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Physico-Chemical Analysis of Soil from Northen Part of Pune District

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ABSTRACT:

Soil is a natural body of mineral and organic material differentiated into horizons, which differ among themselves as well from underlying materials in their morphology,physical make-up,chemical composition and biological characteristics.In pune district due to industrialization and other anthrogenic activity the soil from its Northen part has been polluted.the The Ghod, Meena River are days by days increased,So this effect on farming in crops.This two river are flows through the Ambegaon and Junnar Tehsil and hence it is felt necessary to carry out the soil analysis to understand the pollution levels of the soils in the adjoining area.In the present study the analyses of soil samles collected from the Industrial and sugarcance field of Chas,Narayangaon,warulwadi located in the Northen part of pune district which is influenced by the solid waste disposal as well as industrial effluents.In the first place soils samples from 3 representative locations were collected for their analysis.Physical parameters like pH,Electrical Conductivity(EC),Organic Carbon(%),calcium and magnesium,and chemical parametrs like Phosphorus,Potassium,copper Iron, Manganese and Zinc were analyzed.From this study it has been revealed that there is excessive dose of phosphorus and potassium into the soil because most farmers are using excessive chemical fertilizers.Similarly Cu,Fe,Mn,and Zn concentration has also been higher than the normal range and due to poorer drainage conditions of this area making soil alkaline.Thus it is concluded that variable concentrations of various parameters and irregular distributions of micronutrients may be attributed due to the added fertilizers during the crop formation.

***Keywords*:** Anthropogenic contaminationutrients,Soil analysis,Pune District

1.INTRODUCTION:

In Pune district due to industrialization and other anthrogenic activities the soil from Northen part of district gets polluted.The Ghod,Meena river are recently,pollution increases.This effect of farming in the soil and human life.pollution are increases days by day .Off course,soil in parameters decreases available.pune district through from Ambegaon Tehsil(Chas) and Junnar Tehsil(Narayangaon,Warulewadi) and hence it is more relevant to carry out soil analysis (Acharya S.M.,2018)[1].Soil is an unconsolidated material of the earth's crust in which terrestrial plants grow if water and temperature are adequate with minimum available nutrients.Soil can develop from weathered rocks,volcanic ash deposits or accumulated plant residues.Soil thus from a substrate for plant growth which performs many functions essential to life and in general,most plants grow by absorbing nutrients from the soil whose ability todo this depends on thenature of the soil.Soil formation is a constructive as well as destructive process(Pujaret.al., 2012)[12]the predominant destructive process are physical and chemical breaking down of materials,plants use nitrogen,potassium,and phosphorus.microrganisms like forms available within the soil are also vital and hence soil is a dynamic medium made up of minerals,organics matter,water,air and microorganisms.The nature of soil primarily depend upon its continued change under material,time,the climate,the organic activity in it etc.(Solanki and Chavda,2012)[16].Since soil is made up of such diverse materials like weathered rock particle and organic materials(humus),it can be classified into various types based on the size of the particles it contain (Tan,1996)[16]The modern concept of soil qualify is the ability to sustain plant animal productivity, increase water and air quality and to contribute plant and animal health (Doran,and Zeiss,2000) [5].The objective of this study is to 1)to analyse the soil samples of Northen part of Pune district, 2) to investigate the effects of anthropogenic activity on the crop productivity,3)to study the effect of sewage water of pune districrt carried by Ghod and Meena river through Ambegoan and Junner taluka on the soil,4) to evaluate the effects of excessive use of chemical fertilizers by farmers the characteristic of soils in pune district ,and 5) to find out the effects of irrigation process and drainage patterns on the soil fertility.

2.MATERIALS AND METHODS:

2.1.Study area:

Pune District in Ambegaon Tehsil and Junnar Tehsil is Northern part showed.Ambegaon Tehsil of coordinate is 19°2'5"N 73°50'11"E and Junnar Tehsil of coordinate is 19°07'00"N 73°55'00"E.This Tehsil falls to Figfoothill of sahyadri mountain range and which is towards the west side of Pune city.The soil samples were collected from the area Junnar tehsil of Pune district (MS). The Junnar tehsil islocated on the north part of Pune district in Maharashtra state of India. It lies between 19°12' north latitude to 73°58'east. The climate here is tropical. When compared with winter, the summers have much more rainfall. In Junnar, the average annual temperature is 24.4 °C. The average annual rainfall is 913 mm.The Pune district is divided into four ago-climatic zones.Ambegaon (Chas)and Junnar (Narayangaon, Warulewadi) Tehsil is sub mountain zone -red to reddish brown soils and plain zone -gryaish black soil(Shailesh,2020)[13] .

2.2 Collection of Samples:

The present study primarily focuses on the Physicochemical analysis of soil samples collected from Ambegaon Tehsil (chas regions) and Junnar Tehsil (Walurwadi, Narayangaon regions) Pune district in the period 2019.Soil samples were collected in Pune district.(fig.a).surgical suites by making a 'V' shaped cut to a depth of 15-20 cm in the sampling spot, uniform thick chunks of soil to 3 cm were collected in a plastic bucket .These soil lumps were broken into small pieces through a wooden pestle and dried. The air dried soil samples were stored in glass bottles and labelled for various laboratory analyses (fig.b.).(James and Wells,1990)[8]

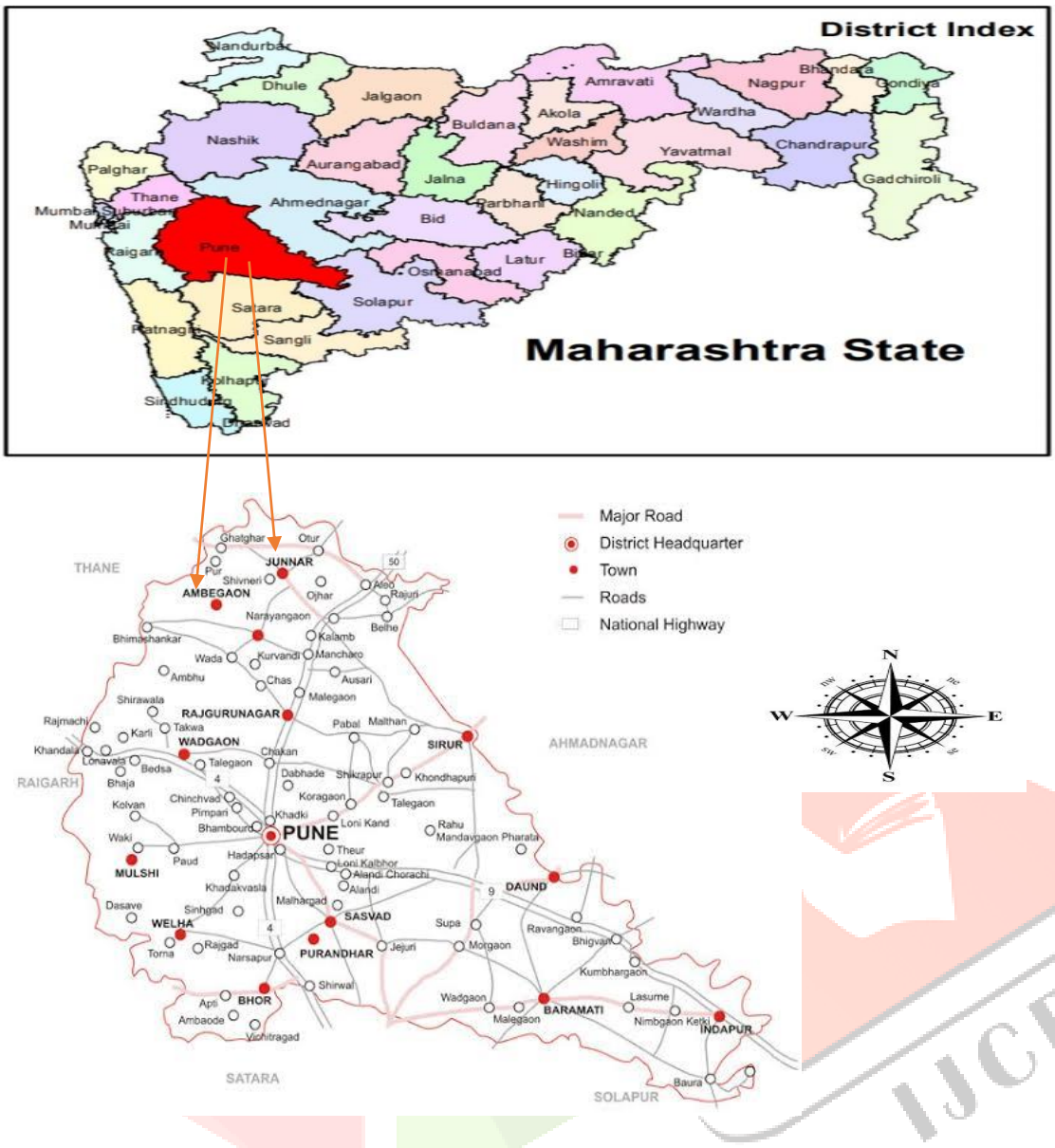
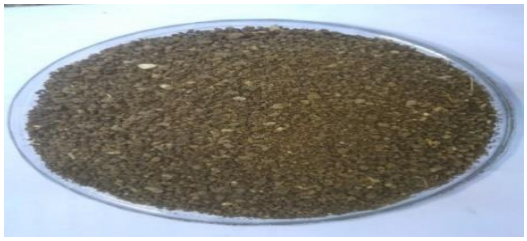


Figure:a.Location map and soil sample collected Ambegaon Tehsil (Chas) and Junnar Tehsil (Warulwadi,Narayangaon) regoins. (villages Map-Maharastra Remote sensing Application Centre).[20]

Chas Region (sample No.1.)	Warulwadi Region (Sample No.2.)
	
Narayangaon region (sample.No.3.)	
	
Fig.b. Collection of soil samples in pune District Region	

2. 3. Soil Texture:

It refers to the estimated per cent of sand, silt, and clay present in the soil, which can be determined through the hydrometer method(Bouyoucos,1951)[2]. The soil aggregates were separated through sodium hexametaphosphate. The aggregates were mixed with sodium hexametaphosphate solution overnight. The soil solutions were transferred to one litre graduated cylinders and filled with water. The soil solutions were mixed with a stirrer to disperse the soil particles. Based on size, the soil particles were separated. Soil measurements were a with a soil hydrometer

2.4. Estimation of pH and EC:

The pH indicates the presence of hydrogen ion in a solution.To estimate the PH of the soil sample, each sample was taken in a different glasses and the final solution was made by adding distilled water in the ratio of 2:1 each. The combined electrode was inserted into supernatant and the pH was recorded. Similarly the pH of different samples was measured and recorded(Jackson,1973)[7] .Electrical conductivity (EC) indicates the presence of ion contents of a solution which is directly proportional to the current carrying capacity of soil, thus giving a clear idea of the soluble salts present in the soil. The electrical conductivity of soil samples was determined by immersing a Digital Electrical Conductivity (Jackson,1973)[7] .

2.5 . Estimation of Organic Matter:

A good physical condition of the plants is dependent on the supply of organic constituents (nutrients) in the soil. The availability of organic matter in the soil is due to the decomposition of plant and animal residues, living and dead microorganisms. It contributes to the soil structure, fertility and water holding capacity. Organic matter present in the soil was estimated by Walkley-Black method(Walkley and Black,1934)[18].

2.6.Estimation of Available Sulphur:

The sulphur was determine by the turbidimetric method(Chesnin and Yien,1950)[4].

Ppm of S in Soil=Y×6.25(dilution factor)

S(kg/ha) = ppm × 2.24

A=Absorbance reading

Y=ppm of S from standard curve against A value

2.7.Estimation of Available Calcium and Magnesium:

The determine calcium and magnesium in soil by versenate (EDTA) titration method (Cheng and Bray,1951)[3].

$Ca2^{+} + Mg2^{+}$ (ml\litre) = Normality of EDTA × Vol.of EDTA ×1000=

Volume of aliquot taken

$Ca2^{+} + Mg2^{+}$(ppm)= $Ca2^{+} + Mg2^{+}$(ml\litre) ×equivalent weight(32)=

2.8.Estimation of Available Nitrogen:

Nitrogen in soil is mainly present in organic form in small quantities with ammonium and nitrates. The available nitrogen was estimated by alkaline permanganate method(Subbiah and Asija,1956)[15]. In a distillation apparatus 20 gm of the soil sample was added to 10ml of 0.35% potassium permanganate, 10ml of 2.5% sodium hydroxide, and 10 ml of distilled water. In a 250 ml beaker 0.02 N sulphuric acid was poured through a 25 ml pipette and with two to three drops of methyl red indicator was added. The solution formed was titrated against 0.02N potassium hydroxide till the pink colour changed into the light yellow. The percentage of nitrogen present in the given soil sample was calculated from the titre value of 0.02N sulphuric acid actually consumed by ammonia.

2. 9. Estimation of Available Phosphorous:

The phosphorus available in soil was found to be in several forms and combinations as orthophosphate, but only a small fraction of it may be available to plants. Available phosphorus was estimated by Olsen's method (Olsen, *et al*., 1954)[11]. 100 ml of 0.5 M sodium bicarbonate (pH 8.5) was added to 5g of soil in a 250 ml conical flask followed by one teaspoonful of carbon black and shaken for 30 minutes and filtered through filter paper (No. 40). 10 ml of the filtrate was pipetted out into a 50 ml volumetric flask with addition of a drop of p-nitrophenol indicator and the pH was adjusted to 3.0 with 4N HCl. Then 5 drops of 0.1 N stannous chloride was added and it was continuously shaken. The colour intensity was read photometrically after 5 min with a 660 light red filter in photoelectric calorimeter.The quantity of phosphorus was calculated as mg/L.

2. 10. Estimation of Available Potassium:

Out of the total non-exchangeable form (fixed K) of potassium present in soil samples, there is small amount of potassium held in exchangeable form (available K). The available potassium in soil samples was estimated by Flame photometric method (Metson,1956)[10]. 25 ml of 1N ammonium acetate was added to a 150 ml conical flask with a 5 g of air dried soil sample and shaken for five minutes mechanically and immediately filtered through a dry grade-1 filter paper. 25 ml of distilled water was added to 5ml of filtrate. The diluted extract was atomized to a flame photometer to note the quantity of potassium in soil samples (mg/L).

2.11.Estimation of Available Copper,Zinc,Iron, Manganese:

Micronutrients like Cu,Zn,Fe,Mn are estimated by using Atomic Absorption Spectrophotometer standard methods (Trivedy andGoel,1984)[17)].Micronutrients include Iron, Manganese,Zinc, Copper,Boron Clorine and Molybdenum.The term refers to plant's needs,not to their abundance in soil.They are required in very small amounts but are essential to plant health in that most are essential to plant health in that most are required to speed up plant's metabolism.They are generally available in the mineral component of the soil and the method commonly used for

determination of available micronutrients in soil samples is by Lindsay and Norvell(1978)[9].This method consists of use of DTPA(Diethylenetriaminepentaacetic acid) as an extractant which has been widely accepted for the simultaneous extraction of micronutrients like Zn,Cu,Fe,Mn is neutral and alkaline soils.

3.RESULT AND DISCUSSION:

An examination of soils samples (Table 1) shows: that the values for pH ranges from 6.7 to 7.5 by results finding by (Jackson,1973)[7].(fig.c.).indicating that the Chas region soils are nearly near by neutral and Warulwadi, Naraygaon regions are not more alkaline and such conditions the(Jackson,1973)[7] as reported by Chas ,warulwadi and Narayangaon regions of Soil is fit for all crops grown in the region and need no treatment. Electrical conductivity value ranges from 0.10 Ds/m to 0.23Ds/m by results finding by(Jackson,1973)[7].(fig.c.).this three regions soils are normal i.e.no problem of all crops growth by reported by (Jackson,1973)[7]. Electrical conductivity is used to estimate the soluble salt concentration in soil and is commonly used as a measure of salinity. The organic carbon pecentages ranges from 0.54% to 0.65%results finding by (Walkley and Black,1934)[18].(fig.c.). indicates that the Chas region soils in low organic carbon and Warulwadi, Narayangaon region soils in medium organic carbon as reported by (Walkley and Black,1934)[18].The organic soil matter includes all the dead plant material and live or dead animals. Most living things in soils including plants, insects, bacteria, and fungi are dependent on organic matter for nutrients and energy. Soils have varying organic compounds in varying degrees of decomposition. Lossof weight on ignition can be used as a direct measured of the OM contained in the soil.Soil Organic matter (SOM) content can be used as an index of N availability (potential of soil to supply N to plants) because N content in SOM in relatively constant.Calcium and Magnesium ranges from 5.5 me/L to 7.5 me/L. Are finding by(Cheng and Bray,1951)[3].(fig.c.). in shows Warulwadi region in more than Chas, Narayangaon region as results reported by(Cheng and Bray,1951)[3] . Sulphur content in soil ranges from 147 Kg/ha to 204.4 Kg/ha results finding by (Chesnin and Yein,1950)[4].(fig.d.). indicates that more sufficient S in Chas region than Warulwadi and Narayangaon regions as reported by (Chesnin and Yien,1950)[4]. When sulphur is deficient the sulphur containing amino acids content in plant decreases and the synthesis of proteins is inhibited.In the soils under the Nitrogen from study the Nitrogen ranges from 250.8 Kg/ha to301.2 Kg/ha results finding by (Subbiah and Asija,1956)[15].(fig.e.).indicating that Nitrogen is medium level in soils as reported by (Subbiah and Asija,1956)[15].Phosphorus is one of the key macronutrient required for plant growth and metabolism. Inorganic phosphate supplied to the soil as a fertilizer is rapidly converted into insoluble phosphate involves microrganisms. Phosphorus in present soils vary from 11.4 Kg/ha to29.6 Kg/ha are results finding by (Olsen et al.,1954)[11].(fig.e.). indicating that Chas and Narayangaon region is low and Warulwadi region is medium as reported by (Olsen et al.,1954)[11].Application a balance between the other plant nutrients and ensuring the normal growth of the crop. Potassium fixation occurs when soils dry and the potassium is bonded between layers of clay.Under certain conditions, dependent on the soil texture, intensity of drying,and initial amount of exchangeable potassium.From the analyzed samples potassium ranges from 189.6 Kg/ha to 304.6 Kg/ha are results finding by (Metson,1956)[10].(fig.e.). indicating Chas region is high available in soil and Warulwadi,Narayangaon region is medium available in soil as reported by (Metson,1956)[10]. The Copper is an essential micronutrient for normal plant growth.The copper content of most plant is generally between 2 ppm to 20 ppm in the plants.As Copper is strongly bound to soils it is very immobile and hence the plant roots are frequently higher in copper concentration than other plant tissues.In the soils under study the concentration of Cu range from 0.25 ppm and 0.72ppm(Lindsay and Norwelll,1978)[9].(fig.f.).indicating that Chas and Warulwadi region s is low copper i.e.deficient in copper in soils and Narayangaon region is sufficient copper in soil as reported by (Lindsay and Norwell,1978)[9].Iron is essential for chlorophyll and protein formation, photosynthesis,electron transfer oxidation and reduction of nitrates and sulphates and other enzymes activities. Iron is one of the most common nutrients for plant growth and development because it exists in low-soluble from that is hardly available for plants . The iron is results finding by (Lindsay and Norwell,1978)[9]. (fig.f.).shows Chas region in soil low iron i.e.deficient is iron and other soils in sufficient. Manganese has oxidation influenced by both chemical and microbiological factors .From the analyzed samples ranges from0.59ppm to 0.86 pppm results finding by (Lindsay and Norwell ,1978)[9].(fig.e.) indicates shows thret samples in soil Manganese is less than2.0ppm i.e.deficent manganese ras reported by (Lindsay and Norwell,1978)[9].Zinc deficient plants are sensitive to pathogenic fungal root diseases (Graham and Webb,1991)[6]. Improvement of Zn nutritional status of plants reduce the exaudation of such compounds from roots and increases resistance to fungal root diseases.The zinc concentrations range from 1.14ppm to 2.59ppm are finding by (Lindsay and Norwelll,1978)[9](fig.f). indicating that in higher sufficient in soils.Soil having available zinc less than 0.6 ppm is rates as deficient is zinc as reported by((Lindsay and Norwell,1978)[9]

Sr.No.	*Parameters*	*Chas Region (Sample 1)*	*Warulwadi Region (Sample 2)*	*Narayangaon Region (Smaple 3)*
1	pH Value	6.7	7.4	7.5
2	Electical Conductivity(Ds/m)	0.23	0.23	0.1
3	Organic Carbon(%)	0.61	0.65	0.54
4	Calcium & Magnesium(meL^{-1})	7.5	6.9	5.5
5	Sulphur(Kg/ha)	204.4	147	168
6	Nitrogen(Kg/ha)	282.3	301.2	250.8
7	Phosphorus(Kg/ha)	11.4	29.9	19.6
8	Potassium(Kg/ha)	304.6	219.5	189.6
9	Copper(ppm)	0.25	0.3	0.72
10	Maganese	0.86	0.59	0.77
11	Zinc	2.59	1.39	1.14
12	Iron	0.91	5.53	8.06

Table 1: showing in different parameter of soil samples from Northern Pune District

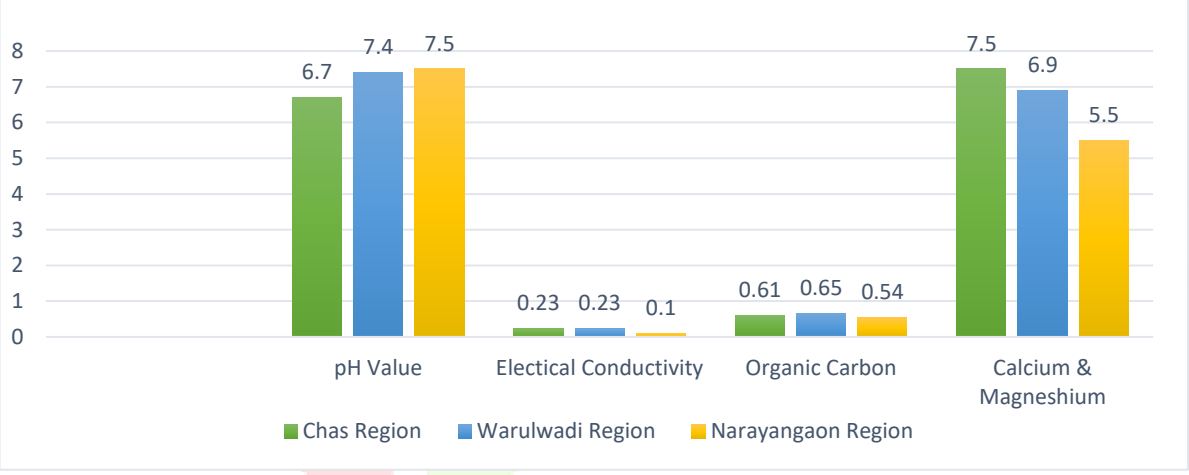


Fig.c. Comparative Analysis :Soil parameters(pH,EC,OC,Ca&Mg)

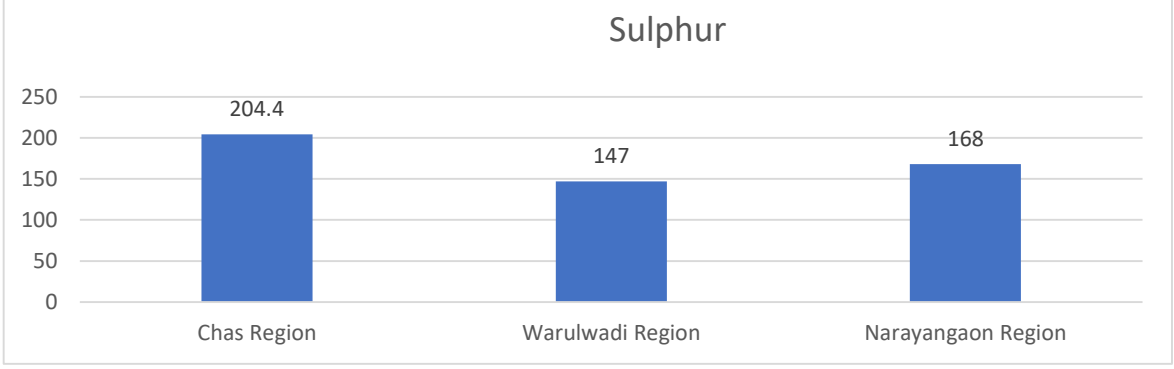


Fig.d. Comparative Analysis:Sulphur

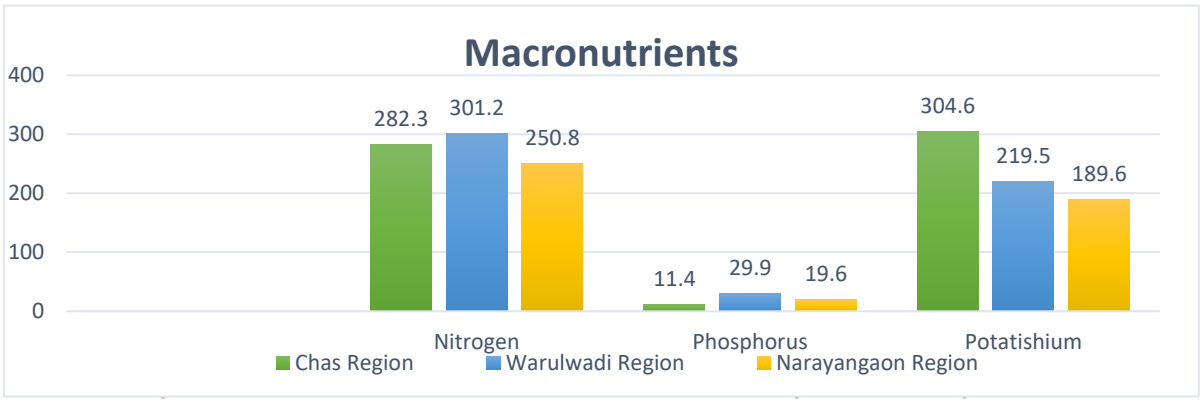


Fig.e. Comparative Analysis: Macronutrients(N,P,K)

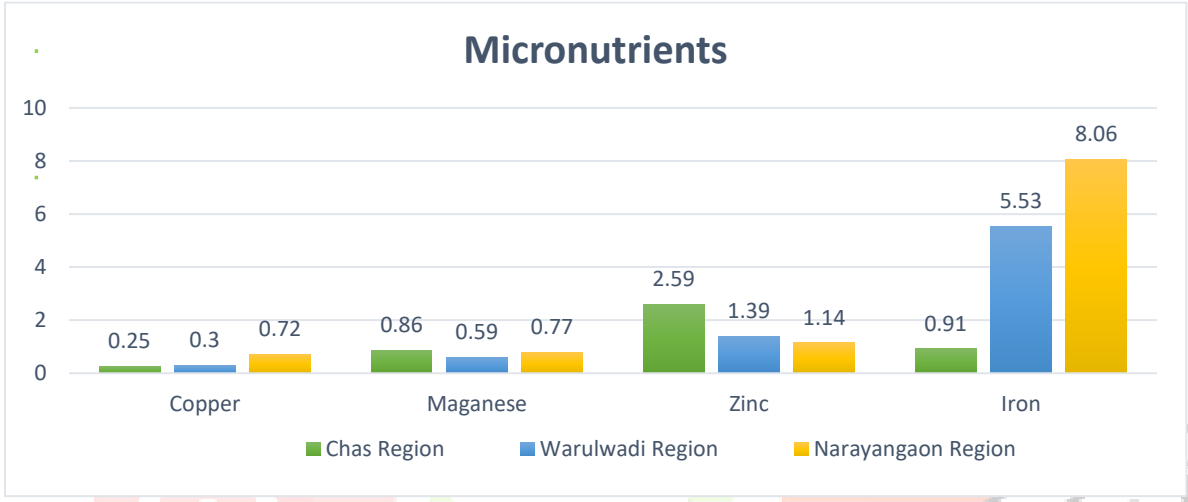


Fig.f. Comparative Analysis: Micronutrients(Cu,Mn,Zn,Fe)

4.. CONCLUSION:

1)The physico-chemical analysis of the soil samples from Ambegaon and Junnar Tehsil (Chas, Narayangaon and Warulwadi) villages towards Northern of Pune district are Normal soil ,but industry and anthropogenic activity in future life control of the wastages disposal through in river .The main crops are sugarcane and onion.

2) The results of the study reveal the values of percentages of Physico-chemical parameters,physicochemical study of soil is important to agricultural chemists for plants growth and soil management.

3)Conclusions that soil.is fit for all crops grown in the region and need no treatment.but ,alkaline soil will present then limestone added because limestones fertilizers efficiency and decreases soil acidity farming like (e.g.sucanes)

4)The results of present study will to identify the type and degree of soil related problems and to suggest appropriate reclamation measure and also to find out suitability for growing corps.It will also helps to study of soil genesis.

5) On the basis of this study farmers can get a approx idea about the amount of which fertilizers and nutrients needed of soil increase the percentage of crops.

6)Most of the farmers are using excessive chemical fertilizers and the too much dose of such fertilizers and the too much dose of such fertilizers in few soils has rendered medium values of P and K.The retention of K could also be due the clay minerals formed by chemical weathering of basalts which is the parent material for the soil.

7)Monitoring of micronutrients in the solids should be done periodically as it can be an efficient way to assess the qualitative and quantitative abundance of the metal concentrations.

8) Growing of cover crops, use of vermicompost, tank slit application,crop residue cycling through mulching and compost,INM,SSNM and green leaf manuring are some of the useful technologies in maintaining soil health.

9) In soil main nutrients (NPK) are easy to healthy pant growth.Organic fertilizers like horse manure are rich in these.However,you will like need to ensure that trace nutrients (Iron,Boron,Coppy, Manganese, Molybdenum,Zinc) are also added.

Acknowledgment

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