

AN IMPROVED RAPID CHEMICAL METHOD FOR ESTIMATION OF CALCIUM IN CALCAREOUS SOILS

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I. INTRODUCTION

THE rapid precipitation tests of calcium by Hance (1936) and Morgan (1937) have some serious defects which limit their applicability to the soils of North Bihar, which have a range of total calcium from almost 0.1 to over 30 per cent. The reasons are not far to seek as the assessment of calcium in soils by both these methods depends on the intensity of discs and lines of various shades and thickness viewed through the test vials containing precipitates of calcium oxalate formed in the acid extracts of soils. Soils rich in calcium, develop voluminous precipitates and above a certain critical point, all readings by these tests give the same high value. The critical point in Morgan's test corresponds to a soil very low (0.5%) in total calcium. Above this value, all soils give a reading of 'high' calcium by the R.C.M. tests. In order, therefore, to have a correct measure of total calcium by the R.C.M. Technique in soils which vary so much in calcium, attempts were made to develop a method that would answer the purpose and yet be simple and easy of manipulation. The method ultimately perfected depends for results upon the measurement of height of precipitates of calcium oxalate after a fixed time and comparing the heights with the standard prepared out of the soils of known calcium content (Fig. 1).

II. IMPROVED METHOD AND WORKING PROCEDURE

Six soils of North Bihar from different places having 1, 5, 10, 15, 20 and 30 per cent. calcium were selected for this purpose. 1 gm. of each of the soils was taken in a 100 c.c. beaker with 20 c.c. N.HCl, and stirred with a clean glass rod till effervescence subsided. The mixture is filtered through filter-paper Whatman No. I and the filtrate collected in a 100 c.c. beaker. Ten drops of the filtrate are introduced with the help of a long capillary dropper into test vials specially prepared from narrow glass tubing of uniform bore having internal diameter of 4 mm., care being taken that the drops

are of uniform size. One drop of liquor ammonia Fort (Conc.) is added at this stage, followed by two drops of glacial acetic acid. If the precipitate formed by the addition of ammonia does not dissolve completely by two drops of acetic acid, addition of an extra one drop of acid is advisable to dissolve the precipitate completely. Twenty drops of a saturated solution of sodium oxalate are then added. The vials at the open end are closed with the thumb or plasticin, and shaken vigorously two or three times. They are then allowed to stand for 15 minutes. The heights of the precipitates are measured and plotted on a graph against the total calcium concentrations. The heights of the precipitates of any unknown soil extract when compared with the graph (Fig. 2) will give approximately the concentration of total calcium in soils.

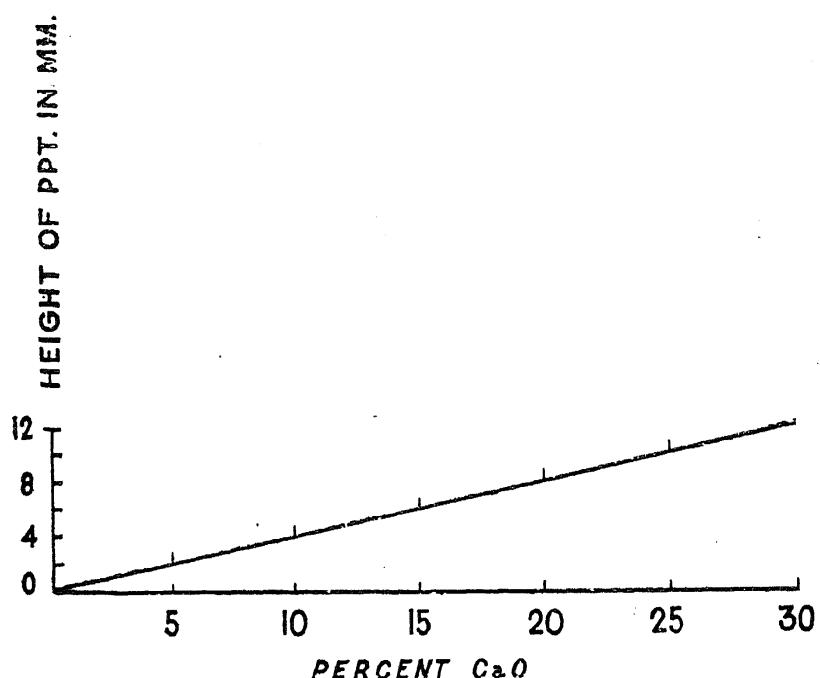


FIG. 2. Showing relationship between height of the precipitate and total calcium.

III. EXPERIMENTAL RESULTS

Eighty soil samples collected from different parts of North Bihar and varying in calcium content from 0.11% to 30% were estimated by the Morgan's method as well as the new method. The results (Table I) bring out clearly on the one hand, the insufficiency of the Morgan's test in giving a correct measure of calcium in soils and on the other, the superiority in this regard of the new method, which has throughout shown values corresponding fairly closely to those obtained from total analysis.

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TABLE I. Showing Calcium estimation by different methods

Sl. No.	Sample No.	% CaO by total analysis	% Ca improv-ed method	Ca in lbs/acr. Morgan
1	4	0.50	1	2000
2	3	0.11	1	500
3	10	0.24	1	1000
4	50	4.62	5	3000
5	9	2.45	2	3000
6	35	6.60	5	3000
7	54	7.00	10	3000
8	27	11.70	10	3000
9	47	14.60	15	4000
10	32	16.90	15	3000-4000
11	31	17.10	15	3000-4000
12	28	18.06	20	3000-4000
13	38	21.04	20	3000-4000
14	45	20.12	20	3000-4000
15	29	22.83	20	3000-4000
16	33	24.50	25	4000
17	30	25.25	25	4000
18	41	28.75	30	4000
19	658/95 .S	5.6	5	4000
20	659/96 .S	14.7	15	4000
21	660/97 .S	11.6	10	4000
22	661/98 .S	14.4	15	4000
23	662/99 .S	12.8	15	4000
24	663/100.S	1.9	1	3000
25	664/101.S	1.2	1	3000
26	665/102.S	0.1	1	750
27	666/103.S	19.9	20	4000
28	667/104.S	1.4	1	2000
29	668/105.S	2.0	1	4000
30	669/106.S	1.3	1	2000
31	670/107.S	1.9	1	2000
32	671/108.S	1.5	1	3000
33	672/109.S	1.9	1	2000
34	673/110.S	1.5	1	2000
35	674/111.S	1.2	1	2000
36	675/112.S	8.3	10	4000
37	676/113.S	8.4	10	4000
38	677/114.S	13.3	10	4000
39	678/115.S	10.1	10	4000
40	679/116.S	8.2	10	4000
41	680/117.S	1.1	1	2000
42	681/118.S	1.1	1	2000
43	682/119.S	0.9	1	2000
44	683/120.S	1.3	1	3000
45	684/121.S	16.4	15	3000
46	685/122.S	14.4	15	3000
47	686/123.S	1.1	1	2000
48	687/124.S	0.8	1	1000
49	688/125.S	0.6	1	1000
50	689/126.S	1.5	1	2000
51	690/127.S	0.8	1	1000
52	691/128.S	1.1	1	1000
53	48	17.1	20	3000
54	56	19.6	20	3000
55	77	3.1	5	3000
56	82	2.7	5	3000
57	96	0.4	1	3000
58	104	0.4	1	3000

TABLE I—(Contd.)

Sl. No.	Sample No.	% CaO by total analysis	% Ca improved method	CaO in lbs/acr. Morgan
59	110	15.6	15	3000
60	117	12.7	15	3000
61	121	0.9	1	2000
62	123	0.6	1	2000
63	127	0.4	1	2000
64	134	0.5	1	4000
65	158	19.4	20	4000
66	162	19.1	20	750
67	177	0.4	1	1000
68	180	0.7	1	3000
69	709/146.S	11.4	10	3000-4000
70	706/143.S	12.0	10	3000-4000
71	698/135.S	23.8	20	3000-4000
72	697/134.S	16.8	15	3000-4000
73	710/147.S	14.2	15	3000-4000
74	701/138.S	3.9	5	3000
75	692/129.S	18.7	20	3000-4000
76	694/131.S	5.3	5	3000
77	699/136.S	5.1	5	3000
78	707/144.S	10.3	10	3000
79	695/132.S	10.4	10	3000-4000
80	693/130.S	22.4	20	3000-4000

IV. SUMMARY

1. The rapid precipitation tests developed by Hance and Morgan do not give satisfactory results in estimating total calcium in calcareous soils.
2. An improved method which depends for results upon the measurement of heights of precipitates of calcium oxalate in capillary tubes is described. This gives values corresponding fairly closely to those obtained from total analysis. Besides the method is simple and easy of manipulation.

V. ACKNOWLEDGEMENTS

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VI. REFERENCES

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