



PHYSICAL PROPERTIES OF SOIL AFFECTED BY THE USE OF AGRICULTURAL WASTE

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ABSTRACT:

The physical and chemical characteristics of soils in rainfed area of Sangamner area were evaluated to assess the fertility and productivity status of the soils. Fifteen soil samples collected from different sample locations were analyzed for soil texture (sand, silt and clay), bulk density, water holding capacity and porosity. Texturally, the studied soils were clayey and clay loam with percentage of sands (32.36 -38.66 %), silts (25- 33.25 %) and clay (23.82-38.3 %). The bulk density of the soils was 1.21-1.38 % while the porosity of the soils ranged from 54.64 – 60.82 %.

Keywords: physical properties, correlation, productivity, soil

INTRODUCTION:

The farming practices that are governed by the principles of ecology have proved productive and sustainable in several parts of the world. Adoption of such farming systems should not be treated as a reversion to the inefficient and less productive agricultural practices since such practices will be more beneficial in all angles for longer period of time.¹⁰ The gravity of the environmental degradation has drawn the attention of the scientists and planners towards finding out ecologically sound, viable and sustainable farming systems for different agro climatic situations, keeping in view the needs of the present and future generations.

Soils are significantly affected by geologic and geomorphologic factors (water, wind, temperature change, gravity chemical interaction. topography, vegetation, living organism and pressure differences)⁷ Different characteristics of soil such as depth, consistency, temperature, nutrient contents, moisture content, permeability, porosity etc., can greatly influence the nature of vegetation that grows on them⁸. The physical, chemical

and biological processes sustained by soil. Continuous uses of chemical fertilizers do not support the microbial life, which is essential for recycling the nutrients, leading to loss of the fertility.¹⁻⁵ The relationship between trees and soil is of importance since they are dependent on each other and on the environment as a whole¹². The support, nutrients and water needed by trees to grow is provided by soil; while trees and other plants are important factors in the formation and enrichment of soil.¹²

MATERIAL & METHODS:

Study location:

Sangamner area is located in the northern part of the Ahmednagar district of Maharashtra State. The Sangamner tahsil lies between 180 36' N and 1901' N latitude and between 740 1' W and 740 56' W longitude.

The area is drained by the Pravara river, which originates in the hilly region of Western Ghats at Ratangarh. Geologically, basalts underlay the Pravara basin. In general the climate is dry and hot the average

maximum temperature during summer is as high as 42°C in month of May and average minimum temperature falls up to 10°C during the month of December. The area receives rainfall, chiefly from the south west monsoon between June and September as the area falls under the rain shadow zone of Western Ghat and receives very low precipitation, annual rainfall ranging from 290 to 594 mm.

Soil sampling, collection and preparation:

Fifteen composite soil samples were collected randomly from different locations covering distinct areas covered under agriculture, at the depth of 0-20 cm using auger. The composite surface (0-20cm) soil samples were collected in the month of May 2019. While collecting soil samples the upper layer of vegetation, surface litter, stones stubble if any were cleared away and then a layer of soil immediately below (0-20 cm) was collected in a polythene bag.¹¹ Bulk soil samples were taken into polythene bags and labelled accordingly. The collected soil samples were air dried, gently crushed and sieved through 2 mm mesh for laboratory analysis.

Laboratory Analysis:

The laboratory analysis carried out on the soil samples included both physical (particle size distribution, bulk density, water holding capacity and soil porosity) Size distribution test was carried out using international pipette method ^{6,9} The bulk density of the soils was determined by drying the undisturbed core samples to a constant weight at 105°C and dividing the oven dried weight of the samples by its volume and the porosity of the soil was determined by assuming that the particle density of the soil is 2.65 g/cm³.¹³⁻¹⁶ Data was also analysed using Pearson correlation to

show the relationship between the determined parameters.

RESULT & DISCUSSIONS:

Physical Properties of the Soil:

The physical properties of soil such as soil texture, bulk density and porosity as pointed out are predominantly important in determining the ability of the soil for saturation of root, water holding, movement of air, lateral and vertical movement of water into the soil as well as the uptake of water by plants.¹⁷⁻¹⁸ These in turn are important properties in soil productivity and fertility.

The particle size distribution characteristics of the soil showed that sand had the highest percentage value ranging from (32.36 -38.66 %), While clay had the lowest value ranging from 23.82-38.3 %. Texturally, the studied soils were clay loam and clayey (Table 1).

Correlation coefficient between coarse sand, fine sand, clay, maximum water holding capacity, apparent specific gravity and porosity of soil in rainfed area are presented in Table 2 The correlation coefficient of coarse sand showed significant negative correlation with fine sand (-0.608**), clay (-0.419*), maximum water holding capacity (-0.400*) and pore space (-0.564**). Silt per cent in soil showed significant negative correlation with clay (-0.607**). The clay per cent in soil showed highly significant positive correlation with maximum water holding capacity (+0.583**) and pore space (+0.441*). Maximum water holding capacity and pore space showed significantly positive correlation (+0.670**)

CONCLUSION:

The study showed that soil texture is one of the most important factors influencing the

physical properties of the soil. Soil physical and chemical properties were the dominant factors influencing the extent of decomposition process. Soil type of characteristics should be improved applying agriculture wastes. For the physical properties vegetable wastes with high content of lignified organic matter can be used successfully, influencing soil density, porosity.

Soil structure another important factor for plant growth according to is developed through help of soil biota such as earthworms and microbes which in turn creates openings for water, entrance for air, secretes sugars and glues which can bewilderment silt and clay particles together to form aggregates Thus, the appreciable amounts of silt and clay in the studied soils suggest that the soil from Sangamner , in the studied areas had a good structure and stable soil aggregates for plant growth. In this study, a higher porosity and lower bulk density was noted which conforms with the relationship between the two factors as observed This may be attributed to the appreciable amount of organic matter in the soil

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Table 1: Determined Physical properties of the studied soils (Average of 3 samples)

No. of samples	Sand%	Silt (%)	Clay (%)	Textural Class	Maximum water holding capacity	Bulk Density (g/cm ³)	Porosity (%)
1	34.15	25.0	36.25	Clayey	49.91	1.21	28.31
2	38.61	33.25	23.82	Silty clay	44.21	1.30	55.89
3	37.98	27.25	37.95	Clay loam	47.15	1.38	60.82
4	32.36	25.2	38.3	Clay loam	49.28	1.34	58.39
5	35.47	29.15	33.05	Clay loam	44.74	1.27	54.64

Table 2: Statistical values of chemical properties of the studied soils parameters

Variable	Fine sand %	Silt %	Clay %	Maximum water holding capacity %	Bulk density gcm⁻³	Porosity %
Coarse Sand %	-0.608**	-0.343	-0.419*	-0.400*	-0.057	-0.564**
Fine sand %	-	+0.122	+0.289	+0.357	+0.113	+0.504*
Silt %	-	-	-0.607**	-0.254	-0.023	+0.026
Clay %	-	-	-	+0.583**	+0.166	+0.441*
Maximum water holding capacity %	-	-	-	-	-0.157	+0.670**
Bulk density gcm⁻³	-	-	-	-	-	+0.005
Porosity %	-	-	-	-	-	-