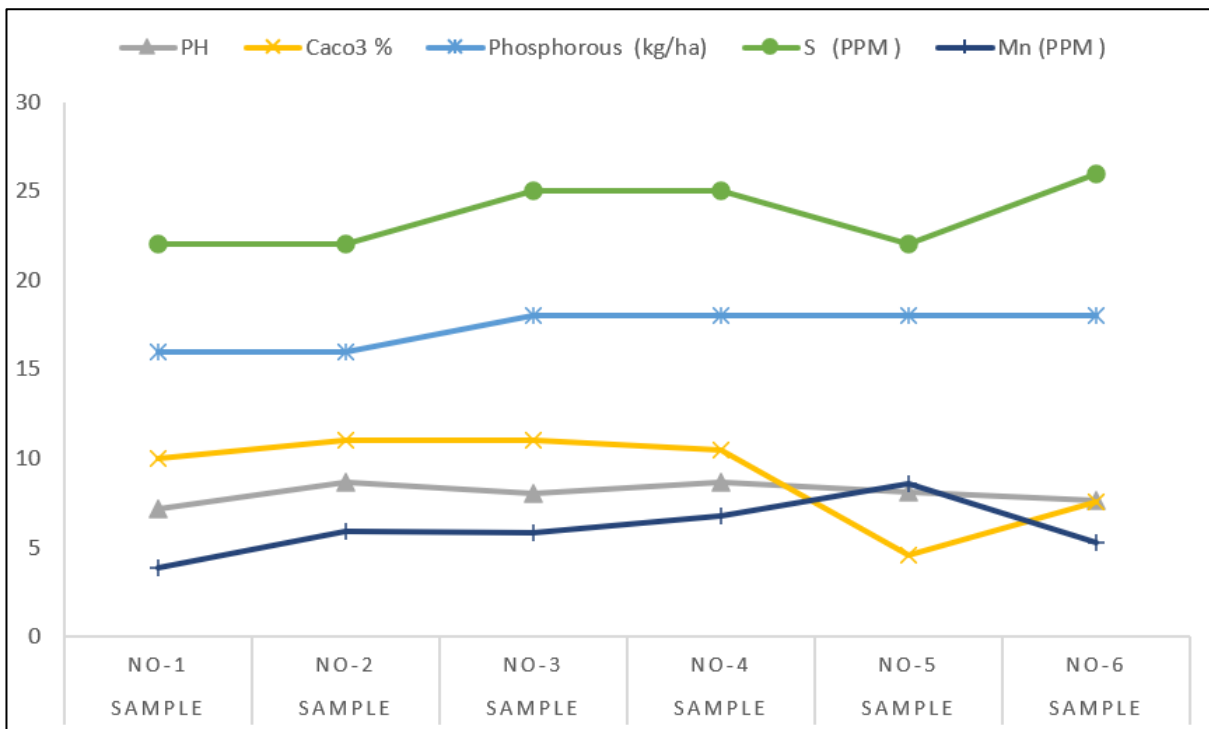


Fig.1. (c)

Fig.1. (a), (b), (c), are the variation in Physico-Chemical parameters of different soil samples

CONCLUSION

The Physico-Chemical parameter were studied and determined by using standard procedures. From the results, it is revealed that there was slight variation in some physicochemical parameters among the study area. It is evident that mostly all the values of physicochemical parameters fall under the permissible limit. The qualities of soil samples were acceptable from majority of Physico-chemical parameter but for some sites soils need to be treated before using it for crops cultivation and concluded that quality of soil samples under study area is nearly fit for crops cultivation, agricultural utilization, this type of work it will be beneficial for the farmers to improve the soil fertility and crop quality. The data obtained clearly indicated that the area is good for agriculture of wheat, Bajara gram, maize, cotton etc. The soil sample in small quantity analyzed that truly represents the field which is to be profitable for farmers.

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