

TWENTY-FIFTH ANNUAL REPORT

1912-1913

OF THE

Agricultural Experiment Station

OF THE

ALABAMA POLYTECHNIC INSTITUTE

AUBURN, ALABAMA

JANUARY 31, 1913

OPELIKA, ALA:

THE POST PUBLISHING COMPANY

1913

ALABAMA POLYTECHNIC INSTITUTE,

Auburn, Ala., Jan. 31, 1913.

GOVERNOR EMMET O'NEAL,

Executive Department,

Montgomery, Ala.

Sir:—I have the honor herewith to transmit to you the Twenty-fifth Annual Report of the Agricultural Experiment Station of this College.

The report of the Treasurer, herewith included, is for the fiscal year ending June 30, 1912.

This report is made in accordance with the provisions of the act of congress (approved March 2, 1887), establishing Agricultural Experiment Stations in the several States and Territories.

It contains the report of the Director, the Chemists, the Veterinarian, the Agriculturist, the Botanist, the Horticulturist, the Entomologist, the Plant Pathologist, and the Professor of Animal Industry, for the year ending December 31, 1912.

Respectfully,

CHAS. C. THACH,

President.

AGRICULTURAL EXPERIMENT STATION.

TRUSTEES.

His Excellency, Emmet O'Neal, President.....	Ex-Officio
H. J. Willingham, Superintendent of Education.....	Ex-Officio
A. W. Bell.....	Anniston, Ala.
N. D. Denson.....	LaFayette, Ala.
W. F. Feagin.....	Montgomery, Ala.
H. L. Martin.....	Ozark, Ala.
W. K. Terry.....	Birmingham, Ala.
J. S. Frazer.....	Mobile, Ala.
R. B. Barnes.....	Opelika, Ala.
R. F. Kolb.....	Montgomery, Ala.
J. A. Rogers.....	Gainesville, Ala.
C. M. Sherrod.....	Courtland, Ala.

STATION COUNCIL.

C. C. Thach	President
J. F. Duggar	Director and Agriculturist
B. B. Ross	Chemist and State Chemist
C. A. Cary	Veterinarian and Director of Farmers' Institutes
J. T. Anderson	Chemist, Soil and Crop Investigations
C. L. Hare	Physiological Chemist
W. E. Hinds	Entomologist
L. N. Duncan (a)	Agricultural Extension Work
F. A. Wolf	Plant Pathologist
J. S. Caldwell (b)	Botanist
E. P. Sandsten (c)	Horticulturist
J. M. Jones (d)	Animal Industry

ASSISTANTS.

T. Bragg	Assistant Chemist
C. S. Williamson	Assistant Chemist
J. B. Jackson	Analyst
J. B. Hobdy (a)	Agricultural Extension Work
E. F. Cauthen	Associate Agriculturist and Recorder
I. S. McAdory	Assistant Veterinarian
W. F. Turner	Assistant in Entomology
M. J. Funchess	Assistant Agriculturist
C. S. Ridgway	Assistant in Botany
J. C. C. Price	Assistant in Horticulture
L. W. Shook	Assistant in Animal Industry
J. T. Williamson	Field Agent in Agriculture
H. M. Conolly	Field Agent in Horticulture
L. W. Summers	Assistant in Animal Industry
S. S. Jerdan	Assistant in Beef Industry
A. R. Gissendanner	Assistant in Swine Husbandry
C. D. Allis	Assistant in Poultry
S. I. Bechdel (a)	Assistant in Agricultural Extension Work
Mrs. B. I. Robinson (a)	Assistant in Girls' Demonstration Work
L. J. Hawley	Field Agent in Agriculture
S. Adler	Assistant in Chemistry
J. A. Dew	Field Agent in Entomology
I. B. Kerlin (a)	Assistant in Agricultural Extension Work
J. F. Duggar, Jr.	Assistant in Agriculture
J. M. Johnson	Assistant in Animal Industry
F. L. Jenkins	Assistant in Animal Industry
A. H. Kierce	Secretary to Director

- (a) In co-operation with U. S. Department of Agriculture.
- (b) F. E. Lloyd, resigned.
- (c) P. F. Williams, deceased.
- d Dan T. Gray, resigned.

REPORT OF HATCH AND ADAMS FUNDS FOR 1911-1912.

Receipts

	Hatch	Adams
To amount from U. S. Treasury-----	\$ 15,000.00	\$ 15,000.00

Disbursements.

By Salaries-----	\$ 7,645.24	\$ 9,967.49
By Labor-----	1,463.67	2,161.68
By Publications-----	429.15	
By Postage and Stationery-----	529.31	168.53
By Freight and Express-----	281.47	182.78
By Heat, Light, Water and Power-----	421.51	183.04
By Chemical Supplies-----	304.79	514.42
By Seeds, Plants and Sundry Supplies-----	481.54	316.39
By Fertilizers-----	229.52	146.70
By Feeding Stuffs-----	1,512.97	28.17
By Library-----	528.48	58.91
By Tools, Implements and Machinery-----	238.54	120.69
By Furniture and Fixtures-----	137.00	307.27
By Scientific Apparatus-----	19.59	351.74
By Live Stock-----	107.00	120.65
By Traveling Expenses-----	188.50	75.09
By Contingent Expenses-----	25.00	
By Buildings and Repairs-----	456.72	296.45
Total-----	\$ 15,000.00	\$ 15,000.00

State of Alabama:

Lee County.

Personally appeared before me, Welborn Jones, a Notary Public in and for said county, M. A. Glenn, known to me as Treasurer of the Alabama Polytechnic Institute, who being duly sworn, deposes and says that the above foregoing account is true and correct. Witness my hand this 31st day of January, 1913.

WELBORN JONES,

[Seal]

Notary Public, Lee County,

This is to certify that I have compared the account with the ledger account of the Treasurer, and this is a correct transcript of the same.

C. C. THACH,

President Alabama Polytechnic Institute.

REPORT OF DIRECTOR AND AGRICULTURIST

J. F. DUGGAR

Dr. C. C. Thach,
President Alabama Polytechnic Institute.

Sir:

I respectfully submit the following report for the past year of the work under my charge as Director and Agriculturist of the Alabama Experiment Station.

PUBLICATIONS.

During the calendar year 1912 the publications of the Alabama Experiment Station consisted of the annual report, six bulletins, nine circulars, and six press bulletins. The titles and authors are given below:

Bulletin No. 162.—**Local Fertilizer Experiments with Cotton in North Alabama in 1911**; by the Director and Assistants. (From Local Experiment Fund).

Bulletin No. 163.—**Steer Feeding in Alabama**; by the Animal Husbandman and the Junior Animal Husbandman.

Bulletin No. 164.—**Cotton Worm or Caterpillar**; by the Entomologist. (From Local Experiment Fund).

Bulletin No. 165.—**Southern Bur Clover**; by the Associate Agriculturist.

Bulletin No. 166.—**Curing Meat on the Farm**; by the Animal Husbandman and Assistant. (From Local Experiment Fund).

Bulletin No. 167.—**Wintering Pregnant Ewes**; by the Animal Husbandman and the Assistant.

Circulars No. 5-6-7.—**The Boll Weevil**; (Reprint). (From Local Experiment Fund).

Circular No. 14.—Part 1: **Vegetable Growing in Alabama**; by the Horticulturist and the Assistant. (From Local Experiment Fund).

Circular No. 14, Part 2—**Vegetable Growing in Alabama**; by the Horticulturist and the Assistant. (From Local Experiment Fund).

Circular No. 15.—**The Southern Pine Beetle and Its Control**; by the Entomologist. (From Local Experiment Fund).

Circular No. 16.—**Rules and Regulations of the Alabama State Board of Horticulture Governing the Importation of Articles Liable to Contain the Mexican Cotton Boll Weevil**; by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 54.—**Cotton Boll Weevil Infested Area in United States and Quarantine Line in Alabama, 1911 to 1912**; by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 55.—**Mosquito Control**; by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 56.—**Fight the Fly**; by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 57.—**Grass Worm or Fall Army Worm**; by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 58.—**Grass Worm or Fall Army Worm Outbreak in Alabama**; by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 59.—**The Boll Weevil Advances**; by the Entomologist. (From Local Experiment Fund).

STAFF.

In the summer of 1912 Professor F. E. Lloyd resigned his position as Botanist of the Experiment Station, to accept a professorship in McGill University. His successor, Prof. J. S. Caldwell, began work in the fall of 1912.

The death of Professor P. F. Williams, December 5th, 1912, removed from the Station Staff one who had for several years successfully directed the Horticultural Department. Professor Williams' work with the pecan and the satsuma orange has attracted wide attention. His successor, Dr. E. P. Sandsten, enters in January, 1913.

At the end of the calendar year 1912, Professor D. T. Gray resigned his position as head of the Department of Animal Industry, to take up experimental work in North Carolina. His successor, who has not yet entered upon his duties, is Professor J. M. Jones.

LOCAL EXPERIMENT WORK THROUGHOUT THE STATE.

By means of a State appropriation made in February, 1911, the Alabama Experiment Station is enabled to extend its work throughout the State; 1912 was the first year in which it was possible to carry on this work throughout an entire calendar year. The general supervision of this local experiment work was entrusted to the Director, who, as Agriculturist, has also immediate charge of fertilizer experiments with field crops, plant breeding away from Auburn, and work with drainage and farm machinery.

To the heads of the Departments of Entomology, Horticulture, Plant Pathology, Extension, and Animal Industry, were assigned the duties in their special lines provided for under this law.

The poultry work was also assigned to the Animal Industry Department.

The local experiment work has been continued in the same general lines as mentioned in the twenty-fourth Annual Report. This work is also the subject of a special report to the Governor each year.

AGRICULTURAL DEPARTMENT.

In accordance with our policy of drawing conclusions from field experiments only after they have been repeated for a number of years, the work on the Station Farm at Auburn was in 1912 largely a repetition of experiments begun in former years. One new line of work, however, begun in 1912, was subsoiling with dynamite, the effects of which are being tested with cotton, alfalfa, and corn.

The experiment in determining the crop producing value of the new form of nitrogen, calcium cyanimid, which has been under way for several years with oats and sorghum as the test crops, was this year expanded so as to use also cotton as one of the three test crops.

The work in breeding barley has also been somewhat increased with the hope of securing a strain of beardless barley that will add another practicable grain crop to our agricultural resources.

Plant breeding with cotton, corn, and oats has required

more time than any other single line of effort. Considerable progress has been made in this work. For example, after six years of breeding, we now have, in the Experiment Station yellow corn, a variety which is much more resistant to corn weevils, and which produces nearly 60 per cent. greater number of ears per hundred plants than was the case with the old variety when this work was begun. Several farmers who have grown this improved corn from this Station express great satisfaction with it.

A variety of corn which has been improved by systematic breeding on this Station for several years is Henry Grady. One strain of Henry Grady corn improved by this Station was more productive than any other of the 16 varieties tested at Auburn in 1912.

Three varieties of cotton, namely, Cook, Cleveland, and Poulnot, are being systematically bred on the Station Farm, and satisfactory progress is being made with each.

Among 30 varieties of cotton tested in plots on the Station Farm in 1912, strains of Cook and Poulnot which had been systematically bred by the Alabama Experiment Station were the four most productive kinds. The seed cotton of one of these strains of Cook afforded 49.3 percentage of lint cotton, while the average outturn, at the gins throughout Alabama is usually considered to be about 33 per cent. Progress was also made in reducing the amount of boll rot on some strains of Cook cotton, but more work has yet to be done in this line with this variety, which is extremely susceptible to this disease. These improved strains will be largely used in the local experiment work done by this Station throughout the state in 1913, thus getting these improved seed into the hands of the most painstaking farmers.

The Agricultural Department is also co-operating with the Chemical Department by growing and keeping records on strains of Cook cotton bred for increased percentages of oil in the seed.

Each year a number of varieties of cotton are crossed, so as to combine the desirable qualities of each. Much time has been given to testing these hybrids, of which more

than twenty apparently promising kinds were grown in 1912. Among these are several which promise to be especially adapted to boll weevil conditions.

The following is an incomplete list of field experiments conducted on the Station Farm at Auburn in 1912:

- Cotton, effects of planting light and heavy seed.
- Cotton, variety tests.
- Cotton, tests of long staple varieties.
- Cotton, best time for applying nitrate of soda.
- Cotton, effects of different forms of phosphate.
- Cotton, calcium cyanimid vs. other forms of nitrogen.
- Cotton, subsoiling both with the plow and with dynamite.
- Corn, variety tests.
- Corn, Williamson vs. other methods of cultivation.
- Corn, subsoiling with dynamite.
- Corn, best rotation for.
- Cowpeas, varieties for seed and for hay.
- Cowpeas, best plant for sowing with this legume.
- Cowpeas, for soil improvement.
- Clovers, tests of species and varieties.
- Clovers, best plant for sowing with this legume.
- Forage crops, tests of a great number of species and varieties.
- Grasses, tests of species and varieties.
- Millets, varieties and best mixtures.
- Nitrogen, best forms for cotton, oats, and sorghum.
- Oats, variety tests.
- Oats, time of sowing.
- Oats, fall strains vs. spring strains.
- Oats, effect of different phosphates.
- Oats, calcium cyanimid vs. other forms of nitrogen.
- Phosphates, best forms for cotton, oats, and soybeans.
- Soybeans, and cowpea mixtures for hay.
- Soybeans, effects of different phosphates.
- Sorghum, tests of varieties.
- Sorghum, best plants for mixing with this plant.
- Sorghum, calcium cyanimid vs. other forms of nitrogen.
- Sorghum, drill vs. broadcast sowing.
- Velvet beans, varieties.

Vetch, varieties and best mixtures.

Wheat, varieties.

The luxuriant growth of the new soil improving plant, kudzu, has attracted much attention. This promises to be especially useful for growing on extremely poor sandy land, and for covering gullies and gall spots in worn out fields.

Sudan Grass. One of the most interesting plants grown in 1912 is Sudan Grass, which is practically Johnson grass without the root-stock that makes the latter plant such an aggressive weed. Sudan grass made a luxuriant growth, and was cut twice. It seems to have most of the advantages of Johnson grass without the difficulty of eradication.

LOCAL EXPERIMENT WORK IN THE AGRICULTURAL DEPARTMENT.

The drainage investigations have been continued in cooperation with the Drainage Division of the Office of Experiment Stations, United States Department of Agriculture. The work has thus far consisted chiefly in testing the effects of tile drainage on soils in several different counties. In addition, expert advice has been given to all applicants for information on drainage, and some of these have been aided through a visit and personal advice by the Drainage Engineer. Plans are on foot for extending this work in the next year and including some topics additional to the use of clay tiling.

In farm machinery, tests of machines for the sowing of oats by the open furrow method were continued. Cotton choppers were tested in five different localities, using three different kinds of machines. A fertilizer mixer was tested, and notes and observations made of new and unusual agricultural machinery employed in the different counties of Alabama, with a view later of making a study of power tractors and other lines of agricultural machinery.

In plant breeding, the principal work has consisted in testing in a number of localities varieties and strains which had been selected and bred at Auburn in previous years.

The following is a list of the local experiments (that is, experiments conducted elsewhere than at Auburn) undertaken in the Agricultural Department during the calendar year 1912:

Cotton, fertilizer test.
 Corn, fertilizer test.
 Cotton, variety test, extensive.
 Corn, variety test, extensive.
 Cotton, variety test, short.
 Cotton, tests of different phosphates.
 Corn, variety test, short.
 Corn, special nitrate experiment.
 Cotton, special nitrate experiment.
 Corn, complete nitrate experiment.
 Corn, isolation test (Plant breeding).
 Cotton, isolation test. (Plant breeding).
 Soy bean test.
 Lyon and Velvet bean test.
 Cowpeas, tests of wilt-resistant varieties.
 Cotton, wilt test, extensive tests of wilt-resistant varieties.
 Cotton, tests of wilt-resistant varieties.
 Peanuts, fertilizer experiments.
 Peanut, variety test, extensive.
 Sugar cane, regular fertilizer experiment.
 Sweet potatoes, regular fertilizer experiment.
 Lime, experiments (various crops).
 Wheat, variety test.
 Winter forage crops, extensive.
 Bur clover, tests.
 Oats, method of seeding.
 Machinery for seeding oats.
 Cotton choppers, tests of.
 Oats (Burt vs. Red).
 Canada peas and spring sown Oregon vetch.
 Oats, variety test.
 Rotation and special phosphate experiment.
 Phosphate and lime experiment with cotton, corn, and oats.
 Tile drainage, experiments.
 Subsoiling with dynamite.
 Alfalfa, inoculation test.
 Japanese sugar cane (for North Alabama).
 Johnson grass fertilizer test.
 Vetch, experiments.
 Cotton, complete nitrate experiment.
 Crimson clover test.
 Forage crops, miscellaneous.

Respectfully submitted,

J. F. DUGGAR,

Director and Agriculturist.

REPORT OF THE CHEMIST

B. B. ROSS

Dr. C. C. Thach,
President Alabama Polytechnic Institute.

Sir:

I beg to submit the following report with regard to the work of the Chemical Department of the Experiment Station for the past year.

The work performed in the laboratories of this Department embraces experimental and investigation work carried out under the provisions of the original Hatch Act and under the later Adams Act, together with inspection work conducted under the requirements of State laws. A large amount of analytical work on miscellaneous samples is also performed in this laboratory, many samples sent in by citizens in various portions of the State having been analyzed during the past year. These samples included marls, natural phosphates, miscellaneous minerals, soils, insecticides, waters, etc.

The reports of Dr. J. T. Anderson and Prof. C. L. Hare set forth in detail the character and scope of the investigations conducted by them in their special lines of work, the attention of the former being given to investigations under the Adams' Act, while the latter is carrying on work under the provisions of both the Hatch and Adams Act.

Analytical work has also been performed in connection with experiments and investigations conducted by other departments of the Experiment Station, the materials analyzed having embraced samples of farm products, fertilizers, insecticides, etc.

Investigations have also been continued by this Department with regard to determining the availability as plant food of the basic slag obtained as a by-product in the manufacture of steel in this State by the open hearth process, immense quantities of this material at present being thrown aside as a waste product.

The laboratory has also conducted investigations as to

the availability of certain classes of organic nitrogenous materials that are used for fertilizing purposes, some of these materials being of doubtful value and utility for this purpose. These investigations are being continued during the present year by Prof. Hare.

The fertilizer work of the past season was much heavier than that of any previous year, the total number of official and unofficial samples analyzed being nearly 2,000. Nearly 400 samples of feed stuffs were analyzed under the provisions of the feeding stuff law, while about 200 samples of foods and drugs were also examined chemically during the past year. As all analyses are made in duplicate, the work accomplished is equivalent to the analysis of 5,000 or more samples.

Samples of illuminating oils have been collected in every county of the State and a bulletin giving results of these oil tests has been published.

Three bulletins giving the results of the analysis of fertilizers, feed stuffs, foods, etc., have been published by the State Department of Agriculture, a large part of the matter appearing in these bulletins having been prepared in this office.

Very respectfully,

B. B. ROSS,

Chemist.

REPORT OF VETERINARIAN

C. A. CARY

Dr. C. C. Thach,

President Alabama Polytechnic Institute.

Sir:

I respectfully submit the following as a synopsis of the work done in the Veterinary Department for 1912.

A study of the action of china berries and china berry leaves when fed to pigs and sheep. We have found that china berries produce distinct intoxication when fed to pigs and if this diet is continued for some time it produces pathological changes in the organs of the body, especially the liver and the kidneys. Further work is now being done along this line.

The effect of cockle burs on pigs is also being studied. It is our aim to determine the action of the young and green cockle burs and also the dried bur itself. The physiological and pathological actions are being studied.

It has been claimed that the common ground ivy is the cause of death of cattle that occasionally eat it. At present we are making a test of this plant to determine whether or not it is toxic for cattle.

We are also continuing the study of the effects of peanuts as a single ration for hogs and pigs. It is a well known fact that peanuts produce a soft or oily lard in hogs. It has further been determined that there is possibly some changes in the bones and nervous system which develop frequent cases of paralysis, especially of the hind limbs. This may be due to the effect of the oily content of the feed.

We are also continuing the test to determine the effect of cotton seed meal when fed to pigs.

The pathological changes and the bacteriology of cows' udders have also been studied as a continuation of the work of previous years.

The observation and records on osteoporosis in horses

and mules and rachitis in pigs are being continued.

A study of the prevalence of animal parasites in domestic animals is made by determining the occurrence and the kind of parasites that are most common in the various domestic animals.

The biology of the cattle tick that was worked out by the Bureau of Animal Industry in co-operation with the Veterinary Department has been published by the Bureau of Animal Industry and will be published in part at an early date by the Veterinary Department.

The record for the Farmers' Institutes for 1912 will be seen by viewing the following table:

Farmers' Institutes Held	18
No. of Counties Visited	16
Number of Sessions	29
Average attendance	128
Total attendance	3720

The Round Up Farmers' Institute and the Summer School for farmers was held at Auburn during the first ten days of August. During this time 75 lectures and demonstrations were given, beginning at 8 a. m. and ending at 10 p. m. every day. At this Institute there was a large number of farmers' wives in attendance who received instructions in domestic science, health and home life. This feature of the round up farmers' institute was very attractive, interesting and most profitable to all in attendance. The total enrollment at the Summer School was 900.

C. A. CARY,

Veterinarian and Director of Farmers' Institutes.

REPORT OF CHEMIST OF SOILS AND CROP INVESTIGATIONS

JAS. T. ANDERSON

Dr. C. C. Thach,

President Alabama Polytechnic Institute.

Sir:

Herewith is respectfully submitted the report of the work done in this division of the Chemical Department during the year 1912.

The study of the fertilizer requirements of soils by the chemical analysis of the cotton plant grown in them, was continued from previous years. All in all several hundred analyses have been made of plants grown under varying conditions of fertilization and in soils of many kinds and grades of fertility, and from the mass of data thus accumulated, several conclusions, it would seem, may safely be drawn.

First, That the potash content of the young cotton plant at a definite stage of growth, say the four-leaf, when grown in a soil rich in potash, is materially higher than that of the plant at the same stage of growth grown in a soil that is poor in potash.

Second, That the plant grown in a poor soil which has been fertilized with potash, has a higher potash content than one which has been grown in the same soil without fertilization.

There is ground for the belief that the conditions which give an increase in the fertilizer content of the plant also give a corresponding increase in the crop yield. Whether there be an ascertainable relation, fixed and definite, between the two, was the subject for investigation during the past year.

The effect of fertilization on the crop producing power of soils is being studied in quite a variety of soils in different parts of the state in a series of co-operative experiments conducted by the Agricultural Department of the Station. Samples of some of these soils were brought to Auburn for

use in common earthenware pots in which plants for analysis could be grown under the same system of fertilization as in the field tests. In this way comparison may be made between the effect of the same fertilizer application on the composition of the plant and on the yield. It would be unsafe to draw any conclusions in so complex a matter from a few isolated experiments. As the subject is deemed worthy of further investigation, the results already obtained will be withheld for the present.

As usual, the fertilizer inspection work for the Station claimed our attention from about the first of March to the first of August. During this period no opportunity is afforded for any analytical work conducted with the Adams Project.

Respectfully submitted,

JAMES T. ANDERSON,

REPORT OF PHYSIOLOGICAL CHEMIST

C. L. HARE.

Chemist, Soils and Crop Investigations.

Dr. C. C. Thach,

President Alabama Polytechnic Institute.

Sir:

I beg to submit herewith report of the work of this division of the Chemical Department during the year 1912.

The investigation of the effects of feeds upon the properties of lards has been continued. During the course of the work more than two hundred lards have been examined and are still being studied.

The work to date indicates that, insofar as the excellence of the lard is concerned, as indicated by its chemical and physical properties, corn is a satisfactory ration for hardening fats that have been produced from such feeds as soy bean and peanut pastures. Such lards have also keeping qualities equal to those of any other.

It appears from results so far obtained that lards produced from feeds which render the lards oily possess poor keeping qualities.

The results further establish the fact that, contrary to the general belief, lards from young pigs have generally the same properties as those from older animals.

It has also been found from the rations studied, that high, medium and low protein rations have practically the same effect upon the properties of lards.

The breeding of cotton for seed of high oil content has been continued. Little encouragement has so far attended the efforts. However in those cases where the oil content has been increased there has been no sacrifice of staple. It has been noted that the percentage of protein decreases to some extent with increase of oil.

The experiment has been extended to include the breeding of cotton seed with high protein content.

Respectfully submitted,

C. L. HARE,

Physiological Chemist.

REPORT OF ENTOMOLOGIST

W. E. HINDS

Dr. C. C. Thach,
President Alabama Polytechnic Institute.

Sir:

The Entomological staff of the Experiment Station during the year of 1912, has included beside the writer, Mr. W. F. Turner, Assistant Entomologist, Mr. J. A. Dew, Field Assistant, beginning work early in February, 1912, and Mr. N. C. Powell, Secretary to the Entomologist. Mr. Turner has resigned, his resignation to become effective January 15, 1913.

CORRESPONDENCE

Entomological correspondence during the past year has included more than 4,000 dictated letters beside several thousand copies of a circular nature.

PUBLICATIONS

We have issued during the year the following publications: Press Bulletins Nos. 54, 55, 56, 57, 58, 59 and 60; Circulars Nos. 15 and 16; a revision and new edition of Circulars 5, 6 and 7; Bulletin 164 and also a revision and new edition of Bulletin No. 159.

Numerous other articles have been published in popular press and scientific journals.

OTHER PUBLICITY WORK

This has included numerous lectures with or without stereopticon illustrations on the boll weevil and other important insects and methods for their control. Numerous requests for such addresses have had to be declined because of lack of funds to cover necessary traveling expenses. The Department has made rather extensive exhibits at the agricultural fairs at Montgomery and Mobile, Ala.

IMPORTANT INSECT PROBLEMS

During the past year, especially through the appointment of a Field Assistant, it was possible to do more in the mat-

ter of demonstrational work in methods of insect control than could heretofore be attempted. A number of valuable demonstrations combined with important experimental work in nearly every case have been conducted applying principally to the following problems: 1. The control of the San Jose scale and plum curculio upon the peach and of the codling moth upon the apple. 2. The control of white flies and scale insects which seriously threaten the rapidly growing satsuma orange industry in south Alabama. 3. Investigation of life history and determination and demonstration of most effective methods of control of the grass worm or fall army worm (*Laphygfrugiperda*) which appeared in great numbers in the southern part of the State early in the spring of 1912 and spread rapidly doing great damage to corn, sorghum and other forage crops, also in many cases to cotton, cow peas, etc. A full report on this work is practically ready for publication.

The cotton worm (*Alabama argillacea*) appeared again in the state earlier in the season than it was noted in 1911 when such extensive damage was done. It did not become as serious, however, probably for two principal reasons. First, the abundant development of parasites on the grass worm earlier in the season providing a very extensive check upon the earlier generations of the cotton worm when that species appeared. Second, a period of extremely hot, dry weather during the latter part of July and first of August was unfavorable for the development of the cotton worm.

MEXICAN COTTON BOLL WEEVIL

The advance of this pest, outlined in our Press Bulletin No. 60, deserves especial mention as the territory newly invaded in 1912 produced the preceding year more than 375,000 bales, whereas that reached by the weevil in 1910 and 1911 combined produced about 90,000 bales. The advance of this serious pest was closely followed and a careful study has been made of its injury in older infested territory under climatic conditions similar to those prevailing in various sections of Alabama. Some progress has been made in the organization of a co-operative campaign against the weevil

by which business interests may be effectively enlisted in bringing about the adoption of such methods as will most surely prevent and reduce serious loss from the advent of this pest.

ADAMS FUND INVESTIGATIONS

The two principal projects previously started have been continued with important results. The study of the life history of the rice weevil (*Calandra oryza*) and field experimental work has indicated several ways in which the great damage done by this pest may be largely reduced. Publication of the results of this work could be made at any time were funds available. This is also true of many phases of the project on fumigation.

Respectfully submitted,

W. E. HINDS, Entomologist.

REPORT OF PLANT PATHOLOGIST

F. A. WOLF

Dr. C. C. Thach,

President Alabama Polytechnic Institute.

Sir:

I herewith respectfully submit a brief statement of the work of the department of plant pathology of the Alabama Agricultural Experiment Station for the year just closed. Since this is the first year of the existence of this department, this phase of the station work has been limited both in scope and in effectiveness.

The investigation of the department has been carried on under the subvention of the Adams fund, special attention being given to the leaf spot and rot of peanuts. The nature of the latter trouble is now quite thoroughly known but it is the present intention to withhold publication until the work on both of these maladies is completed.

Work, either in the nature of demonstration or experimentation relative to the control of some of the more common diseases, has been conducted under the Local Experiment Fund. Several demonstrations in co-operation with the department of Entomology upon the control of the plum curculio, brown rot and scab of peaches gave most satisfactory results. Some interesting data relative to the control of lettuce wilt or drop is at hand. Work is now in progress upon the rot of egg plants, stem rot of asters, leaf blight of Persian walnuts, certain persimmon diseases and a physiological disorder of figs. Some of this work can be finished from the experiments now in progress in the greenhouse and some of it will necessitate duplication with the employment of field conditions. As these problems are completed they will appear either in botanical journals or in station publications.

During the past year the following papers have appeared:

1. A disease of the cultivated fig, *Ficus carica* L. *Ann. Myc.* 9: 622-624, figs. 3, Dec., 1911.

2. The brown leaf spot of colt's foot, *Tussilago Farfara* L. *Ann. Myc.* 10: 65-67, figs. 7, 1912.
3. Spore formation in *Podspora anserina* (Rabh) Winter. *Ann. Myc.* 10: 60-64, figs. 11, 1912.
4. Some fungous diseases of the prickly pear, *Opuntia Lindheimeri* Engelm. *Ann. Myc.* 10: 8-34, pls. 3 and figs. 8, 1912.
5. Gummosis, *Plant World* 15: 60-67, 1912.
6. A plant disease survey in the vicinity of San Antonio, Texas. U. S. Dept. Agr. Bul. 226, 1-129, pls. 19 and figs. 2, 1912, (with F. D. Heald).
7. Some apple diseases, *Proc. Ala. State Hortic. Soc.* 9: 69-75, 1912.
8. Oedema on manihot, *Phytopathology* 2: 131-134, pl. 11 and fig. 1, 1912, (with F. E. Lloyd).
9. The perfect stage of the rose *Actinonema*. (extract) *Science n. s.* 35: 151, 1912. Paper read before the Botanical Society of America at Washington, D. C.
10. A field method for distinguishing certain orange stock, *Agr. Exp. Sta. Circular* 17: 88-93, pls. 3 and figs. 6, 1912.
11. The perfect stage of *Actinonema rosae*. *Bot. Gaz.* 54: 218-234, pl. 13, 1912.
12. Notes on the anatomy of *Opuntia Lindheimeri* Engelm, *Plant World* 15: 294-299, figs. 10, Dec., 1912.
13. A new species of *Gnomonia* on hickory. *Ann. Myc.* 10: 488-491, pl. 15, 1912.
14. Black spot of roses. *Ala. Exp. Sta. Bul.* (In press).

Respectfully submitted,

FREDERICK A. WOLF,

Plant Pathologist.

REPORT OF THE BOTANIST

F. E. LLOYD, J. S. CALDWELL

Dr. C. C. Thach,
President Alabama Polytechnic Institute.

Sir:

The work here reported upon was that done during the portion of the year 1912 included between the date of the last annual report and September 1, when my resignation from the chair of Botany and from the office of Plant Physiologist to the Station took effect. At the courtesy of the Institute and Station, I continued my work upon the artificial ripening of persimmons during the first half of September, the cost of apparatus and experimentation during that time being charged to the appropriate fund.

TRANSPIRATION IN COTTON, *GOSSYPIMUM HERBACEUM*.

The work of the previous year was repeated during the summer of 1912 with the assistance of Assistant Professor C. S. Ridgway at Auburn, while supplementary work was done at the Desert Botanical Laboratory, Tucson, Arizona. Acknowledgements are due to the Carnegie Institution of Washington for courtesies extended.

The objects especially in view were (1) to check the results of 1911 and (2) to extend them by comparison to another definite and widely separated variety of cotton. For the latter purpose *Dixie* and *Dillon* were used, the latter being a marked cluster type. The pure seed was supplied by the Bureau of Plant Industry, with which the work was done in co-operation.

A partial report of results is in process of publication in the forthcoming issue of the Bulletin of the Torrey Botanical Club. In this paper a new type of microscope is described, which serves the purpose of studying living stomata *in situ*, in the manner referred to in my previous report. The remainder of the work is in process of elaboration leading to publication, and when this occurs, the results given will be properly credited to the Adams Fund

appropriation for the Department of Plant Physiology of this Station.

ARTIFICIAL RIPENING OF PERSIMMONS.

The experimentation of 1912 was directed toward determining the relation of rate of becoming non-astringent to different pressures of carbon dioxide. A special apparatus was devised for the purpose, and pressures up to 90 lbs. were obtained and kept constant for the periods of treatment required. It was found that the relations in question when plotted in a graph take the form of an hyperbola, and it seems probable, if more data were made available, that this form of graph would properly describe such relations. It was found possible to reduce the period required to render persimmons non-astringent to about 15 hours with 45 lbs. pressure. The chief results have been embodied in a preliminary paper now in press and soon to appear in **Science**. The first public announcement of them was made in general terms in the McGill University Lecture for 1912, upon taking up my duties as McDonald Professor of Botany in that institution. There is in process of preparation a paper which includes all the protocols of experiments done by me at Auburn, together with such practical suggestions as have been indicated, the whole to be submitted for publication as a Bulletin of the Station. I have to thank Dr. F. A. Wolf for hearty co-operation during the work of last September, and Mr. C. L. Coleman, Fairhope, Ala., for a supply of fruits of **Tanenashi** persimmons for use in the experimental work.

PUBLICATIONS.

(1) Tannin-colloid complexes in the persimmon. Johns Hopkins University Circular, Feb., 1912.

(2) The association of tannin with an emulsion colloid in the acorn of *Quercus laurifolia* Michx, *Ibid*, Feb., 1912.

(3) Artificial process of ripening persimmons. Trucker and Farmer pp. 20-21, Feb., 1912, also in Proc. Ala. Hort. Soc., 9th Annual Meeting, pp. 57-63, 1912.

(4) Oedema in Manihot, with F. A. Wolf. Phytopathology 2:131-134 with plate, 1912.

(5) Leafwater and stomatal movement in the cotton, *Gossypium herbaceum*, and a method of direct visual observation of stomata. Bull. Torr. Bot. Club (in press).

(6) Guayule, a desert rubber plant. Pop. Sci. Mo. 81: 313-330, Oct., 1912.

(7) The acclimatization of Guayule. (Digest in India Rubber World, 47: 183-184. Jan., 1912). The entire paper in press in the same.

(8) The artificial ripening of bitter fruits. (McGill University Lecture, October, 1912). Science N. S. 36: 879-889, Dec. 27, 1912.

(9) The induction of non-astringency in persimmons at supra-normal pressures of carbon dioxide. Science (in press).

(10) The cotton plant in Egypt. Plant World, (in press).

Respectfully submitted,

FRANCIS E. LLOYD.

The writer entered upon his duties as Plant Physiologist on September 9th, 1912. A rather full statement of the work undertaken since that time or projected for the coming year is submitted herewith, in order that subsequent reports may have the character of reports of progress rather than statements of purpose of work already well toward completion.

Mr. C. S. Ridgway continued his investigation of the occurrence of callose in root hairs during the year, and has demonstrated the presence in root hairs of plants grown in a number of soils and under a considerable variety of conditions of a substance possessing all the physical properties and giving all the micro-chemical reactions of typical callose as found in the sieve-tubes of the higher plants. A publication giving in detail the results thus far obtained is in press, and a further study intended to discover the conditions which induce the formation of callose in root hairs is in progress.

The principal lines of work now in progress and planned as objects of attention for the next year are the following:

1. A study of balanced solutions with especial reference to the higher plants. Current theories as to the relations existing between the commoner elements, as sodium, potassium, magnesium, and calcium, which are present in the soil water, are based almost wholly upon the general fact that these elements exist in sea water in such relative concentrations as to form an antagonistic or balanced solution which is non-toxic for marine organisms, although any one of the salts present would be speedily fatal if present alone in the same concentration occurring in the mixture. The existence of antagonistic relations between a considerable number of toxic elements, as notably in the mammalian blood, has been demonstrated by animal physiologists, and the studies of Loew, some twenty years since, showed the existence for plants of a similar antagonism between calcium and magnesium. The conception has in recent years been considerably extended by Osterhout, working with seed plants grown in watercultures. This investigator has announced the existence of some thirteen antagonisms between as many pairs of elements, including both metals and non-metals, each member of any pair being decidedly toxic when alone, but entirely harmless when the other is present in definite volume relations with it.

The profound significance of these conclusions in their bearing upon agriculture is immediately obvious. Should such antagonistic relations between elements everywhere present in cultivated soils hold for the normal conditions of growth of land plants as for water cultures, it follows that the soil solution is a balanced solution, in which each salt has a definite role to play in antagonizing the injurious effects of other salts. Should this be true, it would follow that our principal concern in maintaining soil fertility should be to discover and to preserve the proper balance between the various constituent elements of the solution. That there is great need for investigation to determine in what measure the antagonisms announced by Osterhout may hold for plants growing in known and controlled conditions in the soil is manifest.

The writer undertook the investigation of this problem

almost three years ago, has been at work practically continuously since, and has already obtained a very considerable body of results of a definite character. The work thus far done has involved the following out of several closely related lines of study, among which are (a) the determination of the exact limits of concentration at which inhibition of germination ceases, the limits of toxic effects, and the range of concentration within which inhibition and stimulation of growth of root or of top occur. These have been fairly completely worked out for sixteen elements, used in the form of chlorides, both in water and in ground quartz cultures. (b) The effect of absorption by a soil in lowering the concentration at which each of these effects occurs. (c) The working out of cultural methods, employing ground quartz in lieu of soil, which permit the maintenance of constant concentration of the salt or salts used during the entire period of growth of the plant. (d) The determination of the ratios between the elements of pairs of salts at which antagonism is manifested, if present.

The present investigation, which will be conducted as an Adams project, will be chiefly concerned with the fourth of these lines of study, work on the others having been practically completed prior to my appointment in this station. The following pairs of salts have already been rather exhaustively studied with relation to the presence or absence of an antagonistic relation between them: sodium chloride with potassium chloride, sodium chloride with chlorides of calcium, barium, lead, magnesium, and ammonium, potassium chloride with chlorides of calcium, barium, lead, magnesium, and ammonium, and magnesium with ammonium. The results of the studies will appear in a series of papers which are now in process of preparation for the press.

2. A study of the relation of the wilting co-efficient for plants grown in various soils to the environmental conditions under which the plants are grown. This study, which was begun in the summer of 1911 at the Desert Botanical Laboratory of the Carnegie Institution, has yielded some very interesting results. These indicate the necessity for material modification of the conclusions reached by

Briggs and Shantz that environmental conditions and consequent rates of evaporation are without discoverable effect upon the percentage of soil moisture remaining when permanent wilting of the plants growing in the soil has occurred. The results thus far obtained show that the percentage of soil moisture at permanent wilting is a variable, reaching a minimum under conditions which inhibit transpiration, as approximate saturation of the atmosphere, and increasing steadily as the rate of transpiration is increased. Comparative study of water-content of leaves and of soil have shown that while the water-content of the soil at wilting is a variable, as just stated, that of leaves is in very high degree constant regardless of the conditions under which wilting occurs, and it appears that in the water-content of leaves at permanent wilting we have a physiological constant of considerable value in studies of the water requirements of plants and the availability of soil moisture. A paper embodying the results thus far obtained is now in press, and further work will be done during the approaching summer.

3. A study of transpiration in cacti. The Cactaceae, in contrast to other green plants, present rates of transpiration which are relatively or absolutely higher during darkness than in day. A study of the causes of this peculiarity led to the discovery that the marked nocturnal rise in transpiration is due to the effect of increasing acidity resulting from imperfect oxidation upon the water-holding power of the contained mucilage. The mucilage has been isolated, freed from the associated protein and carbohydrate impurities, and its physical behavior, especially with relation to the variation in its power to absorb water and to withstand desiccation under varying conditions of acidity or alkalinity of the medium in which it is dissolved, has been studied somewhat in detail. The chemical composition of the mucilage has also been studied, and its general likeness to the colloidal plant gums studied by O'Sullivan and Robinson has been demonstrated. Pure preparations of the mucilage as a barium salt have been made, these have been subjected to gradual hydrolysis, and the percentages of pentose and

of hexose sugars which occur in combination with an organic acid nucleus in the molecule have been determined. The organic acid which forms the nucleus of the complex molecule has not been definitely determined, as the absence of facilities for the chemical aspects of the work necessitated its abandonment at this point. The very strong similarity, both in physical behavior and in chemical composition, between this mucilage and those from which certain adhesive gums of commercial importance are made, indicates that the work may have some immediately practical bearings, and it is a matter of great regret that it is impossible to continue the chemical side of the investigation.

4. Further investigation of some phases of the problem of boll shedding in cotton is planned for the approaching summer. This work will probably take the form of (a) attempts to produce boll shedding at will under artificially controlled conditions; (b) a detailed histological study of the tissues concerned; (c) the study of relation of disturbances of nutrition to shedding; (d) a study of the relation of age, size and number of bolls on the plant to the process of shedding; (e) further investigation of varietal differences with respect to shedding of bolls.

Respectfully submitted,

JOSEPH S. CALDWELL.

REPORT OF ANIMAL HUSBANDMAN

JESSE M. JONES

Dr. C. C. Thach,
President Alabama Polytechnic Institute.

Sir:

During the past year one circular and three bulletins have been issued from the Animal Industry Department, dealing with the following subjects:

Circular 18: (1) Feeding and Managing Dairy Cattle.

(2) Feed and Care of the Calf.

(3) Selection and Care of the Bull.

(4) Silo and Silage.

Bulletin 166 Curing Meat on the Farm.

Bulletin 167 Wintering Pregnant Ewes.

Bulletin 168 Fattening Hogs in Alabama.

Bulletin 168 is a partial report of the work done at the Station and also a partial report of the work done at the District Agricultural Schools with which the Station is co-operating.

The work has been largely a continuation of the work carried on during the past year. Some new problems however, have also been undertaken.

SWINE.

First, the study of the economic results of finishing hogs on green pasture crops in comparison with dry lot methods, with the school at Albertville, has been discontinued. Work has been continued at the other schools and on the farms where work has been undertaken.

Second, work in co-operation with the Department of Chemistry concerning hardening of the flesh and the lard of hogs, after they have been grazed on green pasture crops, is still in progress.

Third, the study of the effect of some southern feeds on the frame work of the body has also been continued in co-operation with the Department of Chemistry.

Fourth, determining whether some of the high priced

concentrates can be economically used in connection with green pasture crops, and the best amount to feed.

Fifth, the work on home curing of meats has been carried on during the year with interesting results.

Sixth, the work has been enlarged during the year on the two hog farms. One farm is in Henry county and one in Sumter county. The value of various southern feeds is being studied under farm conditions, and other problems in connection with growing pigs are also being studied.

Seventh, work has been undertaken to determine the cost of keeping brood sows during winter and summer when fed on various feeds.

Eighth, the subject of the cost of raising grade and pure bred pigs has also been undertaken.

BEEF CATTLE.

The co-operative work with the Bureau of Animal Industry at Washington has all been placed on Mr. O. E. Cobb's farm in Sumter county and is progressing satisfactorily. The questions still under consideration are:

First, the cost of raising beef calves under farm conditions.

Second, the study of the question of supplementing summer pasture with cotton seed by-products in fattening steers.

Third, investigating the fattening of calves, during the winter, on feed and silage. About 50 calves are on feed at the present time.

Fourth, to test the results of feeding hays along with cotton seed by-products in fattening steers.

Fifth, arrangements have been made to begin studying the cost of maintaining pure bred beef cows at the Station.

DAIRY COWS.

The dairy herd is of sufficient size now to begin experimental work and arrangements are being made to study the following questions:

First, the value of various home-grown feeds for milk production.

Second, the study of the value of various concentrates for milk production.

Third, the cost of raising pure bred calves and of maintaining dairy heifers.

POULTRY.

The work at the Hamilton School is in progress and oat and rye pasture are being tested for increasing the laying capacity of hens.

The flock record work has been discontinued with Mr. Allis, and arrangements are being made to begin work with Mr. R. L. Todd of Montgomery, who has a flock of about 400 hens.

L. W. SUMMERS,
Assistant Professor of Animal Industry.

REPORT OF HORTICULTURIST

E. P. SANDSTEN.

Dr. C. C. Thach,
President Alabama Polytechnic Institute.

Sir:

I respectfully submit the following report of work in the Horticultural Department for the year ending December 31st, 1912.

In making this report I have fully availed myself of the valuable help of Prof. J. C. C. Price, Assistant in Horticulture, and Mr. H. M. Conolly, Field Agent of the Department. My own connection with the Department has been too recent to acquaint myself with the various lines of work now in progress.

INVESTIGATIONS UNDER THE ADAMS ACT.

Peach Breeding for Resistance Against the Brown Rot.

This work has been in progress for a number of years and a large number of crosses have been made and the seed of these crosses have been planted for future fruiting. The very nature of this work makes progress slow and tangible results obtainable only after several years of work. We have encountered considerable difficulty in obtaining fertile seed from the crosses, and consequently the cross seedlings are relatively few.

Irish Potato Investigation.

The object of this experiment is to find some means by which the second crop of potatoes can be successfully stored for planting the following year and also to devise some means by which the first crop of Irish potatoes can successfully be utilized for seed for the second crop. Considerable progress has been made in this work and to further extend it, we are planning a new kind of storage and some means for treating the first crop so that it will pass through a short dormant period before the same is used for seed for the second crop. Considerable progress has been

made and much valuable data accumulated. This is an important problem to the truckers and farmers of the State and should be pushed to an early completion.

INVESTIGATION UNDER THE HATCH FUND.

Citrange Investigation.

Due to the unfavorable weather conditions during the blooming time in the spring of 1912, no crosses were obtained. No report has yet been received from the Bureau of Plant Industry in Washington from the cross bred seed that were sent to it and it will undoubtedly take several years yet for trees from these seeds to produce fruit. It is the plan of the Department to make further crosses the coming spring and extend this promising line of work.

In connection with plant breeding work in the Department, it is necessary to work with a large number of plants as the chances of obtaining valuable seedlings are relatively small and to facilitate this work it is important that the Department be provided with more land on which the new seedlings obtained can be tried out.

The work on canning vegetables and fruits on the farm for home use has been tried and proved successful. A small circular will be issued in the near future upon this subject. The canning of sweet potatoes has proven entirely successful and this will open up a comparatively new industry in the State as it will be possible to utilize the sweet potato crop in the fall, when the market is dull and prices low, to good advantage.

Fertilizer tests on various vegetables have been conducted during the present season and valuable data have been obtained, which will appear later in publications.

Greenhouses.

The work in forcing vegetables under glass is being continued and extended to cover fertilizer, variety and soil tests.

Orchard Fruits.

The work with orchard fruits has been along the lines of proper orchard management, the control of Blight, Brown Rot, and Borers.

PUBLICATIONS

The following publications were issued by the Department:

Circular 14—Parts 1 and 2: "Vegetable Growing in Alabama."

LOCAL EXPERIMENTAL WORK

This work has been carried on by Mr. H. M. Conolly under provisions made for the expenditure of the funds appropriated for this particular purpose. The line of work taken up during the year has been that of fertilizer and vegetable tests and has been distributed over fourteen counties and 23 places in all. Besides, sixty of the counties in the State have been visited and 10,000 miles been covered by rail and 1500 by other conveyances. In addition 22 Farmers' Institutes and farmers' meetings were attended and valuable information was thus brought direct to the farmers and growers.

Most of these experiments were concentrated in sections where horticultural crops formed the main source of income and where information upon the best methods is at present badly needed. This line of work is much appreciated by the vegetable growers as relatively little work has been done along this line.

Spraying demonstrations for the control of insect pests and fungus diseases were also carried on in many counties and interest stimulated in the raising of clean fruit. The following lines of work were undertaken and considerable progress made:

- (1) Truck and fruit survey of the State.
- (2) Fruit and vegetable region of the State with varieties suited to each region.
- (3) Collection and study of the promising seedling fruits and nuts of the State.
- (4) Developing the home vegetable garden and the home fruit orchard.
- (5) Demonstrations in spraying.
- (6) Improving school grounds and farm homes.
- (7) Testing of varieties of vegetables and fertilizers for the same.

- (8) The use of a commercial storage house for the keeping of sweet potatoes.
- (9) Testing the keeping qualities of various varieties of sweet potatoes.
- (10) The economical production of cabbage in the Mobile district.

STATE NURSERY INSPECTION.

The State nursery inspection for the past year was done by J. C. C. Price and H. M. Conolly of this Department. Due to illness of the late Prof. Williams, he was unable to participate in the work and due credit should be given to these gentlemen for performing the work efficiently.

The inspection of the State nurseries and the issuing of certificates and official tags, both for nurseries in the State and outside nurseries, entails a large amount of field and office work. The field work, unfortunately, comes at a time when the experimental work of the Department is in full swing and hence interferes greatly with it.

The number of nurseries in the State is about the same as last year and the same holds true with outside nursery-men doing business in the State.

The following are the lists of nurserymen in the State and nurserymen outside of the State and dealers to whom certificates and official tags have been issued:

CERTIFICATES ISSUED 1912-1913.

Alabama Nurserymen.

- 1. Chase Nursery Company, Huntsville.
- 2. Oaklawn Nurseries—A. W. Newson, Prop., Huntsville.
- 3. Garth Rolfe, Huntsville.
- 4. Huntsville Wholesale Nurseries—Huntsville & Gladstone.
- 5. Sugg Nursery Co., Gladstone.
- 6. J. O. Kelly and Sons, Jeff.
- 7. Fraser Nursery Co., Huntsville.
- 8. J. B. Stevenson, Madison.
- 9. Cullman Nurseries—C. S. Biggers, Prop., Cullman.
- 10. Birmingham Nurseries, Birmingham.

11. W. D. Summerfield, Birmingham.
12. Glen Iris Nurseries, Birmingham.
13. H. W. Luther, Birmingham.
14. Carlos Reese, Birmingham.
15. Colmant Nurseries, Birmingham.
16. Horticultural Sales Co., Sterrets.
17. W. W. Gravlee, Newtonville.
18. J. B. Earnest, Roanoke.
19. Lipp Nurseries, Roanoke.
20. Elmwood Cemetery Nurseries, Birmingham.
21. Owen Nursery—W. L. Owens, Ashland.
22. J. M. Joiner, Roanoke.
23. Morningview Floral Co.,—H. L. Von Trott, Montgy.
24. Rosemont Gardens, Montgomery.
25. Cliff A. Locke, Eufaula.
26. Alvin Japanese Nursery Co., Grand Bay.
27. Griffing Bros. Co., Branch 6, Grand Bay.
28. Fairhope Nursery—A. M. Troyer, Fairhope.
29. J. S. Gaylord, Barnwell.
30. H. E. Scott, Battle Wharf.
31. I. C. Beatty, Sr., Birmingham-Dolcito.
32. Industrial School Gardens, Mobile.
33. Saibara Nurseries, Mobile.
34. Irvington Nursery—A. H. Daves, Irvington.
35. Little Gem Floral Garden—H. P. Loding, Mobile.
36. Mobile Nurseries, G. W. DeVaughn, Prop., Mobile.
37. Roseview Nursery—F. E. Welch, Crichton and Chunchula.
38. Mrs. M. A. Farnham, Citronelle.
39. Mrs. L. P. Lilly, Citronelle.
40. Citronelle Nursery and Orchard Co., Citronelle.
41. Shadrick Stephenson, Russell.
42. William Wake, Flomaton.
43. L. M. H. Whetstone, Autaugaville.
44. Sneed Brothers, Prouto.
45. L. H. Reed and Company, Deer Park.
46. Eagle Pecan Co.,—Willis Thompson, Pittsview.
47. Cusseta Nursery—W. L. Morris, Prop., Cusseta.
48. R. H. Dickie, Citronelle.

49. Alpha Orchard and Nursery Co., Yellow Pine.
50. Frank Holman, York.
51. R. E. Shaw, Whatley.
52. Revier and Sons, Mobile.
53. Long View Pecan Groves—W. H. Moulthrop, Eufaula.
54. Paul Hoffman, Waverly.

Alabama Dealers.

1. Geo. E. Luffman, Birmingham.
2. C. S. Biggers, Cullman.
3. J. M. Crutchfield, Cullman.
4. Colmant Nurseries, Birmingham.
5. J. B. Earnest, Roanoke.
6. A. M. Preston, Blountsville.
7. Central Nursery and Orchard Co., Jasper.
8. Loveman, Joseph and Loeb, Birmingham.
9. J. J. Holmes, Montgomery.
10. Judson Strock, Verbena.
11. John B. Stroud, Pass Christian, Miss.
12. C. H. Kennedy, Arley.
13. D. C. Calkins, Foley.
14. E. Day, Birmingham.
15. M. M. Dawson, Montgomery.
16. A. M. Troyer, Fairhope.
17. H. L. Oppenborn, Swift.

Nurserymen Outside the State.

1. Griffing Bros. Co.—Port Arthur and McAllen, Tex.
2. Southern Nursery Co., Winchester, Tenn.
3. Wm. Warner Harper—Andorra Nurseries, Chestnut Hill, Pa.
4. The Morris Nursery Co.—Westchester, Pa.
5. Biltmore Nurseries, Biltmore, N. C.
6. T. S. Hubbard and Co.—Fredonia, N. Y.
7. Jackson and Perkins Co.—Newark, N. Y.
8. Hoopes Bros. and Thomas Co.—Westchester, Pa.
9. Henry A. Dreer, Inc., Riverton, N. J.
10. L. Roesch and Son, Fredonia, N. Y.
11. Commercial Nursery Co., Winchester, Tenn.
12. A. A. McElveen, Concord, Ga.

13. Smith Bros., Concord, Ga.
14. The Josselyn Nursery Co., Fredonia, N. Y.
15. Ellwanger and Barry, Rochester, N. Y.
16. Stark Bros. Nurseries and Orchards Co., Louisiana, Mo.
17. The New England Nurseries, Bedford, Mass.
18. Storrs and Harrison Company, Painesville, Ohio.
19. Schmidt and Botley—Springfield, Ohio.
20. Richland Nurseries, Rochester, N. Y.
21. Chase Brothers Co., Rochester, N. Y.
22. Perry Nursery Co., Rochester, N. Y.
23. Georgia Nursery Co., Concord, Ga.
24. Brown Bros. Co., Rochester, N. Y.
25. W. W. Thomas, Anna, Ill.
26. Continental Plant Co., Kittrell, N. C.
27. Cedar Hill Nursery Co., Winchester, Tenn.
28. Thomas Meehan and Sons, Germantown, Pa.
29. W. N. Scarff, New Carlisle, Ohio.
30. J. C. Hale Nursery Co., Winchester, Tenn.
31. Excelsior Nurseries, G. H. Miller and Sons, Proprs., Rome, Ga.
32. The Griffing Bros. Co., Macclenny, Fla.
33. Bobbink and Atkins, Rutherford, N. J.
34. J. Van Lindley Nursery Co., Pomona, Kernersville and Spout Springs, N. C.
35. Wild Bros. Nursery Co., Saracoxie, Mo.
36. Thomas Meehan and Sons, Dresher, Pa.
37. Peter Henderson and Co., Jersey City, N. J.
38. Summitt Nurseries, Monticello, Fla.
39. Greensboro Nurseries, Greensboro, N. C.
40. Lynnville Nurseries, Lynnville, Tenn.
41. Tennessee Nursery Co., Humboldt, Tenn.
42. Woodlawn Nursery, Prospect Station, Tenn.
43. The Frank H. Wild Floral Co., Saracoxie, Mo.
44. L. W. Peck, Hartwell, Ga.
45. Franklin Davis Nursery Co., Mullikin, Md.
46. Easterly Nursery Co., Cleveland, Tenn.
47. Piedmont Nursery, Hartshorn, R. D. No. 1, N. C.
48. The J. Steckler Seed Co., Ltd., New Orleans, La.

49. A. D. Williams, Yatesville, Ga.
50. The Fresno Nursery Co., Inc., Fresno County, Cal.
51. Marble City Nursery Co., Knoxville, Tenn.
52. The Florida Nursery and Trading Co., Paxton, Fla.
Postoffice, Florala, Ala.
53. Glen Brothers, Rochester, N. Y.
54. Mount Hope Nursery Co., Smithville, Tenn.
55. Lone Oak Vineyard, Decherd, Tenn.
56. H. C. Hastings Seed Co., Atlanta, Ga.
57. The Biloxi Nursery Co.—James Brodie, Proprietor,
Biloxi, Miss.
58. P. J. Berckmans Co., Augusta, Ga.
59. J. G. Harrison and Sons, Berlin, Md.
60. Tennessee Nursery Co., Cleveland, Tenn.
61. The Simpson Nursery Co., Monticello, Fla.
62. The D. Hill Nursery Co., Dundee, Ill.
63. Wagner Park Conservatory—B. P. Wagner, Sidney,
Ohio.
64. Old Dominion Nurseries—W. T. Hood and Co.,
Richmond, Va.
65. Munson Nurseries, Denison, Tenn.
66. Globe Nurseries, Bristol, Tenn.
67. Turkey Creek Nurseries, Macclenny, Fla.
68. Mountain Creek Nursery Co., McMinnville, Tenn.
69. Forest Nursery and Seed Co., McMinnville, Tenn.
70. Center Grove Nursery Co., Smithville, R. 5, Tenn.
71. Sink Creek Nursery Co., Smithville, R. No. 1, Tenn.
72. G. M. Bacon Pecan Co., DeWitt, Ga.
73. Joe Shadow Nursery Co., Winchester, Tenn.
74. The Glen Saint Mary Nurseries Co., Glen Saint Mary
and Winter Haven, Florida.
75. American Rose and Plant Co., Springfield, Ohio.
76. Wm. Anderson, Temple, Ga., R. F. D.
77. Seven Springs Nursery Co., Smithville, Tenn.
78. Pecan Grove Nursery Farm—J. B. Wight, Prop.,
Cairo, Ga.
79. Dibrell Nursery, McMinnville, R. No. 4, Tenn.
80. The Shenandoah Nurseries—D. S. Lake, Proprietor,
Shenandoah, Iowa.

81. The United States Nursery Co., Roseacres, Miss.
82. Toomsba Nurseries—W. C. Rogers and Sons, Toomsba, Miss.
83. Bluhm Nursery Co., Smithville, Tenn.
84. I. E. Bass and Sons Pecan Co., Lumberton and Columbia, Miss.
85. Smithville Nursery Co., Smithville, Tenn.
86. Royal Palm Nurseries, Oneco, Fla.
87. The Louisiana Nut Nurseries—Jones and Stewart, Props., Jeanerette, La.
88. Peachwood Nurseries—A. C. Coles, Prop., State Line, Miss.
89. Jas. Cureton, Austell, Ga.
90. Alvin Japanese Nursery, Alvin, Texas.
91. B. W. Stone and Co., Thomasville, Ga.
92. C. Forkert, Ocean Springs, Miss.
93. Chattanooga Nurseries, Chattanooga, Tenn.
94. Sam Stokes and Son, Lecompte, La.
95. Bechtel Pecan Nurseries—Thos. Bechtel, Proprietor, Ocean Springs, Miss.
96. S. Saibara, Webster, Texas.
97. Saibara Nurseries, Big Point, Miss.
98. Rood Pecan Groves, Albany, Ga.
99. Washer and Stewart, Smithville, Tenn.
100. Newton Nurseries—J. R. Woodham, Prop., Newton, Miss.
101. Carroll County Nursery—Chas. P. Turner, Prop., Carrollton, Ga.
102. Samuel Fraser, Geneseo, N. Y.
103. Mrs. W. R. Stuart, Ocean Springs, Miss.
104. Frank R. Lewis, Pascagoula, Miss.
105. Pecan Grove and Nursery—Edwards and Patterson, Props., Milledgeville, Ga.
106. J. W. Adams and Co., Springfield, Mass.
107. Fayette County Nursery, Fayetteville, Ga.
108. Valdesian Nurseries, Bostick, N. C.
109. German Nurseries—Carl Sonderregger, Proprietor, Beatrice, Nebr.
110. M. L. Alleshouse, Arcadia, Texas.

111. George Trautman, Jr., Geneva, N. Y.
 112. Glen Cliff Nursery, Decherd, Tenn.
 113. J. A. Withrow, Ellijay, Ga.
 114. Ramsay Pecan Co.—R. T. Ramsay, Prop., Ocean Springs, Miss.
 115. E. H. Landon, 250 Newland St., Los Angeles, Cal.

NURSERY STOCK INSPECTED IN 1912.

Apples	863,000
Peaches	3,095,255
Plum	62,040
Cherry	206,974
Apricot	14,060
Pears	354,010
Grapes	78,200
Pecans	567,680
Miscellaneous Nuts	67,565
Pomegranates	2,085
Ornamentals—	
Trees	273,662
Shrubs	3,783,117
Roses	998,950
Mulberries	112,672
Persimmons	8,437
Figs	70,700
Quinces	1,500
Satsuma Oranges	207,900
Oranges	6,000
C. T. Stocks	2,063,000
Kumquots	4,800
Grape Fruit	500
Total:	12,842,022

SEEDLING STOCK INSPECTED IN 1912.

Apple Seedlings	180,000
Peach Seedlings	2,951,000
Plum Seedlings	115,000
Cherry Seedlings	75,000
Pear Seedlings	300,000
Total:	3,621,000

Respectfully submitted,
 E. P. SANDSTEN, Horticulturist.

