Brassicæ both by means of graft and by the agency of the aphid *Myzus persicæ*. We succeeded in conveying leaf roll twice, once through a turnip and thence to a President potato, in both instances by graft; and again through a Brussels sprout and on to a President potato, both by means of the aphis *Myzus persicæ*. Neither hosts showed any symptoms, but the virus which was recovered on the Presidents produced a typical leaf roll in the first case and a poorly developed and ambiguous syndrome in the second.

We were from the start, however, confronted with an unexpected complication: in a large number of cases the virus carried over to the potato and thence to tobacco or *S. glutinosa* plants from infected Brassicæ or other foreign host was the *Y* virus (Sol. Virus 2, K.M.S.), and not leaf roll. Careful checking of all controls and examination of our potato leaf roll sources showed that it was these latter which were harbouring the *Y* virus, notwithstanding that they had been exhibiting acute leaf roll for nearly twenty years without a sign of the usual *Y* virus symptoms.

Our researches have proved that the *Y* virus can be carried by turnips, cabbages, kale and Brussels sprouts without symptoms, and that from them it can be conveyed to potatoes by graft or by means of *Myzus persicæ*, and thence to tobacco or *S. glutinosa*. In addition, we have shown that red clover, the garden pea and bindweed may be infected with the *Y* virus by means of *Myzus persicæ* without producing symptoms. The Brassicæ are frequently the overwintering hosts of *Myzus persicæ*: may it be that they and the well-nigh ineradicable bindweed may also act as reservoirs for these destructive potato viruses during the winter months?

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A Bacterial Disease of Forsythia

A BACTERIAL disease has appeared in an East Anglian nursery on bushes of *Forsythia spectabilis* and *F. intermedia*. When, early in the year, the two-year-old branches are removed to the forcing house, the flower buds remain dormant or open imperfectly. Sometimes only a few twigs on a branch are affected; more often the branch as a whole remains dormant. Examination of the cut end of the shoot shows a stain in the wood, usually crescent-shaped, and varying in colour from scarlet to dark brown. At the time of cutting, the diseased branches cannot be distinguished superficially from healthy branches, but the stain in the wood betrays the presence of the disease. On any bush, healthy and diseased shoots arise from different stools. Excision of diseased branches (but not of the diseased stools) has been practised, but the bushes continue to die back, indicating that the disease can spread from the diseased to the healthy stools.

From stained wood a bacterium was readily isolated; this produced green fluorescence on beef-infusion agar and in Uschinsky's solution. Its reactions in culture media show it to be closely related to *Pseudomonas syringæ*. The Forsythia organism was inoculated into the wood of young Forsythia bushes growing in pots, and produced a dark stain in the wood; the following spring the flower buds opened normally. Inoculated into swelling flower buds, the organism caused a delay in opening of about a week compared with wounded controls. When inoculated into young succulent lilac and Forsythia shoots, blackened lesions appeared; shortly afterwards the shoots died. *Ps. syringæ* was inoculated into the wood of Forsythia bushes but produced no stain in the wood and did not affect the opening of the flower buds. When *Ps. syringæ* was inoculated into young succulent shoots of Forsythia, black lesions developed and shortly afterwards the shoots died and turned black.

It thus seems probable that the organism isolated from Forsythia belongs to the *Ps. syringæ* group. Wormald[1] records a disease of Forsythia, probably caused by *Ps. syringæ*, the symptoms of which were elongated black lesions on the shoots and spots on the leaves.

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[1] Wormald, Annual Report E. Malling Res. Sta., 1935 (Sect. III), p. 145.

Excretion of Thiamin and Biotin by the Roots of Higher Plants

THE fact that soil in the immediate vicinity of plant roots supports a much higher microbial population than that existing outside the plant's zone of influence has been recognized for many years. Although it has been suggested that 'root excretions' account for this effect, these hypothetical exudates have never been identified, nor has their mode of action been satisfactorily explained. In studying the relation of plants to soil-borne diseases, it was considered desirable, therefore, to examine the possibility that excretion of minute amounts of bacterial growth factors by the growing plant might be a fundamental factor in determining the character of the rhizosphere microflora.

One hundred representative bacteria were isolated from each of the rhizospheres of Bison and Novelty flax, after three weeks' growth in uniform soil under greenhouse conditions, and from the rhizospheres of two varieties of tobacco grown in the field. A similar number of control organisms was isolated in each case from soil outside the root's zone of influence. Each of the isolates was inoculated into two media, one containing glucose, potassium nitrate and inorganic salts, and the other containing, in addition, cysteine 50 mgm., *m*-inositol 100 mgm., thiamin 100 γ, β-alanine 100 γ, nicotinic acid 100 γ, and biotin 0·5 γ, per litre. All growth-substances were used in pure form except biotin, a concentrate of which was prepared by the procedure of Kögl and Tonnis[1] and shown to be approximately 0·5 per cent pure[2].

Results in every case showed that those organisms dependent for their development on a supply of previously synthesized growth-factors were markedly more abundant in the rhizosphere than in control soils[3], suggesting that the plant may excrete the necessary factors for their nutrition. In testing the growth-factors separately on twenty-five organisms selected from flax and tobacco rhizospheres, for which the more complex medium was essential, all were found to require either thiamin or biotin or both, but in no case did inositol, β-alanine, or nicotinic acid show any growth-promoting properties.