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The Soil Population and Its Behaviour

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(g) Analytical

- XLII. R. G. WARREN AND A. J. PUGH. "*The Colorimetric Determination of Phosphoric Acid in Hydrochloric Acid and Citric Acid Extracts of Soils.*" *Journal of Agricultural Science*, 1930. Vol. XX, pp. 532-540.

The existing macromethods for the determination of phosphoric acid in soils are unsuitable for large numbers of analyses as the time and labour involved are excessive, especially for such empirical determinations as "Available Phosphoric Acid," by means of citric acid. Further in certain cases these methods are not free from serious errors. These disadvantages have prevented extensive work on soil phosphorus and attention has therefore been given to the application of colorimetric methods so that analyses may be made rapidly.

Accurate colorimetric determination of phosphoric acid in soil extracts demands not only the absence of large amounts of silica and organic matter, and a controlled acidity for development of colour, but also the absence of ferric iron. To satisfy these conditions a method was devised in which the organic matter, including citric acid, was oxidised by sodium permanganate in hydrochloric acid solution. Silica was only removed from solution for soils that contained less than .02 per cent P_2O_5 soluble in hydrochloric acid. Ferric iron was precipitated with potassium ferrocyanide, and the excess which would redissolve the iron and cause interference during colour development, was removed by ensuring the presence of sufficient manganese. Finally, the acidity was adjusted by utilising the blue to purple colour change of the precipitated ferrocyanide instead of an added indicator. Two colorimetric methods, Deniges and Fiske-Subbarow, were applied to solutions prepared in this way, and good agreement was obtained with the gravimetric method. In this method lengthy operations such as quantitative filtration, evaporation and ignition of organic matter were eliminated or reduced to a minimum.

Correction to above paper. On p. 539, l. 5, should read: "Rinse into a 1 litre graduated flask containing 500 cc. of 10 N sulphuric acid."

THE SOIL POPULATION AND ITS BEHAVIOUR

(Bacteriological and General Microbiological Departments)

- XLIII. H. G. THORNTON. "*The Influence of the Host Plant in Inducing Parasitism in Lucerne and Clover Nodules.*" *Proceedings of the Royal Society (B)*, 1930. Vol. CVI, pp. 110-122.

The formation of fresh nodules upon inoculated lucerne seedlings placed in the dark soon ceases, and there is a cessation of cell division throughout the root. The bacteria become parasitic upon the host tissues. In old nodules on lucerne and clover plants growing in the light, the bacteria behave similarly. Bacteria from the original infection thread invade the nodule tissue, causing it to disintegrate. It is suggested that lack of carbohydrate is the basal factor in both conditions. When the air supply to lucerne seedlings growing in agar is limited, the nodules do not function normally but, carbohydrate supply not being the limiting factor, the host tissue is not then injured.

- XLIV. H. G. THORNTON. "*The Early Development of the Root Nodule of Lucerne (Medicago sativa, L.)*." *Annals of Botany*, 1930. Vol. XLIV, pp. 385-392.

Bacteria infect the root hairs, the infection threads passing into the cortex without invading the central cylinder of the root. Cell division is thereby induced. The infection threads, naked at their growing points, tend to swell into zooglear masses. In the older portions of the thread, a sheath is formed round them continuous with the wall of the host cell. The zooglear masses remain un-sheathed and release bacteria into the host cytoplasm. Division of the host cells ceases by the time the infection thread sheath is formed. The host cells are apparently uninjured by the bacteria save in old nodule tissue.

- XLV. H. G. THORNTON AND P. H. H. GRAY. "*The Fluctuations of Bacterial Numbers and Nitrate Content of Field Soils*." *Proceedings of the Royal Society (B)*, 1930. Vol. CVI, pp. 399-417.

Samples of field soil were taken at two hourly intervals. Fluctuations in bacterial numbers greatly exceeding the variation in bacterial content of simultaneous samples, were found to occur by day and by night. To reduce sampling errors, a plot of soil was specially prepared, and in soil from this plot significant fluctuations in bacterial numbers were found, greatly exceeding the variation between simultaneous samples. The maximum count usually occurred about 10 a.m. No correlation between the changes in bacterial numbers of soil moisture content was found; correlations of bacterial numbers with rainfall soil temperature, and nitrate content of soil, were doubtful. Results were examined statistically, and the methods of statistical analysis are given in full in the paper.

- XLVI. H. L. JENSEN. "*Decomposition of Keratin by Soil Micro-organisms*." *Journal of Agricultural Science*, 1930. Vol. XX, pp. 390-398.

Keratin, prepared from horn meal, added to moist soil and allowed to decompose in the laboratory, was found to undergo a decomposition resulting in a slow accumulation of ammonia and nitrate. The addition of keratin produced no significant increase in the number of bacteria able to grow on agar, but markedly increased the number of actinomycetes, especially in garden soil. Two strains of actinomycetes were isolated and found capable of thriving in pure culture on keratin and forming ammonia therefrom.

- XLVII. A. KALNINŠ. "*Aerobic Soil Bacteria that Decompose Cellulose*." (With summary in Latvian.) *Latvijas Universitātes Raksti, Lauksaimniecības Fakultātes, Serija I*, 1930. Vol. XI, pp. 221-312.

A number of aerobic bacteria that decompose pure cellulose, have been isolated from 28 samples of English soils. Forty-eight strains are described. All except one are widely distributed in English soils and appear to belong to new species. The conditions of growth have been studied in considerable detail. It was found that the organisms can derive energy from other carbohydrates besides

cellulose. One species, *Bacterium protozoides*, was able to produce a substance resembling glucose from cellulose in quantities up to 30 per cent of the original cellulose.

XLVIII. JANE MEIKLEJOHN. "The Relation between the Numbers of a Soil Bacterium and the Ammonia produced by it in Peptone Solutions; with Some Reference to the Effect on this Process of the presence of Amoebae." *Annals of Applied Biology*, 1930. Vol. XVII, pp. 614-637.

Using a soil bacteria "YB" alone in liquid cultures, an inverse linear relation was found between bacterial numbers and efficiency, and the greatest rate of production of ammonia was found to correspond to a bacterial content of about 500 million per cc.; the rate was lowered by any increase in numbers above this figure.

A greatly increased lag period was observed as a result of diluting the inoculum ten times.

Comparing a soil protozoo an *Hartmanella* and "YB" against "YB" alone in sand cultures, it was found that the presence of the amoebae, while lowering the bacterial numbers, seemed to increase the rate of ammonia production.

THE PLANT IN DISEASE; CONTROL OF DISEASE
(Entomological, Insecticides and Fungicides, and Mycological
Departments)

(a) Insect Pests and Their Control

XLIX. H. F. BARNES. "On the Biology of Gall-Midges affecting Meadow Foxtail Grass." *Annals Applied Biology*, 1929. Vol. XVII, pp. 339-366.

Three midges do serious damage to the seeding of meadow foxtail grass; they are *Dasyneura alopecuri* (Reuter), *Stenodiplosis geniculati* (Reuter) and *Contarinia merceri* n. sp. All three occur almost wherever the grass is grown. "Blindness" or empty husks in meadow foxtail grass is due very largely to attacks of *C. merceri*, which midge does the most extended damage. Keys are given for the separation of larvae, pupae and adults. Control measures are discussed and a method of keeping sheep on the grass until a certain safety date, i.e., a date when the crest of emergence of the female midges is over, is strongly advocated in districts where the bionomics is known.

L. H. F. BARNES. "Unisexual Families in *Rhabdophaga heterobia*." *The Entomologist's Monthly Magazine*, 1929. Vol. LXV, pp. 256-257.

Describes experimental observations showing that unisexual families occur in this midge. This feature is extremely rare among animals with bisexual reproduction and the facts recorded are comparable with Metz's work dealing with various species of *Sciara*.

LI. H. F. BARNES. "A New Thrips-Eating Gall Midge, *Thripsobremia liothripis*, Gen. et. sp. n. (Cecidomyiidae)." *Bulletins of Entomological Research*, 1930. Vol. XXI, pp. 331-332.

This new species of gall midge is described from material received from Trinidad by the Imperial Institute of Entomology. Its