plants. No such symptoms were shown by *Datura metel* inoculated with sap from virus *S*-infected Arran Victory.

By grafting King Edward on to the American variety Saco, which is immune to virus *S*, it was possible to obtain plants, the sap of which gave no symptoms when inoculated on to fathen but still produced virus *M* symptoms in *Datura metel*. Scions from these Saco plants produced paracrinkle symptoms in both virus *S*-infected Arran Victory and in plants of a virus *S*-free stock of Arran Victory produced by Kassanis⁶ at Rothamsted by the apical meristem culture method. It would appear, therefore, that paracrinkle symptoms in Arran Victory are produced by the virus *M* component alone of the virus complex found in King Edward.

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AGRICULTURE

Determination of Dieldrin Deposits on Sprayed Mud Surfaces

CHEMICAL investigations into the behaviour of insecticides sprayed on to mud walls require a sampling technique which will remove the insecticide actually present on the surface, and available to the insects, but not that which is sorbed into the bulk of the mud. For laboratory work, Barlow¹ has used 'Sellotape' for this purpose, while Alessandrini² has used parchment paper coated with a film of silicone grease. Both these techniques suffer from the disadvantage that the sticky material which is used to pick up the insecticide particles is mounted on a comparatively rigid backing, which prevents its penetrating into the small depressions and irregularities which generally occur on mud surfaces, and which are accessible to insects. Unrealistically low figures are therefore obtained. It was thought that this difficulty might be overcome by the formation of an adhesive film *in situ* on the mud surface, and it has been found that in the laboratory satisfactory films for this purpose can be obtained using solutions containing 1-2.5 per cent w/v of high-viscosity grade (1,500-2,000 cp. for a 1 per cent solution at 25° C.) sodium carboxy-methyl cellulose. The addition of glycerol to the sodium carboxy-methyl cellulose solution is usually necessary; in most cases up to 5 per cent v/v suffices to give a pliable film, but on certain muds up to 25 per cent v/v of this has been necessary to prevent the formation of a hard, brittle film which removes an excessive amount of mud.

The sodium carboxy-methyl cellulose solution is applied to the mud surface mounted on a piece of cotton gauze and should be removed as soon as pos-

sible after drying is complete. The film is separated from the gauze by soaking in cold water, and, to ensure complete extraction of the insecticide, the resulting solution is treated with sodium hydroxide and potassium permanganate, and allowed to stand for 30 min. Excess permanganate is removed by careful acidification and treatment with sodium bisulphite. The insecticide is then extracted from the mixture with a suitable solvent, and determined by any convenient method. In the experiments described below, *n*-hexane was used as solvent, and a total chlorine determination using sodium diphenyl reagent was employed. Subsidiary experiments showed no significant loss of dieldrin occurred during the extraction and subsequent treatment.

A series of glass plates and blocks of Uganda mud were sprayed with an aqueous suspension of a dieldrin 50 per cent wettable powder; weighing of the plates before and after spraying showed an average deposit of 114 mgm. dieldrin/sq. ft. Using the above technique, recoveries of 86, 84, 92 and 82 mgm./sq. ft. were obtained from the surfaces of the mud blocks. A similar series of experiments using blocks of Babati (Tanganyika) mud gave recoveries of 74, 83 and 76 mgm. dieldrin/sq. ft., compared with an average deposit of 100 mgm./sq. ft. indicated by weighing of the glass plates. These figures indicate a recovery of between 70 and 80 per cent from both types of mud, and this is adequate to enable sorption to be demonstrated, as shown by the results in Table 1, which were obtained by spraying three series of mud blocks with a dieldrin 50 per cent wettable powder at 65 mgm./sq. ft. and determining the surface deposit at various times after spraying.

Table 1

Days after spraying	Dieldrin recovered (mgm./sq. ft.)		
	Babati	Uganda	Mexico, D.F.
0	54	49	50
1	—	7.0	39
2	—	5.5	—
7	9.7	3.7	24
14	4.0	2.5	15

Results are given for three muds, two of which (Uganda and Babati) have been shown from biological data to be highly active in sorbing dieldrin, and the third (Mexico D.F.) to be less active.

This technique has been tested satisfactorily in the laboratory on a number of different types of mud, although the concentrations of sodium carboxy-methyl cellulose and glycerol required to give the most satisfactory film vary from one to another. Provided that care is taken in removing the film, the amount of mud removed is very small; it has been observed, however, that this is apt to vary with the type of mud used, and this factor should therefore be borne in mind when comparing results of experiments carried out on different muds. The applicability of this technique to muds which give a very loose and friable surface has not been examined.

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