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Studies on physico-chemical parameters in different soil samples from Erode District, Tamil Nadu, India

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Abstract

Soil physicochemical properties can be regarded as an important tool to assess soil health, which further form a base for biological activity in soil. These soil physicochemical properties are comparable in identical land-uses. However, the changes in land-use types and their effects on soil physicochemical properties are largely debates and rather unclear. Soil serves as an important thing in agriculture because this determines the plant growth and health. The present circumstance of industrialization and urbanization has taken a toll on environment, polluting the soil, air and water. Pollution as well as global warming has exhibited detrimental effects on our natural resources of soil becomes the inexplicable. Failing monsoon rains due to climatic changes, population explosion, and depletion of natural water and soil resources such as ground soil, agricultural soil as well as intentional man-made pollution of agriculture pesticide to soil scarcity. Even the scarcely available water is located by contaminants and pollutants which include mutagens, carcinogens, and pathogenic microbes affecting all the file forms affecting the ecological balance. Considering the above mentioned problem criteria, a part of the present work has been designed to analyze the quality of ground soil around the industrial premises. For this objective, we have collected different types of soil samples from various locations in and around sathyamangalam area in Erode District focusing on quite far away from industrial premises considering the concepts of leaching. Basic physio-chemical properties of soil colour, pH, chloride, sulphate, phosphate, silicate, nitrate, moisture, nitrogen, phosphorous, potassium using specific techniques used in laboratory for the samples have been analyzed by APHA standards. These analysis help in the addition of the nutrients of the soil and provide a nutritive indicator value of the sampling sites. Highest possibility of soil quality issues which affects the day to day consumption of soil samples for the domestic needs of the people has been emphasized.

Keywords: Soil samples; Physico-chemical parameters; Soil Colour; Soil Moisture; Erode District

1. Introduction

Due to human and industrial activities the ground soil is contaminated. This is the serous and major issue in now a day. Thus the analysis of the soil quality is very important to preserve and prefect the natural eco system. Soils serve as natural habit for both plants and animals. It provides water and reservoir of various nutrients to the plant body. Soil is defined as the weathered super facial layer of earth crust which is capable of supporting life. It is formed by combined action of climate factors such as water, light temperature and biotic factors such as plants, animals and microbes (Aastha Malik, 2017). Soil consists of some of the components say as inorganic, organic materials living organism present in the soil. In additional to water and air which depend upon natural condition and type of soil. However, physically soil is mixture of minerals particles with varying sizes. According to this course particles 2 to 0.2 mm which form coarse sand, smaller particles 0.2 to 0.02 mm form sand. Finer particles 0.02 to 0.002 mm form slit very fine particles less than 0.002 mm form clay. On the basis of properties of soil, soil is divided into various types say as sandy soil clay and loamy soil calcareous laterite and peat soil (Gairola *et al.,* 2012).

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The physical properties of soil largely depend on the size of particles that soil is composed the properties are porosity, soil water, soil air and capillary. Acidity and alkalinity of the soil are more importance for growth and distribution of plants various kinds of bacteria and fungi are present in soil for maintaining fertility dark colour substance that is humus is present in the soil (Garcia-Rulz et al., 2008). This is formed by decomposition of dead animals' plants. It is more importance to plant, crops both chemically and physically. It increases soil fertility and provide nutrients for growth of plants and other microorganisms including nitrogen fixing bacteria which also increase the availability of minerals in dissolved state to the plants. It can retain high amount of water and also increases the aeration and percolation of water (Gupta *et al.,*2007). Bell and Dell in 2008 have showed that deficiency of nutrients has become measure restrictions to productivity and stability of soil. In the Satana (Baglan) Tahasil main crops are wheat, Bajara, Maiz, Onion, vegetables etc. The certain external factors effect on plant growth like air temperature, light, mechanical support, nutrients and water. A plant requires elements for their growth and completion of life cycle. These elements include carbon, hydrogen, oxygen, nitrogen, Phosphorous, potassium etc. (Gupta, *et al.,* 2000). The fertility of the soil depends upon concentration of N, P, and K, organic and inorganic material. The study of physicochemical parameters of soil is important to agriculture chemist for crops, plants growth and soil management (Trasar-Cepeda *et al.,* 2008).

According to Joffe (1949) the soil is a natural body of mineral and organic material differentiated into horizons, which differ among themselves as well as from underlying materials in their morphology, physical make-up, chemical composition and biological characteristics (Solanki and Chavda, 2012). Soil can develop from weathered rocks, volcanic ash deposits or accumulated plant residues. Soil thus form a substrate for plant growth which performs many functions essential to life and in general, most plants grow by absorbing nutrients from the soil whose ability to do this depends on the nature of the soil. Soil formation is a constructive as well as destructive process (Pujar *et.al.,* 2012) the predominant destructive process are physical and chemical breaking down of materials, plants and animal structures which result in the partial loss of more soluble and volatile products. Soil types are a major factor in determining what types of plants will grow in a certain area as plants use inorganic elements from the soil such as nitrogen, potassium and phosphorus. Since soil is made up of such diverse materials like weathered rock particles and organic material (humus), it can be classified into various types based on the size of the particles it contain (Tan, 1996; Ganguly, 2007). The modern concept of soil quality is the ability to sustain plant and animal productivity, to increase water and air quality and to contribute plant and animal health (Doran, and Zeiss, 2000). Although all physico-chemical properties are involved in soil functioning, bio chemical properties tend to react most rapidly to get change in the external environment (Nannipieri *et al.,* 1990; Trasar-Cepeda *et al.,* 2008).

Soil qualities are related with agricultural activities. It includes physical, chemical and biological properties. These characters play a vital role in soil and make it suitable for agricultural activities (Rakesh *et al.,* 2012). Soil is composed of many minerals, soil organic matter, water and air. It is very complex in nature (Vishal *et al.,* 2009; Flores Magdaleno *et al.,* 2011). Soil quality is related with environmental issues. Agricultural soils are contaminated due to synthetic fertilizers and synthetic pesticides. Industrial effluents are discharged in agricultural areas. Runoff from water streaming also plays a major role in agricultural soil contamination. Soil quality is measured by soil nutrients. Soil physicochemical parameters are the good indicator of soil fertility. Soil quality and crop productivity are decreased due to continuous use of fertilizers. For sustainable agricultural production, fertility status of agricultural soils is evaluated. Its role is very specific in crop production and yield. Nutritional quality of crops depends on soil nutrients in soil profile (Dhanve *et al.,* 2018). In agriculture soil compaction is caused by mechanization and large machineries (Beylich *et al.,* 2010; Allman *et al.,* 2015). The present study was conducted to understand the current status of agricultural soils. It is useful to farmers; they decide how to increase the crop yield in their areas. Soil management is a qualitative parameter. Soil organic carbon play a major role in crop production and it reduces the environmental issues on agriculture (Adhikari and Hartemink, 2016; Chabbi *et al.,* 2017; Hatfield *et al.,* 2017). Soil quality is a significant factor. It determines the suitability of crops to grow. Good soil is an indicator of good environment. A good soil should be suitable for all kinds of plants to grow on it (Shanmuganathan, and Rajendran, 2018).

Soil as a component of the terrestrial ecosystem fulfils many functions including those that are essential for sustaining plant growth. Some of the function includes partitioning of applied water into drainage and runoff, storage of the plant - available water. Supply of adequate oxygen to roots, provision of favourable conditions of seedling establishment, storage of nutrition are essential to plant growth. These functions constitute the criteria against which soil quality is assessed (Brady *et al.,* 2002; Moody *et al.,* 2008). Nearly all human activities generate waste, and way in which this is handled, stored, collected and disposed of can pose risks to the environment and to public health (Zhu *et al.,* 2008). Healthy soil consists of approximately 40% minerals, 23% of air, 23% of water, 6% of organic material and 8% of living organism. A study of soil profile supplemented by physical, chemical and biological properties of the soil will gave full picture of soil fertility and productivity good productive soil cropland (Doran *et al.,* 1996; Galal *et al.,* 2010).

Chemical fertilizer or manure enhanced the number of total and spore -forming bacteria actinomycetes and fungi in the soil (kanazawa *et al.,* 1988). Incubation temperature reported in the literature usually varies between 25-30°C (Alexander, 1977). In terms of diversity of the tested soils, the number and enzymatic activity of microorganisms depended on soil pH, but also on soil usage. Previous studies highlight a significant correlation between soil pH and organic matter content and composition of soil microbial communities (Nazir *et al.,* 2010; Pereira *et al.,* 2011). The presence, distribution and abundance of Azotobacter sp. is mainly determined by environmental factors, soil characteristics (pH, nutrients and the organic matter content), the presence of heavy metals and pollutants, and vegetation composition (Bhatia *et al.,* 2009; Kizilkaya, 2009). The optimum pH for growth of Azotobacter strains is 7-7.5; therefore its population is the most numerous in neutral or alkaline soils (up to 104 g-1 of soil). Since these bacteria are especially susceptible to soil acidification, Azotobacter strains are generally absent or present in very low number in soils with pH < 5.0 (Barnes *et al.,* 2007).

As a dynamic biological entity within a continuously changing environment (García-Ruiz et al., 2008), the quality of soil is defined by its physicochemical and/or biological conditions. Land-use change is directly associated with soil quality variation. This change is normally reflected by the shifts of a set of soil physicochemical properties and microbial indices (Aon and Colaneri, 2001). Soil physicochemical properties are relatively stable as it takes decades to detect their changes even after years of land use transformations (Parr and Papendick, 1997; Arévalo-Gardini et al., 2015). Compared with physico-chemical changes, soil nitrogen (N) pool is more sensitive to aboveground plants/land-use variations.However, very few studies have focused specifically on assessing whether vertical (soil depth) or hor-izontal (land-use type) factors impose stronger impact on soil properties in this region. In our study, we thus emphasized on the interactions between these two factors, and how soil variables vary along soil depth gradients in changing land-use types.

Erode district having population of about 30,00,000 as per the 2001 census. The total area of the district is 8209 Sq. Km. Erode District is located between 10^0 35 ’ and 12^0 0 ’ North latitude and 76^0 50 ’ and 77^0 50 ’ East longitude. It is positioned North Western part of Tamilnadu. The average rainfall of Erode region is 700 mm. The boundaries of the district are Namakkal and Karur in east, Coimbatore and Nilgiri in the west, Dindigal in the south and Karnataka in the north. Erode is characterized with a scanty rainfall and a dry climate with dry weather throughout except during the monsoon season. Soil quality is dependent on the type of the pollutant added and the nature of mineral found at particular zone of agriculture land. Monitoring of the soil quality of agriculture land is done by collecting representative soil samples and analysis of physicochemical characteristics of soil samples at different locations of sathyamangalam in Erode District. Estimation of soil quality index through formulation of appropriate using method and evaluate the quality of tube well water by statistical analysis for post and pre monsoon seasons. Result of soil quality assessment showed that most of the soil quality parameters slightly higher in the wet season than in the dry season. Correlations the physico-chemical characteristics water pollutants by appropriate statistical method (Chitra, 2020).

To this end, this study was designed to assess the changes in soil physicochemical, parameters as described earlier Xue et al. (2015) and across contrasting land-use types refereeing them as horizontal gradients. Discriminant analysis (DA) is used as powerful statistical tool in soil research to assess biodiversity among various habitats (Feret et al., 2011) This potential tool was thus employed in our study to achieve the following objectives: a) to assess whether the investigated soil properties have discriminating features along land-use types b) to determine which parameters contributed most to these variations and c) to establish whether discriminations in soil nutrients indices were stronger than in physicochemical and nitrogen properties.

2. Material and methods

2.1. Study Area

Sathyamangalam is a municipal town located on the foothills of the Western Ghats extending towards the east of 90 Nilgiri Mountain, in Erode district of Tamil Nadu state in India. It lies on the banks of river Bharani, a tributary of 91 Cauvery. It is about 70 km from Coimbatore and 450 km from Chennai. The area of the Municipality is 29.24.sq. 92 km. Agricultural wetlands are predominant on both sides of the river 96 and dry lands are predominant on the northern side of the town. The latitude and longitude of Sathyamangalam are 97 11° 30' 17.1936'' N and 77° 14' 18.2256'' E. 98 99 The open dumpsite is located towards the Eastern side of the town at about 2 km and it is on the Southern side of 100 Sathyamangalam Athani - Bhavani Main Road. The Malaiyadipudur dumping site has been operating since 1970. Soil samples were collected from four different places of same village. The samples were collected from 0-15cm depth. These samples then sieved using a manual sieve to avoid the large particles like stone in the sample. The dried in the hot air oven at 60°C to remove the moisture content of the soil. After the drying of the soil the further analysis were carried out. The layout of the study area with different types of soil sampling locations is shown in (Fig. 1).

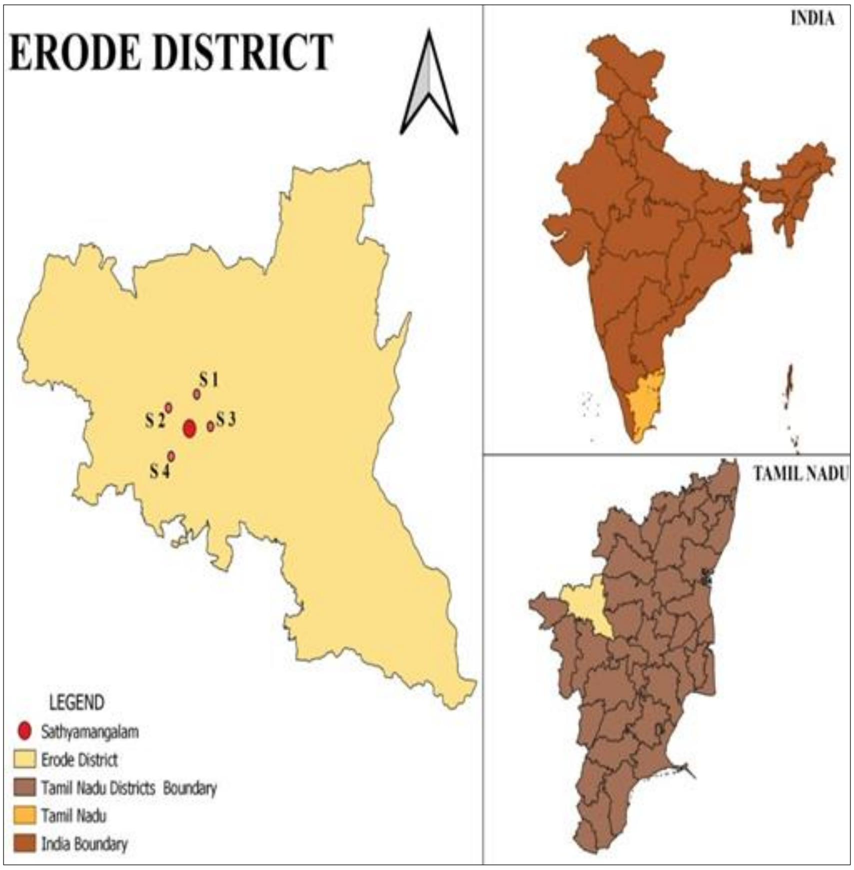

Figure 1: Location map of study site

2.2. Soil sampling and experimental design

Table 1 Method use for estimation of parameters

Parameter	Method
pH	pHpaper
Soil Colour	By viewing
Soil Moisture	Hot air oven drying method
Chloride	Titration
Nitrate	Colorimeter
Phosphate	Colorimeter
Silicate	Titration
Sulphate	Titration
Nitrogen	Alkaline permanganate
Phosphrous	Colorimeter
Potassium	Flame photometry

Four types soils were selected as representatives of land use change: previously existed cropland and orchard (unconverted), abandoned land (for natural recovery) and grassland (naturally recovered). These land-uses are located in the same area within the Zhifanggou catchment, with similar geomorphological positions and slope aspects. In Oct 2022- March 2023, areas of 100 m × 100 m were selected in each of land-use types. The methods uses for estimation of parameters of the investigated sites are as given in (Table 1). In each site, three replicate subplots were randomly selected with an area of 10 m × 10 m and five replicate soil subsamples were collected from each subplot, at the soil depths of 0-10 cm, 10-30 cm and 30-60 cm using auger boring with a drill size of 80 cm length and 5 cm diameter. Three scales of 10, 30 and 60 cm were marked on the drill before sampling. 5 subsamples of identical soil depths were mixed to form a composite sample of approximate 500gm. The same process was repeated for each soil depth separately to minimize the spatial variability of soil. The fresh soil samples were then sealed in plastic bags and transported to the laboratory in iceboxes. Collected soil samples were then sieved (< 2 mm) to remove discernible roots, stones and macro-fauna and were air dried to measure the soil physicochemical properties. Aliquots of the samples were stored at 4°C for the microbial biomass and basal respiration analyses.

2.3. Soil sample analysis methods

2.3.1. Soil physicochemical properties analysis

Soil water content was measured gravimetrically by oven drying moist soil samples (105 °C, 24 h). The bulk density was determined using cutting ring by the standard methods recommended by the soil agricultural and chemical analysis (Nu, 1999). Soil pH and electrical conductivity were determined in a soil-to-water (1:2.5, W/V) mixtures of dry soil and distilled water using a Delta 320 pH meter (MettlerToledo Instruments (Shanghai, China) Co., Ltd. Soil pH is essentially the negative logarithm of hydrogen ion concentration. The pH of the soil declines as the amount of hydrogen ions in the soil rises, making the soil naturally more acidic. The pH range for acidic earth is from below 7 to zero. The alkaline character of the soil will range from 7 to 14. The soil properties were readily determined by the pH. The soil colour has variation from the sample to sample the variation can be due to the type of soils. Commonly the colour of varies from black to red. The colour of the soil can be determined by the visual examination. And so the colour of the soil determines the type of the soil. Soil organic carbon (SOC) was determined via wet oxidation using dichromate in an acid medium followed by the $FeSO_4$ titration method (Bao, 2007). Available P (AP) content was measured by lixiviating-molybdenum blue colorimetry after extraction with 0.5 M $NaHCO_3$ (pH 8.5) for 30 min (Nu, 1999). Total nitrogen (TN) was measured with Kjeldahl digestion and distillation azotometry. Nitrate-N (NN) and ammonium-**N** (AN) were determined by extraction with 1 M KCl at a ratio of 1:5 (W/V) using an automated Continuous-Flow Auto Analyzer (Bran Luebbe AA3, Germany) (Nu, 1999). Mineralizable nitrogen (MN) was determined by the aerobic culture method (Nu, 1999) and was calculated by subtracting the initial soil ammonium-N from the final soil ammonium-N after incubation at 40 °C for 7 days. Organic N was calculated by subtracting the content of inorganic N (NH4 + and NO3 −) from total N. Extractable organic N was determined by extracting with K_2SO_4 as described by Wu and Brookes (2005). The K_2SO_4-organic N extracts were oxidized by alkaline persulphate to determine nitrate using ultraviolet spectrophotometry analysis at 220 nm and 275 nm in a Hitachi UV2300 spectrophotometer.

2.4. Data analysis

Two-way ANOVA was performed (with PASW Statistics 18) to evaluate the influence of land-use types, soil depths and their interaction (land-use∗depths) on soil physicochemical, Chloride, nitrate, phosphate, silicate, sulphate, nitrogen, phosphorus, and potassium indices. In addition, simple main effects were analyzed (also with PASW Statistics 18) for soil properties that have statistically significant interactions. For this purpose, we developed a one-way ANOVA to assess significant differences in terms of soil types and land use. Differences among means were assessed with Turkey HSD post hoc texts ($P < 0.05$) Discriminant functions were calculated using PASW Statistics 18. Soil physicochemical (Organic C, total N, C/N ratio, available phosphorus, bulk density, pH and electrical conductivity), nitrogen forms (Nitrate-N, ammonium-N, organic N, mineralizable N, microbial biomass N and extractable organic N) were taken for calculations of discriminant functions of land-use types and soil depths (0–10 cm, 10–30 cm and 30–60 cm) separately. In order to identify the significant/dominant characteristics as drivers of discrimination/separation of the various soil parameters, two discriminant functions - discriminant function 1 (DF 1) and discriminant function 2 (DF 2) were calculated with the detailed discriminant functional coefficients (for each soil parameter).

3. Results

3.1. Physical parameters of Soil samples

The pH of the soil declines as the amount of hydrogen ions in the soil rises, making the soil naturally more acidic. The pH range for acidic earth is from below 7 to zero. The alkaline character of the soil will range from 7 to 14. The soil properties were readily determined by the pH. The soil colour has variation from the sample to sample the variation can be due to the type of soils. Commonly the colour of varies from black to red. The colour of the soil can be determined by the visual examination. And so the colour of the soil determines the type of the soil. The soil pH was determined by potentiometric pH meter using 1:2.5 soil water suspension ratios by Jackson. The value of pH showed lie in the alkaline side, pH of these soils is greater than 7. Alkalinity is measure of saline or salt effected soil. If pH is less than 6.0 then soil type is acidic, the soil pH range from 6-8.5 its type is normal soil and greater than 8.5 then it is said to be alkaline type soil.Overall, by the estimation of the pH it is determined that the Station 1and 2 the soil sample is slightly acidic variation compare to the study area from station 3 and 4 is slightly basic in nature (Table 2a,b and Fig 2). The moisture content of the station 1and 2 is six times lesser then the station 3& 4, this indicates the water holding capacity of the station 1and 2 is very less (Table 2a,b and Fig 2).

3.2. Micro and Macro Nutrients

The micro nutrients like chlorides, nitrates, phosphates, sulphates and silicates are rich in the station 1, is higher compared to that of the other stations. Station 4 has moderate amount, Station 2 and 3 has very less amount of these micronutrients (Table 2a,b and Fig 3). The available nitrogen was determined by alkaline per magnet method (Subbiah and Asija, 1956) Nitrogen is an essential plant nutrient, for growth of plant canopy. Deficiency of nitrogen shows stunted growth development of yellowish green leaves and also deduces protein content and yields. Nitrogen is low in all soil samples. Phosphorous is called the master key element in soil quality. It is a most important element in every living cell. It is essential for growth, cell division root growth and elongation seed and fruity development and early ripening (Kachhave and More, 1982). Also it helps in energy storage and transfer. In study area phosphorous ranges 15.11 to 54.13 kg/ha. Potassium plays an important role in different physiological processes of plants. Potassium is major nutrient for the production of superior quality crop. Its main role is catalytic in nature. Available potassium content ranges from 125.31 to 630.15 kg/ha. Majority of the soil samples show high available potassium. The soil of the Marathwada contained high to medium available potassium (Miller and Donahue, 1992; Olsen *et al.,* 1954; Piper, 1966; Richards, 1968) and Somwanshi*et al.,* 1999). The macronutrients like nitrogen, phosphates and potassium is higher in the station 1 in the both sampling periods compare to the study area from station 2 has the least amount of macro nutrients in it (Table 2a,b and Fig 4).

Table 2a Physico-chemical characteristics of soil sample in different study area October 2022- December 2022

Parameters	Sample 1	Sample 2	Sample 3	Sample 4
pH	6.4± 0.13	6.7± 0.13	7.2± 0.13	7.5± 0.13
Soil colour	Deep brown	Slight brown	Brown	Deep brown
Soil moisture %	10.3± 0.1	11.1± 0.1	61.3± 0.05	70.6± 0.05
Chlorides (mg\g)	12.3± 0.05	10.6± 0.10	2.8± 0.10	4.2± 0.13
Nitrates(mg\g)	24.7± 0.13	19.4± 0.13	16.4± 0.13	17.5± 0.05
Phosphates (mg\g)	0.3± 0.005	0.27± 0.013	0.23± 0.005	0.21± 0.008
Silicates (mg\g)	-0.06± 0.0005	-0.1± 0.049	-0.09± 0.379	0.09± 0.0008
Sulphate (mg\g)	1.3± 0.081	0.93± 0.004	1.5± 0.081	1.16± 0.047
Nitrogen (mg\g)	2.80± 0.005	2.70± 0.005	2.66± 0.005	1.16± 0.047
Phosphorous (mg\g)	1.5± 0.005	1.2± 0.005	1.4± 0.005	1.3± 0.005
Potassium (mg\g)	2.23± 0.005	2.20± 0.005	2.20± 0.005	119± 0.005

During the observation of this 3 months the soil has shown slight variations and this may be rectified by the addition of the fertilizers to the soil. This is caused by the climatic change during the study period.

Table 2b Physicochemical characteristics of soil sample in different study area Jan 2023- March 2023

Parameters	Sample 1	Sample 2	Sample 3	Sample 4
pH	6.1± 0.05	6.5± 0.05	7.1± 0.05	7.3± 0.05
Soil colour	Deep brown	Slight brown	Brown	Deep brown
Soil moisture %	10.4± 0.151	10.7± 0.151	60.8± 0.265	70.2± 0.306
Chlorides (mg\g)	12.4± 0.237	10.6± 0.372	2.4± 0.492	3.7± 0.675

Nitrates(mg\g)	0.5± 0.005	0.3± 0.005	16.5± 0.033	17.3± 0.0357
Phosphates (mg\g)	0.5± 0	0.3± 0.005	0.3± 0.008	0.3± 0.005
Silicates (mg\g)	0.04± 0.005	0.07± 0.005	0.03± 0.005	0.09± 0.005
Sulphate (mg\g)	1. 2± 0.268	0.92± 0.013	1.3± 0.178	1.13± 0.103
Nitrogen (mg\g)	2.80± 0.005	2.70± 0.005	2.66± 0.005	2.60± 0.005
Phosphate (mg\g)	1.53± 0.005	12.3± 0.005	1.13± 0.005	1.33± 0.005
Potassium (mg\g)	2.25± 0.005	2.55± 0.005	2.55± 0.005	2.55± 0.005

This is carried out in the different study area Jan 2023- March 2023 observations this also shows slight variation in the nutritive value and physical properties of the soil this is happened due to the reasons like climate change and agricultural practices.

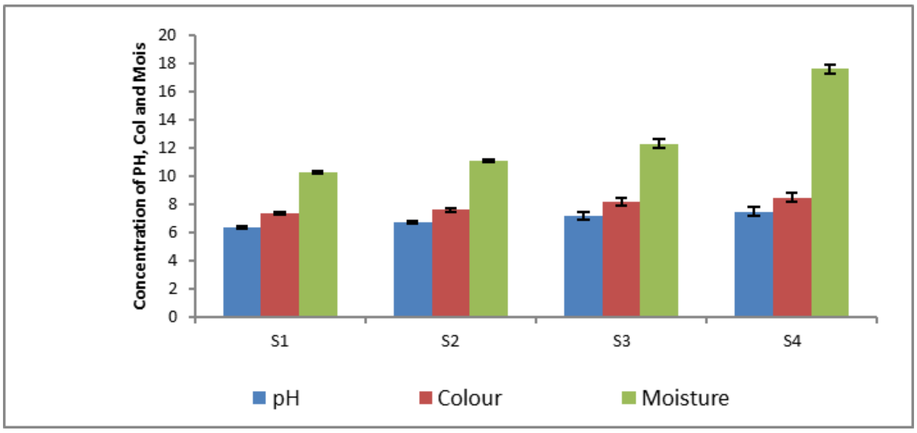

Figure 2 Physical characteristics in the sediment samples at four different sampling sites during Oct 2022 - March 2023

By the above observation of the study the soil pH is caused bythe sudden rain and so there is slight variation seen during the study period, colour of the soil varies due to the application of the ash to avoid the pest attack and the moisture occurs by over heat caused by the sun light and observed much variations in each station.

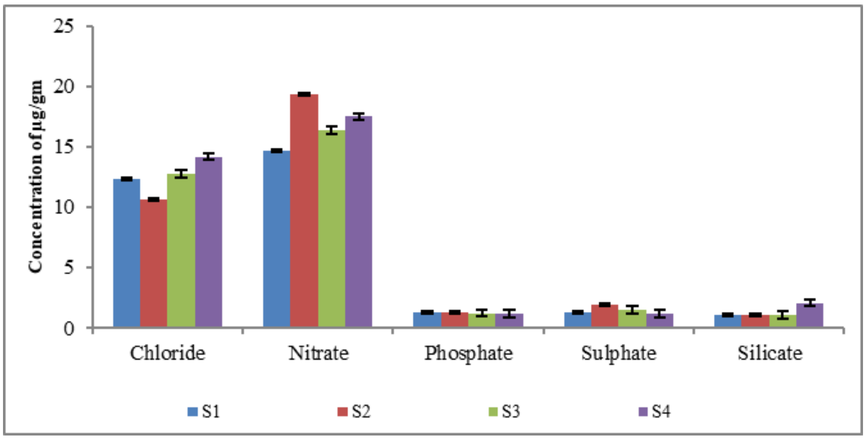

Figure 3 Micronutrients in the sediment samples at four different sampling sites during Oct 2022 - March 2023

In the above graph the micronutrients of the soil is observed and the soil showed much variation in the every particular element among all the other elements the chloride and nitrate is observed to be more in amount comparatively this can be solved by application of the fertilizers according to the need of plants.

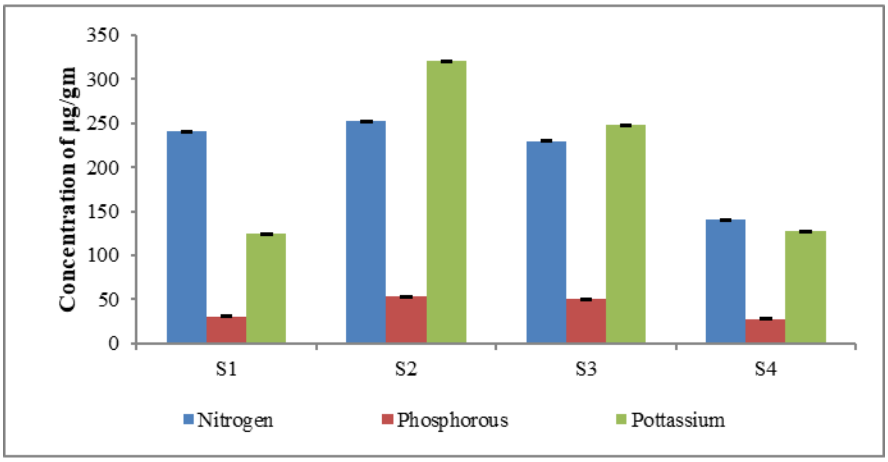

Figure 4 Macronutrients in the sediment samples at four different sampling sites during Oct 2022 - March 2023

In the above graph showing we observe that the macronutrients in the 4 station also are in the moderate level and this is essential for the plant to grow further in all circumstances.

4. Discussion

The observed trend is an important finding in that it indicates that the physical environment of soil plays an important role in shaping the structure of bacterial communities, along with chemical and biological factors such as amount and type of organic matter (Crecchio *et al.,* 2007; Nusslein and Tiedje, 1999; Zhou *et al.,* 2002; Das et al., 2012), pH (Fierer and Jackson, 2006), redox potential (Braker *et al.,* 2001), inhibitor substances (Kandeler *et al.,*2000; Moffett *et al.,* 2003), predation (Jousset *et al.,* 2008; Rosenberg *et al.,* 2009). Our study design sought to limit the influence of such confounding factors and so does not address the magnitude of their effects on richness relative to the texture effect. The finding of increased richness in coarser soils is in agreement with previous research (Carson *et al.,* 2010; Treves *et al.,* 2003) indicating that maintaining lower (more negative) matric potentials in soil results in higher bacterial richness. The more highly fragmented water phase present in coarser soils exerts control over bacterial community structure by providing more isolated microhabitats, thereby fostering higher richness. Organic farming improve soil ecosystem quality (Tandon, 1993; Cavigelli *et al.,* 2013) through enhancement of soil nutrient status and soil enzyme activity, but the overall impact of agricultural management on composition, richness and diversity of soil microbial populations is still insufficiently understood (Sumeet Gairola et al., 2012; Stagnari *et al.,* 2014; Jafar Aham et al., 2015).

Agricultural soil systems is considered to be an alternative land use options to help prevent soil degradation and improve soil physicochemical variations different study area from Coimbatore district. Biological properties can be also optimized in the soil under agricultural systems. Soil microbial communities play a vital role in plant health and soil quality. Agricultural soil have much role in the growth and development of plants through nutrient regeneration by biological processes either decomposition or by fixing the nitrogen and solubilize/mobilize phosphorous. Several authors have reported that nutrients are higher in the soil systems due to the effects of trees and organic matter inputs and the differences in litter quality and quantity and root exudates. Chander *et al*., 2019 reported that the effects of growing trees in combination with field crops on soil microbial biomass was evaluated and the amount of microbial biomass carbon and the enzymatic activities were greater in soils under agroforestry systems than in conventional systems and investigated the effects of the monocropping of rice on the soil nutrient and microbial biomass in India and observed that the soil microbial biomass was increased by 42% (microbial carbon) and 13% (microbial nitrogen) in agroforestry systems as compared to monocropping.

Soil pH influences soil chemistry as well as availabilities of nutrients and toxic substance activities of certain pesticides (Pandeeswari *et al..,* 2012; Kiran G. Chaudhari, 2013). Soil EC is an easily measured yet reliable indicator of soil quality, crop performance nutrient cycling and biological activity and can sever quick indicator of plant available nitrate - N (Johnson *et al*., 2005; Wagh et al., 2019). Similarly Sonaimuthu (2016) also observed higher nitrogen up to 583.4 kg ha-1 in station 4 and 1 from sathiyamangalam, Erode District. The higher accumulation of soil organic matter in the forest soils than the other land use soils may be due to the continuous accumulation of undecayed and partially decomposed plant and animal residues in the surface soils as reported by Lechisa Takele et al. (2014). Similarly Sonaimuthu (2016) has also observed 9.45 percent of organic carbon in station 3 and 4 from sathiyamangalam, Erode District. The present investigation also finds support with the work of Venkatachalam et al. (2007) who has reported that high amount of nitrogen in station 4 and 1 from sathiyamangalam, Erode District. (306.91 kg ha-1). The phosphorus is the ore based mineral which has no influence by plant communities in that area and this might be the reason for higher phosphorus content in that area. Similar results were also reported by Mani et al. (2006) that the highest available phosphorus content was recorded in station 4 and 1 from sathiyamangalam, Erode District.. The floral species diversity was very high in this area and this might be the reason for the higher potassium content in the soil. The values of available potassium in the present study are similar to those recorded by Venkatachalam et al. (2007) who has reported it in some parts of the sathiyamangalam, Erode District, Tamil Nadu, but in general varied considerably. The current study reveals that the domestic and agriculture waste causes the pollution problems in the surroundings environment of the sampling station. The Physico-chemical parameter shows the wide variation from one station to another station which reflects the nutrient status of the station. Soil management practices after the physicochemical properties of soil and the soil microbial community may respond to these changes in way that the ability of the soil to resist soil borne diseases are due to increasing population, urbanization, industrialization and modern agricultural production. At most carrying of soil and it maintains will improve the productivity of crop and maintain the soil ecosystem.

5. Conclusion

The soil samples collected from four different sampling sites, Sathyamangalam taluk is examined and analysed for physicochemical parameters and the microbial content. However, the parameters were estimated during the study period are pH, colour, moisture, chlorides, nitrates, sulphates, phosphates, nitrogen, phosphorous, potassium and the presence of the bacteria are studied. The study was conducted in the period during from October 2022- December 2022 and January 2023- March 2023. There were no much variations are seen during these period. The study explored that the nutritive content of the soil fall on the ideal range in that the soil. By the further analysis of the soil sample from stations 4 and station 1 has the higher amount of the micro nutrients as well as the macro nutrients. Similarly, the Station 4 has moderate amount of nutrients and station 3 has least amount of nutrients and station 2 has the very least amount of nutrients. From this study we suggest that the station 3 and 4 has least amount of nutritive value so the fertilizers have to be given to increase the nutritive value of the soil. There is abundant bacteria is found in the station of sampling sites. This will serve as data base for soil properties of the study area and which can be further used for the soil management and soil conservation works in this area in the future, pertaining to habit improvement programs and future management and conservation activities in this area.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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