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Annals of Biological Research, 2020, 11 (3): 01-06
(http://scholarsresearchlibrary.com/archive.html)

ISSN 0976-1233
CODEN (USA): ABRNBW
ISSN:0976-1223

Assessment of Soil Physico-Chemical Properties of Conserve Areas of North Gujarat Region

D.D. Prajapati[1]*, S.A. Bhatt[2]

[1]Mehsana Urban Institute of Science, Ganpat University, Kherva, Mehsana, Gujarat, India

[2]Department of Life Sciences, Hemchandracharya North Gujarat University, Patan, Gujarat

***Corresponding Author:** D.D. Prajapati, Mehsana Urban Institute of Science, Ganpat University, Kherva, Mehsana, Gujarat, India, E-Mail: Prajapati.dhaval64@gmail.com*

ABSTRACT

The sacred forest is a small piece of land surrounded by special types of trees and creeping plants. The local community maintains its original appearance and regards it as a holy place, Soil is the source and absorption place of all nutrients on the earth. Soil quality parameters vary from landscape to landscape based on changes in parent material, climate change, and terrain and vegetation types. The current investigation is about, soil physical and chemical properties between selected sacred grove of North Gujarat including Sabarkanths, Banaskantha, Aravalli, Mehsana and Patan, were total 25 soil sample were analysis of various physical properties of soil sample such as pH, Electrical conductivity, Organic carbon (OC), Phosphorous (P), Nitrogen (N), Sulfur (S), Boron (B), Zinc (Z), Iron (Fe), Manganese (Mn), Copper (Cu) and depending on the variability if different parameter of physical and chemical component were play a diverse role in plant association and to sustain the plants in sacred groves.

Keywords: Sacred grove, Soil, Physical properties, Chemical properties, North Gujarat.

INTRODUCTION

The protection of nature and natural resources has always been an important part of cultural spirit, especially in many parts of the world, communities have connected themselves with the biophysical environment and established spiritual connections [1], Traditionally, communities all over the world have nature reserves dedicated to protecting ancestral spirits. These sites cover a wide variety of habitats and are usually located in areas with rich biodiversity [2]. Religious and traditional beliefs, cultural customs and customs play a vital role in protecting the environment and biodiversity, [1], The sacred grove compresses the microbial population, biomass, soil enzyme activity, and soil fertility gradient in the weakly acidic organic soil of the humid subtropical terrestrial ecosystem in the main mountain area. The effect of soil characteristics on the microbial population, activity and biomass is evaluated, and Understand the dynamics of microbial biomass in degraded ecosystems and mature forests [3], According to the Forest Protection Commissioner and Head of the Forest Forces (HoFF) of the Gujarat Government of Gujarat State, during the rainy season, microbes have less metabolic activity, so they need more nutrients. It has an area of 1,96,024 square kilometers and is located in the westernmost part of the country, in northern Gujarat, it is regarded as arid area, including Banaskantha, Sabarkantha, Aravalli, Mehsana and Patna. The annual rainfall is 625 mm-875 mm. According to reports, Ha wise is 22,986.9 (12.53) in the entire Gujarat state. Soil is an important part of our agriculture [4].

Soil is a natural medium that can provide plants with water, nutrients, air and heat to promote their healthy growth and provide mechanical support for plants [5]. Soil Organic Carbon (SOC) and available Nitrogen (N) reserves are controlled by the complex interaction of soil physical, chemical and biological conditions [6], There is also a positive correlation between soil nitrogen and soil nitrogen use efficiency [7]. Maintaining Soil quality is essential to ensure the sustainability of the environment and the biosphere. Previous soil research mainly focused on agriculture [8-10], Soil physical and chemical research is based on various parameters, such as pH, conductivity, texture, moisture, temperature, soil organic matter, available nitrogen, phosphorus and potassium [11].

he physical and chemical properties of soil in desertified areas and their effects on the growth of Populus euphratica are: soil pH is between 7.83-8.00, total salinity is 0.4%, and organic matter is between 0.33%-0.80% [12]. According to Patel et al., analysis was carried out from 20 samples among them pH varies between the range 8.7 and 6.9 with the mean value of 7.69. Were in (EC) is varied from 0.27 to 0.55 dScm-1 with a mean value of 0.40 dScm-1, Organic Carbon (OC) report in range 0.35-0.76 with a mean 0.58, phosphorous in high range (>24.6) [5]. Plant species richness mainly increases the abundance of these extractible soil organic compounds through complementary effects between plant species related to the contrast range of soil compounds. Which express the influence of plant diversity on soil heterotrophic microbial diversity [13], Biodiversity increases the functions of ecosystems and provides support for a series of services valued by society, including those provided by soil [14].

MATERIALS AND METHODS

Study area

In this study the soil samples were collected from different sacred groves from North Gujarat, the Northern part of the Indian state of Gujarat includes the districts of Banaskantha, Sabarkantha, Aravalli, Mehsana, and Patan which play a diverse important in an ecology (Figure 1).

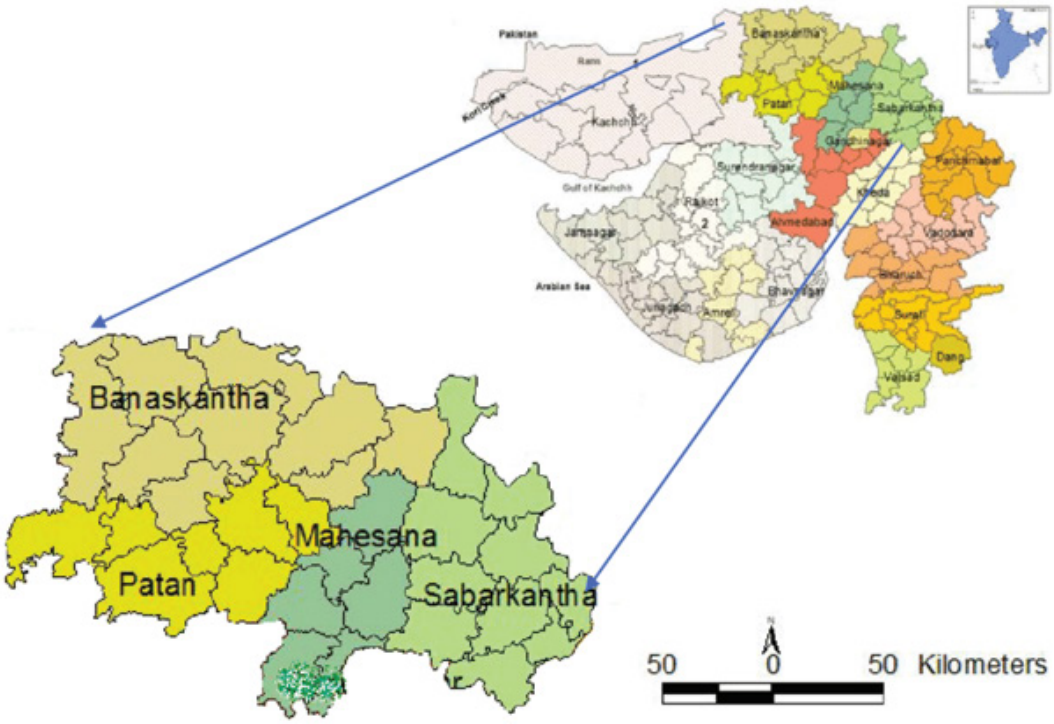

Figure 1. Study area; Northern part of the Indian state of Gujarat

Sampling

In this study the soil samples were collected from 25 different sacred groves from north Gujarat from each 5-soil sample was collected which represented in Table 1. Soil samples were taken systematic and scientific method with different level 10 cm-20 cm and 20 cm-30 cm surface level. Samples were dried and packed with a label in polyethylene bags. Soil samples were brought in the Lab for the analysis of physic chemical properties as like as pH, Electrical Conductivity (EC), Organic Carbon (OC), Nitrogen (N), Phosphorous (P), Sulfur (S), Boron (B), Zinc (Z), Iron (Fe), Manganese (Mn) and Copper (Cu) (Table 2).

Table 1: Selected site of sacred groves from north Gujarat region

Sr. No	Sacred groves site	Sr. No	Sacred groves site
1	Aamlajod (Sabarkantha)	14	Motabamodar (Banaskantha)
2	Bhadresar (Sabarkantha)	15	Rinchadi (Banaskantha)
3	Nadari (Sabarkantha)	16	Khadoda (Aravali)
4	Vireshwar (Sabarkantha)	17	Malpur (Aravali)
5	Bhiloda (Sabarkantha)	18	Meghraj (Aravali)
6	Diyodarda (Patan)	19	Ubharanimata (Aravali)

7	Gogalasana (Patan)	20	Sulpanshwer (Aravali)
8	Koita (Patan)	21	Basana (mahesana)
9	Siddhpur (Patan)	22	Kheralu (Mahesana)
10	Vasai (Patan)	23	Ladol (Mahesana)
11	Chokibor (Banaskantha)	24	Ranasipura (Mahesana)
12	Jetava (Banaskantha)	25	Saduthala (mahesana)
13	Kanbiyavas (Banaskantha)		

Table 2. Parameters and method for experiment

Sr. No	Physico chemical Parameter	Experimental Method
1	pH	pH Metry
2	Electrical conductivity	Conductometry
3	Organic carbon (OC)	Colorimetry
4	Phosphorous (P)	Colorimetry
6	Nitrogen (N)	Colorimetry
7	Sulfur (S)	Colorimetry
8	Boron (B)	Colorimetry
9	Zinc (Z),	Colorimetry
10	Iron (Fe),	Colorimetry
11	Manganese (Mn)	Colorimetry
12	Copper (Cu)	Colorimetry

pH

The most significant property of soil is its pH level, its effects on all other parameters of soil. Therefore, pH is considered while analyzing any kind of soil. If the pH is less than 6 then it is said to be an acidic soil, the pH ranges from 6-8.5 it's a normal soil and greater than 8.5 then it is said to be alkaline soil.

Electrical conductivity

Electrical conductivity is also a very important property of the soil; it is used to check the quality of the soil. It is a measure of ions present in solution the electrical conductivity of a soil solution increases with the increased concentration of ions. Electrical conductivity is a very quick, simple and inexpensive method to check health of soils. It is a measure of ions present in solution. The electrical conductivity of a soil solution increases with the increased concentration of ions.

Carbon

Soil organic carbon is the basis of soil fertility. It releases nutrient for plant growth, promotes the structure, biological and physical health of soil, and is buffer against harmful substances. Increasing soil organic carbon has two benefits-as well as helping to mitigate climate change, it improves soil health and fertility. Many management practices that increase soil organic carbon also improve crop and pasture yields.

Nitrogen

Nitrogen is very important for plant growth, plant food processing and chlorophyll production. Sometimes nitrogen is also dangerous, it can cause the plant to burn, causing the leaves to wither and the plant to be unable to produce flowers. Nitrogen may also cause many environmental damages to groundwater and the ocean.

Phosphorus

Phosphorus is a most important element present in every living cell. It is one of the most important micronutrients essential for plant growth. Phosphorus most often limits nutrients remains present in plant nuclei and act as energy storage.

Sulfur

Sulfur is as necessary as phosphorus and is considered an essential mineral. What effect does sulfur have on plants? Sulfur in plants helps to form important enzymes and contributes to the formation of plant proteins. Its demand is very low, but its lack can cause serious plant health problems and loss of vitality.

Boron

Boron (B) is a micronutrient essential to the growth and health of all crops. It is an integral part of plant cell wall and reproduc-

tive structure. It is a kind of mobile nutrient in the soil, which means it can easily move in the soil.

Zinc

Zinc is a micronutrient. Which concerned in many physiological functions inadequate supply will reduce crop yields. Zinc deficiency is the most widespread Micronutrient deficiency problem, almost all crops and calcareous, sandy soil, peat Soils, and soils with high phosphorus and silicon content are expected to be insufficient.

Iron

Iron is an essential micronutrient for almost all living organisms, because iron plays a vital role in metabolic processes such as DNA synthesis, respiration and photosynthesis. In addition, many metabolic pathways are activated by iron, and it is a prosthetic group for many enzymes. The imbalance between the solubility of iron in the soil and the demand for iron by plants is the main cause of iron poisoning.

Manganese

Manganese is an essential mineral nutrient for plants and plays a key role in a variety of physiological processes (especially photosynthesis). Manganese deficiency is a common problem, most commonly found in sandy soils, organic soils with a pH higher than 6 and severely weathered tropical soils.

Copper

Copper activates certain enzymes involved in lignin synthesis in plants, which are essential in several enzyme systems. It is also needed in the process of photosynthesis, which is essential for plant respiration and helps the plant metabolism of carbohydrates and protein. Copper can also enhance the flavor and color of vegetables and the color of flowers.

RESULTS AND DISCUSSION

Soil is a fundamental part of the dynamic herbal environment that comprises the interactions of organisms, air, water, nutrients, and several other components of our natural global environment. The nature of the soil affects its basic functions, such as water conservation, promotion of biodiversity, support for agriculture and resistance to flooding , erosion and landslides [15], the physicochemical parameter were analysis from the different sacred groves from north Gujarat region which report as pH represent 6.43 to 8.65 range, according to the Dora et al., Soil pH affects processes that are interlinked with the soil global environment biological, geological, but chemical dimensions, as well as how these processes cause changes in soil pH by caused by humans interventions [16]. The plant itself has a major impact on acidity as well. Depending on the stage of development of the crop, the food available, the variations in root temperature and light intensity, the roots may secrete either acid or alkaline substances. So, you see why the root environment's pH will fluctuate constantly were highest pH observe in Mehsanan and the lower pH 6.42, were EC varies the in range Minimum and Maximum EC is 0.04 to 1.32, At the same time, the most inert carbon cycle component of terrestrial ecosystems, and the most dynamic component of terrestrial geological processes, positions it at the heart of carbon biogeochemistry [17]. Were it report lower Sulpanshwe (Aravali) and Basana (mahesana) with 0.08 and Maximum observe in Vasai (Patan) 3.56%, application of phosphorus can be a valuable measure for improving crop production in semi-arid areas, but to maximize treatments, more awareness of both its general effects and effects on particular crops is needed [18], where the abundance of Phosphorous in sacred groves report the minimum range is Ranasipura (Mahesana) 16.48 kg/hect and maximum Rinchadi (Banaskantha) 53.56 kg/hect, The effects of nitrogen are related to the effect with increasing the growth of plant tops and, at same time , increasing its absorption of phosphorus [19]. Efficient use of Nitrogen (N) fertilizer is important for the production of crops, environmental quality and human health [20]. The total nitrogen report in sacred groves is in minimum range is 20.8 kg/hect which report in Sulpanshwe (Aravali) and Basana (mahesana) were the maximum range report in Vireshwar (Sabarkantha) 925 kg/hect, Sulphur was a neglected element in soil science [21]. Although it plays a vital role in the production of protein, vitamins, chlorophyll, glucoside oils and in structurally and physiologically essential sulphide bonds in plant cells and essentially modern groups of enzymes were the Sulfur present minimum in Ubharanimata (Aravali) with 3.28 and maximum Gogalasana (Patan) 12.3 mg/kg [22], Boron is an essential element for many physiological and biochemical reactions that occur in plants. The physical and chemical properties of the soil change due to differences in parent materials or ecological characteristics, and this difference will affect the absorption of nutrients [23]. The minimum value of Boron 0.32% in Chokibor (Banaskantha) and Maximum 0.77% Nadari (Sabarkantha), Zinc micronutrients are of great significance to plant growth and yield, soil fertility and enzymatic metabolic activities to increase crop yields [24] the amount of zinc record is 0.63 mg kg-1 in Gogalasana (Patan) and 1.73 mg kg-1 in Sulpanshwe (Aravali) , Iron is an essential micronutrient for almost all living organisms because iron plays a vital role in metabolic processes such as DNA synthesis, respiration and photosynthesis. Reported amount on iron in soil is 2% in Gogalasana (Patan) at minimum ration were the maximum ration 4.58%, Manganese is an indispensable element for plants and can participate in various metabolic processes, mainly in photosynthesis, and as an antioxidant coenzyme. However, excessive amounts of this micronutrient are toxic to plants. The phytotoxicity of manganese is manifested in the reduction of biomass and photosynthesis, as well as biochemical abnormalities, such as oxidative stress [25], the amount of manganese were observed diverse were the minimum ration report is 3.42 Basana (mahesana) and Meghraj (Aravali) 7.71. In addition to many other uses related to human activities, the widespread use of copper in agricultural and industrial processes also leads to point and non-point source pollution of copper to the environment. Although copper is

relatively non-toxic to mammals and is an essential micronutrient necessary for the metabolic activities of many prokaryotic and eukaryotic organisms, if the concentration increases, copper is toxic to all organisms. Copper pollution in agricultural farming soil will adversely affect the living part of the soil organic matter, and seriously threaten the continuous food and fiber production were the amount of Copper varies the range were the minimum range Kanbiyavas (Banaskantha) 0.42 and the maximum concentraction report at 1.4 Rinchadi (Banaskantha) [26]. The mineral nutrient elements play essential roles such as constituent of cell structures and cell metabolites, in cell osmotic relations and turgor-related processes, energy transfer reactions, enzyme-catalysed reactions and plant reproduction. Plant productivity depends on the efficient discharge of these functions (27) (Table 3).

Table 3. Analysis data of various site of Gujrat

Sr. No	Site Name	pH	EC (Ms)	OC (%)	P (kg/ hect)	N (kg/ hect)	S (mg/ kg)	B (%)	Zn (mg/ kg^{-1}	Fe (%)	Mn	Cu
1	Aamlajod (Sabarkantha)	7.12	0.09	1.43	48.2	371	7.9	0.51	1.03	4.58	7.18	0.64
2	Bhadresar (Sabarkantha)	7.1	0.43	3.33	41.19	865.8	6.28	0.53	1.13	4	5.99	0.97
3	Nadari (Sabarkantha)	7.67	0.14	0.78	20.6	202.8	6.17	0.77	1.58	2.9	5.66	0.94
4	Vireshwar (Sabarkantha)	7.15	0.38	3.56	44.18	925	6.29	0.55	0.74	2.21	7.09	1.19
5	Bhiloda (Sabarkantha)	7.38	0.18	1.85	24.72	481	3.69	0.55	0.73	2.89	4.09	0.83
6	Diyodarda (Patan)	7.48	0.12	1.16	28	301.6	6.48	0.64	0.71	3.94	5.75	0.98
7	Gogalasana (Patan)	7.43	0.04	1.25	21.08	325	12.3	0.67	0.63	2	6.83	0.79
8	Koita (Patan)	7.4	0.13	2.8	37.23	728	7.02	0.6	0.92	3.91	7.01	1.13
9	Siddhpur (Patan)	7.63	0.09	2.32	30.48	603.2	4.44	0.49	1.42	2.72	7.08	0.83
10	Vasai (Patan)	7.28	1.32	3	23.98	780	7.44	0.47	1.67	3.58	6.58	0.64
11	Chokibor (Banaskantha)	7.51	0.07	1.38	27	358.8	11.03	0.32	0.91	3.98	7.1	0.92
12	Jetava (Banaskantha)	7.05	0.19	0.6	40.21	156	6.48	0.69	0.97	4.04	4.71	1
13	Kanbiyavas (Banaskantha)	6.77	0.12	1.5	37.09	390	8.08	0.64	1.12	3.66	5.79	0.42
14	Motabamodar (Banaskantha)	7.7	0.23	0.26	22.85	67.6	3.94	0.48	1.09	3.68	4.18	0.66
15	Rinchadi (Banaskantha)	6.43	0.08	1.14	53.56	296.4	4.93	0.45	0.67	3.52	4.16	1.4
16	Khadoda (Aravali)	7.4	0.16	2.26	44.08	587.6	9.24	0.65	0.93	2.96	6.01	0.69
17	Malpur (Aravali)	7.71	0.16	2.55	49.48	663	6.08	0.7	1.18	2.54	3.78	1.31
18	Meghraj (Aravali)	7.45	0.18	0.24	24.28	62.4	9.24	0.57	1.23	3.74	7.71	1.1
19	Ubharanimata (Aravali)	6.97	0.25	1.16	37	301.6	3.28	0.45	1.49	3.87	6.35	1.12
20	Sulpanshwe (Aravali)	7.4	0.14	0.08	43.02	20.8	9.28	0.67		4.12	6.74	0.71
21	Basana (mahesana)	7.32	0.08	0.08	20.6	20.8	6.16	0.62	0.71	3.14	3.42	0.75
22	Kheralu (Mahesana)	7.21	0.09	0.98	28.84	72.8	5.54	0.69	1.17	3.24	4.98	1.2
23	Ladol (Mahesana)	8.65	0.24	2.55	41.2	663	6.17	0.61	0.91	2.98	4.15	1.2
24	Ranasipura (Mahesana)	7.1	0.23	1.03	16.48	267.8	5.18	0.55	0.83	3.78	4.03	0.83
25	Saduthala (mahesana)	7.38	0.18	1.85	24.72	481	3.69	0.55	0.73	2.89	4.09	0.83
Minimum Range		6.43	0.04	0.08	16.48	20.8	3.28	0.32	0.63	2	3.42	0.42
Maximum Range		8.65	1.32	3.56	53.56	925	12.3	0.77	1.73	4.58	7.71	1.4

CONCLUSION

The present study is a preliminary attempt to study the nature of soil in different sacred groves areas in sabarkantha, mehsana, banaskantha, Patan and Aravalli districts of North Gujarat, India. This could help to understand the nutrient profile of the district and to prescribe the levels micro elements which diversely effective growth of conserved plants.

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