Agri. Res. J. Kerala, 1973 11 (2) 126—129

THE MOLYBDENUM STATUS OF KERALA SOILS*

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Molybdenum has been recognised to be an essential element for plant growth since Arnon and Stout (1939) demonstrated the clear-cut response of tomato plants to Mo in water cultures. According to Goldschmidt (1954) ths lithosphere contains on an average 2.3 ppm of Molybdenum. Dakshinamurti et al (1955) found that the total Mo content of Delhi soils varied from 0.7-2.6 ppm. In their investigation of some other Indian soils, Chatterjee and Dakshinamurti (1962) observed the total Mo content of alluvial soils to be in the range of 1.0-5.6 ppm of which about 5 - 9.6% was in the available form. In the regur and laterite soils the level of Mo was about 1.5 ppm, of which only 1.3 - 2.3 % was available. Reddy (1964) noted that the total Mo content of the soils of Gujarat varied from 0.5 - 4.1 ppm. Agarwala (1963, 1964) has reported that the total Mo content of the alluvial soils of Uttar Pradesh varied from 0.013 - 0.55 ppm. In the alkali soils of Uttar Pradesh, Singh and Singh (1966) noted that the total Mo content ranged from 0.4 to 2.78 ppm with an average of 0.8 ppm. In Kerala no systematic investigation of the distribution of Molybdenum in soils has been carried out so far and hence the present study.

Materials and Methods

The materials for this investigation consisted of 14 soil profiles collected from different parts of Kerala. As the profiles often lacked horizon differentiation the soils were collected from fixed depths of 0-30, 30-60 and 60-90 cm. In the case of the two *kari* profiles from Vechoor, samples from only two horizons could be collected as the fields were submerged under water at the time of soil collection. After collection from the fields the samples were air-dried for about a week, gently ground with a wooden mallet and the material passing through a 2mm sieve was collected and stored in labelled glass bottles.

Total Mo in the soils was determined by the method proposed by Sandell (1950) and later modified by Atkinson et al (1958). Standard analytical procedures were followed for the other estimations.

* From the Thesis submitted by the Senior Author (V. R.) for the M. Sc. (Ag) Degree of the Kerala University, 1969.

Table 1.

Distribution of total Molybdenum in Kerala soils in relation to other soil characters

Sl. No,	Locality	Soil group	Depth cm	pH	Org.C %	Nitro-gen %	C. E. C. me/100g	Total Mo ppm
1.	Kayamkulam, Site I	Sandy	0-30	5.1	0.17	0.03	2.1	2.1
			30-60	5.4	046	0.06	2.2	2.0
			60-90	5.2	0.14	0.04	2.0	1.0
2.	Kayamkulam, Site II	Sandy	0-30	5.0	0.19	0 04	1.5	2.2
			30-60	5,3	0.15	0.03	1.9	2.0
			60-90	5.2	0.12	0.02	2.1	1.1
3.	Chirayinkil	Sandy	0-30	6.0	0.17	0.02	4.4	0.9
			30-(.0	5,0	0.08	001	2.4	0.8
			60-90	5.1	0.15	0.003	2.0	0.7
4.	Alwaye	Alluvial	0-30	5.1	4.16	0.41	18 8	2.6
			30-60	4 3	2.54	0,29	13.4	2.6
			60-90	4.2	2.26	0.29	13 8	2.1
5.	Trichur	Alluvial	0-30	5.0	2.84	0.40	9 8	2 3
			30-60	4.5	0.34	0.05	4,9	2.0
			60-90	4.8	0.15	0.05	5.7	1.7
6.	Perinthalmanna	Laterite	0-30	4.8	0 33	0.11	4.4	1.0
			30-60	4.6	0.52	0.21	6.8	1.3
			60-90	4,7	0.16	0.07	3.8	1.2
7.	Angadipuram	I aterite	0-30	4.4	0.91	0.10	5.1	1.0
			30-60	4.8	0.39	0.08	6.2	1.2
			60-90	4.6	0.15	0.08	5.4	1.1
8.	Kozhinjamapara Site I	Black	0-30	7.8	0.57	0.08	48.0	1.2
			30-60	7.5	0.29	0.07	47.3	1.1
			60-90	7.8	0.37	0.04	46.9	1.0
9.	Kozhinjamapara Site II	Black	0-30	8.0	0.23	0.05	47.2	1.1
			30-60	7.6	0.40	0.04	49.6	1.1
			60-90	7.9	0.37	0.04	47.0	1.0
10.	Palode	Forest	0-30	4.6	1.04	0.12	5.9	0.9
			30-60	4.8	0 65	0.05	3.6	0.8
			60-90	4.9	0.17	0 01	3.0	0.8
11.	Vellayani	Red	0-30	4.3	0.35	0.04	2.5	1.7
			30-60	4.3	0.20	0.03	1 8	1.5
			60-90	4.4	0 23	0.02	1.6	1.4
12.	Pachalloor	Red	0-30	4.7	0.43	0.04	2.1	2.2
			30-60	1 9	0.33	0.03	2.5	2.2
			60-90	4 9	0.20	0.02	2.4	2.0
13.	Vechoor, Site I	Kari	0-30	3.9	8.06	0,45	27.3	1.4
			30-60	3 0	10.60	0.41	24.1	1.2
14.	Vechoor, Site II	Kari	0-30	3.7	10.06	0.45	28.8	1.3
			30-60	3.0	9.66	0.54	24.0	1.1

Results and Discussion

The data relating to the distribution of total Mo in relation to some of the soil characters such as pH, organic carbon, total nitrogen and the cation exchange capacity are given in Table 1.

Total Mo in the surface samples varied from 0.9 ppm in the Chirayinkil and Palode profiles to 2.6 ppm in the profile from Alwaye with an average of 1.6ppm In the second layers the variation was from 0.8 ppm in the Chirayinkil and Palode profiles to 2.6 ppm in the Alwaye profile with an average of 1.5 ppm. In the third layers also the lowest amount of Mo (0.7 ppm) was found in the Chirayinkil profile and the highest amount in the profile from Alwaye (2.1 ppm) the average being 1.1 ppm. These values of total Mo for Kerala soils are in close agreement with the average value of 0.7 - 2.6 ppm reported for Delhi soils by Dakshinamurti *et al* (1962)

In all the profiles, except the laterite profiles from Perinthalmanna and Angadipuram, total Mo was found to decrease steadily with depth. The surface accumulation of this element in most of the soils studied may be attributed to the enrichment of the soil by plant residues and also to the addition of traces of this element through commercial fertilisers.

The distribution of total Mo does not show any significant correlation to other soil characters such as pH, organic carbon, total nitrogen and the cation exchange capacity. This is in agreement with the findings of Barshad (1948) and of Evans and Purvis (1951) who noted a surprisingly uniform distribution of total Mo in soils in spite of a wide range in soil characters such as the pH, texture and the parent material.

Summary

A study was made of the distribution of total Mo in fourteen typical soil profiles of Kerala, Total Mo in the first, second and third layers of these profiles varied from 0.9 to 2.6, 0.8 to 2.6 and 0.7 to 2.1 ppm, the average values for the three layers being 1.6, 1.5 and 1.1 ppm respectively. This element decreased with depth in all the profiles except the laterite profiles in which the intermediate layers contained the maximum amount. No significant correlation existed between total Mo and other soil properties such as pH, organic carbon, total nitrogen and cation exchange capacity. In spite of the wide variation in the soil properties the distribution of Mo in the soils was remarkably uniform.

Acknowledgement

Grateful acknowledgement is made to the University of Kerala for permission to publish this work.

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(M.S. *received: 30-3-1974*)