PLANT PATHOLOGY

Keeping Lettuce Clean

by our Botany Correspondent

LETTUCE which suffers from virus diseases may have been infected by chickweed, groundsel and other weeds growing among the crop. Plant pathologists at the National Vegetable Research Station, Wellesbourne, have found that cucumber mosaic virus, which causes a serious yellowing disease in outdoor lettuce, is often present in nearby weeds. Most of the weeds have no symptoms of disease and are apparently not inconvenienced by the infection.

Relating the progress of lettuce research in the latest annual report from the station (price 10*s*), the director, Professor D. W. Wright, reports that some of the weeds have been implicated in the survival of the virus in the soil from one season to the next. Apparently chickweed (*Stellaria media*) and groundsel (*Senecio vulgaris*) not only survive the winter but also produce infected seeds. Thus there is the danger that the virus, protected within dormant chickweed seeds, could persist in a field for several years. This knowledge has set an ecological problem for Wellesbourne, and also given impetus to the constant search for new and better herbicides.

Halo blight on dwarf beans.

Another disease that has inspired investigation is halo blight of dwarf and runner beans. Caused by the bacterium *Pseudomonas phaseolicola*, this disease can be severe in a wet season. The first signs of infection are lesions on the cotyledons (shown in the illustration) and later so-called halo lesions develop on leaves and pods. The disease is a considerable problem in dwarf beans which are grown for processing, because even a few infected and unsightly pods can cause a crop to be rejected. In the past it has been difficult to detect a few infected seeds among a large batch, but a method developed at Wellesbourne will reveal one infected seed in 10,000. Seeds are first ground to extract the bacteria, which are then isolated and identified by serological and bacteriophage tests. In this way the percentage infection in a seed stock can be determined by testing samples of varying size.

Yet another recent Wellesbourne success has been the development of a method for culturing almost unlimited numbers of plants from one excised growing tip. To obtain a mass of proliferating units it is only necessary to place the growing tips in aseptic flasks of culture medium, which are shaken continually. When one such unit is transferred to a static culture tube a normal plant develops. Although the technique is fairly expensive to maintain it apparently has worthwhile possibilities, particularly for breeding autumn and winter cauliflowers, which are very difficult to seed, and which by this method can be propagated from small pieces of curd.

BIOPHYSICAL TECHNIQUES

Raman Revisited

from our Molecular Biology Correspondent

READERS with an interest in anticipating new trends in biophysical methods might give a thought to laser Raman spectroscopy. After the early studies of Edsall and his colleagues on proteins, the Raman method, at least as far as biological molecules were concerned, fell into neglect. The introduction of laser excitation to provide vastly higher intensity than the conventional mercury arc has, however, provided a new impetus for this approach.

By contrast with infrared spectroscopy, observations can readily be made on aqueous solutions, and an example of the application of Raman spectroscopy to solutions of simple model systems has been given by Sutton and Koenig (*Biopolymers*, **9**, 615: 1970). A study of the spectra of oligo-L-alanines in the solid state and in water illustrates the use of the conformation-sensitivity of amide frequencies, and has been used to show that in the solid state even the trimer exists in an antiparallel pleated-sheet form, though the dimer, alanylalanine, is in a different, and non-planar, conformation. The ionized end-groups can be identified, and show that all the oligomers are zwitterions in the solid, just as in solution. In solution the dipeptide and tripeptide have very similar spectra, which are interpreted to reflect a common non-planar conformation, similar to that of the dipeptide in the solid, which must arise from severe restraints on the angles of rotation, such as are apparent in calculated energy maps for these molecules.

The potential of the laser Raman method in relation to real proteins is well demonstrated in a study by Lord and Yu (*J. Mol. Biol.*, **50**, 509; 1970) on lysozyme. This shows that remarkably good spectra can be obtained, which resolve a whole series of side-chain frequencies. Those of the aromatic amino-acids are especially prominent, and in the 500–700 cm^{-1} region, bands associated with the S–S and C–S bonds of the cystine and methionine residues are observed. The relative intensities of the C–S and S–S bands of the cystines in lysozyme differ grossly from those of free cystines, for example. A comparison with model disulphide compounds of known geometry in crystals suggests a correlation between these relative intensities and dihedral angle, and differences between the average dihedral angles of the disulphide bridges in ribonuclease and lysozyme are inferred. Bands arising from the ionized and unionized carboxyl group can be identified, though only the second is well resolved.