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# Study of Physico-chemical Parameters for Soil Quality of Agricultural Field Used in Villages of Nanded- Waghala Municipal Corporation, District : Nanded (Maharashtra), India

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## ABSTRACT

The soil is the most important component of our farming. The type of soil is a major factor in determining what types of plant will grow in any area. Soil sampling is the most important step for any soil Analysis. Some important physicochemical parameters of agricultural soil sample near Godavari River from Nanded Taluka. Dist. Nanded, State Maharashtra were studied. Soil samples were collected from 12 representative locations from depths of 0 to 20 cm for physicochemical study. Some physicochemical parameters such as colour, moisture, pH, total organic carbon, Electrical Conductivity (EC), % of Nitrogen (N), % of Phosphorus ($P_2O_5$), % of Potassium ($K_2O$), TDS and different metals content were analyzed by using standard procedures. From this study it has been revealed that there is excessive dose of Potassium (K) & phosphorus (P) into the soil due to excessive use of chemical fertilizers. Similarly concentration of elements such as Mg, Ca etc. has also been seen higher than the normal range due to application of sewage water from river & poorer drainage conditions, which leads to increase in soil alkalinity. This study shows that variable concentrations of various parameters and irregular distributions of micronutrients is decreasing the quality of soil for use of agriculture crop formation mean while there is marked variation in nutrients and parameters of various sample point in different agricultural field. This knowledge will help to the people who are interested to work in agricultural field.

**Keywords:** Physiochemical parameters, Micronutrients, Soil, fertilizers, TDS, flame photometric method, Conductivity, etc.

## I. INTRODUCTION

Soil is basic life support system which is a mixture of minerals, organic matter, liquids and myriad of micro and macro organisms that can support plant life & acts as important valuable resources of the nature. All living things are directly or indirectly dependent on soil for day to day needs and 95 % of the human food is derived from the earth soil. Soil has complex function which is beneficial to human and other living organism. It acts as a filter, buffer storage, transformation system and thus protects the global ecosystem against the adverse effects of environmental pollutants.

Study of Soil quality is the most important today. Soil quality is the capacity of a specific kind of soil to function within natural or managed ecosystem boundaries to sustain plant and animal productivity. Each plant species has its nutritive requirements differing from varying concentrations of micro and macro elements at different levels and concentrations (such as Pb, Cd, Fe, etc.) and the soil's physicochemical parameters such as moisture, pH, electrical conductivity (EC), organic carbon (OC), potassium, sodium, calcium and magnesium .Thus the agricultural chemist must know the importance of physicochemical parameters for soil management and plant growth [1-2]. The fertility of the soil depends on the concentration of N, P, K, organic and inorganic materials, conductivity, moisture content, specific gravity Nitrogen as a fertilizer [3-6]. The concentration of these physiochemical parameters affects the agricultural land positively or negatively depending on the levels or concentrations to which they are available.

Activities of human have caused massive loss of this soil organic carbon such as the use of fire on soil, tillage, drainage, grazing management expose, use of fertilizers, pesticides and sewage sludge etc…When the soil is

contaminated, it means that the whole environment is indirectly or directly polluted, This is because crop yield will be adversely affected by soil contamination. Additionally, excess uptake of atmospheric heavy metals emissions has been identified as a one of the reason of heavy metal contamination in vegetable crops. Vegetable growing areas which are situated near to the industries have high risk of contamination of high concentrations of heavy metals in vegetables. These Contaminants can adversely impact the health of living species when inhale or come in contact with contaminated soil. The excessive application of nitrogen, other organic fertilizers and inorganic fertilizers to these vegetables can accumulate high levels of nitrate, other anions as well as heavy metals. When untreated wastes are used in agricultural field, then there is risk of diseases like cholera, typhoid, dysentery, malaria, ulcers etc. Soils can be contaminated by many factors such as industrial activities, automotive emission, mining and repeated use of metal rich compounds including fertilizers, fungicides, untreated wastewater irrigation, and bio compounds. The effect of pH on heavy metal availability to plants has been reported by many researchers and it is accepted that, as pH decreases, the solubility of metals in the soil solution increases and, therefore, they become more readily available to plants [7].

In India, large quantities of chemical fertilizers are used which leads to increase productivity but decreases the quality of soil. Hence today its real time to analyze physicochemical parameters of soil, because with excess of chemical fertilizer exposure to the soil, it is difficult to control the worst effects of these harmful chemicals to the plants, human being and animals[8-9].

**1.1 Survey & Background for Research:**

Nanded is one of the agricultural favored side situated near the coast of River Godavari located in dist. -Nanded, State-Maharashtra, India. For commercial purpose, due to because of physical, chemical & geographical condition of this soil, Nanded is an eminent place for cultivation of wheat, jawar, pulses, sugarcane, vegetables and fruits etc. Now the river polluted with tremendous amounts of wastes from residence houses and industry. The contaminated water from this river is used for the irrigation for farming of wheat, jawar, pulses, sugarcane, vegetables. A survey around these coastal areas revealed that most solid and liquid wastes which contain some of the heavy metals (like Pb, Cd, Fe, etc.) are carelessly dumped on the open areas, and these may leach into the soil after rainfall and consequently pollute the soil. Hence, this affects significant effect on the soil and crops which cause the health problem to living species due to bioaccumulation of trace metals with time.

This draws the significant attention for me to study qualities of these lands, to determine the presence of heavy metals, radicals, hydrocarbon contents, etc. at different levels & concentration. The main aim of physicochemical parameters study of these collected soil samples from different villages is to analyze the quality of soil for agriculture purpose and scope of soil for future farming.

## II. MATERIALS & METHODS

**2.1 Study Areas:**

Nanded is the one of the largest agricultural place in Maharashtra. The study area lies between latitude 19°16′N and longitude 77°31′E, and elevation between 366m. The study was conducted at selected sites of twelve different agricultural villages of Nanded, in district Nanded, state Maharashtra. ($S_1$-Taroda.bk, $S_2$-Pasadgaon,$S_3$-Sugaon Khurd,$S_4$-Babulgaon ,$S_5$-Kakandi, $S_6$-Rahati, $S_7$-Pimpalgaon Korka,$S_8$-Daryapur, $S_9$-Borgaon, $S_{10}$-Jannapuri, `$S_{11}$-Jaitapur, $S_{12}$-Jannapuri ) which represent soils of that village.

**2.2. Sample Collections:**

All top quality soil samples were collected from agriculture side during summer season randomly at 0 to 20 cm depths from twelve selected agriculture areas with a soil auger and obtained a minimum volume of 0.5 kg of soil per sampling area. These collected sample were stored in sterilized zip lock as described by Arotupin et.al (2008)[10] .

**2.3. Sample Pre-treatment & Preservation:**

The soil samples were air dried for a period of one week. Then they are ground using mortar and pestle and passed through 2.0 mm sieved. Further the soil samples were kept in dry polythene packets for subsequent physical, chemical analysis.

### 2.4. Sample Analysis Methods:

A.R. grade chemicals and reagents from S. D. Fine and Merk chemicals, Bombay is used for analysis of physicochemical parameters. The soil samples were suspended in distilled water (1:4 w/v) and allowed to settle down particles for analysis of physicochemical parameters. Methods used for Estimation of these physiochemical Parameters were carried out with standard procedures [11-16].

Methods use for estimation of some physicochemical parameters is shown in Table 1.

**Table 1.** Methods Used for Estimation of Some Parameters

| Sr. No. | Physiochemical Parameters | Methods |
|---|---|---|
| 1 | Colour | By Viewing Soil |
| 2 | Moisture | By Weighing |
| 3 | pH | pH metry |
| 4 | electrical conductivity (EC), | Conductometry |
| 5 | % organic carbon (OC) | Titration (Walkley and Black method using diphenylamine indicator) |
| 6 | Available Nitrate Nitrogen | Titration (alkaline permanganate method) |
| 7 | % Alkalinity | Titration |
| 8 | Total Dissolved Solid | TDS metry |
| 9 | Calcium | by EDTA titration & atomic absorption spectrophotometer |
| 10 | Magnesium | by EDTA titration & atomic absorption spectrophotometer |
| 11 | % Phosphorus | Bray's method |
| 12 | % Potassium | Flame photometric method |

Analysis of these physiochemical parameters were carried out in the P.G. Laboratory of Department of Chemistry, Gramonnati Mandal's Arts, Commerce & Science College Narayangaon, Taluka Junnar, Dist.-Pune, MS, India.

## III. Results and Discussion

Physicochemical parameters of twelve samples are summarized in Table 2.

**Table 2.** Physicochemical Parameters of Soil Samples

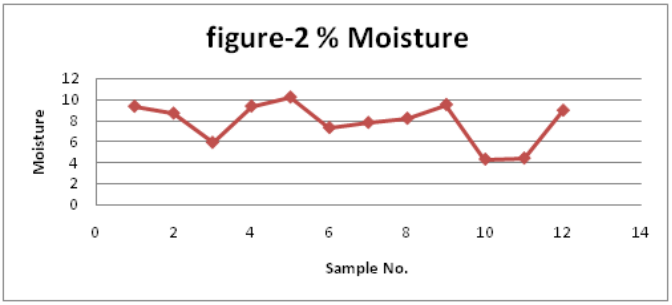
| Sr. No. | Physiochemical Parameters | $S_1$ | $S_2$ | $S_3$ | $S_4$ | $S_5$ | $S_6$ | $S_7$ | $S_8$ | $S_9$ | $S_{10}$ | $S_{11}$ | $S_{12}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Color | Faint Black | Faint Black | Faint Black | Dark Black | Dark Black | Faint Black | Faint Black | Dark Black | Dark Black | Faint Black | Faint Black | Dark Black |
| 2 | % Moisture | 9.36 | 8.70 | 5.90 | 9.38 | 10.24 | 7.32 | 7.81 | 8.21 | 9.53 | 4.29 | 4.40 | 8.98 |
| 3 | pH | 7.72 | 7.92 | 7.45 | 7.78 | 7.45 | 7.26 | 7.10 | 7.55 | 6.94 | 7.35 | 7.12 | 7.65 |
| 4 | electrical conductivity (EC), | 0.18 | 0.26 | 0.22 | 0.14 | 0.23 | 0.19 | 0.11 | 0.09 | 0.16 | 0.11 | 0.15 | 0.14 |
| 5 | % organic carbon | 0.74 | 0.63 | 0.30 | 1.28 | 0.45 | 0.98 | 1.23 | 1.11 | 0.86 | 0.98 | 1.20 | 0.98 |

### 3.1 Colour:

The colour of the sample $S_1$, $S_2$, $S_3$, $S_6$, $S_7$, $S_{10}$ and $S_{11}$ are faint black, whereas colour of sample $S_4$, $S_5$, $S_8$, $S_9$ and $S_{12}$ is dark black.

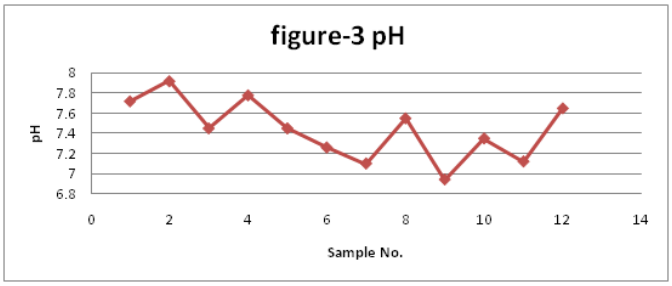
### 3.2 Moisture:

The moisture content value ranges from 4.29% to10.24%. It is clear from result that the sample $S_5$has highest moisture content than remaining eleven samples.



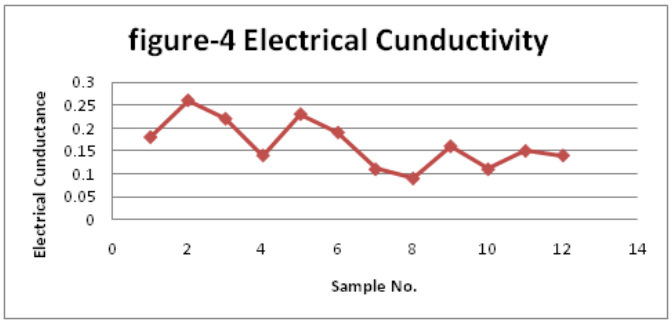

### 3.3 pH:

The pH of soil is one of the most important parameter which determines the capacity of soil. pH value expresses the acidity or alkalinity of the soil. It affects mineral, nutrient quality and much microorganism activity. All the pH values are less than 8.5 (table-2). The range for pH value for soil is -acidic. < 6.5, Normal alkaline -6.5-7.8, medium alkaline 7.8- 8.5, Alkali > 8.5.The pH values for above selected samples were observed in between the ranges from 6.94 to 7.92. The samples $S_2$ is very slightly high alkaline and remaining samples are in normal alkaline range.



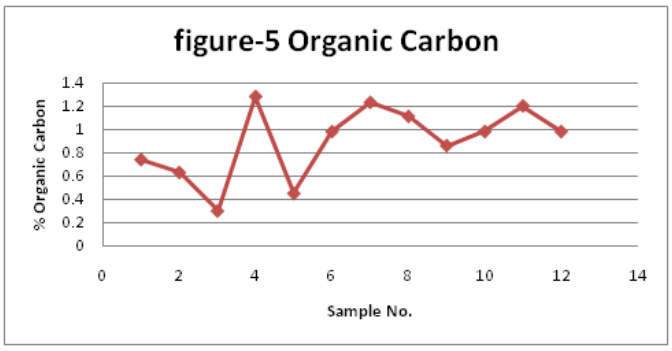

### 3.4 Electrical Conductivity:

The measurement of electrical conductivity gives a clear idea of soluble salt present in the soil. Conductivity depends upon the dilution of soil suspension. Standard value of Electrical conductivity in soil is - Normal < 0.8 dsm-1, critical for salt tolerant crops 1.6 -2.5 dsm-1, Injurious to most crops > 2.5 dsm-1.The conductivity values ranges from 0.09 µS to 0.26 µS . Conductivity of sample $S_8$ is less as compared to other remaining samples.



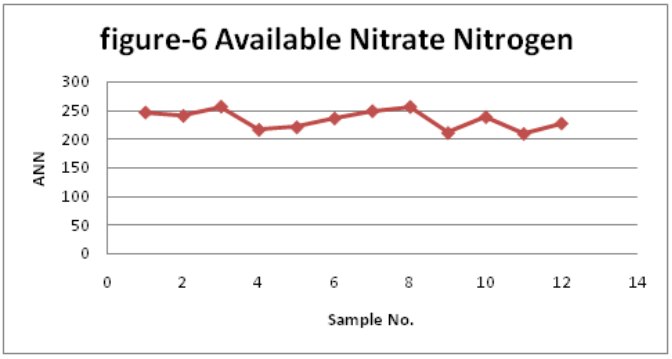

### 3.5 Organic Carbon:

Organic carbon is the index for nitrogen. The source of organic carbon in the cultivated soil included crop residue, animal manure, cover crops, green manure and organic fertilizer etc. Standard value of organic carbon value is - low < 0.50, medium 0.50- 0.75 and high > 0.75. Organic carbon values of selected samples ranges from 0.30% to 1.28%. Organic carbon of sample $S_4$ is high as compared to other remaining samples.



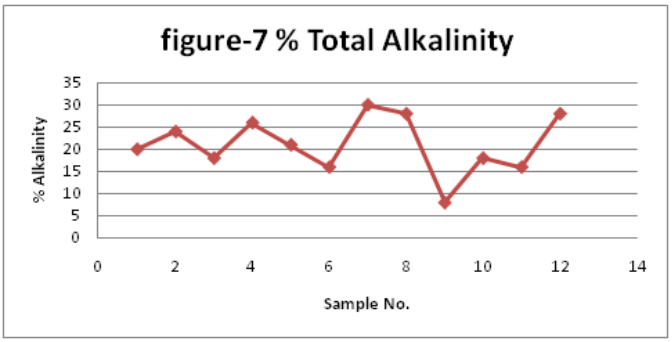

### 3.6 Available Nitrate Nitrogen:

Available nitrate nitrogen in the soil ranges from 208.6 Kg/hectare to 256.4 Kg/hectare. The soil sample $S_3$ has high nitrate nitrogen as compared to remaining collected samples.



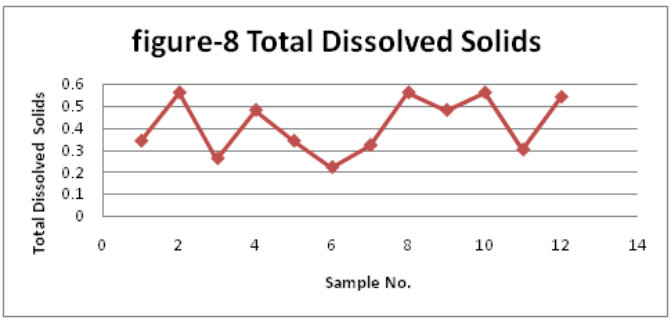

### 3.7 Alkalinity:

Alkalinity was observed in the ranges from 08% to 30%. Alkalinity of sample $S_9$ is less as compared to other collected samples.



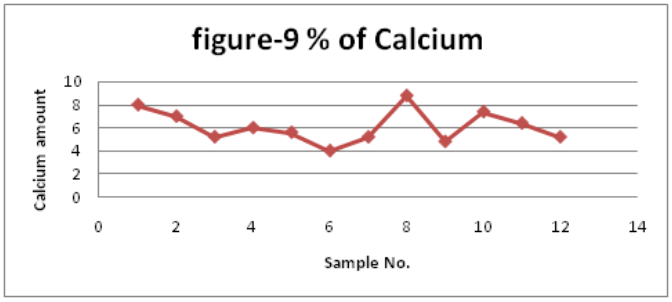

### 3.8 Total Dissolved Solid (TDS):

TDS values for soil samples ranges from 0.22 to 0.56. Soil sample $S_6$ has lowest TDS as compared to other remaining samples.



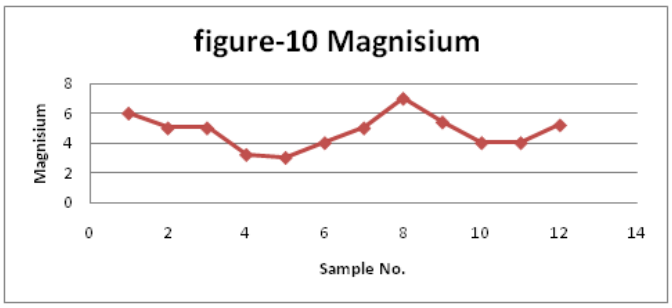
### 3.9 Calcium:

Calcium ranges from 4.0 ml/100gm to 8.8ml/100gm. Soil sample $S_8$ have high calcium content as compared to remaining analyzed samples.



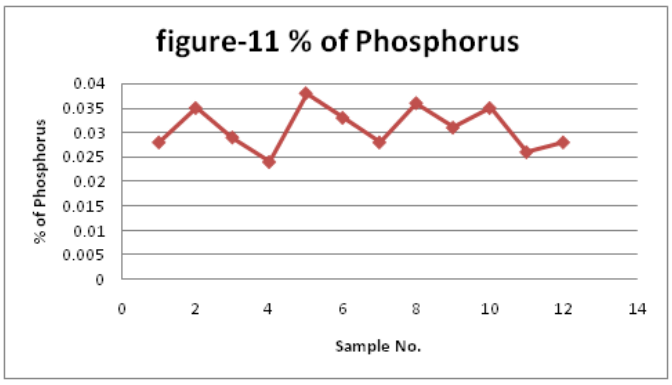

### 3.10 Magnesium:

In the form of $Mg^{+2}$, magnesium is available for plant. Magnesium content in the soil samples ranges from 3 ml/100gm to 7ml/100gm. Sample $S_4$ contains less amount of magnesium.



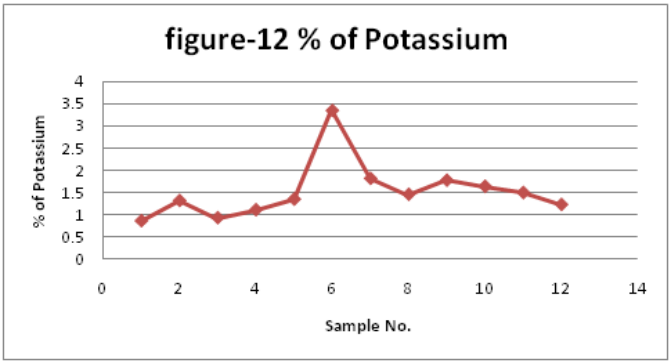

### 3.11 Phosphorus:

Phosphorus was found in the range of amount low, medium, high (table no.2). Inorganic orthophosphate plays an important role in aquatic ecosystem. Phosphorus is the most important micro nutrient. Phosphorus values for soil samples ranges from 0.024% to 0.038%. Soil sample $S_5$ has highest phosphorus amount as compared to other remaining samples.




### 3.12 Potassium:

Potassium is present in the form of K2O in soil. Although potassium present in small amount in soil sample, it plays an important role as micronutrient. The K is relatively abundant in the earth's crust; most of it is not accessible to plant. Potassium values for soil samples ranges from 1.23 to 3.36. Soil sample $S_6$ has highest potassium quantity as compared to other remaining samples.




## IV. Conclusion

The research carried out on soil quality of twelve study areas in different villages in Nanded shows that the pH of soil samples was slightly alkaline , the level of organic carbon found to be very low, which is not helping the soil to function for agricultural use. The electrical conductivity and NPK values of all soil samples were found to be very less. Hence commercial fertilizers containing required essential elements needs to be added for proper growth and development of crop. Magnesium and calcium content in all soil samples are in high amount this is due to because of exposure to high metals contamination. The physiochemical parameters of soil should be protected by discouraging bush burning and grazing management which cause loss of soil organic carbon. When these are done, the quality of the soil will be improved, enhancing the agricultural use of it, on the other hand life of these areas will enjoy safe environment and healthy life.

## V. Acknowledgments


## VI.

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