

adsorption and washing, to provide an estimate of the 'background' level of virus associated with cells during the eclipse phase of the growth cycle. All samples were snap frozen and stored at dry ice-box temperatures until assays could be carried out.

Results of one experiment are shown in Fig. 2. This indicates that considerable inhibition of both viruses occurred at all concentrations of the analogue studied. The recovery of HS at higher drug concentrations after treatment for 24 h may have been due to the survival of IUdR resistant mutants⁹ of HS and their subsequent replication in later cycles of growth.

The inhibition of both viruses by IUdR, when grown under identical conditions, indicates that the nucleic acid of ILT is DNA, and provides further evidence for the inclusion of this virus within the herpes virus group.

Note added in proof. Since this letter was submitted for publication, evidence has come to hand that some halogenated derivatives of 2'-deoxyuridine, notably 5-bromo-2'-deoxyuridine, inhibit the multiplication of certain RNA viruses which require the participation of DNA at an early stage of multiplication (Bader, *Virology*, **22**, 462; 1964; Thormar, *ibid.*, **26**, 36; 1965). However, in conjunction with other reports of similarities between ILT and HS, a virus known to contain DNA, the parallel inhibition of both viruses by IUdR must be regarded as further evidence that the nucleic acid of ILT is DNA.

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SOIL SCIENCE

Measurement of Exchangeable Aluminium in Acid Soils

MANY acid soils are known to contain exchangeable aluminium, but no satisfactory quantitative method for its determination has hitherto been available. This has proved to be a handicap in investigations of the degree of saturation with metal cations, suspected toxicity of adsorbed aluminium to crop plants as well as other soil properties influenced by exchangeable aluminium.

Neutral solutions of various salts will displace a definite amount of aluminium under standard experimental conditions. The quantity of aluminium released in this way may exceed the cation exchange capacity of the soil, so that some way must be found for distinguishing between the exchangeable and non-exchangeable components present in the extract. A technique for estimating this latter function is proposed here.

Exchangeable aluminium is displaced with difficulty by other cations, but it can be effectively removed by a long series of successive extractions. If it is assumed that the amount of non-exchangeable aluminium dissolved during each extraction in the series is constant, then the sum of the contributions from this source can be subtracted from the total extractable aluminium to give an estimate of exchangeable aluminium. For this approach to be successful, experimental conditions with respect to soil-to-solution ratio, temperature and period of contact must be kept constant during extraction.

In accordance with a Nernst type distribution, it may be expected that with each successive extraction, a steadily decreasing amount of exchangeable aluminium

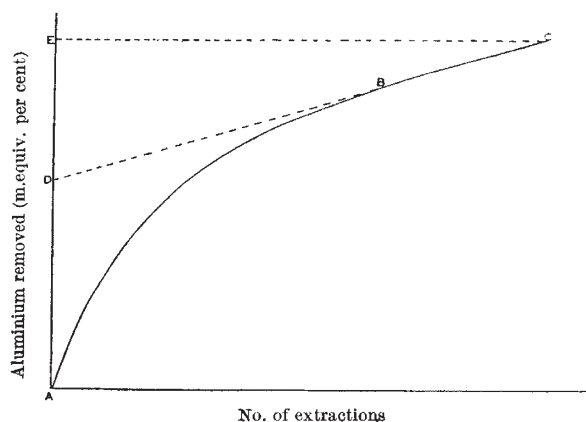


Fig. 1. Characteristic curve for the progressive extraction of aluminium from acid soils

will be released together with a constant quantity of non-exchangeable aluminium. The Nernst curve should thus become linear if continued beyond the point at which all exchangeable aluminium has been removed.

In Fig. 1, the curve *AB* represents the progressive removal of both forms of aluminium and the linear part *BC* that of non-exchangeable aluminium only. The amount of the latter removed per extraction will determine the slope of *BC* which will also depend largely on the solubility of the solid phase aluminium compounds. When *BC* is extrapolated, *AD* will represent exchangeable and *DE* non-exchangeable aluminium.

The experimental procedure is as follows. Place 5 g air-dry soil in a tared 100-ml. centrifuge tube and add 50 ml. extracting solution adjusted to the field pH of the soil; shake for exactly 2 min in a reciprocating shaker. Centrifuge and decant the clear supernatant into a suitable container. Re-weigh the tube so as to obtain the weight of the occluded solution; add a further 50 ml. of extractant, shake, centrifuge and decant. This procedure is repeated 24 times, decanting into a separate container each time. Determine the aluminium present in each extract and plot the cumulative data as shown in Fig. 1.

Exchangeable aluminium measured by this technique appears to be a characteristic of the particular soil and is reasonably constant irrespective of the nature of the extractant as shown in Table 1.

Table 1. EXCHANGEABLE AND NON-EXCHANGEABLE ALUMINIUM EXTRACTED BY DIFFERENT SALT SOLUTIONS

Solution	Aluminium removed (m.equiv. per cent)		
	Total aluminium	Non-exchangeable aluminium*	Exchangeable aluminium
0.2 N KCl	5.7	0.075	3.9
0.2 N NH ₄ Cl	6.0	0.079	4.0
0.2 N CaCl ₂	5.4	0.074	3.6
0.2 N NH ₄ NO ₃	6.0	0.087	3.8
N NaCl	6.1	0.090	3.8

* Per extraction.

Aluminium was determined by the method of Frink and Peech¹.

The sample used was from the *A*₁ horizon of a highly weathered acid ferrallitic soil with a pH value of 4.5 in water and 3.8 in N potassium chloride. It has a cation exchange capacity of 6.0 m.equiv. per cent with a base saturation of 20 per cent (excluding aluminium). The five extracting solutions were all adjusted to pH 4.0, which was regarded as the field pH value of the soil. Twenty-four separate aluminium determinations are required for each estimate of exchangeable aluminium, so that differences between the five extractants could be due to experimental error. Exchangeable hydrogen probably accounts for the difference between cation exchange capacity and total bases including exchangeable aluminium.

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