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STUDY OF SOIL ON THE TOPS OF PROTECTED AND UNPROTECTED RAVINES OF THE OTTANGAN RIVER AT KHANDER , AGRA , U.P., INDIA.

B.P.S. Chauhan,[1] A.K. Singh,[2] Harish Chandra Singh,[1] Sanjeev Kumar Yadav[3] And Prem Prabhakar[4]

[*] Department of Botany, J.S. University Shikohabad, Firozabad, U.P., India.
[**] Department of Botany, R.B.S. College, Agra, U.P., India.
[***] Department of Chemistry, J.S. University, Shikohabad, Firozabad, U.P., India.
[****] Department of Chemistry, Paliwal College, Shikohabad, Firozabad, U.P., India.
Corresponding author: drbpschauhan@gmail.com

ABSTRACT – Study of soil on the tops ravines in the both protected and unprotected sites have been done to know their conservation, in which soil samples are collected to both ravine areas as protected and unprotected from three different depths as 0 - 15, 15 - 30, 30 - 60 cm. and six properties of soil have been studied such as sand, silt, clay, PH, organic carbon, nitrogen. Moreover to this ratio of carbon and nitrogen has also been recorded. Except silt, remaining properties of soil which studied are reduced in unprotected area's of soil samples as table and graph are showing.

KEYWORDS – Soil, Tops, Ravines, River, Khander.

INTRODUCTION – Soil acts as a baseline for the growth and productivity of any forest community. But there are a number of different factors which lead to the disturbance of plants soil system by disrupting the soil profiles and their functions. These factors damage the biological, nutritional, chemical and physical components of soil quality along with the degeneration of vegetation.

According to Bennett (1955) where the land surface is bared of protective covering or vegetation, erosion agencies become thousand times faster and more furious in their ghastly action of erosion than under natural conditions. The vegetation canopy in the first instance dissipates the energy of raindrops and thus prevents direct impact of water in its dislodgement of soil particles. The vegetative cover offers resistance to the flow of water on the land surface and prevents run off from acquiring erosive velocity. As a result of the erosion of soil and nutrient the degradation of land takes place, which ultimately reduces the capacity of the land to sustain vegetation. It has been observed in the conditions of ravines in Agra that with soil and water conservation measures the productivity of land can be improved and restored to produce more biomass/ unit area per unit time.

Soil erosion is not only the concern of an individual but of the entire human society of the nation. Safety and security of soil against any sort of infection is the more sacred duty (pledge) of every citizen (Chandra Bhan, 1973). It is not universally accepted that there is a serious problem of soil erosion and watershed degradation, and that something needs to be done on the issue of (i) Appraisal of erosion problems and conservation of land and water under all land uses. (ii) Development of techniques of rainfed farming and efficient water management. (iii) Evaluation of hydrological behavior and management of watersheds for reducing sediment discharge and improving water regime. (iv) Monitoring of changes in environment as affected by land use and management practices. (v) Developing techniques for stabilizing special problem areas such as

ravines landslides and hill torrents. (vi) Demonstration of practices in soil and water conservation and watershed management for protection and production purposes and (vii) Transfer of knowledge by training at various levels. It is only in very recent times that due to various socio – economic – politico – demographic reasons, that this mismanagement and misuse of natural resources has intensified, leading to degradation, denudation and destruction of these natural resources and therefore to the need of preventing these adverse consequences (Tejwani 1999).

The land is invariably undulating and prone to severe run off and soil erosion. Effective conservation measures are needed to enhance the retension of soil moisture. Increased construction and maintenance cost involved with mechanical methods limit their large scale adoption, whereas vegetative barriers offer low cost alternative. Mishra et al. (1997) reported the efficiency of vegetative barriers in conservation of rainwater, checking run off associated soil loss and their overall performance. Vegetative barriers like *Vetiveria zizanioides, Pennisetum purpureum, Eulatiopsis binate* and *Thysanolaena maxima* were tested by Mishra et al. (1999) for soil moisture conservation and sustained land productivity. The protective planting of trees, shrubs, grasses or other plants is needed for the adequate control of erosion, run off and proper land use. A good vegetative cover provide complete protection to the soil from the erosive forces of wind and water. Decaying plants produce organic matter to increase the soils ability to absorb rainfall (Stallings, 1964).

Present State of Knowledge – Nitant et al. (1993) investigated the soil conservation properties of some grasses (*Vitiveria zizanioides, Saccharum munja* and *Heteropogon contortus*) growing on red and black soils in Research Farm Centre of Soil and Water Conservation Research and Training Institute, Research Centre, Datia. They recorded production of above ground biomass, root spread and root biomass added to soil in 30 cm. depth and describe the significant differences in the soil binding capacities of roots of grasses.

Patiram et al. (2001) studied the upper part of catchment of Teesta River and its tributaries of Sikkkim hill. They explained that the upper part of catchment area of Teesta River and its tributaries can be effectively utilized on the basis of integrated watershed management to protect the natural resources (land, water and forest etc.) for the ecological balance of Sikkim hills.

Sharma et al. (1996) approached some new technological issues and watershed management programmes in ravines, coastal, saline and waterlogged ecosystems other than conventional watershed development for rainfed arable areas.

Bahar et al. (2001) studied litter production pattern in Eucalyptus tereticornis plantation of age 15 years in protected and unprotected plots in Upper Gangetic Plain. Litter production of leaf, twing and bark were recorded in both areas like protected and unprotected. Monthwise data on litter production were also recorded and describe that Eucalyptus tereticornis produces 33% more litter in protected plots as compared to unprotected one.

Grasses as a measure of protecting the earthern soil conservation was found to be indispensable by Mishra et al. (1999). Vasudevah et al. (1965) and Singh et al. (1967) studied soil loss under different slopes and concluded that grasses and legumes were very effective in reducing rate of soil erosion. Bhushan et al. (1984), Sur and Sandhu (1995) recorded that the run off and soil loss was significantly reduced under natural grass cover under different soil and climatic condition.

Nambiar et al. (1968) described the diameter, spread and verticle extent of the roots of grasses

which play a major role in soil aggregation in deeper layers of the profile. Puri et al. (1977) reported that root weight and binding factors significantly increased with fertilization of grasses. Binding factor increased by 66% in case of Dichanthium annulatum and 97 % in case of Cenchrus ciliaris when fertilized at 40 kg $P_2 O_5$ / ha. Chandra et al.(2001) conducted the regeneration survey and soil profile study in A. N. R. (Assisted Natural Regeneration) protected mixed forest area of Barhi, Katni (M.P.) and observed the organic matter and soil PH .

Physiography – In Uttar Pradesh, Agra District is about 200 km. south of Delhi and is well connected by railways, road and air. Agra District dissected all around by deep gorges and minor streams, is situated on a plateau in south – west corner of Uttar Pradesh. The plateau forms a vast stretch of land with denuded topography of ravines. The whole area is drained by the river Yamuna, Chambal and Ottangan and a large number of minor streams. These ravines have been formed on account of gully erosion. Every year due to rapid run – off the ravines are dug deeper and wider and the plateau gets much eroded as the streamlets approach the river. The district has dry climate except during monsoon months with an annual rainfall of 765 mm, 90% annual rainfall received during the monsoon season. Monsoon rain which start in the last week of June and very active in July- August, tapering off by the middle of September, cause considerable erosion. May – June being the hottest months when the maximum temperature touches 48 ^{o}c and minimum temperature goes as low as 1^{o}c in the months of December-January. The evaporation ratio is also high due to strong wind velocity and high temperature.

Materials and Methods – Soil samples were collected from protected and unprotected areas at the depth of 0 – 15, 15 – 30, 30 – 60 cm and physical and chemical characters were studied comparatively by testing soil samples for texture, PH, organic carbon and total nitrogen following Gupta (1999).

Study Site - Study site is Khander village which situated at 5-6 km. from Fatehabad on Bah road and about 35 km. from Agra. This village comes under the block Fatehabad. The study site is made up of ravine system of different types of gullies varying from more shallow to more deep and spread in 553 Sq. hectares area on the sides of Ottangan River. This river has very high current and large area of spread. Mans of this village do not make their permanent houses. Peoples cultivate their crops and gets benefits of agriculture when the ravine of river become dry. This Ottangan River is made by the mixing of various streams and this village is near the combination site and possesses a range of vegetation and erosion affected areas.

Result and Discussion – Analysis of the soil on the top topography in protected and unprotected ravines.

S. No.	**Properties of soil**	**Depth of soil in protected ravine**			**Depth of soil in unprotected ravine**		
		0-15 cm.	**15-30 cm.**	**30-60 cm.**	**0-15 cm.**	**15-30 cm.**	**30-60 cm.**
1-	Sand	84.5 %	84.3 %	84.3 %	83.5 %	82.9 %	82.6 %
2-	Silt	7.3 %	7.1 %	7.0 %	11.5 %	13.6 %	12.8 %
3-	Clay	8.5 %	8.7 %	8.3 %	3.9 %	3.1 %	4.8 %
4-	PH	8.2	8.3	8.3	8.1	8.1	8.2
5-	Organic carbon	0.33 %	0.34 %	0.33 %	0.037 %	0.029 %	0.031 %

s	Total nitrogen	0.3 %	0.3 %	0.28 %	0.2 %	0.25 %	0.17 %
7-	Ratio of carbon and nitrogen	1:1.1	1:1.13	1:1.17	1:0.18	1:0.11	1:0.18

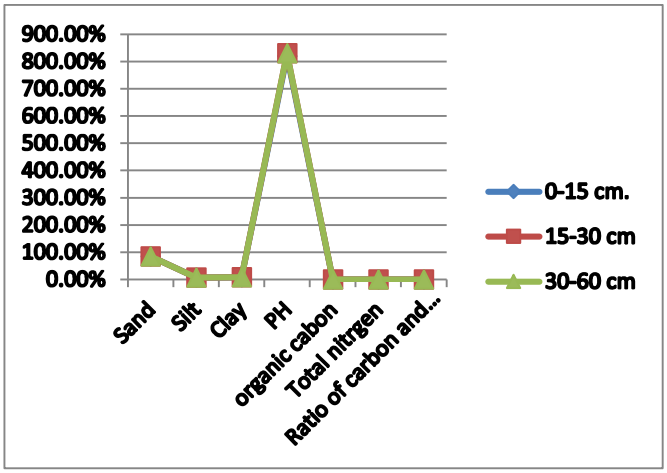

Figure showing quantity of properties of soil of various depth samples in protected ravine.

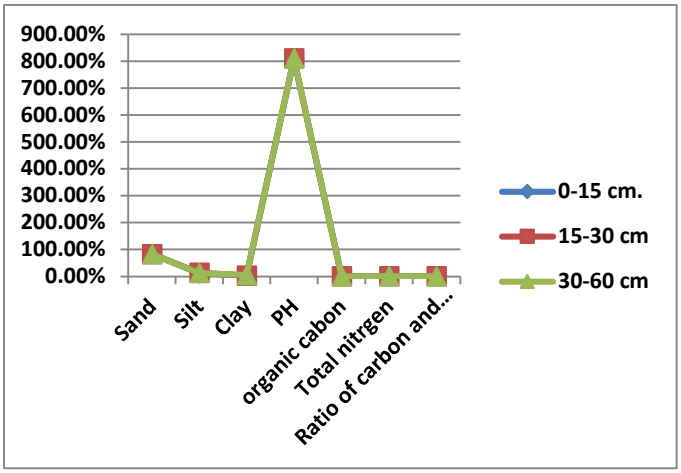

Figure showing quantity of properties of soil of various depth samples in unprotected ravine.

The analysis of the soil on the top topography in protected ravine showing that sand percentage in all depth samples increased more in comparison to samples of unprotected ravines. 84.5 % sand found from samples collected from depth of 0 -15 cm. which is the highest value in protected ravine whereas 83.5 % sand is recorded from the samples of 0 -15 cm. depth in unprotected ravines which is the highest value of that area. The lowest percentage of sand in protected ravine 84.3 in the sample of depth of 15 – 30 cm. and 30 – 60 cm. but lowest value in unprotected ravine was 82.9 % in samples collected from the depth of 15 – 30 cm.

Silt percentage high found in all samples of unprotected ravine in comparison to protected ravine. Highest percentage of silt recorded in protected ravine is the 7.3 % samples collected from the depth of 0 – 15 cm. whereas this value in unprotected ravine recorded 13.6 %. The these data indicating that soil erosion more take place in unprotected ravine. So that percentage of sand reduced in unprotected ravine and silt cannot flowed out and due to this silt quantity increased in unprotected ravine.

Data of clay is also indicating that percentage of clay increased in protected ravine and reduced in unprotected ravine showing highest soil erosion take place in unprotected ravine. PH value more recorded in the samples collected from depth of 30 – 60 cm. (PH8.3) in protected ravine and in unprotected ravine highest PH recorded from sample collected from depth of 30 – 60 cm. (PH 8.2) .

Highest organic carbon percentage in protected ravine is 0.34 % which found in sample collected from depth 15 – 30 cm. in comparison to unprotected ravines. High percentage of organic carbon in protected ravine also indicating that soil erosion quantity decreased in protected ravine due to high percentage of vegetation in these area.

Total nitrogen recorded from the protected ravine was same in sample collected from 0-15,

15-30 cm. depths (0.3 %) which is the highest percentage in this area. But in unprotected ravine highest data of nitrogen recorded (0.25) in samples collected from depth of 15-30 cm. After the study of ratio of carbon and nitrogen it has been found that more difference in ratio of carbon and nitrogen recorded in unprotected ravine than the protected ravine.

Conclusion – It is concluded from result that percentage of sand, clay, organic carbon, total nitrogen and PH increased considerably in top area of protected ravine in comparison to unprotected ravine and ratio of carbon and nitrogen showing more difference in unprotected ravine due to soil erosion is more found in unprotected area and fertility of soil decreased. It has been proved by this study that to check soil erosion and improve soil structure and fertility in ravines land, the vegetation must. Plants play important role in checking various type soil erosion and making good health of soil of ravines.

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