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Physico-chemical Analysis of Soils in Surguja district Chattishgarh, India

Swati Shrivastava and V.K. Kanungo

ABSTRACT
Field experiments were conducted in 10 selected sites near the 10 villages (Daultpur, Sarma, Rambora, Basen, Endutikra, Semighoghara, Dava, Bisunpur, Ajirma, Shivpur) of Surguja district (Oniyo and Moloko Ashipa) representing forest ecologies in the Surguja district area of Chhattishgarh during 2009 and 2010. The objective was to determine the effects of Hydrogen ion concentration (pH), Electric conductivity (mS/cm), Nitrogen, Potassium phosphorous the soil.

Keywords: Surguja Soil, physico-chemical analysis.

1. Introduction
Forest soils influenced the composition of forest stand and ground cover, rate of tree growth, vigor of natural reproduction and other silviculturally important factors [1]. Physico-chemical characteristics of forest soils vary in space and time because variation in topography, climate, weathering processes, vegetation cover, microbial activities and several other biotic and abiotic factors. Vegetation also plays an important role in soil formation [2]. The yearly contribution of surface vegetation to soil, in the form of needles, leaves, cones, pollen, branches and twigs, gradually decomposes and becomes a part of the soil. The nutrient thus, returned in the soil, exerts a strong feedback on the ecosystem processes. Plant tissues (above and below ground litter) are the main source of soil organic matter, which influences the physicochemical characteristics of soil such as, texture, water holding capacity, pH and nutrients availability [3]. Nutrients supply varies widely among ecosystems (Binkly and Vitousek, 1989), resulting in differences in plant community structure and its production. Total forest area in the region of Surguja district is 18, 188.44 sq.km which constitute 44% of the total area of the district. shal is the most common resin producing species of Surguja. It is a large conifer and a principal species of the Surguja tropical deciduous forests. The nature of soil profile, pH and nutrient cycling between the soils and trees are the important dimensions to determine the site quality. The vegetation influences the physico-chemical properties of the soil to a great extent. It improves the soil structure, with help of available literature the present study was carried out with the hypothesis that; How tropical deciduous forests soils differ in physiochemical properties. How the nutrient (NPK) varies of forests [5].

2. Materials and Methods:
Surguja district of Chhattisgarh which lies in the northern part of Chhattisgarh state is biodiversity rich area, dominated by tribal communities. Borders of Uttar Pradesh, Jharkhand, Orissa, and Madhya Pradesh states are adjoining to the district. The district has over extension between southeastern parts of Vindhyachal-Baghelkhand region of peninsular India. Surguja lies between 23^0 37'25"to $24^0$6'17" north latitude and $81^0$34"40" to 84^0 4"40"east longitude. Sampling is an important step of any analysis. The field was divided in area so that each sample represents a10 sites near the 10 villages of Surguja district. The composite soil samples were collected in polythene bags 0-15 cm depth with the help of stainless steel auger. The field sample is spread out on a tray for air drying. When it dries, sieve over a 2 mm sieve and store in air tight polythene beg. A total of 10 Villages forest sites, tropical deciduous forest types were selected and thus total 10 samples were collected. Soil pH (1:2.5 ratio of soil: water) was measured with dynamic digital pH meter. Electrical conductivity estimated by using digital water and soil analyzer kit and values were expressed in mS/cm respectively.

Total nitrogen content determined using of the Kjeldal methods [6] and potassium (K) determined by Ammonium acetate method of Hanway and Heidel [7]. Procedures for analyzing available phosphorus are BRAY [8] method for acid soils. The nutrients status was compared among the sites and between the forests. The economic analysis of nutrients (NPK) was estimated Kg/ha^{-1}.

3. Results and Discussion:

The variation in physic-chemical characteristics of the soil of 10 sites near the 10 villages from Surguja district, Chhattishgarh have been studies and the data were summarized in the tables 1, 2, and the interpretation of data has been made with the help of statistical tools.

3.1 Hydrogen ion concentration (pH):-

The hydrogen ion concentration (pH) of 10 sites soil ranged from a minimum of Rambora village soil 5.55pH to a maximum Ajirma village 6.20pH (Table-1, 2, Fig-1) shows the variation in hydrogen ion concentration (pH) of soil.

3.2 Electric conductivity (mS/cm):-

The electric conductivity (mS/cm) of 10 sites soil ranged from a minimum of Basen village soil 0.10 mS/cm to a maximum Sarma, Shivpur village 0.20 mS/cm (Table-1, 2, Fig-2) shows the variation in electric conductivity (mS/cm) of soil.

3.3 Nitrogen (Kg /ha^{-1}):-

The nitrogen (Kg /ha^{-1}) of 10 sites soil ranged from a minimum of Semighoghara village soil 0.20 Kg/ha^{-1} to a maximum Ajirma village 0.60 Kg/ha^{-1} (Table-1, 2, Fig-3) shows the variation in nitrogen (Kg /ha^{-1}) of soil.

3.4 Phosphorus (kg /ha^{-1}):-

The phosphorus (kg /ha^{-1}) of 10 sites soil ranged from a minimum of Semighoghara village soil 12.82 Kg/ha^{-1} to a maximum Endutikra village 55.26 Kg/ha^{-1} (Table-1, 2, Fig-4) shows the variation in phosphorus (kg /ha^{-1}) of soil.

3.5 Potassium (Kg/ha^{-1}):

The potassium (Kg/ha^{-1}) of 10 sites soil ranged from a minimum of Ajirma village soil 181.12 Kg/ha^{-1} to a maximum Bisunpur village 567.15 Kg/ha^{-1} (Table-1, 2, Fig-5) shows the variation in potassium (Kg/ha^{-1}) of soil.

Table 1: Physicochemical characteristics of soil in villages of district Surguja during the year 2009.

Physicochemical parameters	Name of the villages				
	Daultpur August-09	Sarma September-09	Rambora October-09	Basen November-09	Endutikra December-09
Hydrogen ion concentration (pH)	006.11	006.18	005.55	005.78	005.87
Electric conductivity(mS/cm)	000.16	000.20	000.17	000.10	000.11
Nitrogen (Kg /ha^{-1})	000.58	000.44	000.33	000.47	000.40
Phosphorus (kg /ha^{-1})	044.11	025.26	012.86	035.19	055.26
Potassium (Kg/ha^{-1})	257.27	181.22	270.57	368.42	302.15

Table 2: Physicochemical characteristics of soil in villages of district Surguja during the year 20010.

S.N.	Physicochemical parameters	Name of the villages				
		Semighoghara January-10	Dava February-10	Bisunpur March-10	Ajirma April-10	Shivpur May-10
1.	Hydrogen ion concentration (pH)	005.92	005.97	006.09	006.20	006.13
2.	Electric conductivity(mS/cm)	000.16	000.12	000.16	000.11	000.20
3.	Nitrogen (Kg /ha^{-1})	000.20	000.39	000.44	000.60	000.59
4.	Phosphorus (kg /ha^{-1})	012.89	15.39	025.26	044.51	044.19
5.	Potassium (Kg/ha^{-1})	326.90	490.00	567.15	181.12	258.30

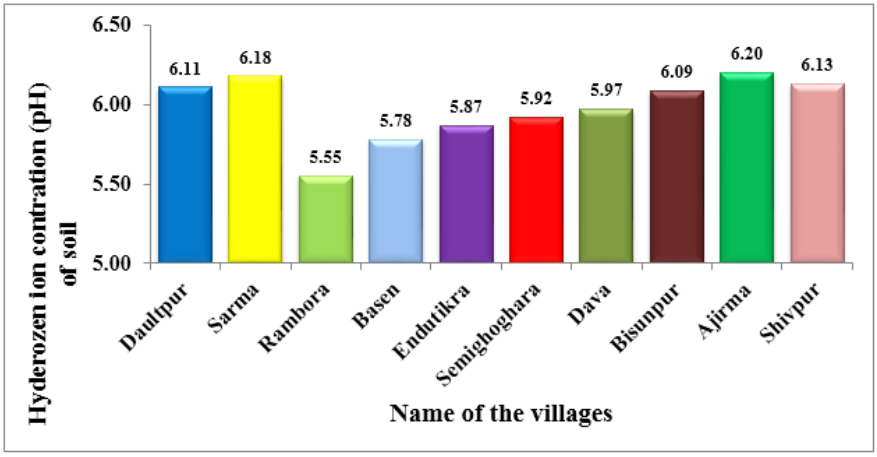

Fig 1: Hydrogen ion concentration (pH) of soil recorded in 10 villages of Surguja district during the year 2009- 2010.

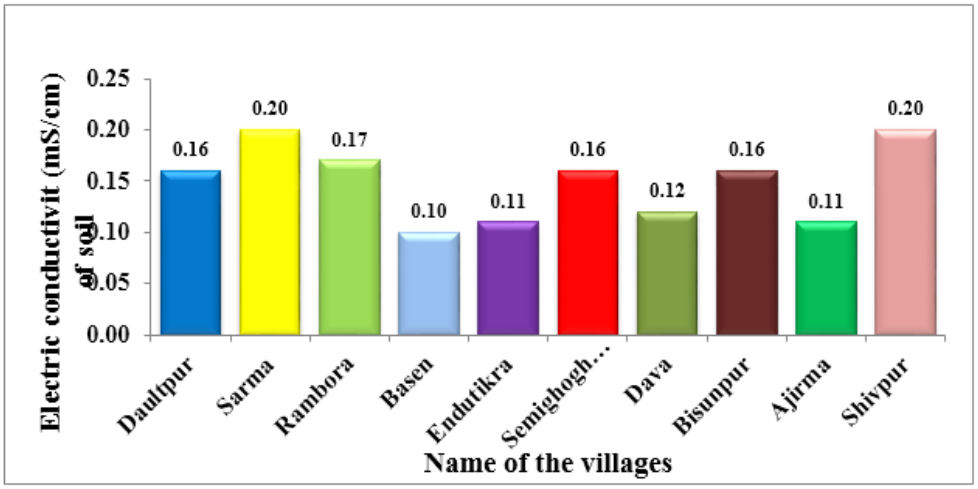

Fig 2: Electric conductivity (mS/cm) of soil recorded in 10 villages of Surguja district during the year 2009- 2010.

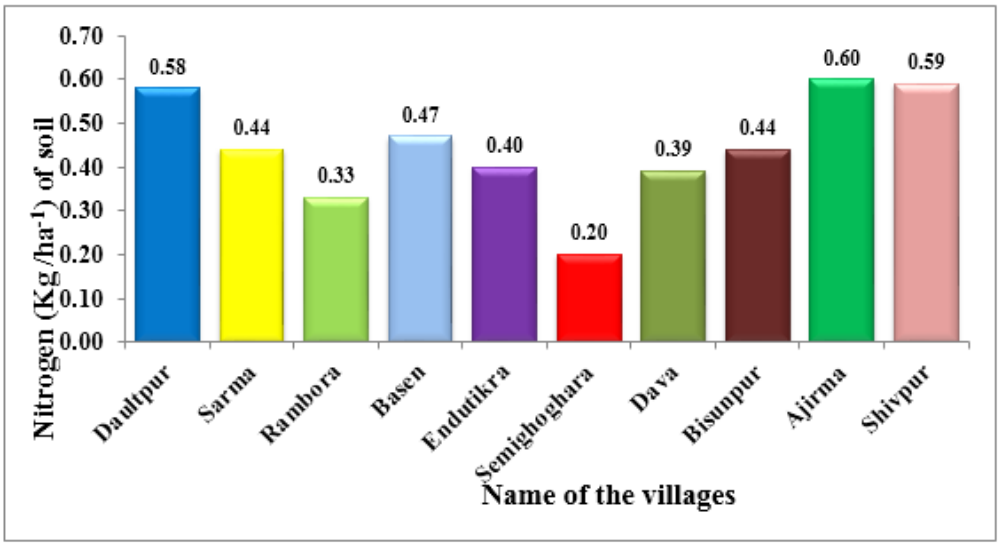

Fig 3: Nitrogen (Kg/ha^{-1}) of soil recorded in 10 villages of Surguja district during the year 2009- 2010

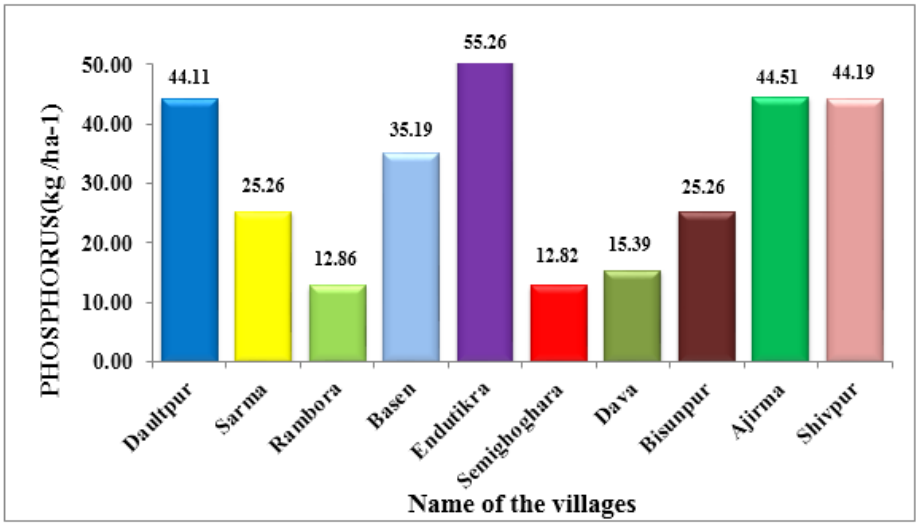

Fig 4: Phosphorus (Kg/ha^{-1}) of soil recorded in 10 villages of Surguja district during the year 2009- 2010.

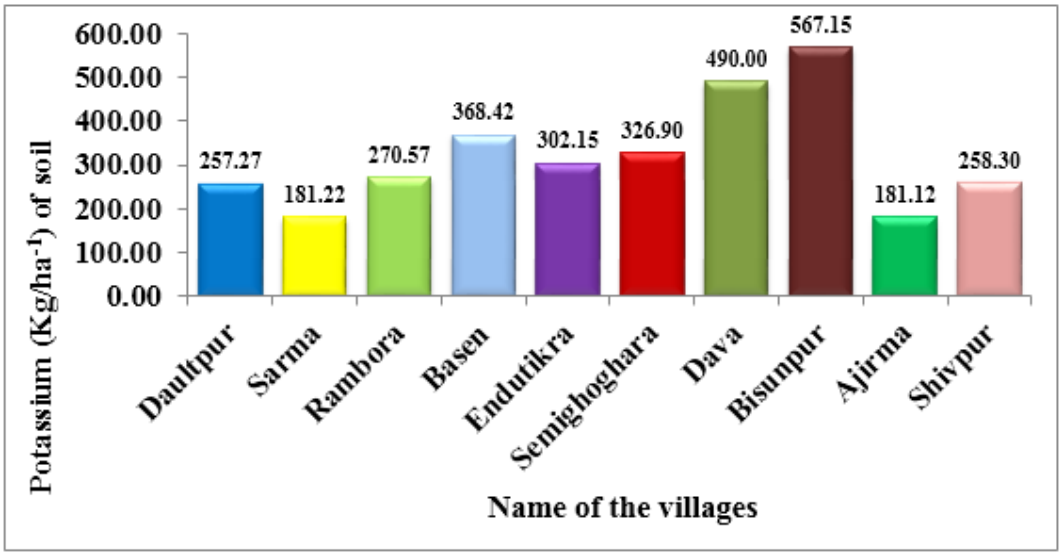

Fig 5: Potassium (Kg/ha^{-1}) of soil recorded in 10 villages of Surguja district during the year 2009- 2010.

4. Conclusion:

The present paper emphasizes the point that forestation using native broad - leave species consistent with region's ecological conditions can act as a proper method to revive and rebuild destructed forests. Moreover, using various species for forestation has different effects on and hence species must be selected carefully in order to improve soil conditions. Considering an increase in productivity and soil Surguja district as our study was conducted in 1st August 2009 to 31st May 2010, additional researches in different villages are still necessary to elucidate the influence of monthly variation on soil such as Surguja. In conclusion, this study has provided baseline information on the abundance and diversity of Surguja district. The study also reveals that Surguja district are highly influenced by physico-chemical changes of the soil and they can be suitable indicators of land use intensity gradient (Table 1.2, Fig-1, 2, 3, 4, and 5).The similar workers investigated by like Paudelbb [9], Sheikhb [10], Singhb [11], Ayoolab [12], Moghimianb [13].

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