New York Agricultural Experiment Station.

GENEVA, N. Y.

DIRECTOR'S REPORT FOR 1908.

W. H. JORDAN.

PUBLISHED BY THE STATION.
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Willard F. Patchin,
Cora A. Whitaker,

Clerks and Stenographers.

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Computer and Mailing Clerk.

Julia H. Hoey, Junior Clerk

Address all correspondence, not to individual members of the staff, but to the New York Agricultural Experiment Station, Geneva, N. Y.

The Bulletins published by the Station will be sent free to any farmer applying for them.

* Riverhead, N. Y.
DIRECTOR'S REPORT FOR 1908.

To the Honorable Board of Control of the New York Agricultural Experiment Station:

GENTLEMEN:

I have the honor to submit herewith a report of the activities of this institution for the year 1908, together with a statement of its condition and needs.

ADMINISTRATION.

STATION STAFF.

It is gratifying to report that the changes in the Station Staff during 1908 were less than for many previous years. In general, continuity of service, especially in scientific inquiry, makes for efficiency of service.

Nathaniel O. Booth, for several years Assistant Horticulturist, severed his connection with the institution on November 15th. During the last few years of Mr. Booth's connection with the institution he devoted his time almost wholly to assisting in the preparation of the publications known as "The Apples of New York" and "The Grapes of New York," in which capacity he rendered highly useful service.

William H. Alderman, B. S. Agr., a graduate of the New York State College of Agriculture, was appointed to the position of Assistant Horticulturist and has entered upon his duties.

MAINTENANCE FUNDS.

The funds available for the maintenance of the Station during the fiscal year beginning October 1, 1907 were as follows:

Salaries ........................................ $28,000
Labor ........................................... 13,000
Expenses of various departments of research ...... 20,000
General expense, heat, light, water, etc. ......... 4,000
Horticultural investigations .......................... 8,000
Fertilizer inspection ................................ 10,000
Feeding stuffs inspection ............................ 3,500

$86,500
The legislature of 1908 appropriated the following sums to the uses of the Station for the fiscal year beginning October 1, 1908:

| Item                                             | Amount  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>$31,000</td>
</tr>
<tr>
<td>Labor</td>
<td>13,000</td>
</tr>
<tr>
<td>Maintenance expenses of departments of research</td>
<td>20,000</td>
</tr>
<tr>
<td>Horticultural investigations</td>
<td>8,000</td>
</tr>
<tr>
<td>General expense, heat, light, water, etc.</td>
<td>4,000</td>
</tr>
<tr>
<td>Fertilizer inspection</td>
<td>10,000</td>
</tr>
<tr>
<td>Feeding stuffs inspection</td>
<td>3,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$89,500</strong></td>
</tr>
</tbody>
</table>

At a recent meeting of your Board it was decided, after a full discussion of the situation, to ask for the following sums with which to carry on the work of the Station during the fiscal year 1909-10:

| Item                                             | Amount  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>$35,000</td>
</tr>
<tr>
<td>Labor</td>
<td>15,000</td>
</tr>
<tr>
<td>Expenses of various departments of research</td>
<td>25,000</td>
</tr>
<tr>
<td>General expense, heat, light, water, etc.</td>
<td>4,000</td>
</tr>
<tr>
<td>Horticultural investigations</td>
<td>8,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$87,000</strong></td>
</tr>
<tr>
<td>Fertilizer inspection</td>
<td>10,000</td>
</tr>
<tr>
<td>Feeding stuffs inspection</td>
<td>3,500</td>
</tr>
<tr>
<td>Extra repairs (in Supply Bill)</td>
<td>2,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13,500</strong></td>
</tr>
</tbody>
</table>

In 1905 your Board asked that $25,000 be added to the maintenance funds of the Station. The financial committees of the legislature did not feel at that time that the resources of the State would justify such an increase of appropriation, and additional sums, amounting in the aggregate to only $10,000, were granted. In 1908 an increase of $3,000 was allowed. It is now desired that the increase originally felt to be necessary shall be fully accomplished.

There are several reasons why this request is reasonable and in accord with the real interests of agriculture. In the first place there has been a constant development of the work of the Station, due not to any forced growth but to the greatly enlarged relations which scientific inquiry and results have come to sustain to practical agriculture. More than this, the general increase in the cost of living has reacted upon salaries
and wages and has greatly increased the cost of maintaining an institution.

In the second place, the support the State is giving to investigation has not kept pace with the aid rendered by the State to other efforts in the interest of agriculture, particularly agricultural education in its various forms and the defense and encouragement of agriculture through a State Department. The following figures make this clear, which refer to appropriations for annual maintenance and not for buildings.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriations 1898</td>
<td>$56,000</td>
<td>$30,000</td>
<td>$119,500</td>
<td>$16,000</td>
<td>$58,000</td>
</tr>
<tr>
<td>Appropriations 1908</td>
<td>250,000</td>
<td>87,650</td>
<td>348,260</td>
<td>180,100</td>
<td>76,000</td>
</tr>
</tbody>
</table>

The sums appropriated to the Station for aiding in the enforcement of inspection laws should not be regarded as used in the work of inquiry.

It is seen that for the enforcement of agricultural law and the encouragement of agriculture in various ways the sum used has trebled or more while the amount applied to agricultural education has come to be nearly two and one-half times that expended in agricultural investigation, increases that are entirely to be commended.

In considering these facts some may argue that the sums applied in the several directions are in proportion to the needs. Such a position can hardly be sustained. The technical work of the agricultural college and school is utterly dependent upon scientific inquiry and without it modern agricultural education would not have been possible. Further progress in our knowledge of the principles of agriculture will come, not from the teacher but from the investigator. Moreover, the administration of law in the interests of agriculture finds an indispensable aid in the studies of the laboratory. But more insistent than all else are the present great unsolved agricultural problems that are facing us in soil management,
animal husbandry, fruit production and in the defense of crops against pests and untoward conditions. Agricultural practice is handicapped not alone by ignorance of what is known but also by our limitations of knowledge. We have learned much during the past fifty years but we have scarcely begun the solution of many of our severest and most important problems.

The sum for which your Board is asking is no greater, and in some cases less, than large states like California, Illinois and Ohio are applying to experiment station work. The extent and complexity of New York agriculture present needs for inquiry equal to, if not greater than, those of any other state.

When it is realized that the agricultural production of New York is worth annually not less than two hundred and fifty millions of dollars and that a saving of one per cent. of this sum through improved methods or the defense of crops against fungus and insect pests, would pay the expense of this institution twenty-five times over, it is easy to realize the actual economy of promoting agricultural knowledge in every possible way.

STATION PUBLICATIONS.

The following figures compiled from the mailing lists now on file at the Station show how the station publications are being distributed:

**Popular Bulletins.**

<table>
<thead>
<tr>
<th>Category</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residents of New York</td>
<td>36,055</td>
</tr>
<tr>
<td>Residents of other states</td>
<td>2,641</td>
</tr>
<tr>
<td>Newspapers</td>
<td>765</td>
</tr>
<tr>
<td>Experiment stations and their staffs</td>
<td>1,476</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>115</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41,052</strong></td>
</tr>
</tbody>
</table>

**Complete Bulletins.**

<table>
<thead>
<tr>
<th>Category</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment stations and their staffs</td>
<td>1,476</td>
</tr>
<tr>
<td>Libraries, scientists, etc</td>
<td>190</td>
</tr>
<tr>
<td>Foreign list</td>
<td>274</td>
</tr>
<tr>
<td>Individuals</td>
<td>3,457</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>115</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,512</strong></td>
</tr>
</tbody>
</table>
As the above statement indicates, the Station bulletins are of two general kinds, those that give a complete, and somewhat technical, account of the investigations or experiments and their results and those that present in a form believed to be available to the average reader the facts and conclusions that we reach. In every "popular" bulletin is printed the statement that the "complete" form on which it is based may be had on request. It is significant that in over eleven years those requesting the complete form are considerably less than one-tenth of the number of persons to whom the "popular" bulletins are sent. This indicates that the simpler and abbreviated statement of our conclusions meets the needs of the great majority of the readers of the bulletins.

Still more significant is the fact that only one copy of a bulletin is distributed in New York for approximately each seven farms. If it could be shown that six out of seven farms do not ask for the bulletins because they have no practical value, it would be a cause for serious reflection on the part of the management of the Station. That this is not the explanation is shown by the fact that a minority of farmers have sought and used to their profit the information that the Station has been able to furnish. It is not the function of the Station to issue merely general educational literature and sow it broadcast over the state. To do this would be to misuse the funds assigned to the Station for an entirely different purpose. Fortunately the distribution of bulletins is not a measure of the Station work. Through popular efforts such as farmers' institutes and extension literature and also through the examples set by their more progressive neighbors, thousands of farmers are benefited by the newer phases of knowledge who pay little direct attention to station publications. It is correct to say that only a minority of the farmers of the state attend the State Fair or receive instruction from the college of Agriculture, nevertheless these institutions are exerting strong influence in agricultural affairs.

Besides bulletins distributed during 1908 the Annual Report for 1907 has been prepared in three parts: (I) The report of
the work for 1907 including an index of the first twenty-five reports, (II) the Grapes of New York and (III) a review of the work of the Station for twenty-five years, including an account of the twenty-fifth anniversary exercises. Part II is not yet available for distribution.

NEW HOUSES.

The five dwelling houses so long contemplated and so long needed are at last completed and are practically ready for acceptance by the State. The method of construction and the quality of work on these buildings appear to be most excellent. The efficiency of inspection by the State Architect and the willingness of the contractors to comply with every reasonable requirement are to be commended.

A BUILDING NEEDED FOR ADMINISTRATIVE AND DEMONSTRATION PURPOSES.

For two years your Board has urged upon the legislature the need of an audience room at the Station combined with space for permanent objective illustrations of our work. The time has now come also when the building in which the library and administrative offices are now located, formerly a dwelling house, should be devoted wholly or in part to other purposes. The action of your Board in deciding to continue your efforts for a building of this nature is in accord with the needs of the institution.

The reasons why such a building should be erected are:

(1) There is no place at the institution where an audience can be assembled, excepting out of doors in the pleasant days of the warm season. This is wrong; for the work of the Station stands in such relation to educational interests and farm practice that some way of assembling audiences on the Station ground and bringing them into close range with the Station activities and results should be made possible.
(2) It is extremely desirable that space shall be provided where the results of Station work can be illustrated in a concrete form. We have many visitors who state that they come to see what the station is doing, not realizing that in the progress of our inquiries they can only see a single point in the progress of an experiment or investigation, which to the untrained eye may be meaningless.

Space is needed for the objective display of results that have been reached in dairy work, in the study of farm pests, field experiments and in other directions. Such an exhibit would be especially useful and instructive in connection with meetings here of horticultural societies and other bodies interested in special lines of production.

(3) The building now used for administrative and library purposes is needed for other uses. It has come to be necessary to arrange for boarding the unmarried members of the staff at some point nearer than the city. Rooms are now available on the Station grounds, but arrangements for meals near the Station are now difficult and uncertain, sometimes impossible. With slight expense the building now used for offices and library could be adapted to the uses indicated and it would be a much needed convenience. Getting a noon lunch a mile or mile and a half away occasions either much loss of time or such haste as is equally detrimental to health and good work.

The contemplated building should contain administrative offices, space for illustrative work and an audience room. It should have not less than 11,000 feet of floor space exclusive of the basement.

REPAIRS.

An extra expense for repairs will be necessary during 1909. Every building on the grounds, exclusive of the new houses, must be painted, new coverings to roofs must be laid, and the chemical laboratory, which has had practically no repairs for seventeen years needs considerable not only in the way of interior painting but also changes necessary to accommodate our increasing chemical work. It is estimated that $2,500 additional will be needed.
GRADUATE SCHOOL OF AGRICULTURE.

The Graduate School of Agriculture, for which plans were made in 1907, was held at the New York College of Agriculture during the month of July. This school was organized not only in the interests of teachers in our agricultural colleges but for the benefit as well of those who are engaged in agricultural research. The faculty was largely made up from the staffs of the agricultural colleges and experiment stations aided by distinguished teachers and scientists from outside these sources, and the students consisted mostly of the younger men from the same institutions. Six members of the staff of this institution served as teachers and nearly every member of the staff attended the school for a portion of the time.

RELATIONS WITH THE NEW YORK COLLEGE OF AGRICULTURE.

I cannot refrain from expressing my high appreciation of the relations in the way of conference and co-operation that now exist between this institution and the New York State College of Agriculture. The members of the staffs of the two institutions consult one another freely in regard to their work, the facilities of both institutions are shared in common, no scientific jealousies exist and my personal relations to Director Bailey afford me inspiration and valuable counsel. No less gratifying are the relations that have grown up with the State Department of Agriculture through official associations and in other ways. The New York State Grange and the various special agricultural organizations of the state are a direct source of strength to the Station and through their confidence and aid emphasize our obligations to render efficient service to the agriculture of the state.

REVIEW OF THE YEAR'S WORK.

INSPECTION WORK.

Commercial fertilizers.—In November, Bulletin No. 204 was distributed giving the results of analysis of 630 samples of fertilizers collected by the Commissioner of Agriculture and
sent to the Station for examination. The conditions under which fertilizer inspection is carried on do not seem to be fully understood. The administration of the fertilizer law is entirely in the hands of the Commissioner of Agriculture. The guarantees are received and filed by his office and the licenses are issued by him. Cases of violation of the law are referred to the Attorney General by him. The only part taken by the Station in this inspection is the analysis of the samples collected and the preparation and printing of the bulletin giving the results of the analyses. The brands of goods which the various samples represent are not known by the station officials. These samples are sent to the station by number, accompanied by a statement of the guarantees as found on the bag, but without the name either of brand or manufacturer. Nothing is known of what is filed in Albany. After the analyses are all completed and reported to the Commissioner, a statement of the brands and the reported analyses is sent back to me for publication as authorized by law. Anyone wishing information as to guarantees or analyses previous to the publication of the bulletin should apply to the Commissioner of Agriculture and not to the Station, for we are not able to give such information until it is received from the Commissioner of Agriculture.
Concentrated commercial feeding stuffs.—Bulletin No. 303, published in July, gives the analyses of 297 samples of concentrated commercial feeding stuffs, classified as follows:

**Classification of Feeding Stuffs Analyzed in 1908.**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Number of brands sampled</th>
<th>Number of samples analyzed</th>
<th>Number of samples materially below guarantee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cottonseed meals</td>
<td>11</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Linseed meals</td>
<td>11</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Gluten feeds</td>
<td>12</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Corn brans</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Dried distillers' grains</td>
<td>10</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Malt sprouts</td>
<td>25</td>
<td>26</td>
<td>1</td>
</tr>
<tr>
<td>Dried brewers' grains</td>
<td>10</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Hominy feeds</td>
<td>15</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Compounded feeds</td>
<td>96</td>
<td>99</td>
<td>9</td>
</tr>
<tr>
<td>Animal products</td>
<td>35</td>
<td>36</td>
<td>6</td>
</tr>
<tr>
<td>Poultry foods (compounded)</td>
<td>34</td>
<td>34</td>
<td>1</td>
</tr>
<tr>
<td>Beet-sugar wastes</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Oat by-products</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Barley by-products</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Unclassified</td>
<td>13</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>279</strong></td>
<td><strong>297</strong></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>

The showing for the inspection of 1907-1908 is very much better than that from 1906-1907. In the former year 69 samples were found to be materially below guarantee, which is practically two and one-half times as many as those reported deficient in this bulletin.

In addition to the analyses required for determining whether the composition of the samples corresponds with the guarantees, special examinations were made of various compounded feeds to discover the nature of the ingredients in the mixtures. Fifty feeds were so examined and in a large majority of cases the presence of inferior materials was clearly evident. The facts were stated in Bulletin 303 essentially as follows:
(1) Nearly all of the compounded feeds examined contain either oat hulls greatly in excess of what belong to the ground oats present, or ground corn cobs.

(2) The molasses feeds; of which there were twelve brands examined, nearly all contained a great variety of weed seeds, some of which are noxious weeds such as mustard, charlock, wild carrot and English plantain (narrow leaved plantain, buckhorn). Germination tests show that in several cases these seeds have not lost the power of germination. For instance, in one sample 50 per ct. of the English plantain seed germinated. It is beyond question possible for these seeds to reach the soil without having lost their germinating power. Moreover, these weed seeds have an unknown nutritive value, and unquestionably many of them having highly resistant coatings pass through the animals undigested. These seeds are, therefore, not only a menace to the land but to the productiveness of the animals that are being fed these molasses feeds on the assumption that they take the place of pure, sound farm grains or of other standard feeding stuffs.

(3) The gluten feeds are found in many instances to contain artificial coloring matter and to have considerable free acid, conditions that are not commendable.

DEPARTMENT OF BACTERIOLOGY.

Inoculation as a factor in growing alfalfa.—The need of inoculation was tested in 67 fields distributed among 33 counties of this State. The bacteria, Ps. radicicola, which enable alfalfa to obtain nitrogen from the air were present, at least in small numbers, in practically all of the 67 experimental fields. However, it was only in one-third of the fields that they were present in sufficient numbers to produce an inoculation in any considerable number of young alfalfa plants.

An attempt to supply the germs by applying pure cultures of Ps. radicicola to the seed, drying and sowing, resulted in almost complete failure, while applying soil from an old alfalfa field at the rate of 150 to 300 pounds per acre invari-
ably produced an abundant inoculation on these experimental fields.

Although but 15 of the 67 experimental plats produced a successful crop of alfalfa without inoculation, 48 of the adjacent plats where inoculating soil had been applied produced successful crops. That is to say, alfalfa growing, on 33 of the 67 fields which were tested, was changed from a failure to a success by the application of inoculating soil. These tests are described in detail in Bulletin No. 300.

The bacterial flora of cheddar cheese.—A quantitative and qualitative study of the bacterial flora has been made during the ripening period in nine normal cheddar cheeses, the work being reported in Technical Bulletin No. 8. There was no evident connection between the number of bacteria present and the rate at which the cheeses ripened. When commercially ripe a cheddar cheese usually contains some millions of living bacteria per gram.

More than 300 pure cultures were isolated and finally reduced to 33 groups according to the classification of the Society of American Bacteriologists. Ten of these groups disappeared from the cheese at once; representatives of nine other groups were found in but single cheeses, although they persisted there for some time; the remaining 14 groups are the most important members of the cheese flora. The *Bacterium lactis acidii* of Leichmann, which includes 4 of these 14 groups, is the only species which was always found and it practically always included over 99 per ct. of the total germ content of the ripening cheese.

DEPARTMENT OF BOTANY.

*Potato spraying experiments.*—During the season of 1907 the potato spraying experiments begun in 1902 were continued along practically the same lines as in previous years; and the results are reported in Bulletin No. 307. In the ten-year experiment at Geneva five sprayings increased the yield 73.7 bu. per acre, while three sprayings increased it 44 bu. In
the duplicate of this experiment at Riverhead, Long Island, the gain due to six sprayings was 31.25 bu. per acre and to three sprayings 18 bu. In fourteen farmers' business experiments, including 152.75 acres, the average gain due to spraying was 36.8 bu. per acre; the average total cost of spraying $5.90 per acre; and the average net profit $17.07 per acre. Twenty-four volunteer experimenters reported gains averaging 30.5 bu. per acre.

Thus far the results are highly favorable to the practice of spraying. In the ten-year experiments at Geneva the average gain for six years from spraying every two weeks has been 121.7 bu. per acre, and from spraying three times during the season 93.5 bu. At Riverhead the corresponding gains have been smaller—60.5 bu. and 32.5 bu. respectively.

In 62 business experiments made in five years the average gain due to spraying has been 49 bu. per acre and the average net profit from spraying $19.86 per acre. In 177 volunteer experiments reported in four years the average gain from spraying was 50.3 bu. per acre.

*Alfalfa troubles.*—The increasing interest in alfalfa culture in New York seemed to warrant an investigation of the various troubles to which the crop is subject; and this investigation furnished material for Bulletin No. 305. Special attention has been given to dodder, fungus diseases and the impurities and adulteration of seed. The chief difficulty with alfalfa in New York is to get the crop established. Several factors may be concerned in this: Poor seed, sour soil, wet soil, sowing with a nurse crop, lack of nodule bacteria, lack of humus, weeds, leaf spot disease, close cutting and winter injury. Dodder is often a serious pest. It is perennial, not annual as generally believed. Trouble with it is avoided by sowing only dodder-free alfalfa seed. The Station will analyze seed samples free of charge. Dodder seeds may be removed from alfalfa seed by sifting if the proper kind of sieve is used. The most practicable method of eradication is that of burning over the dodder-infested spots. The only important fungus disease is leaf spot. This causes an enormous loss in the aggregate, but
seldom ruins the crop completely. The remedy for leaf spot consists in mowing whenever the plants turn yellow and become so badly diseased that their growth is severely checked. The investigation disclosed the existence of several new alfalfa diseases the most important being one called "yellow top," the cause of which was not definitely determined. There are no very important insect enemies of alfalfa in New York.

*Sporotrichum bud-rot of carnations.*—This disease, previously known only in Nebraska, recently appeared in some New York greenhouses. The Botanist and one of the Assistant Entomologists working in co-operation have made a considerable study of it, the investigations being reported in Technical Bulletin No. 7. The cause of the disease was proven to be a fungus, *Sporotrichum poae* Pk. This fungus is found in the decayed tissue of diseased buds in constant association with a peculiar mite which, apparently, serves as a distributor of the fungus. The mite was identified as *Pediculopsis graminum* Reut. a species heretofore unknown in this country, but in Finland recognized as one of the chief agents in the production of a common grass disease called "Weissähnlichkeit." June grass in New York is abundantly affected with the same disease which is here known as "silver top." The fungus and mite have been found, frequently associated, on June grass affected with silver top, but their relation to that disease has not been investigated.

DEPARTMENT OF CHEMISTRY.

*Methods of paying for milk at cheese-factories.*—This subject is one of fundamental importance to dairymen who produce milk for cheese-making. This Station has given the matter more extensive and thorough study than any other institution, having previously published two bulletins (68 and 110) in relation to it. As many as six different methods have been proposed, which may be grouped under the following general divisions: (1) on the basis of the weight of milk; (2) on the basis of milk-fat; and (3) on the basis of the yield
of cheese. The first method has been proved beyond all ques-
tion to be unfair, because milk varies greatly in its cheese-
producing power. It has been shown that in different milks
the yield of cheese from 100 pounds of milk may be as low as
8 pounds and as high as 13 pounds. The yield of cheese might
be supposed to furnish a fair basis, but it has been proved that
cheese made from milk rich in fat is superior in quality and
value to cheese made from milk poorer in fat. When milk is
paid for on the basis of its fat content, the yield, composition
and quality are all taken into consideration. While a pound
of fat in rich milk is equivalent to less cheese than a pound
of fat in poorer milk, owing to the somewhat larger relative
amount of casein in the latter, the quality of cheese made
from richer milk is enough better to make up for this differ-
ence in yield in relation to milk-fat. Besides being the most
fair basis, when yield and quality of cheese are considered,
the payment according to the milk-fat exercises a most impor-
tant and direct influence upon the milk producers; because
it removes all temptation to skim or water milk, and because
it offers a special inducement to produce milk containing
larger amounts of milk-fat.

The full discussion of these methods will be found in Bulle-
tin No. 308.

DEPARTMENT OF ENTOMOLOGY.

Control of scale in old apple orchards.—The control of the
pest in old apple orchards is the most important phase of the
San José scale problem in this State. Realizing the dangers
that threatened the apple industry, the Station began a series
of co-operative tests to ascertain practical measures for pro-
Tecting the older trees. These tests were conducted for several
years in commercial apple orchards at Youngstown in Niagara
County, Geneva in Ontario County and Yorktown in West-
chester County; and are reported in Bulletin No. 296. In
these experiments the standard remedies were employed for
the treatment of the main portions of the orchards, and com-
parative tests were made of the more promising sprays of
recent introduction. The tests have proven clearly that it is possible, without great expense, to protect old trees so thoroughly that the crops are not lessened and that little if any of the fruit shows spotting. Experience, derived from our own experiments and observations on the efforts of commercial fruit growers, demonstrates, with increasing emphasis each year, that the control of the scale on old apple trees is practicable, and that efficient protection can be afforded at a relatively nominal expense, compared with the returns from a well managed orchard. The cost of spraying apple orchards varied from year to year and with different fruitgrowers. The principal factors that determine the expense are labor, machinery, size of trees, weather conditions, kind and cost of spraying supplies and general management.

Of the various sprays that have been tested, the sulphur wash and the home-made oil emulsions have, on the basis of efficiency, economy and safety to the trees, proven the most satisfactory remedies. Of the two, the oil emulsions have generally been somewhat more efficient than the sulphur wash in the treatment of old apple trees, and excellent results have been obtained with a light treatment of emulsion on trees previously sprayed with the lime-sulphur wash to reach the scales on the young wood. Either of these sprays singly or the emulsions supplementing an application of the sulphur wash, if thoroughly applied, can be depended on to control the scale, and are recommended for the treatment of old trees. Miscible oil in the proportions used has prevented important injuries to the trees and has generally proven an efficient remedy for the scale. These preparations of good grade are among the most satisfactory substitutes for orchardists who do not desire to employ home-made mixtures.

Screening for the protection of cabbage seed beds.—This bulletin, No. 301, deals with experiments to test the value of cheesecloth screening for the protection of cabbage seed beds against injuries by root maggots. In most sections of this State where cabbages are raised, the growers experience
much difficulty in raising enough seedlings, of required size, to plant the desired acreage, because of the destructiveness of these insects. Of the various measures that have been employed in the experiments with this pest, screening of the plants has afforded the most efficient protection to seed-beds. Because of its efficiency for this purpose, the attention of growers is called in this bulletin to the value of screening of beds as one means of protecting plants from injuries by root-maggots.

In the experiments, four large beds were made, the seed being sown respectively on April 29, May 13, May 17 and May 28. Screening was applied to 21 rows, of 150 feet in length, of the planting of May 13. The remainder of the bed, consisting of 68 rows of equal length, was considered as a check. Plants raised under cloth grew faster and reached the desired size for transplanting one week before the seedlings in the check area. The screened sets were seasoned by the removal of the covering thirteen days before the time of replanting, and showed no more wilting when transplanted than did the check seedlings. The screened bed was entirely free of maggots, and produced 50,000 sets, which were replanted. The check bed, of more than three times the size, yielded only 30,000 desirable plants. The cabbage-maggots were generally very destructive to unprotected seedlings. The experiments show that screening entirely protects seedlings from injuries by maggots, and indicate that it is possible to season the plants, by removal of the covering a few days before transplanting, so as to avoid the excessive wilting and losses which sometimes attend the planting in the field of sets grown in covered frames.

_Dipping of nursery stock in the lime-sulphur wash._—Dipping in the lime-sulphur wash is a method of treatment proposed for the disinfecting of nursery stock for such pests as the San José scale, woolly aphid and other destructive insects. Its utility for these purposes has not been thoroughly established, and more knowledge on the safeness and efficiency of
this treatment has been desired. Bulletin No. 302 is a contribution of additional data, which are based on experiments to determine: (1) The effectiveness of the lime-sulphur wash as a dip on the San José scale, and (2) the effects of dipping in this mixture upon the health of nursery trees.

Tests were made of the standard lime-sulphur wash at temperatures of 60°, 100°, 120°, and 212° F. For purposes of comparison, experiments were also made with kerosene emulsion, containing 10, 15, and 20 per ct. of oil; miscible oil diluted with 10, 15 and 20 parts of water; and hydrocyanic acid gas at the rate of 0.3 gram of potassium cyanide per cubic foot. The stock used for these tests was 180 3-year old Bartlett pears and 970 3-year old Ben Davis apples, all of which were infested with the San José scale; and 300 Mann apples, 470 Bartlett pears, 300 Satsuma plums and 300 Fitzgerald peaches, all of which were clean and healthy trees.

While good results were secured from some of the spraying mixtures used in these tests, the practice of dipping cannot be recommended as a general substitute for fumigation with hydrocyanic gas. None of the mixtures were as effective on the San José scale as the gas, except under conditions destructive to the trees, while fumigation, if properly conducted, is harmless.

Control of leaf blister mite in apple orchards.—Bulletin No. 306 deals largely with experiments to determine the comparative merits of various sulphur sprays in preventing spotting of apple foliage by the leaf blister-mite. The mixtures that were tested were the boiled lime-sulphur wash, the home-made concentrated lime-sulphur wash, and two commercial preparations; and all of them gave equally satisfactory results. One application of either of these sprays has practically prevented spotting of foliage by the mite. With the increased availability of the sulphur sprays these are recommended as practicable remedies for the treatment of apple orchards. A plan of spraying that is well adapted for the treatment of apple trees is an application of a sulphur wash as the buds are
swelling and before the leaves appear, followed by the usual second and third applications of the bordeaux mixture in their proper season.

DEPARTMENT OF HORTICULTURE.

Distribution of Station strawberries and raspberries.—In the Spring of 1908 the Station distributed four new varieties of red raspberries and three new varieties of strawberries. These varieties were the incidental outcome of the experimental work in plant breeding. Bulletin No. 298 gives full descriptions of the seven new varieties and briefly discusses the objects of the breeding work which brought them forth. The objects, briefly stated, are: (1) The study of the correlations of the different characters of plants; (2) investigations of the laws of inheritance and variability; (3) the adaptation of plants to new environment; (4) the development of hardy plants; (5) the development of resistance to disease; (6) improvement through crossing and hybridizing as a basis for generalizations as to the use of these operations in plant breeding; (7) systematic selection from pure-bred seedlings; (8) to discover what botanical and horticultural groups of the several fruits and vegetables best transmit their characters to their offspring either as pure-breds or in crosses; and (9) incidental to the above lines of research, the production of new varieties.

The relation of weather to the setting of fruit: with blooming data for 866 varieties of fruit.—In Bulletin No. 299 attention is called to the fact that the relations of weather to the formation and development of fruit have been lost sight of in the current discussions of the failures of blossoms to set fruits. Data are given to show that unfavorable weather is the predominating one of the several factors which cause the loss of fruit crops during blooming time. The following constituents of weather, with their relations to the setting of fruit, are discussed: Late frosts, wet weather, temperature, daily range in temperature, sunny weather, wind, and fogs.
Means of controlling weather are discussed, the selection of locations with reference to general and local climate receive attention, and the fact that varieties of fruits may be selected with reference to their ability to withstand injurious weather is given a somewhat full discussion. The time of blooming is a particularly important period in the growing of fruits as to the welfare of crops regarding other factors than weather; as, to secure proper cross-fertilization, and in their relations to insects and fungi. The blooming data for the varieties of fruit grown on the Station grounds, 866 in all, are therefore given in this bulletin with a discussion of the uses to which such information may be put.

Varieties of strawberries, with cultural directions.—Bulletin No. 309 describes the newer varieties of strawberries with some of the standard kinds for comparison. These descriptions are followed by some cultural directions so that the bulletin may be used in answering the numerous inquiries which come to the Station in regard to the growing of strawberries. In describing the varieties an effort has been made to lay especial emphasis on the good and the poor characters of the new sorts as tested under the conditions at this Station. Attention is called to the fact that the results as published are not to be taken as absolute and that they may not even indicate what might be expected under widely different conditions of environment.

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CIRCULAR.


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