

THE ZINC STATUS OF KERALA SOILS

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Zinc has received considerable attention in India in recent years after Nene (1965) showed that the *Khaira* disease of paddy is due to the deficiency of this element. According to Nene and Sharma (1969) the deficiency of Zinc is widespread in paddy, wheat, maize, jowar etc. in U. P., Madhya Pradesh, Bihar, Punjab and several other states. Though the deficiency of Zinc has not been conclusively proved in Kerala soils it is possible that under the influence of intensive fertilizer use for higher crop production an imbalance or deficiency of some of the micronutrients, especially zinc, might eventually occur. Hence the present study was undertaken to get a general idea of the distribution of total and available zinc in the major soil groups of Kerala.

Materials and Methods

Fourteen soil profiles representing the seven major soil groups of Kerala were used in this study. As the profiles often lacked clear horizon differentiation, the soils were collected from fixed depths of 0-30, 30-60 and 60-90 cm. In the case of the two submerged soils from Vechoor, samples could be collected only from the first two horizons. The soils after collection from the field were air-dried and gently ground with a wooden mallet and the material passing through a 2 mm nylon sieve was stored in labelled glass bottles. Total zinc was extracted in 2 g of the soil using 10 ml of Perchloric-sulphuric acid mixture as suggested by Jackson (1958) and estimated by the A. O. A. C. method (1960). Available zinc was determined by the method proposed by Shaw and Dean (1952). Standard analytical procedures were followed for the other estimations.

Results and Discussion

The data relating to the distribution of total and available zinc in the soil profiles, as well as some of the relevant soil characters such as, pH, organic carbon, total nitrogen and cation exchange capacity are presented in Table 1.

Total zinc varied in the surface soils from 3.5 ppm in the red soil from Pachalloor to 72.0 ppm in the alluvial profile from Alwave with an average of 21.9 ppm. In the second layers the variation was from 3.5 ppm in the red soil from Vellayani and the *kari* soil from Vechoor-site I, to 56.0 ppm in the sandy

Table I

Distribution of total and available zinc in Kerala soils in relation to other soil characters

No.	Locality	Soil group	Depth cm	PH	Org. C %	Nitrogen %	C.E.C. me/100g	Zn (ppm)	
								Total	Available
1.	Kayamkulam - Site I	Sandy	0-30	5.1	0.17	0.03	2.1	9.0	0.5
			30-60	5.4	0.16	0.06	2.2	11.5	1.8
			60-90	5.2	0.14	0.04	2.0	22.5	2.3
2.	Kayamkulam - Site II	Sandy	0-30	5.0	0.19	0.04	1.5	40.0	2.3
			30-60	5.3	0.15	0.03	1.9	56.0	2.8
			60-90	5.2	0.12	0.02	2.1	100.0	4.1
3.	Chirayinkil	Sandy	0-30	6.0	0.17	0.02	4.4	14.5	2.8
			30-60	5.0	0.08	0.01	2.4	25.5	3.6
			60-90	5.1	0.15	0.003	2.0	11.5	3.9
4.	Alwaye	Alluvial	0-30	5.1	4.16	0.41	188	72.0	1.8
			30-60	4.3	2.54	0.29	13.4	6.0	18
			60-90	4.2	2.26	0.29	13.8	17.0	2.3
5.	Trichur	Alluvial	0-30	5.0	2.84	0.40	9.8	31.0	2.8
			30-60	4.5	0.34	0.05	4.9	36.5	2.6
			60-90	4.8	0.15	0.05	5.7	22.5	4.4
6.	Perinthalmanna	Laterite	0-30	1.8	0.33	0.11	4.4	17.0	5.7
			30-60	1.6	0.52	0.21	6.8	20.0	5.7
			60-90	4.7	0.16	0.07	3.8	22.5	6.7
7.	Angadipuram	Laterite	0-30	4.4	0.91	0.10	5.1	22.5	6.7
			30-60	4.8	0.39	0.08	6.2	22.5	7.7
			60-90	4.6	0.15	0.08	5.4	25.0	8.0
8.	Kozhinjampara Site I	Black	0-30	7.8	0.57	0.08	48.0	17.0	7.7
			30-60	7.5	0.29	0.07	47.3	56.0	6.7
			60-90	7.8	0.37	0.04	46.9	9.0	4.1
9.	Kozhinjampara Site II	Black	0-30	8.0	0.23	0.05	47.2	6.0	3.9
			30-60	7.6	0.40	0.04	49.6	31.2	3.6
			60-90	7.9	0.37	0.04	47.0	3.5	3.0
10.	Falode	Forest	0-30	4.6	1.04	0.12	5.9	31.0	4.1
			30-60	4.8	0.65	0.05	3.6	6.0	3.6
			60-90	4.9	0.17	0.01	3.0	6.0	1.8
11.	Vellavari	Red	0-30	4.3	0.35	0.04	2.5	17.0	1.8
			30-60	4.3	0.20	0.03	1.8	3.5	2.0
			60-90	4.4	0.23	0.02	1.5	14.5	2.8
12.	Pachalloor	Red	0-30	4.7	0.43	0.04	2.1		0.8
			30-60	4.9	0.33	0.03	2.5	9.0	1.3
			60-90		0.20	0.02	2.4	3.5	1.3
13.	Vechoor - Site I	Kan	0-30	3.9	8.06	0.45	27.3	6.0	0.3
			30-60	3.0	10.60	0.41	24.1	3.5	0.8
14.	Vechoor - Site II	Kari	0-30	3.1	10.06	0.45	28.8	20.0	0.5
			30-60	3.0	9.66	0.54	24.0	6.0	1.0

soil from Kayamkulam-site II, and the black soil from Kozhinjampara-site I, the average being 20.9 ppm. In the third layers also the variation was from 3.5 ppm in the black soil from Kozhinjampara-site II, and the red soil from Pachalloor to as much as 100.0 ppm in the sandy soil from Kayamkulam-site II with an average of 21.5 ppm.

Available zinc varied in the surface soils from 0.3 ppm in the *kari* profile from Vechoor-site I to 7.7 ppm in the black soil from Kozhinjampara-site I with an average of 3.0 ppm. In the second layers the variation was from 0.8 ppm in the *kari* soil from Vechoor-site I to 7.7 ppm in laterite profile from Angadipuram, the average being 3.2 ppm. The variation of available zinc in the third horizons was from 1.3 ppm in the red soil from Pachalloor to 8.8 ppm in the Angadipuram profile with an average of 3.7 ppm.

There was significant positive correlation between total and available zinc ($r = +0.396$) and significant negative correlation between available zinc and nitrogen ($r = -0.328$) at the five per cent level. Correlations with other soil characteristics were not found significant, possibly because the soils belonged to very widely varying soil groups.

The downward distribution of total zinc did not follow any regular pattern. Available zinc, on the other hand, increased steadily with depth in ten (Nos 1-4, 6, 7 and 11-14) of the fourteen profiles and decreased with depth in three profiles (Nos 8, 9 and 10). In the other profile (No. 5) it was a minimum in the intermediate horizon.

It is noteworthy, that the level of available zinc in all the soils except the surface soils from the Vechoor are well above the threshold value of 0.55 ppm suggested by Brown et al (1962). Hence the level of available zinc in Kerala soils may be considered as being generally satisfactory.

Summary

Total zinc in fourteen typical soil profiles of Kerala varied from 3.5-72.0 ppm in the surface horizons, 3.5-56.0 ppm in the second horizons and from 3.5-100.0 ppm in the third layers, the averages for the three horizons being 21.9, 20.9 and 21.5 ppm respectively. The variation in available zinc was from 0.3-7.7 ppm in the surface layers, 0.8-7.7 ppm in the second layers and from 1.3-8.0 ppm in the third horizons, the averages being 3.0, 3.2 and 3.7 ppm respectively. There was significant positive correlation between total and available zinc and significant negative correlation between available zinc and nitrogen. The downward distribution of total zinc in the profiles was irregular, whereas available zinc increased with depth in ten of the fourteen profiles. On the basis of the threshold value of 0.55 ppm Kerala soils may be generally considered to be satisfactory with respect to available zinc.

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സംഗ്രഹം

കേരളത്തിലെ പതിനാലു മാതൃകാ മൺ പ്രൊഫയിലുകൾ പരിശോധിച്ചതിൽ ആകെക്കുള്ള സിങ്കിന്റെ (raioos)⁰ മേൽ മേഖലയിൽ 3.5-72.0 പി. പി. എം., (ശരാശരി 21.9) രണ്ടാമത്തെ മേഖലയിൽ 3.5-56.0 പി. പി. എം. (ശരാശരി 20.9) മൂന്നാമത്തെ മേഖലയിൽ 3.5-100.0 പി. പി. എം. (ശരാശരി 21.5) എന്നീ ക്രമത്തിലാണെന്നു കണ്ടു. സസ്യങ്ങൾക്കു ലഭ്യമായ സിങ്കിന്റെ തോതു് മുകളിൽ നിന്നും താഴോട്ടുള്ള മൂന്നു മേഖലകളിൽ യഥാക്രമം 0.3-7.7 പി. പി. എം. (ശരാശരി 3.0) 0.8-7.7 പി. പി. എം. (ശരാശരി 3.2) 1.3-8.0 പി. പി. എം. (ശരാശരി 3.7) എന്ന ക്രമത്തിൽ ആയിരുന്നു. ആകെക്കുള്ള സിങ്കം സസ്യലഭ്യമായ സിങ്കം തമ്മിൽ ഗണ്യമായ ധനസഹസംബന്ധവും, നൈഷേധം സസ്യലഭ്യമായ സിങ്കം തമ്മിൽ ഗണ്യമായ ജ്ഞസഹസംബന്ധവും ഉണ്ടായിരുന്നു. പ്രൊഫയിലുകളിൽ മേൽ മണ്ണിൽനിന്നും താഴോട്ടുള്ള ആകെ സിങ്കിന്റെ വ്യാപനത്തിൽ പ്രത്യേക ക്രമം ഒന്നും തന്നെ പ്രകടമായിരുന്നില്ല. എന്നാൽ പതിനാലിൽ പത്തു പ്രൊഫയിലുകളിലും സസ്യലഭ്യമായ സിങ്കം മുകളിൽനിന്നും താഴോട്ട് ക്രമമായി വർദ്ധിച്ചു വന്നു. മണ്ണിൽ സസ്യലഭ്യമായ സിങ്കിന്റെ തോതു് കറഞ്ഞപക്ഷം 0.55 പി. പി. എം. എങ്കിലും ആയിരിക്കണം എന്ന തത്വം അനുസരിച്ചു നോക്കിയാൽ കേരളത്തിലെ മണ്ണുകളിൽ ഈ മൂലകത്തിന്റെ തോതു് പൊതുവെ തൃപ്തികരമാണെന്നു കാണാം.

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