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Study of Soil Quality from Aprupa watershed basin, Sangola Taluka, Solapur District, Maharashtra,India.

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Abstract: With the present population of India, there is an increasing demand for food, fiber and fuel, resulting in tremendous pressure on our finite land resources, especially soil and water. India is blessed with monsoon for rains and that we can do little to alter the nature's gift. On the other side, the soils that support our food productivity have to be managed and used based on their characteristics and extent of distribution, constraints and potentials. The National Bureau of Soil Survey and Land Use Planning (NBSS&LUP) with various central and state agricultural agencies had initiated soil resource mapping of various states during the last decade of 20th century. The goals of such work were many. The important one was to promote agricultural land research on mapped soils so that soil based research finding can be transferred to other areas analogous in climate and soil-site conditions, ascertain the kinds and degree of soil degradation for immediate attention and amelioration.

Present study was undertaken to learn the soil geochemistry in aprupa watershed basin sangola taluka, Solapur, Maharashtra. The parameter PH,EC,OC,N,P,K were analyzed to find out the quality of soil from the aprupa watershed basin. The soils of aprupa watershed basin were loamy and clayey in nature, alkaline in nature with embryonic soils- entisoles and inceptisols. The trace elements are determined in parts per million (ppm).The soils in the aprupa watershed basin are prone to salinity and alkalinity.

Keywords: Watershed, Trace element, Clayey and loamy soils, salinity and alkalinity, GIS

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I. INTRODUCTION

With the present population of India, there is an increasing demand for food, fiber and fuel, resulting in tremendous pressure on our finite land resources, especially soil and water. India is blessed with monsoon for rains and that we can do little to alter the nature's gift. On the other side, the soils that support our food productivity have to be managed and used based on their characteristics and extent of distribution, constraints and potentials. The National Bureau of Soil Survey and Land Use Planning (NBSS&LUP) with various central and state agricultural agencies had initiated soil resource mapping of various states during the last decade of 20th century. The goals of such work were many. The important one was to promote agricultural land research on mapped soils so that soil based research finding can be transferred to other areas analogous in climate and soil-site conditions, ascertain the kinds and degree of soil degradation for immediate attention and amelioration. Further, to monitor the soil health and to forewarn the emerging constraints. Those who mastered agriculture, amassed wealth and power, A soil is a 3-D body occupying the uppermost part of the earth's crust and having properties differing from the underlying rock material as a result of interaction between hydrosphere, biosphere, atmosphere lithosphere etc. Further, its formation is largely controlled by parent rock, climate, geomorphology, relief, biological activity and time. Soils acts as natural sinks and filters for various metals Pendias and Pendias(1984). Geochemical elements in soils have mobility which is largely influenced by soil pore pH, CEC, REDOX potential, Z/r index of metals, organic chelation etc. (Govil et al 1999). However, Devi and Satyanarayan (2001) stated that the rural folk add copious amounts of fertilizers and pesticides in a hope to increase from production and the fertilizers and pesticides also find their way into soil system and ultimately into the aquifers and surface water reservoirs. Thus human activities exert a significant influence on present and future uses of the land.

The present study was carried out with the objective of identifying the quality of the soil for groundwater prospect zonation of aprupa watershed basin. In the present study GIS software are used to preparation of Base map, elevation map and base map of aprupa watershed basin.

Soils of Solapur, Maharashtra

The figure 2 shows the soil map of the investigated aprupa watershed basin exist in Solapur district.Maharashtra is located on Deccan plateau and is divided into 3 sub-regions namely (a) upper Maharashtra plateau (b) lower Maharashtra plateau and (c) lower Maharashtra metamorphic plateau.

National Bureau of Soil Survey and Land Use Planning (1995) had categorized Solapur, Osmanabad and many districts of Marathwada and Vidharba under lower Maharashtra Deccan plateau. The soils are of undulating land with moderately gentle sloping are excessively drained, neutral (pH 6.5-7.5) loamy to clayey-skeletal lithic with moderately water holding capacity and moderate erosion.

The soils in aprupa watershed basin are entisols and inceptisols. The entisols is an order of embryonic soils that have no distinct pedogenic horizons and represent the initiation of soil profile development. The clayey and loamy soils are observed in the aprupa watershed basin.

Study Area

The study area covered 230 sq. km. the upper aprupa watershed Basin basin is in sangola,taluka of Solapur,district 450 km SE of Mumbai , 260 km S of Pune , 180 km from Kolhapur , 100 km from Solapur city . Part of S.O.I. Toposheet 51 O/10 &13, 53 C/1 & 2, Bounded by N Latitude $17^{o}10'$-17^{o} 24' ,E Longitude $75^{o}12'$-$75^{o}20'$. Covering the villages Alegaon, Digewadi,Ambewadi, Medsinghgi, waghma, Shirshi, shindewadi, Gheradi,waki, dikhsal, pare,sutarwadi, chavanwadi which is found almost to be dry throughout the year, excepting for surface water flow for few days in a year during rainy season.(Fig1)

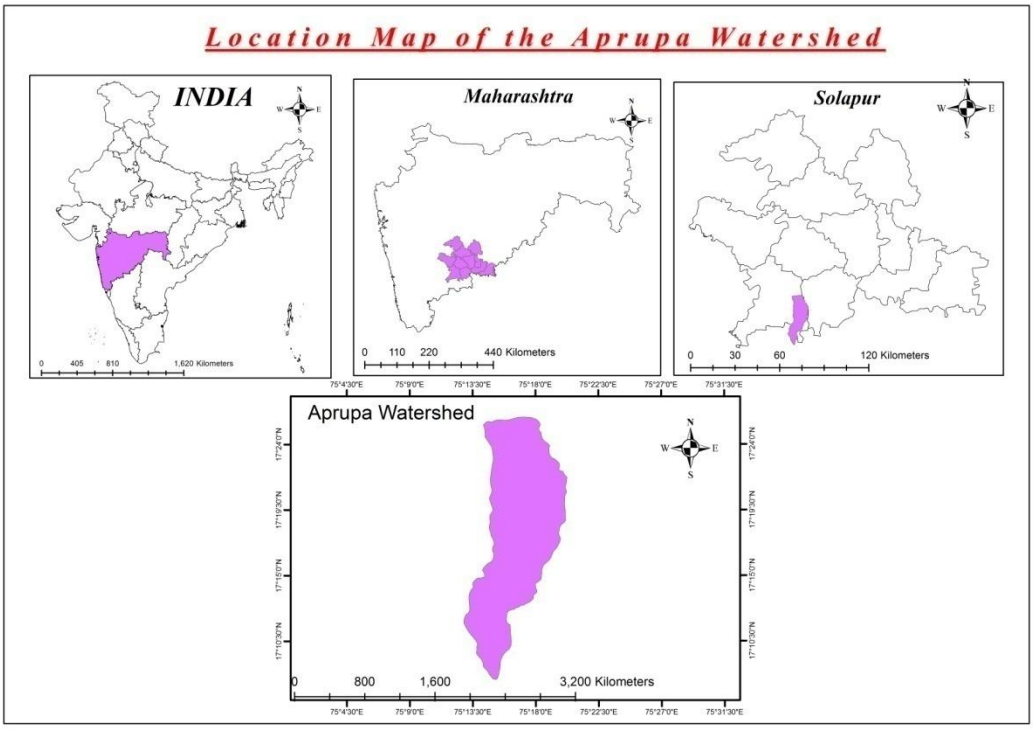

Fig no- Illustrates the location map of Aprupa watershed basin

Geology of the study area

From the accompanying map showing the regional geological setting, it will be seen that the area includes Deccan trap lava flows and they have assumed a great importance in Indian stratigraphy because of the great variety of rock types, complex structural features.

The study area shows the basaltic lava flows which represent the peripheral portions of the Deccan traps. They occupy the western, central and southern India. The Deccan traps are the most extensive geological formations of the Indian peninsula, ranging in age from upper cretaceous to Oligocene (Krishnan, 1968). The traps are divided into three main divisions, viz the upper, the middle and the lower with the inter –trapping beds at the base . They are generally composed of fine grained compact basalts which at places are vesicular and amygdaloidal, amygdales containing secondary minerals like zeolites and different from the silica. However, in some places the basaltic flows are intercalated with ash beds, volcanic breccia's and acid and intermediate differentiate like rhyolites and andesite, Deccan traps considered to be theolelitics plateau basalts.

II. MATERIAL AND METHODS FOR SOILS

The mineral constituents of soils inherited from the parent rocks have been exposed for various period of time to weathering and pedogenic processes. The soil mineral system, which is not necessarily in equilibrium with the soil solution, is complicated by the processes of degradation and new mineral formation, as well as by mineral reactions with organic compounds. The approximate constituent of mineral composition of surface soils is silicates, carbonates, hydrous oxides, oxides etc. These minerals phases are diverse in each of its category. Further, the size and shape of minerals particles determines their physical and chemical properties (Pendias 1984).

A representative sample of soil has to be obtained which is relatively homogenous in nature and that projects the event that we are looking. The objective of the sampling is to collect a proportion of material small enough in volume, which can be coherently transported and handled easily in laboratory. In the present study representative soil-geochemical samples were collected from various locations.

Sample preparation and analysis of Soil

The soil samples were subjected to sample preparation. This stage includes drying, hand crushing, sieving, grinding and lastly coning and quartering.

Table no.1- Illustrates the soil parameter from the study area

Sr. no	Sample name	pH	EC	OC	N	P	K
1	A4	7.67	0.28	0.58	24.1	24.68	432.32
2	A5	8.32	0.24	0.88	48.3	8.71	321.44
3	A6	8.36	0.83	0.76	32.1	33.22	660.80
4	B2	8.62	0.23	0.88	22.04	15.64	147.84
5	B4	8.9	0.36	1.18	45.1	8.71	256.48
6	B5	7.62	0.26	1.39	0.23	17.42	704.18
7	B6	7.9	0.17	0.82	0.32	8.87	1048.32
8	C4	7.9	0.11	0.52	34.5	9.35	132.18
9	C5	7.96	0.16	0.88	18.23	10.32	127.68
10	C7	8.4	0.38	0.37	22.7	14.52	201.62

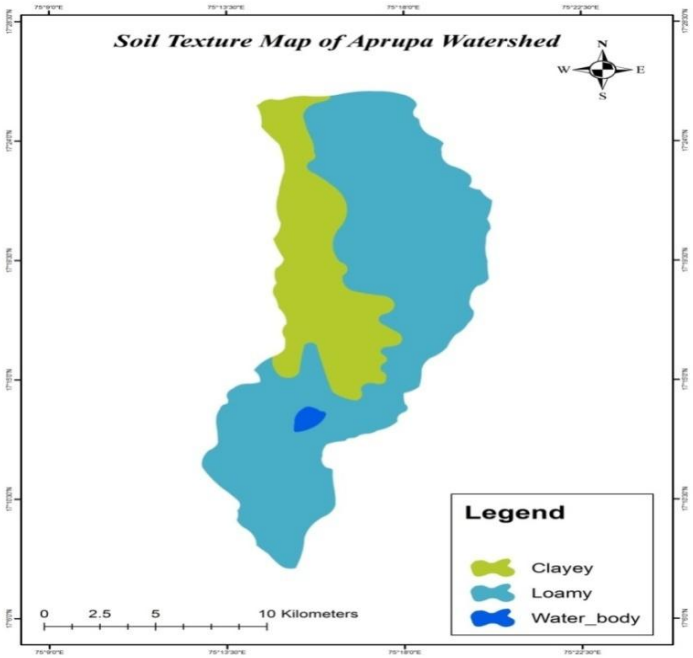

Fig no.2- Illustrates the Soil map of Aprupa watershed basin

This stage helps in obtaining a truly representative homogeneous sample. Considerable care was exercised to avoid contamination and finally submitted to District Soil testing laboratory,Solapur. The various parameters determined from soil amples are pH,EC,OC, N, P, K at District Agricultural soil testing laboratory ,Solapur. (Table 1)

III. RESULT AND DISCUSSION

Distribution of pH in the soils from Aprupa watershed basin

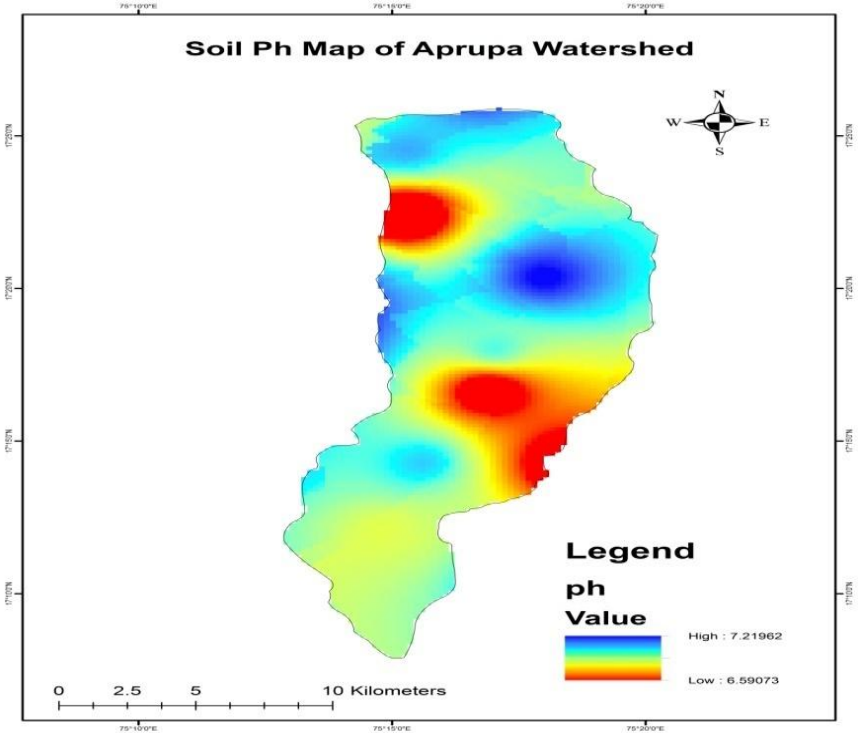

Fig no.3- Illustrates the distribution of PH from Aprupa watershed basin

The range of pH noticed in the Aprupa watershed basin soils are from 7.67-8.9. The average pH for the soil samples representing the area is 7.59. The figure 3 illustrates the distribution of pH in the soils of investigated area. Relatively higher values of pH are noticed in the surface soils from digewadi, geheradi and sutarwadi area towards the mouth of the basin. Low values of soil pH are observed in and around alegaon,waghmare wadi,pare,medsinhgi coinciding with weathered zeoltic and massive basalts.

Distribution of electrical conductivity in soils from Aprupa watershed basin

The electrical conductivity in the soils is estimated using conductivity meter. The range of EC in the soils from the area of study is from 0.11- 0.83. The average value for the entire soils from Aprupa watershed basin is 0 .24. The higher EC contours are in the form of broad zones toward northern parts of the basin. The low values are found near alegaon, medsinghi located in the southern parts of Aprupa watershed basin.

Distribution of Nitrogen in the soils from Aprupa watershed basin

The range of Nitrogen concentration in soils is between 0.23-48.3 ppm. The average concentration of N in the area is 27.03 ppm. The figure 4 shows the distribution of the said parameter in the study area. It is observed from the figure 4 the higher concentration contours are encircled around towards mouth of Aprupa watershed basin. Lower concentration contours are noticed atupper ridge. The Nitrogen has higher correlation coefficient values with EC, Ca and Mg. The values are N Vs. EC = 0.58. N Vs. Ca is 0.54 and N Vs. Mg. y = 0.51. The higher concentration contours in Aprupa watershed basin is basically due to application of N based fertilizers to the crops.

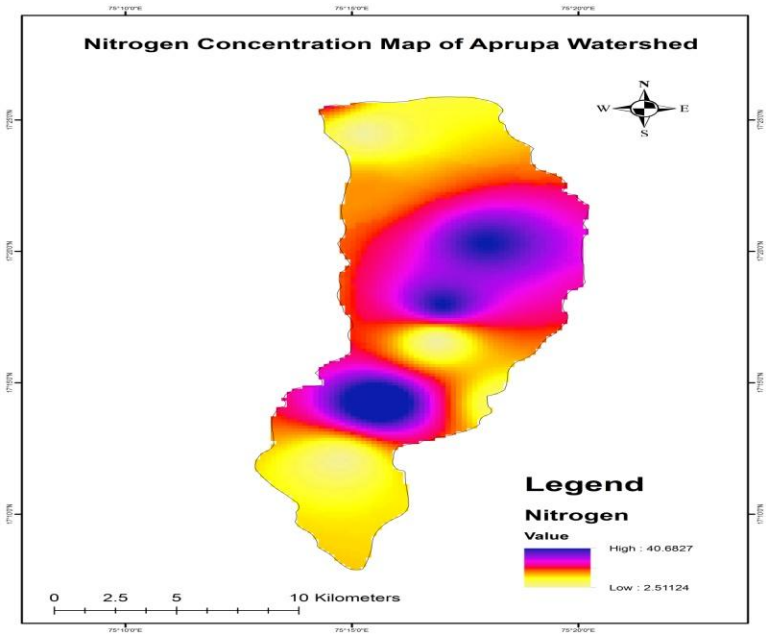

Fig no.4- Illustrates the distribution of Nitrogen from Aprupa watershed basin

Distribution of Phosphorous in soils from Aprupa watershed basin

The figure 5 shows the dispersion of phosphorous in soils from investigated area. The maximum and minimum values of phosphorous in soils are 24.68 ppm and 8.71 ppm, respectively. The higher values of phosphorous are indicative of application of phosphate fertilizers for agricultural practices in the region and are non lithogenic in its origin. Further, it does not show any positive correlation coefficient with other parameters.

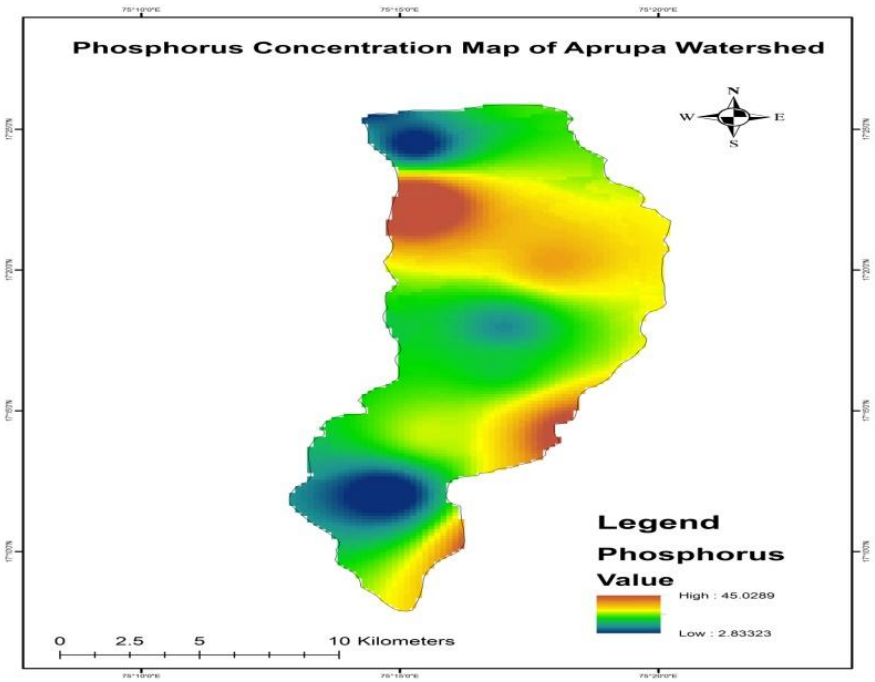

Fig no.5- Illustrates the distribution of Phosphorus from Aprupa watershed basin

Distribution of Potassium in surface soil samples from Aprupa watershed basin

The thematic figure 6 illustrates the dispersion of potassium in the soils from the study area. Its minimum value is 127 ppm and noticed south of the basin and maximum value 1048 ppm observed at upper ridge. No distinct relationship exists between other parameters estimation with potassium in soil from the study area.

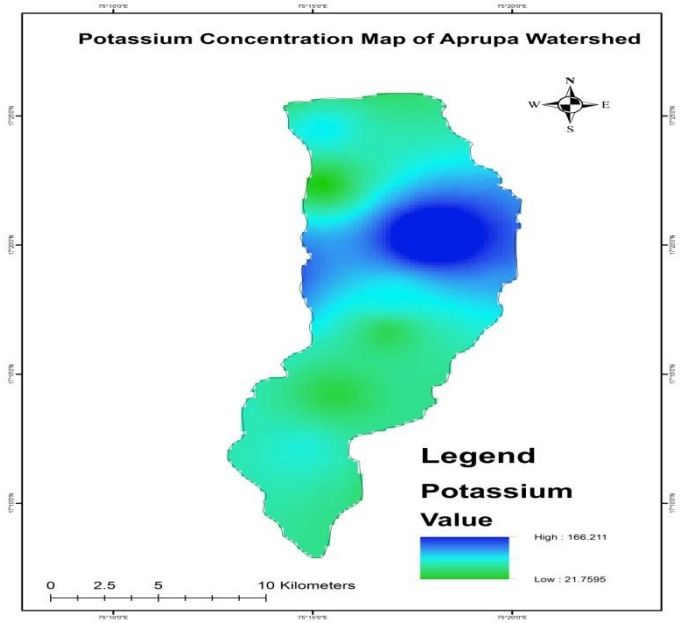

Fig no.6- Illustrates the distribution of Potassium from Aprupa watershed basin

Hence, positive correlation is distinctively absence. Application of synthetic fertilizers for cultivation of crops may have resulted in pervasively high values in the above mention region.

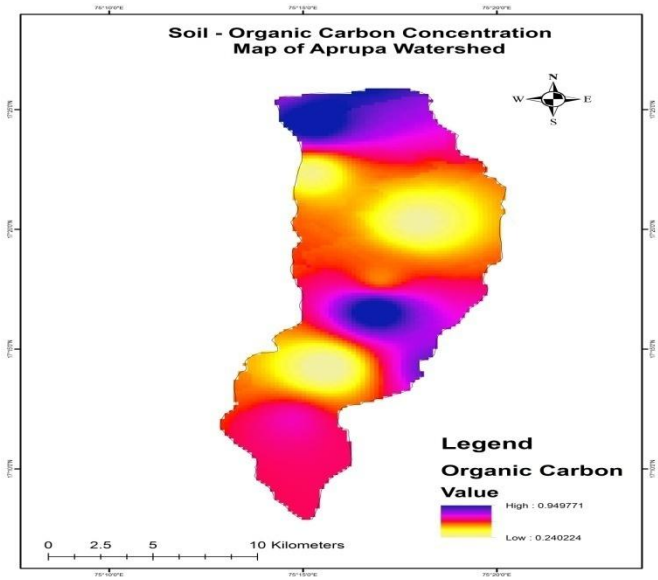

Fig no.7- Illustrates the distribution of Organic Carbon from Aprupa watershed basin

Distribution of Organic Carbon in surface soil samples from Aprupa watershed basin

The thematic figure7 illustrates the dispersion of potassium in the soils from the study area. Its minimum value is 0.37 ppm and noticed south of the basin and maximum value 1.39 ppm observed at upper ridge. No distinct relationship exists between other parameters estimation with potassium in soil from the study area. Hence, positive correlation is distinctively absence. Application of synthetic fertilizers for cultivation of crops may have resulted in pervasively high values in the above mention region.

IV. CONCLUSION

A geological and geomorphologic aspect supports the formation of soils like – embryonic soils such as Clayey and Loamy. Fracture filling carbonates noticed in the watershed prohibit infiltration of rainwater. The soils in the plains of the aprupa watershed basin are prone to saline and alkaline in nature.

From the above study due to the clayey and loamy soil in the basin, to reduce the concentration and improve the water quality suggested hydro fracturing in the basaltic terrain of watershed basin.

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