RESEARCH

USDA Scientists Find Answer to Phosphate Mystery

Blocking of phosphate ions at the plant root surface by hydroxyl ions is the explanation offered by USDA scientists to the problem of why alkaline soils often have higher phosphate requirements than do acid soils. Experience has shown that a crop requiring as much as 300 pounds per acre of available phosphorus, when grown in alkaline soil, may do just as well with only 25 pounds on an acid soil.

C. E. Hagen and H. T. Hopkins at USDA's Beltsville, Md., experiment station grew barley in nutrient solutions and measured phosphorus uptake. With an extremely acid solution (pH 4), phosphorus uptake was high. Uping pH to 6, they found phosphate ion uptake dropped 11%. At a neutral level, phosphate uptake declined to 74%, and when the solution was a mild alkaline (at pH 7.7), phosphate uptake was 85% below than in the extremely acid solution.

Hagen and Hopkins also report that two forms of soluble phosphate—monohydrogen phosphate ions and dihydrogen phosphate ions—can be absorbed by plant roots. Some plants need only dihydrogen phosphate, some need both. The greater the soil alkalinity, the greater the breakdown of complex forms of phosphate and the more one-hydrogen phosphate ions present. When the soil is moderately acid, soil phosphate ions aren't broken down so far and the number of two-hydrogen phosphates exceeds that of the one-hydrogen phosphate ions.

Plants treat the dihydrogen form and the monohydrogen form as separate groups, permitting neither to use any part of the other's entry quota. The hydroxyl ion competes, according to the USDA researchers, with both phosphates.

Pyrethrum Laboratory Opens in Kenya

The Pyrethrum Board of Kenya, a producer's association, has announced opening of a $100,000 research laboratory at Nakuru, Kenya. The laboratory is to be devoted to seeking the answers to such questions as: what breeding means can be used to increase pyrethrin content of the flowers; how can flower volume be increased with full preservation of pyrethrin content, and how can the breeding of new strains be used to improve the biological activity of the plant.

BUSINESS AND FINANCE

Stauffer Earnings Up 33%

Preliminary unaudited earnings of $12,305,000, or $4.04 per share for 1955 are announced today by Stauffer Chemical. This represents an increase of 33% over 1954 earnings of $9,210,000, or $3.02 per share. Sales for 1955 were reported at $145,490,000, up 24% from 1954 sales of $116,916,000. These figures include earnings and sales of Consolidated Chemical Industries which was merged with Stauffer in last November.

Michigan Chemical Shows $340,000 Profit for 1955

Michigan Chemical Co. reports a profit of $341,314 for 1955, or 64 cents a share. In 1954, the company showed a net loss of $228,894 or 43 cents a share. Of the 1955 profit, 19 cents a share came for nonrecurring income resulting from the sale of property.

Sales totaled $6,526,275 for the year, a 12% increase over the 1954 sales of $5,829,342.

Monsanto's Sales at $522 Million

Monsanto Chemical's sales including those of Lion Oil, for 1955 amounted to $522,349,097.

Unaudited net income for the year 1955 was $42,169,970 which is equivalent, after preferred dividends, to $1.98 a common share.

Earnings for 1955 were not strictly comparable with those for 1954 because the merger with Lion Oil Company made advisable some accounting procedure changes.

Hercules Sales Gain 21%

Hercules Powder's 1955 report to stockholders shows a 21% increase in sales and an increase of 34% in net income.

Net sales and operating revenues in 1955 amounted to $226,651,058, an all-time high, compared with $187,547,566 in the preceding year.

Net income after all charges was $19,012,125, equal to $6.90 a share of common stock. This compares

NOW IN OPERATION–GAF'S NEW PLANT FOR HIGH PRESSURE ACETYLENE DERIVATIVES

the story behind the headline

For those of you who have not been eating, sleeping and breathing high pressure acetylene reactions as we have, a brief reminder on the background of these products may be in order. In the early 1930's, Dr. J. Walter Reppe, working in Germany, licked the previously "impossible" problem of handling acetylene efficiently and safely at high temperatures and high pressures in chemical syntheses. This led him and his group into varied investigations which resulted in the synthesis of numerous chemicals which had previously been completely unknown, or at best only obtainable by elaborate and expensive reactions.

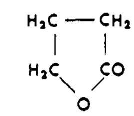
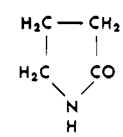
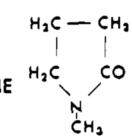
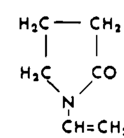
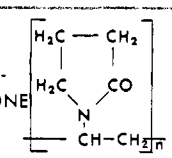
Even though widespread work in this field has continued steadily up to the present, and the laboratories of General Aniline in this country have been engaged in their own independent research for more than ten years, vast and challenging areas of research still remain for exploration in the new branch of chemistry involving high pressure acetylene reactions.

When the GAF laboratories began synthetic work in the new field, none of the products they turned out had ever been available in the U.S. in commercial volumes and at commercial prices. We, therefore, found it necessary to do some rather fancy, long-range extrapolating from the physical and chemical properties of all of the products to their potential applications and sales volumes in order to decide which would be of greatest immediate industrial value. Following these decisions came sales development, application research, and process development in the laboratory and pilot plant. Finally, the plant stage has been reached for the first group of products now to be made at GAF's new Calvert City plant.

They are a related series resulting from the reaction of acetylene with formaldehyde to yield a mixture of butynediol and propargyl alcohol. In a relatively brief time they have developed an astonishing and, we must confess, in part unexpected range of applications about which GAF's Commercial Development Department has told you in advertisements, data bulletins and personal visits. Along with the large new plant now also comes a new, full-scale sales department eager to help you use these products to your best advantage.

We expect to be reporting the commercialization of many more high pressure acetylene derivatives in the future, but no announcement will have quite the significance of this first one, both for you and for us. We believe it represents a milestone for our industry: the first of many commercial high pressure acetylene derivatives plants in the United States.

PRODUCTS TO BE AVAILABLE FROM GAF's NEW PLANT AT CALVERT CITY, KENTUCKY:

PROPARGYL ALCOHOL	$HC{\equiv}CCH_2OH$	2-BUTYNE-1,4-DIOL	$HOCH_2C{\equiv}CCH_2OH$
1,4-BUTANEDIOL	$HOCH_2CH_2CH_2CH_2OH$	BUTYROLACTONE	
2-PYRROLIDONE		N-METHYL-2-PYRROLIDONE	
N-VINYL-2-PYRROLIDONE		POLYVINYLPYRROLIDONE (PVP)	

For technical information, price schedules and samples write to:

ACETYLENE CHEMICALS DEPARTMENT

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From Research to Reality

with net income of $14,140,070 in 1954, equal to $5.10 a share.

Expenditures for construction in 1955 totaled $12,998,000, financed entirely through internally-generated funds. Albert E. Forster, Hercules president, said the 1956 construction program is expected to "exceed the all-time high of some $21 million spent for this purpose in 1954."

A major construction project completed during the year was the nitrogen plant at Tarrant, Ala., by Ketona Chemical Corp., in which Hercules and Alabama By-Products Corp. each own 50% of the stock.

The report showed that 17% of Hercules production was consumed during 1955 by the protective coatings industry; 13% by the paper industry; 10% in mining and quarrying; 9% by synthetic fibers; 8% by the plastics industry; 8% in agricultural chemicals; 5% each by the petroleum and rubber industries and by identifiable military uses; 3% by the construction industry; 2% by the adhesives industry; and 15% by others.

Research expenditures for 1955 totaled $7,903,000, an increase over the preceding year when $7,578,000 was spent for this purpose.

Takamine to Merge with Miles Laboratories, Inc.

Merger of Takamine Laboratory, Inc., into Miles Laboratories, Inc., has been approved by stockholders of both companies. Subject to directors' approval, the merger is to become effective March 7. Takamine produces industrial and pharmaceutical enzymes. Miles Laboratories, whose stock was recently offered to the public for the first time, produces drugs and fine chemicals, as well as citric acid by deep fermentation.

NPFI Protests Freight Increase

National Plant Food Institute has protested the proposed 7% freight increase on fertilizer and fertilizer materials as an "insurmountable hardship on farmers and the fertilizer industry."

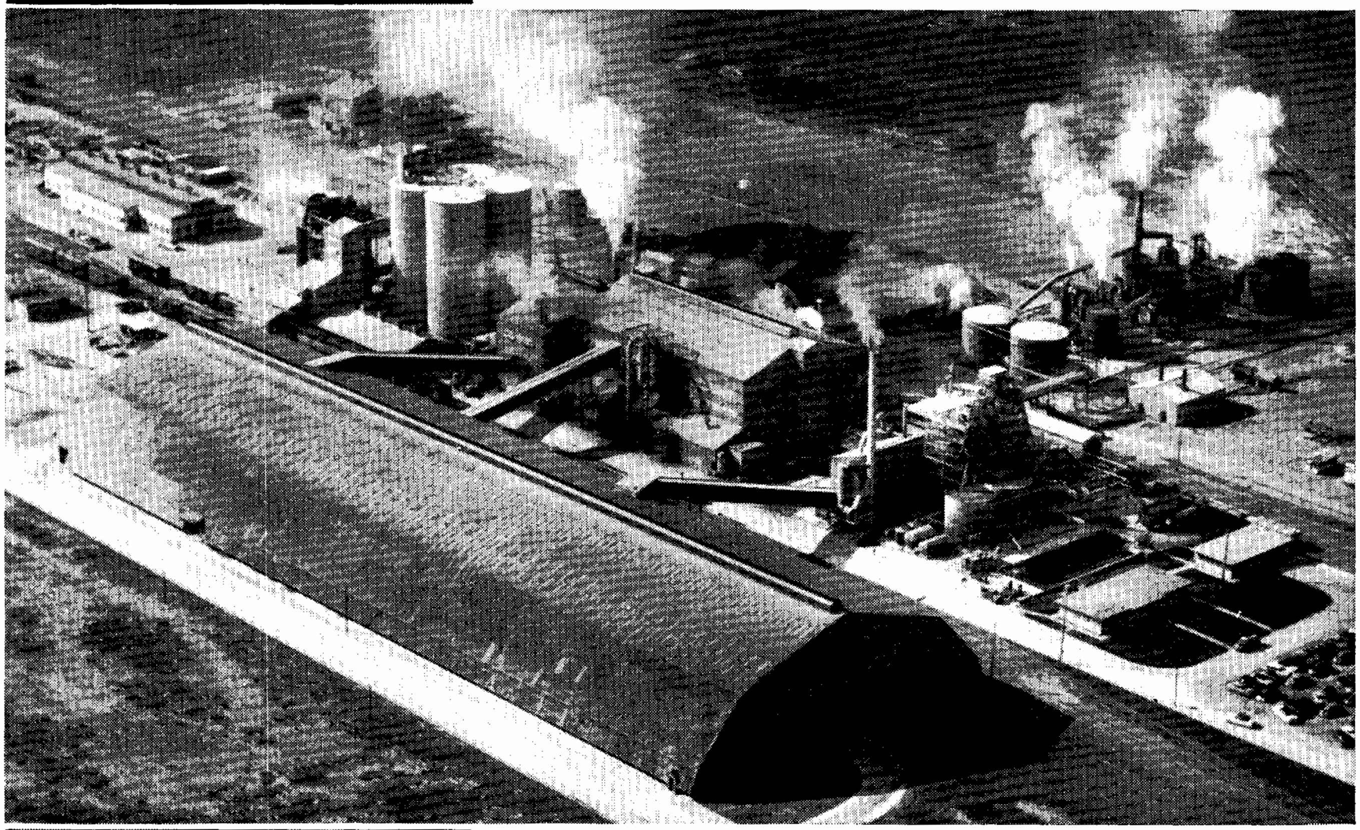
The protest was filed with the Interstate Commerce Commission and revealed by Paul T. Truitt, executive vice president of NPFI.

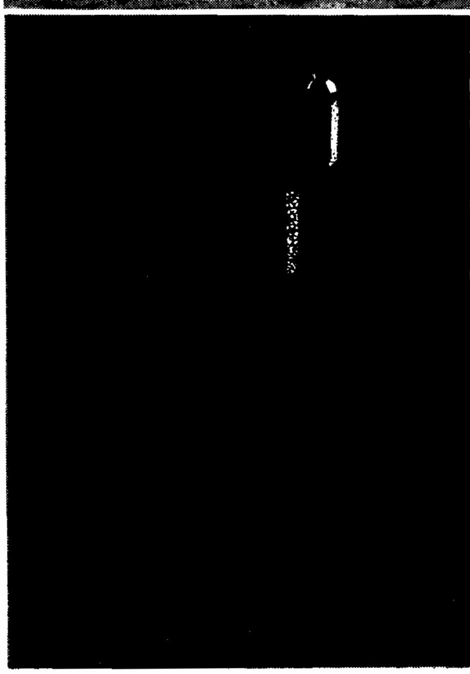
"Freight rates now constitute a disproportionately high share of the total cost of fertilizer and this is at a time when farm income is near disastrously low levels," he said. "Any increase in the cost of agricultural production only would add further to the serious farm problem that faces the nation."

Mr. Truitt said that "the assumption by the railroads that any increased freight charges could be absorbed by the industry or by the farmer is not true in the case of fertilizers," emphasizing that "plant food costs have been held to the lowest level of any major item entering into the cost of agricultural production."

"Farm income has declined substantially," he said. "The outlook is for additional declines during the coming year. The farmer will have less money with which to buy fertilizer. This indicates a decline in farm consumption of fertilizer even if there is no increase in the cost because of a freight rate increase. To impose an increase in freight rates on fertilizer under these conditions would run counter to the long-established policy of the Commission to keep freight rates on fertilizers at the lowest reasonable level because of their economic value to the farmer and because their use by the farmer encourages a high production of materials for shipment by the carriers."

Bonnie giant with a fine-textured touch





Result:

better granulation with International's new

TRIPLE Superphosphate

This giant International plant at Bonnie, Fla., adds the touch of fine texture to International's Triple Superphosphate — controlled uniformity of particle size, even density and low-moisture. These improved physical properties reduce your formulation costs. Promote better granulation. Give the same excellent ammoniation in batch after batch.

International's superior texture lets you operate at higher ammoniation rates and temperatures, too, for more economical formulation. Result: lower manufacturing costs; better agglomeration; and case-hardened, free-flowing, granular fertilizer products that farmers prefer. Write or wire for samples and quotations.

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Phosphate Chemicals Division • General Offices: 20 North Wacker Drive, Chicago 6

He said that "fertilizer is one of the most effective 'tools' that farmers have in fighting the so-called price-cost-squeeze and neither they nor the fertilizer industry can stand further freight rate increases under present economic conditions."

ASSOCIATIONS

Ag and Food Division to Present 2 Symposia, 47 Papers

The Division of Agricultural and Food Chemistry begins its four-day program for the 129th AMERICAN CHEMICAL SOCIETY meeting on Monday April 9 with a symposium on relation of environment to nutritive quality of crops. Another symposium, on food and agriculture with H_2O-plus, is to be held on Wednesday. The ACS meeting begins on April 8 in Dallas, Tex., and continues through April 13.

In addition to the Ag and Food Division's program there are papers and symposia of interest in other divisions. In the Division of Biological Chemistry, there are symposia on recent studies in carbon dioxide fixation, metal ions in biochemistry, and a series of papers on plant biochemistry.

The program of the Ag and Food Division follows.

Monday Morning and Afternoon (April 9)

Symposium on Relation of Environment to Nutritive Quality of Crops

Walter J. Peterson, *Presiding*

WALTER J. PETERSON. Introductory Remarks.

KENNETH C. BEESON. Soil and Environmental Factors Affecting the Nutritional Quality of Plants—Historical Aspects.

G. FRED SOMERS. The Vitamin Composition of the Plant in Relation to its Nutrition.

JOHN F. THOMPSON. Factors Affecting the Amino Acid Composition of Plants.

ROBERT VAN REEN AND ALVIN NASON. Role of Minerals in Enzyme Systems.

EDGAR R. LEMON. Soil Physical and Meterological Interrelationships Involved in Plant Nutrition.

Ruth Reder, *Presiding*

HENRY L. LUCAS, JR. Designs and Procedures for Relating Soil, Climate, and Nutritive Composition.

EDWARD J. THACKER. The Use of the Rabbit in Evaluation of Forages in Soil-Plant-Animal Studies.

MARY SPEIRS. The Relation of Soil and Weather Factors to the Organic Constituents of Plants as Found in a Regional Study.

LUTHER R. RICHARDSON. The Relation of Soil and Weather Factors to the Inorganic Constituents of Plants as Found in a Regional Study.

ALVIN L. MEXON. Problems Concerned with Mineral Elements in Animal Nutrition.

Tuesday Morning and Afternoon (April 10)

General

W. O. Lundberg, *Presiding*

ORLAND A. KROBER AND ROBERT W. HOWELL. Relation of Sulfur Level to Nutritional Value of Soybeans.

CARL W. BONHORST AND IVAN S. PALMER. Metabolic Interactions of Selenate, Sulfate, and Phosphate.

L. J. TEPLY AND R. F. PRIER. A Nutritive Evaluation of Coffee, Including Niacin Bioassay.

HAROLD SALWIN, MARY D. DEVINE, AND J. H. MITCHELL, JR. Determination of Choline in Noodles as a measure of Egg Yolk Content.

VIRGINIA R. WILLIAMS AND E. A. FIEGER. Investigation of Factors Influencing the Amylose Content of Rice Starch.

JULIUS W. DIECKERT AND NELLE J. MORRIS. Chromatography of Sugars on Glass Paper Impregnated with Silicic Acid.

JANET L. C. RAPP AND PHILIP C. ANDERSON. The Roles of Essential Amino Acids and Available Hydrogen in the Feeding of Urea to Ruminants.

C. F. KREWSON, T. F. DRAKE, J. W. MITCHELL, AND W. H. PRESTON, JR. Growth Regulators. VI. Amino Acid Derivatives of 2-(2,4-Dichlorophenoxy)-Propionic Acid and Their Plant-Regulating Effects in Preliminary Screening Tests.

Divisional Luncheon. ROGER J. WILLIAMS. The Wisdom of the Body —To Eat.

A. L. Elder, *Presiding*

A. LAURENCE CURL AND GLEN F. BAILEY. Comparison of Xanthophylls from Leaves and Orange Juice.

LYLE JAMES SWIFT. Composition of Commercial, Segment, and Peel Juices of Florida Oranges.

TORSTEN HASSELSTROM AND MALCOLM C. HENRY. The Effect of High Energy Radiation on the Carboxyl Group in Small Molecules.

GEORGE P. DATEO, RICHARD C. CLAPP, KURT S. KONIGSBACHER, DONALD A. M. MACKAY, ERIC J. HEWITT, AND TORSTEN HASSELSTROM. Food Flavor. I. Identification of the Volatile Sulfur Flavor Components of Cooked Cabbage and the Nature of the Precursor in the Fresh Vegetable.

SAMUEL R. HOOVER. (**Borden Award in the Chemistry of Milk Address.**) Studies in Water Adsorption of Proteins.

E. R. IBERT, F. T. FISHER, AND J. F. FUDGE. Partial Fractionation of Water Soluble Nitrogen in Coastal Bermuda grass.

JAMES E. WEBSTER AND FRANK DAVIS. The Effect of Weathering Upon Dry Standing Sorghum Forage.

S. S. BLOCK AND GEORGE TSAO. Mushrooms from Sawdust.

Business Meeting.

Wednesday Morning (April 11)

Symposium on Food and Agriculture with H_2O-Plus

Louis Koenig, *Presiding*

LOUIS KOENIG. Introductory Remarks.

L. V. WILCOX. Irrigation with Saline Waters.

JAMES A. MCMILLAN AND VERNICE C. COOK. A Trace Element Food Supplement from Sea Water.

ARNOLD E. SCHAEFER. Nutritive Properties of Sea Salt.

ROBERT C. MERZ. Irrigation with Sewage Effluent for Agricultural Purposes.

CLARENCE G. GOLUEKE, W. J. OSWALD, AND HAROLD B. GOTAAS. Animal Food Production from Waste Waters.

ROBERT A. CANHAM. Current Developments in Spray Irrigation of Food Canning Waste.

Thursday Morning and Afternoon (April 12)

Pesticides Subdivision

Hobart O. Thomas, *Presiding*

J. A. NOONE. Introductory Remarks.

W. F. PHILLIPS. Announcements.

MERVIN E. BROKKE, ULO KIIGEMAGI, AND L. C. TERRIERE. A Modified Colorimetric Method for the Determination of Aramite Residues.

IRWIN HORNSTEIN. Colorimetric Analysis for Toxaphene.

L. C. TERRIERE AND ULO KIIGEMAGI. A Simplified Bioassay for Insecticide Residue.

PAUL A. GIANG AND R. L. CASWELL. Polarographic Determination of 0,0-Dimethyl 2,2,2-Trichloro-1-Hydroxyethyl Phosphate (Bayer L 13/59).

S. S. BLOCK. Is 8-Quinolinol Fungitoxic?

MARSHALL A. MALINA, ARTHUR GOLDMAN, LEO TRADEMAN, AND PERCY B. POLEN. Deactivation of Mineral Carriers in the Preparation of Stable Heptachlor Formulations.

J. F. LES VEAUX. Methods of Making Calcium Arsenates.

W. F. Phillips, *Presiding*

J. A. NOONE. Introductory Remarks.

THOMAS G. BOWERY, ROBERT L. RABB, FRANK E. GUTHRIE, AND ROBERT J. MONROE. TDE and Endrin Residues on Tobacco.