ROTHAMSTED RESEARCH

Report for 1931

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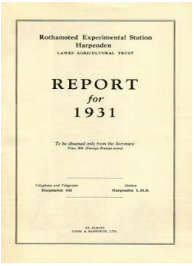

Insect Pests

Rothamsted Research

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ditions of laboratory testing, develop small infections. The development of the parasite has been traced in a number of these varieties and, in some, the increase of the disease seems to be prevented by the development of a necrotic area in the region of infection by which the plant sloughs off the parasite with the dead tissues.

Critical examination of doubtful specimens of wart disease has been continued for the Ministry of Agriculture and the National Institute of Agricultural Botany and reports have been made on seventy-four specimens belonging to thirty-seven varieties.

Investigations into the relation of nutrition to certain fungal diseases of the potato plant by L. M. J. Kramer, at Rothamsted and at Woburn, showed no correlation between manurial treatment and the severity of attack by blight (*Phytophthora infestans*). The distribution of the disease was determined by the direction of the prevailing wind and the presence of infective centres.

Pot culture experiments, however, showed that excessive applications of phosphatic fertilisers increased infection of tubers by pink rot (*Phytophthora erythroseptica*).

A method of assessing the extent of fungal invasion of potato tubers was devised which corrects for the errors due to the size of the tuber. It has been extensively used and is of wide application.

THE INSECT PESTS

Wheat Midges. Observations made by H F. Barnes during the past five years on the incidence of wheat blossom midges on Broadbalk, combined with studies of the records of the Ministry's entomological advisors, have revealed some degree of periodicity in their attack. About every fourth or fifth year they do great damage to wheat, but in the intervening years the damage is insufficient to warrant any expenditure on control measures. The figures for the damage on Broadbalk for the last five years are :

Year.	1927	1928	1929	1930	1931
Percentage of damage to grain	3.2	6.5	7.7	17.6	21.4

Thus 1930 and 1931 were years of great damage on Broadbalk. The Ministry's records show that 1916, 1920 and 1926 were also peak years of damage. H. F. Barnes is following up these remarkable observations. If they lead to forecasting of attack some valuable practical results might be expected to emerge.

Varieties of Plants immune to insect attack. Agricultural pests are not easily controlled by direct methods such as spraying, which is so effective for hops and fruit. Indirect methods, including the use of resistant or immune varieties, are more suitable.

H. F. Barnes has continued his search for varieties of willows immune to gall midge attack ; this year he has concentrated on the midge that attacks the cricket bat willow (*S. coerulea*) which causes serious loss of sets, and has found certain basket willows immune to attack.

M. E. Metcalfe has been doing similar work on clovers and grasses, such as timothy, rye grasses and cocksfoot. All varieties of red

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clover are as a rule attacked by the red clover seed midge, but the white clovers are not. The extent of damage depends on the time of flowering of the clovers; possibly it could be avoided by delaying flowering until the flight of midges is over.

H. C. F. Newton is investigating the causes of plant immunity, and has begun a series of amputation experiments to ascertain which organ or organs on the insect enables it to differentiate between the varieties of plants.

The Pigmy Mangold Beetle (*Atomaria linearis*) has of late years been a troublesome pest of mangolds, but its life history could not be worked out because neither the eggs nor the larvae could be found in the soil. This has now been done by H. C. F. Newton, so that further knowledge of the pest can be obtained which may lead to the discovery of suitable remedies.

Other Activities. The department has kept in touch with the problems in the British Empire, and during 1931 has helped by identifying gall midges, on which H. F. Barnes is a recognised specialist, from Trinidad, Brazil, Algiers, Russia, Germany, Sicily, Cyprus, Turkey, Sierra Leone, Uganda, Nigeria, Malay and Formosa.

INSECTICIDES

Pyrethrum. For some years past F. Tattersfield and J. T. Martin have closely studied pyrethrum (*Chrysanthemum cinerariaefolium*), the flowers of which when dried and ground, form one of the most effective and convenient of all insecticides. Its popularity may be gauged from the fact that its production in Japan, the chief source of supply, rose from 279,931 lb. in 1911 to 11,622,906 lb. in 1928; its cultivation has also been started in France, Switzerland, Spain and the Argentine. Attempts are being made in conjunction with J. C. F. Fryer, of the Ministry of Agriculture to develop pyrethrum growing in this country; the results are distinctly promising. A very poor sandy soil gave an excellent sample. The manurial treatments so far tried have not markedly affected either yield or toxic quality of the flowers.

Climatic factors are, however, important. In tropical countries Uganda, Tanganyika and Trinidad, the plant grows but will not produce flowers; on the uplands of Kenya, however, good crops of flowers of high toxic value were obtained. In temperate conditions the number and the pyrethrin content of the flowers are reduced by reducing the illumination (e.g. by cutting off the hours of daylight) and finally with sufficiently low illumination (1,000 watt lamp only), no flowers are produced.

The toxic properties are due to two closely allied substances called pyrethrin I and II, which are esters of a ketonic alcohol, pyrethrolone, and two acids, one monobasic and the other dibasic. Neither the pyrethrolone nor the acids are toxic, only the combination of the two. The pyrethrin content of the flower heads depends on the plant; the order of merit of the different plants tested has been much the same in each of the three years of the experiment. There is some evidence that cuttings from high yielding plants will in turn produce high pyrethrin yields, though whether the property is transmissible by breeding is not yet certain.

Hitherto pyrethrum (made up as talc-pyrethrum dust) has suf fered from the serious drawback that it is liable to lose its toxicity

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