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"Drainage Characteristics and Its Relation to Soil pH and EC ofKurunda River basin of Maharashtra, India"

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Abstract: Morphometric analysis of the river is very important factors for the purpose of the management and conservation of soil, water, natural resources and environmental protection. Therefore present study focusing on the Kurunda river basin for the study of its drainage characteristics of soil with references to pH and EC. pH and Electrical Conductivity shows negative relation with stream frequency, relief ratio, drainage density, drainage intensity, Slope, drainage texture, ruggedness number, gradient ratio, compactness constant etc.pH increases from 1st stream order towards 5th stream order, EC dominant found in the 3rd and 5th order relatively.

Keyword: Drainage characteristics, Soil pH, EC, Correlation, River basin.

INTRODUCTION

Drainage basins comprise the land and the various over ground and underground water channels running through it. A drainage basin is classified according to how its water channels are distributed in the surrounding land area. The output of a drainage basin is the input to the water supply (Lerner and Lerner, 2009).The Earthland surface is covered by layer of soil, its thickness varies from place to place (Islam and Weil, 2000; and Glab and Kopec, 2009). Tropical forests have thin soils that are poor in nutrients, while grasslands in temperature regions have soil that is rich and well able to support flora and fauna (Belnap et al, 2001; and Dorana and Zeiss, 2000). There are several different types of soil depending on how the soil is formed and where it is located (Georgios et al, 2011; and Sotres et al, 2005). Therefore, soil resources need to conserve by conserving water resources of basin. Evolution of river basins is a result of interactions between the regime of matter and energy flows entering and moving beyond them and the resistance of surface topography (Vienna, 2011).The basins characterization in the second half of the twentieth century, along with traditional parameters, includes the morphometric elements of the geographic systems (Horton, 1945).

Many times, soil developed by transformations activity of various agents' viz. water, wind, sea waves, glacial flows, etc. In short, the micro-leveled characteristic of soils depends on its source region. Many times in river basin, the physical and chemical properties of soil are strongly associates with nature of the basin. It also affects by erosion, transportation, deposition and such activities on it.So the present investigations try to relationships between river basin and soil. The emphasis of soils has mainly aims to understand the association between soil properties and morphometry of the basin.

The objectivesof the present study were (i) to assess and comparethe changes in the physio-chemical properties of Soil and drainage characteristics;and (ii) to explore the relationships among changesin different soil parameters.

STUDY AREA

Kurunda river basin is located in the Basmath tahsil of Hingoli district. It is a main tributary of Asna River, a tributary of Godavari River. Kurunda River flows from north to south direction for about 15.50 km and meets to River Asna at village Kinhola of Basmath tahsil (Figure 1). The geographical location of this basin is 19º 20' to 19º 31' N latitude and 77º 10' to 77º 16' E longitude. The basin height is between 380 and 531 meter from mean sea level. The northern parts of the basin are hilly.

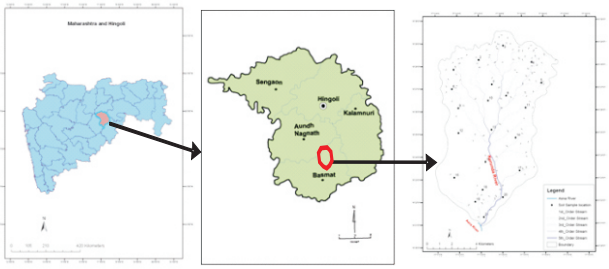

Figure 1: Location Map of the Study Area

MATERIALAND METHODS

For the present study SOITop sheets has been used, viz. 56 E/3 and 56 E/7. The basic map prepared with the help of GIS Software and the theory of stream order proposed by Horton (1945), Strahler (1964) and Miller (1953) have been applied for basic analysis.While collecting soil samples for in-depth soil analysis, slope and stream orders were mainly considered and collected soil samples from 21 sites. The parameters and their methods of soil analysis are given below, which are applied in the Laboratory work. The pH value of soil sample measured by using Digital pH meter and EC values of the soil sample under investigation were

measured using Digital Conductivity meter.

SOIL ANALYSIS

After collection of soil samples, a number of tests have been performed. Each soil sample have analyzed for 3 times per parameter. It is just because of minimizing human error in the laboratory work. After getting 3 results of particular parameters, the average value of that have been considered as a final result. Standard or routine soil tests vary from laboratory to laboratory. Here, in the present study pH and EC have been measured by applying standard methods of soil analysis.

RESULT AND DISCUSSION

pH is considered as one physico-chemical parameter of soil. pH determines the soil salt(Arifin et al, 2012).The pH measured in soil ranges from 6.25 to 8.09. From the table 2 it is observed that 20 of the soil samples show good pH character and 1 of the soil samples show alkaline pH character. The EC measured in soil ranges from 180 to 480µS/cm. table 2 it is observed that total soil samples show good EC character.

It will also help in the determination alkalinity and its index. Therefore, the correlation of pH with other parameters is significant. In this study, there is no positive correlation between pH and morphometric parameter such as stream frequency, drainage density, relief ratio,drainage intensity, slop, ruggedness number,gradient ratio andcompactness consentetc.all above mentioned parameters having negative correlation with pH.

Electrical Conductivity also determines the salt content in soil sample. In present soil analysis study electrical conductivity shows negative correlation with drainage density, drainage texture,gradient ratio, relief ratio and ruggedness number.

Results of all 3 tests and their average value, But for the discussion, only average values are considered, which are summarized in table 2. The detailed discussions and explanations have given one by one as below.

Sr. No.	Parameters	List of parameter having significance of correlation	
		Positive	Negative
1	pH	–	1) Stream frequency (-0.5560) 2) Relief ratio (-0.6608) 3) Drainage density (-0.4343) 4) Drainage intensity (-0.5170) 5) Slope (-0.6410) 6) Drainage texture (-0.5132) 7) Ruggedness number (-0.5600) 8) Gradient ratio (-0.6608) 9) Compactness constant (-0.6941)
2	Electrical Conductivity	–	1) Drainage density (-0.4813) 2) Ruggedness number (- 0.4710) 3) Gradient ratio (-0.4967) 4) Relief ratio (-0.4967) 5) Drainage texture (-0.4453)

Table 1: List of parameters having significance of Correlation

Sample No.	pH	EC(µS/cm)	Sample No.	pH	EC(µS/cm)
1	6.37	280	13	7.58	240
2	6.25	260	14	7.75	180
3	6.47	220	15	7.65	320
4	7.27	200	16	7.93	300
5	6.49	220	17	8.03	320
6	7.87	380	18	7.96	480
7	7.00	340	19	7.97	360
8	7.57	420	20	8.09	380
9	7.75	200	21	7.92	360
10	8.02	220	Avg.	7.49	295.24
11	7.47	240	Max	8.09	480
12	7.92	280	Min	6.25	180
			SD	0.61	81.22

Table 2: Soil samples physical parameters of Kurunda River basin

The minimum pH was recorded at sampling site 2 was 6.25 and the maximum pH was recorded at sampling site 20 was 8.09 observed. Hence average pH value of recorded is 7.49.The pH value of sampling site 2, 1, 3, 5 and 7 having less than 7, because this part is present above 440 meter height, while highest pH value occur in sampling site 20, 17, 10, 19 and 18 because this part is present in fifth stream order (Figure 2).

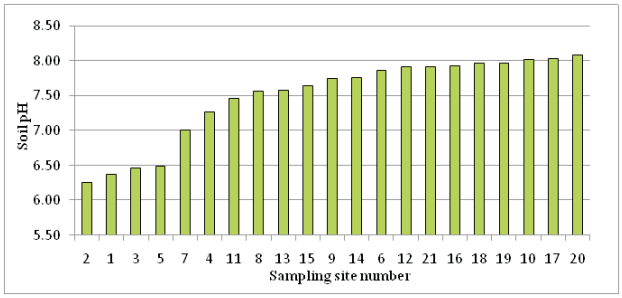

Figure2: Graphical representation of pH of soil

The minimum Electrical conductivity was recorded at sampling site 14 was 180µS/cm and the maximum Electrical conductivity was recorded at sampling site 18 was 480µS/cm observed. Hence average EC value of recorded is 295.2µS/cm. From figure 4 we see sampling site 14, 9, 10, 3, 5, 11 and 8 having less than 260 µS/cm ECsampling site 6, 20, 8 and 18 having more than 360 µS/cm EC.

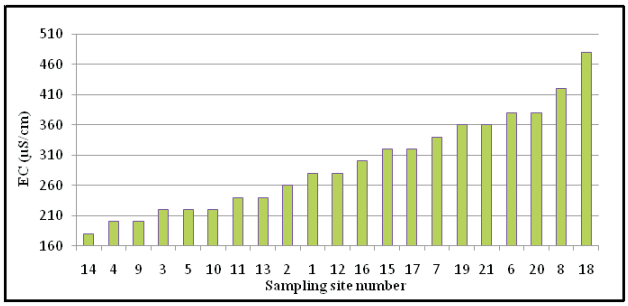

Figure3: Graphical representation of Electrical Conductivity of soil

CONCLUSION

From this study, it was concluded thatthe 'Drainage characteristics and its relation of soil pH and EC', focuses on the watershed area of Kurunda river which reinforces light on surface structure, soil type, river frequency, density, slope and river network that helps to understand surface structure of soil. It is an attempt to study the relation between drainage characteristics and soil pH and EC. The twenty one sites from Kurunda river basin were selected to collect the soil samples and made an analysis for pH and EC. The correlation between all morphometric parameters of soil has been studied by using statistical techniques and methods.

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