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Potassium Fixation in the Laterite Soils of Nilgiris District *

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Laboratory incubation studies were conducted with surface samples from high level laterite soils of Nilgiris District to study the fixation of applied potassium in the soils and to know the relationship between K fixation and other soil properties. K fixation ranged from 4·6 per cent to 20·0 per cent and this low percentage of K fixation might be due to the abundance of Kaolinite clay in these soils. No significant relationship was obtained between percentage K fixation and soil properties like organic carbon, CEC, clay content and pH.

Most of the K present in soil is not immediately available to the plants. When soluble form of K is added to soil as fertilizers, it is fixed or rendered unavailable even under the most ideal field conditions. This problem has received the attention of many workers.

In the high level laterite soils of Nilgiris District where potato is grown, high doses of K are being applied every year. So the study of K fixation in these soils was carried out. Dhar and Singh (1963) reported that soils of high pH and those rich in Ca, Mg and Na fixed more K than did acid soils and soils poor in bases. Higher K fixation due to the presence of montmorillonite clay in the soil clay fraction was reported by Balasundaram and Krishnamoorthi (1974) and Grewal and Kanwar (1967).

MATERIAL AND METHODS

Surface soil samples from twenty seven profiles collected from different areas of the district covering wide range of rainfall and elevation were used for the incubation studies. The clay content, organic matter, pH and cation exchange capacity of the soil samples are furnished in Table I. The soil samples were incubated at laboratory temperature with graded doses of water soluble K (0 to 360 Kg K_2O/ha) for seventy two hours. At the end of the incubation period the neutral normal ammonium acetate exchangeable K was determined in each sample. The difference between the K content in the control (0 Kg K_2O/ha) and in the rest gave the amount of K that was not fixed. From the difference between 'K' that was not fixed and the added K, the amount of fixed K was determined and expressed as percentage.

RESULTS AND DISCUSSION

The percentage of K fixation in the soils collected from different areas are given in the Table II.

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Percentage of K fixation ranged from 4.6 to 20.0 when all the levels of added K were taken into consideration. The low percentage af K fixation might be due to the aboundance of Kaolinite clay in these soils (Bala-

TABLE 1 Clay, Organic matter contents, pH and Cation exchange capacity of the surface soils.

Location	Clay %	Organic matter %	pH	Cation exchange capacity (me/100g.)
Aravenu	24.42	2.69	4.5	12.4
Burliar	19.33	1.40	6.7	12.4
Coonoor	48.19	1.71	5.2	8.0
Jakanerai	32.84	2.52	4.9	12.0
Kallar	5.37	1.29	6.7	12.0
Kattabattu	12.77	3.78	6.2	11.0
Kengarai-Kilhatty village	52.51	2.10	4.4	9.0
Kodaned	35.06	3.83	5.0	10.4
Kotagiri	15.83	3.15	4.8	13.2
Melur-Horcucni	27.69	3.55	6.0	15.0
Shoulurmattan	22.94	2.77	5.1	9.7
Gle-nwas Estate	27.86	2.36	5.2	12.5
Gudualar-Dherversole	41.53	1.15	5.2	8.7
Mudumalai	24.25	1.63	5.6	13.4
Nadugani	34.87	1.41	5.2	6.6
Naduvatam	20.28	2.47	4.7	10.3
O-valley	47.98	1.14	4.8	12.9
Bickatty-Karapad	41.72	0.95	5.4	8.0
Doddabetta	18.03	5.54	4.4	7.0
Emeralad	43.76	1.51	4.7	7.6
Gaikandi	38.25	2.71	4.7	8.1
Ithalar	33.88	2.18	5.1	14.4
Kinnakarai	15.82	1.96	6.3	9.8
Kunda-Ketchiketti	28.57	0.97	5.2	9.2
Nanjanad	42.55	3.29	4.9	11.1
Ootacamund	29.32	2.54	6.6	12.0
Parsen Valley	49.97	4.49	4.8	11.0

sundaram and Krishnamoorthy, 1974). This is similar to the results of Feng and Chang (1964) in Taiwan rice soils and that of Nambiar (1972) who obtained the lowest percentage of K fixation in laterite soils.

TABLE II Percentage of fixation of added potassium

Location	Percentage of added K fixed at the levels of added K_2O (Kg/ha)			
	30.0	90.0	120.0	360.0
Aravenu	17.1	19.4	19.3	19.3
Berliar	18.5	19.6	19.4	19.4
Coonoor	18.1	18.7	19.3	19.3
Jakanarai	18.5	19.4	19.4	19.4
Kallar	20.0	19.8	19.8	19.8
Kattabettu	17.1	19.4	19.4	19 4
Kengarai	17.1	19.3	19.3	19.3
Kodanad	20.0	19.4	19.4	19.4
Kotagiri	18.5	19.5	19.3	19.3
Melur	17.1	19.4	19.4	19.4
Sholurmattam	15.6	19.8	19.6	19.4
Glenwas Estate	18.5	19.9	19.9	19.9
Gudalor	20.0	19.4	19.4	19.4
Mudumalai	18.5	19.7	19.5	19.5
Nadugani	17.1	19 6	19.3	19.3
Naduvattam	17.1	19.4	19.4	19.4
O'Valley	20.0	18.9	19.3	19.3
Bikkatty	20.0	19.3	19.6	19.6
Doddabetta	18.5	19.4	19.4	19.4
Emarald	19.3	19.6	19.6	19.6
Gaikandi	19.3	19.6	19.6	19 6
Ithalar	17.7	18.6	19.7	19.7
Kinnakorai	4.6	14.7	17.7	16.1
Kundah	17.1	19.6	19.7	19.3
Nanjanad	17.8	19.7	19.6	19.6
Ootacamund	11.2	18.8	19.3	19.3
Parssen valley	18.5	19.5	19.6	19.6

In most of the soil samples studied, there was an increase in percentage K fixation with increasing levels of added K up to certain level and then it remained constant, which might be due to the progressive satisfaction of K fixing capacity through increased K addition. Similar trends were obtained by Nambiar (1972).

No significant relationships were obtained between percentage K fixation and soil properties like CEC, organic carbon, clay content and pH. There was also no wide variation among the soils in percentage K fixation. Hence it is suggested that the type of clay present in the soil alone is responsible for K fixation in these soils.

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