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Assessment of Physical and Chemical Properties of Soil of Thondamuthur, Anaimalai and Karamadai Block of Coimbatore District, Tamil Nadu, India

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ABSTRACT

An experiment was conducted in 2022-23 with prime objective to assess the Physical and Chemical Properties of Soil at different depths of various sites of Thondamuthur, Anaimalai and Karamadai blocks of Coimbatore District, Tamil Nadu. The soil samples were collected at 0 -15, 15-30 and 30-45cm depth following standard procedures. The texture of soil samples was sandy loam. It clearly indicated that soil has good Water Holding Capacity (32.99 to 40.42%) with drainage where bulk density has shown significant range 1.04 Mg m^{-3} to 1.22Mg m^{-3} and Particle density ranges from 2.07 Mg m^{-3} to 2.50 Mg m^{-3}. The pH of soil is neutral to alkaline in nature 7.372 to 8.285 which is suitable for all kinds of crops were electrical conductivity also shown (2.07 to 2.28 dSm^{-1} and was suitable for all crops. Organic carbon ranged from medium to high (0.586 to 1.209 %). These soils have optimum Nitrogen 284.9 kg ha^{-1} to 381.8 kg ha^{-1} in all blocks. Phosphorus 22.13 kg ha^{-1} to 26.15 kg ha^{-1} content is optimum in all samples. Potassium 112.58 kg ha^{-1} to 158.63 kg ha^{-1}. Optimum in all locations. There is an including awareness of the need to pay greater attention in the role of organic matter enhancement for good soil health and proper nutrition of plant so as to attain optimum economic yield and soil is suitable for all major tropical and sub-tropical crops.

***Key words**: Coimbatore District, Thondamuthur, Anaimalai and Karamadai Block, Physio-chemical properties.*

Inroduction

Soils provide food, fodder and fuel for meeting the basic needs of human and animals with the growth in human and animal population, demand for more food production is on the increase. however, the capacity of the soils to produce is limited and limits to production are set by intrinsic characteristics, agro-ecological setting, use and management. these demands systematic appraisal of our soil resources with respect to their extent, distribution, characteristics, behaviour and use potential' which is very important for developing an effective land use system for argumenting agricultural production on sustainable basis (FAO, 2018).

Soil fertility is the ability of a soil to sustain plant growth by providing essential plant nutrients and favourable chemical, physical, and biological characteristics as a habitat for plant growth. Fertilizers are chemicals or natural substances or materials that are used to provide nutrients to plants, usually via application to the soil, but also to foliage or through water in rice systems, fertigation or hydroponics or aquaculture operations. Nutrient sources include chemical and mineral fertilizers, organic fertilizers, such as livestock manures and composts, and

sources of recycled nutrients (FAO, 2021).

Coimbatore is situated in the extreme west of Tamil Nadu, near the state Kerala covering an area of 642.12 Sq. Km. sq.kms. Surrounded by mountains on the west, with reserve forests and the (Nilgiri Biosphere Reserve) on the northern side. The Noyyal River runs through Coimbatore and forms the southern boundary of the corporation. The city sits amidst Noyyal's basin area and has an extensive tank system fed by the river and rainwater. There are 12 blocks in Coimbatore district namely Anaimalai, Annur, Kinath ukidavu, Karamadai, Thondamuthur, Sulur, Pollachi North, Pollachi South, Sarkarsamakulam, Sulthanpet, Periyanaichenpalayam and Madukarai. In which the samples are taken from Thondamuthur, Anaimalai and Karamadai. The District Coimbatore R-GIS coordinates Latitude :11 01′ 2.50" N 76 57′31.98" E. Coimbatore receives high rainfall from North East Monsoon of 444.3 mm. Rainfall distribution is also good. Temperature varies from 18.6 Celsius to 35.7 Celsius. Of the total geographical area 7.47 lakhs ha and 3.14 lakhs ha are under net sown area and gross cropped area while 0.19 lakh ha is sown more than once. While the area under Food crops accounted for 54.17 per cent and that of non-food crops formed 45.83per cent only,Important crops grown in the district are Paddy, Cholam (Jowar), Cumbu (Bajra), Ragi, Maize, Small millets, Pulses, Sugarcane, Banana, Spices and Condiments, Fruits and Vegetables which constitute the Food crops. It is reported that fruits, vegetables, flowers, medicinal plants and horticulture crops are cultivated in the district covering an area of 52011 ha. The major plantation crops grown are Coconut (28.2 percent of the total area), Tea, Coffee, Areca nut (1577 ha) and Cardamom. Cashew and curry leaf are also grown in a few pockets. Fibres, Oilseeds, Drugs and Narcotics, Dyes, Fodder crops, green-manure crops, Flowers and Other Miscellaneous tree crops and Groves constitute Nonfood crops. Cocoa cultivation has also been started on a small scale as an intercrop in the coconut plantations with area coverage of 330 ha. Mango, banana, guava, lime, papaya and grapes are some of the major fruit crops grown in about 9894 ha. Banana is also cultivated quite extensively and has covered 4983 ha with production of 1,45,880 MT. Mango cultivation is gaining impetus in Coimbatore. The district occupies second position in the State in area under grapes with 386 hectares and an estimated production of 9000 MT of fruit. The Spices like chillies, coriander, tamarind, cardamom, pepper, ginger, turmeric and cloves are also grown in about 8067 hectares.

Methodology

Analysis of the soil samples were under the methods, the physical parameters include Soil Texture, Bulk Density, Particle Density, Water Holding Capacity, whereas chemical parameters include pH, Electrical Conductivity, Organic Carbon, Macro-Nutrients (NPK) Soil textural class was determined by using Bouyoucos Hydrometer (Bouyoucos, 1927). Bulk density, Particle density, Water holding capacity was determined by using Graduated Measuring Cylinder method (Muthuaval *et al.,* 1992). pH was estimated with the help of Digital pH meter after making 1:2 soil water suspension (Jackson, 1958). Electrical Conductivity was estimated with the help of Digital Conductivity meter (Wilcox, 1950). Percent Organic Carbon was estimated by Wet Oxidation method (Walkley and Black, 1947). Available Nitrogen was estimated by Alkaline Potassium Permanganate method, using Kjeldahl apparatus (Subbiah and Asija, 1956), Available Phosphorus was estimated by Olsen's extraction followed by Spectrophotometric method (Olsen *et al.,* 1954), available Potassium was estimated by Neutral normal Ammonium Acetate extraction followed by Flame photometric method (Toth and Prince, 1949).

Results

Physical Properties

The Soil colour (Dry Condition) of soil varied from Brown, Dark brown, Very Dark Brown, Reddish Brown. Dark reddish Brown, Light Reddish Brown and Soil colour (Wet Condition) of the soil varied Brown, Dark brown, Reddish Grey, Light Reddish Brown, Dark Reddish Brown and Very Dark Brown. The Soil Textural classes identified were Sandy Loam. The sand, silt and clay percentage varied from 64.4 to 72.5 sand, 12.7 to 18.8 silt and 13.1 to 18.7 clay in Sandy Loam. Bulk Density was varied from 1.01 Mg m^{-3} to 1.33 Mg m^{-3} and the highest Bulk Density was found in S_2 (1.33 Mg m^{-3}) which sites from Thondamuthur Block. The Particle Density varied from 2.01 Mg m^{-3} to 2.51 Mg m^{-3} and the highest Particle Density was found in S_3 (2.51 Mg m^{-3})

Table 1. Physio-Chemical Parameters of different blocks of Coimbatore district

Sampling Sites	BD Mg m^{-3}	PD Mg m^{-3}	WHC %	pH	EC	% OC	Nkg ha^{-1}	Pkg ha^{-1}	Kkg ha^{-1}
L1	1.03	2.18	37.99	7.37	2.11	0.87	381.83	22.13	130.97
L2	1.21	2.29	40.36	8.01	2.18	0.99	294.93	24.28	118.56
L3	1.09	2.50	38.40	8.11	2.13	0.59	318.87	23.67	130.46
L4	1.17	2.23	40.42	8.16	2.08	0.96	284.87	23.81	140.54
L5	1.13	2.41	32.99	7.72	2.11	0.91	315.83	26.03	149.23
L6	1.16	2.38	37.58	7.96	2.11	0.96	342.57	26.15	130.01
L7	1.09	2.14	34.71	8.27	2.28	0.78	349.47	24.30	139.14
L8	1.05	2.08	37.43	8.07	2.18	0.98	345.40	25.67	149.78
L9	1.05	2.24	33.85	8.29	2..29	0.66	291.27	25.13	152.09

Note:

L1 – Alandurai (Thondamuthur)
L2 – Nadhegoundenpudur (Thondamuthur)
L3 – Puthupalayam (Thondamuthur)
L4 – Somandurai (Anaimalai)
L5 –Tatur (Anaimalai)
L6 – Ambarampalayam (Anaimalai)
L7 – Bettadapuram (Karamadai)
L8 – Anna Nagar (Karamadai)
L9 – Vadavalli (Karamadai)

a site from Thondamuthur Block. Most of the crops grown in the soil which was taken is banana and the crop residues were incorporated in the soil and hence due to the compactness the bulk density and particle density in the soil is low. The Water Holding Capacity (%) ranged from 32.99 to 40.42% from Anaimalai Block hold the water best at 40.42% (S_2)

Chemical Properties

The pH value ranged from 7.372 to 8.289 and the highest value was recorded at site S_9 (pH 8.289) from Karamadai Block. The Electrical Conductivity ranged from 0.079 to 0.319 dS m^{-1} and the highest value was recorded at the site S_6 (0.319 dS m^{-1}) from Anaimalai Block and the soil was found to be normal. The value of total Organic Carbon (%) varied from 0.586 to 1.209% and the organic carbon content was found highest at site S_5 (1.209%) from Anaimalai Block. High level of organic carbon is due to the presence of high level of organic matter in the soil. The available Nitrogen content of soil ranged from 284.9 to 381.8 kg ha^{-1} and nitrogen content was optimum in all blocks. The available Phosphorus content of soil ranged from 20.32 to 29.33 kg ha^{-1}. All the sites have optimum phosphorus content. The highest value was recorded at S_6 (29.33). Available Potassium content of soil ranged from 112.5 to 158.6 kg ha^{-1} and all the sites have optimum potassium content.

Conclusion

It was concluded that soil parameters studied during the course of investigation clearly indicated that soil has good water holding capacity and good physical condition. The pH of soil is neutral in nature and the Electrical conductivity was suitable for all crops. Organic carbon ranged from medium to high. These soils have optimum NPK in all the sites. depths. Some nutrients are mostly present in upper depths and some of other nutrients is present in lowest depths. The main reason for the optimum level of macronutrients is due to high level of organic matter and the use of crop residues as a source of manure. There is a need to pay greater attention in the role of enhancement of potassium in the soil for good soil health and proper nutrition of plant so as to attain optimum economic yield for all major tropical and sub-tropical crops

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