

# PHYSICO CHEMICAL PROPERTIES OF SOILS IN SHEVAROY HILLS, TAMILNADU, SOUTH INDIA

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## Abstract

Biodiversity varies with space and time and to understand the patterns and changes biodiversity distribution has been important in today's life. The impacts on biodiversity resulting from the utilization of water and soil properties have direct role in biodiversity than in most terrestrial ecosystems. The study area Shevaroy hills various plantations (Pine apple, orange, coffee cultivations) and quarrying for the extraction of bauxite ores. The present study results shows that Shevaroy have been transformed from natural forest to manmade plantations, opening the door for urbanization and have direct effect on soil properties.

## Keywords

Shevaroy, Bauxite, Man made vegetation.

## INTRODUCTION

Though, the assessment of biological rich areas brings out distinctiveness of the landscapes as driven by pattern of richness, endemism, biological corridors, community composition and diversity. Biodiversity varies in space and time, to understand the patterns and drivers of variation in biodiversity distribution has been a central topic in ecology. The impacts on biodiversity resulting from the utilization of water as a resource have been included because water flow modification and water pollution have led to far greater declines in biodiversity than in most terrestrial ecosystems (Dudgeon *et al.*, 2006). There are several water sources spreads over the

study area and Yercaud Lake is one of the main tourists spot and mainly used for recreation purposes. The area receives total rain fall of about 1500mm to 2000mm. Studies of fresh water systems, and the human impact on such systems, are quite timely, and such studies pave the way to prime regulatory mechanism for the ecosystem as a whole, and may reveal both the rate and direction of whatever changes take place within the system (Varshney, 1989). Similarly, physico chemical characteristics of forest soil differs due to variations in topography, climate, physical weathering processes, vegetation cover, microbial activities, and the properties of soil quality determines the diversity of species. The soils of Eastern Ghats are such treasure to the inhabitants of that region. Soil quality cannot be measured because of its complex property, however, it can be estimated from soil properties which can be measured and considered as indicators of soil quality (Islam and Weil, 2000). Soil microbes play key roles in ecosystems and mediate many ecological processes that are central to ecosystem functioning, including nutrient cycling (Balser and Firestone, 2005) and the regulation and maintenance of plant biodiversity (Zak *et al.*, 2003). Further, biotic and environmental factors form the fundamental forces that drive the activity, structure and diversity of soil microbial communities (Ogram *et al.*, 2006). Microbiologists have been investigating the impact of microbial diversity on the stability of ecosystem function since the 1960 (Harrison *et al.*, 1968). To be efficient and reliable, nature conservation needs to take climate change and its direct and indirect implications into consideration (De Meester *et al.*, 2010).

At present there is a particular interest in the relation between biodiversity, simply defined as the number of species present in the system, and function in the soil.

## **Methodology**

### **SOIL CHARACTERISTICS OF STUDY SITES**

#### **Collection of soil samples**

Soil samples were collected from all the study area according to different vegetation types. The samples were collected at the depth of 15 cm where 5- 10 samples were collected from each area at different periods of time. The collected soil samples were packed in polythene bags, shade dried and stored for analysis.

## Analysis of soil samples

Soil sampling and chemical analyses (Table 1) were carried out by the methodology by Knudsen and Beegle, 1988.

## Statistical analysis

The difference in soil properties among different vegetation types were calculated by one way ANOVA and the calculations were performed by using SPSS 16.

**Table 1. Analytical procedure for physico chemical parameters of soil (Knudsen and Beegle, 1988)**

Parameters	Methodology
Electric conductivity	Ec meter
pH	pH meter(Elico)
Nitrogen	Versenate method(Titration)
Phosphorous	Versenate method(Titration)
Potassium	Absorption method
Manganese	Absorption method
Zinc	Absorption method
Copper	Absorption method

## RESULTS

### Soil characteristics of study sites

Table 2, shows the physico chemical properties of soil observed in the study sites. High level of electric conductivity (0.30 dS m<sup>-1</sup>) was observed in mixed vegetation and low in (0.1 dS m<sup>-1</sup>) silver oak plantations. The pH in natural vegetation (4.36) was found to be very low and high (6.46) in agriculture. The nitrogen content was high (144 mg/l) in silver oak plantations and low (41.0 mg/l) in coffee plantations. While, the phosphorous content was high (37.60 mg/l) in natural vegetation and low (10.0) in coffee plantations. However, the observed potassium content was more (51.33 mg/l) in teak vegetation and less (21.60 mg/l) in agricultural land. The manganese content was low (2.43 mg/l) in agricultural land and high (6.50 mg/l) in natural vegetation. The zinc content exhibited more (1.92 mg/l) in agricultural land and low in Bamboo plantations(0.62mg/l). The copper content was high (3.7 mg/l) in agricultural lands and coffee plantations while less (0.59 mg/l) in silver oak plantations.

The difference in the soil properties of different vegetation types are shown in Table 3. Among different vegetation types, significant results were observed between all the soil properties except electric conductivity.

**Table 2. Physico chemical parameters of the soil in the study area**

	Ec	pH	N	P	K	Mn	Zn	Cu
Soil properties	dS m- 1		(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
Natural forests	0.26±0.15	4.36±0.20	131±0.57	37.6±1.527	23±2.64	6.5±0.26	1.52±0.27	1.36±0.25
Bamboo	0.06±0	6.13±0	143±2	20.33±	44±2.5	6.3±0.2	0.62±0	0.86±0

plantations	.15	15	08	3.05	1	6	03	.06
Teak plantations	0.2±0.	6.03±0.	101±3.	24±2.6	51.33±	3.6±0.4	0.96±0.	0.66±0
	11	11	00	4	0.57	35	042	.20
Silver oak plantations	0.1±0.	6.23±0.	144±2.	23.33±	45±2.0	6.36±0.	0.80±0.	0.59±0
	611	611	51	2.08	0	461	16	.29
Mixed vegetation	0.3±0.	5.73±0.	48.0±2	12.6±2.	22.3±3.	3.7±0.1	1.53±0.	1.80±0
	15	15	.95	08	21	0	32	.10
Horticultural crops	0.2±0.	5.8±2.5	48.3±2	10.6±1.	22.6±3.	2.46±0.	1.4±0.6	3.23±0
	1.00	1	.51	51	78	66	6	.15
Agriculture	0.2±0.	6.46±0.	54±3.0	12±1.0	21.6±1.	2.43±0.	1.92±0.	3.70±0
	1.00	40	0	0	15	41	04	.20
Coffee plantations	0.2±0.	6.1±6.1	41±4.0	10±9.6	23±20.	2.9±2.8	1.9±1.9	3.70±3
	20	0	0	6	30	0	0	.50

Values are means of three replicates determinations (n=3) ± standard deviation, Ec- Electric conductivity, N- Nitrogen, P- Phosphorous K-Potassium, Mn- Manganese, Zn- Zinc, Cu- copper.

**Table 3. ANOVA values for the soil properties among different sites**

Soil properties	F' value	Significance
Ec	1.545	0.226
Soil pH	14.09	0.05*
Nitrogen	1.000	0.00**
Phosphorous	8.374	0.00**
Potassium	87.67	0.00**
Manganese	65.85	0.00**
Zinc	9.40	0.00**
Copper	129.83	0.00**

Values are significantly different at \*\*P<0.001; \*P<0.005.

## Discussion

### Soil properties of the study area

Soils accommodate a significant proportion of the worldwide biodiversity at least 25% of described living species (Bardgett and Wardle, 2010; Decaëns, 2010). Forest biomass and soils are considered to have a large potential for temporary and long-term carbon (C) storage (Houghton, 2005).

The pH in Natural vegetation is very low and high in agriculture vegetation. Soils of strict natural reserve had lower pH values which imply higher acidity which made it more conducive for bacteria to inhabit, while mesofauna abundance and diversity are significantly affected by change in soil pH (Adeduntan, 2009). In a similar study, soil pH under forest and tea plantation is slightly lower to pH under vegetables cultivation. The base saturation and cation exchange capacity of soil under vegetables cultivation is significantly higher than under the forest and tea plantation. The main reason for this is the application of lime to the soil (Sahibin *et al.*, 2002).

The result of the present study indicates that soil in the forests were acidic in nature, soil with higher pH values generally have poorer capacity for regeneration (Suoheimo, 1995).

The Ec is high in mixed vegetation and low in silver oak plantations. The nitrogen content is higher in silver oak plantations and low in mixed vegetation. Phosphorus shortage will affect the development of plant roots and branches of the tiller, delaying the maturity of trees finally. In short, due to the impact of human activities, soil physico chemical properties corresponding changes will occur, and these changes tend to affect the tree's normal growth and development.

The phosphorous is high in natural vegetation and low in horticultural crops. Hence the present study emphasized optimum phosphorous suitable for the growth of plants. Potassium and zinc content found to be more in teak vegetation. Some of the monoculture plantations also have reasonable nutrients and this may be due to the falling of litter. Manganese is low in agricultural and high in natural vegetation. The copper content is high in horticultural crops and less in silver oak plantations. The present study observed that the most of nutrients were high or moderately present in horticulture and agriculture crops and may be due to applications of fertilizers and pesticides. On the other hand, the soil nutrients were also depending on the local environmental factors such aspect as rainfall, and vegetation composition. Further, biotic and environmental factors form the fundamental forces that drive the activity, structure and diversity of soil microbial communities (Ogram *et al.*, 2006).

The status and release of nutrients in forest soil are highly linked with microenvironment, litter dynamics, altitude and type of vegetation. Polyculture supports nutrient enrichment condition, and on the contrary monoculture land is nutrient poor (Mishra and Laloo, 2006; Mishra, 2010). Soil nutrient is mainly depending on the vegetation types. While, the natural resources like forest trees and soil will relatively remain conserved (Spaccini *et al.*, 2002). However, the present study also confirmed that the soil nutrients showed difference between monoculture and polyculture vegetations. Cultivating and cropping in the stand forest (a type of agroforestry) is another practice of crop production in the region which also decreases the soil quality in some extent, but

not as much as the completely deforested method. Therefore cropping in between the forest trees may be the most feasible and recommending way of crop production, by which the relatively high populated region will be nourished.

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