

New York Agricultural Experiment Station.

GENEVA, N. Y.

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an

FORTY-FOURTH ANNUAL REPORT

FOR THE FISCAL YEAR ENDED JUNE 30, 1925

R. W. THATCHER



PUBLISHED BY THE STATION
UNDER AUTHORITY OF CORNELL UNIVERSITY

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STATE OF NEW YORK:

DEPARTMENT OF FARMS AND MARKETS,

ALBANY, *January 6, 1926.*

To the Legislature of the State of New York:

As Commissioner of Farms and Markets, I have the honor to submit herewith the Forty-fourth Annual Report of the New York State Agricultural Experiment Station, at Geneva, N. Y., in pursuance of the provisions of the Agricultural Law.

I am respectfully yours,

BERNE A. PYRKE,

Commissioner of Farms and Markets.

ITHACA, N. Y., *August 1, 1925.*

His Excellency, ALFRED E. SMITH, *Governor of New York, Albany, N. Y.:*

Hon. BERNE A. PYRKE, *Commissioner of Farms and Markets, Albany, N. Y.:*

SIRS.—In compliance with the requirements of sections 1039 and 1039-a of the Education Law of the State of New York, and of the provisions of the act of the United States Congress of 1887, known as the Hatch Act, authorizing the establishment of agricultural experiment stations in the several states, I have the honor, on behalf of Cornell University, to transmit herewith the forty-fourth annual report of the New York State Agricultural Experiment Station, covering the fiscal year ended June 30, 1925. The year has been one of noteworthy accomplishment in the research undertakings of the Station, and I commend the report to the thoughtful examination of persons interested in the progress of agricultural science and practice.

Respectfully submitted,

LIVINGSTON FARRAND,

President of Cornell University.

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FORTY-FOURTH ANNUAL REPORT

OF THE

New York State Agricultural Experiment Station

DR. LIVINGSTON FARRAND, *President of Cornell University, Ithaca, N. Y.*

SIR.—In the absence of Dean Mann of the New York State College of Agriculture, thru whom the annual report of this Station would normally come to you, I have the honor to transmit directly to you the following report of the various activities of the New York State Agricultural Experiment Station for the year ended June 30, 1925. I respectfully recommend that this report be printed as the Forty-fourth Annual Report of the Station, for transmission to the Governor and to the Commissioner of Farms and Markets as required by law.

The work of the year at the Station has been characterized by a very noticeable increase in enthusiasm for and attention to the research work which is the particular function of this Station, on the part both of the members of the staff and of the citizens of the State. Much of this research work is in the nature of long-continued and careful study of horticultural or agricultural problems, which must necessarily be carried thru several or many years of observations before definite conclusions can be reached. Some of these studies were more or less interrupted by emergency work during and immediately following the World War. But the effect of these interruptions, both on the character of work undertaken and on the morale of the staff, has now entirely disappeared and the general spirit of enthusiasm and earnest interest in research work which has so long characterized the staff of this Station is again in evidence. As will be specifically shown in later

paragraphs of this report, a considerable number of these long-continued projects of research were brought to definite conclusions and their results prepared for publication during the year. But the newer developments of agriculture and horticulture are continually bringing forward new and more complicated problems, so that the number of such problems which are being presented to the Station for solution is constantly increasing. In recognition of this, the Legislatures of 1923, 1924, and 1925 have each made provision for additional members of the staff and equipment for special types of investigational work. The coming to the staff, thru these means, of a considerable number of scientists who have been recently and thoroly trained in their special fields of research has been an added element of inspiration and strength.

Taken altogether, it may fairly be said that the past year has been one of the best in the history of the Station in results accomplished and in the general *esprit de corps* of the Station staff.

EXPENDITURES FOR GENERAL MAINTENANCE DURING THE YEAR

The following is a summarized statement of the expenditures for various phases of Station maintenance during the year. Payments of these expenditures were made by the treasurer of Cornell University, as proper vouchers were presented to him, with monthly reimbursements from the State Treasurer from funds available thru the several appropriations as indicated below. Full details of these transactions appear in the report of the treasurer of Cornell University for the year 1924-1925.

1. Expenditures contracted for and chargeable to preceding year, but paid after July 1, 1924:
From appropriations by Chapter 225, Laws of 1923:

Maintenance and Operation:

Fuel, light, power, and water.....	\$674 09
Printing	1,749 07
Equipment and supplies.....	1,208 77
Traveling expenses.....	126 95
Communication	71 85
Repairs	4 80

Total maintenance and operation..... \$3,835 53

Investigation of insect pests and diseases affecting raspberry plants.....	\$191 91	
<hr/>		
Total investigation of insect pests and diseases affecting raspberry plants.....		\$191 91
Long Island Vegetable Research Farm.....	\$289 73	
<hr/>		
Total Long Island Research Farm.....		289 73
New Construction:		
Coal shed	\$1,819 65	
<hr/>		
Total new construction.....		1,819 65
From Chapter 574, Laws of 1923:		
Hudson Valley Horticultural Investigations:		
Office equipment	\$10 25	
Laboratory equipment.....	38 07	
Field equipment	220 38	
Horses and tractor cultivation.....	38 04	
Traveling expenses	79 01	
Fuel, light, power, and water.....	32 00	
<hr/>		
Total Hudson Valley Horticultural Investigations.....		417 75
2. Expenditures chargeable to current year's funds:		
From appropriations by Chapter 140, Laws of 1924:		
Personal Service:		
Salaries	\$135,879 17	
Labor	27,999 99	
<hr/>		
Total personal service.....		163,879 16
Maintenance and Operation:		
Fuel, light, power, and water.....	\$7,997 59	
Printing and advertising.....	6,516 20	
Equipment, supplies, and materials.....	22,241 14	
Traveling expenses	2,775 35	
Communication	2,599 56	
Rent	242 10	
Repairs	4,375 11	
Fixed charges and contributions.....	60 00	
Contingencies	37 00	
<hr/>		
Total maintenance and operation.....		46,844 05
Investigation of insecticides and fungicides.....	\$5,000 00	
<hr/>		
Total investigation of insecticides and fungicides.....		5,000 00

Investigation of insect pests and diseases of raspberry plants	\$4,364 56	
Total investigation of insect pests and diseases of raspberry plants		\$4,364 56
Long Island Vegetable Research Farm.....	\$7,806 20	
Total Long Island Vegetable Research Farm.....		7,806 20
Hudson Valley Horticultural Investigation:		
Salaries	\$9,000 00	
Miscellaneous labor.....	1,200 00	
Maintenance and operation.....	4,429 47	
Total Hudson Valley Horticultural Investigation.....		14,629 47
Personal Service:		
Labor at Urbana vineyard.....	\$37 50	
Total labor at Urbana vineyard.....		37 50
Construction of storage and packing house at Fredonia experimental vineyard..	\$1,886 35	
Total for construction of storage and packing house at Fredonia		1,886 35
From Federal Funds:		
Hatch Fund:		
Salaries	\$837 50	
Labor	662 50	
Total Hatch fund.....		1,500 00
Adams Fund:		
Salaries	\$1,500 00	
Total Adams fund.....		1,500 00
From Ring Memorial Fund:		
Books purchased	\$58 47	
Total Ring Memorial fund.....		58 47
From Income from Sale of Farm Products:		
Personal service	\$5,670 19	
Traveling expenses.....	346 06	
Maintenance and operation.....	2,178 35	
Total income		8,194 60
Total expenditures		<u><u>\$262,255 36</u></u>

ADMINISTRATION

STATION STAFF

The changes in the research staff which occurred during the year were chiefly in the nature of additions which were made possible by several new sources of funds, available to the Station directly or thru cooperation with other research agencies. It is fortunate that there were no losses of members of the staff who have been a long time in the service of the Station and whose value to the research work is due in large part to their long experience and association in it. Also, there have been only a very few resignations among the younger or newer members of the staff.

Frank H. Lathrop resigned on October 31, 1924, after a little over a year of service as Associate in Research (Entomology) in the Hudson River Valley Horticultural Investigations, in order to accept the position of head of the department of entomology at Clemson College, South Carolina.

Walter F. Morton resigned as Assistant in Research (Chemistry) on February 28, 1925, to enter commercial work.

Fred P. Nabenhauer resigned as Assistant in Research (Chemistry) on April 15, 1925, in order to take charge of the research laboratory of a large industrial firm in Philadelphia.

Elizabeth Hopkins was on leave of absence from her work as Assistant in Research (Botany) during the academic year 1924-25, for graduate study at the Massachusetts Agricultural College and for travel abroad.

Frederick G. Mundinger was promoted from Assistant in Research to Associate in Research (Entomology) in the Hudson River Valley Horticultural Investigations on November 1, 1924.

Johannes Christensen and Mrs. Johannes Christensen, both graduates of the University of Copenhagen, Denmark, served temporarily to fill vacancies as Assistants in Research in Entomology and Botany, from December 1, 1924, to April 30, 1925, and to June 30, 1925, respectively.

R. Bruce Dayton, B. S., a mid-year 1925-graduate of the Pennsylvania State College, was appointed Assistant in Research (Chemistry), effective March 1, 1925.

Foster L. Gambrell, M. S., a graduate of Clemson College, S. C., with two years of graduate work at Ohio State University, was appointed Assistant in Research (Entomology), effective May 1, 1925.

A. C. Dahlberg, after nearly three years' service as Associate in Research was promoted to be Chief in Research (Dairying), effective July 1, 1925.

Ralph H. Shriner, Ph. D., a graduate of Washington University with post-graduate training in physiological chemistry at the University of Illinois, was appointed Associate in Research (Biochemistry), to take effect July 1, 1925.

Carl S. Pederson, M. S., who, after graduation from the University of Wisconsin, has served two years as assistant in the Bacteriology Department of that institution, was appointed to fill a new position as Assistant in Research (Bacteriology) which was authorized by the Legislature of 1925, to begin July 1, 1925.

Thru funds furnished by commercial firms for the study of the insecticidal properties of certain chemicals which have been newly suggested for this use, Foster L. Gambrell and F. C. Took were on duty at this Station during the summer of 1924, and Fred W. Clise and Donald Collins during the summer of 1925, to make detailed field observations of the results of spraying experiments with these materials.

Thru a cooperative arrangement with the Bureau of Entomology of the United States Department of Agriculture, Robert Cecil and J. Christensen have been assigned to this Station for the summer of 1925, to study the spread of the Mexican bean beetle into this State and methods for its control.

From funds supplied thru the National Research Council by the Chemical Foundation, Miss Rachel Haines, B. A., has been employed as a laboratory assistant to Dr. H. J. Conn at this Station, for histological studies of biological stains, beginning May 1, 1925.

To fill the new positions which are created by chapter 232, Laws of 1925 of New York, to provide for the investigations with canning crops, as discussed below, the following appointments have been made, to take effect July 1, 1925: As Associate in Research (Horticulture), Chas. B. Sayre, M. S., who has served four years as Assistant Professor of Vegetable Gardening at Purdue

University and for the past five years as Assistant Professor of Olericulture in the University of Illinois and Assistant Chief in Olericulture of the Illinois Experiment Station; as Associate in Research (Plant Pathology), Leon K. Jones, Ph. D., who graduated from the Oregon Agricultural College and carried on graduate work in plant pathology for the M. S. and Ph. D. degrees at the University of Wisconsin and has been for the past four years Assistant in Plant Pathology at the latter institution; and on the same date, Hugh Glasgow, Ph. D., Associate in Research (Entomology) will be transferred to the canning crops investigations.

CANNING CROPS INVESTIGATIONS

Attention has been called in preceding reports to the provision by the State Legislature of special funds for "insecticide and fungicide investigations," for "investigations for the control of raspberry diseases and insect pests," for the investigations concerning the control of insect pests and diseases of vegetable crops at the "Long Island Vegetable Research Farm," and for the "Hudson River Valley Horticultural Investigations." In the report for the year ended June 30, 1923 (pages 17 and 18), the need for special study of local problems and the advantages and disadvantages of providing for such study by means of special appropriations were discussed at some length.

To the Legislature of 1925 there was presented, by a committee representing the producers and canners of fruits and vegetables in this State, a request for a special appropriation of a little different kind. This committee was appointed, after a two years' study of the needs of the canning crop industry, to present to the Legislature the urgent need of funds in addition to those already available to either this Station or that at Cornell University for the study of certain special problems involved in the production of canning crops. The presentation of this matter by the committee to the finance committees of the Legislature resulted in the passage of chapter 232, Laws of 1925, which provides for the "experimental study of the problems of increasing the production and controlling the diseases and injurious insects of vegetables and fruit crops grown for canning" and makes an appropriation of \$20,500 in addition to the regular budget appropriations to

this Station, to carry on the investigations for the year beginning July 1, 1925.

These investigations with the canning crops are not local in character in the sense that they are confined to some specific locality; but are general in scope, altho limited to certain special horticultural enterprises. Hence, it is not necessary to establish "outlying laboratories" for this type of work and it has been decided to carry it on from the Geneva Station as a center, and under the supervision of an advisory committee consisting of the Director of Experiment Stations and the heads of the Departments of Vegetable Gardening, Plant Pathology, and Economic Entomology of Cornell University and of the Divisions of Horticulture, Botany, and Entomology of this Station. Plans for the new work are now well under way, and it is hoped that future Legislatures will continue the funds for its support as a part of the regular budget of the Station.

APPROPRIATIONS

The funds available to this Station for the year covered by this report, as appropriated by the Legislature of 1924, were as follows:

By Chapter 140—To be immediately available:

Personal Service:

Labor at Urbana experimental vineyard....	\$800 00
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Maintenance and Operation:

Rent	2,250 00
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New Construction and Permanent Betterments:

New boilers	3,500 00
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Packing and storage shed at Fredonia.....	1,925 00
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Total immediately available.....	\$8,475 00
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By Chapter 140—To be available for the year ending June 30, 1925:

Personal Service:

Salaries of staff, etc.....	\$136,590 00
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Laborers	28,000 00
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Long Island Vegetable Research Farm.....	6,000 00
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Hudson Valley Horticultural Investigations	10,200 00
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	180,790 00
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Maintenance and Operation:

Fuel, light, power, and water.....	\$9,750 00
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Printing	7,000 00
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Equipment, supplies, and materials.....	\$24,000 00	
Traveling expenses	3,500 00	
Communication	2,775 00	
Fixed charges and contributions	100 00	
Rent	375 00	
Repairs and alterations	4,400 00	
Contingencies	75 00	
Long Island Vegetable Research Farm	2,050 00	
Hudson Valley Horticultural Investigations.	5,000 00	
		<hr/>
Total maintenance and operation.....		\$59,025 00
Maintenance Undistributed:		
Investigation of insecticides and fungicides..	\$5,000 00	
Controlling raspberry pests	4,500 00	
		<hr/>
Total maintenance undistributed.....		9,500 00
		<hr/>
Total		\$257,790 00
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The budget requests for the support of this Station which, with the approval of the Board of Trustees of Cornell University, were transmitted on October 1, 1924, to the State Board of Estimate and Control for consideration and recommendation to the Legislature of 1925 were as follows:

Personal Service:

Salaries of staff.....	\$169,550 00
Wages of laborers.....	29,200 00

Total personal service.....	\$198,750 00
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Maintenance and Operation:

Fuel, light, power, and water.....	\$8,000 00
Printing and advertising.....	9,000 00
Equipment, supplies, and materials.....	25,000 00
Traveling expenses.....	3,500 00
Communication	2,775 00
Fixed charges and contributions.....	75 00
Rent	2,775 00
Repairs	5,000 00
Contingencies	50 00
Long Island Vegetable Research Farm.....	1,800 00
Hudson River Valley Horticultural Investi- gations	3,900 00

Total maintenance and operation.....	61,875 00
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Maintenance Undistributed:

Insecticide and fungicide investigations....	\$5,000 00
Suppression of raspberry pests.....	4,500 00

Total maintenance undistributed.....	\$9,500 00
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New Construction and Permanent Betterments:

Horticultural laboratory building.....	\$275,000 00
Equipment of horticultural laboratory.....	40,000 00
New boilers in biology building (additional) .	3,500 00
Replacement of dairy stalls.....	1,800 00

Total new construction.....	320,300 00
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Total	\$590,425 00
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The Board of Estimate and Control approved the several items for maintenance and operation without material change except a reduction of \$1,000 in the estimate for printing bulletins, but recommended a reduction of approximately \$8,500 in the amount requested for salaries of the staff. These requests and recommendations then went to the finance committees of the Legislature for their consideration. Later in the session, the request for the additional appropriations for canning crops investigations was presented to these same committees by the representatives of the canning industry.

The total appropriations for the support of this Station for the year beginning July 1, 1925, passed by the Legislature of 1925 and approved by the Governor, are as follows:

By Chapter 181 — General Maintenance:

Personal Service:

Salaries of staff, etc.....	\$145,350 00
Laborers	28,000 00
Long Island Vegetable Research Farm....	6,500 00
Hudson Valley Horticultural Investiga- tions	10,200 00

	\$190,050 00
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Maintenance and Operation:

Fuel, light, power, and water.....	\$8,000 00
Printing	8,000 00
Equipment, supplies, and materials.....	25,000 00
Traveling expenses	3,500 00
Communication	2,775 00

Fixed charges and contributions.....	\$75 00	
Rent	2,775 00	
Repairs and alterations.....	5,000 00	
Contingencies	50 00	
Long Island Vegetable Research Farm....	1,800 00	
Hudson Valley Horticultural Investiga- tions	3,500 00	
	<hr/>	
Total maintenance and operation.....		\$60,475 00
Maintenance Undistributed:		
Investigation of insecticides and fungicides	\$5,000 00	
Controlling raspberry pests.....	4,500 00	
	<hr/>	
Total maintenance undistributed.....		9,500 00
New Construction and Permanent Betterments:		
Additional for new boilers.....	\$3,500 00	
	<hr/>	
Total new construction.....		3,500 00
By Chapter 232 — Canning Crops Investigations:		
Personal Service:		
Three associates in research.....	\$10,000 00	
Miscellaneous labor.....	2,400 00	
Expenses other than personal service:		
Rental of lands and buildings.....	1,200 00	
Office equipment and supplies.....	600 00	
Laboratory equipment and supplies.....	1,000 00	
Field equipment and supplies.....	3,000 00	
Hired horses or tractor cultivation.....	400 00	
Traveling expenses	1,500 00	
Communication	200 00	
Fuel, light, power, and water.....	200 00	
	<hr/>	
Total canning crops investigations.....		20,500 00
	<hr/>	
Total		\$284,025 00
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The appropriation bill which passed the Legislature also contained an item of \$275,000 for the erection of the horticultural research laboratory building at this Station; but this item was vetoed by Governor Smith with the explanation that "this building is a part of the permanent building equipment of the State and should be provided from the bond issue now pending." The Legislature has twice voted the necessary appropriation for this building and the Governor has twice vetoed the item with explana-

tions which show that he is not opposed to the project itself, but only to the making of the appropriation from general revenue funds. It would seem, therefore, that if the proposal to authorize the Legislature to create bonded indebtedness to the amount of \$10,000,000 per year for ten years for the purpose of erecting necessary State buildings is approved by popular vote at the next election, the funds for the erection of this urgently needed building should be immediately forthcoming.

In any event, provision for this building must be made at the earliest possible moment if the research work of the Station is not to suffer a most serious handicap. No new laboratory building space has been provided for this Station since 1898. During that time the staff has grown from 19 to 53 scientific workers, with corresponding necessary increases in laboratory helpers, clerks, etc. The result has been that for several years past the research workers have been crowded to an extent which seriously interferes with efficient work. With the addition of the new work and investigators which has been outlined above, the situation has become intolerable. Scientific workers are being housed in basement or attic rooms which are not comfortable for office use during hot summer or cold winter months, and their investigations limited by the lack of any laboratory or greenhouse space in which to check up field observations. The members of the staff are maintaining a commendable "grin and bear it" attitude, but cannot help but realize that the service which they can render to the State is being seriously limited by the present inadequate laboratory facilities.

This situation is clearly recognized also by the many citizens of the State who are calling on the Station for additional assistance, and it is sincerely to be hoped that the weight of public opinion in this matter will be sufficient to insure favorable action by the Legislature and the Governor at the next opportunity.

PROGRESS OF STATION WORK

The following brief summaries of the progress of the work on the several projects in each of the Divisions, prepared by the Chief of the Division in each case, will serve to give a general review of the year's achievements. Work on several of these

projects was brought to definite conclusions and the results published either as bulletins of this Station or as articles in scientific journals, as indicated in the final pages of this report. Within the limits of space of this report, it is of course possible to give only the very briefest of reviews of the investigational work which is in progress in any given year.

DIVISION OF AGRONOMY

Altho the efforts of the Division of Agronomy are centered around eight major projects, the work during the past year has been very largely confined to five of these. The field work on orchard fertilization has been terminated, the manure preservation work terminated at least temporarily, and the fertilizer work with the Crittenden farm plats is at present in a transition period between one completed project and another not definitely outlined. The five projects mentioned are as follows:

1. Lysimeter investigations.
2. A study of the decomposition and detrimental effect of cereal straw.
3. Investigations with high-nicotine tobaccos.
4. Physiological and nutritional studies of the apple tree.
5. A study of certain unproductive muck soils.

LYSIMETER INVESTIGATIONS

The work of the lysimeter project is being continued according to the original plan. The two four-year rotations, namely, barley, wheat, alfalfa two years, and barley, wheat, timothy two years, are still being compared as to production of dry matter and loss or gain of nutrients from the soil. Three different sets of duplicate tanks allow of variations in grass treatment, namely, no addition of nitrogen to alfalfa, a large excess of nitrogen on alfalfa, and replacement of alfalfa or timothy entirely by two years of fallow. This gives a good check on the influence of the legume on the nitrogen balance.

Some interesting data are also available on the loss of nutrients other than nitrogen, also on gains in certain constituents from the atmosphere. Altho the analytical work is not up to date, it is hoped to publish this year the results of the first two rotations (eight years).

CEREAL STRAW STUDIES

Some very definite advance has been made on this project during the past year. The reason for the immediate, altho minor, detrimental effect of fresh straw on the growth of seedlings (barley and wheat especially) has been pretty well established. Some definite toxic compounds, organic in nature, have been isolated from straw and some other farm plant materials. The later effect of high carbon plant residues in furnishing energy material for bacteria which utilize nitrates has, of course, been fairly well worked out by many investigators. This Station, however, has shown by sterile culture work that no micro-organisms are responsible for this immediate detrimental effect which is especially marked in water or agar cultures and to a less extent in sand cultures.

The practical handling of straw to overcome these two effects and to make it a valuable farm asset is still to be accomplished. Lack of facilities has up to the present prevented the working out of this phase of the problem.

HIGH-NICOTINE TOBACCO

The work on high-nicotine tobacco for insect control has been along several lines during the past year. *Nicotina rustica* from three sources has again been grown and has shown considerable difference in nicotine content. Individual plant selections have been made from one of these three sources which has repeatedly shown considerable variation in plant characters, with a view of securing a plant with higher nicotine content. These individuals varied quite widely in nicotine content.

Topping versus not topping has again been used with the higher nicotine again found in the topped plants. Broadcast planting has run low in nicotine, whether highly fertilized with nitrogen or not. Dried blood and sulfate of ammonia seem to have increased nicotine to a small extent. Nitrate of soda did not do so.

A number of strains of the Pryor variety of *N. tabacum* have again been grown from original seed to check up seasonal effect. During the past season these strains have contained double the

nicotine of the year before. Altho it appears possible to grow *N. rustica* with a nicotine content of 5 to 7 per cent (leaf), it seems desirable to determine if this can be done year after year with fluctuating seasonal conditions. If this can be done, the next step lies along the line of practical utilization of such tobacco for insect control.

NUTRITIONAL STUDY OF THE APPLE TREE

The work on this project during the past year has been confined largely to greenhouse studies. French crab seedlings have been used for this preliminary study. They have been grown in sand cultures under a considerable range of nutrient treatment. It has been shown that vigorous vegetative growth of these seedlings will take place under a considerable range of nutrient combinations. Equally good growth was secured with the nutrients in widely different proportions, providing the total concentration of nutrient ions was low. Low concentrations, maintained at a constant level, are conducive to best top and root development, altho in some cases a concentration four times as great produced remarkably good development, providing a proper balance of ions was maintained.

A lot of 300 seedlings very carefully selected from a larger lot of over 5,000 still showed a wide variability as regards taper, color of bark, root development, weight, and especially the way in which the buds developed when the seedlings were placed in sand cultures. This fact is further evidence of the main probable source of the high variability of trees in later life which are originally placed on seedling stock.

UNPRODUCTIVE MUCK SOIL

This project has just been begun during the past year. It is the outgrowth of many inquiries during recent years from muck farmers in many parts of New York as to the causes of the failure of some crops on certain muck areas. This problem is not a new one as more or less work has been done in years past by other investigators, but with surprisingly meager results. It is hoped that field and laboratory investigations may throw some light on this obscure problem.

DIVISION OF ANIMAL INDUSTRY

FEEDING EXPERIMENTS WITH POULTRY

Feeding experiments with poultry have been continued. One made during the year with three lots of hens was part of a series which has relation to the physiological needs for fresh vegetable foods, the utilization of coarser foods, and the limitations in their use. This experiment involved also the incubation of several lots of eggs, and care of as many lots of chicks for short periods. A report of the results from several of the experiments in this series is being prepared for publication.

BREEDING EXPERIMENTS WITH POULTRY

Work on a series of breeding experiments with poultry has been continued. These were planned for a study of the effects of selection and in-breeding. Besides the rearing of young stock every year, this work necessitates the keeping of records for many mature birds. Because of the improbability of securing a satisfactory number of progeny from all matings, it is necessary to use many more than the minimum number that would suffice under perfect conditions. The work called for the rearing of as many young birds as possible from 22 different matings during the season.

STUDY OF SOIL REQUIREMENTS

On the field used in this study a crop of alsike clover was grown in 1924. Work with the samples taken from this crop has not been completed; but in growth of plant somewhat different results were obtained from certain soil treatments than with some other legumes. In general, however, results were in accord with those obtained with a number of other crops, especially in evidencing the persistent differences in crop-producing power of strips of similar soil treated alike for a long time. The questions primarily considered in work on this project concerned certain calcium, magnesium, and sulfur relations in plant and soil, altho other questions have naturally been involved in the study.

DIVISION OF BACTERIOLOGY

GENERAL PROBLEMS

Systematic studies of bacteria.—Work has been continued during the year on the identification and classification of bacterial species important in cheese and other dairy products, food stuffs, and soil. The results of the work on the spherical bacteria (*Coccaceae*) that were published just at the end of the previous year have been rewritten in summarized form and published as a series of papers in the *Centralblatt für Bakteriologie*. Brief reports of the work on the *Coccaceae* and on the red chromogenic bacteria have been given before the Society of American Bacteriologists. The latter organisms have proved to have varied and important relationships to man in causing a rotting of white fish (*Coregonus*) eggs at fish hatcheries, a decomposition of sardines at canning factories, a red spotting of plantation rubber in the tropics, besides occasional reddening of common cooked foods such as bread, rice, cauliflower, fowls, and the like. Systematic studies of soil bacteria and of bacteria causing lactic acid fermentations have been continued during the year.

Standardization of biological stains.—The Commission on the Standardization of Biological Stains under the direction of H. J. Conn has continued its investigation of dyes for biological purposes, having now tested and certified nearly all of the important biological stains. At the same time the data which have accumulated have been written up in the form of a book which is ready for the press and will be issued during the coming year. This book will be published and sold by the Commission. Brief notes on various phases of the work have been published during the year.

SOIL AND MANURE PROBLEMS

Soil flora studies.—Owing to changes in the staff at the New Jersey Station, the cooperation in this work between the two institutions has had to stop, but the work is being continued at Geneva.

The work during the past two years has been wholly on the non-spore-forming bacteria. Very little new information concerning this group has been obtained, but the data already at hand have been prepared for publication.

Effect of straw on plants.—To round up the previous work on the subject and obtain conclusions sufficiently definite for publication, further laboratory work has been done in the way of growing plants under sterile conditions. It has been found that straw extracts exert a harmful effect on plants in the absence of bacteria, even when the straw extract is sterilized by filtration instead of by heat so as to avoid any possible decomposition due to high temperatures. As a result, it has been concluded that the harmful effect of straw is at least partly chemical. Certain organic compounds have been isolated from straw extract which have been found to have a toxic effect upon seedlings.

No publications have been issued during the current year but a bulletin on the subject has been written and is to be submitted shortly for publication.

DAIRY PROBLEMS

Milking machines.—During the year the results of the studies on the sanitary efficiency of the Surge milker have appeared as a complete bulletin (No. 524) with a popular edition.

Types of bacteria in dairy utensils.—The identification of the types of micrococci isolated from dairy utensils has been completed and a technical bulletin (No. 112) prepared which will appear under the title "The Micrococci Associated With Dairy Utensils."

Studies on the heat resistance of these and of other types of organisms that survive the pasteurization process have been continued.

City milk control problems.—Attention has also been given to the standardization of methods of counting bacteria in milk. This problem is of particular interest to dairy farmers who are receiving payment for their milk on the basis of the number of bacteria present. Observations on the system of grading of milk now in use in the cities of the State lead to the conclusion that as city milk supplies become more standardized in sanitary quality, there is less and less justification for the complex system of grading now in use in the State. This has led to the recommendation that the city of Geneva follow the lead of other cities of the State in recognizing but two grades of milk, namely, a very high grade raw milk and an equally high grade pasteurized milk.

Ripening of cheese.—Work has been in progress for sometime to determine roughly the types of bacteria desirable in milk for the normal ripening of cheddar cheese. The effect of various temperatures for holding the milk at the dairy previous to cheese making is being studied to throw light on the proper method of handling milk which is to be made into cheese. Experimental cheeses are being cured at different temperatures to find if the particular organisms developed by the various methods of handling the milk are also influenced in their action on the cheese by the temperature of curing.

Inasmuch as certain types of organisms probably contribute largely to flavor production, work is under way to isolate, if possible, typical flavor-producing strains with the idea of developing improved starters for the production of high grade cheddar cheese. Several series of cheeses have been made from high grade milk to which have been added pure cultures of certain cheese organisms. After ripening at controlled temperatures, these experimental cheeses have been scored. The results will appear in Station publications.

FERMENTATION STUDIES

Tomato and sauerkraut fermentations.—During the year the investigation of the gaseous fermentation of tomato pulp and catsup has been completed and published as Technical Bulletin No. 110. The organism has been found to be one of the lactobacilli which shows the unusual property of fermenting sugars in natural tomato broths with the production of gas. This fermentation takes place less rapidly in ordinary bacteriological media and might easily be overlooked unless special culture media are used. As the organism does not appear to have been described previously, it has been named and described as *Lactobacillus lycopersici* Mickle (*Abs. Bact.*, 8, 403-404. 1925).

The State having provided funds to employ an additional assistant for the development of work in this field, investigations are to be continued during the coming year on sauerkraut and tomato products.

DIVISION OF BIOCHEMISTRY

PHYTOSTEROLS IN THE ENDOSPERM OF GRAPES

The unsaponifiable fraction of the fats obtained from cottonseed meal and linseed meal yielded mixtures of sterols from which no definitely homogeneous products could be isolated. From rice bran were obtained several sterols and also some myricyl alcohol. Among the sterols we were able to identify dihydrositosterol, stigmasterol, and sitosterol. In addition to these compounds there was present a large amount of a non-crystallizable oil which was subjected to fractional distillation. More work will be necessary before definite conclusions can be drawn regarding the nature of this liquid portion of the unsaponifiable matter. Some of the fractions of high boiling point gave the typical sterol color reactions.

An investigation of the sterols occurring in corn oil is also under way. The work is not completed, but the results so far obtained would indicate that instead of consisting of practically pure sitosterol, as has been supposed heretofore, these sterols represent a very complex mixture. We have been able to identify two sterols in the mixture that were not known previously to occur in this oil, viz., dihydrositosterol and also a small amount of stigmasterol. The balance of the crystalline sterols from corn oil must consist of three or more different sterols. Sitosterol is probably present, but so far we have been unable to obtain any pure sitosterol from corn oil.

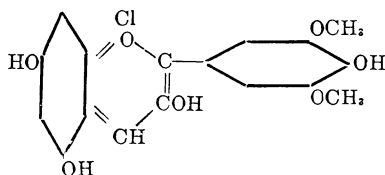
INVESTIGATION OF THE PIGMENTS OF GRAPES

The work on this project concerned itself with a study of the pigment occurring in the Isabella grape which is a hybrid grape representing *Vitis vinifera* and *Vitis labrusca*. The pigment isolated from Isabella was found to be identical with the anthocyanin, oenin, found in dark blue European grapes, *Vitis vinifera*, by Willstätter and Zollinger, and also identical with the pigment found in Seibel seedlings last year.

The anthocyan was a mono-glucoside that gave a beautiful crystalline chloride corresponding to a formula $C_{23}H_{25}O_{12}Cl + 4H_2O$. When hydralyzed by boiling with dilute hydrochloric acid, it gave

one molecule of glucose and one molecule of the crystalline anthocyanidin chloride, $C_{17}H_{15}O_7Cl + 1.5H_2O$. The glucoside differed from the anthocyanins isolated from American grapes in that it gave no color reaction with ferric chloride.

Analysis of the anthocyanidin chloride indicated that it was a dimethyl ether of delphinidin. By oxidation of the acetyl derivative of anthocyanidin by potassium permanganate we were able to prepare an acetyl derivative of dimethyl gallic acid. By saponifying the latter, the free dimethyl gallic acid was obtained in the form of long colorless needles and we were able to identify this compound as syringic acid. It is evident, therefore, that the constitution of anthocyanidin chloride is represented by the following formula:



DIVISION OF BOTANY

MUSHROOMS AND TOADSTOOLS

How to tell a mushroom from a toadstool has long been a puzzle to many people who like wild mushrooms but dare not eat them for fear of being poisoned by toadstools. It should be understood that there is no single test by means of which it may be determined whether a given fungus is edible or poisonous. One must learn to recognize the different kinds of fungi by observing their structure and appearance in much the same way that he learns to know the different kinds of trees, flowers, and vegetables. Realizing that there is widespread interest in the subject, the Station will shortly publish a bulletin which will explain how one should proceed who wishes to become acquainted with the mushrooms and toadstools.

Studies on several species of edible fungi are in progress. Special attention is being given to their propagation out-of-doors, but so far little success has been had along this line.

DISEASES OF CRUCIFEROUS CROPS ON LONG ISLAND

Investigations under this project have been pursued very actively during the past year. Since two important diseases, black-rot and blackleg, are commonly transmitted by means of infected seed, a special effort has been made to find a method of seed disinfection which is at the same time safe, practicable, and thoroly effective. Some of the various chemical treatments which have been recommended have proved partially successful, but the best results have been had with a form of hot-water treatment which has been tested on an extensive scale. During the past spring nearly 1,000 pounds of cauliflower, cabbage, and Brussels-sprouts seed were hot-water treated for Long Island farmers by the Plant Pathologist at the Long Island Vegetable Research Farm near Riverhead. Altho very effective, this hot-water treatment is not entirely satisfactory because it is too complex for general use by farmers. An attempt will be made to find a simpler method.

In Bulletin No. 506 the statement was made concerning the black-rot organism, *Pseudomonas campestris*, that "it has not been possible to demonstrate that this disease lives over winter in the soil." Recent experiments on Long Island have furnished conclusive proof that the organism *can* survive one winter in the absence of living crucifers, tho the amount of such carry-over is very slight.

RASPBERRY DISEASE INVESTIGATIONS

The experiments on the control of mosaic in red and purple raspberries have shown that there is a wide variation in the several factors concerned. Under the same climatic conditions the rate of spread of mosaic varies greatly according to the variety of raspberry. Also, in different sections of the State, the rate of spread varies in the same variety, due probably to the relative abundance of the carrier aphids. Attention has been centered on the two common species of raspberry aphids in order to determine the reasons for these variations. Experiments are also under way to determine methods of eliminating the carrier aphids in raspberry plantings. The experiments on roguing as a means of mosaic control in the Station plats have yielded excellent results. A study of the relative susceptibility of different varieties is being

made, and in cooperation with the Horticultural Division an attempt is being made to develop resistant varieties by breeding.

DEEP SCALD OF APPLES

At various times during the past few years complaints have been received concerning a trouble of cold storage apples characterized by large, slightly sunken areas on which the tissue is dead and discolored to a depth of one-half inch or more. At first it was suspected of being an undescribed fungous disease, but upon investigation it was found to be only a form of the non-parasitic malady known as deep scald. The blue-black color of the diseased areas, often a striking feature of the trouble, was found to be due to the invasion of the affected tissues by a common fungus, *Oospora lactis*. Inoculation experiments with pure cultures of *O. lactis* have shown that it is unable to attack healthy apple tissue. Its relation to deep scald is merely that of an invading saprophyte.

VIABILITY OF CHINA ASTER SEED

In the course of investigations on the diseases of the aster it has been discovered that, by proper storage, the viability of aster seed can be maintained for a longer time than was formerly thought possible. Ordinarily the viability falls off rapidly during the second year.

HARDSHELL IN BEANS

Bean-breeding experiments aimed at the production of varieties free from hardshell and also resistant to bacterial blight and anthracnose have been highly successful. Crosses between the varieties Michigan Robust and Well's Red Kidney have resulted in several good new varieties which appear to meet the requirements. Comparative tests will now be made to determine which of them are the best.

DYING OF FRUIT TREES IN THE HUDSON VALLEY

Observations of the past two years confirm those made previously, namely, that the causes of this trouble are various. In many cases the cause is clear to anybody who will carefully

examine the trees. However, much of it is due either to winter injury or to still more obscure causes which require investigation. It appears that parasitic fungi enter into the problem but rarely.

APPLE FRUIT DISEASES IN THE HUDSON VALLEY

Experiments on the control of *Phoma* fruit-spot and bitter rot have yielded no results of consequence, owing to the scarcity of these diseases during the past two years. The studies on scab have been more fruitful, but have brought out nothing of sufficient importance to require discussion at this time.

SEED TESTING AND SEED STUDIES

During the year ended June 30, 1925, there were received at the seed testing laboratory 4,158 samples of field-crop, flower, and vegetable seeds for either purity analysis or viability test, or both. In all, 5,438 tests were made upon these samples. The volume of this kind of work was approximately one-third greater than in any previous year. The demand for seed testing is steadily increasing, but the point has been reached where no further increase in volume of work is possible without more assistance in the seed laboratory. The two analysts now employed cannot possibly do more of this service work as it should be done and at the same time attend to the regular official seed inspection work, which also is increasing in volume. Additional assistance has become especially urgent with the passage by the last Legislature of an amendment to the State seed law which brings vegetable seeds under inspection. This leaves out of consideration research work on seeds of which there is much which might be done with profit, if there were time for it.

DIVISION OF CHEMISTRY

THE PROPERTIES OF CASEIN

During the past year attention has been directed toward preparing pure casein, uncontaminated with hydrolysis products or other proteins. It is obvious that if anything definite is to be learned concerning the properties of the individual milk proteins, a method must be devised for separating the constituents of the crude casein precipitate from each other, so that each chemical

entity may be experimented with separately. The precipitation of casein in the isoelectric condition at a given hydrogen-ion concentration and also the production of an ash-free casein by electrodialysis are both very simple processes compared with freeing the casein from the other proteins occluded by it during the initial precipitation. At present insufficient data have been collected in this laboratory to warrant any statement regarding the satisfactory isolation of any one pure protein from the crude mixture. Results indicate, however, that a much purer casein has been prepared than was initially used. Whether this purified product is one chemical substance or is still a mixture, remains to be ascertained.

THE CHEMISTRY OF INSECTICIDES AND FUNGICIDES

The work on this project during the year included: (1) A comparison of the adherence of sulfur dusts and sulfur-containing sprays to orchard foliage during summer months. It was found that the sulfur applied as dust is washed off the foliage by rains or mechanically lost by wind action much more rapidly than is that applied in spray form. (2) A study of the factors which affect the volatility of nicotine from tobacco dust and hydrated lime dusts; in which it was found that humidity is the factor of chief importance, followed by that of temperature. (3) Investigations of the possibility of growing tobacco of high-nicotine content gave further information as to the factors which affect nicotine production in tobacco and point to the possibility of securing strains of *Nicotiana rustica* of high nicotine content. (4) Several new compounds which have been suggested for use as insecticides or fungicides were given preliminary study as to their probable effect when mixed with standard materials.

INSPECTION WORK

During the second half of 1924, the analysis of 673 samples of fertilizers was completed; and there have been received for analysis during the first six months of 1925, 634 samples, about 500 of which have been analyzed. During the year, 2,013 samples of feeding-stuffs have been received of which over 1,400 have been analyzed up to July 1, 1925.

DIVISION OF DAIRYING

DAIRY HERD MANAGEMENT

Since the issuance of the last annual report, the entire herd has been subjected to the agglutination test for contagious abortion thru the courtesy of the Veterinary College at Cornell University. The test was undertaken on account of an abortion by a two-year-old heifer of her second calf. The entire herd gave negative reactions with the exception of two mature cows whose history indicated that they probably did not have the disease and were not infecting other animals. The Station herd had contagious abortion from 1900 to 1912, but the infection died out and the herd is now free of the disease.

No tubercular reactions were obtained on the last test, and the Station herd has not had a proved case of tuberculosis in 20 years.

Semi-official testing of individual cows in the herd under the supervision of the American Jersey Cattle Club was begun in May, 1922. This testing was undertaken for the purpose of getting the good records made at the Station officially recognized by the American Jersey Cattle Club, by Jersey breeders, and by the interested public. The cows are not especially fitted or handled for the test, so it does not interfere with experimental work. All two-year-old heifers are milked twice a day and half of the other cows are also milked twice a day, the balance being milked three times per day. This arrangement is due to experiments and is not affected by the test. Three mature cows finished their records in 1923 and produced in 365 days an average of 9,031 pounds of milk and 499 pounds of fat per cow. In 1924, three mature cows and seven heifers at an average age of 2 years, 11 months finished their records. The mature cows in 325 days produced an average per cow of 8,991 pounds of milk and 508 pounds of fat. The heifers in 322 days produced 6,849 pounds of milk and 414 pounds of fat. Most of the cows freshened two months after the records were completed and all cows but one qualified for class AAA or AA. A silver medal offered by the American Jersey Cattle Club was won by one of the young cows. These fine records are especially gratifying when one considers the low cost at which the Station herd was developed and that most of the cows in the herd have been or are being tested.

DAIRY PRODUCTS

Ice cream investigations.—The study of the texture of ice cream has been published as Technical Bulletin No. 111 of this Station. An extensive study of the homogenization of ice cream mixtures is under way, but no report is available at this time.

Market milk investigations.—The study of the viscosity, surface tension, and whipping properties of milk and cream will appear as Technical Bulletin No. 113. The results of this investigation show that in a very general way high viscosity and low surface tension are related to good whipping properties. However, this relationship is not constant because the surface tension was not uniform from one batch of cream to another and the viscosity of cream could be greatly altered by the treatment of milk before separation.

Cheese investigations.—Cream and Neufchatel cheese have become an important factor in the cheese industry and these types of cheese have not been studied to any extent. An investigation is being conducted to give information on the details of manufacture and their effect upon the cheese.

Analytical investigations.—Last year a special committee was appointed by the American Dairy Science Association to investigate the practicability of the Gerber test for fat in milk and cream which has been recently introduced in this country. This study is being conducted in cooperation with the Dairy Division of Cornell University and the Dairy Bureau of the United States Department of Agriculture. The data obtained thus far indicate that both the Gerber and Babcock tests give results that agree well with the Roese-Gottlieb test.

INSPECTION OF TESTING GLASSWARE

The Babcock glassware received during the year has been very accurate, only 1 piece from each 300 tested being rejected. The bacteriological glassware was not satisfactory, since 1 piece from each 9 tested was rejected. An attempt is now being made to improve the quality of the bacteriological glassware. A small shipment of glassware for the Gerber test was received and tested.

GLASSWARE TESTED FROM JULY 1, 1924, TO MAY 30, 1925.

KIND OF GLASSWARE	NUMBER RECEIVED	NUMBER INACCURATE	NUMBER BROKEN
Babcock:			
Milk bottles, 8 per cent.	24,520	85	151
Cream bottles, 9 gram, 6 inch, 50 per cent	3,691	6	41
Cream bottles, 9 gram, 9 inch, 50 per cent	192	.....	1
Pipettes, plain 17.6 cc.	5,715	19	108
Miscellaneous, not marked S. B.	659	.....	1
Total Babcock glassware.	34,777	110	302
Bacteriological:			
Pipettes, 1.0 cc.	14,272	1,667	61
Gerber.	250	6	1
Total glassware, all kinds.	49,299	1,783	364

DIVISION OF ENTOMOLOGY

STUDIES ON APPLE INSECTS

In the Catchpole orchard at North Rose major consideration is being devoted to the problem of developing an efficient and safe method of combating the fruit-tree leaf-roller (*Cacoecia argyrospila*). The two most promising means of control are the application of oil preparations at the period when the eggs are about ready to hatch, the sprays functioning as ovicides, and the treatment of the trees with arsenicals when the young caterpillars first appear, followed by applications at intervals of one week or ten days thruout the hatching period. As the newly hatched caterpillars are more susceptible than the mature larvae, the object of this system of treatment is to keep all foliage and fruit well coated with the poison at a period when the apple trees are making the most rapid growth. Seven of the leading brands of oil sprays are being tested at varying strengths; and as certain of these have been used for three consecutive seasons, it is hoped that the experiments of this season will permit definite statements regarding their efficiency and safeness in combating the leaf-roller. Relative to the employment of arsenicals, the primary object of the tests is

to determine the susceptibility of the insect to poison sprays and the dosage requirements and number of applications needed in severely infested orchards to secure commercial control.

The experiments with spreaders, such as glue, calcium caseinate, and various soaps were continued and, as heretofore, no appreciable improvement in the killing efficiency of common spray mixtures was derived from the incorporation of such materials. Theoretical considerations suggest the desirability of adding calcium caseinate to the lime-sulfur and lead-arsenate spray as a means of avoiding certain undesirable chemical reactions. The casein material also serves a very useful purpose in the preparation of such sprays as sulfur suspensions and lubricating oil emulsions.

The investigations relative to the rosy aphid had as their chief object the determination of the insecticidal properties of oil emulsions and tobacco dust in combination with lime-sulfur solution against the newly hatched nymphs. The influence of oil preparations and certain sulfides in destroying the eggs of this insect was also considered. The results of these experiments show conclusively the wisdom of directing spraying operations with the aim in view of securing the destruction of the newly hatched nymphs. Timely and careful applications of several different kinds of spray mixtures have afforded very efficient protection against the rosy aphid. The data derived from these tests are now being prepared for publication.

The home-made lubricating oil emulsion has proved an efficient insecticide for the control of the San Jose scale and continues to serve a very useful purpose in combating this pest in old apple orchards where it has been difficult for the growers heretofore to secure satisfactory protection with lime-sulfur solution at standard strengths. As there is some doubt relative to the safeness of oil sprays of this type when used for successive years, the tests have been planned with the view of determining the accumulative effects of treatment over a period of years as well as to ascertain the killing efficiencies of oils of varying types and viscosities and their utility as spreaders in combination with other spray mixtures for foliage applications. The investigations of the life history and habits of the codling moth in Orleans, Chautauqua, and Monroe Counties have revealed important facts relative to the activities of the hibernating caterpillars as well as the egg-laying habits of

the first brood of moths. The data point out clearly that the "cover" sprays have been made heretofore with little definite knowledge of the habits of the moths relative to egg deposition as influenced at least by differences in seasonal conditions, which probably accounts in large part for the inability of growers in certain areas to secure adequate protection from the pest. With a clearer understanding of the habits of the codling moth in that area it is anticipated that an increasing number of growers will endeavor to time the application of the "cover" sprays with respect to seasonal conditions as regards egg deposition.

STUDIES ON PEAR INSECTS

In the season's studies of the pear psylla chief consideration was given to the problem of determining the effectiveness of the different treatments in the official spray schedule on the eggs, nymphs, and adults as compared with such new insecticides as lubricating oil emulsion, dust mixtures containing nicotine and calcium cyanide, and tobacco dust in combination with lime-sulfur solution or wettable sulfur.

As regards ovicidal properties no mixture was so effective as lime-sulfur, and while the oil sprays were, generally speaking, not so efficient, many nymphs succumbed soon after hatching, due apparently to toxic emanations from the oil treatment of the bark or from contact with oil residues. With respect to the nymphs the spray mixtures gave invariably better control than the dust mixtures, the lime-bordeaux mixture containing nicotine being unexcelled by any other preparation.

Tests with calcium-cyanide dust (B grade) indicated that so far as the control of the flies or adults is concerned, the material equals approximately a lime-nicotine dust (2 per cent nicotine) in effectiveness. The data secured in the dusting and spraying experiments conducted in Niagara County have been prepared for publication and a bulletin (No. 527) setting forth the results of the four years' tests will soon be available for distribution. Likewise, the manuscript dealing with the tests with calcium cyanide dust for the control of the psylla adults or flies has been submitted for publication (Bulletin No. 529).

SUSCEPTIBILITY OF INJURIOUS INSECTS TO DUST MIXTURES

As reported previously, the experiments during the past three years with dust mixtures containing nicotine applied as a delayed dormant application have given unsatisfactory control of the rosy aphid, due apparently to the low temperatures which normally prevail at this period and the relatively small amount of the preparation which is actually retained by the bare twigs and the undeveloped leaf and blossom buds. In the light of these results and since there are growers who would like to use dust mixtures to combat this pest, efforts have been directed to ascertain the effectiveness of nicotine dusts when applied later in the season, considering especially a period when the nymphs were relatively quite young and before the affected foliage was appreciably curled by the insects. The initial tests this year along this line have yielded promising results, indicating quite strongly that the rosy aphid is susceptible to such treatment, providing that it is not made much later than when the pink color of the more advanced blossom clusters is first observed. If sufficient dust mixture is used and if the blossom and leaf clusters are uniformly coated with the material, a striking reduction in the amount of aphid-injured apples has been secured in all of the orchards under experiment. If a grower desires to dust, this is apparently the most favorable time to apply the material. In addition to sufficient dosage, other conditions that favor effective results are fairly high temperatures, freedom of foliage from moisture, and little or no air stirring. Applications of dust mixtures during the pink period and the calyx period have invariably proved ineffective.

Other aspects of this project which are receiving attention may be briefly noted as follows: The efficiency of the self-mixing dust-machine in making dust mixtures containing nicotine or calcium cyanide or combinations of these materials; calcium cyanide for the treatment of squash plantings to combat the striped cucumber beetle and squash bug; sodium fluosilicate for the control of currant aphid; the value of tobacco dust for the treatment of cauliflower seedbeds to combat aphids and thrips; and dust mixtures for the treatment of the injurious insects of grape vineyards.

CONTROL OF CABBAGE MAGGOT IN THE SEEDBED

Tests of screening materials having different sizes of mesh as well as texture of cloth have been conducted in cooperation with growers of cabbage seedlings and studies relative to the fungicidal and insecticidal properties of corrosive sublimate alone or in combination with sodium nitrate have been continued. Some attention has also been given to materials calculated to prolong the life of the screens. The experiments show clearly that seedbeds can be protected efficiently from injury by screening or by the use of corrosive sublimate or tobacco dust. The data have been prepared for publication in Bulletin No. 512.

STUDIES ON GRAPE INSECTS

The interest stimulated by the application of insecticides and fungicides in the form of dust to plants has raised the question whether this method might be applicable to the control of the more injurious grape insects, such as the root-worm, leafhopper, and berry moth. Of the experimental efforts with these materials none so far have given more definite results than those dealing with the grape root-worm and for this reason the data relative to this project are the first to be compiled for publication. Bulletin No. 519 discusses the results of field trials made during 1921 and 1922 in vineyards located in Chautauqua County in which various kinds of dust mixtures were compared with standard spray materials.

The outstanding fact of these tests was the failure to discover a dust mixture which afforded efficient protection against the root-worm. This is attributed largely to the lack of adhesive properties of the common commercial dust preparations. Bordeaux mixture containing lead arsenate was superior to all other treatments. The results of the experiments with other grape insects, notably the leafhopper, are withheld from publication pending opportunities to repeat the tests when the insects are sufficiently abundant, which they have not been during the past two summers.

EFFICIENCY OF DUST MIXTURES IN COMBATING STRIPED
CUCUMBER BEETLE

Investigations in the control of the cucumber beetle, *Diabrotica vittata*, were chiefly directed to a study of the comparative values of nicotine and arsenical dust mixtures.

Nicotine-lime dusts of 2, 3, and 4 per cent strengths were used. Under controlled conditions these mixtures proved highly toxic to the beetles provided direct contact and high temperatures were registered. On the other hand, all strengths were injurious to foliage and growth under such conditions as were highly toxic to beetles. Light applications of dust under lower temperature conditions eliminated plant injury but greatly reduced the efficiency as an insecticide.

Tests were made with funnel attachments and box fumigators in order to improve the efficiency of nicotine dusts. These methods did not prove very satisfactory, chiefly because of the apparent resistance of beetles to such exposures under average field conditions, and because of poor distribution of dust.

In the tests with arsenical dust mixtures, experiments were carried out to compare (1) the toxicity of lead and calcium arsenates and zinc arsenite; (2) the efficiency of hydrated lime, gypsum, kaolin, and flour as diluents; (3) the efficiency of dust mixtures of low to high arsenical content composed of each of the above arsenicals and diluents in the proportions of 1 to 5, 1 to 10, 1 to 15, and 1 to 20 by weight, respectively.

Under controlled conditions, zinc arsenite, whether used pure or diluted with hydrated lime in proportions as low as 1 to 15, was more toxic than lead or calcium arsenate. However, all dust mixtures, whether pure or diluted, showed a greater repellent or protective value than toxicity.

Under field conditions, the dusts composed of dilutions of 1 to 15 and 1 to 20 showed a higher efficiency in protecting the plants than pure arsenical dusts or dilutions of 1 to 5 or 1 to 10. However, dusts composed entirely of the diluent gave decidedly inferior results in growth and yield than those containing arsenicals. There was little indication as to the superiority of any one of the arsenicals, either as a deterrent or a poison. Zinc arsenite when applied to the foliage while moist caused severe injury.

Gypsum gave superior results to any of the other diluents, altho only slightly better than hydrated lime, whether used pure or with arsenicals. The disadvantages of gypsum are that it is a relatively "heavy" diluent and as such it is not always discharged from the duster in ready amounts.

Hydrated lime was superior to gypsum and other diluents in physical properties and as a dust carrier. Results indicated, however, that plants treated with dusts containing hydrated lime did not yield as heavily as plants treated with gypsum dust mixtures. Flour was superior to all the diluents in adhering qualities when applied to moistened foliage.

Plants treated with arsenical dusts showed superior results to those treated with nicotine-lime dusts. The appearance of the plants indicated that this result was chiefly due to the elimination of stunting and foliage injury caused to a certain degree by the toxic effect of lime and nicotine to tender shoots.

CONTROL OF THRIPS AND APHIDS ON CAULIFLOWER

Experiments with nicotine products for the control of aphids and thrips in the cauliflower seedbed were continued. Comparative tests were made with superfine tobacco dust, pure and diluted with hydrated lime; nicotine sulfate dust mixtures at 2 per cent strength expressed as nicotine; and nicotine sulfate spray composed of 1 pint of nicotine sulfate to 100 gallons of water.

Under controlled conditions, a series of tests were made with tobacco dust mixtures on the aphid *Myzus persicae* with the object of determining the toxicity of the dust mixtures, with or without hydrated lime as a diluent. All dust mixtures containing hydrated lime averaged greater toxicity than pure tobacco dust.

Under field conditions, tobacco dust, whether pure or diluted, gave superior results to nicotine sulfate dust mixtures or spray solutions applied at the same dates and with the same frequency. Moreover, tobacco dust diluted in equal proportions by weight with hydrated lime (the highest dilution tried) gave equally effective results as the lower dilutions.

An attempt was also made to control aphids and thrips infesting cauliflower plants recently set out in the field. For this purpose a self-mixing dusting machine was used with a trailer attached. Satisfactory results were obtained in the preparation and application of a 2 per cent nicotine-lime dust. Owing to the smallness of the plants, it was necessary to arrange four distributors to each row in order to obtain the necessary contact with the foliage. The use of a 20-foot trailer did not eliminate

the need for accurate placement of distributors to the rows so that the dust might hit the plants. Where the trailer was used the plants improved during their earlier growth and headed earlier than where no trailer was used. Gauging the results by the total yield, there was little indication of the relative value of a trailer in dusting with nicotine-lime dust against aphids on cauliflower plants.

STUDIES OF POTATO INSECTS

Tests have been made with lead and calcium arsenate and zinc arsenite, either pure or diluted with hydrated lime, for the purpose of determining their comparative toxicity to the potato flea beetle, *Epitrix cucumeris*, and in order to find out what relation, if any, such toxic properties have to the protection of the plant from flea beetle injury.

The results showed that the killing efficiency of arsenical dusts did not bear any close relationship to their protective efficiency in the case of the potato flea beetle. It was apparent thru the experiments that flea beetles readily avoided dusted foliage and fed only on tissues free or nearly free of dust particles. In this respect hydrated lime applied pure was as effective as mixtures of hydrated lime and arsenicals. Where beetles were brought into direct contact with dusted foliage, calcium arsenate, pure, killed the highest percentage of beetles, namely, 81.91. Of the dust mixtures with high arsenical content, namely, 1 to 5 to 1 to 9, those containing calcium arsenate averaged the highest percentage of dead beetles, 36.37. Of the dust mixtures with low arsenical content, namely, 1 to 11 to 1 to 15, those containing zinc arsenite averaged the highest percentage of dead beetles, or 17.02.

In averaging the different series the proportion of 1 to 7 resulted in the largest number of beetles being killed with arsenical-lime dusts.

DIVISION OF HORTICULTURE

VARIETY TESTS

Possibly the most important and certainly the longest continued work in the Division of Horticulture is that of testing varieties of hardy fruits. An attempt is made to test every variety of hardy fruits that can be grown in the climate of New York.

Results of these tests are published in a series of bulletins called New or Noteworthy Fruits, seven of which have appeared, and in monographs on the various fruits. Material is at hand for the publication of the eighth bulletin in the series, and it is hoped that this will go to press during the present year. The *Small Fruits of New York*, seventh in the series of fruit books, is now in press, and will shortly be ready for distribution. Descriptions of varieties grown are given at the horticultural meetings in the State and to the horticultural press from time to time. Exhibits of the various varieties are also made at the State Fair and at the meetings of the New York State Horticultural Society in the annual sessions of this institution.

BREEDING NEW FRUITS

Closely correlated with the testing of varieties is the work of breeding new varieties. Nothing is more certain than that the greatest progress made in pomology is in the introduction from time to time of new varieties. This has been true for any period in the past, is true at the present time, and probably will be true for any future time. The varieties of no fruits are perfect, nor will any ever attain perfection, and since new conditions are constantly arising in pomology, both as to culture and the purposes for which the product is used, there must ever be a demand for new varieties irrespective of the major fact that thru breeding the evolution of fruits must give better varieties. Attention is again called to the two objects always in view in breeding fruits at this Station: To ascertain how the characters of fruits under study are inherited; and to produce new varieties of fruits for one purpose or another. From year to year the Station names and distributes new varieties thru the New York State Fruit Testing Association. During the past year some 10 or 12 tree and small fruits have been named and distributed by this organization, bringing the total number of varieties distributed by the Station up to about 80, and the total number of seedlings of the various fruits up to some 60-odd thousand. None of the fruits distributed by the Station are to be had directly from the Station, but all must be purchased thru the New York State Fruit Testing Association.

FERTILIZER EXPERIMENTS WITH FRUITS

Tests of fertilizers for various fruits continue both at this Station and at the substations at Fredonia, Urbana, and Hudson, N. Y. The most important of these experiments is one begun on the Station grounds in 1896 with Rome Beauty apples. Three reports of this experiment have been published at intervals since the experiment began and all show that applications of commercial fertilizers are not needful to the apple on soils such as those that constitute the Station farm. The last report was published in 1924 and another is not contemplated for some years to come.

Experiments with fertilizers for grapes at Fredonia, Urbana, and Hudson seem to show that nitrogen alone is sufficiently beneficial to be worth purchasing by grape growers for their vineyards. Work at Hudson, however, has been carried on so short a time that it is hardly safe to say as yet that fertilizers are not needed in the Hudson River Valley.

PRUNING EXPERIMENTS

Experimental work in pomology must of necessity be long continued. In reports such as this, to give details is often but a repetition of what has been published in past reports. In particular this is the case with the pruning experiments which have been carried on since 1912. It seems only needful to say, therefore, that the pruning experiments described in past reports are being continued. The object of these experiments can be given in a few words: To test the value of much and little pruning; to test the value of summer as compared with winter pruning; and to test the value of high- and low-headed trees.

EXPERIMENTS IN PROPAGATION

The studies of methods of propagating fruit trees are continued. In a comparison of budded and grafted apple trees with the object of finding out whether varieties propagated by these two methods come in bearing at different times, or whether the trees are better under one than the other method, it now seems safe to say that there is no difference whatsoever in any character between apple trees budded and those that are grafted. This is the thirteenth season in which there has been an opportunity to compare trees propagated in the two ways.

In the spring of 1912 Rome Beauty trees propagated from the most productive trees and the least productive trees in a Rome Beauty orchard were set in adjoining rows for comparison. Buds were worked on Northern Spy cuttings to secure uniformity in stock. There is nothing to show that in the 13 years these trees have been growing in the orchard that those propagated from the most productive trees are any better than those grown from the least productive trees. The purpose of the experiment is, of course, to determine whether or not variations so often seen in fruit trees are inherited. Since but one variety has been under study and the number of trees comparatively small, 60 in each of the two divisions, it can by no means be said that the case has been proved that variations are not inherited, but this experiment contributes some evidence toward a final conclusion.

STOCK EXPERIMENTS

As reported for the past several years this Station is carrying on experiments to test the value of different stocks for the different fruits. Reports have been made from time to time on stocks for apples, plums, and cherries. This work is being continued, but nothing new in the way of results was published during the past year.

A STUDY OF SEX IN FRUITS

Dr. A. B. Stout, Director of Laboratories of the New York Botanical Garden, is continuing his work in the study of sex in the various fruits with especial attention to the apple and grape. Some interesting results have been obtained the past year in the study of sterility and fertility in the apple with the probability that during the present year the results will be published. These problems of sterility and fertility in cultivated varieties of fruits are the most troublesome ones that confront fruit growers, and it is hoped that Dr. Stout's work will contribute much toward solving some of them.

WORK WITH VEGETABLES

The last Legislature passed a bill authorizing the preparation of a series of monographs on vegetables similar to those that have been published by this Station on hardy fruits. Work with several vegetables has been under way for several years and is being

continued. Studies of all the varieties obtainable of peas, beans, musk-melons, cucumbers, and radishes are being made in cultural experiments and their origin, history, and evolution are being looked up indoors. It is possible that reports on peas and beans may be forthcoming during the present year.

The last Legislature authorized this Station to make studies of canning crops which for the present at least are to include vegetables chiefly. As noted elsewhere, a tract of land has been rented and experiments are being planned in vegetable culture to solve some of the problems of the growers of canning crops. It seems likely that the first of these to be taken up would have to do with varieties and strains of varieties best adapted for the canners' needs, but without question a wide range of studies will be undertaken as the work proceeds.

HORTICULTURAL EXPERIMENTS IN THE HUDSON RIVER VALLEY

As reported last year, fruit investigations in the Hudson River Valley are being carried on by H. B. Tukey of this Division. This work in the Hudson River Valley seems to be progressing well with a prospect that there will soon be interesting results from the various projects which are: A test of natural and commercial fertilizers for apples; a variety test of apples, peaches, pears, plums, cherries, grapes, and small fruits; a test of fertilizers for sour cherries; a test of fertilizers for grapes; pruning sour cherry trees; cover crops for orchards; and a test of new varieties of fruits which originated at this Station.

PUBLICATIONS

Publication of the results of research work completed at the Station during the past year was made in eight technical bulletins and in ten complete bulletins. The technical bulletin series comprises reports on investigations of a purely scientific nature of interest primarily to other investigators working in similar fields. The complete bulletins, while reporting results of experimental work often of quite technical nature, deal with matters that have a direct application to farm practice. The complete bulletins are of interest to other research workers and to the layman who has an inclination to go into the details of an experiment.

In order to put before the public the outstanding results of the Station's experiments as reported in the complete bulletins, a third series of publications, the so-called popular bulletins, are issued from time to time. These popular bulletins have a wide distribution among the farmers of this and neighboring states, and are available free of charge to anyone who cares to receive them.

Occasional "circulars" are also issued when needed for use in answering correspondence. These circulars contain general information on subjects about which numerous inquiries are received at the Station and upon which the Station specialists can speak with authority. The circulars are not intended for general distribution.

THE NEWS SERVICE

The syndicated press service inaugurated in 1921 has been continued during the past year, and the interest of the recipients of this service appears to have been sustained. The "news" stories are sent out at weekly intervals to newspapers and farm papers and monthly to the Farm Bureau publications in this State. These stories are based on the experimental work under way at the Station and supplement the more formal publications of the Stations researches.

During the past year news items were sent to about 130 daily papers, 290 weeklies, 90 farm papers, and 55 Farm Bureau publications. Except for the Farm Bureau papers, these papers were not confined to this State but were scattered thruout the country. A total of 218 news stories were sent out during the past year.

THE FRUIT BOOKS

Manuscript for *The Small Fruits of New York* is now in the printer's hands and the book will probably be available early in next year.

The 1925 Legislature authorized the publication in three volumes of a work dealing with vegetables which will be similar in method of treatment, make-up, etc., to the monographs on the hardy fruits. Work on these volumes is already in progress, and funds recently made available to the Station thru the passage of the Purnell bill at the last session of Congress are being devoted to furthering this project.

THE MAILING LISTS

The distribution of the Station bulletins, i. e., the technical, complete, and popular bulletins, is made on the basis of the subject-matter content of each publication, a classified mailing list being maintained for this purpose. Each new applicant to receive the Station bulletins is asked to indicate the subjects in which he or she is especially interested in order that only those bulletins may be sent which will prove useful to the recipient. The system of distribution is so flexible, however, that no one need be deprived of any Station publication which he believes he might find profitable.

The classifications under which the different types of bulletins are distributed and the number of names in the different groups are set forth below.

CLASSIFICATION OF STATION MAILING LISTS AND THE NUMBER OF NAMES ON THE VARIOUS LISTS ON JUNE 30, 1925.

CLASS OR GROUP	TECHNICAL BULLETINS	COMPLETE BULLETINS	POPULAR BULLETINS
All publications.....	1,649	2,366	9,233
Agronomy.....	782	1,553	1,958
Animal nutrition.....	711	.....	.....
Bacteriology.....	1,060	1,523	.....
Botany and plant pathology.....	1,021	1,932	.....
Chemistry of dairy products.....	782	.....	.....
Dairying.....	467	964	1,234
Entomology.....	731	1,468	.....
Horticulture.....	789	1,697	3,129
Plant chemistry.....	932	.....	.....
Special lists:			
Ice cream plants.....	79	79	.....
Milk plants.....	178	178	.....
Feed inspection.....	.....	677	.....
Fertilizer inspection.....	.....	529	.....
Seed inspection.....	.....	522	.....
Insecticide inspection.....	.....	763	.....

Based on geographical distribution, the bulletins are mailed out about as indicated below. These figures are for June 30, 1925.

APPROXIMATE GEOGRAPHICAL DISTRIBUTION OF STATION BULLETINS.

WHERE MAILED	TYPE OF BULLETIN		
	Technical	Complete	Popular
Residents of New York.....	250	1,700	11,000
Residents of other states.....	2,500	4,000	1,000
Foreign.....	850	850	.....
Miscellaneous.....	500	500	1,000

BULLETINS AND CIRCULARS ISSUED

The following list includes the bulletins and circulars issued by the Station during the year ended June 30, 1925.

TECHNICAL BULLETINS

- No. 104. July. Filtration and clarification of milk, by A. C. Dahlberg and J. C. Marquardt. Pages 27, pls. 4, charts 2, graph 1. Distributed November 15, 1924.
- No. 105. July. The bacterial flora of milking machines, by A. H. Robertson. Pages 52, charts 2. Distributed November 15, 1924.
- No. 106. July. An experiment in breeding apples. II, by Richard Wellington. Pages 149, chart 1. Distributed March 15, 1925.
- No. 107. September. A correlation between color of grape leaves at time of foliation and fruit color, by F. E. Gladwin. Pages 8. Distributed March 15, 1925.
- No. 108. September. Studies with phytosterols: I. The phytosterols of the endosperm of corn, by R. J. Anderson. II. The phytosterols of wheat endosperm, by R. J. Anderson and Fred P. Nabenhauer. III. The separation of unsaturated from saturated sterols, R. J. Anderson and Fred P. Nabenhauer. IV. Reduction of sitosterol preparation of dihydrositosterol or sitostanol, by R. J. Anderson and Fred P. Nabenhauer. V. Sitosterol, by R. J. Anderson and Fred P. Nabenhauer. Pages 40, Fig. 1. Distributed March 15, 1925.
- No. 109. December. A taxonomic review of currants and gooseberries, by Alwin Berger. Pages 118, pls. 8. Distributed May 28, 1925.

- No. 110. January. A gaseous fermentation of tomato pulp and related products, by Friend Lee Mickle and Robert S. Breed. Pages 27. Distributed April 20, 1925.
- No. 111. March. The texture of ice cream, by A. C. Dahlberg. Pages 42, pls. 4, chart 1. Distributed May 28, 1925.

COMPLETE AND POPULAR BULLETINS

- No 517. July. Comparative efficiency of dust and spray mixtures in controlling the currant aphid, by P. J. Parrott and S. W. Harman. Pages 21, pls. 4, figs. 2. Distributed November 15, 1924.
- No. 518. July. Experiments with potatoes: I. Dusting vs. spraying, by F. C. Stewart and P. J. Parrott. II. Row competition and border effect, by F. C. Stewart. Pages 36. Distributed November 15, 1924.
Popular edition. Pages 4.
- No. 519. July. Dusting and spraying to control grape root-worm, by F. Z. Hartzell. Pages 29, pls. 2, charts 2. Distributed November 15, 1924.
Popular edition. Pages 4, pls. 2.
- No. 520. July. The grafting of American grapes, by F. E. Gladwin. Pages 18, pls. 6. Distributed November 15, 1924.
- No. 521. August. Chemical studies of the combined lead arsenate and lime-sulfur spray, by R. W. Thatcher and Leon R. Streeter. Pages 20. Distributed November 15, 1924.
- No. 522. August. Control of leafroll and mosaic in potatoes by isolating and roguing the seed plot, by F. C. Stewart. Pages 14. Distributed November 15, 1924.
Popular edition. Pages 4.
- No. 523. November. Fumigation with hydrogen cyanide for control of pear psylla, by R. L. Webster. Pages 23, pls. 4, fig. 1. Distributed March 15, 1925.
- No. 524. November. Milking machines: VIII. The sanitary efficiency of a simplified type of milking machine, by Friend Lee Mickle. Pages 48, pls. 12, figs. 2. Distributed March 15, 1925.
Popular edition. Pages 8, figs. 3.
- No. 525. December. Changes in the composition and cost of fertilizers in New York from 1914 to 1924, by L. L. Van Slyke. Pages 19. Distributed March 15, 1925.
- No. 526. December. Variations in varieties of canning peas, by F. H. Hall. Pages 20. Distributed March 15, 1925.
Popular edition. Pages 4.

CIRCULARS

- No. 77. September. Successful cream whipping, by J. C. Hening. Pages 4, fig. 1.
- No. 78. January. Spraying and dusting experiments with apples in 1924, by P. J. Parrott, Hugh Glasgow, and F. C. Stewart. Pages 16.
- No. 79. February. Guide to the horticultural work of the Hudson Valley Fruit Investigations, by H. B. Tukey. Pages 8, figs. 6.

JOURNAL ARTICLES

The following papers reporting results of investigations made at this Station appeared in various scientific journals during the year ended June 30, 1925, or subsequent to the last report.

- The validity of names applied to genera and subgenera of the Coccaceae, G. J. Hucker and R. S. Breed. *Centralbl. f. Bakteriolog., II Abt.*, **64**, 321-328. 1925.
- A study of the characters of primary importance in the differentiation of the micrococci, G. J. Hucker. *Centralbl. f. Bakteriolog., I Abt., Orig.*, **95**, 109-123. 1925.
- Studies on the serological relationships of the species of micrococci, G. J. Hucker. *Centralbl. f. Bakteriolog., I Abt., Orig.*, **95**, 123-136. 1925.
- The species of the genus *Micrococcus* Cohn, G. J. Hucker. *Centralbl. f. Bakteriolog., II Abt.*, **64**, 481-491. 1925.
- The Gram stain in relation to the *Micrococcus* group, G. J. Hucker. *Centralbl. f. Bakteriolog., I Abt., Orig.*, **95**, 446-450. 1925.
- The utilization of non-protein sources of nitrogen by the micrococci, G. J. Hucker and L. F. Rettger. *Centralbl. f. Bakteriolog., II Abt.*, **64**, 1925.
- The utilization of protein decomposition products by the micrococci, G. J. Hucker. *Centralbl. f. Bakteriolog., II Abt.*, **64**, 1925.
- Report of the referee for the Committee on Standard Methods for the Examination of Milk, R. S. Breed. *Amer. Jour. Public Health*, **15**, 207, 1925.
- A report on basic fuchsin, H. J. Conn. *Science*, **60**, 387-388. 1924.
- Certified stains — what they are and how to obtain them, H. J. Conn. *Jour. Lab. and Clinical Med.*, **10**, 321-322. 1925.
- New applications of biological stains, H. J. Conn. *Jour. Chem. Education*, **2**, 184-185. 1925.
- Second progress report on black-rot (*P. campestris*) investigations on Long Island, E. E. Clayton. Abs. in *Phytopath.*, **15**, 48-49. 1925.
- Second progress report on seed treatment for blackleg (*Phoma lingam*) and black-rot (*P. campestris*) of cruciferous crops, E. E. Clayton. Abs. in *Phytopath.*, **15**, 49. 1925.
- The efficiency of various spray and dust mixtures in controlling rosy aphis, P. J. Parrott and Hugh Glasgow. *Jour. Econ. Ent.*, **18**, 214-218. 1925.

- The control of aphids which infest cauliflower seedbeds on Long Island by tobacco dust mixtures, H. C. Hockett. *Jour. Econ. Ent.*, **18**, 128-132. 1925.
- The preparation of basic arsenate of lead of definite composition, Leon R. Streeter and R. W. Thatcher. *Ind. and Eng. Chem.*, **16**, 941-942. 1924.
- Factors which influence the nicotine content of tobacco grown for use as an insecticide, R. W. Thatcher, Leon R. Streeter, and R. C. Collison. *Jour. Amer. Soc. Agron.*, **16**, 459-466. 1924.
- Some practical points relative to control of rosy aphis, P. J. Parrott. *Proc. 70th Ann. Meet. New York State Hort. Soc.*, 17-22. 1925.
- Report of plant diseases, W. O. Gloyer. *Proc. 70th Ann. Meet., New York State Hort. Soc.*, 23-29. 1925.
- Environmental factors that affect the efficiency of nicotine sprays and dusts with pear psylla, F. Z. Hartzell. *Proc. 70th Ann. Meet., New York State Hort. Soc.*, 41-43. 1925.
- Recent plant disease work in the Hudson Valley, E. V. Shear, Jr. *Proc. 70th Ann. Meet., New York State Hort. Soc.*, 81-87. 1925.
- Horticultural problems in the Hudson River Valley, H. B. Tukey. *Proc. 70th Ann. Meet., New York State Hort. Soc.*, 91-101. 1925.
- Susceptibility of the pear psylla to calcium cyanide dust, F. G. Munding. *Proc. 70th Ann. Meet., New York State Hort. Soc.*, 182-186. 1925.
- New fruits, Richard Wellington. *Proc. 70th Ann. Meet., New York State Hort. Soc.*, 187-191. 1925.
- Variations of plat yields in field experiments with the grape and their interpretation, F. E. Gladwin. *Proc. 21st Ann. Meet. Amer. Soc. Hort. Sci.*, **1924**, 45-51.
- The nectarine as a future commercial fruit in New York State, Richard Wellington. *Proc. 21st Ann. Meet. Amer. Soc. Hort. Sci.*, **1924**, 60-62.
- A test to determine whether environment has produced different strains of Baldwin, G. H. Howe. *Proc. 21st Ann. Meet. Amer. Soc. Hort. Sci.*, **1924**, 62-63.
- An experience with pollenizers for cherries, H. B. Tukey. *Proc. 21st Ann. Meet. Amer. Soc. Hort. Sci.*, **1924**, 69-73.

Respectfully submitted,

R. W. THATCHER,

Director.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, GENEVA, N. Y.,
June 30, 1925.