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## Report for 1933

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### The Plant in Disease : Control of Disease

#### Rothamsted Research

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Grove peats require liming and that the Winterburn and Stonyplain peats do not require liming for satisfactory crop production.

The cellulose content of the peats varies from none to about 47 per cent. of ash-free cellulose, and the lignin from about 20 to 49 per cent. A decrease in cellulose content is usually accompanied by an increase in lignin. Cellulose, lignin, and ash together nearly always make up about two-thirds or more of the weight of the peat. Nitrogenous organic matter would account for about 3 to 16 per cent., and petroleum-ether-soluble material for only 1 per cent. or less of the total peat.

Growth of oat seedlings and bacterial plate counts indicated that the fertility of Carnwood surface peat was not greatly increased or affected by the addition (about three to four months earlier) of ordinary applications of fertiliser salts.

At the end of an incubation period of 50 days appreciable losses of cellulose had occurred in the Carnwood peat cultures to which an abundant supply of fertiliser salts had been added; and bacterial numbers were increased by the addition of fertiliser salts. In the case of the Winterburn peat the losses of cellulose, if any, were within the experimental error of the determination.

After nineteen days' incubation at a relatively high temperature (55°C.), all of the cultures of Spruce Grove peat showed loss of cellulose, the largest loss occurring in the culture to which lime was given, in addition to an abundant supply of the other nutrient salts.

## THE PLANT IN DISEASE: CONTROL OF DISEASE

(Departments of Entomology, Plant Pathology and Statistics)

### (a) INSECTS AND THEIR CONTROL

- XLII. H. F. BARNES. "*Studies of Fluctuations in Insect Populations. II. The Infestation of Meadow Foxtail Grass (Alopecurus pratensis) by the Gall Midge Dasyneura alopecuri (Reuter) (Cecidomyidae).*" *Journal of Animal Ecology*, 1933, Vol. II, pp. 98-108.

It is shown that the relative times of emergence of the host insect and its parasites are important in regulating the subsequent numbers of the host insect. Early emergence of the parasites, together with late emergence of the host insect, may result in a greatly increased population of the injurious insect, in other words an epidemic outbreak.

- XLIII. H. F. BARNES. "*Gall Midges (Cecidomyidae) as Enemies of Mites.*" *Bulletin of Entomological Research*, 1933, Vol. XXIV, pp. 215-18.

This paper concerns those gall midges whose larvae are predaceous on mites throughout the world. This is the third paper dealing with zoophagous gall midges. Previous papers dealt with those forms attacking Aphids (1929) and Psyllids, Tingids, Aleurodids and Coccids (1930).

- XLIV. H. F. BARNES. "*A Cambium Miner of Basket Willows (Agromyzidae) and its Inquiline Gall Midge (Cecidomyidae)*" *Annals of Applied Biology*, 1933, Vol. XX, pp. 498-519.

This contains a resumé of information about Dipterous cambium miners (Agromyzidae). The morphology and bionomics of *Dizygomiza barnesi* Hendel sp.n. are described. A list of *Salix* species, including the Cricket Bat willow, attacked by the larvae is given, as well as records of two Braconid parasites and an inquiline gall midge and its parasites.

- XLV. H. C. F. NEWTON. "*On the Biology of some Species of Longitarsus (Col. Chrysom.) living on Ragwort.*" *Bulletin of Entomological Research*, 1933, XXIV, pp. 511-520.

The life histories of five species of *Longitarsus* feeding on Ragwort are described and their part in the biological suppression of the weed indicated.

- XLVI. H. C. F. NEWTON. "*On the Biology of Psylliodes hyoscyami Linn. (Col. Chrysom.), the Henbane Flea Beetle with Descriptions of the Larval Stages.*" *Annals of Applied Biology*, 1934, Vol. XXI, pp. 153-161.

*P. hyoscyami*, usually a rare beetle, occurred in epidemic numbers on the Henbane crop at a medicinal herb farm. Its life history was investigated and recommendations for control made.

#### (b) BACTERIAL DISEASES

- XLVII. R. H. STOUGHTON. "*The Influence of Environmental Conditions on the Development of the Angular Leaf-spot Disease of Cotton. V. The Influence of Alternating and Varying Conditions on Infection.*" *Annals of Applied Biology*, 1933, Vol. XX, pp. 590-611.

A regular diurnal variation in soil temperature is shown to have the same effect on primary infection as a constant temperature near the mean of the fluctuations. The mean soil temperature at the time of sowing and for the first few days of germination is the chief controlling factor in primary infection. Similar results are obtained for the variation in air temperature. Plants kept in total darkness are entirely resistant to infection. The relations of the whole series of experiments on the influence of environmental conditions are discussed.

- XLVIII. C. G. HANSFORD, H. R. HOSKING, R. H. STOUGHTON and F. YATES. "*An Experiment on the Incidence and Spread of Angular Leaf-Spot Disease of Cotton in Uganda.*" *Annals of Applied Biology*, 1933, Vol. XX, pp. 404-420.

Experiments on the incidence and spread of the angular leaf-spot disease of cotton, carried out at two centres in Uganda, are described.

Treatment of the seed by sterilisation with sulphuric acid and mercuric chloride resulted in a reduction in the amount of the disease throughout the season.

Treatment of the seed with a bactericidal dust had a significant effect on total germination, the plots sown with this seed having a greater number of plants at the end of the season, independently of those killed by the disease.

Primary infection was almost entirely limited to plots sown with seed inoculated with the organism.

Spread of the disease occurred in a direction down the slope of the ground and along the lines of the surface wash.

The implications of the experiment are discussed and proposals made for modifications in technique.

(c) VIRUS DISEASES

- XLIX. J. HENDERSON SMITH. "Some Aspects of Virus Disease in Plants." *Empire Journal of Experimental Agriculture*, 1933, Vol. I, pp. 206-214.

A general account of the present position of research in virus diseases.

- L. J. CALDWELL. "The Physiology of Virus Diseases. IV. The Nature of the Virus Agent of Aucuba or Yellow Mosaic of Tomato." *Annals of Applied Biology*, 1933, Vol. XX, pp. 100-117.

A method is discussed whereby it is possible to count the spots found on the leaves of *N. glutinosa* after inoculation with liquids containing different dilutions of aucuba mosaic virus. The fact that the number of spots found is proportional to the amount of dilution is taken as indicating the particulate nature of the virus. A method is suggested for counting the number of virus particles present in a juice. It is shown that the amount of virus present in a juice does not increase after agitation or after treatment with proteolytic enzymes. With trypsin and diastase the amount of virus is apparently decreased. This decrease, it is suggested, is due to the adsorption rather than to the destruction of the virus. The amount of multiplication of the virus in the tissues of *N. glutinosa* is examined and compared with the much greater multiplication in tomato tissues.

- LI. F. M. L. SHEFFIELD. "Virus Diseases and Intracellular Inclusions in Plants." *Nature*, 1933, Vol. CXXXI, p. 325

Many virus diseases induce the occurrence of abnormal phenomena in the cells of the host, large protein bodies often being formed. Previous work on Aucuba Mosaic disease had suggested that these bodies were coagulation products of the cytoplasm. Attempts were therefore made to reproduce the phenomena by physico-chemical means. Various methods were used and varying degrees of success obtained. By treating plants with salts of molybdic acid it was possible to parallel all the microscopic effects of aucuba mosaic disease.

- LII. F. M. L. SHEFFIELD. "The Development of Assimilatory Tissue in Solanaceous Hosts Infected with Aucuba Mosaic of Tomato." *Annals of Applied Biology*, 1933, Vol. XX, pp. 57-69.

The development of the chloroplasts in *Solanum nodiflorum*, *S. lycopersicum* and *Nicotiana tabacum* is described and comparisons are made with plants infected with aucuba mosaic.

In the normal plants after cell division ceases in the meristematic tissue certain minute bodies, which are present in the cytoplasm of all young cells, commence to enlarge. A vacuole is formed in each, and this gets bigger as the proplastid increases in size. A starch grain is formed in the vacuole. The outer stroma becomes pigmented and pores are formed in it. Increase in size continues, the mature plastid being about  $5\mu$  in diameter. A second or third starch grain may be formed in the vacuole. Chloroplasts sometimes divide.

In plants infected with aucuba mosaic certain of the leaf tissues are devoid of plastids and the cells may be undifferentiated. The absence of chlorophyll is brought about by the inhibition by the virus of the development of the plastid primordia. Usually the primordia are destroyed. If plastid development is not prevented in a very early stage, perfectly normal plastids are formed. Mature plastids are never affected by the virus but occasionally intermediate stages may be.

Soon after infection with aucuba mosaic disease, these plants are characterised by the production of large intracellular inclusion bodies in many of the cells. Such bodies are not found in the meristematic tissue, but incipient bodies appear when the cells are increasing in size and after plastid development is well advanced. For this reason inclusion bodies are formed indiscriminately in green and chlorotic areas, the virus presumably having reached the green tissues too late to inhibit plastid development.

An attempt was made to determine whether the prevalence of intracellular inclusion bodies in tegumentary tissues and their rarity in assimilatory tissues is due to differences in the pH of the tissues, but the results obtained were rather indefinite.