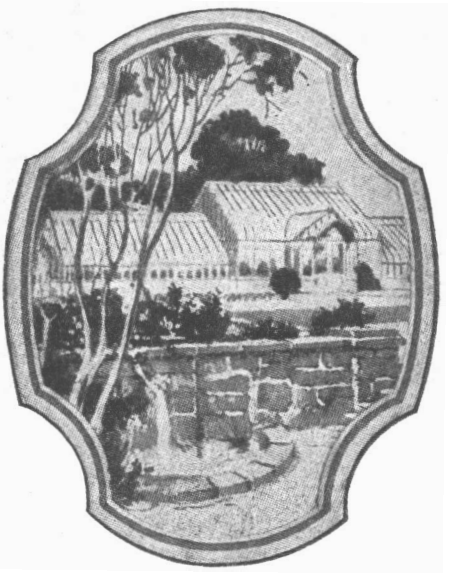
New York State Agricultural Experiment Station

Geneva, N. Y.



A Few Facts About the Station and its Work

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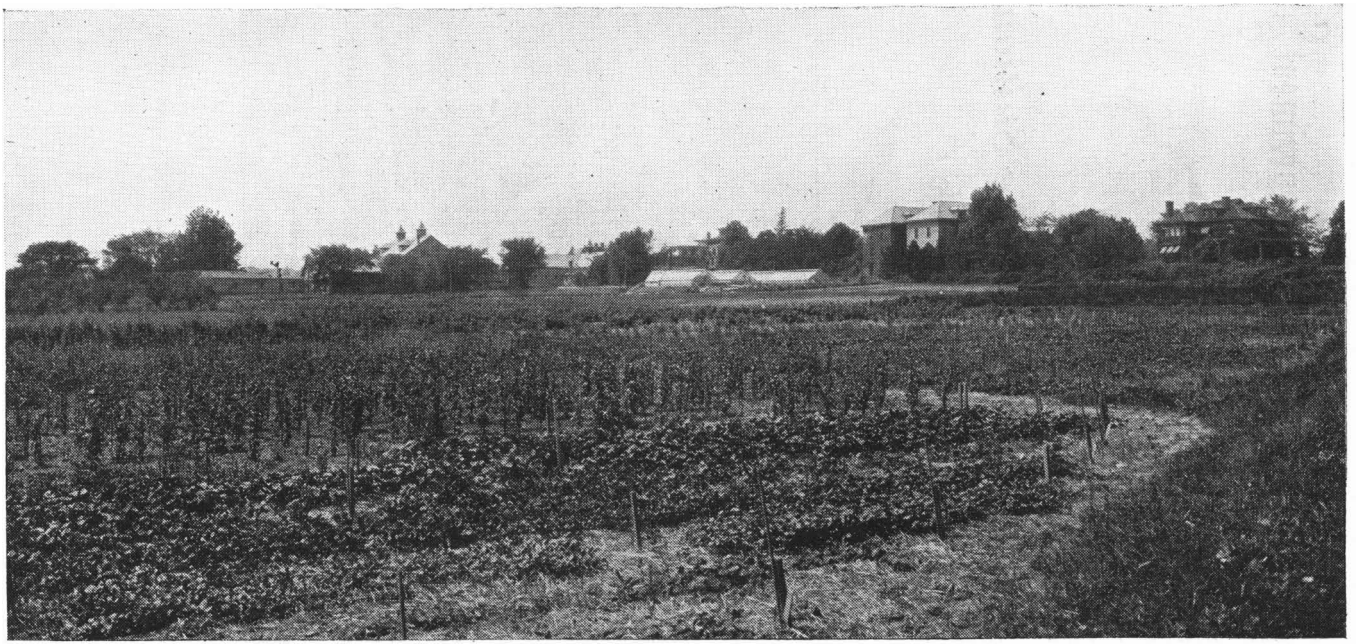
New York State Agricultural Experiment Station
GENEVA, N. Y.

A Few Facts About the Station and its Work

JORDAN HALL.

REVISED, JULY 1, 1925.



LOOKING NORTH ACROSS THE STATION GROUNDS.

A FEW FACTS ABOUT THE STATION AND ITS WORK

By act of the Legislature of 1881, an agricultural experiment station was established in the State of New York, the sixth in the United States, and on March 1, 1882, work was begun on the site selected at Geneva in Ontario County. In the words of the act, the Station was established "for the purpose of promoting agriculture in its various branches by scientific investigation and experiment." Since then, the chief work of the Station has been to study, in a scientific way, the problems confronting the farmers of the State. To accomplish this, suitable buildings and laboratories have been provided, together with a farm of 246 acres. This farm is not in any sense a "model" farm, but serves primarily as an outdoor laboratory for the performance of experiments under field conditions. A corps of highly trained specialists, including chemists, bacteriologists, botanists, entomologists, horticulturists, and dairy specialists, is engaged in the study of numerous problems relating to the soil, plant and animal nutrition, diseases and insects affecting plants, the propagation of improved varieties of fruits and vegetables, dairy management, etc. In all, more than eighty main lines of work are now under way.

STATION LOCATED IN FRUIT REGION

Geneva is situated at the foot of Seneca Lake, about 30 miles south of Lake Ontario, in what is known as the "Finger Lakes" region of Western New York. This region is famous for its fruits, orchards, vineyards, and small fruit plantings abounding on every side in the vicinity of the numerous lakes which seem to temper the climate and make possible the production of an abundance of apples, pears, peaches, plums, cherries, grapes, and berries of all kinds. With a large part of the Station's activities devoted to a study of various problems relating to fruit growing, its location in this region is most fortunate.

In developing the work of the Station every effort has been made to prevent over-emphasizing one line of research at the expense of other fields of endeavor in order that a list of the Station's projects may present a well-rounded out program for New York agriculture, but it has been inevitable that the Station's activities follow a few rather definite channels.

Besides the buildings and grounds maintained at Geneva, the Legislature has from time to time enlarged the work of the Station to include very specialized investigations in distant parts of the State, where soil and climatic conditions and farm problems are quite different from those encountered in Ontario County. One such outlying project is located at Riverhead on Long Island, where the Vegetable Research Farm has been established to study the special needs of Long Island truck farmers, particularly with respect to insect pests and diseases which afflict their crops.

In addition, the Hudson River Valley Fruit Investigations now occupy an important place in the Station program, and three men, two at Poughkeepsie and one at Hudson, are engaged in experimental work relating to the peculiar problems confronting fruit growers in that region.

The Station has maintained for some time a Vineyard Laboratory at Fredonia in Chautauqua County, where an entomologist and an horticulturist have aided materially in solving some of the troubles of the grape and pear growers in western New York.

HELPING THE FRUIT GROWER

New York is one of the three leading States in the Union with respect to the area devoted to fruit growing and to the yield of fruit.

THE BIOLOGY BUILDING.

In 1919, when the last census was taken, almost 26,000,000 quarts of small fruits were harvested; over 14,000,000 bushels of apples and peaches; more than 1,800,000 bushels of pears, plums, and prunes; and over 152,000,000 pounds of grapes. New York fruits were valued at more than $51,500,000 in the last census, an increase of more than 100 per cent over the figure for the preceding census. The Experiment Station has played a prominent part in this remarkable development of the fruit industry in the Empire State.

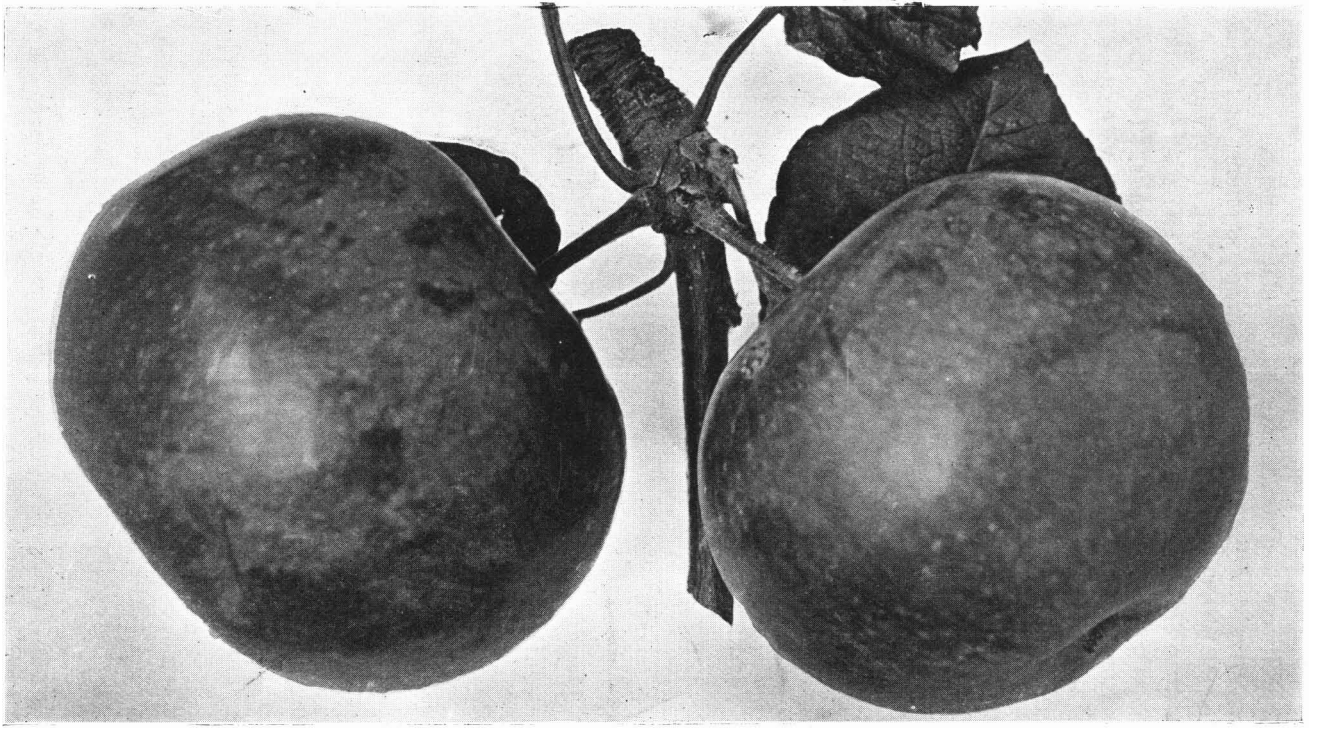
NEW FRUITS

From the early days of the Station's existence down to the present time an effort has been made to test every variety of hardy fruit that

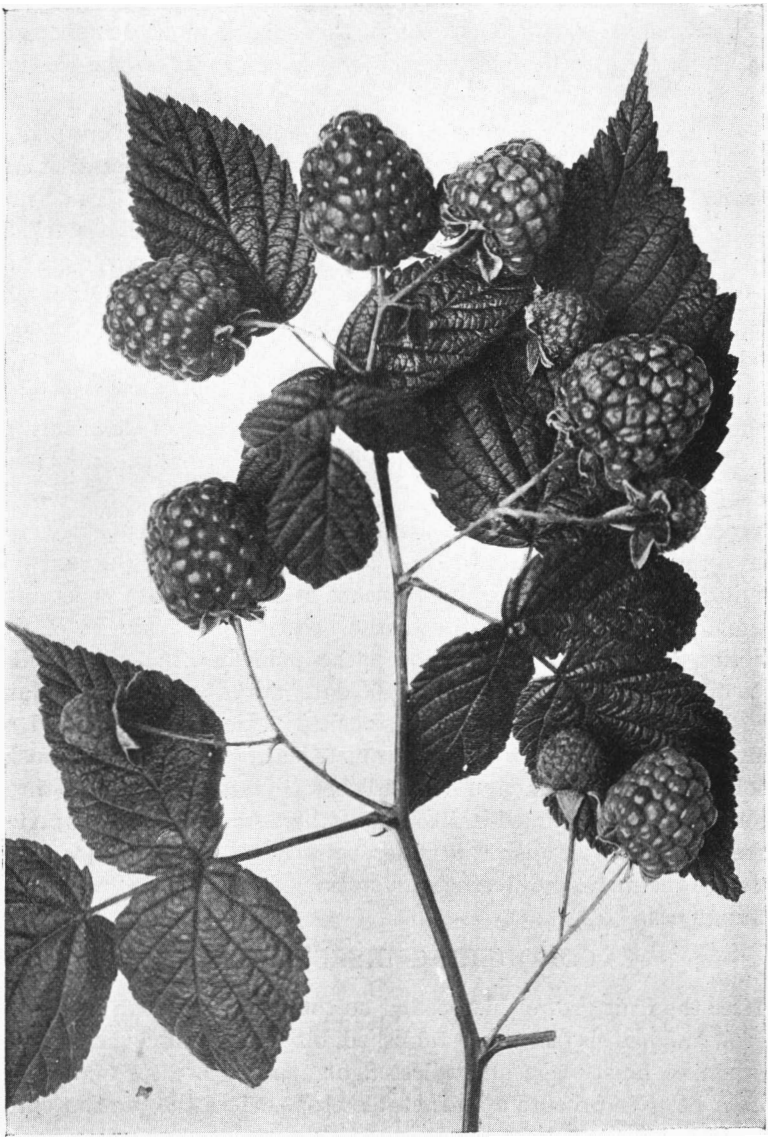
SEEDLING STRAWBERRIES.
About 5,000 seedlings are under observation in this planting.

will grow on the Station grounds at Geneva. Most of the fruit varieties offered by American nurserymen and many from foreign countries are to be found in the Station plantings. These tests have formed the basis for the most authoritative accounts available of the different varieties of hardy fruit. New York fruit growers, as well as those in many other states, look to the Station fruit specialists for first-hand information on varieties of fruit suitable for their conditions.

The breeding of new fruits has also occupied the attention of the Station horticulturists since the founding of the Station, and during this time more than 40,000 seedlings of various sorts have been



EARLY MCINTOSH.
recently developed by



CAYUGA RED RASPBERRY, A NEW STATION SEEDLING.

grown. From these 40,000 seedlings some 70-odd new varieties of different fruits have been secured which were deemed worthy of naming and distributing to fruit growers for further testing. Before a variety is named and sent out for further trial it must demonstrate some superiority to the best existing varieties grown on the Station grounds.

When a new variety has been found worthy of further trial, it is turned over to the New York State Fruit Testing Cooperative Association, Inc., which has its headquarters at Geneva. The Fruit Testing Association then undertakes to propagate sufficient stock to supply its members and others at a nominal charge to cover cost of propagation, etc. If the variety proves worth while, it is gradually taken up by nurserymen and others and finally becomes a recognized sort.

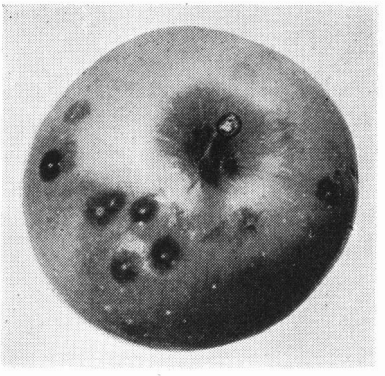
Other important lines of work include pruning experiments with apples, pears, and plums; studies of the relative value of clean culture and sod in the apple orchard; and fertilizer experiments in commercial apple orchards.

Experimental work with vegetables, practically suspended for many years, was resumed in 1922. The main purpose of the renewed activity is to secure detailed descriptions of all varieties of vegetables suitable for growth in the State, the descriptions, histories of the varieties, and similar information to be published in volumes like those of The Fruits of New York. To date, fairly complete field data have been secured on about 450 so-called varieties of peas and as many or more of beans, and incomplete data on about 230 muskmelons, 140 cucumbers, and 400 radishes. Tests of these last three vegetables were continued in 1925, and others started with asparagus, rhubarb, and horseradish. Further tests have also been made to illustrate the marked differences in strains of well-known varieties of canning peas.

CONQUERING INSECT PESTS

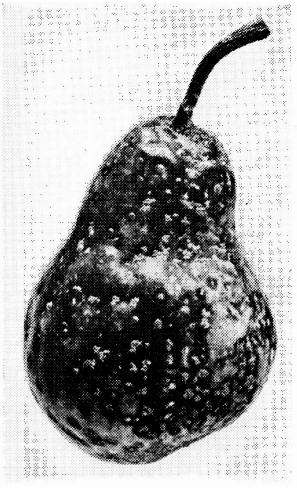
After the fruit grower has settled on the varieties which he wishes to grow and has his planting established, his troubles have only begun, for then he must wage an endless fight against diseases and insect pests if he is to procure a marketable crop. Here the Station entomologists and plant disease specialists have rendered a service to the fruit grower which can scarcely be overestimated. In fact, it is probably not too much to say that only because of their tireless efforts is it possible to produce marketable fruit in New York.

One of the first insect problems attacked by the Experiment Station workers and one of the hardest that they have been called upon to solve was the appearance in 1895 of the dread San Jose scale in the nurseries and orchards of the State. So much feared was this pest and so uncertain were any of the control measures then known that by 1896 fruit growers were asking the Station entomologists if it was worth while to set out any more apple trees. To them apple growing in New York seemed to be doomed. The entomologists, however, were confident that in time they could conquer the scale and they assured the growers that the pest was not a permanent menace to the industry. Many laborious tests of various methods of control were made before a satisfactory method was finally worked out in which a lime-sulfur spray applied while the trees were dormant gave the desired protection.

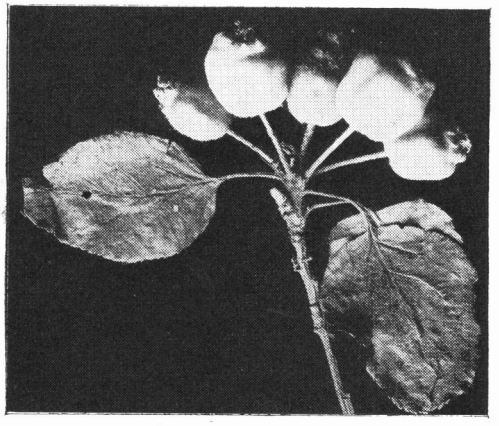


APPLE INFESTED WITH SAN JOSE SCALE.

The control of scale has been so satisfactory in years past that fruit growers have almost come to regard the pest as of little consequence. Unfortunately, in some cases, this attitude has led to neglect of the necessary precautions and, as a result, San Jose scale is coming back into the orchards of the State in alarming numbers. A warning has been issued to this effect, and the indications are that proper steps will be taken to prevent a widespread recurrence of the scale. The routine system of spraying advocated for New York orchards insures protection against scale and other common insect pests, so that the up-to-date fruit grower has little to fear from this source.

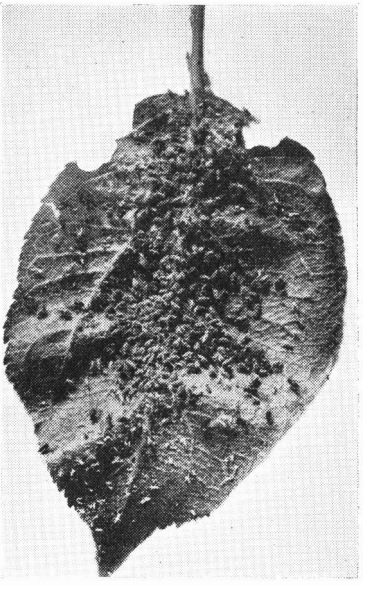


SAN JOSE SCALE ON PEAR.



"APHIS APPLES," THE RESULT OF FEEDING OF APPLE APHIDS.

New York apple growers are often much troubled with aphids, tiny insects which appear early in the spring and feed on the tender new leaves and the newly formed apples. This feeding causes the leaves to curl up and produces dwarfed, misshapen fruit unfit for marketing. The Station entomologists studied the habits of these insects and devised a satisfactory method of combating them by spraying with nicotine early in the spring. The apple red bug, the codling moth, the curculio, the apple maggot or railroad worm, all of these and many other apple pests are being successfully combated in New York orchards as a result of Station experiments.



ROSY APHIDS ON APPLE LEAF.

Numerous other more or less important insect pests of fruit trees have been the subject of study from time to time, and effective control measures found. Combination sprays, whereby several insects will be combated with one application of spray, have now come into general use with New York fruit growers, due very largely to the researches of the Station entomologists. Spraying for several pests at once is much more economical of time, labor, and money than trying to combat each pest separately. In fact this would not be possible in commercial orchards, nor practicable in smaller plantings.

The use of insecticide dusts in place of the usual spray preparations has attracted much attention in America in recent years. A great deal has been claimed for dusting as an improvement over spraying, and the Geneva Station has been studying the matter from every

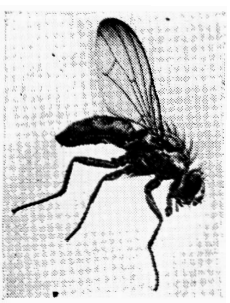
DUSTING FOR APPLE RED BUGS.

angle. The entomologists have reserved their judgment, however, until the Station experiments have furnished more conclusive proof.

The Station specialists are constantly on the lookout for sudden outbreaks of unusual pests or for severe infestations of some especially destructive insect, and this vigilance has many times proved of great benefit to New York fruit growers.

CABBAGE MAGGOT CONTROL

Another important line of insect work in progress at Geneva is a series of experiments on the cabbage maggot. The cabbage crop is the most important vegetable crop grown in New York. Nearly every year tremendous losses are sustained by the growers thru the destruction of seedling cabbage plants by the maggot or worm-stage of a small fly. Effective methods of screening cabbage seed beds, which prevent the flies from reaching the young plants, have

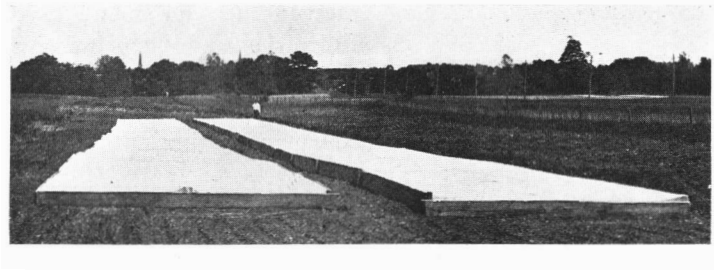


ADULT CABBAGE MAGGOT.

been perfected by the Station specialists, and, in the spring, many acres of screened beds are now seen thruout the State. Lately, the entomologists have developed a simple but most effective method for poisoning the young maggots with corrosive sublimate. The poison is applied in solution around the base of the plants at about the time the eggs are hatching out. This method promises to supplant the screening method as it is much less troublesome and has other advantages over screening.

TREATING CABBAGE SEEDLINGS WITH CORROSIVE SUBLIMATE FOR MAGGOT.

Work is also being done with grape pests, pear and peach insects, small fruits and vegetable pests, and other insects. It is not too much to say that the entomologists are rendering a service to the farmers of the Empire State which, if computed in terms of dollars saved the farmers annually thru the discovery of cheap and effective methods for combating insect pests, would far exceed the sum appropriated each year for the support of all the Experiment Station work.

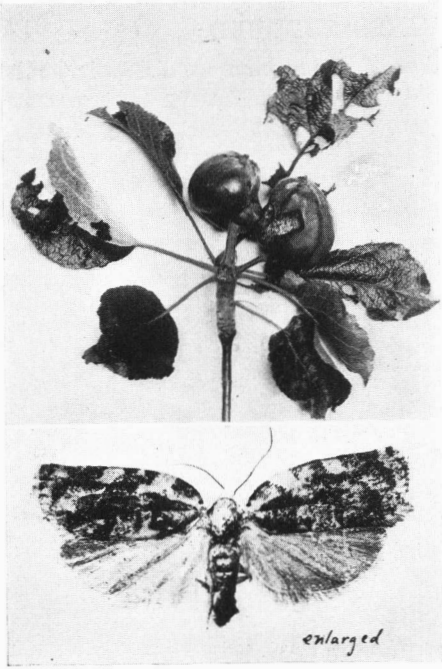


SCREENED CABBAGE SEED BEDS,—ONE WAY OF COMBATING MAGGOT.

Station entomologists are also working on Long Island and in the Hudson River Valley, studying the insects peculiar to those regions and to the crops grown there. The farmers in these sections of the State are confronted with entirely different problems from those found in other parts of the State, and in order to help them, the Station has assigned men to work on these problems wherever they occur.

CHERRY MAGGOT

In all of the leading sour-cherry growing areas there is an urgent demand on the part of canning companies for fruit free from injurious insects and diseases. As the plum curculio and the cherry maggot affect seriously the quality as well as the yield of cherry orchards, the Station workers are making careful investigations of the life histories, habits, and seasonal activities of the different species, the object being to guide growers in their spray practices and to insure the production of fruit which will meet the requirement of the canning trade. Present spray recommendations, if intelligently followed, will enable growers to secure suitable control with comparatively little overhead expense or additional effort.

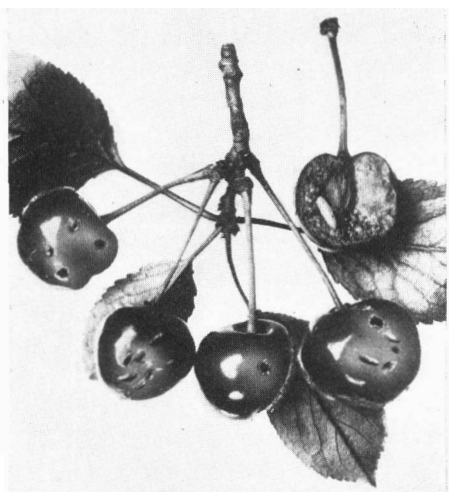


FRUIT TREE LEAF-ROLLER.

FRUIT-TREE LEAF-ROLLER

In certain locations, particularly in Wayne, Orleans, and Monroe Counties, the fruit-tree leaf-roller is a source of much apprehension to fruit growers. Where well established, it is one of the most destructive of orchard pests, reducing yields by feeding on the young fruit clusters and causing malformations in the fruit by feeding on the fruit itself during the growing period.

While the control of this insect is difficult, it is believed that it can be con-

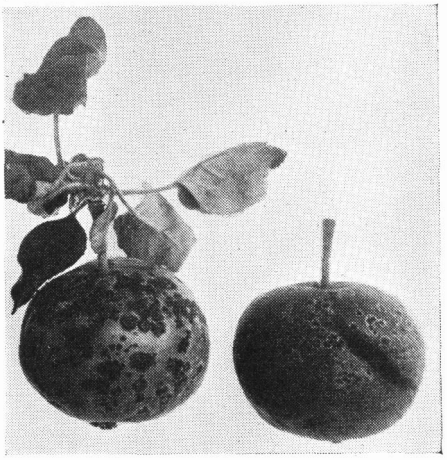


CHERRY MAGGOT.

trolled by the use of oil sprays applied just as the buds begin to open to destroy the egg clusters, followed by applications of arsenicals during the period when the young caterpillars are hatching.

PLANT DISEASES SUBDUED

The insect enemies of orchard and garden have an able ally in the host of plant diseases which are ever present to take a toll from the unwary farmer. An unrelenting warfare must be waged against these foes if success is to be achieved in fruit and vegetable growing in New York.



APPLES AFFECTED WITH SCAB.

The plant disease specialists at the Experiment Station have made possible thru their researches just as effective methods of controlling the more important diseases of orchard and garden crops as have the entomologists with respect to insect pests. The routine sprays now applied by all progressive fruit growers as a matter of course are combinations of insecticides and fungicides which furnish at one and the same time the needed protection against insects and diseases.

The greatest menace to the New York apple and pear grower is scab. The prevalence of this disease in New York orchards is much influenced by seasonal conditions, a wet season greatly favoring the spread of the scab fungus. The prudent grower, therefore, takes no chances, but sprays regularly with lime-sulfur as recommended by the plant disease specialists at the Experiment Station.

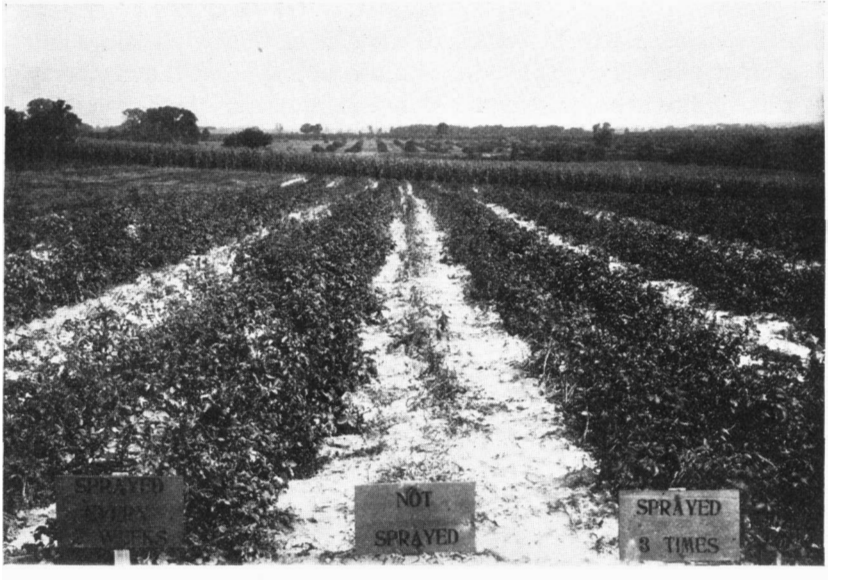
POTATO SPRAYING PROVED PROFITABLE

The potato crop in New York amounts annually to millions of dollars. Potatoes in this State, among other troubles, are especially susceptible to blight and many farmers suffer considerable losses each year from this disease. Nearly 25 years ago the Experiment Station inaugurated a series of long-time spraying experiments which demonstrated conclusively that potato blight can be effectively controlled by spraying with bordeaux mixture. During a 10-year period the sprayed plats gave an average increase in yield of 97.5 bushels per

acre over the unsprayed plats. In some years blight is much more prevalent than in others. Equally as important as showing the possibilities of controlling the disease, therefore, was a demonstration that spraying could be done at a profit year after year regardless of the prevalence of the disease. These experiments marked a new era in potato growing in New York.

OTHER CROP DISEASES

Many other crop diseases have received attention from the Station pathologists or are now being investigated. In one of the early investigations of this kind made by the Station the bacterial nature of pear blight was demonstrated. In 1896 a remedy was found for the cucumber downy mildew, a disease which threatened the destruction



A PRACTICAL DEMONSTRATION OF THE VALUE OF SPRAYING FOR POTATO BLIGHT.

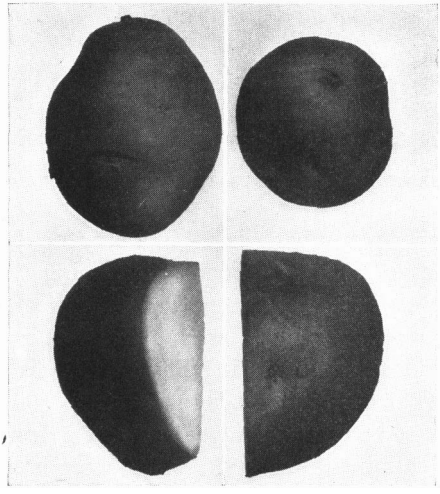
of the cucumber pickle industry on Long Island. Important discoveries have been made concerning the cause and control of apple tree canker. Studies on bean blight and the diseases of China aster are under way at Geneva. On Long Island an intensive study of cauliflower diseases is being made. In the Hudson River Valley the root rot of fruit trees is receiving special attention. The newest plant disease project is the pea root rot a destructive disease of peas grown for canning purposes. This latter is a part of the Canning Crops Investigations recently inaugurated.

RASPBERRY TROUBLES

One of the present lines of work deserves special mention. This is in regard to a study of raspberry diseases, particularly raspberry mosaic. The New York raspberry crop in 1919 amounted to nearly $3,000,000, and raspberry growing is one of the leading industries in certain sections of the State. Within the last few years many commercial plantings have shown a marked decline in the yield and quality of the fruit. So serious has this become in some localities that the industry is practically at a standstill. A special investigator was assigned by the Experiment Station to determine the cause of this decline and, if possible, to find a remedy. The trouble has been diagnosed as mosaic, an insidious disease that spreads thru every part of the plant including the roots and suckers. Evidently the disease is transmitted from plant to plant by a tiny aphid, but the greatest damage has been done by setting diseased stock in new plantings and thus greatly increasing the centers of infection thruout the raspberry regions. Since every part of a diseased plant carries the disease, the only remedy is to destroy all diseased plants and use planting stock known to be disease free. The production of large quantities of such stock is now the chief problem before the industry, and the Experiment Station is taking the lead in bringing this about. Every indication points to a restoration of raspberry growing to its former prosperous state within the next few years.

SEED POTATOES STUDIED

In addition to the spraying experiments for potato blight, the Station potato specialist has also devoted much time to studies of seed potatoes and potato planting. As a result of these experiments several interesting things have been discovered, only two or three of which can be mentioned here.



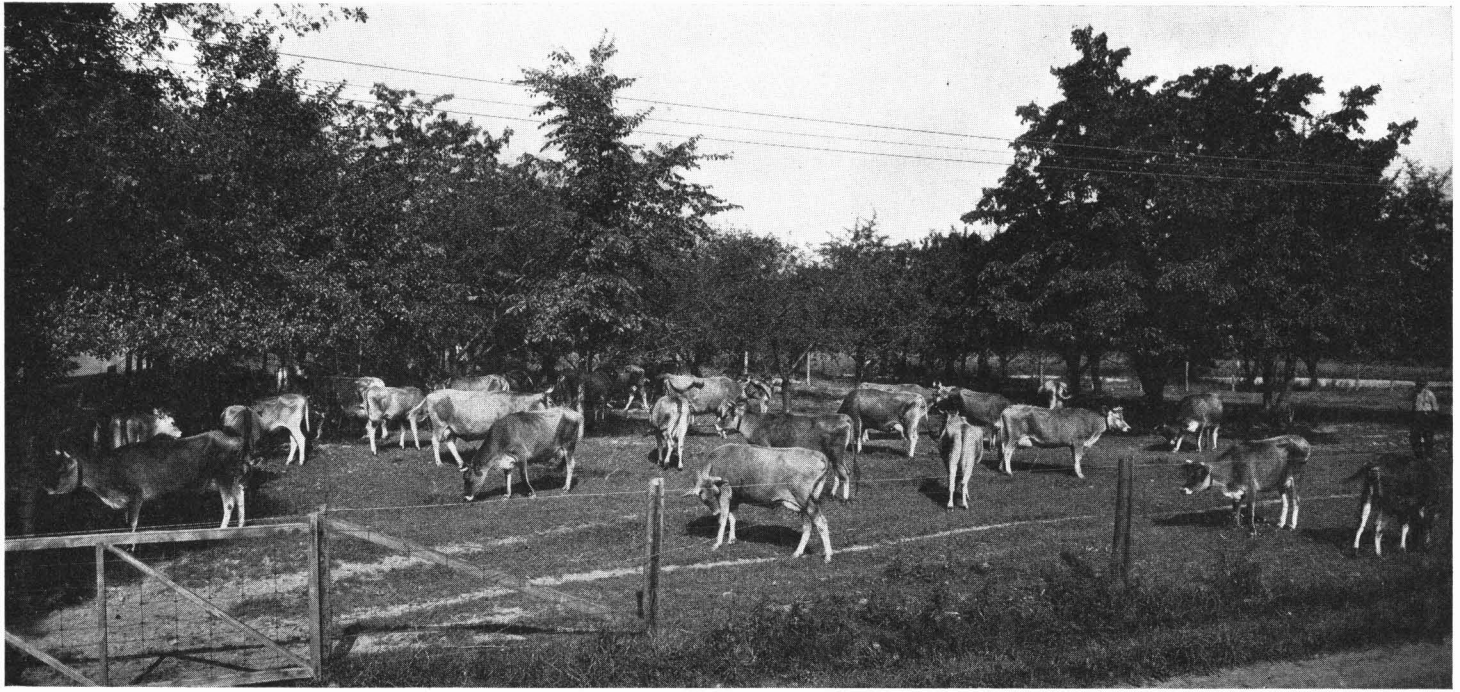
WHOLE SMALL TUBERS AND PIECES OF LARGE TUBERS FROM THE SAME PLANT.

It has been conclusively demonstrated by careful test that for planting purposes whole small potatoes from healthy, vigorous plants are as good as, if not a little better than, pieces of large tubers from the same

plant. The yields have been consistently larger from the whole small seed potatoes and the proportion of marketable potatoes has not been materially affected by the use of small potatoes for seed. The Station specialist does not recommend the continued selection of small potatoes for seed year after year, but it is evident that where the seed potatoes come from healthy stock there need be no reluctance in using the small tubers for seed.

Another interesting development in the potato work was the discovery that missing hills in the potato field are not a total loss, due to the fact that the hills on either side of the blank space produce enough more than normal hills to make up over one-half of the loss from the missing hill.

The relative yields of potato plants grown from halves of the same tubers, the advantages of home-grown seed potatoes, the best spacing of the potato hills, these and many other matters relating to potato growing are dealt with in the Station bulletins on this subject.



THE STATION JERSEY HERD IN 1924.
Each cow produced more than double the fat yield of the average New York dairy cow.

A GREAT DAIRY STATE

New York State has a total population of something over 10,000,000 persons, more than 8,500,000 of whom live in the cities of the State. With this enormous market at his very door, the New York farmer finds a tremendous demand for dairy products, especially fluid milk. The total farm value of dairy products in New York in 1922 amounted to $144,000,000.

The research problems of the dairy industry include a wide range of dairy practices and sciences, and the Station from its beginning has conducted investigations in the dairy field, specializing in the fields of herd management and nutrition, and in chemical, bacteriological, and manufacturing problems.

DAIRY HERD MANAGEMENT

It is generally conceded that pure-bred cattle of the dairy breeds produce, on an average, much more milk and fat than common cows of no particular breeding. Nevertheless, the common, or scrub cows, are in the majority in this country. The Station has successfully established a high-producing herd of Jerseys at a cost which is within the possibilities of most farmers. Two bred heifers were purchased in 1900 and bull calves have been obtained as needed since that time. The two heifers cost $250.00 and the bulls an average of $116.66 each, or $31.82 per year up to 1923. The average yield per cow in the Station herd for the year 1924 was 7,267 pounds of milk containing 427 pounds of fat, while the average for cows of all breeds in the State was about 5,000 pounds of milk and 167 pounds of milk fat.

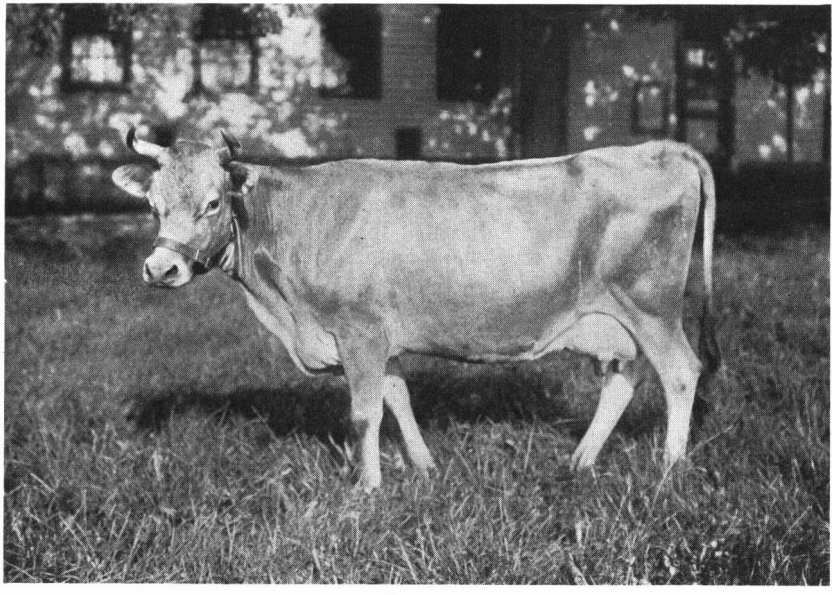
When a herd produces as much milk and fat as the present Station herd, it is difficult to improve the average production. Increased production can be accomplished by better feeding methods, more rigid culling of the poorest cows, and by the selection of better bulls. With present knowledge of dairy herd management, it is comparatively easy to feed cattle properly, to pick out the low yielding cows by weighing and testing the milk produced by each cow, but it is very difficult to select bulls whose daughters will inherit the tendency to give more milk and fat than their dams. More attention will be given to the selection of the sires that are to be used in the Station herd.

TUBERCULOSIS CONTROL

In 1900, a veterinarian, after a physical examination, pronounced one cow in the Station herd of Jerseys tubercular. When the animal was slaughtered the diagnosis was found correct. The entire herd was then tested with tuberculin and 18 of the 28 animals reacted.

Upon retest in 1901, four more animals reacted. Owing to the excellent breeding of the diseased animals, it was decided to follow the Bang method of handling a tubercular herd, and the 22 reactors were separated from the healthy animals and kept for breeding purposes. By 1905, the Station herd comprised 30 healthy animals and the reacting cows were killed. **All were found to have the disease. No** demonstrated case of tuberculosis has appeared since that time.

The Station herd is tested for tuberculosis each year and every precaution is taken to prevent infection of the healthy animals by isolating and testing new individuals before placing them with the herd, and by guarding against all other known sources of infection.



A FINE TYPE OF DAIRY COW.
This cow made a semi-official record of 534 pounds of milk fat as a senior 2-year old and 714 pounds as a junior 4-year old.

The fact that the disease has not reappeared in the herd in the past 20 years is a striking demonstration of the possibilities of completely eradicating and controlling a much-dreaded disease by means of methods entirely practicable for any dairyman to employ, and is one of the most valuable contributions of the Station to the dairy industry.

MILKING MACHINES

The problem of eliminating milking by hand thru the use of milking machines has been of much interest to farmers because the milking machine was designed to save labor. The first machine was installed

at the Station in 1906. It was replaced by another make in 1907 and the same machine, with the improvements made from time to time, has been in constant service since that time. From time to time other machines have been installed to test particular points in connection with experimental work, and extensive comparative data have been available from dairy farms in the vicinity of Geneva. Studies with milkers of all of the common types have been made possible thru cooperation with the City of Geneva in the supervision of its milk supply.

An extensive comparative test of the milking machine in use in 1912 showed that it had no effect upon the yield of milk or fat and that it was a practical machine.

Milking machines are being employed more and more extensively on New York dairy farms, but their use has been retarded by difficulties met in the production of milk containing low numbers of bacteria. Milk as drawn with the early machines invariably contained millions of bacteria per cubic centimeter as soon as it had passed thru the machines. As the manufacturers of machines were not in a position to solve this problem satisfactorily for themselves, the extensive work that has been done at the Station in devising simple and efficient means of cleaning and sterilizing milking machines has played an important part in making the machines the success that they are on dairy farms. While many refinements will undoubtedly be placed on these valuable labor-saving farm machines in the future, all of the manufacturers of the standard makes of milkers now on the market are in a position to show dairymen how to produce high grade sanitary milk with their machines.

SANITARY MILK PRODUCTION

The importance of market milk in the State has caused the Station to devote much time to problems relating to the production of sanitary milk. Coincident with the demand that milk as delivered to the consumer shall contain a minimum number of bacteria, there has been need of exact information as to the source and kinds of bacteria that get into milk. It is only with information of this kind that the practical dairyman can meet this reasonable demand. The Station therefore early took up a study of the relative importance of various sources of contamination, the outcome of which was to show that the dairy utensils were normally the chief source of the bacteria in fresh milk. The udder itself is normally an unimportant source of bacteria, while the numbers derived from dust and dirt of the type that may show as visible sediment in milk were found to be much less than had been assumed previously. The latter findings do not however relieve the dairyman in any way from the need of care to protect

the milk from contamination, as it is the kind of the bacteria that get into the milk that are of importance from the sanitary standpoint rather than the number. As knowledge of the nature of the bacteria derived from these various sources is still very fragmentary, the Station is at the present time engaged in a systematic study of the types

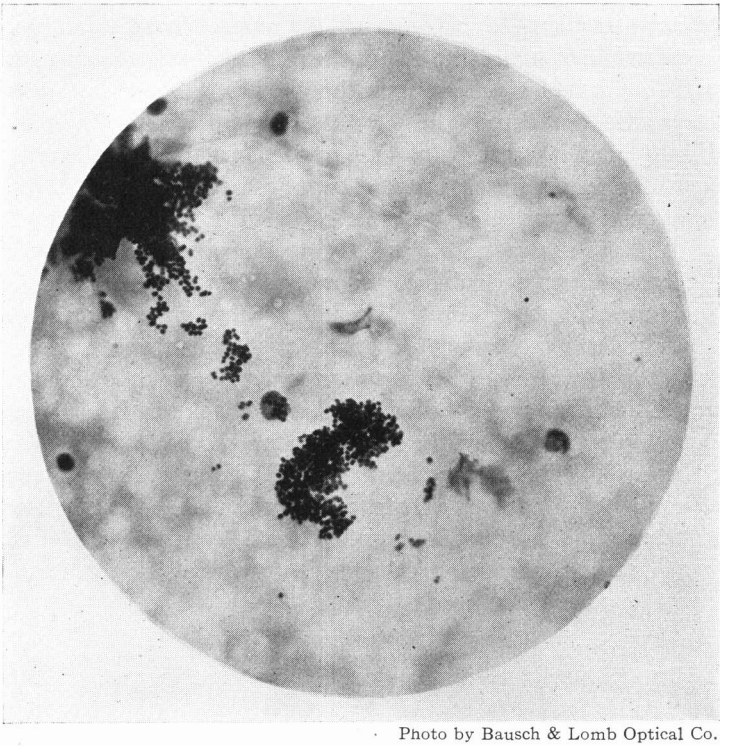


Photo by Bausch & Lomb Optical Co.

MASSES OF BACTERIA IN MILK AS SEEN UNDER A MICROSCOPE.

It is very difficult to find bacteria in high grade milk with a microscope. The above cut shows typical masses of bacteria that are found in milk which has been handled in improperly cleaned utensils. Magnified 600 times.

present in dairy utensils and in other places from which milk bacteria are derived.

As the production of milk absolutely free from sediment is impossible, the industry is interested in methods of removing sediment completely and quickly. The milk clarifier is often used for this purpose and the milk filter has recently been introduced for the same purpose. A detailed investigation of these two machines showed that both efficiently removed the sediment from milk.

CHEESE MAKING

New York has long held an enviable reputation as one of the leading cheese producing states in the country. The contributions of the Geneva Station to the cheese industry have aided materially in making this record possible and mark one of the notable achievements of the Station's history.

Entering the field when cheese making was more or less of a hit or miss process and when almost nothing was known regarding the changes which take place during cheese ripening, the Station inaugurated a series of investigations which not only revolutionized the cheese industry in New York, but placed cheese making the country over on a more scientific basis. Studies have been made of the effect upon the yield and quality of cheese of the fat content of milk, the season of manufacture, the lactation period of the cows, the breed of cattle used in producing the milk, and the sanitary quality of the milk. Investigations into certain factory processes, too, have yielded results of wide commercial importance, particularly the practice of paraffining cheese and the proper temperature of curing.

The Station workers are now investigating the more fundamental principles involved in the ripening changes in cheese in the hope that further information of value to the industry may be secured. The chemists are studying the proteins of milk and the changes in casein during the curing process, and the relation of these changes to the quality of the ripened product; while the bacteriologists are endeavoring to learn which of the many different kinds of bacteria found in milk are desirable for the production of a high grade cheese.

CREAM AND ICE CREAM

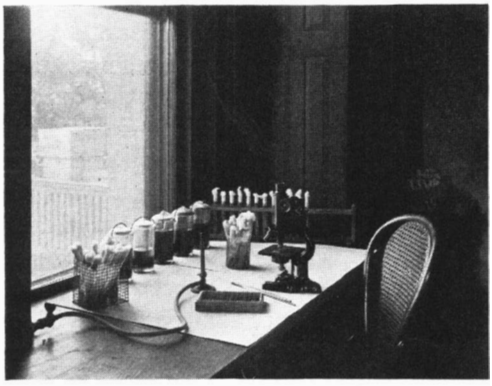
The viscosity of cream or its apparent thickness is often used as a means of judging the richness of cream, and its ability to whip. A study of this problem showed that the ease with which cream whips, altho related to the percentage of fat, age, and temperature of the cream, may not be related to the viscosity of the cream. This is due to the fact that the viscosity of cream can be greatly altered by pasteurization and the condition of the fat at the time the milk is separated.

Problems of the ice cream industry have not received much study from experiment stations. Much valuable information on this subject has been made available as a result of investigations at this Station. A greenish black discoloration which appeared sporadically in chocolate ice cream was found to be due to the action of the iron in the ice cream cans upon the tannins in the cocoa. The microscopic

appearance of ice cream has been shown and the factors affecting ice crystal formation in ice cream have been studied. The formation of ice crystals affects the smoothness of ice cream and its market value.

ANALYTICAL METHODS

In the course of the chemical and bacteriological work on milk and dairy products, numerous analytical methods have been developed. Many of these have found only a technical use and are not of interest to the layman, but several have become of general interest to the industry. The preliminary work on the Babcock fat test was carried out at this Station by its originator, who later developed it at the Wisconsin Station. Extensive use was made of this test at this Station in the early days to determine the normal fat content of the milk of the various dairy breeds.



A CORNER IN THE BACTERIOLOGICAL LABORATORY.

This Station, in cooperation with the College of Agriculture at Ithaca and the United States Department of Agriculture, is now making a study of the comparative value of the Babcock test for milk fat, universally used in this country, with the Gerber test which is extensively used in Europe.

In recent years the microscopic method of examining milk in order to determine the number of bacteria present has been developed at the Station and has found wide use in the dairy industry. Because the purchase price of large quantities of market milk in the State is determined partially by the number of bacteria present, the Station has given much time to determining the accuracy of the methods of counting bacteria now in use, and has been instrumental in securing a supervision of the methods followed in the laboratories thruout the State.

GLASSWARE FOR BUTTER FAT AND BACTERIOLOGICAL TESTS

A very large part of the milk and cream in New York State is bought and sold on the basis of the milk fat present. This necessitates extensive use of the Babcock fat test. The accuracy of the results secured is dependent in no small degree upon the use of ac-

curately graduated glassware, and this accuracy is of vital interest to the farmer. One of the most important services rendered the dairymen of the State by the Station is the examination of tens of thousands of pieces of glassware used in this testing work with the rejection of those pieces found inaccurately graded.

New York has also made a beginning in controlling the analytical methods used in making bacterial counts where these are used as a basis for payment. Large numbers of the pipettes used in this work have been examined with a comparatively high percentage of rejections due to inaccurately graduated glassware.

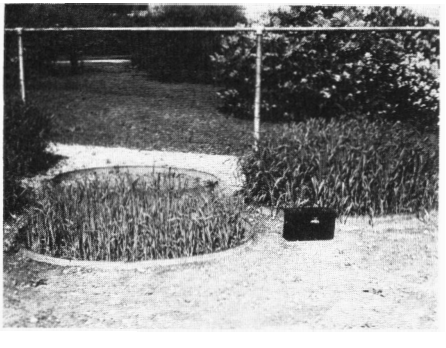
SOIL PROBLEMS

PRODUCTION

Mention has already been made of fertilizer experiments in New York apple orchards. The soil specialists are now planning a series of investigations with fruit trees grown in small containers to which will be added various amounts of fertilizer ingredients. The containers provide for the collection of the drainage water so that accurate studies of the in-go and out-go of plant food material may be made. Controlled studies of the use of plant food by the tree may also be made. It is hoped to determine the effect of fertilizers upon fruit trees much more accurately in this way than is possible with trees growing in the orchard where so many factors enter in to affect the results. It is expected that the trees can be grown in their containers for many years.

THE LYSIMETERS

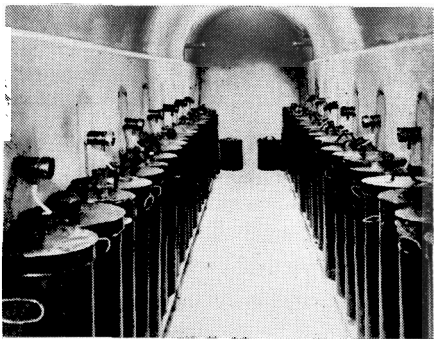
Studies are also under way with a very fertile soil and a less fertile soil in large steel containers or lysimeters which are so arranged that all the drainage water passing thru the soils may be collected for analysis. The lysimeters are 4 feet, 8½ inches in diameter and 4 feet deep. A regular crop rotation is grown on the two soils, and a definite system of fertilizing the soils is followed. Special attention is being given to the effect of legumes in the rotation on the nitrogen supply in the two soils. The relationship between the mineral plant foods in the two soils and the crops grown on them and the effect of soil depth on



CROPS GROWING IN LYSIMETERS.

these relationships are also being studied.

Only one of the many interesting things observed in these experiments can be mentioned here, and that is the influence of alfalfa and of timothy on the barley crop following them in the rotation. After two years of alfalfa, barley yielded almost twice as much dry matter as it did after two years of timothy. Furthermore, even with this heavy crop production, the alfalfa rotation lost thru the drainage water seven times as much nitrate nitrogen in five years as did the timothy rotation. Just what has caused this great increase in the nitrogen supply with the alfalfa rotation is not yet fully understood, but this serves to show the possibilities of such carefully controlled experiments in solving some of the perplexing problems of soil fertility.



APPARATUS FOR COLLECTING DRAINAGE WATER FROM LYSIMETERS.

PRESERVING MANURE

Barnyard manure, as everyone knows, is a valuable aid in building up the soil. It not only adds plant food to the soil, but it greatly improves the physical condition because of its large amount of humus-forming material or organic matter. Scientists have known for a long time that under ordinary farm conditions manure deteriorates rapidly, losing much of its valuable nitrogen and organic matter. Several methods of checking or preventing this loss have been suggested, but nothing very definite has been known of just what goes on in the manure pile. Recently, however, the Station soil specialists have announced the results of experiments in which this matter has been receiving special attention. Manure was treated with different materials which were supposed either to check the deterioration of the manure or to absorb the nitrogen as it was given off. Of the materials tested, ordinary acid phosphate gave by far the best results. Manure treated with small amounts of acid phosphate showed a loss of only 15 per cent of its nitrogen in four months as compared with a loss of 51 per cent for untreated manure. Manure with acid phosphate lost 25 per cent of its organic matter in four months, while untreated manure lost 63 per cent. The Station specialists recommend that

acid phosphate be scattered on the fresh manure each day at the rate of about two handfuls per animal. Manure is low in phosphoric acid, so that addition of the acid phosphate also makes a better balanced fertilizing material.

FERTILIZER PLAT EXPERIMENTS

Besides the intensively controlled experiments represented by the lysimeter investigations, the Station is also conducting field work on problems relating to soil productivity. The character of this work is being changed somewhat to correspond more closely to modern methods of experimentation in this field which permit of better control over the experimental work.

MUCK SOIL PROBLEMS

Certain special problems concerned with the growing of crops on muck soils are being given attention. It is possible that this work will lead to some rather broad investigations, both chemical and biological, dealing with these important soils.

EFFECT OF STRAW IN THE SOIL

It has been realized for some time that if straw or other similar material is mixed with the soil there is likely, under certain conditions, to be a harmful effect upon the crop immediately following. This has been found true particularly in the West where soils are cropped continuously with grain and not much animal manure is available. Even in New York the same fact is somewhat noticeable, particularly on the lighter soils. In spite of this immediate harmful effect, it is also true that after the straw is once decomposed in the soil it is beneficial rather than harmful.

EFFECT OF ADDING FRESH STRAW TO MANURE.

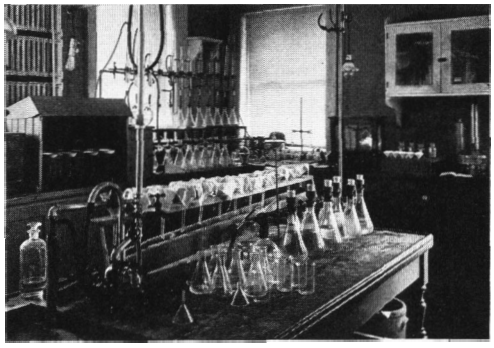
A very good example of the harmful effect of straw is shown in the illustration. In this experiment two sets of pots were prepared contain-

ing quartz sand to which had been added mineral fertilizer in the form of pure chemicals in sufficient quantity to supply all the potash and phosphorus needed by the plants. Then, in addition, each set of pots was furnished with rotted manure to supply a limited quantity of nitrogen. Wheat straw was chopped up and mixed with half of the pots, while the other half were left without the straw. The photograph shows the growth produced in two of these pots, one (Pot 9) with and one (Pot 1) without straw. The plants were not vigorous in either pot, because their nitrogen supply was limited; but it is very evident from the photograph that they were much better in the absence of straw than in its presence.

The general explanation given for this phenomenon is that the straw stimulates bacteria which are harmful to plants because they feed upon the same nutrient elements as the plants and in this way deprive the crops of their food. Recent investigations at this Station indicate, however, that the explanation is not as simple as this, but that the trouble is due partly to other causes. Work is now in progress both to find out the actual causes of the harmful effect and also to learn how to treat straw so that it can be added to soil without doing any harm to the crops.

PROTECTING THE FARMER'S POCKETBOOK

The Experiment Station was organized primarily for research, but it renders another important service to the farmers of the State in its inspection work. Enormous sums are spent each year by New York farmers for fertilizers, feeding stuffs, insecticides and fungicides, and seeds of all sorts. In buying these farm necessities, the farmer, either consciously or unconsciously, is making use of the services of the Experiment Station, for every brand of fertilizer or feed offered for sale in New York and all farm crop seeds sold in lots of 10 pounds or more must undergo a thoro test in the Station laboratories. Certain regulations with regard to the labeling of these products have been fixed by law, and the laboratory tests show whether or not the labels are correct. The inspection service is a protection to the buyer and to honest manufac-



CHEMICAL INSPECTION LABORATORY.

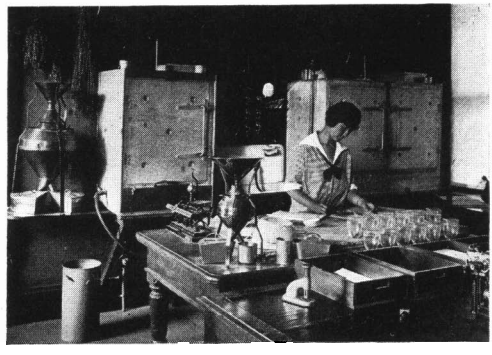
turers and dealers against fraudulent claims of unscrupulous persons who otherwise might pass off inferior stock for high grade goods. It would be difficult to estimate the value of this service to the agricultural interests of the Empire State. Certainly chaos would prevail if these safeguards were not provided.

FERTILIZER AND FEED INSPECTION

The results of analyses of official samples taken by the State Inspectors and analyzed at the Experiment Station are published by the State Department of Farms and Markets, Albany, N. Y. Application should be made to that department for all regular Inspection Bulletins. From time to time, bulletins containing special information for farmers in regard to the composition and cost of feed and fertilizer materials will be published by the Experiment Station.

SEED INSPECTION

Seeds are, weight for weight, the most expensive and the most variable material the farmer has to purchase. The seed used is considered one of the most important factors in crop production. It is important to know the quality of seed about to be purchased or planted. At least two qualities, purity and viability, and often more, which influence the value of the crop, may be definitely determined by testing. The object of seed testing, then, is to determine by laboratory means as accurately as possible before seed is planted the nature and vigor of the crop which may result from its use.



SEED INSPECTION LABORATORY.

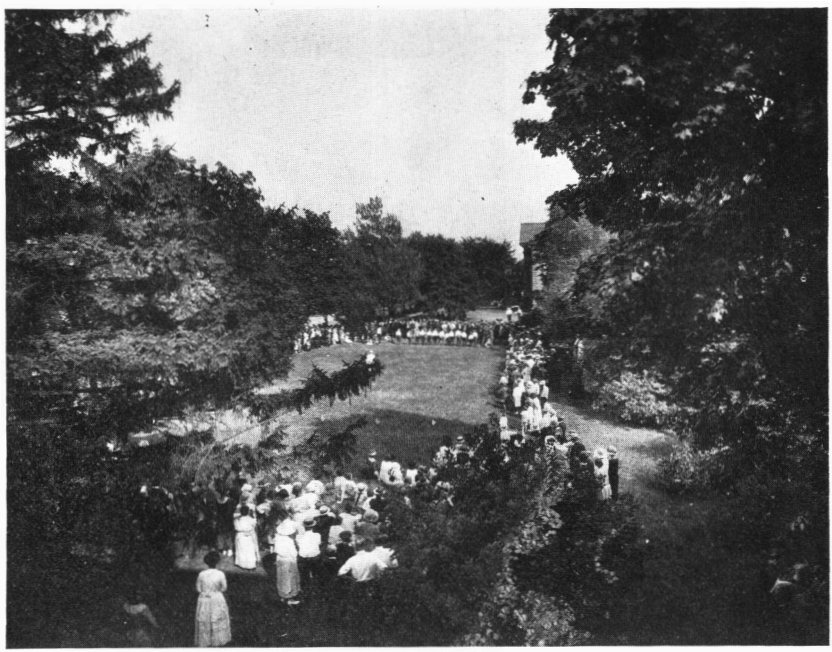
Since 1905, this Station has made analyses and tests of seeds free of charge for farmers, and since 1912, when the first seed law was enacted and established the State's seed testing laboratory at the Station, analyses and tests have been made to aid in enforcing the seed law designed to protect both the purchaser and the reliable seedsman. The seed testing laboratory, operated as a public service project growing in range and usefulness each year, is entirely a service and a protection to the buyer of seeds, whether he consciously accepts its

facilities by having seeds tested or unconsciously enjoys its protection by buying tested and fully labeled lots of seed upon the market.

The law requires each and every lot of seed to be fully and completely labeled, and the buyer can find out, if he will, thru the seed testing laboratory whether such label statements are truthful ones. This service, which has long been available and which is now coupled with legal requirements around and thru which it is built and vastly enlarged and enhanced, has completely revolutionized the sale of seeds in this State in that they now are sold on a quality basis. It has provided a type of service of inestimable value to agricultural interests and without which chaos would prevail in the sale of seeds and but little protection would be afforded.

GETTING INFORMATION TO THE FARMER

The Station's obligations to the farmer have not been fully discharged with the completion of an experiment. It still remains to put before him in a clear, understandable form the results obtained



FARMERS' GATHERING ON THE STATION GROUNDS.

and to show him how these results may be applied to his farming operations. The Station has always regarded this as equally as important as the experiment itself.

PUBLICATIONS

When experiments are completed, the results are published in detail in the Station bulletins and their application to farm practice clearly indicated. Frequently, a brief popular account of the experiment is also prepared in pamphlet form and distributed widely among the farmers of the State. The Station bulletins may be had free of charge and are sent into every State in the Union and to many foreign countries. Names of those interested in the Station's work are added to the mailing lists upon request and bulletins mailed to them as they appear.

The practice of spreading agricultural information thru newspapers and farm papers is rapidly gaining favor. Even the big daily papers in the larger cities carry much farm "news" and experiment stations have been quick to seize this opportunity to spread their teachings of better farming methods. The Experiment Station is able to reach thru the newpapers a much larger number of people than in any other way. Brief items of timely interest are sent to the papers each week so that the public is kept informed of the latest developments in the Station experiments.

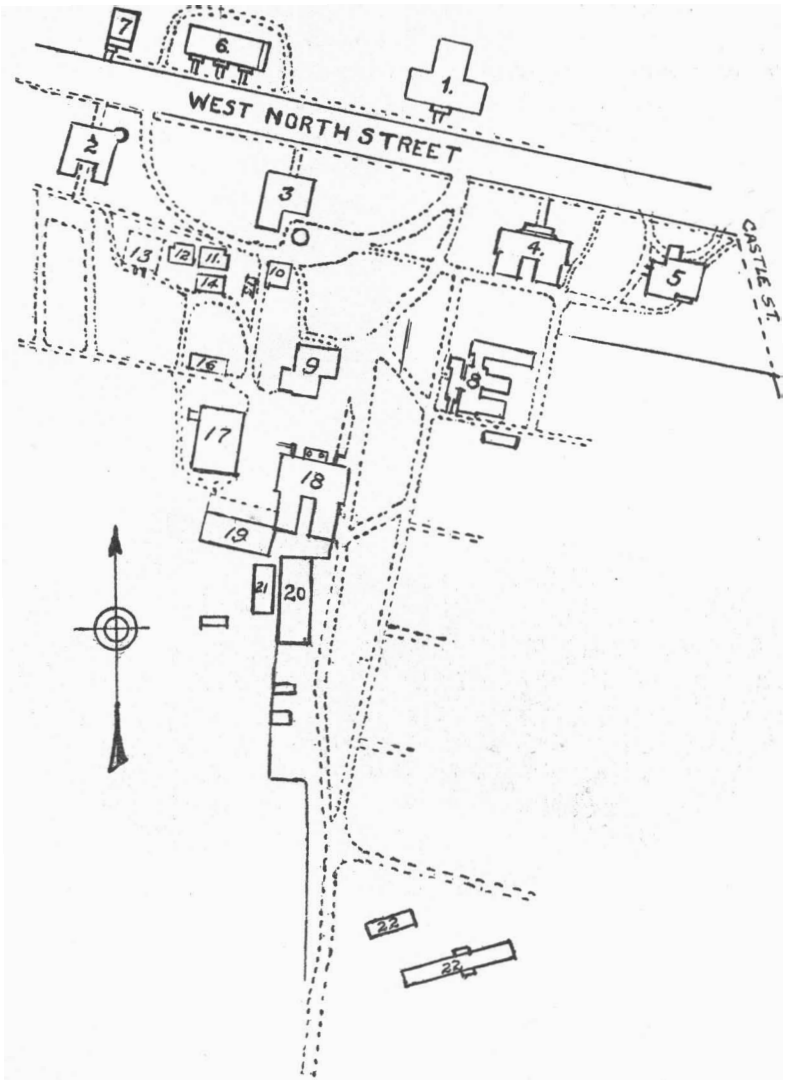
THE MUSEUM

The Station museum is unique among the agricultural museums of the country in that the exhibits depict the contributions of the Geneva Station to agriculture rather than being a collection of curiosities. Models of the new fruits developed by the Station horticulturists and of typical malformations of fruits and vegetables caused by the more common insect pests and diseases form a conspicuous part of the exhibit. Large paintings illustrate the work in progress with insect pests of fruit. Visitors find the museum extremely interesting and informing as to the past achievements and present work of the Station.

FUTURE PLANS

A final word regarding the future of the Experiment Station. If the Station is to serve the State and Nation effectively, it must lead the way into new fields of endeavor; not be content simply to follow the trend of the times. In order to assume a wise leadership, the Station authorities have formulated a program for the development of the work at Geneva for the next 10 to 20 years. This program is an attempt to anticipate the probable needs for research along every line of endeavor in which the Station is engaged, so far as these needs can be foreseen by those who have been intimately associated with agricultural development in the Empire State during the past 20 or 30

years. How much promise this program holds for the advancement of New York agriculture is shown by the way in which it has been received by the farmers of the State. The program was first announced in the early summer of 1922 and during that year it received the enthusiastic endorsement of every agricultural organization in New York with the assurance that these organizations would press for its approval by the State Legislature. The program has been submitted to the Governor and Legislature; not with the idea that it is to be put into full operation at once, but with the expectation that it will serve as a guide for the wise appropriation of public funds for the advancement of agriculture in New York along lines that will insure the greatest returns to the State for the money invested.



1. Jordan Hall
2. Chemical Laboratory
3. Residence
4. Biological and Dairy Bldg.
5. Director's Residence
6. Residence
7. Residence
8. Green-houses
9. Horse barn
10. Storage
11. Carpenter Shop
12. Fruit Storage
13. Lysimeter Cellar
14. Spray Platform
15. Gasoline Storage
16. Ice House
17. Storage and Potato Cellar
18. Dairy Barn
19. Exercise Shed
20. Manure Shed
21. Nutrition Shed
22. Poultry Houses