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Distribution of Exchangeable Calcium in Nilgiris Soils

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In view of the importance of exchangeable calcium determination as a measure of lime requirement of acid soils, this parameter was tested in 33,300 soil samples collected for the preparation of village level fertility map. This paper records the results of the first systematic investigation on exchangeable calcium content in the soils of the individual farmers holdings of the district. Areas falling under different ranges of exchangeable calcium content are indicated.

Calcium occurs in soil minerals which weather fairly more readily than the other common soil minerals. There is therefore, a tendency for the amount of calcium in a soil to gradually decline as weathering and leaching progress. The loss of calcium from soils in humid regions would undoubtedly be much more rapid especially if Ca++ ions were not strongly attracted to cation exchange sites.

The Nilgiri soils are subjected to heavy rainfall. The loss of easily soluble nutrients especially calcium is quite considerable due to leaching and erosion. This is evidenced by low acid conditions. Such conditions could be rectified by returning to the soil appropriate amounts of lime.

Lime requirement is calculated based on the pH values. But the exchangeable calcium in a soil has an important relation to the soil pH and to the availability of several other nutrients. Furthermore, exchangeable calcium is a better indicator in calculating lime requirement of any soil to raise the pH to the desired level, since the base saturation percentage of different soils having the same pH is decidedly variable because of differences in cation-exchange capacity. Considering the above factors, exchangeable calcium was also recorded for Nilgiri soils and its distribution pattern is indicated in this paper.

MATERIALS AND METHODS

As many as 33,300 surface soil samples were collected from the entire farmlands of the Nilgiris. Exchangeable calcium was extracted with 25 ml of 1 N neutral ammonium acetate in 5 gm portion of soil and measured in a Carl Zeiss Flame Photometer using a calcium filter.

RESULTS AND DISCUSSION

The values on the average exchangeable calcium content in the various

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TABLE I. Villagewar percentage distribution of exchangable calcium in different groups

Name of the village	No. of samples analysed	Range of values lb/ac	Average lb/ac	Per cent of the total samples analysed				
				1000	1001-2000	2001-3000	3001-4000	4000
OOTACAMUND BLOCK								
Masanigudi	317	475-9125	2635	16.09	26.56	25.55	11.04	20.82
Mulligur	105	475-2950	1065	51.42	44.76	3.82	—	—
Melkundha	86	250-3475	1241	41.86	48.73	8.14	1.27	—
Kilkundha	90	475-4575	1707	8.89	60.00	20.00	7.78	3.33
Bikkatty	96	400-2500	1018	59.37	36 46	4.17	—	—
Balacola	704	100-4025	1100	49.72	46.02	4.26	—	—
Ithalar	912	250-3375	1041	60.84	31.03	7.02	1.11	—
Nanjanad	584	100-4375	980	60.45	37.16	2 23	—	0.16
Ootacamund	2877	300-4750	1857	12.62	52.99	25.48	5.63	3.28
Thummanatty	4058	325-4475	1127	48.54	44.26	6.23	0.64	0.33
Kogguchi	1331	325-4650	1253	39.75	48.75	6.98	2.03	2.49
Kukal	536	775-4750	2373	1.68	28.54	55.17	11.38	3.23
Edanad	1604	100-5525	1639	16.46	56.30	23.19	3.42	0.63
Thuneri	3690	475-6030	1463	33.20	43 60	20 19	2.66	0.35
Kadanad	541	400-5000	2253	7.03	35 35	37.70	11.64	6.28
Hullathi	588	325-4900	2122	5.61	44.89	35.70	11.53	2.24
Sholur	444	444-10000	2281	5.63	50.67	23.42	11.04	9.24
Naduvattam	80	175-1625	674	78.75	21.25	—	—	—
Kinnakkorai	45	700-3050	1488	22.22	60.00	15 56	2.22	—
COONOOR BLOCK								
Melur	41	625-2375	1282	21.96	75 60	2.44	—	—
Hulikkal	39	625-3750	1619	12.82	69.23	10.26	7.69	—
Burliar	64	700-3375	2115	4.98	23.40	70.36	1.56	—
Yedapalli	75	400-3050	1437	33.33	54.67	9.33	2.67	—
Coonoor	90	1553-4825	2703	—	10.00	50.00	31.11	8.89
Ubbathalai	115	325-3050	1393	27.83	53.91	13.92	4.34	—
Jagathala	253	325-3650	1562	11.86	71.16	15.00	1.98	—
Ketti	3894	250-4650	1140	48.28	43.91	7.41	0.41	0.29
Adigaratti	197	550-4850	1577	27.41	53.80	8.12	6.61	4.06
KOTAGIRI BLOCK								
Naduhatti	90	475-3550	2152	1.09	58.23	58.23	2.18	—
Kotagiri	198	550-2750	1304	25.25	65.64	9.11	—	—
Jakkanarai	90	900-3475	1915	1.11	63.33	28.89	6.67	9.11
Kengarai	76	1625-4900	2774	—	11.84	60.53	17.10	10.53
Kadinamalai	90	775-4575	2577	3.33	15.56	63.33	15.56	2.22
Arakodu	72	1875-3850	3135	—	1.39	38.88	55.56	4.17
Denad	90	400-4150	1496	17.78	62.22	15.56	15.11	3.33

Nandipuram	90	475-3550	2076	2.22	48.84	46.72	2.21	—
Thengumarada	130	775-3550	3394	—	33.08	58.46	7.69	0.77
Kodanad	90	1000-2574	1694	—	74.44	25.56	—	—
Nedugula	2251	200-4850	1678	16.92	56.90	20.04	4 00	2.14
Konakkarai	78	775-3550	1886	6 41	50.00	37.18	6.41	—
GUDALUR BLOCK								
Erumad	2010	100-3850	231	94.17	5.57	0.20	—	0 05
Cherangode	2076	100-6650	540	93 28	5.97	0.25	0.25	0.25
Nelliyalam	603	100-3650	482	89.06	7.14	1.90	1.90	—
Munanad	623	100-3650	1032	55.38	35.63	7.73	1.26	—
Devala	144	100-1250	339	97.88	2.12	—	—	—
O'Valley	115	475-6560	1614	30.30	41.74	21.74	5.33	0.89
Gudalur	240	100-2750	691	84.58	14.58	0.84	—	—
Mudumalai	120	625-3750	1637	32.50	34.17	27.50	5.83	—
Srimadurai	202	250-3475	1225	46.52	33.66	19 28	0.54	—
Cherumuli	160	250-2850	464	82.50	11.89	5.61	—	—
Padanthorai	320	250-3050	740	71.25	28.13	0.31	0.31	—
Nellakkotta	80	475-2950	1743	21.25	36.25	42.50	—	—

villagesof the district are given in Table I. A wide range of exchangeable calcium was observed in the soil samples. The exchangeable calcium in individual soil samples varied from 100 lb per acre to more than 10,000 lb per acre. On an average, the exchangeable calcium content in soils of Naduvattam village was found to be the lowest, with 674 lb per acre whereas the samples from Thengumarada village recorded an average of 3394 lb per acre. The average figures for the various blocks with the percentage of samples falling under different groups are furnished in Table II.

Walker (1952) stated that soils testing more than 0.2 per cent of ex. Ca. (more than 4000 lb per acre) could be taken as the safe limit above which no lime is recommended. In the present study except for 1.55 per cent of the area in the Nilgiris, the soils need liming. About 75.64 per cent of the area in Ootacamund, 71.55 per cent in Coonoor, 49.55 per cent in Kotagiri and 87.95 per cent of the area in Gudalur blocks recordod very low exchangeable calcium content of less than 2000 lb per acre. The percentage areas in the district are 31.64,39.61, 21.76, 5.44 and 1.55 falling under different groups of exchangeable calcium of less than 1000 lb per acre, between 1001 and 2000 lb per acre, between 2001 and 3000 lb per acre, between 3001 and 4000 lb per acre and more than 4000 lb per acre respectively.

The exchangeable calcium status is very poor in areas bordering Kerala State (Erumadu, Nelliyalam, Cherangod, Devala, Cherumuli, Gudalur, Padanthorai, Naduvattam and Nanjanad villages) This may be due to the fact that these areas are exposed to the heavy south west monsoon rains from July to August every year. Thengumarada village is situated in the eastern border of district and is in the plains. Hence it recorded the maximum content.

TABLE II. Blockwise distribution of exchangeable calcium

Name of the Block	No. of samples					Percentage of the total				
	1000	1001-2000	2001-3000	3001-4000	4000	1000	1001-2000	2001-3000	3001-4000	4000
Ootacamund	5993	8456	3252	663	302	32.63	43.01	17.09	4.39	2.83
Coonoor	2038	2181	450	73	26	21.22	50.63	20.76	6.26	1.13
Kotagiri	459	1776	863	183	65	6.17	43.30	38.58	9.85	2.07
Gudalur	5601	834	205	38	7	66.55	21.40	10.67	1.27	0.11
Total	14091	13247	4773	957	400	31.64	39.61	21.76	5.44	1.55

Liming is needed to the soils of the district in more than 98.45 per cent of the area as evidenced by the exchangeable calcium content of less than 4000 lb per acre in those soils. But a wide range of variation in the exchangeable calcium content in the soils of all the villages calls for a further detailed study of the problem of liming in conjunction with the base saturation percentage, pH, the crops to be grown in these soils to decide upon the quantity of lime to be applied. Areas exposed to heavy rains recorded the lowest amounts and areas situated in the plains where loss due to solubilisation and leaching are at the minimum recorded the highest amounts of exchangeable calcium.

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