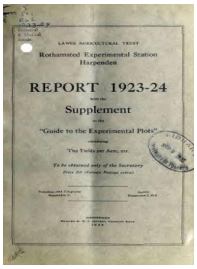
Report for 1923-1924 With the Supplement to the Guide to the Experimental Plots Containing the Yields per Acre Etc.



Full Table of Content

Insecticides

Rothamsted Research

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the numbers of both bacteria and protozoa decrease rapidly for the first two or three days, after which there is a slow but steady fall for periods exceeding three months. No explanation can as yet be offered.

Wart Disease of Potatoes.—An important case of control of a soil micro-organism has been investigated by Dr. Brierley, Mr. Crowther, Miss Glynne and Mr. Roach. Wart disease, one of the worst potato troubles in this country, is caused by an organism having a remarkable power of persisting in the soil so that it cannot be eliminated by the ordinary method of ceasing temporarily to grow potatoes. The direct method of studying the effect of various chemicals on the organism is inapplicable owing to the difficulty of germinating the winter sporangia: pot experiments failed owing to difficulties of obtaining infection in pots, till Miss Glynne showed how this could be brought about. Direct field experiments were the only satisfactory method of procedure, and these, while tedious and costly, showed that heat (which owing to obvious practical difficulties was tried only in pot experiments), formaldehyde and sulphur were all effective in dealing with the disease. Heat is too expensive, so also is formaldehyde at present, and possibly for a long time to come, but sulphur is relatively cheap. Mr. Roach overcame the earlier failures by using the Simar cultivator, and so ensuring a better mixture of the sulphur with the soil. There is evidence that on light soils, such as are generally used for potatoes, an application of 12 cwts. per acre of sulphur eliminates wart disease. A large scale trial is now being made to test the practicability and effectiveness of the treatment. Heavier soils apparently require bigger doses of sulphur.

On the other hand, it does not appear that the "scab" of potatoes caused by the fungus *Spongospora subterranea* is amenable to treatment by sulphur, although in America, positive results are said to have been obtained.

INSECTICIDES.

The Staff of the Department of insecticides, fungicides, and partial sterilising agents, under Mr. F. Tattersfield, have for the past three years been engaged in a search for a substitute for nicotine. The seeds and leaves of a tropical plant, *Tephrosia vogelii*, have been found to possess approximately the same toxicity as nicotine; these could readily be obtained should the need arise. Special attention has been directed to the possibility of using synthetic substances, since these can be made to any desired standard of purity, and in any quantity. The work is done on systematic lines, the effects of the various groups being studied as they are substituted in a relatively simple molecule such as benzene. Thus it is found that the introduction of a nitro (NO_2) group into the benzene molecule considerably increases the toxicity, while the methyl (CH_3) group has less effect than any of those tested, the order being :—

$$NO_2 > NH_2 > OH > Cl > CH_3$$

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When two or more groups are introduced into the molecule the toxicity is much affected by their relative positions in the ring (see p. 66). Several of the substances finally obtained are highly toxic both to insects and eggs; some are being tried this year on a field scale.

This investigation, like that on partial sterilisation, raises the important problem of exploiting a laboratory discovery and applying it on the large scale. Between the Rothamsted Station and the agricultural and horticultural industries there is the important difference that the one is working with a few pounds only, while the other may require in the aggregate thousands of tons. It is not possible for the Research Station to bridge this gap, nor to carry up to the farm stage the methods it may evolve. When superphosphate was discovered at Rothamsted many years ago, Lawes completely separated the factory and exploitation sides from the Rothamsted experiments. In a letter to the Ministry of Agriculture, published in the Journal of the Ministry of Agriculture, February, 1922, Lord Elvedon emphasised the lack of bridging agencies, and offered himself to finance a non-profit making syndicate for the exploitation of the "artificial farmyard manure" process (see p. 32). This is proving a very effective way of securing development. Both the insecticide and partial sterilisation work are now almost ripe for extension to the factory, as also is some of the physical work described above. The most suitable procedure has yet to be decided.

PLANT PATHOLOGY.

New laboratories have been erected, to which in September, 1924, the Entomological and Mycological Departments migrated; work is now being done under eminently satisfactory conditions.

In the Entomological Department Dr. Imms has concentrated the attention of the Staff on insecticides, on aphids and on the gout fly of barley. The work on insecticides has already been described (p. 35).

Dr. Davidson's aphid studies have shown the important connection between the nutrition of the host plant and the rate of multiplication of the insects; contrary to general belief, it is the best nourished beans on which the aphids multiply most rapidly.

Certain varieties of field beans are only slightly susceptible to aphid attack, and plant breeding experiments suggest that this factor can be transmitted to new varieties. It appears possible, therefore, that a bean might be evolved of commercial value, and, at the same time, possessing considerable resistance to aphid attack. No rapid progress towards the production of such a variety can be expected owing to the laborious nature of the work and the necessity of making detailed tests at every stage.

A pure line of the bean aphis has been carried on continuously since 1920, over 80 generations having been passed through. The sexual cycle appears with remarkable regularity during early

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