

RP-68

**ELIMINATION OF ACID DRIFT DURING POTENTIOMETRIC MEASUREMENT OF ROOT-CEC**

DIFFERENT methods employed to measure the cation exchange capacity of roots were found to give different values for the same material, in spite of their consistency within themselves. The method of Crooke (1964) is perhaps the most commonly used one for this purpose because of its rapidity and feasibility. Use of dried roots in this method though it reduces the acid drift during the titration of standard KOH against 'hydrogen' root-KCl suspension, yet it does not fully eliminate this phenomenon. This was clearly demonstrated by Ando *et al.* (1969). Crooke<sup>2</sup> reported that acid drift occurring with dried roots during the titration could be attributed to simple diffusion of H<sup>+</sup> from the interior of the root particles. Hence, an arbitrary titration period of generally 5 minutes is employed. From the foregoing, it is apparent that titration in the absence of roots would avoid any possibility of acid drift. An attempt is made to this end in the present study.

The method follows essentially the same principle and steps as that of Crooke<sup>2</sup> with a few modifications. Cleaned roots were oven dried at 80° C overnight and powdered in a mill. The powdered roots were passed through a 30 mesh sieve and caught on a 100 mesh sieve. Sub-samples of 100 mg and 200 mg were used for CEC measurements, of dicots and monocots respectively. The weighed roots were treated with 200 ml of 0.01 N HCl in a 400 ml beaker for 5 minutes and the root-HCl suspension was quantitatively poured into a funnel fitted with glass wool at about 3 to 4 cm of tail from the cone. The packing of glass wool need not be too thick but should hold the root particles from being carried down along with the washings. The roots in the funnel were then washed free of chloride with distilled water. H<sup>+</sup> ions on the roots were subsequently displaced by 6 separate 50 ml washings of 1 N KCl (adjusted to pH 7) and the KCl washings were collected in a 500 ml beaker to be titrated back to exactly pH 7 with 0.01 N KOH using a glass electrode. The titration was carried out on a magnetic stirrer and CEC expressed as m.e. per 100 g dry roots.

The use of root particles of the size between 0.5 to 0.16 mm (30-100 mesh) has the advantage that they offer greater flexibility with regard to packing of funnel with glass wool. The difference in particle size was not found to affect the CEC

values over this range<sup>2</sup>. The leaching of hydrogen ions from H-roots was complete after washing with 4 separate 50 ml portions of 1 N KCl (pH 7) and the suggestion for 6 washings was made here only as a safe margin.

Comparison of the method described with that of Crooke<sup>2</sup> and precision are furnished in Tables I and II. The difference between the methods was

TABLE I  
Comparison of the method

Plant	*CEC (m.e. per 100 g dry roots)		†Difference (Acid drift)
	Crooke's method	Method described	
<i>Monocots</i>			
Hybrid napier	5.17	4.99	0.18
<i>Tripsacum lexum</i>	7.49	6.52	0.97
<i>Cocos nucifera</i>	12.17	9.82	2.35
<i>Dicots</i>			
<i>Crotalaria</i> sp.	10.13	9.01	1.12
<i>Vigna</i> sp.	14.72	11.10	3.62
<i>Stylosanthes</i> sp.	23.00	20.10	2.90
<i>Cleome</i> sp.	23.64	21.23	2.41

\* Mean of three values.

† Difference is not statistically significant.

TABLE II  
Precision of the method

Plant	No. of measurements	CEC (m.e. per 100 g dry roots)		
		Range	Mean	SD*
<i>Vigna</i> sp.	8	10.62-11.58	11.16	0.445
<i>Cleome</i> sp.	8	19.78-22.20	21.11	0.928
<i>Crotalaria</i> sp.	8	8.69-10.61	9.17	0.678
<i>Tripsacum lexum</i>	8	5.80- 7.23	6.28	0.413
Hybrid napier	8	4.83- 5.79	5.01	0.334
<i>Cocos nucifera</i>	8	8.69-10.14	9.45	0.443

\* Standard deviation.

attributed to acid drift. Though the values are not significantly different, the results show that acid drift increases with increase in CEC of plant roots suggesting thereby that the comparison of CEC values of different materials will be affected if Crooke's method is used. The method is precise, rapid and it completely eliminates the acid drift,

since the titration is carried out in the absence of roots.

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1. Ando, T., Baker, J. H. and Drake, M., *Plant and Soil*, 1969, 31 (3), 473.
2. Crooke, W. M., *Ibid.*, 1964, 21 (1), 43.