present. This organism is very similar if not identical to non-indol-producing strains of Pfeiffer's bacillus. Oftentimes the organism has been obtained in pure culture from the involved lung and bronchial exudate. It has not been found in the respiratory tract of normal swine. Freshly isolated cultures of the organism, when administered intranasally, may produce a disease which might be confused with the natural infection in swine but which, unlike the natural disease, is not contagious. Cultures on artificial media for two months or longer are non-pathogenic.

Suspensions of tracheal exudate and lung from infected animals passed through Berkefeld N filters, when introduced into the nasal passages of normal swine, cause a variable disease complex, apparently dependent upon the strain of infectious material under study. One strain, obtained in 1928, produced a clinical picture and lesions which closely resembled those following the intranasal injection of unfiltered infectious material. With other strains the disease produced by the filtrate has been very mild and transient and sometimes difficult of certain recognition. The contrast between the mild disease caused by the filtrate and the typical disease induced by unfiltered infectious material has been particularly striking with two strains of the disease obtained in 1930. In all instances bacteriological examination of the lung and tracheal exudate of filtrate infected swine has failed to reveal the influenza-like organism and sometimes these sites have been found bacteriologically sterile. The mild disease induced by the filtrate is contagious.

If a small amount of a culture of the influenza-like bacillus, carried on artificial media for over two years and long since non-pathogenic for swine, is added to a Berkefeld N filtrate and this mixture injected intranasally into normal swine, a typical swine influenza results and this disease is transmissible by contact to other swine. In such experiments control animals inoculated with culture alone remain perfectly normal, animals receiving filtrate alone develop a mild, transient, scarcely recognizable disease, while animals receiving a mixture of the two develop typical swine influenza.

The experimental data obtained in the investigation and briefly outlined in this note indicate that the primary inciting agent in swine influenza is filterable. However, since the influenza-like bacillus is always found in field and experimental cases and is capable experimentally of converting the mild disease caused by the filtrate into clinically and pathologically typical swine influenza, it seems probable that both the filterable agent and the bacillus are etiologically essential to the production of the disease and that, in this rôle, they act synergistically.

It is conceivable that these results may be suggestive in the study of influenza and certain other respiratory infections in man and animals.

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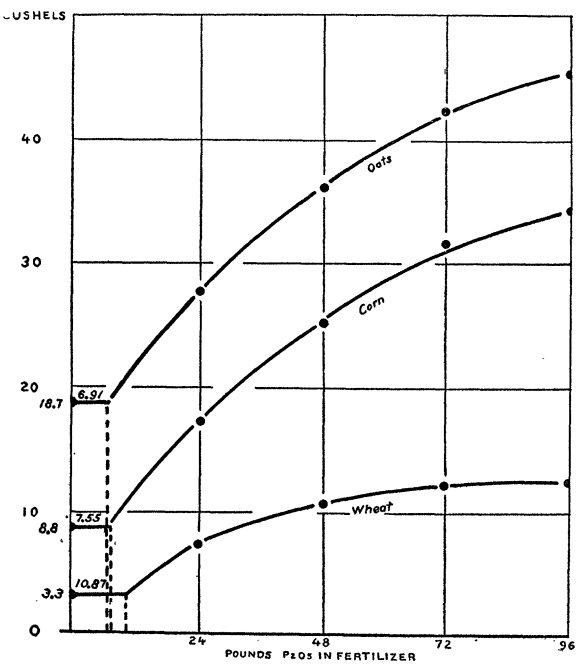
MEASURING ABSORBED PHOSPHATES AND NITROGEN

WHEN phosphate or nitrate fertilizers are applied in certain cases small amounts of the plant food element appear to be absorbed by the soil and held in a condition unavailable to the growing crop. The usual increase in yield with increasing applications appears not to begin until the quantity applied exceeds the amount that can thus be absorbed. Whether potash is similarly absorbed is not yet known.

The purpose of this communication is to point out what seems to be a method of measuring the amount of a plant food element absorbed in the manner above described. The accompanying drawing shows the relation between amount of phosphoric acid applied and corresponding yields of oats, corn and wheat at the Snowshoe Branch Station of the Pennsylvania Experiment Station, as reported in Pennsylvania Bulletin No. 166.



The dots along the curves show actual yields. The curves are calculated from the yields for 24, 48, 72 and 96 pounds of P_2O_5 for each crop by means of the equation

$$Y = M - AR^x \qquad (1)$$

in which Y is the yield when x units (of 24 pounds each) of P_2O_5 are applied per acre, M is the maximum toward which the yield increases as x increases indefinitely, A is the difference between M and the yield for $x=0$, and R is the ratio of the decreasing geometric series of which the terms are the increments of Y corresponding to successive unit increases in x.

From applications of 24 to 96 pounds of P_2O_5, the agreement between actual and expected yields is excellent. But in each case the yield for $x=0$ lies considerably above the curve. The facts are explained if we assume that, of the phosphates applied, 6.91 pounds per acre are absorbed by the soil and held in a condition unavailable to oats, the corresponding figure for corn being 7.55 pounds and for wheat 10.87 pounds.

In previous work I have found that corn can obtain considerably more phosphate from a given soil than can wheat.

If the above assumptions are correct, oats should have yielded the same for any application of P_2O_5 between 0 and 6.91 pounds; corn for applications between 0 and 7.55 pounds, and wheat between 0 and 10.87 pounds. The validity of this assumption could easily be tested by a series of applications such as 0, 2, 4, 6, 8 and 10 pounds in addition to the application actually used in these experiments. A number of replications would be necessary to insure accuracy in the yields obtained.

The method of determining the values 6.91, 7.55 and 10.87 is simple. It is merely to find the point on the respective curves at which the value of Y in equation (1) above is the same as the observed yield at $x=0$. The values of the constants in equation (1) were determined by the method of least squares from the yields at $x=1$, 2, 3, and 4 units of 24 pounds P_2O_5 each.

Niklas and Miller, in an article[1] dealing with the form of the yield curve, assemble nine series of experiments with nitrogenous fertilizers, in all of which the phenomenon of nitrogen absorption is plainly evident. I have taken the trouble to recalculate the constants in the yield equation for each of these nine series, first with the yield at $x=0$ included, second, with this yield omitted. In each case the curve calculated without the yield at $x=0$ fits the observed yields better than that calculated with Y_0 included. This indicates that some nitrogen is actually absorbed in each series of experiments. Evidence of nitrogen absorption also appears in some field experiments in this country, particularly on delta soils in Mississippi.

In view of this situation it is obvious that in accurate experimental work with fertilizers the check plots should not be left unfertilized; they should receive an application of fertilizer at least as large as the quantity the soil is capable of absorbing and holding in a condition unavailable to the growing crop.

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[1] H. Niklas and M. Miller, "Beiträge zur Mathematischen Formulierung des Ertraggesetzes," *Zeitsch. f. Pfl.-ernahr., Düng. u. Bodenkunde*, Teil A, 8 Band, Heft 5., S. 289–297.

BOOKS RECEIVED

Abstracts of Theses: Ogden Graduate School of Science. Volume VII. Pp. xi + 484. University of Chicago Press. $3.00.

ADAIR, FRANK E., Editor. *Cancer: Comprising International Contributions to the Study of Cancer in Honor of James Ewing.* Pp. xix + 484. 168 illustrations. Lippincott.

American and Canadian Committees on Modern Languages. A Summary of Reports on the Modern Foreign Languages. Pp. vii + 261. Macmillan.

D'ALVIELLA, GOBLET. *Histoire des Bois et Forêts de Belgique.* Volume IV. Pp. 448. Illustrated. Paul Lechevalier, Paris.

DODGE, RAYMOND. *Conditions and Consequences of Human Variability.* Pp. x + 162. Yale University Press. $2.50.

EATON, RALPH M. *General Logic.* Pp. xii + 630. Scribner's. $3.00.

FRAME, W. S. *Stream Gaging in Arkansas from 1857 to 1928.* Pp. viii + 141. Illustrated. Arkansas Geological Survey.

GARTH, THOMAS R. *Race Psychology.* Pp. xiv + 260. Whittlesey House, McGraw-Hill. $2.50.

GERMAIN, LOUIS. *Faune de France.* Volume XXI: Mollusques Terrestres et Fluviatiles. Pp. 477. 467 figures. 13 plates. Paul Lechevalier, Paris. 150 fr.

GILLESPIE, JOHN W. *New Plants from Fiji.* Pp. 99. 57 figures. Bernice P. Bishop Museum, Honolulu.

HIROA, TE RANGI (P. H. Buck). *Samoan Material Culture.* Pp. xi + 724. 338 figures. 56 plates. Bernice P. Bishop Museum, Honolulu.

JUDD, HENRY P. *Hawaiian Proverbs and Riddles.* Pp. 91. Bernice P. Bishop Museum, Honolulu.

LODGE, SIR OLIVER. *Beyond Physics.* Pp. 184. Greenberg. $2.00.

LOVE, CLYDE E. *Elements of Analytic Geometry.* Pp. xi + 147. 85 figures. Macmillan. $1.60.

MCLESTER, AMELIA. *The Development of Character Traits in Young Children.* Pp. xvi + 126. Scribner's. $1.25.

MEYER, WILLY. *Cancer.* Pp. xxxiii + 427. 16 plates. Hoeber. $7.50.

WARMING, EUGENE, and P. GRAEBNER. *Lehrbuch Der Ökologischen Pflanzengeographie.* Pp. 480. 232 figures. Verlag von Gebrüder Borntraeger, Berlin. 24 M.

YONGE, C. M. *Scientific Reports: Great Barrier Reef Expedition, 1928–29.* Volume 1: No. 1. Origin, Organization and Scope of the Expedition. Pp. 11. 4 plates. 2 shillings.

No. 2. Studies on the Physiology of Corals: Feeding Mechanisms and Food. Pp. 57. Illustrated. 5 shillings.

No. 3. Studies on the Physiology of Corals: Digestive Enzymes. Pp. 81. 2 shillings. British Museum (Natural History), London.