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Report for 1933

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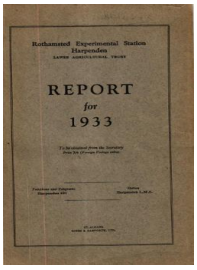

Plant Pathology

Rothamsted Research

Rothamsted Research (1934) *Plant Pathology ;* Report For 1933, pp 38 - 39 **- DOI: https://doi.org/10.23637/ERADOC-1-3**

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sugar there is no evidence of any preference for ammonia over nitrate. The loss in presence of ammonia was about 14 per cent. with a C/N ratio of 8, but was nil, or even replaced by a slight gain, when the ratio was 84. Evidence is given that the loss of gaseous nitrogen takes place within the cell of the micro-organism and is not a simple decomposition of ammonium nitrate. There is also evidence that in presence of nitrate the loss is still greater, though no definite figures can yet be given.

Fungal tissue is fully available to micro-organisms as a source of nitrogen ; it is as easily and as completely nitrified as ammonia and it left no resistant unnitrifiable residue.

In all these decompositions brought about by micro-organisms there is also much resynthesis, the organisms building up their body tissues out of the decomposition products.

The sticky part of the humic residue left in the decomposition of farmyard manure is supposed to have considerable physical effect in the soil ; its formation has been studied in detail. It is most easily formed when the decomposition is begun by fungi and then carried further by bacteria ; the optimum pH is about 9.5 or 10. Nitrate and fungal tissue are better sources of nitrogen than ammonia, and the action proceeds better when the mineral bases are sodium or potassium than when they are calcium or magnesium.

PURIFICATION OF EFFLUENTS

D. W. Cutler and E. H. Richards, and their staffs, are applying these results with considerable success to the purification of effluents from sugar beet factories and from milk factories. In both cases organic matter has to be decomposed and in both cases micro-organisms are far the cheapest agencies for doing the work. The conditions required are a ready supply of oxygen, suitable reaction and suitable carbon/nitrogen ratio. The requirements may vary at different stages in the decomposition : thus the decomposition of complex substances like proteins and fats proceeds most rapidly when the first stages are done under anaerobic, and the later stages under aerobic conditions.

For sugar beet factory effluents appropriate conditions have been worked out, and the results are embodied in a report issued by the Department of Scientific and Industrial Research, under whose aegis all this work has been done. For milk factory effluents the problem is proving more difficult because of the presence of fat ; this is an old trouble long familiar to sewage experts, called upon to deal with the soap in domestic sewage. In view of its importance a special investigation of the decomposition of fat has been started. Conditions have been found under which both the fat and the casein can be precipitated from the effluent, leaving a liquid that can be run over biological filters without fear of clogging them.

PLANT PATHOLOGY

A new stage in the history of the Plant Pathology Department is opened with the appointment of J. Henderson Smith as Head and of G. Samuel as Mycologist in place of W. B. Brierley, and R. H. Stoughton respectively. Professor Brierley is writing his results for publication. Professor Stoughton's have been published, thus bringing to a close the work on Black Arm of cotton, the bacterial

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disease caused by *B. Malvacearum*, an investigation hitherto financed by the Empire Marketing Board. Miss Glynne has continued her work on Wart Disease of Potatoes and on Take-all (*Ophiobolus graminis*, Sacc) on wheat. The Wart Disease investigation is widened so as to include a study of some of the new varieties under examination at Ormskirk, a special grant being given by the Ministry of Agriculture for this purpose. A rapid method devised by Miss Glynne is used for distinguishing immune from susceptible varieties. This method, which needs only a few weeks for execution, gives results which agree in general with those obtained in the field after some two or three years trials ; it is therefore a great convenience to the potato breeder, because it shows him at once what material to discard and what to preserve. Miss Glynne finds an intermediate group of potato varieties which can be attacked by the disease organism, but which have the power of sloughing it off, so that it does no damage to the crop and causes no apparent loss in the field.

Miss Glynne also continued her survey of fungus diseases on the experimental plots, which is giving a mass of valuable observational data.

Thanks to action on the part of the Ministry of Agriculture, it has been possible to continue in full the investigations on Virus Diseases of Plants, hitherto financed by the Empire Marketing Board. No striking advance can be reported this year, but there has been a good deal of general progress as the result of much quiet steady work. In spite of many attempts, no method has yet been found of growing the virus outside the plant. The analysis of virus diseases has continued. A fourth " ring spot " disease of tobacco has been found, caused by a mixture of two separate viruses, neither of which alone can produce it. The aucuba virus of tomato, which has been in our laboratory for some time, is now shown to be a mixture of two which act differently and apparently are to some extent mutually inhibitory. The production of virus symptoms by a trace of molybdic acid and perhaps of other chemicals has been further followed up, as also has the part played by the insect that carries the virus from one plant to another.

A beginning has been made by J. M. Birkeland on the application to plant viruses of the serological methods so much used in animal pathology.

ENTOMOLOGY

The chief investigations in this Department are concerned with :

(1) The factors responsible for the variations in numbers of insect populations ;

(2) The causes of the attraction of insects to the plant that they attack ;

(3) Methods by which they can be kept in check.

In studying the variations in numbers of insects from time to time, C. B. Williams has arranged some ingenious lighted traps to take samples of the night flying insect population. The catches for each separate hour of the night are kept distinct, and records are taken showing the meteorological conditions throughout the night, including continuous records of rainfall, temperature, pressure, wind direction and velocity, humidity, cloudiness, and degree of brightness. Data are being amassed, but it is too early to discuss them as yet.