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PHYSICAL PROPERTIES OF THE RED SOILS OF KERALA

In India the red soils occupy about 200,000 sq. miies and in Kerala they are localised in the southern parts of Trivandrum district. The physical properties of soil help to determine not only the nutrient supplying ability of soil solids but also the supply of water and air, so vital to plant life. The present investigation was undertaken to assess the physical properties of the red soils where many important crops such as coconut, paddy and tapioca are grown.

The studies were confined to twentyfour soil samples collected from twelve different sites from depths of 0—30 and 30—60 cm in Trivandrum district.

The soil samples after collection were air dried, ground, passed through a 2 mm sieve and the percentage of particles greater than 2 mm size was separately determined. The colour of soil samples was noted using a Munsell colour chart, mechanical components were determined by the International Pipette method and physical constants using Keen—Raczkowski box.

The surface soils were found to be red in most cases while a yellowish tinge was noted in the sub-surface samples from Muttacaud and Thiruvallam. Marked variation in colour was not observed between surface and sub-surface layers and so horizon differentiation on the basis of colour was not easy. Menon and Mariakulandai (1957) observed that the colour of the red soils is due mainly to iron oxides which occur as thin coatings on the soil properties. The surface soils were reddish and the lower ones showed yellowish tinge due to the fact that dehydration of iron oxides was greater in the surface layers. When the iron oxides occur as haematite or anhydrous ferric oxide, the colour imparted is red, with limonite or hydrated ferric oxide the soil gets yellowish colour and the mixtures of the two oxides gave different shades of red and yellow depending on which oxide predominates.

The average percentages of gravel (Table 1) in the surface and sub-surface samples were 2.2 and 1.6 respectively. In the surface samples the coarse sand fraction varied from 38.5 to 58.1 per cent, fine sand 9.2 to 15.6 per cent, silt 7.5 to 19.6 per cent and the clay 18.9 to 32.1 per cent. In the sub-surface samples the coarse sand, fine sand, silt and clay ranged from 38.1 to 55.0 per cent, 8.0 to 14.3 per cent. 9.4 to 19.4 per cent and 21.3 to 33.4 per cent respectively. Durairaj (1961) obtained very high correlation between clay and coarse or fine sand

The various physical constants of the soil studied are given in Table 2. In the surface samples the apparent density varied from 1.2 to 1.7 with an average of 1.4; the maximum water holding capacity 21.5 to 47.5 percent, the average being 30.7 per cent; the porespace from 32.8 to 54.7 percent with an average of

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Table 1

General description and mechanical composition of the soil samples

Location	Depth (cm)	Colour	Organic matter %	Coarse sand %	Fine sand %	Silt %	Clay %	Particles > 2 mm %
Vellayani	0-30	Dusky red	1.5	58.1	13.5	7.8	18.9	0.58
	30-60	Reddish brown	1.5	51.1	13.4	12.2	21.5	0.68
Kalliyoor	0-30	Dark red	1.5	51.8	12.8	11.3	22.5	1.00
	30-60	Reddish brown	1.3	49,2	12.9	9.7	26.5	0.68
Muttacaud	0-30	Red	1.3	S8.6	15.4	14.9	29.0	1.72
	30-60	Reddish brown	1.2	39,7	12.3	14.6	32.2	8.81
Thiruvallam	0-30	Red	1·2	49.4	9.4	19.4	20.0	14.41
	30-60	Reddish yellow	1.2	51.3	8.0	17.7	21.3	5.73
Venganoor	0-30	Dusky red	1.5	55.9	15.3	7.5	19.5	0.26
	30-60	Dark red	1.4	54.6	11.9	9.5	23.5	0.24
Pallichal	0-30	Reddish brown	1.4	55.6	14.7	9.1	19.0	1.15
	30-60	Red	1.3	50.8	13,3	10.6	23.4	1.41
Vizhinjam	0-30	Reddish brown	1.2	49.8	12.8	10.9	25.1	2.66
	30-60	Dark red	0.9	50.2	11.2	19.6	18.9	3.66
Poovar	0-30	Dark red	1.2	38.5	10,2	18.0	32.1	0.27
	30-60	do	0.9	38.1	8.7	18.1	33.4	0.32
Thirupuram	0-30	do	0.7	56.4	10.9	9.8	21.6	1.34
	30-60	Dusky red	0.7	55.0	10,0	10.4	22.9	1.18
Olathanni	0-30	do	1.0	51.9	9.2	8.6	28.8	0.44
	30-60	do	1.0	50.6	8.2	9.7	30.6	0.56
Ooroottukala	0-30	do	1.5	39.9	15.6	12.1	29.9	1.10
	30-60	Dark red	1.4	38.6	14.3	12.3	32.1	0.37
Aluvila	0-30	Reddish brown	1.4	48.1	11.3	17.9	21.0	1.15
	30-60	Red	1.3	47.5	10.8	17.7	22.5	1.41

Table 2

Physical constants of the soils

Sl. No.	Apparent density	Maximum water holding capacity %	% of porespace	Volume expansion %
1 a	1.5	23.0	46.8	1.9
b	1.7	27.8	41.9	3.3
2 a	1.3	35.6	48.3	0.5
b	1.3	36.5	47.1	0.9
3 a	1.2	47.2	54.4	2.3
b	1.2	48.0	52.1	2.4
4 a	1.3	21.7	36,6	1.1
b	1.5	22.5	35,4	1.5
5 a	1.2	27.0	41.1	1.1
b	1.3	28.9	41.1	3.1
6 a	1.2	47.5	54.7	2 2
b	1.3	48.3	54.6	2.4
7 a	1.6	23.1	36.8	2,0
b	1.6	23.6	36.1	2.3
8 a	1.3	30.5	45.1	1.3
b	1.4	30·7	44.8	1.3
9 a	1.7	41.6	52 6	2.2
b	1.8	42.6	50.1	2.6
10 a	1.6	22.1	36.7	1.4
b	1,7	22.9	35.9	1.9
11 a	1.5	21.5	36.9	1.5
b	1.6	23.5	36.1	1.8
12 a	1.6	22.7	32.8	1.6
b	1.6	23.3	33.0	1.7

44.0 percent and the volume expansion from 0.5 to 3.0 percent, the average being 2.0 percent. In the sub-surface samples, the apparent density ranged from 1.2 to 1.8 with an average of 1.5, the maximum water holding capacity 22.5 to 48.3 per the average being 31.9 percent, porespace 33.0 to 54.6 percent with an average of 42.8 percent and the volume expansion 0,9 to 3.3 percent, the average being 2.1 percent. Comparatively low bulk density indicates that these soils are lose and porous. The sub–surface soil samples showed increase in apparent density due to the compact nature. But for the porespace, all the physical

constants tended to increase with depth, the results are in general agreement with those reported by Rangaswamy (1965) and Parvathappa (1964). As the bulk density increases with depth the porespace decreases and thus the sub-surface samples are more compact in nature.

സംഗ്രഹം

കേരളത്തിലെ ചുവന്ന മണ്ണിന്റെ ഭൗതിക ഗുണങ്ങളം പരിശോധിച്ചപ്പോൾ അവ വളരെ ഇളക്കമുള്ളതും, വായുസഞ്ചാരം മിതമായുള്ളതുമാകയാൽ വിളകളുടെ വളർച്ചയ്ക്ക് ഏറെറവും അനുയോജ്യമാണെന്ന് കണ്ടു.

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