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Characterisation Of Soils Of Western Ghats In Dakshina Kannada District, Karnataka

G.C. SATISHA AND BADRINATH

Department of Soil Science and Agricultural Chemistry, University of Agricultural Science, Bangalore-560 065.

Abstract : *Eight typical soil profiles collected from Western Ghats at high elevation of Dakshina Kannada district of Karnataka were studied for assessment of their fertility status. The soils of western ghats at Agumbe upland and midland were silty clay loam, clay loam and clay in texture. They were distinctly acidic (pH 4.4 to 5.9). The status of organic carbon decreases with terrain elevation. The nutrient status was low to adequate. The surface soil has higher amount of available zinc, copper and iron than subsurface layer.* (**Key Words** : *Soils of Western Ghats, acidity and fertility Status).*

Dakshina Kannada occupies a major part of the coastal belt in Karnataka state of Western ghats district occupies . Soils of this coastal region are basically lateritic in nature with high amount of sesquioxides, and are put to forestry and plantation crops. Since the system of farming in this area has remained unchanged for many years, it was felt imperative to characterise these soils to take amciorative measures for improving their productivity. Existing information on these soils is meagre to obtain a remunerative system of plantation farming.

MATERIAL AND METHODS

Following the topo-sequence and other relevant features a cross section was selected in Dakshina Kannada district of Western Ghat - Agumbe to Kankandy Mangalore coast. Soil samples from typical profiles were collected at fixed depth intervals and analysed for physical and chemical properties (Jackson 1973; Piper 1966 ; Black 1965), and for available micronutrient content (DTPA method) (Lindsay & Norvell 1978), and available boron as described by Hatcher and Wilcox (1950).

RESULTS AND DISCUSSION

The soils of Western Ghats at Agumbe were silty clay loam in texture with high porosity, water holding capacity and per cent expansion. But the soils on hillocks at Mudrady were clay in texture with high bulk density and low moisture holding capacity. The upland soils at Mulupaddi and

Kankanady were Barren and wastelands. They have high bulk density, medium water holding capacity and low per cent expansion. In Midland areas of Brahmavar and Kankanady, the soil texture varied from clay to sandy clay loam with moderate bulk density and water holding capacity and low expansion (Table 1).

All soils were distinctly acidic (pH 4.4 to 5.9). Soils situated on hillocks at Mudrady (Brahmavar - UAS Farm) were highly acidic with pH varying form 4.4 to 4.9. However, the acidity is found to decrease with elevation. The status of organic carbon also decreases with elevation. Soils of high elevation at Agumbe were rich in organic matter followed by soils situated at Hillocks - Mudrady. Similar trend was observed with regard to total nitrogen (Table 2). The soil samples studied were predominantly kaolinitic in nature, cation exchange capacity was low. Among them soils of Western Ghats at Agumbe and Brahmavar - UAS old farm showed relatively higher CEC. The base saturation ranges from 13 to 49 per cent. The available sulphur status was alarmingly low in all the soils. With respect to micronutrients, the soils were adequate in zinc throughout the profile. Surface soils

Table 1. Physical properties of soils of Western Ghats in Dakshina Kannada district.

Depth (cm)	Texture	B.D. (g cm^{-3})	P.D. (g cm^{-3})	P.S. (%)	Max. WHC (%)	Expansion
Western Ghats (Agumbe)						
0-15	Sicl	1.24	2.98	58.19	54.97	14.82
15-30	Sicl	1.39	3.25	57.05	48.02	17.59
30-45	Sicl	1.39	3.03	54.02	46.93	17.36
Hillocks (Mudrady)						
0-15	C	1.46	2.34	37.81	38.80	11.39
15-30	C	1.32	2.54	37.80	42.12	11.98
30-45	C	1.52	2.47	38.33	36.77	10.88
Upland (Mulupaddi)						
0-15	Cl	1.56	2.33	32.87	33.92	10.95
15-30	Cl	1.54	2.61	41.02	37.18	11.36
30-45	Cl	1.47	2.19	32.38	36.38	10.81
Upland (Kankanady)						
0-15	Cl	1.50	2.43	38.24	37.40	10.01
15-30	Cl	1.46	2.60	37.43	33.67	7.48
30-45	Cl	1.51	2.39	36.80	32.81	6.80
Barren and Wasterland (Hiriadka)						
0-15	Cl	1.45	2.73	40.70	37.78	8.24
15-30	Cl	1.56	2.69	42.09	33.69	12.02
30-45	Cl	1.59	2.32	31.64	32.87	10.22
Marginal land (Brahmavar - UAS Farm)						
0-15	C	1.42	2.45	42.46	41.43	9.56
15-30	C	1.33	2.32	42.06	44.82	8.62
30-45	C	1.31	2.16	39.40	45.72	9.42
Midland (Brahmavar - UAS old Farm)						
0-15	Cl	1.49	2.35	36.54	36.72	9.75
15-30	C	1.45	2.73	46.70	41.87	11.97
30-45	C	1.41	2.35	39.94	40.82	12.78
Midland (Kankanady)						
0-15	Scl	1.47	2.18	30.55	36.65	8.56
15-30	Scl	1.42	2.57	32.75	35.53	4.74
30-45	Scl	1.52	2.68	38.10	31.60	7.91

Sicl = Silty clay loam; C = Clay; C1 = Clay laom; Scl = Sandy clay loam

BD = Bulk density; PD = Particle density; PS = Pore space.

TABLE 2. Physico-chemical properties of soils of Western Ghats in Dakshina Kannada Ditrict.

Soil depth (cm)	pH (1:2.5)	EC. (dSm^{-1})	OC. (%)	Total N (%)	CEC	Exch. Ca	Exch. Mg	BS (%)	Avail. S (ppm)	Nutrients Zn	Cu	Mn	Fe	B	N	P	K
					Cmol (p^+) kg^{-1}					<----------ppm---------->					(Kgha^{-1})		
Western Ghats (Agumbe)																	
0-15	5.5	0.08	3.05	0.310	13.2	2.9	2.8	43	0.18	3.27	4.27	34.7	18.3	0.73	676	5	268
15-30	5.6	0.14	2.20	0.220	11.2	2.1	2.0	37	0.18	1.59	4.35	45.5	17.8	0.78	516	10	209
30-45	5.9	0.07	1.45	0.105	10.1	2.9	1.8	44	Tr.	0.76	4.32	40.5	20.2	0.59	498	5	184
Hillocks (Mudrady)																	
0-15	4.7	0.29	1.84	0.210	9.2	2.0	0.7	29	0.16	0.53	0.94	9.3	27.5	0.50	498	7	228
15-30	4.9	0.08	1.70	0.155	6.8	2.2	0.5	49	0.47	0.49	0.87	8.8	24.2	0.41	411	4	134
30-45	4.7	0.32	1.27	0.111	8.8	2.1	0.5	30	Tr.	0.40	0.72	9.0	19.0	0.45	258	10	137
Upland (Mulupaddi)																	
0-15	5.0	0.09	1.52	0.141	3.6	0.8	0.2	28	0.15	0.65	0.89	2.3	29.2	0.45	298	6	88
15-30	5.2	0.05	0.78	0.059	4.1	0.8	0.3	27	Tr.	0.65	0.60	7.7	19.2	0.45	258	5	914
30-45	5.3	0.04	0.32	0.029	4.8	0.9	0.5	29	2.27	0.37	0.28	5.4	7.3	0.50	218	5	118
Upland (Kankanady)																	
0-15	5.2	0.03	1.02	0.073	7.6	2.2	0.8	40	0.08	0.84	2.88	3.4	39.4	0.45	254	7	838
15-30	5.8	0.01	0.67	0.068	7.6	2.5	0.7	42	4.97	0.32	1.12	9.3	8.7	0.41	251	7	76
30-45	5.7	0.01	0.39	0.038	5.2	2.8	0.5	63	6.69	0.34	0.76	4.3	2.90	0.37	251	7	118
Barren and Wasteland																	
0-15	5.2	0.04	0.88	0.090	8.0	1.9	0.1	25	5.29	0.34	0.32	10.5	12.3	0.59	207	7	103
15-30	4.6	0.42	0.53	0.063	7.9	2.2	1.1	41	2.76	0.22	0.21	11.0	9.3	0.54	174	6	120
30-45	5.0	0.05	0.28	0.034	5.6	0.9	1.0	33	6.77	0.76	0.16	8.6	4.0	0.78	120	5	61
Marginal land (Brahmavar-UAS Farm)																	
0-15	4.4	0.82	0.95	0.078	10.8	1.0	0.4	13	4.27	0.57	0.34	41.1	10.1	0.50	312	5	164
15-30	4.6	0.32	0.67	0.061	8.2	2.2	0.9	38	3.62	0.36	0.25	36.2	7.7	0.78	247	5	130
30-45	4.6	0.17	0.60	0.069	4.0	1.6	0.1	43	9.95	0.48	0.24	36.5	5.7	0.64	214	5	108
Midland (Brahmavar-UAS Old Farm)																	
0-15	5.2	0.19	1.13	0.110	8.8	1.7	0.6	26	0.46	2.43	1.84	26.0	26.0	0.45	378	5	66
15-30	5.6	0.09	0.53	0.057	11.7	1.7	1.2	25	0.08	0.81	0.47	18.8	7.0	0.50	341	5	103
30-45	5.8	0.34	0.46	0.045	15.6	4.2	1.4	36	1.61	0.37	0.18	7.4	5.0	0.54	301	7	130
Midland (Kankanady)																	
0-15	5.3	0.13	1.49	0.132	6.8	1.7	0.4	39	0.18	1.09	2.00	3.3	68.0	0.45	396	37	146
15-30	5.6	0.07	1.81	0.146	5.0	1.5	0.4	38	Tr.	1.03	2.34	3.6	64.4	0.41	360	25	141
30-45	5.7	0.03	1.27	0.112	4.2	1.6	0.3	45	0.93	0.78	2.53	3.6	55.8	6.41	407	25	149

OC = organic matter; BS = base saturation, P = P_2O_5, K = K_2O

have higher amount of available zinc, copper and iron than subsurface lay- er. Presence of available iron in toxic amounts was evident in soils of the Midland at Kankanady. Available boron status in all soils was generally low. It is obvious that soils of Western Ghat at Agumbe were quite productive. Low status of available phosphorus was mainly attributed to its higher removal than replenishment and also of high P fixing capacity. The low status of available zinc in the lower depths of these soils were associated with high rate of mineralisation and leaching losses without concomittent replenishment (Viramani & Kanwar 1971). Available micronutrient content was low in barren and wasteland soils of Hiriadka which may possibly be due to surface erosion. In general, there was fairly wide variation micronutrient content and it was attributed to the stage of weathering of minerals and the reduced conditions prev- ailing in the lower horizons Nair and Cottenie (1971). The soils were low in available boron because of complexation with silicate mineral as well as subjected to leaching losses (Bhandari & Randhawa 1985).

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