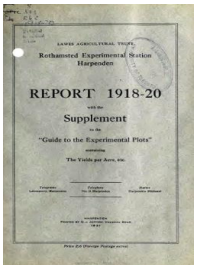
Report 1918-20 With the Supplement to the Guide to the Experimental Plots Containing the Yields per Acre Etc.



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Bacteriological Department XVIII, XIX

Rothamsted Research

Rothamsted Research (1921) *Bacteriological Department XVIII, XIX ;* Report 1918-20 With The Supplement To The Guide To The Experimental Plots Containing The Yields Per Acre Etc., pp 41 - 42 **- DOI: https://doi.org/10.23637/ERADOC-1-109**

justified. This objection does not apply to the dilution method described above.

XVIII. W. F. Bewley and H. B. Hutchinson. *"On the Changes through which the Nodule Organism (Ps. radicicola) passes under Cultural Conditions."* Journal of Agricultural Science, 1920. Vol. X. pp. 144-162.

Under certain cultural conditions the nodule organism from the roots of red clover, broad bean, lucerne and lupin exhibits a tendency towards granular disintegration of the cell with the formation of small non-motile coccoid bodies, about 0.4μ diameter.

In the culture media ordinarily in use these coccoid bodies are not formed extensively, but cultivation on soil extract media rapidly leads to their production, until finally they constitute the predominant type in the culture.

A life-cycle consisting of five stages is described :—

1.—*The pre-swarmer form (non-motile).* When a culture of the organism is placed in a neutral soil solution, it is converted after four or five days into the pre-swarmer form.

2.—*Second stage, larger non-motile coccus.* In presence of saccharose, certain other carbohydrates and phosphates, etc., the pre-swarmers undergo a change. The original coccoid pre-swarmer increases in size until its diameter has been doubled, but still remains a non-motile coccus.

3.—*Swarmer stage, motile.* The cell then becomes ellipsoidal and develops high motility. This form is the well-known "swarmer" of Beijerinck.

4.—*Rod-form.* Proceeding in an "up-grade" direction, the swarmer becomes elongated and gives rise to a rod-form, which is still motile but decreasingly so. So long as there is sufficient available carbohydrate in the medium, the organism remains in this form.

5.—*Vacuolated stage.* When, however, the organism is placed in a neutral soil extract or the available carbohydrate becomes exhausted, it becomes highly vacuolated and the chromatin divides into a number of bands. Finally, these bands become rounded off and escape from the rod as the coccoid pre-swarmer.

The formation of the coccoid bodies (pre-swarmers) may also be induced by the addition of calcium or magnesium carbonates to the medium or by placing the organisms under anærobic conditions. Of a considerable number of compounds other than carbohydrates, calcium phosphate alone was capable of bringing about the change from pre-swarmers to rods.

The organism also appears to be affected greatly by the reaction of the soil. In the main, the normal rod rapidly changes into the pre-swarmer form in calcareous soils; acid soils cause the production of highly vacuolated cells and eventually kill the organism, while a slightly alkaline soil was found to be capable of supporting vigorous growth without altering the form of the cells.

The effect of various temperatures on the rapidity of pre-swarmer formation has been studied. Relatively high temperatures (30° and 37°) either prevent or postpone the entrance of down-grade changes.

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XIX. H. B. Hutchinson and J. Clayton. "*On the Decomposition of Cellulose by an Aerobic Organism (Spirochæta cytophaga n. sp.).*" Journal of Agricultural Science, 1919. Vol. IX. pp. 143-173.

Examination of Rothamsted soils on different occasions has revealed the presence of an organism capable of breaking down cellulose with comparative ease. Morphologically, the organism appears to possess greater affinities with the Spirochætoideæ than with the bacteria, and the name *Spirochæta cytophaga* is therefore suggested.

While the Spirochæt is capable of considerable vegetative growth as a sinuous filamentous cell, it also appears to pass through a number of phases which terminate in the production of a spherical body (sporoid) which differs in a number of respects from the true spores of the bacteria. Germination of the sporoid again gives rise to the filamentous form, which possesses perfect flexibility and is feebly motile. The latter does not apparently possess flagella.

Spirochæta cytophaga is essentially aerobic; its optimum temperature is in the region of 30°. Both the thread and sporoid stages are killed by exposure to a temperature of 60° for ten minutes.

The nitrogen requirements of the organism may be met by a number of the simpler nitrogen compounds—ammonium salts, nitrates, amides and amino-acids. Peptone is also suitable in concentrations up to 0.025%. Stronger solutions, *e.g.*, 0.25% lead to a marked inhibition of growth. The organism fails to grow on the conventional nutrient gelatine or agar.

Comparative experiments with a number of higher alcohols, sugars and salts of organic acids show that none of these is capable of meeting the carbon requirements of the organism. Cellulose is the only carbon compound with which growth has been secured.

Although none of the monoses, bioses and other carbohydrates is able to support growth, many of them exert an inhibitive action on cellulose decomposition if present in other than very low concentrations. This may be correlated with the reducing properties of the carbohydrate. Maltose, for example, has been found to be approximately 70 times more toxic than saccharose.

Of the various by-products of the action of Spirochæta cytophaga may be mentioned: (*a*) a pigment possessing relations to the carotin group, (*b*) mucilage which does not give rise to optically active compounds on hydrolysis, and (*c*) small quantities of volatile acids.

Evidence is also adduced to show the relation of cellulose decomposition to the assimilation of atmospheric nitrogen.

XX. A. W. Rymer Roberts. "*On the Life History of Wireworms of the genus* Agriotes, *Esch., with some Notes on that of* Athous Hæmorrhoidalis, F." Part I. Annals of Applied Biology, 1919. Vol. VI. pp. 116-135.

The biology and life history of the common "wireworm" was studied during the years 1916-1919. In England and probably also in Wales and Scotland, *Agriotes obscurus* is generally the

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