

THE NATURE OF PLANT VIRUSES.

Summary of talk by Dr. I. D. Blair, 18th September, 1944.

Plant viruses are the cause of much loss through diseases of economic plants. They threatened to ruin the whole sugar-cane industry of the West Indies, they reduce the value of the sugar-beet crop in the United States, and they greatly lower the yield of potatoes in all parts of the world.

Familiar virus effects are leaf-mosaics, where the foliage is mottled dark green and yellow though cultural conditions are good, necrotic spots, stripes or streaks on leaves, and distortion, stunting, etc. of whole plants. Much work has been directed towards determining the nature of plant viruses and there has been some doubt whether they are living organisms or non-living matter. They are exceedingly minute, and pass through filters impermeable to the smallest bacteria. They can exist in dry tissue without multiplying, but in living tissue they spread very rapidly. They permeate the whole plant sap, and can be transmitted from plant to plant by means of sucking insects, within which the virus must sometimes undergo a latent period. Modern work seems to indicate that the tobacco mosaic virus is actually a crystalline protein that can be isolated from the juice of affected plants but not from that of healthy ones. The crystalline protein, like a virus, multiplies rapidly in appropriate plants and produces identical diseases. On the other hand the crystalline protein may be just a symptom of the disease, originating either from nuclear fragments or as a reaction product of the breakdown of protein metabolism. No known living organism is exclusively protein, and all known living organisms contain proportions of different constituents associated with water; it would seem strange to regard as living the virus protein crystal which lacks water.

Classification of viruses is chaotic. Serological tests are applied, like those used with animal sera. There are complications because several kinds of plant may carry the one disease virus, and, for example, the sap of the tomato may carry virus disease of cucumbers as well as of various solanums and of rice.

Attempts at control of virus diseases are varied. Except in legumes (especially beans) true seeds do not harbour virus. But vegetative parts like bulbs and tubers may carry virus without any outward sign of it. If virus-free stock can be used to begin with, it can often be kept clean. There are certain tests for freedom from infection, but inspection alone is often not sufficient.

Though insects rarely if ever carry virus over from season to season the infection may lurk in crop residues and weeds and these should be destroyed.

Infection may be spread by workers passing from diseased to healthy plants, or by mechanical pressure, as when a diseased potato leaf is rubbed by the wind against a healthy one. Any focus of infection should be removed.

Control of insects by spraying etc. has some effect, but often the insects responsible are very small and easily missed.

Disease resistant plants are being produced; an outstanding example is the sugar-cane.

Heat therapy can control infection; water at 50° C. prevents development of some virus disease.

Vaccination technique has been tried. By introducing weak extracts of virus-infected sap into certain plants a resistance to a stronger virus may be built up.

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A large number of questions and a prolonged and lively discussion showed members' interest in Dr. Blair's lecture, which dealt with one of the very modern topics of plant science.