ANALYSIS OF PHYSICO-CHEMICAL PROPERTIES OF SOIL FROM LATUR CITY.

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ABSTRACT:

The soil is important constituent for the farming and other human requirements. The present investigation deals with the physical and chemical composition of soils collected from six areas of Latur district from Maharashtra. Some soil samples were analysed for parameters that play an important role in soil fertility and crop yield. For the Physico-chemical study of soil pH, Organic Carbon, Phosphorus, Potassium was as per standard methods. Pearson Correlation Coefficient was calculated for pH-Organic Carbon, pH-Phosphorus, pH-Potassium, which indicates moderate negative correlation and Organic carbon-phosphorus, Organic carbon-Potassium, Potassium and phosphorus show strongly positive correlation.

Keywords: Physicochemical properties, soil, Latur district, Soil fertility.

INTRODUCTION:

Soil is the effective association between the biosphere and lithosphere, it represents a practically non-renewable natural resource, with a vital role for the environment and agriculture (Moraetis et al., 2016). Soil pollution is one of the big problems that intimidate plant and people's survival, like discharge from solid waste, drainage of industrial waste into the soil, leakage of polluted water into the soil, blowout of underground storage tanks, or more usage of pesticides and fertilizers (Seifi et al., 2010). Unprocessed wastes are frequently conducted or convey from the industries and households to the ground in marginal environments through which rivers flow. This could change the physio-chemical properties of soil onto which the wastes are disposed and this is unpleasant to the ecosystem (Tening et al., 2013). As the elemental transporter for the preservation and normal functioning of terrestrial ecosystems, soil interrelation with plant life in the ecosystem. On the other hand, soil water saltiness is essential to the underground environment of plant life in erosion-prone areas, it influences and prevents the growth of natural plant life directly (Liu P., et al., 2012). Natural plant life is a key factor in the preservation of biological diversity and erosion control (Li Y and Liu J, 2000). Thus, the structural distribution characteristics of soil physio-chemical properties and its connection with plant life growth are the key fields for the study of repairing ecology (Zheng T., et al., 2010).

The capability of soil to give rise to some products or carry out some functions may reduce with definite land uses. These exhibit changes in soil properties like nutrient content i.e. nitrogen, phosphorus, potassium, calcium, magnesium, sodium and pH, organic matter, cation exchange capacity, structure, etc (Akinrinde and Obigbesan, 2000; Akamigbo and Asadu, 2001). It has been noticed that as the fertility of soil gets decreased, soil structure incapacitates and the soil becomes susceptible to erosion (Adetunji, 2004).

Some factors like altitude, parent rocks, plant life, and anthropogenic activities affect the physio-chemical properties of soil and water such as pH, organic matter, cation exchange capacity (CEC), soil texture, and water chemistry. Soil pH influences nutrients availability and the excellent condition for this is at pH 5 to 7 (Arp and Krausse, 2006). Soil pH is determined by both acid and base-forming cations in the soil. The most common acid-forming cations are hydrogen (H+), aluminum (Al3+), and iron (Fe2+ or Fe3+), and common base-forming cations which includes calcium (Ca2+), magnesium (Mg2+), potassium (K+) and sodium (Na+). In inclusion to the effects of pH on nutrient availability, and Al3+ and Mg2+ toxicity, individual plants and soil organisms also differ in their tolerance to basic or acid soil conditions (Ann McCauley et. al., 2017). Soil texture decides the rate at which water drains through saturated soil; water moves more freely through sandy soils than it does through clayey soils. Soil moisture is the short-term storage of water within a superficial layer of the earth's top surface, as compared to the total amount of water available throughout the globe (Engman ET, 1991) and (Srivastava HS, 2006). Organic matter has long been seen as a main component of soils. Many soil researchers and geologists consider that it is the effect of organic matter and biological activity that differentiate soil from the underlying rock and parent material (Soil Survey Staff 2010). Thus, there is a considerable need to study the physical-chemical properties of soils for agricultural and environmental purposes.

The soil quality analysis comprises an analysis of parameters and processes which results on soil working efficiently as a component of a sound ecosystem (Ku Smita Tale et. al., 2015). Soil quality may contain a capacity for water detainment, carbon sequestration, plant fecundity, waste remediation, and other functions, or it may be defined more barely. For example, a forest plantation supervisor may explain soil quality as the dimensions of a territory to manufacture biomass (SS Kekane et. al., 2015). We aimed to focus on physicochemical soil properties of soil and pH, soil organic carbon / organic matter, phosphorus and potassium from Latur city.

MATERIALS AND METHODOLOGY

Soil samples were collected from the different sites from Latur (Maharashtra, India) places like Shivaji Chowk (Most polluted area), MIDC industrial area, Government Hospital area Latur, Wada Hotel near Rajiv Gandhi chowk, department of biotechnology Rajarshi Shahu Mahavidyalaya (Autonomous) Latur and from Farm. Collected soils were completely air-dried and then it is passed through a 2mm sieve and stored in accordingly labeled plastic bags for analysis. The soil samples were analyzed for their Physico-chemical properties as per standard methods.

Soil pH is calculated with help of glass electrode (Shoemaker et al., 1961) method, Organic carbon/Organic Matter was determined by the fast-wet oxidation method and modified method of Walkley and Black (Walkley and Black, 1934). For the phosphorus Olesen's method and highely calcareous soils which having pH greater than 7.4, the Olsen sodium bicarbonate method is used (Olsen, S. R et. al., 1954).

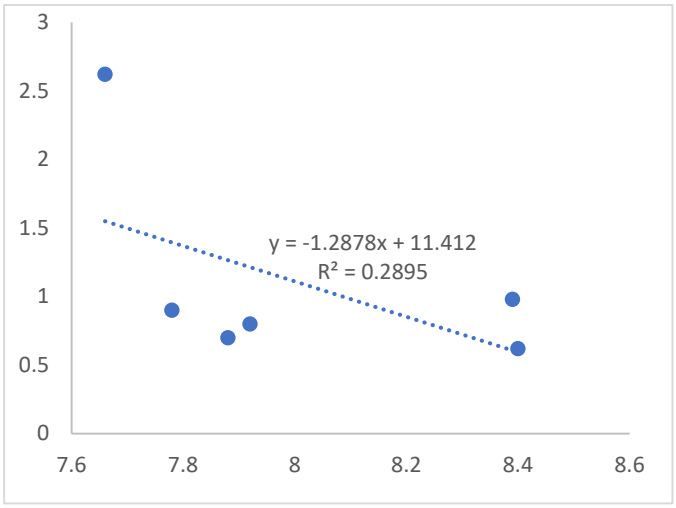
Available potassium (K) from soil sample was determined, with neutral ammonium acetate and the contents of K in solution and was estimated by flame photometry (Jackson, 1973).

Different soil parameter are correlated with help of formula of Pearson Correlation Coefficient formula and excel-2013.

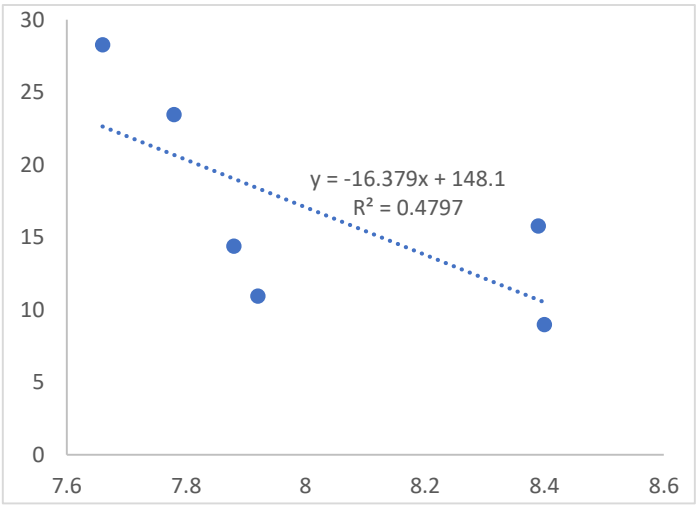
Results and Discussion:

pH is a principal parameter for determining, it assist in certify the availability of plant nutrients. pH can also help in maintaining the soil fertility. In the present research, pH ranges from 7.66 to 8.4. The minimum pH (7.66) was recorded at Rajarshi Shahu College Latur area and maximum (8.4) at most Chatrapati Shivaji Chowk, Latur. The total Organic Carbon shows variations in their concentration. Among the six soil samples, the highest concentration of organic acid was recorded in farm. And the minimum concentration of organic carbon was observed in the Department of biotechnology Rajarshi Shahu Mahavidyalaya (Autonomous) Latur. The total phosphorus content farm have greater phosphorus concentration i.e. 28.28 Kg/hectare, it is most useful for crop production or plant growth. And the minimum concentration of phosphorus was observed in the Department of biotechnology Rajarshi Shahu Mahavidyalaya (Autonomous) Latur area i.e. 8.99 Kg/hectare. The concentration was ranges from 8.99 to 28.28 Kg/hectare. Potassium is related with the movement of water, minerals, nutrients and carbohydrates in plant tissue. The quality of soil affects the growth and development of plant. The amount of potassium from of soil was recorded from 439.36 to 1641.27 Kg/hectare.

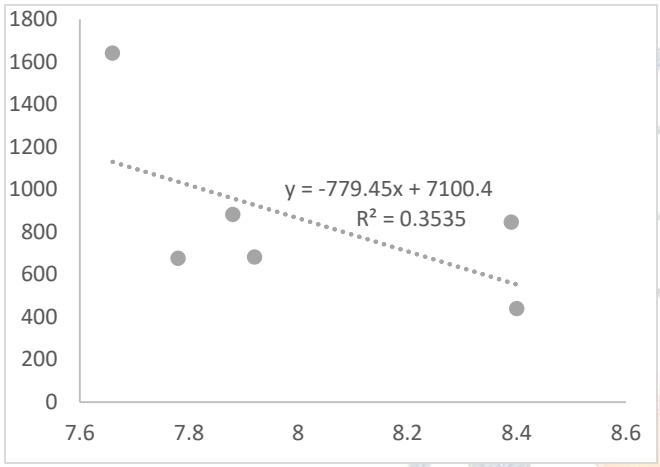
Sr. no	Location of soil Sample	Soil pH	Organic Carbon %	Phosphorus (Kg/hectare)	Potassium (Kg/hectare)
1	Chatrapati Shivaji Chowk, Latur	7.78	0.9	23.46	675.94
2	MIDC industrial area, Latur	7.66	2.62	28.28	1641.27
3	Vilasrao Deshmukh Govt. Medical Institute of Sciences, Latur	8.39	0.98	15.79	845.98
4	Department of biotechnology Rajarshi Shahu Mahavidyalaya (Autonomous) Latur	8.4	0.62	8.99	439.36
5	Wada Hotel near Rajiv Gandhi chowk, Latur	7.88	0.7	14.4	881.72
6	Farm , Latur	7.92	0.8	10.96	681.22



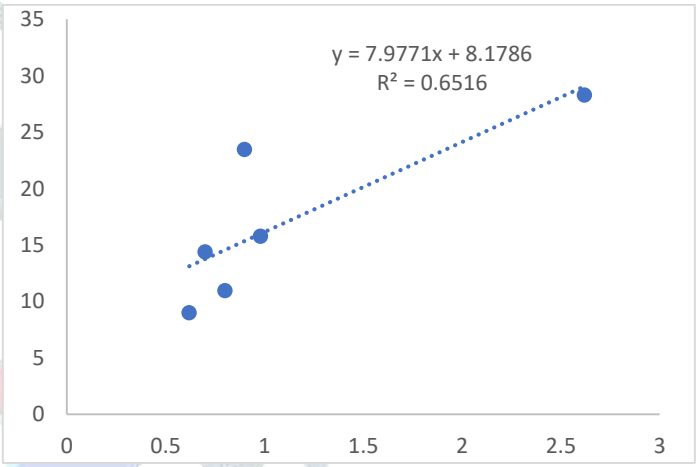
Graph showing Pearson Correlation Coefficient moderate negative correlation for pH and organic carbon of soil sample.



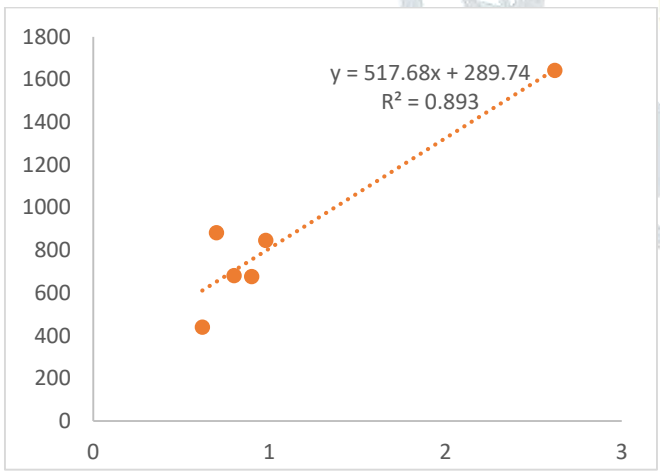
Graph showing Pearson Correlation Coefficient moderate negative correlation for pH and organic phosphorus of soil sample.



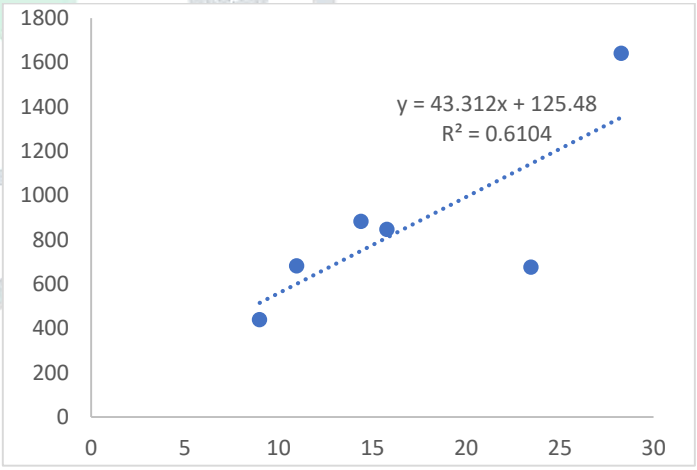
Graph showing Pearson Correlation moderate negative correlation Coefficient for pH and Potassium of soil samples.



Graph showing Pearson Correlation Coefficient strong positive correlation for Organic carbon and phosphorus for soil samples.



Graph showing Pearson Correlation Coefficient strong positive correlation for Organic carbon and Potassium for soil samples.



Graph showing Pearson Correlation Coefficient strong positive correlation for Potassium and phosphorus for soil samples

Conclusions:

Physico-chemical analysis soil in different areas in Latur city concluded that soil quality can be carried out by different parameters. Most of the parameters are completely higher or lower than acceptable limits due to their environmental factors surrounding them. Hence the present investigation helps in determining the values of different chemical parameters and the nutrient concentrations of soil samples collected from some

sites of Latur city, Maharashtra. Different analysis concluded that the, pollution free area such as farm has a greater number of chemical parameters like, potassium, phosphorus and organic carbon which is useful for plant growth and development. And on the other hand, the most polluted area and industrial area has recorded less concentration of chemical parameters. All the parameters either directly or indirectly impact on the soil fertility. It is necessary to reduce pollution and industrial waste disposal in soil.

Acknowledgements:

We would like to thank Department of Biotechnology, Rajarshi Shahu Mahavidyalaya (Autonomous) Latur for their guidance and support by providing platform for expression of my knowledge.s

REFERENCES:

1. Adetunji. M.T., (2004). Integrated soil nutrient management options for Nigerian Agriculture. In managing soil resources for food security and sustainable environment. Proceedings of the 29th Annual Conference of the Soil Science Society of Nigeria. 6 -10 December 2004, University of Agriculture Abeokuta, Nigeria. Soil Science Society of Nigeria, Abeokuta, Nigeria. pp. 27- 34.
2. Akamigbo, F.O.R., Asadu, C.I.A., (2001). The influence of parent materials on the soils of Southeastern Nigeria, East Africa. East African Agricultural and Forestry Journal 48(1-4): 81-91.
3. Akinrinde, E.A., Obigbesan, G.O., (2000). Evaluation of fertility status of selected soils for crop production in five ecological areas of Nigeria. Proc. 26th Annual Conference of the Soil Science Society of Nigeria, 30 October - 3 November 2000, University of Ibadan, Ibadan, Oyo State, Nigeria, pp. 279–288.
4. Liu P., et al., (2012) "Characteristics and Causes of the Spatial Variations of Soil Water and Salt Content under Populus euphratica Oliv. in the Middle and Lower Reaches of the Shule River Basin". Journal of Natural Resources 27 (2012): 942-952.
5. Moraetis D, Lydakis-Simantiris N, Pentari D, Manoutsoglou E, Apostolaki C, Perdikatsis V (2016). Chemical and physical characteristics in uncultivated soils with different lithology in semiarid Mediterranean clima. Appl. Environ. Soil Sci. 3590548. 13 p.
6. Olsen, S. R., Cole, C. V., Watanabe, F. S. & Dean. L. A. (1954). Estimation of available phosphorus in soils by extraction with NaHCO3, USDA Cir.939. U.S. Washington.
7. Seifi RM, Alimardani R, Sharifi A. (2010). How can soil electrical conductivity measurements control soil pollution? Res. J. Environ. Earth Sci. 2(4):235-238.
8. Shoemaker, H. E., Mclean, E. O. and Pratt, P. F.(1961). Buffer methods for determining lime requirement of soils with appreciable amounts of extractable aluminum. Soil Sci. Soc. Am. Proc. 25: 274-277.
9. Soil Survey Staff. (2010). Keys to Soil Taxonomy. (Eleventh Edition). US Department of Agriculture. Natural Resources Conservation Service. US Government, Washington DC.
10. Srivastava HS, Patel P, Navalgund RR. How Far SAR has Fulfilled Its Expectation for Soil Moisture Retrieval. Asia-Pacific Remote Sensing Symposium. 2006; 641001–641001-12.
11. SS Kekane, RP Chavan, DN Shinde, CL Patil, SS Sagar,(2015). A review on physico-chemical properties of soil", International Journal of Chemical Studies 2015; 3(4): 29-32.

12. Tening AS, Chuyong GB , Asongwe GA, Fonge BA, Lifongo LL, Mvondo-Ze AD, Che VB, Suh CE (2013). Contribution of some water bodies and the role of soils in the physicochemical enrichment of the Douala-Edea mangrove ecosystem. Afr. J. Environ. Sci. Technol. 7(5):336-349.

13. Walkley, A. and Black, I. A. (1934). An examination of the Degtjareff method for determining soil organic matter and a proposed modification of the chromic acid titration method. Soil Science, 37: 29-38.

14. Zheng T., et al. (2010).Soil heterogeneity and its effect on plant community in qasis desert transition zone in the lower reaches of Tarim River. Journal of Desert Research.