Ohio Agricultural Experiment Station.

BULLETIN 120

AND

NINETEENTH ANNUAL REPORT
FOR 1899-1900.

WOOSTER, OHIO, JULY 1, 1900.

The Bulletins of this Station are sent free to all residents of the State who request them. Persons who desire their address changed should give both old and new address. All correspondence should be addressed to

EXPERIMENT STATION, WOOSTER, OHIO.

COLUMBUS, OHIO
FRED J. HEER, STATE PRINTER
1900

1 Ann. Sta. Bul. 120.
Nineteenth Annual Report

of the

Ohio Agricultural Experiment Station

For the Year Ending June 30, 1900.

Published by Order of the State Legislature.

COLUMBUS, OHIO
FRED J. HEER, STATE PRINTER
1900
ANNOUNCEMENT.

The Ohio Agricultural Experiment Station is organized under an act of the General Assembly of Ohio, passed April 17, 1882, and supplemented by an act of Congress approved March 2, 1887.

The Station is prepared to test new varieties of grains, fruits and garden vegetables; to examine seeds that are suspected of being unsound or adulterated; to identify and name grasses, weeds and other plants; to identify insects and suggest measures for the control of such as are injurious, to give advice concerning the prevention of the fungous diseases which affect vegetation, and to assist in the diagnosis and control of tuberculosis and other diseases of cattle.

The Station is not prepared to furnish analyses of chemical or commercial fertilizers, as in Ohio that work is performed under direction of the Secretary of the State Board of Agriculture, at Columbus; but the Station will at all times respond to requests for advice concerning the use of such fertilizers.

The Station is not prepared to examine foods and dairy products suspected of adulteration, as that work is in charge of the Ohio Dairy and Food Commissioner, whose office is at Columbus.

Any citizen of Ohio has the right to apply to the Station for any information it can give, and all such applications will receive prompt attention.

Visitors to the Station are always welcome.

Address all communications to

EXPERIMENT STATION,
Wooster, Ohio.
ORGANIZATION OF THE
OHIO AGRICULTURAL EXPERIMENT STATION.

BOARD OF CONTROL.

R. H. Warder .................................. North Bend
J. T. Robinson .................................. Rockaway
Hon. L. M. Strong .................................. Kenton
The Governor of the State  }
The Director of the Station }  Ex officio

OFFICERS OF THE BOARD.

J. T. Robinson .................................. President
R. H. Warder .................................. Secretary
Percy A. Hinman .................................. Treasurer

STATION STAFF.

Charles E. Thorne ......................... Wooster ................ Director
William J. Green ....................... " ................................ Horticulturist and Vice-Director
J. Fremont Hickman, M. A. S. .......... " ................................ Agriculturist
Francis M. Webster, M. S. ............ " ................................ Entomologist
Augustine D. Selby, B. Sc. .......... " ................................ Botanist and Chemist
Percy A. Hinman .............................. " ................................ Bursar
John W. Ames, B. Sc. .......... " ................................ Assistant Chemist
John F. Hicks .............................. " ................................ Assistant Botanist
Wilmon Newell, M. Sc. ............. " ................................ Assistant Entomologist
William Holmes ................ .. " ................................ Foreman of Farm
Charles A. Patton .................. " ................................ Ass’t Foreman and Meteorologist
Annie B. Ayres ........................... " ................................ Mailing Clerk
Cary Welty .............................. " ................................ Mechanic
Edward Mohr .................. Strongsville .................. Supt. Northeastern Sub-Station
Lewis Schultz ................ Neapolis ................ Supt. Northwestern Sub-Station

The Bulletins of this Station are issued at irregular intervals. They are paged consecutively, and an index is included with the Annual Report, which constitutes the final number of each yearly volume.

Bul. 120
To His Excellency, George K. Nash, Governor of Ohio:

Sir: I have the honor to transmit herewith the nineteenth annual report of the Ohio Agricultural Experiment Station, for the fiscal year ending June 30, 1900. R. H. Warder, Secretary.
REPORT OF THE TREASURER.

To Hon. J. T. Robinson, President of the Board of Control:

Sir: I respectfully submit herewith the financial report of this Station for the fiscal year ending June 30, 1900:

In Statements A, B, C and D, respectively, will be found a record of the receipts and expenditures from the various funds; Statement A being a statement of account with the annual appropriation received from the U. S. Treasury, and a copy of the report made to the Governor of the State, the Secretary of Agriculture and the Secretary of the U. S. Treasury; Statement B being a statement of account with the State Treasury; and Statement C showing the receipts and expenditures from farm produce and other sales.

The three statements, A, B and C, are combined in Statement D, which shows the total income and expenditures for the fiscal year.

STATEMENT A.

The Ohio Agricultural Experiment Station in Account with the United States Appropriation, 1899-1900.

Dr.

To receipts from the Treasurer of the United States, as per appropriation for the fiscal year ending June 30, 1900, as per act of Congress approved March 2, 1887. ................. $15,000 00

Cr.

By expenditures for:

Salaries ........................................... $12,073 10
Labor .............................................. 1,310 27
Postage and stationery ....................................... 69 27
Publications ........................................... 13 13
Heat, light and water .................................. 305 96
Seeds, plants and sundry supplies ...................... 534 27
Fertilizers .......................................... 4 56
Feeding stuffs ....................................... 323 33
Library ............................................... 77 05
Tools, implements and machinery ..................... 165 57
Furniture and fixtures ................................ 20 03
Scientific apparatus .................................. 4 28
Contingent expenses .................................. 10 00
Building and repairs .................................. 89 18

$15,000 00
I, the undersigned, duly appointed Auditor of the Corporation, do hereby certify that I have examined the books and accounts of the Ohio Agricultural Experiment Station for the fiscal year ending June 30, 1900, that I have found the same well kept and classified as above and that the receipts for the year from the Treasurer of the United States are shown to have been $15,000.00, and the corresponding disbursements $15,000.00; for all of which proper vouchers are on file and have been by me examined and found correct.

And I further certify that the expenditures have been solely for the purposes set forth in the Act of Congress approved March 2, 1887.

Signed,

J. T. Robinson,
Auditor of Board of Control.

Attest: Chas. E. Thorne, Custodian.

I hereby certify that the foregoing statement of account to which this is attached, is a true copy from the books of account of the institution named.

P. A. Hinman,
Treasurer of Board of Control.
## ANNUAL REPORT

### STATEMENT B.

**Ohio Agricultural Experiment Station in Account With the State Treasury.**

<table>
<thead>
<tr>
<th>Date of Appropriation</th>
<th>Appropriation for—</th>
<th>Total Amount to the Station's Credit</th>
<th>Total Amount Expended</th>
<th>Balance in Treasury June 30, 1900</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>Expenses of the Board of Control</td>
<td>$500 00</td>
<td>$217 84</td>
<td>$282 16</td>
</tr>
<tr>
<td>1900</td>
<td>Sub-stations for field experiments</td>
<td>2,200 00</td>
<td>441 85</td>
<td>1,785 15</td>
</tr>
<tr>
<td>1900</td>
<td>Bulletin illustration</td>
<td>400 00</td>
<td>123 27</td>
<td>276 73</td>
</tr>
<tr>
<td>1900</td>
<td>Special work in entomology, botany, horticulture and chemistry</td>
<td>3,500 00</td>
<td>631 21</td>
<td>2,868 79</td>
</tr>
<tr>
<td>1900</td>
<td>General repairs, labor and supplies</td>
<td>3,000 00</td>
<td>2,949 17</td>
<td>550 83</td>
</tr>
<tr>
<td>1900</td>
<td>Investigation of tuberculosis, and other diseases of cattle</td>
<td>3,000 00</td>
<td>3,000 00</td>
<td>3,000 00</td>
</tr>
<tr>
<td>1900</td>
<td>New construction</td>
<td>4,850 00</td>
<td>4,850 00</td>
<td>4,850 00</td>
</tr>
<tr>
<td>Totals for 1900</td>
<td></td>
<td>$17,950 00</td>
<td>$4,363 34</td>
<td>$13,586 66</td>
</tr>
<tr>
<td>1898</td>
<td>Expenses of the Board of Control</td>
<td>$362 97</td>
<td>$199 54</td>
<td>*163 43</td>
</tr>
<tr>
<td>1898</td>
<td>Bulletin illustration</td>
<td>443 65</td>
<td>443 65</td>
<td>443 65</td>
</tr>
<tr>
<td>1898</td>
<td>Special work in entomology, botany, horticulture and chemistry</td>
<td>146 41</td>
<td>146 41</td>
<td>146 41</td>
</tr>
<tr>
<td>1898</td>
<td>Investigation of tuberculosis</td>
<td>124 61</td>
<td>124 61</td>
<td>124 61</td>
</tr>
<tr>
<td>1899</td>
<td>Expenses of the Board of Control</td>
<td>300 00</td>
<td>300 00</td>
<td>300 00</td>
</tr>
<tr>
<td>1899</td>
<td>Sub-stations for field experiments</td>
<td>2,298 35</td>
<td>2,298 35</td>
<td>2,298 35</td>
</tr>
<tr>
<td>1899</td>
<td>Bulletin illustration</td>
<td>400 00</td>
<td>400 00</td>
<td>400 00</td>
</tr>
<tr>
<td>1899</td>
<td>Special work in entomology, botany, horticulture and chemistry</td>
<td>3,000 00</td>
<td>3,000 00</td>
<td>3,000 00</td>
</tr>
<tr>
<td>1899</td>
<td>General repairs, labor and supplies</td>
<td>852 16</td>
<td>852 16</td>
<td>852 16</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>$25,879 15</td>
<td>$12,129 06</td>
<td>$13,586 66</td>
</tr>
</tbody>
</table>

*This amount lapsed to the State Treasury.*

In addition to the above amounts appropriated for the use of the Experiment Station, the amount of $15,000 has been appropriated to the
Board of Control of the Experiment Station for the State fiscal years 1900 and 1901 for the enforcement of the law providing for the inspection of nurseries and orchards, the text of which is given in the appendix to this report. Of this amount $171.86 was expended prior to June 30, 1900.

STATEMENT C.

Ohio Agricultural Experiment Station in Account with the Produce Fund.

To Receipts:—

June 30, 1900.
From sales of agricultural produce ............................................ $1,788 67
   dairy produce .............................................................................. 496 84
   live stock .................................................................................. 1,010 06
   horticultural produce .............................................................. 1,486 59
   botanical produce ...................................................................... 9 98
   labor ....................................................................................... 164 09
   rents ......................................................................................... 917 00
   miscellaneous sales .................................................................... 487 15
   fees for testing dairy cattle (milk test) ..................................... 149 20
   fees for inspection of nurseries ................................................ 172 87
   fees for chemical analysis ....................................................... 55 00
   Northeastern Sub-station ......................................................... 94 88
   Northwestern Sub-station ......................................................... 132 49

Total receipts for the year ................................................................. $6,964 82
To balance brought forward July 1, 1899 ........................................ 832 06

Total .................................................................................................. $7,796 88

By Expenditures:—

June 30, 1900.
For labor ............................................................................................ $3,705 44
   postage and stationery ............................................................... 33 07
   freight and express ..................................................................... 217 75
   heat, light and water .................................................................. 172 28
   seeds, plants and sundry supplies ............................................... 657 49
   fertilizers .................................................................................... 27 56
   feeding stuffs ............................................................................. 12 78
   library ......................................................................................... 164 88
   tools, implements and machinery ................................................ 217 16
   furniture and fixtures ............................................................... 2 10
   scientific apparatus ..................................................................... 1 20
   live stock .................................................................................... 300 40
   traveling expenses ..................................................................... 38 19
   contingent expenses ................................................................... 34 10
   building, repairs and farm improvement ................................... 419 62
   miscellaneous ........................................................................... 498 14

Total expenditures for the year ....................................................... $6,412 16
By balance carried forward .............................................................. 1,384 72

Total .................................................................................................. $7,795 88
ANNUAL REPORT

STATEMENT D.

TOTAL RECEIPTS AND EXPENDITURES OF THE OHIO AGRICULTURAL EXPERIMENT STATION FOR THE YEAR ENDING JUNE 30, 1900.

Total Receipts:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>From U S. Treasury</td>
<td>$15,000 00</td>
</tr>
<tr>
<td>State appropriations</td>
<td>17,950 00</td>
</tr>
<tr>
<td>miscellaneous receipts</td>
<td>6,964 82</td>
</tr>
<tr>
<td><strong>Total receipts for the year</strong></td>
<td><strong>$39,914 82</strong></td>
</tr>
<tr>
<td>To balance brought forward July 1, 1899</td>
<td>8,761 21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$48,676 03</strong></td>
</tr>
</tbody>
</table>

Total Expenditures:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>For salaries of technical and office staff</td>
<td>12,009 23</td>
</tr>
<tr>
<td>special and temporary services</td>
<td>10 00</td>
</tr>
<tr>
<td>foremen and skilled laborers</td>
<td>3,416 44</td>
</tr>
<tr>
<td>ordinary labor</td>
<td>6,122 24</td>
</tr>
<tr>
<td><strong>Total labor</strong></td>
<td><strong>9,538 68</strong></td>
</tr>
<tr>
<td>publications</td>
<td>1,047 17</td>
</tr>
<tr>
<td>postage and stationery</td>
<td>440 00</td>
</tr>
<tr>
<td>freight and express</td>
<td>472 58</td>
</tr>
<tr>
<td>heat, light and water</td>
<td>669 16</td>
</tr>
<tr>
<td>chemical supplies</td>
<td>143 01</td>
</tr>
<tr>
<td>seeds, plants and sundry supplies</td>
<td>1,983 67</td>
</tr>
<tr>
<td>fertilizers</td>
<td>152 68</td>
</tr>
<tr>
<td>feeding stuffs</td>
<td>946 92</td>
</tr>
<tr>
<td>library</td>
<td>394 05</td>
</tr>
<tr>
<td>tools, implements and machinery</td>
<td>867 21</td>
</tr>
<tr>
<td>furniture and fixtures</td>
<td>22 13</td>
</tr>
<tr>
<td>scientific apparatus</td>
<td>284 11</td>
</tr>
<tr>
<td>live stock</td>
<td>550 40</td>
</tr>
<tr>
<td>traveling expenses</td>
<td>1,565 84</td>
</tr>
<tr>
<td>contingent expenses</td>
<td>351 23</td>
</tr>
<tr>
<td>building, repairs and farm improvement</td>
<td>1,685 01</td>
</tr>
<tr>
<td>miscellaneous</td>
<td>408 14</td>
</tr>
<tr>
<td><strong>Total expenditures for the year</strong></td>
<td><strong>$33,541 22</strong></td>
</tr>
<tr>
<td>By balance, expenses of Board of Control, lapsed</td>
<td>163 43</td>
</tr>
<tr>
<td>By net balance carried forward</td>
<td>14,971 38</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$48,676 03</strong></td>
</tr>
</tbody>
</table>

Respectfully submitted,

P. A. Hinman, Treasurer.
REPORT OF THE DIRECTOR.

Hon. J. T. Robinson, President of the Board of Control:

Sir: I have the honor to submit herewith the nineteenth annual report of this Station, it being my thirteenth report as Director.

INSPECTION OF NURSERIES AND ORCHARDS.

The last General Assembly of the State enacted a law intended to prevent the introduction and spread of San José scale, black knot, peach yellows, “and other dangerous insects, and tree, shrub, vine or plant diseases;” the full text of which is given in an appendix to this report. The execution of this law has been laid upon the Board of Control of this Station. Since the work thus provided for is merely police work no part of it can be legally supported from the fund given by the National Government to the State for purposes of investigation. It therefore becomes necessary to so organize the work that it shall be clearly separated from the scientific research which is the only work authorized by the National law under which this Station is organized.

BOVINE TUBERCULOSIS.

The confidence of the General Assembly in the Experiment Station was strikingly shown by the unsolicited addition of an item to the general appropriation bills, appropriating to the Station $3,000 each year for 1900 and 1901 “For investigation and prevention of tuberculosis and other diseases in cattle, throughout the State of Ohio.”

No other responsibility ever laid upon this Station has exceeded this in importance; for the action is the outcome of the growing conviction, on the part of those best qualified to judge, that tuberculosis in cattle plays an important part in the diffusion and perpetuation of this deadliest scourge of the human race.

This problem of the prevention and control of bovine tuberculosis is being attacked, throughout the civilized world, by men who are bringing to bear upon it the highest ability and the most elaborate training in the methods of modern scientific research. It is a many sided problem, and there is work to be done in field and stable as well as in the laboratory, and especially is there work to be done on the minds of men, in arousing them to a true appreciation of its importance; but unless all this work, that conducted in field and stable as well as the
most elaborate laboratory research, and especially that which aims to put the results of these researches before the people, be actuated by the scientific spirit, which is simply the spirit of truth illumined by the ripest human knowledge, and which is equally far from exaggeration and from underrating, then it would better not be undertaken at all.

INVESTIGATIONS OF THE YEAR.

THE MAINTENANCE OF FERTILITY.

Bulletin 110 (91 pp, 10 plates) contains a more complete report of the Station's work on this problem than had previously been made. This report contains not only a resumé of most of the field experiments thus far made, but also a study of the soils on which these experiments are located, in respect to their mechanical and chemical composition; this part of the work having been executed by the Chemical department of the Station.

While chemical analysis has not yet reached the point of serving as a reliable guide to the fertilizing of the soil, yet it offers useful suggestions in that direction. Certainly the more fully we understand the physical and chemical composition and the geological history of our soils the more intelligently we can treat them.

This combined field and laboratory study of the soil is bringing out results which strongly emphasize the need of further work in this direction. This is one of the richest states of the Union in mineral wealth; but the value of the annual product of Ohio's farms and orchards is more than six times that of the combined annual output of all her mines of coal and iron, all her wells of oil and gas, and all her quarries of stone. But there has as yet been no attempt at a systematic study of the soils of the state, such as that given to its mineral resources.

ANIMAL HUSBANDRY.

Bulletin 117 (14 pp, 1 plate) reports a series of experiments in the treatment of sheep for the stomach worm, Strongylus contortus (Rud.), including an apparently successful experiment in prevention by keeping the animals housed until after the season for this parasite has passed.

The correspondence of the Station shows that the benzine or gasoline remedy for this pest, first suggested by Prof. Ch. Julien, of the Agricultural Experiment Station at Grignon, France, is being more and more widely used and with generally favorable results when properly employed.

The Station herd of cattle has apparently been brought to the condition of perfect health by the methods employed to rid it of tuberculosis three years ago. Since that time the tuberculin test has been applied regularly every six months to the entire herd. There have been three cases of reaction, which were promptly disposed of; but whereas there were frequent deaths in the herd from obscure causes before the final
cleaning out under the tuberculin test in the spring of 1897, no such cases have occurred since that date.

An experiment in feeding for beef was made during the winter, but its results have not yet been published.

CEREAL CROPS.

Bulletin 118 (26 pp) carries forward to 1899 the report of the variety and cultural tests of wheat, which have been a prominent feature of this Station's work. These tests continue to indicate a high rate of productiveness in the Mealy wheat, a distinct variety sent to this Station by the National Department of Agriculture several years ago. The high rate of yield of the Poole wheat continues to be maintained.

The almost unprecedented destruction of the wheat crop of 1899-1900 by the combined influence of Hessian fly and winter killing is a matter of great consequence in a state where the wheat crop occupies so important a position as in Ohio. The Station's experiments strongly indicate that the remedy for both these sources of loss lies in a more thorough and intelligent attention to the maintenance of fertility. On land depleted by exhaustive cropping, including even the rotative cropping practiced on many farms, on which three or four crops of cereals are taken from the land before any attempt is made at recuperation through clover or manure, the crop was almost totally destroyed; but where similar land was under shorter rotations with systematic manuring a fair yield was obtained, while on land that had never been depleted of its fertility the yield rose to 40 bushels per acre.

HORTICULTURE.

Bulletin 113 (13 pp, 5 plates) reports a comparison of varieties of plums, selecting from the Station's list of about 175 varieties those which had come into bearing by 1899.

The Station's orchards are justifying the care which has been given them by the large crops of fine fruit on the older trees and by the healthy foliage and strong growth of the younger ones.

ENTOMOLOGY.

Bulletin 112 (7 pp, 1 plate) is a report on the clover root borer. Bulletin 114 (9 pp.) is a description of the methods of insect study at the Station; Bulletin 116 (4 pp, 1 plate) is a report on the grape-cane gall-maker and its enemies, and Bulletin 119 (9 pp, 1 map) is a report on the Hessian fly.

BOTANY.

Bulletin 111 (50 pp, 8 plates) is a summary of the work of this Station, from 1891 to 1899, in the control of diseases of plants. This bulletin reviews in detail the earlier work of this Station on apple scab, work which has demonstrated the practicability of controlling this
destructive fungus, and treats more briefly on subsequent work on other fungous diseases of plants, including especially the leaf curl of the peach.

CHEMISTRY.

Bulletin 115 (18 pp) is a report on the continuation, through 1899, of the sugar beet and sorghum investigations, made during previous seasons in coöperation with the U S Department of Agriculture on the one hand and with farmers on the other, for the purpose of studying the possibility of introducing these crops in Ohio. As already stated, the chemical department of the Station has made a series of analyses of the soils upon which the field experiments of the Station with fertilizers are being conducted, a work involving several months of exacting labor.

The foregoing summary of the Station's publications gives a general view of the character of its work. The different lines of investigation may be grouped as follows:

1. Study of the soils of the Station and of the State, with reference to their physical and chemical composition and to the cultural and fertilizing methods best calculated to conserve moisture and fertility.

2. Study of crops, including grains, forage crops, fruits and vegetables, with reference (a) to the relative usefulness of different varieties, (b) to cultural methods and (c) to the growth habits of different species.

3. Study of the diseases affecting crops, including rusts, smuts, mildews, bacterial diseases, etc.

4. Study of the habits of injurious insects and of measures for their control.

5. Comparison of different breeds of cattle and sheep with reference to their relative value for different purposes.

6. Researches in the nutrition of animals, including the relative value of different foods, contrast of different methods of feeding, and study of the assimilative process of different individuals.

7. Investigation of the diseases of animals.

COöPERATIVE WORK.

COöPERATION WITH THE NATIONAL DEPARTMENT OF AGRICULTURE.

In the execution of its work the Station has had invaluable assistance from the National Department of Agriculture. Through the Section of Seed and Plant Introduction of that Department the Station has received seeds of sugar beets, sorghum and many other varieties of plants, some of which have proven to possess great merit. As has been stated above, the "Mealy" wheat, which we consider one of the most valuable varieties on our list, was first distributed by the National Department. The Botanical Division has furnished the Station with several hundred samples of weed and other seeds, very valuable for purposes of identification. The Chemical Division has rendered assistance in the analysis of sugar beets. The Bureau of Animal Industry has furnished frequent install-
ments of tuberculin for use in coöperative researches in bovine tuberculosis. While the investigations of sugar beets and sorghum and of bovine tuberculosis are the only lines of this work which may be called strictly coöperative, yet all the divisions of the Department have been called upon for assistance, which has always been promptly and courteously rendered. In fact, the relations between the Department and the Station are such that but few days pass without a communication of some sort passing between the two institutions.

This statement of the service rendered to the work of agricultural investigation by the National Department of Agriculture would be incomplete without reference to the work of the Office of Experiment Stations. This office stands as the representative of the Secretary of Agriculture in his relation to the Experiment Stations. Its chief functions are to protect from misuse the fund given by the General Government for research in agriculture, known as the Hatch fund; to serve as a bureau of information for the stations regarding agricultural research in this and other countries, and to aid them in their work by advice and counsel.

The work of this office has thus far been administered with exceptional tact and fidelity. It has prevented flagrant abuses of the Hatch fund, and its publications are of great value to station workers and others. This is especially true of the "Experiment Station Record," a serial publication in which are given abstracts of the publications of all American experiment stations and titles of the publications of similar institutions in foreign countries. The work of this office could be largely extended on present lines with very great benefit to the cause which it represents.

COOPERATION WITHIN THE STATION.

In the studies of soils, of plant growth and of animal nutrition above mentioned the Agriculturist, Horticulturist and Chemist of the Station are working in close coöperation; many of these problems can be attacked successfully only through the field or stable; others only through the chemical or biological laboratory; but, for the final and successful solution of all, the microscope must follow the plow, and the delicate balance of the chemist must supplement the wagon scales.

The Chemist and Botanist of the Station is the Experimentalist of the Agricultural Student's Union of the State; and through this organization numerous lines of investigation are carried on by coöperation between the Station and farmers scattered over the State.

COOPERATION BETWEEN STATIONS.

While there is no organized coöperation between the different stations, nor any formal agreement as to division of labor, yet in actual practice much the same results are attained as would be reached by such agreement. The wide differences in soil and climate and in other
agricultural conditions of the different states necessarily involve similar differences in the leading objects of investigation pursued by the different stations.

It is a matter of course, for instance, that the Louisiana Station should lead in the matter of sugar production; that cotton culture should absorb the chief attention in the stations within the cotton belt; that wheat and corn should claim the precedence in the latitude of Ohio; that Wisconsin should specialize in the direction of dairying; that irrigation problems should be of chief interest in the arid regions, and that the conservation of soil fertility should occupy a leading place in the older agriculture of the eastern states. But where several stations, located in regions having greater similarity of conditions, undertake similar lines of research the result is not the waste of effort which some have predicted, but a more speedy attainment of the end in view. A few of the many results of work of this character are the practically universal use of the Babcock test for milk fat, following the repeated demonstrations of its value by various stations; the general adoption of the spray pump as an indispensable factor in fruit production; the introduction of sub-watering in greenhouse management; the world wide acceptance of the tuberculin test as the most reliable diagnostic in bovine tuberculosis.

THE RELATION OF THE STATION TO THE AGRICULTURE OF THE STATE.

It is the function of the Experiment Station to gather suggestions from all quarters; to put these to test under the conditions of agricultural practice which prevail within its special environment, and to place the results of its investigations before the farmers of the State. One of the ways in which these results are made most directly available to the farmer is through personal correspondence and in such correspondence about 10,000 letters are written annually at this Station in answer to inquiries on special points, while many hundreds of similar answers are given verbally to persons who come to the Station for information, sometimes from considerable distances.

Another medium through which the Station’s work is effectively brought before the people is the Farmers’ Institute, and this channel of communication has been regularly employed by the members of the Station staff. The demand for help at these institutes, however, has become so great as to necessitate a curtailment of the time given to this work, in order to avoid a too great interference with the research work of the Station.

The fact that the assistance of the Station is sought in the directions indicated in constantly increasing measure is sufficient evidence that the farmers of the state are finding this assistance to be practically helpful to them in their work.
Following are some of the points in which the Station's work is being turned to practical use by the farmers of the State as shown by their testimonials:

As the result of the Station's field experiments farmers are becoming acquainted with the general principles upon which rational fertilizing depends, and are learning to purchase their fertilizing materials at a great saving of cost.

The variety tests of the Station give early and reliable information regarding the relative merit of newly introduced sorts, and many farmers and horticulturists have learned to watch the Station's work and to wait for the result of these tests before investing their money in the highly lauded "new" varieties that are annually put upon the market.

No line of the Station's work has been of greater immediate value to the farmer and fruit grower than the prevention of fungous diseases of plants. In the subduing of apple scab alone several commercial orchardists have testified that the Station's advice to them has been worth hundreds of dollars in single seasons, and similar testimony has been given with reference to the value of that advice in the prevention of vegetable mildews and blights.

Many farmers have testified to having received material aid in combatting the chinch bug from the Station's distribution of chinch bug fungus, and in general a better understanding of the methods of insect control is manifest.

The advice of the Station is frequently sought with respect to selections of breeds of cattle and to the value of different feeding stuffs.

Many testimonials have been received as to the efficiency of the benzine treatment for stomach worms in lambs, first published in America by this Station.

In this case, as in many others, the Station's work has been secondary to that of some other original investigator; yet oftentimes such work is absolutely essential to the practical utilization of the original discovery. The Station which limits its work to original research, without any attempt at the verification of the work of others, will fall far short of its possible usefulness.

THE OPPORTUNITIES FOR POST-GRADUATE WORK AT THE STATION.

During the present season two college professors have spent some time in the pathological and chemical laboratories of the Station, pursuing special lines of investigation, and frequent applications are made for employment in some of its departments, by young men or women who desire to avail themselves of its opportunities for advanced study.

In all cases where the privileges of the Station's laboratories are granted the recipient is required to render some compensation, in the form of expert service or otherwise, and in occasional instances it has been possible to make arrangements for the employment of advanced students on terms mutually beneficial to Station and student.
I believe that the time has come when steps should be taken looking toward the organization of a system of student assistance, under which certain portions of the technical work now required at the Station might be done by post-graduate students, working under the immediate supervision of the department chief.

ACKNOWLEDGMENTS.

The following publications have been received during the year as donations to the Station's library, or in exchange for its bulletins:

**BOOKS, PAMPHLETS AND SCIENTIFIC PERIODICALS.**

Agricultural Experiment Stations: The bulletins of all the experiment stations of the United States and Canada are regularly received. Cloth-bound reports have been received from the following stations:


Michigan, annual reports for 1898 and 1899. Minnesota, annual report for 1899.


Academy of Science of St. Louis, Dr. G. Hambach, Librarian, Washington University, St. Louis, Mo. Transactions for 1899-1900.

Agricultural education in Great Britain: Report on grants for, in the year 1898-99, by P.G. Cragie, Secretary to the Board of Agriculture.

American Museum of Natural History, Central Park, N. Y., City; Bulletins.

Argentine Demonstration Grafica de la Cosecha 1898-99 en la Republica Argentina. Hecha por el Ingeniero Agronomo Jose Cilley Vernet, Buenos Aires.

Barbados: Reports of the results obtained on the experimental fields at Dodd's Reformatory, 1898 and 1899, by J. P. d'Albuquerque, Island Professor of Chemistry and Agricultural Science, and J. R. Bovell, Superintendent of Botanical Station.

Bessarabia: The most injurious insects of tobacco in, by K. Lindeman.


California State Board of Trade, G. A. Dennison, Secretary, San Francisco: Annual Reports.

Canada: Geological and natural history survey; Catalogue of Canadian plants, by John Macoun; 5 parts.


Chicago Academy of Science: Annual report for 1897; The mollusca of the Chicago area.

Cincinnati Society of Natural History: Journal.

Columbus Horticultural Society, Homer C. Price, Secretary, Columbus, O.: Reports.

Ecole Nationale d'Agriculture de Montpellier, France. Sur le Parasitisme du Phoma Reniformis, par MM Ravaz et Bonnet; Produits de la Vigne, par M. L. Ravaz; Les Systemes de Taille appliques a la Vigne, par M. L. Ravaz.
Finland: Ueber die Weisähigkeit der Wiesengräser in Finland, von Enzio Reuter, Helsingfors.

Formaldehyde as a Milk Preservative, by A. B. Young, M. D., Secretary State Board of Health, Augusta, Maine.

German Kali Works, N. Y. City; Reports of German experiments in the use of fertilizers.

Halle: Zehnter Jahresbericht der Versuchstation für pflanzenschutz, 1899; Landwirtschaftliche Jahrbücher, 1899; Untersuchungen über die Zweckmässigst form der Kombination von Kupferhaltigen Fungiciden mit Seifenlaugen, von Dr. M. Hollrung.

Hamburg: Bericht über die Thätigkeit der Station für Pflanzenschutz im Jahre 1898-99. Dr. C. Brick, Director.

Hamburg: Bericht über die Thätigkeit der Station für Samencontrele 1897-98; Dr. A. Voigt, Director.

Hawaiian Experiment Station, Honolulu, Hawaii, Walter Maxwell, Director: Report for 1899.

Illinois Horticultural Society, L. R. Bryant, Secretary: Transactions for 1899.


Jamaica Botanical Department: William Fawcett, Director: Bulletins.

Java: Collection de la Station Experimentale pour l'industrie sucriere dans l'ouest de Java a Kagok-Tegel, pour l'exposition universelle de Paris, 1900. Verslag over 1899 van het Proefstation voor Suikerriet in West-Java, te Kagok-Tegel. De Riet-Schorskever Xyleborus perforans Wollaston door Dr. L. Zehntner; Mededelingen van het Proefstation voor Suikerriet in West-Java te Kagot-Tegal.


Kansas State Board of Agriculture, F. D. Coburn, Secretary, Topeka: Quarterly Bulletin on "Forage and Fodder."

Kansas State Horticultural Society, Wm. H. Barnes, Secretary, Topeka: Transactions for 1899.

Maine State Board of Agriculture, B. Walker McKeen, Secretary, Augusta: Bulletins for 1899-1900.

Massachusetts State Board of Agriculture, James W. Stockwell, Secretary; Annual Report for 1899.


Mexico: Memoria de la Secretaria de Fomento; 1892-1896. Ministere de Fomento, City of Mexico.

Michigan Farmers' Institutes, R. L. Butterfield, Director, Reports for 1896-1899.

Minneapolis Department of Health: Annual Reports, 1898-1899; A. K. Norton, M. D., Commissioner.

Missouri Botanical Garden, St. Louis; Wm. Trelease, Director: Annual Report, 1900.

Missouri Horticultural Society; L. A. Goodman, Secretary, Westport: 42nd Annual Report for 1899.

National Live Stock Association, Chas. F. Martin, Secretary, Denver, Colo.: Third Annual Report, 1900.

New Jersey State Board of Health, Henry Mitchell, M. D., Secretary, Trenton: 23rd Annual Report.

New York Farmers, the: Proceedings, 1899-1900; Mr. Thomas Sturgis, Secretary, 72 Trinity Place, N. Y. City.
New York State College of Forestry, Cornell University, Ithaca, N. Y.: First and second annual reports; B. R. Fernow, Director.
North Carolina Department of Agriculture, Biological Division: Regulations for the control of the contagious diseases of live stock.
North-West Brand Book, 1900: Registered cattle brands; Department of Agriculture, North-West Territories, Hon. Geo. H. Bulyea, Commissioner, Regina, Assiniboia, N. W. T.
Oberlin College Laboratory Bulletins of the Wilson Ornithological Chapter of the Agassiz Association, Lynds Jones, Editor, Oberlin, Ohio.
Ohio State Academy of Science, E. L. Moseley, Secretary, Sandusky: Eighth Annual Report, 1900.
Ohio State Board of Agriculture, W. W. Miller, Secretary, Columbus: Annual Report for 1898 and official reports on analysis of fertilizers.
Ontario Agricultural College, Guelph, Ont., Can.: Reports of college and experimental farm.
Ontario Department of Agriculture, Hon. John Dryden, Minister of Agriculture: Annual Report for 1898. 2 Vols.
Pennsylvania Department of Agriculture, Prof. John Hamilton, Secretary, Harrisburg: Annual Report for 1898 and bulletins.
Society for the Promotion of Agricultural Science, Prof. Thomas F Hunt, Secretary, Columbus: Proceedings of the 20th annual meeting.
Station Viticole et de Pathologie Végétale, Fondée et dirigée par V. Vermorel, Villefranche (Rhone) France; Note sur l'emploi du sulfure de carbone en grande culture: Etude sur le grêlet: Defense des recoltes par le tir du canon.
Switzerland: Station laitière de Lausanne, G. Martinet, Directeur: Extraits de la Chronique agricole du Canton de Vaud.
Tuskegee Normal and Industrial Institute, Tuskegee, Ala.: Bulletins of experiment station; G. W. Carver, Director.
United States Department of Agriculture, Hon. James Wilson, Secretary: Year-book for 1899, and many publications of divisions. The station is under special obligations to the chiefs of the various Divisions in this department and to Prof. Cleveland Abbe, editor of the U. S. Monthly Weather Review, for courteous assistance in completing the files of the various departmental publications.
University College of North Wales, Bangor; Thomas Winter, M. A., Professor of Agriculture: Ninth annual report on experiments with crops and live stock for 1899.
University of Minnesota: Minnesota Plant Life, by Conway MacMillan, State Botanist.
University of Pennsylvania: Contributions from the Botanical laboratory.
University of the State of New York: Melvil Dewey, Secretary, Albany: Reports of State Geologist, 1895, 1896; of State Entomologist, 1897; of State Botanist, 1897; of Director of State Museum, 1897 and State Library Bulletins on legislation, Nos. 11 and 12 ("Index to Legislation by States, 1899" and "Trends of Legislation in the United States").
Victoria Department of Agriculture: Experiments on rust in wheat and on fodder plants, by D. McAlpine, Government Vegetable Pathologist, Melbourne, Victoria, Australia.

Virginia Department of Agriculture, George W. Koiner, Commissioner: Official bulletin on analysis of fertilizers, 1899.

Wien: Verhandlung du K. K. Zoologisch-botanischen Gesellschaft in Wien; Redigiert von Dr. Carl Fetsch, 1899.

Wisconsin Farmers' Institutes, Geo. McKerrow, Director: Reports 1896-1899.

GOVERNMENT SERIAL PUBLICATIONS.

Agricultural Gazette of New South Wales: Issued monthly by direction of the Secretary for Mines and Agriculture, Sidney, New South Wales, Australia.

Agricultural Journal, Cape of Good Hope: Published monthly by the Department of Agriculture, Cape Town, South Africa.

Agricultural Journal and Mining Record: Issued fortnightly by the Natal Department of Agriculture and Mines, Maritzburg, Natal, South Africa.

Boletin de Agricultura, Mineria e Industrias: Publicado por la Secretaria di Fomento, Colonizacion e Industria de la Republica Mexicana: Published monthly, City of Mexico.

Boletin de la Sociedad Nacional de Agricultura: (Published monthly at 772 Monjitas, Chile, South America.)

Boletin Mensual de Observatorio Meteorologico Central de Mexico: Oficina Tipografica de la Secretaria de Fomento, City of Mexico.

Consular Reports: Published monthly by the U. S. Department of State, Washington, D. C.

Experiment Station Record: Published monthly by Office of Experiment Stations, U. S. Department of Agriculture, Washington, D. C.

Journal of Agriculture and Industry of South Australia: Issued monthly under direction of the Hon. Ministers of Agriculture and Industry, Adelaide, South Australia.

Queensland Agricultural Journal: Issued by direction of the Secretary of Agriculture, Brisbane, Queensland, Australia.


AGRICULTURAL AND TRADE JOURNALS.

Acker und Gartenbau Zeitung, Milwaukee, Wis.

Agricultural Epitomist, Indianapolis, Ind.

Agricultural Student, Columbus, Ohio.

American Agriculturist, New York City.

American Farmer, Indianapolis, Ind.

American Grange Bulletin, Cincinnati, Ohio.

American Guernsey Cattle Club Herd Register, Petersboro, N. H.

American Sheep Breeder and Woolgrower, Chicago, Ill.

Beet Sugar Gazette, Chicago, Ill.

Boletin de Agricultura Tropical. San Jose de Costa Rica, A. C.

Breeder and Farmer, Zanesville, Ohio.

Breeders' Gazette, Chicago, Ill.

California Cultivator, Los Angeles, Cal.

Canadian Entomologist, London, Ontario, Canada.

Chicago Daily Drovers' Journal, Chicago, Ill.

Cincinnati Price Current, Cincinnati, Ohio.

Daily Drovers' Telegram, Kansas City, Mo.
Dairy and Creamery, Chicago, Ill.
Deutsch-Amerikanischer Farmer, Lincoln, Chicago and New York.
Deutsche Landwirtschaftliche Wochenschrift, Berlin, Germany.
Elgin Dairy Report, Elgin, Ill.
Fanciers' Review and Fruit Grower, Chatham, N. Y.
Farm and Fireside, Springfield, Ohio.
Farm Home, The, Springfield, Ill.
Farmers' Advocate, London and Winnipeg, Canada.
Farmers' Guide, Huntington, Ind.
Farmers' Home, Dayton, Ohio.
Farmers' Institute Bulletin, Fayetteville, N. Y.
Farmers' Magazine, Madison, Wis.
Farmers' Review, Chicago, Ill.
Farmers' Tribune, Des Moines, Iowa.
Farmers' Voice, Chicago, Ill.
Farm, Field and Fireside, Chicago, Ill.
Farm Magazine, The, Milwaukee, Wis.
Farm, Stock and Home, Minneapolis, Minn.
Forester, The, Princeton, N. J.
Fruit Growers' Journal, Cobden, Ill.
Gleanings in Bee Culture, Medina, Ohio.
Golden Egg, The, St. Louis, Mo.
Green's Fruit Grower, Rochester, N. Y.
Hoard's Dairyman, Fort Atkinson, Wis.
Holstein Friesian Register, Brattleboro, Vt.
Homestead, The, Des Moines, Iowa.
Hospodar (Bohemian), Omaha, Neb.
Indiana Farmer, Indianapolis, Ind.
Insect World (Japanese), Gifu, Japan.
Japanese Agriculturist (Japanese), Azabu, Tokio, Japan.
Jersey Bulletin, Indianapolis, Ind.
Journal of Agriculture, St. Louis, Mo.
Michigan Sugar Beet, Bay City, Mich.
Mirror and Farmer, Manchester, N. H.
Montana Fruit Grower, Missoula, Mont.
National Farmer and Stock Grower, National Stock Yards, Chicago, Ill.
National Provisioner, New York, N. Y.
Naturaliste Canadien, Le, Chicorstimi, Quebec, Can.
Ohio Farmer, Cleveland, Ohio.
Oregon Agriculturist, Portland, Oregon.
Popular Agriculturist (Japanese), Tokyo, Japan.
Practical Dairyman, Chatham, N. Y.
Prairie Farmer, Chicago, Ill.
Southern Planter, Richmond, Va.
Southwest, The, Springfield, Mo.
Southern Farm Magazine, Baltimore, Md.
Southwestern Farmer, Wichita, Kan.
Statistical Sugar Trade Journal: Willett & Gray, 91 Wall St., N. Y. City.
Strawberry Specialist, Kittrell, N. C.
Tri-State Farmer and Gardener, Chattanooga, Tenn.
Wallace's Farmer, Des Moines, Iowa.
West Virginia Farm Reporter, Charleston, W. Va.
Western Creamery, San Francisco, Cal.
Western Fruit Grower, St. Joseph, Mo.
Western Tobacco Journal, Cincinnati, Ohio.

GENERAL NEWSPAPERS.

From Ohio.

Crawford County News, Bucyrus.
Cumberland Echo, Cumberland.
De Graff Journal, De Graff.
Democrat, Pomeroy.
Democratic Herald, Delaware.
Fremont Journal, Fremont.
Greenville Democrat, Greenville.
Hardin County Republican, Kenton.
Jacksonian, Wooster.
Medina County Gazette, Medina.
Monroe Journal (German), Woodsfield.
New Waterford Magnet, New Waterford.
News Democrat, Georgetown.
Ohio State Journal, Columbus.
Semi-Weekly Gazette, Delaware.
Shelby Times, Shelby.
Tipp Herald, Tippecanoe City.
Tri-State Farm News, Toledo.
Tuscarawas Chronicle, Uhrichsville and Dennison.
Utica News-Herald, Utica.
Wayne County Herald, Wooster.
Weekly Gazette, Cincinnati.

From other States.

Baltimore Weekly Sun, Baltimore, Md.
Detroit Free Press, (Semi-weekly), Detroit, Mich.
Kansas Semi-Weekly Capital, Topeka, Kan.
Orilla Packet, Orilla, Ontario, Canada.
Public Ledger (Daily), Philadelphia, Pa.
Rural Topics, Morgan City, La.
Salt Lake Herald (Semi-weekly), Salt Lake City, Utah.
Weekly Union, Manchester, N. H.
Weekly World-Herald, Omaha, Neb.
The Station is also under obligations for the following favors:

SEEDS, PLANTS AND SUNDRIES.

Adler Color and Chemical Works, New York City, Nos. 2, 3, 4, 5, 6, Arsenoids.

Albright, B. F., Coalburg, O.: 1 Variety of potato.
American Cereal Co., Chicago, Ill.: 4 tons of "Quaker Dairy Feed."
Barnes Mfg Co., Mansfield, O.: 1 spray pump.
Barteldes, F. & Co., Lawrence, Kan.: 2 pkts. seeds.
Brown & Son, Kansas City, Mo.: Diseased gladiolus corms.
Bucher & Gibbs Plow Works, Canton, O.: 25 lbs. sugar beet seed.
Calhoun, J. W., Savannah, O.: 8 varieties seedling potatoes.
Cox, U. F., Bradrick, O.: 1 variety apple cions.
Crawford, M., Cuyahoga Falls, O.: 1 variety of strawberry plants.
Dirk, John V., Wingston, O.: 1 gallon seed corn.
Earhart, W. H., Lexington, O.: 1 variety of apple cions.
Earlville, O.: 3 varieties apple cions.
Farnsworth, W. W., Waterville, O.: 1 variety of strawberry plants.
Flansburgh & Pierson, Leslie, Mich.: 1 variety of strawberry plants.
Funk, Levi, Waynesburg, Pa.: 1 variety raspberry.
Gill, Geo. W., Columbus, O.: 2 bushels seed wheat.
Graves, W. J., Perry, O.: 1 variety of peach trees.
Grey, F. L., Amelia, O.: 1 variety raspberry plants.
Hanover, H. D., Dayton, O.: Clematis plants for study of disease.
Heath, F. C., Tidal, Pa.: 5 varieties of potatoes.
Holaday, A., Scappoose, Oregon: 1 variety cherry tree.
Holmes, Harry L., Harrisburg, Pa.: Several pkts. seeds.
Lebold, F. A., Bolivar, O.: 1 variety of potato.
Lentz, D. J., Piqua, O.: 1 variety of potato.
Mace, G. W., Greenville, O.: 1 variety of potato.
Martin, H. H., Mapleton, O.: 2 varieties of strawberry plants.
Miller, D. J., Saltillo, O.: Apple, plum and cherry cions; 1 variety raspberry plants.
Myers, Dr. John A., 12-16 John St., N. Y. City: 4 bags nitrate of soda.
Nichols, A. M., Granville, O.: 1 variety tomato seeds.
Owen, W. H., Catawba Island, O.: Samples whale oil soaps.
Persing, M. J., Clyde, O.: Apple cions and currant plants.
Pioneer Nursery Co., Salt Lake City, Utah: 1 variety pear cions.
Poole & Bailey, N. Y. City: Insecticide soaps.
Richie, Atlantic, Iowa: 1 variety raspberry plants.
Root, A. I., Medina, O.: 1 variety potato.
Sampsel, S. A., Clyde, O.: 1 variety strawberry plant.
Scott, Geo. E., Mt. Pleasant, O.: 1 peck seed corn.
Searls, Elmer, Los Angeles, Cal.: Seeds of Pinus Paryana Nutt.
Stearns, C. C., Grand Rapids, O.: 1 variety peach tree.
Todd, W. S., Greenwood, Del.: 1 variety strawberry plant.
Troyer, A. J., Hector, O.: 1 peck seed oats.
U. S. Department of Agriculture: Section of pure seed investigation; 5 centuries of American economic seeds; sugar beet seeds; sorghum seeds and seeds of cereals.

Van Orman, Lewis, Iowa: 4 pkts. seeds.
Waddell, A. L., Tumwater, Wash: 1 variety apple cions.
Wallis, Henry, Willston, Mo.: 1 variety grape vines.
Warstler, Geo. T., Justus, O.: 1 variety potato.
West Disinfectant Co., Chicago, Ill.: 1 gallon disinfectant.
Whiton, W. W., Wakeman, O.: 1 variety of potato.
Willow Branch Nursery, Anderson, O.: 1 variety strawberry plants.
Wohlert, A. E., Alton, Pa.: 1 variety of cauliflower.

Respectfully submitted,

Chas. E. Thorne, Director.
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APPENDIX A.

The Orchard and Nursery Inspection Law.

An act to prevent the introduction and spread of the San Jose scale and other dangerous insects and dangerously contagious diseases affecting trees, shrubs, vines, plants and fruits.

SECTION 1. Be it enacted by the General Assembly of the State of Ohio, That the Board of Control of the Ohio Agricultural Experiment Station immediately on the taking effect of this act, shall appoint a competent person or persons who shall, under the direction of the Board, perform the duties hereinafter provided.

SECTION 2. It shall be the duty of the Board, either in person or through their assistants, to seek out and cause to be exterminated the San Jose scale and other dangerous insects, and tree, shrub, vine, or plant diseases. Black knot and Peach yellows are hereby declared to be dangerous within the meaning of this act, and trees, shrubs, vines or plants affected with either of these diseases, shall be subject to its provisions. The mention of San Jose scale, peach yellows and black knot in this section shall not be held to exclude other insects or diseases which may be found to be dangerous, from the provisions of this act.

Said Board in person, or through their assistants, shall examine once in each year, not later than August 15th, all nurseries in the State of Ohio as to whether they are infested with San Jose scale or other dangerous insects, or infected with dangerously contagious tree, vine, shrub, or plant disease; and if upon inspection, such nurseries appear to be free from such insects or diseases, the Board shall upon the receipt of $10.00 give each owner of such nursery or nurseries, a certificate to the facts, provided that it shall require but one day or part of one day to make such inspection, and for each additional day or fraction thereof required to complete the inspection, $5.00 shall be charged therefor, and collected before the certificate is granted. In addition to the above fee nurserymen must furnish transportation to and from railway station, and facilities for reaching their growing stock, to such person or assistants selected by the Board to make said inspection. This certificate shall be void after August 15th, of the year following. A duplicate of each certificate, together with a statement of amount received therefor, shall be filed by said person or assistants with the Secretary of the Board, within ten days of its issue, and neglect to file such duplicate of certificate and statement shall be treated as a misdemeanor. If any dangerously injurious insects or infectious diseases are found on the premises of any nursery, or nursery stock, the Board may order and enforce such treatment of said nursery stock, as they may deem sufficient in addition to a thorough inspection before granting a certificate, and the same per diem shall be charged for overseeing treatment as for nursery inspection. Whenever a nurseryman or any other person shall ship or deliver within this state, except for scientific purposes, trees, shrubs, plants or other nursery stock, he shall place upon each car load, box, bale or package a copy of a certificate, the original of which is signed by a state or government inspector, stating that stock has been inspected and has been found apparently free from dangerous insects and dangerously contagious tree, shrub, vine and plant diseases. The illegal use of said certificate...
by changing, defacing or placing it on uninspected stock, or using the same after
date of expiration or revocation, shall render the owner or shipper liable to the
penalty prescribed for a violation of this act.

No person growing for sale any trees, shrubs, vines, or plants, shall deliver
the same without applying to the Board for the certificate provided for in this act.

Provided, however, that existing certificates, issued by the Entomologist of
the Ohio Agricultural Experiment Station, shall be held to be valid until June
1, 1900.

Section 3. It shall further be the duty of said Board through their assistants
to cause the examination of all orchards, gardens, and other premises, either
public or private, which they shall have reason to suppose to be infested or in­
fected with any dangerously injurious insects or infectious diseases, liable to
spread or to be conveyed to other premises, and for this purpose, said Board
and their assistants are authorized, during reasonable business hours, to enter
into or upon any farm, orchard, nursery, garden, storehouse or other building
or place used for growing, storing, packing or sale of nursery and other horti­
cultural products. If said Board or their assistants shall find on inspection as
aforesaid that any nursery, orchard, garden, or other property or place is in­
fested or infected with such dangerously injurious or infectious diseases liable to
spread or to be conveyed to other premises, to the serious injury of the property
thereon, the same shall be declared a public nuisance, and they shall notify, in
writing, the owner or persons in charge of such infested or infected property,
and shall direct him, within a time and in a manner prescribed in such notice,
to use such measures as shall prevent the conveyance or spread of such insects
or disease to the property of others and such infested or infected property must
not be removed from the premises after the owner or person in charge of the
same shall have been notified as aforesaid, without the written permission of said
Board or their assistants. If the person so notified shall refuse or neglect to

treat and disinfect said premises or property in the manner and within the time
prescribed, it shall be the duty of the Board to cause such premises or property
to be so treated, and they shall certify to the owner or person in charge of such
premises one-half of the cost of the treatment. If said sum is not paid to them
within sixty days thereafter, the same may be recovered, together with the costs
of action, before any court in the state having competent jurisdiction. Any tree,
plant, shrub, etc., which may in the judgment of the Board or their assistants,
be so badly infested, or infected, as to render expense of treatment unjustifiable,
shall be declared a public nuisance and may be destroyed by them or their as­
sistants without liability for compensation to the owner thereof. Right of appeal
from the decision or requirements of the assistants may be made to the said
board, within three days after notice of such decision or requirements has been
served, and the decision of the Board shall be final.

Section 4. Every package of trees, shrubs, vines or plants shipped into this
state, from any other state, territory, country or province, shall be plainly la­
beled on the outside with the name of the consignor, and consignee, and a cer­
tificate showing that the contents have been inspected by a state or government
officer, and that the trees, shrubs, vines or plants therein contained appear to
be free from all dangerous insects and dangerously infectious diseases. If any
trees, shrubs, vines, or plants are shipped into this state without such certificate
plainly fixed on the outside of the package, box or car containing the same, the
facts must be reported within twenty-four hours to the said Board by the
railroad, express or steamboat company, or by other person or persons carry­
ing the same, and it shall be unlawful to deliver any such property until it has
been examined by the Board or their assistants and by them certified to be ap­
parently free from dangerous insects or dangerously contagious diseases. Any
agent or any common carrier, or persons carrying such property as aforesaid, who shall fail to give such notice as hereby required shall be deemed guilty of a violation of this act. When nursery stock is shipped into this state accompanied by a certificate as herein provided, it shall be held prima facie evidence of the facts therein stated. But the Board by themselves or their assistants, when they have reason to believe that any such stock is infested or infected as heretofore described shall be authorized to inspect the same. In case such stock is found to be infested or infected by any of the aforesaid insects or plant diseases, such stock shall be held subject to order of shipper not to exceed ten days before being declared a public nuisance and destroyed. All expenses incurred by the Board or their assistants, in carrying out the provisions of this act shall be paid out of the funds appropriated by this act.

SECTION 5. Any person violating or neglecting to carry out the provisions of this act, or offering any hindrance to the carrying out of this act shall be adjudged guilty of a misdemeanor, and upon conviction before any justice of the peace, shall be fined not less than ten dollars and not more than one hundred dollars for each and every offense, together with all the costs of prosecution, and shall stand committed until the same is paid. It shall be the duty of the County Prosecuting attorney to prosecute all violations of this act and all amounts so recovered shall be paid over to the State Treasury.

SECTION 6. The Board shall make an annual report to the Governor of the State, a copy of which shall be sent to the Ohio State Horticultural Society at its annual meetings, showing the number of nurseries inspected, the number of certificates issued, the number of trees treated or disinfected by them or their assistants, the kinds and amount of property destroyed by them in pursuance of this act and such other facts concerning the operation of their office, under this act, as the said Board may deem necessary.

SECTION 7. The provisions of this act shall not apply to florist's green house plants, bulbs, flowers and cuttings, commonly known as green house stock.

SECTION 8. The said assistants shall pay over to said Board of Control, all funds coming into their hands under the provisions of Section 2, of this act, with an itemized statement of the sources whence received, which moneys shall be used by said Board to aid in carrying into effect the provisions of this act, and the amount so received shall be stated in the annual report of said Board. The said assistants shall also make to said Board an itemized statement of their expenses and the amounts paid for assistants employed in prosecuting the work under this act, which, when certified by the said Board, shall be paid out of the State Treasury upon the warrant of the Auditor of State.

SECTION 9. There is hereby appropriated to the said Board of Control for the purpose of carrying out the provisions of this act the sum of ($15,000.00) fifteen thousand dollars for the years of 1900 and 1901, or so much thereof as may be necessary. The Auditor of State is hereby authorized to draw his warrants upon the State Treasurer against the sum herein appropriated upon the presentation of proper vouchers and the State Treasurer shall pay the same out of any funds in the public treasury, not otherwise appropriated.

SECTION 10. An act known as “House Bill 580” [“House Bill 580”], passed October 18, 1896 [“April 18, 1896”], entitled “Ohio Black-knot Yellows and San Jose Scale Law” is hereby repealed.

SECTION 11. Whereas an emergency exists, therefore this act shall take effect and be in force on and after its passage.

(Signed) A. G. REYNOLDS, Speaker of the House of Representatives, JNO. A. CALDWELL, President of the Senate.

Passed April 14, 1900.
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# APPENDIX B.

## BULLETINS

*of the*

**Ohio Agricultural Experiment Station.**

1899-1900.

## CONTENTS.

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METEOROLOGICAL SUMMARY—PRESS BULLETINS—INDEX.

METEOROLOGICAL SUMMARY FOR 1899.

BY C. A. PATTON.

EXPLANATION OF TABLES.

The following tables contain statistics of temperature, rainfall, etc., for the year, and are compiled from data obtained by daily observations. T stands for “trace”—less than .01 inch of rainfall. Temperature is given in degrees Fahrenheit.

Table I shows the daily rainfall at the Station during the year in inches and hundredths.

Table II shows the daily mean temperature for each day of 1899, the monthly mean temperature with the twelve years' average.

Table III gives a comparison of the monthly mean temperature and rainfall for the Station, with the twelve years' average for the same.

Table IV gives a comparison of the monthly mean temperature and rainfall for the State, with the twelve years' average for the same.

Table V gives the monthly mean temperature and rainfall for the Station and State for 1899 with the twelve years' average for the same.

Table VI contains the mean temperature, the highest and lowest temperatures, with the range of temperatures for each month; the number of clear, fair, and cloudy days; the rainfall and prevailing direction of wind, for the Experiment Station 1899.

Table VII contains the principal points of interest on temperature, state of weather and rainfall for the Station during the year and a grand summary for twelve years.
Table VIII contains the principal points of interest on temperature, state of weather and rainfall for the State during the year and a grand summary for seventeen years.

The statistics for the State and for this Station previous to 1893 are compiled from the publications of the Ohio Meteorological Bureau and State Weather Service, the twelve-year average being computed from the observations of the Wooster Station of the Ohio Meteorological bureau, now located on the grounds of the Experiment Station, one mile south of Wooster.

NOTES ON THE WEATHER AT THE STATION, 1899 — SUMMARY BY MONTHS.

JANUARY.

The mean temperature for January was 26.6°, which is .4° below the Station average for January. The highest temperature, 55°, occurred on 4th, 14th and 23rd. The lowest, —6°, on the 31st. Cloudy weather prevailed, rain or snow fell on ten days. The total precipitation was 3.29 inches, which is .04 inch below the Station average for January. The prevailing wind was south.

FEBRUARY.

The mean temperature for February was 21.3°, which is 6.6° below the Station average for February. The highest temperature, 57°, occurred on the 26th, the lowest, —21°, on the 10th. Cloudy weather prevailed, rain or snow fell on nine days. The total precipitation was 1.64 inches, which is 1.53 inches below the Station average for February. The prevailing wind was south and southwest.

MARCH.

The mean temperature for March was 35°, which is .6° below Station average for March. The highest temperature, 67°, occurred on the 11th, the lowest, 9°, on the 8th. Cloudy weather prevailed, rain or snow fell on seventeen days. The total precipitation was 3.95 inches, which is .62 inch above the Station average for March. The prevailing wind was northwest.

APRIL.

The mean temperature for April was 52.1°, which is 3.2° above the Station average for April. The highest temperature, 86°, occurred on the 30th, the lowest, 21°, on the 2nd and 5th. Clear weather prevailed, rain or snow fell on seven days. The total precipitation was 1.28 inches, which is 1.22 inches below the Station average for April. The prevailing wind was southeast.

MAY.

The mean temperature for May was 60°, which is 2.4° above the Station average for May. The highest temperature, 86°, occurred on
the 16th, the lowest, 30°, on the 21st. Fair weather prevailed, rain fell on eleven days, the total rainfall was 4.42 inches, which is .07 inch above the Station average for May. The prevailing wind was south.

JUNE.

The mean temperature for June was 69.4°, which is 1.4° above the Station average for June. The highest temperature, 92°, occurred on the 6th, the lowest, 40°, on the 17th. Clear weather prevailed, rain fell on eleven days. The total rainfall was 1.95 inches which is 2.07 inches below the Station average for June. The prevailing wind was south.

JULY.

The mean temperature for July was 70°, which is .7° below the Station average for July. The highest temperature, 94°, occurred on the 24th, the lowest, 45°, on the 10th. Fair weather prevailed, rain fell on eleven days. The total rainfall was 3.73 inches, which is .38 inch below the Station average for July. The prevailing wind was south.

AUGUST.

The mean temperature for August was 71°, which is 2.3° above the Station average for August. The highest temperature, 95°, occurred on the 20th, the lowest, 39°, on the 7th. Clear weather prevailed, rain fell on three days. The total rainfall was 0.53 inches, which is 2.13 inches below the Station average for August. The prevailing wind was south-east.

SEPTEMBER.

The mean temperature for September was 61.6°, which is 1.5° below the Station average for September. The highest, 94°, occurred on the 3rd, the lowest, 32°, on the 30th. Fair weather prevailed, rain fell on thirteen days. The total rainfall was 5.56 inches, which is 2.38 inches above the Station average for September. The prevailing wind was northwest.

OCTOBER.

The mean temperature for October was 55°, which is 5.3° above the Station average for October. The highest temperature, 92°, occurred on the 24th, the lowest, 22°, on the 30th. Clear weather prevailed, rain or snow fell on eight days. The total precipitation was 2.21 inches, which is .34 inch below the average for November. The prevailing wind was south.

NOVEMBER.

The mean temperature for November was 43.2°, which is 3.4° above the Station average for November. The highest temperature, 66°, occurred on the 18th, the lowest, 22°, on the 27th. Fair weather prevailed, rain or snow fell on seven days. The total precipitation was 1.59
inches, which is 1.85 inches below the Station average for November. The prevailing wind was southwest.

DECEMBER.

The mean temperature for December was 29°, which is 2.8° below the Station average for December. The highest temperature, 63°, occurred on the 12th, the lowest, —2°, on the 16th. Cloudy weather prevailed, rain or snow fell on nine days. The total precipitation was 2.78 inches, which is .04 inch above the Station average for December. The prevailing wind was west.
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**Monthly mean**: 28.6 23.3 35.0 62.1 69.0 69.4 70.9 71.0 61.6 55.0 43.2 29.0

**Twelve-year average**: 27.0 27.9 35.6 48.9 57.6 68.0 70.7 68.7 63.1 49.7 39.8 31.8
**METEOROLOGICAL SUMMARY.**

**METEOROLOGY — TABLE III.**

MONTHLY MEAN TEMPERATURE AND RAINFALL FOR TWELVE YEARS AT WOOSTER.

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*From Canton record.*
## Monthly Mean Temperature and Rainfall for Twelve Years for the State

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**Averages:** 28.9 29.9 37.8 50.8 59.4 70.7 73.2 71.1 65.0 61.9 41.1 33.4 51.2

## Rainfall — Inches.

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<th>June</th>
<th>July</th>
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**Averages:** 3.09 2.95 3.49 2.71 3.80 3.79 3.71 3.81 2.66 2.30 3.41 2.52 3.14
## METEOROLOGY—TABLE V.

**MEAN TEMPERATURE AND RAINFALL FOR THE STATION AND STATE, 1899, AND FOR TWELVE YEARS.**

*Temperature in degrees Fahrenheit. Rainfall in inches.*

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<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>Year</th>
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<td>1.95</td>
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### MÉTÉOROLOGY—TABLE VI.

**SUMMARY BY MONTHS FOR 1899.**

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<th>Prevailing wind</th>
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<th>1891.</th>
<th>1892.</th>
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<td>118.0°</td>
<td>104.0°</td>
<td>105.0°</td>
<td>107.0°</td>
</tr>
<tr>
<td>Mean daily range of temperature</td>
<td>18.7°</td>
<td>18.9°</td>
<td>21.0°</td>
<td>19.0°</td>
<td>20.2°</td>
<td>22.0°</td>
<td>22.0°</td>
</tr>
<tr>
<td>Greatest daily range of temperature</td>
<td>42.0°</td>
<td>41.0°</td>
<td>42.0°</td>
<td>46.0°</td>
<td>45.0°</td>
<td>45.0°</td>
<td></td>
</tr>
<tr>
<td>Least daily range of temperature</td>
<td>2.0</td>
<td>4.5°</td>
<td>4.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Number of clear days</td>
<td>125</td>
<td>109</td>
<td>116</td>
<td>116</td>
<td>96</td>
<td>127</td>
<td>127</td>
</tr>
<tr>
<td>Number of fair days</td>
<td>103</td>
<td>119</td>
<td>110</td>
<td>123</td>
<td>164</td>
<td>154</td>
<td>154</td>
</tr>
<tr>
<td>Number of cloudy days</td>
<td>137</td>
<td>137</td>
<td>125</td>
<td>98</td>
<td>105</td>
<td>84</td>
<td>84</td>
</tr>
<tr>
<td>Number of days rain fell</td>
<td>119</td>
<td>149</td>
<td>119</td>
<td>119</td>
<td>429</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Total rainfall</td>
<td>38.23 inches.</td>
<td>39.87 inches.</td>
<td>54.21 inches.</td>
<td>38.36 inches.</td>
<td>41.46 inches.</td>
<td>40.61 inches.</td>
<td>30.60 inches.</td>
</tr>
<tr>
<td>Greatest monthly rainfall</td>
<td>4.64 inches.</td>
<td>6.73 in.—July.</td>
<td>7.45 in.—Oct.</td>
<td>4.26 in.—June.</td>
<td>7.89 in.—June.</td>
<td>6.33 in.—Feb.</td>
<td>4.41 in.—May.</td>
</tr>
<tr>
<td>Least monthly rainfall</td>
<td>1.39 inches.</td>
<td>1.36 in.—Oct.</td>
<td>1.74 in.—Dec.</td>
<td>1.05 in.—April.</td>
<td>1.37 in.—Oct.</td>
<td>1.38 in.—July.</td>
<td>0.76 in.—Aug.</td>
</tr>
</tbody>
</table>

| Prevailing direction of wind | S | S | S | S | S | S | S |

## METEOROLOGY — TABLE VII — Concluded.

**SUMMARY BY YEARS AND GRAND SUMMARY FOR TWELVE YEARS AT WOOSTER.**

<table>
<thead>
<tr>
<th>Year</th>
<th>1895 Experiment Station</th>
<th>1896 Experiment Station</th>
<th>1897 Experiment Station</th>
<th>1898 Experiment Station</th>
<th>1899 Experiment Station</th>
<th>Summary for twelve years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean temperature</td>
<td>47.8°</td>
<td>49.6°</td>
<td>49.4°</td>
<td>50.4°</td>
<td>49.5°</td>
<td>49.1°</td>
</tr>
<tr>
<td>Highest temperature</td>
<td>98.0° June 4</td>
<td>93.0° Aug. 9</td>
<td>96.0°</td>
<td>96.0° July 3</td>
<td>95.0° Aug. 20</td>
<td>92.5° Aug. 8, 1901</td>
</tr>
<tr>
<td>Range of temperature</td>
<td>104.0°</td>
<td>99.0°</td>
<td>114.0°</td>
<td>105.0°</td>
<td>116.0°</td>
<td>120.0°</td>
</tr>
<tr>
<td>Mean daily range of temperature</td>
<td>21.8°</td>
<td>19.0°</td>
<td>21.5°</td>
<td>20.3°</td>
<td>22.9°</td>
<td>20.5°</td>
</tr>
<tr>
<td>Greatest daily range of temperature</td>
<td>55.0° Oct. 6</td>
<td>43.0° May 3</td>
<td>49.0° Oct. 5</td>
<td>50.0° Nov. 14</td>
<td>52.0° Oct. 24</td>
<td>55.0° Oct. 6, 1895</td>
</tr>
<tr>
<td>Least daily range of temperature</td>
<td>1.0° Nov. 27</td>
<td>3.0°</td>
<td>0.0° Feb. 6</td>
<td>5.0°</td>
<td>11.0° Feb. 18</td>
<td>0.0° Feb. 6, 1897</td>
</tr>
<tr>
<td>Number of clear days</td>
<td>125</td>
<td>130</td>
<td>124</td>
<td>133</td>
<td>126</td>
<td>120</td>
</tr>
<tr>
<td>Number of fair days</td>
<td>117</td>
<td>106</td>
<td>123</td>
<td>104</td>
<td>114</td>
<td>121</td>
</tr>
<tr>
<td>Number of cloudy days</td>
<td>123</td>
<td>130</td>
<td>115</td>
<td>128</td>
<td>125</td>
<td>118</td>
</tr>
<tr>
<td>Number of days rain fell</td>
<td>102</td>
<td>134</td>
<td>128</td>
<td>134</td>
<td>116</td>
<td>125</td>
</tr>
<tr>
<td>Total rainfall</td>
<td>31.45 inches</td>
<td>38.47 inches</td>
<td>36.16 inches</td>
<td>47.85 inches</td>
<td>32.93 inches</td>
<td>39.18 inches</td>
</tr>
<tr>
<td>Least monthly rainfall</td>
<td>1.00 in. Feb.</td>
<td>0.71 in. Oct.</td>
<td>0.29 in. Sept.</td>
<td>2.15 in. Sept.</td>
<td>0.53 in. Aug.</td>
<td>0.29 in. Sept., 1897</td>
</tr>
<tr>
<td>Prevailing direction of wind</td>
<td>N.</td>
<td>S. W.</td>
<td>N. W.</td>
<td>N. — S. W.</td>
<td>S.</td>
<td></td>
</tr>
</tbody>
</table>

### METEOROLOGY—TABLE VIII.

**Summary by Years and Grand Summary for Seventeen Years for the State.**

<table>
<thead>
<tr>
<th>For the State</th>
<th>1883</th>
<th>1884</th>
<th>1885</th>
<th>1886</th>
<th>1887</th>
<th>1888</th>
<th>1889</th>
<th>1890</th>
<th>1891</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean temperature</td>
<td>49.4°</td>
<td>50.6°</td>
<td>48.°</td>
<td>49.6°</td>
<td>51.4°</td>
<td>49.5°</td>
<td>51.1°</td>
<td>52.4°</td>
<td>52.°</td>
</tr>
<tr>
<td>Range of temperature</td>
<td>115.5°</td>
<td>133.°</td>
<td>132.°</td>
<td>120.1°</td>
<td>129.°</td>
<td>117.°</td>
<td>113.°</td>
<td>107.1°</td>
<td>106.°</td>
</tr>
<tr>
<td>Greatest daily range of temperature</td>
<td>143° Mar. 15</td>
<td>155.° Sept. 5</td>
<td>158.5° Dec.</td>
<td>55.2° Jan. 30</td>
<td>57.° Dec. 11</td>
<td>57.° April 11</td>
<td>50.°</td>
<td>53.° Mar. 30</td>
<td>49.5° Apr. 11</td>
</tr>
<tr>
<td>Average number of days rain fell</td>
<td>146</td>
<td>145</td>
<td>148</td>
<td>131</td>
<td>121</td>
<td>125</td>
<td>115</td>
<td>140</td>
<td>120</td>
</tr>
<tr>
<td>Mean yearly rainfall</td>
<td>44.98 inches</td>
<td>40.19 inches</td>
<td>30.08 inches</td>
<td>37.71 inches</td>
<td>33.60 inches</td>
<td>39.64 inches</td>
<td>39.58 inches</td>
<td>50.33 inches</td>
<td>38.61 inches</td>
</tr>
<tr>
<td>Mean daily rainfall</td>
<td>.123 inch</td>
<td>.110 inch</td>
<td>.104 inch</td>
<td>.001 inch</td>
<td>.002 inch</td>
<td>.108 inch</td>
<td>.092 inch</td>
<td>.138 inch</td>
<td>.110 inch</td>
</tr>
<tr>
<td>Prevailing wind</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1892</th>
<th>1893</th>
<th>1894</th>
<th>1895</th>
<th>1896</th>
<th>1897</th>
<th>1898</th>
<th>1899</th>
<th>*</th>
<th>Summary for seventeen years.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean temperature</td>
<td>50.°</td>
<td>50.1°</td>
<td>52.4°</td>
<td>49.9°</td>
<td>51.8°</td>
<td>50.6°</td>
<td>52.°</td>
<td>51.5°</td>
<td>50.7°</td>
</tr>
<tr>
<td>Range of temperature</td>
<td>128.°</td>
<td>126.°</td>
<td>132.°</td>
<td>130.°</td>
<td>121.°</td>
<td>140.°</td>
<td>125.°</td>
<td>144.°</td>
<td>152.°</td>
</tr>
<tr>
<td>Average number of days rain fell</td>
<td>121</td>
<td>113</td>
<td>100</td>
<td>89</td>
<td>124</td>
<td>110</td>
<td>121</td>
<td>107</td>
<td>120</td>
</tr>
<tr>
<td>Mean yearly rainfall</td>
<td>37.16 inches</td>
<td>39.63 inches</td>
<td>29.75 inches</td>
<td>28.46 inches</td>
<td>39.58 inches</td>
<td>38.54 inches</td>
<td>34.51 inches</td>
<td>37.88 inches</td>
<td>34.51 inches</td>
</tr>
<tr>
<td>Mean daily rainfall</td>
<td>.100 inch</td>
<td>.110 inch</td>
<td>.068 inch</td>
<td>.070 inch</td>
<td>.120 inch</td>
<td>.100 inch</td>
<td>.119 inch</td>
<td>.094 inch</td>
<td>.104 inch</td>
</tr>
<tr>
<td>Prevailing wind</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
<td>S. W.</td>
</tr>
</tbody>
</table>

*1 Jan. 15, Mar. 29. *2 Feb. 9, 10, 11.
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PRESS BULLETINS.

Eighteen press bulletins have been published during the year, several of which have been later incorporated in the general series. Those not thus incorporated are republished here.

No. 194, August 7, 1899: NITROGEN AND POTASH IN FERTILIZER. (Incorporated in Bulletin 110.)

No. 195, August 15, 1899: STOMACH WORMS IN SHEEP. (Incorporated in Bulletin 117.)

No. 196, August 14, 1899: COMPARISON OF VARIETIES OF WHEAT. (Incorporated in Bulletin 118.)

No. 197, August 21, 1899: STOMACH WORMS IN SHEEP. SUCCESSFUL TREATMENT.

The letters which are being received almost daily at the Ohio Experiment Station, complaining of the ravages of the sheep stomach worm, indicate that this parasite is unusually abundant this season, and it is believed that the following experience of Mr. J. E. Wing in the use of the Julien benzine treatment, described in Press Bulletin 195 of this Station, may be of very great value to sheep owners.

The treatment, it will be observed, is extremely simple and inexpensive, and farmers whose lambs are unthrifty or dying are urged to follow Mr. Wing's plan of determining, by post mortem examination, whether a lamb which died or of one which has been killed for the purpose, whether the trouble is due to this parasite.

The parasite is to be looked for in the fourth stomach, and is a minute, white, thread-like worm, about three-fourths of an inch in length.

REPORT OF MR. WING.

About August first ('98) a car-load of lambs was received here from the Chicago market. They were not all from one grower but evidently had come from several sources, some being range lambs, others farm grown. Some were grade Shropshires, others were white-faced and of doubtful origin, favoring the Mexican type. The lambs were thin and some beginning to scour. Soon after reaching here they became worse and the scouring and emaciation progressed rapidly. About 45 died before my attention was called to the sheep.

At once I diagnosed them as being affected with stomach worms, (*Strongyulus contortus*), and as soon as another died we made a post mortem examination which proved the correctness of the diagnosis, for the worms were present in the fourth stomach in thousands. It was simply a writhing mass of worms, some even twined together in balls as large as marbles. The lamb was apparently free from other parasites.

The treatment began immediately, gasoline being administered to the entire lot, whether seeming sick or well. It took about one minute to dose each lamb, three men working. The dose given was two teaspoonfuls of common gasoline with four ounces of sweet milk, well shaken together to form an emulsion. Each dose was mixed separately.

Of the 240 lambs treated one died, apparently from the effect of the medicine. Most of them seemed to mind it very little and soon began to eat.
They were treated three times at intervals of 24 hours; each time being given two teaspoonfuls of gasoline in four ounces of milk. After the first dose they seemed to improve, the scouring checked and the movements became more lively and the eyes brighter.

After four days we selected two of the worst cases for killing and made careful post-mortem examination of them. Before killing it was noted that the dung had become quite natural in color and consistency. The skin was also becoming slightly pinkish in hue, although time enough had not elapsed to allow complete recovery from the anemic condition that accompanies worm infection.

The first lamb killed was very thin and had less than the normal amount of blood, but that seemed of nearly normal quality. Examination of the lungs showed a small area of congestion, accounting for the cough that had been somewhat noticeable before treatment. This lung affection seems to usually accompany infection from stomach worm. There can be no direct connection, but doubtless the weakening of the system invites invasion of other disease germs. No trace of the verminous parasites of the lungs was found, so that it is believed that the affection was more in the nature of congestion from a light attack of pneumonia or kindred disorder. The liver was normal, possibly larger in proportion than the other organs. The kidneys were small, one almost wasted away, but no disease was apparent, the atrophy seeming more in the nature of a dwindling because of the general lowness of the health of the animal.

The intestines were healthy, no nodular disease apparent, no tape-worms present. In the colon were found a few worms that at first were believed not to be stomach worms; they were slightly thicker than natural specimens and white in color, but further examination under the microscope seemed to decide that they were really *Strongylus contortus*, quite out of place and perhaps not destined to live very long.

Above this place no worms of any sort were found. The fourth stomach in particular was entirely free from them and while not quite in a normal condition, yet seemed nearly so.

I wish to emphasize the fact that not one stomach worm was found in the usual lodging place of the pest; that the few found in the colon were many feet away from their natural living place and not apparently in good health, and that it is probable that they were driven there by the fumes of the gasoline and would eventually have passed out and perished.

The digestion of this lamb had so improved and its organs were in such comparatively good condition that there is no reason to suppose that it would not have become fat, although it is hardly probable that it would have reached the development that might have been expected had this invasion not been suffered.

The second lamb dissected revealed a similar condition, except that the kidneys were normal and the lungs nearly so; no stomach worms were found in any part, but a very few nodules were seen on the intestines. It is improbable that there were enough of them to have interfered much with its fattening. This lamb had also resumed a normal condition in regard to the contents of the intestines and was evidently gaining fast.

The testimony of the men who care for the lambs is that since having the gasoline they seem like a different lot of sheep entirely. They eat hungrily, are lively in their movements, do not scour, and have all the appearance of beginning to thrive.

Excepting the one that died none have been injured in the least by the treatment, so far as can be observed.

The dissection was performed by Dr. E. R. Stockwell, a skillful veterinarian.

*Mechanisburg, O.*

*Joseph E. Wing.*
No. 198, August 21, 1899: Varieties of Wheat and Home-mixed Fertilizers.

(1) A Seven-year Comparison of Varieties of Wheat. (Incorporated in Bulletin 118.)

(2) A Comparison of Factory-mixed and Home-mixed Fertilizers.

For three years the Ohio Experiment Station has been carrying on a field test in which four different brands of factory-mixed fertilizers have been compared with mixtures of slaughterhouse tankage, acid phosphate and muriate of potash, made up by the Station so as to carry as nearly as possible the same percentage of nitrogen, phosphoric acid and potash as those claimed for the factory mixtures. The plan of this test is to grow corn, wheat and clover in rotation, the fertilizers being applied to the corn and wheat. The land is divided into three sections, in order that each crop may be grown each year. In starting the test in 1897 two sections were planted to corn, thus duplicating the test that year. One of these was sown to wheat in the fall and one to Soy beans in the spring, so that the crops of 1898 were wheat, corn and Soy beans. Clover was sown on the wheat in 1898 and has been harvested this year. The wheat sown for this year's crop, however, was destroyed by winter-killing, and was plowed up and sown to oats. The crops thus far harvested, therefore, have been three of corn and one each of wheat, oats, Soy bean hay and clover hay. Following are the average results obtained:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Average Yield per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From 4 factory brands</td>
</tr>
<tr>
<td>Corn, 3 crops</td>
<td>bush., 43.94</td>
</tr>
<tr>
<td>Wheat, 1 crop</td>
<td>bush., 9.94</td>
</tr>
<tr>
<td>Oats, 1 crop</td>
<td>bush., 36.52</td>
</tr>
<tr>
<td>Soy beans, 1 crop</td>
<td>lbs., 5,450</td>
</tr>
<tr>
<td>Clover hay, 1 crop</td>
<td>lbs., 1,620</td>
</tr>
</tbody>
</table>

It will be seen that the spring crops show but little difference from the two kinds of fertilizers, but the wheat and clover show a marked preference for the home mixture.

Apparently the chemical treatment, by which it is claimed that the nitrogen of the factory fertilizers is made more available, results in making it so readily soluble that it is washed out of the soil before the wheat and clover can make use of it.


No. 200, November 6, 1899: Fall Treatment of Insect Pests.

(1) Fall Treatment of Wheat Fields Where Crop Has Been Destroyed by Hessian Fly.

Reports are coming to the Ohio Agricultural Experiment Station, complaining of serious ravages of the Hessian fly in wheat fields. In many cases, it is being claimed, that among the early sown fields hardly a plant has escaped attack. The question is frequently asked whether it will pay to resow at this late date. In all cases where the first sowing has been destroyed by the fly, the ground should be plowed before sowing. In fact, it may be said that if fields have been ravaged past all possibility of securing a profitable crop next year, such fields should be plowed this fall, or very early next spring, preferably the former. It is probably too late, now, to risk resowing this fall, but it must be understood that, if left above ground, the fly will develop in these fields next spring and go to other fields to work its ravages.
As to how seriously a field must be infested to warrant plowing under this fall, that is a matter that each farmer must settle for himself. If the soil is rich and the weather during fall and spring very favorable for plant growth, the grain will yet send up a second growth of tillers this fall, which, if they withstand the winter, with a very favorable spring will supply enough straw to produce a part of a crop. But the risk is great, and no one, not on the ground, can safely advise in the matter.

Late sown wheat is escaping, very largely, the fall attacks of the fly, but the close proximity to a seriously injured field will endanger even a late sown field to attack next spring, unless the early sown field is plowed under before the adult flies appear.

(2) FALL MEASURES FOR PREVENTION OF CHINCH BUG ATTACK.

In western and southern Ohio, chinch bugs winter largely among matted grass, fallen leaves and other rubbish. They also winter over in great numbers in shocks of corn fodder, left out in fields over winter, and outbreaks in wheat fields, even where sown among corn, have again and again been traced to such shocks standing out over winter among the wheat. Shocks of corn, or fodder, should be drawn in from off the wheat fields this fall. When possible to do so, all matted grass, fallen leaves, or other rubbish bordering on wheat fields, should be burned between this date and May 1st next.

In the timothy meadows of northern and northeastern Ohio, where the timothy grass has this year been destroyed, examination should be made about the roots of the grass along the margins of such areas of destruction. If chinch bugs are found, they can be prevented from doing further injury, next spring by plowing the ground quite deeply this fall, which will place them so far below the surface that they will be destroyed, and thus prevented from continuing their ravages next year. In timothy meadows the pest must be looked for just below the surface of the ground about the bulbous roots of the grass.

(3) FALL AND WINTER WORK AGAINST INJURIOUS INSECTS.

Many of our most destructive insects pass the winter either among matted prostrate grass, among fallen leaves or especially along osage hedges, lanes and fence corners. Wherever such places can be burned over in late fall, winter or early spring, the effect will be to destroy many of these. Instead of having our annual clearing up in May, as many do who clear up their premises at all, this should be done during the seasons above mentioned, as by May many of the destructive insects have left their winter quarters and are beyond reach.

In the orchard, the falling of the leaves will reveal cocoons and even insects themselves upon the trees that can not be easily detected while the foliage is still hanging to these trees. Many insects pass the winter within a folded leaf that is attached to the twig to prevent it from dropping off, and in this way deceive the eye of the orchardist. It will pay to go over the orchard and remove all of the cocoons and dried leaves still clinging to the trees.

No. 201, November 13, 1899: FALL PLOWING VS. WHITE GRUBS AND WIRE WORMS.

(1) FALL MEASURES FOR PREVENTION OF THE RAVAGES OF THE WHITE GRUB ANOTHER YEAR.

What is commonly known as the white grub, or grub worm, is the young of the brown May beetle, or June bug, which occurs in such abundance in late May and June, and is not, as is often suggested, the young of the common Tumble bug. These May beetles deposit their eggs in June, usually about the roots of the grass. These eggs hatch in about a month, and the young grubs, though very
small, even immediately after hatching appear to be larger than the egg. They feed upon the roots of grass and by the first of November are about half an inch in length, having all the appearance of the full grown grub excepting in the matter of size. With the coming of cold weather, or perhaps more properly speaking, in late autumn, they go deeper into the ground, sometimes a foot or even more, and make for themselves small earthen cells by packing the earth more densely about their bodies, and in these cells pass the winter, coming upward in the spring, feeding upon the grass roots throughout the entire summer, and at the end of the second autumn they have reached about two-thirds of their ultimate dimensions. They now burrow into the ground, and again pass the winter in an earthen cell, coming to the surface again in the spring and feeding until the latter part of May, in this latitude, when they abandon the grass roots, burrow down into the ground, and again make an earthen cell within which they transform to the adult beetle.

It is possible that an occasional individual may appear above ground in the fall, but the mass of them pass the winter in this condition and come to the surface as adults the following May. Thus it will be seen that they have fed during a portion of three years. The young of the insect is, by nature, a grass feeder, and therefore, they are always more abundant in fields that have remained in grass for a long series of years. The major portion of their injury in cultivated fields occurs the first summer immediately following a series of grass crops.

From what has been stated of the life history of these pests the reason for this will be readily understood. Now, the insect cannot be kept off grass lands, nor is there any practical way of reaching these grubs under ground, and as they never get to the surface, their control by topical application is not only difficult but practically impossible. As yet, we have found but one practical way of dealing with these pests, and, while that is not infallible, it seems to prove effective in the majority of cases. This consists in the fall plowing of grass lands as a preparation for the grain crop the following year. While early fall plowing is known to be often effective, it is quite probable that late fall or winter plowing is much more dependable. The reason for this is that after the grubs have constructed their winter quarters they are probably too stupid to construct others. If then the ground is broken, the grubs within their winter quarters are either thrown up to the action of continued freezing and thawing, or, if not thrown up, are exposed to the more direct effects of rain and frost, and thus killed by the winter weather. That this method is effective in the majority of cases there can be hardly a doubt. During the present year the Ohio Agricultural Experiment Station has been in receipt of a number of letters stating that where portion of a field which, for some years, had been devoted to meadow or pasture, was plowed in the fall, and the remainder in the spring, the fall plowed portion escaped injury during the past summer, while the spring plowed portion suffered very severely.

A concensus of all the evidence obtained up to date, indicates that fall plowing is the most reliable and profitable method, known at present, for preventing the ravages of the white grub.

(2) FALL TREATMENT OF GRASS LANDS TO PREVENT THE RAVAGES OF WIRE WORMS.

The parent of the wire worm is an entirely different insect from that of the white grub. In this case, the fully developed insect being the slender, brownish beetles, known as snapping beetles on account of their habit, when placed upon their backs, of throwing themselves into the air with a slight snap and turning over and alighting upon their feet. Their life history is very much the same as that of the white grub. These are also grass feeding insects, but while the white grub is more usually found upon higher lands, which the female seems
to select for a place to deposit her eggs, the snapping beetles, or skip-jacks, seem to prefer the lower, cooler and damper lands. It is for this reason that the lower lands are more often affected by this pest, and it frequently occurs that the patches of black soil among clay will be more especially subject to infestation. While it would seem that the harder and more compact body of the wire worm would be less susceptible to climatic influences, nevertheless, we find no more practical prevention of the occurrence of this pest than the fall plowing of sod lands, and, as with the white grub, it is quite probable that late fall or winter plowing will be preferable. While this does not, in all cases, insure absolute freedom from the attacks of these insects, there seems a stronger probability of their ravages another year being prevented in this way than by any other known to us.


No. 203, February 26, 1900: Free Distribution of Improved Varieties of Sorghum.

The United States Department of Agriculture has, for a number of years, been conducting experiments in the improvement of varieties of sorghum. The result of this work is a considerable increase in the sucrose content of several varieties, which the Department is now offering for free distribution to the farmers of the country through the medium of the State Agricultural Experiment Stations. The Ohio Station, at Wooster, will receive a consignment of this seed, which will be distributed free to farmers within the state who wish to improve the quality of their sorghum cane.

Since the quantity of seed is limited and since the object of distribution is to furnish the farmers with a start of better varieties of sorghum, the seed will only be sent out in quantities sufficient to plant one acre or less.

Farmers in Ohio who wish to secure some of this seed should apply at once to

Ohio Agricultural Experiment Station,
Wooster, Ohio.

No. 204, March 26, 1900: Free Distribution of Sorghum Seed.

More than four thousand requests for sorghum seed have been received by the Ohio Experiment Station, in response to its announcement of free distribution of improved seed, furnished by the National Department of Agriculture for this purpose. This large demand was altogether unexpected, as a similar announcement made a year ago, brought only 122 applications for seed. Since the supply of seed furnished by the Government, though very liberal, is altogether inadequate to furnish a sufficient quantity of seed to each of so many applicants for a satisfactory test, the Experiment Station has purchased a large additional quantity of seed from the same person in Kansas who furnishes the Government supply, and this will be added to the free distribution.

This is done from a desire not to disappoint those who are expecting seed from the Station and in belief that this seed, which has been carefully bred for ten years past, under the direct supervision of the Chemical Division of the National Department of Agriculture, will be the means of effecting a direct improvement in the sorghum crop of Ohio.

Even with this additional quantity of seed it will be impossible to send more than half a pound of seed to each applicant, but this will be sufficient for a fair test of the new varieties and will enable the farmers of the state to raise sufficient seed for next season's planting.
The seed will be sent out in April, in ample time for planting, as sorghum should not be planted in this latitude before the last of April or first of May. It grows so extremely slowly at first, especially in cool weather, that it will require extra labor to keep the weeds down if it is planted before the ground is reasonably warm.

A bulletin is in course of preparation which will give full directions concerning the culture and management of sorghum, which will be sent to all who receive seed and to such others as may apply for it.

No. 205, April 2, 1900: Comparison of Varieties of Potatoes.

The following varieties of potatoes comprise a partial list of those on trial at the Ohio Experiment Station the past season, the majority having been planted three seasons or more.

Those are included concerning which there is most interest at present, either because they are new or have been brought prominently before the public in various ways. Those are more especially noted which are worthy of commendation.

It is not the practice of the Station to say much about a variety until it has been tested more than one year, nor is it thought best to avoid mentioning a variety simply because it is not new.

The safest varieties for general planting are those which have been found to be adapted to a diversity of soils. To aid in the determination of varieties of this class is the object of these brief notes.

Acme.—An early variety, resembling the Early Ohio but rather more prolific, its average for three seasons being about ten per cent. above the Early Ohio. It ripens at about the same time as the Early Ohio.

Bovee.—An early white variety with pink markings. It stands second in the list of early sorts as to productiveness. It is commonly ranked with the Early Ohio as to earliness, but it should be rated as a few days later. Its average yield for three years is about forty per cent. above the Early Ohio.

Carmen No. 3.—A well known second early, or late, white variety, similar in habit of growth and shape of tubers to the Rural New Yorker No. 2, but rather more prolific. The tubers are smooth and uniform in size, and nearly all are marketable. It is regarded as one of the best of its class for market, but as only second rate in quality.

Craighead.—Tubers rather long, slightly flattened, smooth, white. A new midseason variety of considerable merit which has been on trial here three seasons. It has given good yields and the tubers are nearly all of marketable size.

Commercial.—A new midseason, pink variety, of considerable promise. The tubers are of good size, regular in shape and smooth. It has been on trial here two seasons and has given satisfactory yields.

Early Trumbull.—An early white variety of recent introduction. It stands at the head of the list in productiveness of early varieties on trial here for the past three years, giving an average of 271 bushels per acre. It has been given a trial in various localities, and while it is not alike successful in all localities, it appears to have given general satisfaction. Its season of ripening is with the Early Rose and Early Harvest. Heretofore Bovee and Early Harvest have stood at the head of early varieties in our trials, but the Early Trumbull must now be accorded first place.

Early Michigan.—Another early white sort which has made a good record quite generally. Its average yield is a little below that of Early Harvest.

Enormous.—A very prolific, late white variety. It is one of the heaviest yielding varieties thus far tested at the Station, its average for three years being 297 bushels per acre, or about 19 per cent. above the combined average of Car-
man No. 3, Sir Walter Raleigh and Uncle Sam, and 33 per cent. above Car-
mman No. 3. It is, however, not quite as smooth as Sir Walter Raleigh and Car-
mman No. 3, but not rough enough to impair its market value.

**GREEN BAY TRIUMPH.**—A white skinned variety of the same shape as Bliss
Triumph, and ripening at the same time. It has been tested here one season
only, but gave a higher yield than any others of its class. It is a clearer white
than the White Bliss Triumph and is worthy of commendation.

**LIVINGSTON.**—A white variety with pink eyes. It has given uniformly good
yields here, and is generally satisfactory.

**PINGREE.**—An early white variety with occasional markings. It has been on
trial here two seasons only. It has given satisfactory yields, but does not keep
as well as most other early varieties.

**UNCLE SAM.**—A late white variety which has uniformly given good yields
here. It is one of the best for late spring use that has been tried here. It gives
about the same yields as Carman No. 3 but is not as smooth.

**WHITE MOUNTAIN.**—A late white variety which has been on trial here two
seasons, and has given good yields, standing near the head of the list in this respect.

**WHITON'S WHITE MAMMOTH.**—Another late white sort, of unusual merit.
One year's experience with it indicates that it is a good cropper. The tubers are
smooth, uniform in size and nearly all marketable.

**No. 206, April 16, 1900:** **The Soy Bean a Substitute for Clover.**

The Soy or Soja bean is an upright, stiff-stemmed, branching bean, intro-
duced a few years ago from Japan, which is rapidly coming to the front as a
most valuable forage plant. It has been grown for several years by the Ohio
Experiment Station with very satisfactory results. Planted on some of our poorest
soils, it has produced two to three tons of excellent dry forage or hay per acre,
which is eaten with relish by all kinds of stock. As a crop to
spread under for green manuring we do not know its equal.

As the Soy bean is a warm weather plant it should not be planted before the
last of May in northern Ohio, nor before the middle in the southern part of the
state. When planted for forage it is sown at the rate of a bushel and a half to
the acre, on well prepared land, sowing with the wheat drill with all the runs open.
Thus sown it soon covers the ground and there is no trouble from weeds or
foxtail. It should be harvested before frost, and cured as hay.

The Soy bean, like clover, adds nitrogen to the soil, and it is therefore a
renovating, instead of an exhausting crop. It is especially suited to take the place
of clover in a systematic rotation where the clover has been killed out by severe
winters, as is the case at present over a large part of Ohio, or where the spring
seeding of clover has failed to catch. The Ohio Experiment Station has used it
in such cases with such good results that it feels justified in urging the farmers
of the state to give it a careful trial.

There are several varieties of Soy beans, some of which will mature seed in
Ohio, while others will not. As a rule, the latter class are more valuable for
forage, as they make larger growth. The beans, however, which are produced
at the rate of ten to twenty bushels per acre, are a valuable feeding stuff, as
they are quite high in protein, and to some extent take the place of such ma-
terials as linseed meal in the ration. The Kansas Experiment Station has fed
them to fattening hogs with the result of effecting a large saving in the quantity
of food required to make a pound of pork, and others report similar results in
feeding them to sheep.

The Experiment Station has no seed of these beans for distribution, but it
may be procured of most of the principal seedsmen.
No. 207, April 9, 1900: (1) Spring Treatment of Fields Where Wheat Has Been Destroyed by the Hessian Fly.

Nearly all over Ohio are thousands of fields of wheat that were badly damaged last fall by fly, which damage has been further emphasized by climatic effects of the winter, to such an extent that the devoting of these fields to other crops, the coming season, will be inevitable. Numerous questions have come to the Experiment Station as to how best to manage these fields.

The question has been asked if the fly will attack the young seeding; if it will attack oats; if it will lie in the ground till next fall and affect the wheat; or, if it is advisable to simply harrow oats upon these fields, seed with timothy, or disk and sow with oats. Before doing anything the farmer must understand, first, that within a few weeks these fields will be swarming with Hessian flies. We have been securing proof of this during the entire winter, by getting infested plants from various parts of the state and hatching out the flies in the warm temperature of the Insectary. When these flies come out from their winter condition, known as the "flax-seed,"—and, by the way, these may be scattered all over the ground away from the plants—not finding sufficient wheat plants upon which to lay their eggs they will migrate to other fields. Thus a very seriously affected wheat field endangers, to a certain extent, every other field of wheat situated in the near vicinity. The only way to prevent this is to plow under the infested fields, turning the old wheat plants as deeply beneath the surface as possible, and harrowing and rolling the ground at once after plowing. This will prevent the flies from doing any further injury, for they will hardly be able to make their way through several inches of compact soil.

Second: Hessian flies will not attack grass, nor oats, but a simple harrowing or disking of the fields will really destroy but very few of them, leaving the rest to develop and go to other fields. Where the wheat has been killed out and the young seeding uninjured, it may look like an unprofitable piece of work to plow under such a field, and, in most cases, the farmer must decide which is the best course to pursue, but he must bear in mind that these flies will develop and go elsewhere to lay their eggs, and that they will not lay them upon oats or grass that may be growing in the same field. Then, again, it must be remembered that the wheat has yet to stand a second attack of the fly between this and harvest. There are probably many fields that look, this spring, as though they might produce a part of a crop, but by the time they have withstood the coming attack of the fly the prospects will be vastly diminished.

In summarizing, it may be said that all wheat fields that do not give fairly good promise of a crop, should be plowed under to a depth of from four to six inches, as quickly as possible, and the ground harrowed and rolled in order to prevent the flies from reaching the surface. The land may then be devoted to oats, corn or any other crop that may be practicable.

One object we have had in view in rearing flies throughout the winter, from plants secured in different portions of the state, was to determine the presence of natural enemies of the fly.

The most useful of these natural enemies winter over in the small, brown so-called "flax-seeds," in which the flies also pass the winter. If there were any large number of these present, it would not only prove that there were many less flies to be developed than there were young last fall, but that the effect of these on the next brood of the flies would be to destroy them and prevent injury; but, with all of our rearing, we have not succeeded in getting any of these natural enemies, though we have gotten myriads of flies, and these have deposited their eggs upon wheat plants in the Insectary. From all the information that we have been able to secure, in this way, there does not seem to be much help for the farmer, in this direction, between this and the time when the wheat is harvested.
THE ONION THRIPS.

The effect of this insect upon the onion is known as the "white blast," from the fact that the tops are prematurely whitened and become wrinkled and shriveled. The insect caused considerable damage in some portions of the state last year in onion fields, and the Ohio Agricultural Experiment Station has been engaged throughout the winter in studying its winter habits. It has been found that the insect passes the winter months in matted grass, among old weeds and other rubbish, as well as among culled onions and refuse that have been left over in the fields in the fall. Onion growers are familiar with the fact that the depredations of this insect appear earliest, and are the most emphasized, along the margins of fields or plots, or in spots over the fields. The reason for this is that the insect winters over in these places. It makes its way from the grassy margins or from the grassy banks of ditches, to the rows of onions adjoining. It winters over in the piles of culled onions and refuse in the fields, and begins its work there, spreading from thence outward. Wherever the grass and weeds along ditches can be rooted up and destroyed it prevents the harboring of this pest. Wherever the old, dry grasses and weeds, along the margins of onion plantations, can be burned, the effect will be to destroy myriads of the pest, and to prevent their breeding the coming season. With frequent, drenching rains, there is not much likelihood of a severe outbreak, but in case of drought, the insect is likely to work more or less serious injury in the extensive onion fields of Ohio.

A spray of one pound of whale oil soap dissolved in eight gallons of water will destroy the pest, and the use of this mixture is recommended on the first appearance of the insects in the fields. At time of first appearance it will probably only be necessary to treat very small areas along the margins of fields, or the small, isolated spots previously mentioned, in order to permanently check their increase.

No. 208, May 21, 1900: San Jose Scale, Tree and Plant Diseases.

A law was enacted by the last General Assembly of Ohio "to prevent the introduction and spread of the San Jose scale and other dangerous insects and dangerously contagious diseases affecting trees, shrubs, vines, plants and fruits." The law provides for an annual inspection of every nursery in the state and forbids the transportation or sale within the state of uninspected nursery stock, whether grown within or outside of the state. It also provides for the inspection of orchards and the compulsory treatment of infected orchards, or the destruction of those in which the infection has progressed so far as to render treatment impracticable. Black knot and Peach yellows are declared to be dangerous within the meaning of the law. The execution of this law is lodged with the Board of Control of the Ohio Agricultural Experiment Station, and the Board has organized the work as a department of the Station, under the general control of the Director of the Station, as representative of the Board of Control, and under the immediate supervision of a chief assistant to be known as Horticultural Inspector. Mr. Lowell Roudebush, of Clermont county, a member of the State Horticultural Society, has been appointed to this position.

The object of this law is to prevent the spread of insects and plant diseases which threaten the destruction of our orchards, and the policy of the Board of Control will be to so carry out its provisions as to give the utmost possible assistance to the fruit growers and nurserymen of the State in the protection of their property. To this end the Inspector will visit suspected orchards on request, so far as his time will permit, and will give advice respecting their treatment. This will be done without any charge to the owner of the orchard except to convey the Inspector from the nearest railway station to the orchard and back again. Orchardists throughout the state are urged to avail themselves of this opportunity to ob-
tain expert advice, and to do so without any fear that valuable trees will be hastily condemned by the Inspector. On the contrary, no tree will be destroyed so long as there remains any reasonable chance of saving it, nor until its existence becomes a source of positive danger to trees adjoining. As the Inspector is himself a practical horticulturist; the fruit growers of the state need have no fear but that this question will be treated from a business standpoint. It is the definite policy of the Board of Control to save and not destroy, a policy with which the Inspector is in full accord, and prompt action on the part of fruit growers in meeting the Board on this ground will save many an orchard that is doomed to destruction by these pests if longer neglected.

As nurserymen can no longer carry on their business in Ohio without a certificate from the Experiment Station they should make application for such certificate at once. Correspondence should be addressed to Experiment Station, Wooster, Ohio.

No. 209, May 28, 1900: The Canker Worm.

The so called "measuring worms" that are now stripping the leaves from apple and elm in many parts of Ohio are canker worms. Had they been taken in hand at their first appearance they might have been destroyed by spraying the trees with a mixture of from 4 to 6 ounces of Paris green with 4 to 6 pounds of slaked lime in 50 gallons of water, the lime being reduced to a milk of lime and strained through a fine wire sieve, so as not to obstruct the nozzle of the spray pump; but when the canker worm has attained nearly its full growth it is not so easily killed and Paris green is not effective. At this stage, however, it may be destroyed by spraying with Swift's Arsenate of lead, Bowker's Arseniclead or Bowker's Disparene, using three pounds of the preparation to fifty gallons of water. These mixtures will not injure the foliage; when fully prepared they have a milky white appearance, and being nearly as thin as water they spray readily, and they adhere for several weeks, thereby avoiding the necessity for more than a single application. They may be obtained of Swift & Co., of Bowker Chemical Co., both of Boston, Mass. These are merely proprietary forms of the standard chemical compound, arsenate of lead.

Recent experiments carried out by the Entomological Department of the Ohio Agricultural Experiment Station have shown that within three days after application of these mixtures to trees seriously overrun by canker worms fully ninety per cent. of the worms were killed.

If treatment is neglected the worms will increase in numbers and by another season will probably kill the trees.

A complete, illustrated description of the canker worm, with its life history, is given in Bulletin 68 of the Ohio Experiment Station.

No. 210, June 4, 1900: Suggestions to Orchardists for Destroying the San Jose Scale.

Summer treatment of the San Jose scale should begin as early as the 15th of June and be continued until September 15th at least, with intervals of not more than ten days between sprayings. This will destroy a very large percentage of the young and thus prevent its spreading.

Two different mixtures can be used, viz.: I, whale oil soap, used at the rate of one-fourth pound to one gallon of water. This mixture will not injure the foliage of tree fruits.

II, a mechanical mixture of kerosene and water, in the proportion of one-gallon of kerosene to ten of water, or what is called a ten per cent. solution. It can be used with safety on all tree fruits except the peach.
For winter treatment, which means while the leaves are off, a stronger solution of whale oil soap and water can be used—two pounds of the former to one gallon of the latter.

Kerosene from twenty to one hundred per cent. has been used with widely different results. The why has not been determined yet. Consensus of opinion is that it should be used on a sunshiny day—the higher the temperature the better.

KIND OF SPRAYER.

The whale oil soap solutions can be used with any of the better class of sprayers. The kerosene mixture requires a specially constructed one, with a device for the mechanical mixing of the kerosene and water, of which there are a number on the market.

In the destruction of trees, shrubs, vines, etc., infected with the San Jose scale, great care should be taken that stumps and sprouts are grubbed out thoroughly and burned with the trunk and branches—otherwise your work will be in vain and the infection but temporarily checked, not destroyed.

Bulletin 72, Ohio Agricultural Experiment Station, will give further information.

No. 211, June 11, 1900: BLACK-KNOT AND PEACH YELLOWS—How to Destroy Them.

BLACK KNOT.

Black-knot is a fungous disease affecting the plum, cherry and kindred tree fruits. The Damson among plums, and the Morello class among cherries are the most susceptible.

SUMMER TREATMENT.

Beginning with the growing season the knots develop rapidly. They should be cut off as soon as seen and burned at once. The badly infected branches should be cut off below point of infection and burned, not left under the tree, nor piled in heaps and left in the orchard.

WINTER TREATMENT.

Affected trees that have been properly treated during the growing period will be free from knots, generally speaking. Should any remain after the leaves have fallen they should be cut off and burned, and badly affected branches also, not later than February 15th, as the spores or seeds are then ripe. A large majority of young trees can be saved by judicious pruning and will ultimately become healthy; otherwise the trees will die and infect others in your and your neighbor's orchard.

PEACH YELLOWS.

Yellows is a highly contagious, incurable disease of the peach. Trees affected with it should be destroyed at the earliest possible moment by uprooting and digging them out and burning roots, trunk and branches, including fruit, on site. No remedy save that has proven successful. Dragging diseased trees or branches through an orchard will infect healthy trees.

Late summer and fall are the most favorable times for detection of yellows by symptoms of fruit and twigs. These are: 1. Premature ripening of the fruit, which is highly colored and spotted and has the flesh marbled with red. 2. Premature unfolding of winter buds. 3. Abnormal development of new buds in the trunk and branches, which grow into slender, sickly-looking shoots.

Bulletins 72 and 92, Ohio Agricultural Experiment Station, will give fuller information, with illustrations.
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PUBLICATIONS OF THE OHIO EXPERIMENT STATION.

The first six annual reports of this Station, for the years 1882 to 1887, inclusive, contain the full record of its work during that period. Such bulletins as were published during these years ("First Series") were intended for newspaper use; they were afterward incorporated in the annuals and no copies of the bulletins can now be furnished. The first and second annual reports are also out of print.

The "Second Series" of bulletins began with 1888. The first seven of these were included in the seventh annual report, and cannot be furnished separately. The bulletins published since 1888 are listed below.

No. 16 (Vol. II, No. 9, 1889) — Experiments with potatoes.
No. 17 (Vol. III, No. 2, 1889) — Field experiments with fertilizers.
No. 20 (Vol. III, No. 5, 1889) — Corn silage vs. sugar beets as food for milk production.
No. 21 (Vol. III, No. 6, 1889) — Wheat: Cultural and variety tests.
No. 22 (Vol. III, No. 7, 1889) — Strawberries and raspberries.
No. 23 (Vol. III, No. 8, 1889) — The plum curculio, cucumber beetle, rhubarb curculio, and clover stem borer. Potato blight.
No. 25 (Vol. III, No. 10, 1889) — Grape rot and corn smut.
No. 27 (Vol. IV, No. 1, 1890) — Corn: Cultural, variety and fertilizer tests. Out of print.
No. 28 (Vol. IV, No. 2, 1890) — Miscellaneous experiments in the control of injurious insects. Out of print.
No. 29 (Vol. IV, No. 3, 1890) — Fertilizers on wheat. Out of print.
No. 30 (Vol. IV, No. 4, 1890) — Wheat: Cultural and variety tests and treatment for smut. Out of print.
No. 31 (Vol. IV, No. 5, 1891) — The wheat midge. Out of print.
No. 32 (Vol. IV, No. 6, 1891) — Experiments with small fruits. Diseases of the raspberry and blackberry. Out of print.
No. 34 (Vol. IV, No. 8, 1891) — Forty years of wheat culture in Ohio. Out of print.
No. 35 (Vol. IV, No. 9, 1891) — Apple scab. The spraying of orchards. Out of print.
No. 37 (Vol. V, No. 1, 1892) — Oats: Cultural and variety tests.
No. 38 (Vol. V, No. 2, 1892) — Mangel wurzels and sugar beets.
No. 39 (Vol. V, No. 3, 1892) — Fertilizers on corn and oats.
No. 40 (Vol. V, No. 4, 1892) — Insects which burrow in the stem of wheat.
No. 41 — Not published.
No. 42 (1892) — Wheat: Cultural and variety tests.
No. 43 (1892) — Greenhouses and greenhouse work. The food of the robin.
No. 44 (1892) — The rusts of Ohio. Wild lettuce. Scab of wheat.
No. 45 (1892) — Insects affecting the blackberry and raspberry.

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No. 46 (1892) — Underground insect destroyers of the wheat plant.
No. 47 (1892) — Eleventh annual report. Meteorological summary. Index
No. 48 (1893) — Profit in spraying orchards and vineyards. Out of print.
No. 49 (1893) — Field experiments with fertilizers.
No. 50 (1893) — Experiments in feeding for milk.
No. 51 (1893) — Miscellaneous entomological papers.
No. 52 (1893) — Twelfth annual report. Meteorological summary. Index.
No. 53 (1894) — Field experiments with commercial fertilizers.
No. 54 (1894) — Strawberries. Out of print.
No. 55 (1894) — The Russian Thistle in Ohio.
No. 56 (1894) — The San Jose Scale.
No. 57 (1894) — Oats: Variety and cultural experiments.
No. 58 (1894) — Thirteenth annual report. Meteorological summary. Index.
No. 59 (1895) — Noxious weeds along thoroughfares and their destruction.
No. 60 (1895) — Feeding for beef.
No. 61 (1895) — Sub-irrigation in the greenhouse.
No. 62 (1895) — The grape-root worm.
No. 63 (1895) — Orchard spraying and notes on varieties of raspberries.
No. 64 (1895) — The smut of oats.
No. 65 (1895) — Variety trials with potatoes.
No. 66 (1895) — Fourteenth annual report. Meteorological summary. Index.
No. 67 (1896) — Oats: Variety and cultural experiments; treatment for smut.
No. 68 (1896) — Some destructive insects.
No. 69 (1896) — The chinch bug.
No. 70 (1896) — Forage crops.
No. 71 (1896) — The maintenance of fertility. Field experiments with fertilizers.
No. 72 (1896) — Peach Yellows, Black Knot and San Jose Scale.
No. 73 (1896) — Investigations of plant diseases in forcing house and garden.
No. 74 (1896) — Fifteenth annual report. Meteorological summary. Index.
No. 75 (1897) — Beet sugar production.
No. 76 (1897) — Potatoes: Cultural notes and variety and fertilizer tests.
No. 77 (1897) — The chinch bug and other destructive insects.
No. 78 (1897) — Corn: Cultural and variety tests. Corn smut.
No. 79 (1897) — Some diseases of orchard and garden fruits.
No. 80 (1897) — The maintenance of fertility. Field experiments with fertilizers.
No. 81 (1897) — The San José scale in Ohio.
No. 82 (1897) — Wheat: Cultural and variety tests.
No. 83 (1897) — A first Ohio weed manual.
No. 84 (1897) — Sixteenth annual report. Meteorological summary. Index.
No. 85 (1897) — Strawberries: Cultural notes and variety tests.
No. 86 (1897) — The story of the lives of a butterfly and a moth.
No. 87 (1897) — The Periodical Cicada, or so-called Seventeen-year Locust, in Ohio.
No. 88 (1897) — Co-operative experiments made by the Ohio Agricultural Students' Union in 1896.
No. 89 (1897) — Prevalent diseases of cucumbers, melons and tomatoes.
No. 90 (1898) — Sugar beet investigations in 1897.
No. 91 (1898) — The lung and stomach worms of sheep.
No. 92 (1898) — Preliminary report upon diseases of the peach. Experiments in spraying peach trees.
No. 93 (1898) — The home-mixing of fertilizers.
No. 94 (1898) — The maintenance of fertility. Field experiments with fertilizers in 1897.
No. 95 (1898) — Seventeenth annual report. Meteorological summary. Index.
No. 96 (1899) — The Army Worm and Other Insects; Wheat and Grass Sawflies; the Corn or Boll Worm; the Painted Hickory Borer; the Raspberry Cane Borer; the Peach Scale.
No. 97 (1899) — Diseases of wheat and oats.
No. 98 (1899) — Small fruits; cultural notes and comparison of varieties.
No. 99 (1899) — Sugar beet investigations in 1898.
No. 100 (1899) — A comparison of factory-mixed and home-mixed fertilizers.
No. 101 (1899) — Experiments with oats.
No. 102 (1899) — Soil and seed treatment and spray calendar for insect pests and plant diseases.
No. 103 (1899) — The San José Scale in Ohio.
No. 104 (1899) — Further studies upon spraying trees and upon diseases of the peach.
No. 105 (1899) — Further studies of cucumber, melon and tomato diseases.
No. 106 (1899) — I. The chinch bug. II. Experiments with insecticides.
No. 107 (1899) — The Hessian Fly.
No. 108 (1899) — Bovine Tuberculosis.

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No. 110 (1899) — The maintenance of fertility.
No. 111 (1899) — Investigations of plant diseases.
No. 112 (1899) — The Clover Root Borer.
No. 113 (1899) — Plums, comparison of varieties.
No. 114 (1899) — How insects are studied at the Ohio Agricultural Experiment Station.
No. 115 (1900) — Sugar beets and sorghum: Investigations in 1899.
No. 116 (1900) — The grape-cane Gall-maker and its enemies.
No. 117 (1900) — Stomach worms in sheep.
No. 118 (1900) — Field experiments with wheat.
No. 119 (1900) — The Hessian Fly in 1899 and 1900.
No. 120 (1900) — Nineteenth annual report. Meteorological summary. Press bulletins.

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This Station has also published four bulletins in a "Technical Series," the first three numbers of which are devoted to entomological and botanical papers, the last to a list of the birds of Wayne county, Ohio.
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