

TWENTY-THIRD ANNUAL REPORT

OF THE

# Agricultural Experiment Station

OF THE

ALABAMA POLYTECHNIC INSTITUTE

AUBURN, ALABAMA

JANUARY 31, 1911

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OPELIKA, ALA:  
THE POST PUBLISHING COMPANY

1911



ALABAMA POLYTECHNIC INSTITUTE.

Auburn, Ala., Jan. 31, 1911.

GOVERNOR EMMET O'NEAL,

Executive Department,

Montgomery, Ala.

SIR:—I have the honor herewith to transmit to you the Twenty-Third 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, 1910.

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 Biologist, the Horticulturist, the Entomologist, and the Professor of Animal Industry, for the year ending December 31, 1910.

Respectfully,

CHAS. C. THACH,

President.

AGRICULTURAL EXPERIMENT STATION.

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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.....	Evergreen, Ala
R. B. Barnes.....	Opelika, Ala.
R. F. Kolb.....	Montgomery, Ala.
J. A. Rogers.....	Gainesville, Ala.
C. M. Sherrod.....	Courtland, Ala.

## STATION COUNCIL.

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Chas. C. Thach, M. A., LL. D.....	President
J. F. Duggar, M. S.....	Director and Agriculturist
B. B. Ross, M. S.....	Chemist
C. A. Cary, D. V. M., B. S.....	Veterinarian and Director Farmers' Institutes
J. T. Anderson, Ph. D.....	Chemist in Charge of Soil and Crop Investigation
W. E. Hinds, Ph. D.....	Entomologist
F. E. Lloyd, A. M.....	Plant Physiologist and Pathologist
C. L. Hare, M. S., M. A.....	Physiological Chemist
D. T. Gray, M. S.....	Animal Industry
L. N. Duncan, M. S.....	Agricultural Extension Work
P. F. Williams, B. S.....	Horticulturist

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## ASSISTANTS.

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Thos. Bragg, M. S.....	Assistant Chemist
C. S. Williamson, M. S.....	Assistant Chemist
E. F. Cauthen, B. S.....	Superintendent of Farm and Recorder
* N. E. Bell, B. S.....	Assistant in Chemistry
I. S. McAdory, B. S., D. V. M.....	Assistant in Veterinary Science
W. F. Turner, B. S.....	Assistant in Entomology
C. S. Ridgway, B. S.....	Assistant in Botany
M. J. Funchess, B. S.....	Assistant Agriculturist
J. C. C. Price, B. S.....	Assistant Horticulturist
E. T. Hallman, D. V. M.....	Assistant in Veterinary Science
W. M. Howell, D. V. M.....	Assistant in Veterinary Science
R. B. Whitesell, D. V. M.....	Assistant in Veterinary Science
E. R. Eudaly.....	Assistant in Animal Industry

\* Resigned.

REPORT OF HATCH AND ADAMS FUND FOR 1909-1910.

RECEIPTS.

	<i>Hatch</i>	<i>Adams</i>
To Amount from U. S. Treasury.....	\$14200.00	\$12600.00

DISBURSEMENTS.

By Salaries.....	\$ 7503.73	\$ 7837.57
By Labor.....	1293.23	805.75
By Publications.....	1274.96	
By Postage and Stationery.....	338.16	37.90
By Freight and Express.....	189.57	182.05
By Heat, Light, Water, and Power.....	604.03	28.60
By Chemical Supplies.....	309.88	118.77
By Seeds, Plants, and Sundry Supplies.....	457.97	761.49
By Fertilizers.....	507 67	84.27
By Feeding Stuffs.....		366.20
By Library.....	556.14	14.90
By Tools, Implements, and Machinery.....	145.98	90.27
By Furniture and Fixtures.....	19.80	103.65
By Scientific Apparatus.....	184.72	1156.31
By Live Stock.....	165.00	252.00
By Traveling Expenses.....	54.46	183.25
By Contingent Expenses.....	15.00	
By Buildings and Repairs.....	579.70	577.02
Total.....	<u>\$14200.00</u>	<u>\$12600.00</u>

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 and foregoing account is true and correct.

Witness my hand this 10th day of February, 1911.

WELBORN JONES,  
Notary Public.

(Seal)

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 A. P. Institute.

## REPORT OF DIRECTOR AND AGRICULTURIST.

J. F. Duggar.

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

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 1910 the publications of the Alabama Experiment Station consisted of the annual report, three bulletins, four circulars, and seven press bulletins. The titles and authors are given below:

Bulletin No. 149—Tests of Varieties of Cotton in 1909; by the Director and the Farm Superintendent.

Bulletin No. 150—Raising Beef Cattle in Alabama; by the Chief and Assistant in Animal Industry.

Bulletin No. 151.—Wintering Steers in Alabama. Fattening Cattle on Pasture in Alabama; by the Chief and Assistant in Animal Industry.

Circular No. 4—Information To Nurserymen in Regard to Fumigation of Nursery Stock; by the Horticulturist and Assistant Horticulturist.

Circular No. 5.—The Boll Weevil Advance in Alabama; by the Entomologist.

Circular No. 6.—Fighting the Boll Weevil; by the Entomologist.

Circular No. 7.—Destroying Boll Weevils by Clean Farming; by the Entomologist.

Press Bulletin No. 36.—Tests of Varieties of Cotton in 1909; by the Director and the Farm Superintendent.

Press Bulletin No. 37.—The Mexican Cotton Boll Weevil; by the Entomologist.

Press Bulletin No. 38.—Boll Weevil Enters Alabama; by the Entomologist.

Press Bulletin No. 39.—Falling of Cotton Squares and Small Bolls; by the Entomologist.

Press Bulletin No. 40.—Destroying Weevils in Corn; by the Entomologist.

Press Bulletin No. 41.—Tests of Varieties of Corn in 1910; by the Director and Farm Superintendent.

Press Bulletin No. 42.—Boll-Weevil Infested Area in the United States; by the Entomologist

As stated in each of my reports for the last two years, a large percentage of the bulletins of the Alabama Experiment Station are now out of print. There is urgent need that a number of the bulletins now out of print be reprinted. However, this cannot be done unless a special fund be appropriated for this purpose.

An increase in the printing fund is also needed in order that the mailing list of the Station be permitted to grow in proportion to the increased need for information shown by the farmers of Alabama. With an ample printing fund, much wider publicity could be given to the fact that these bulletins should be in the hands of every Alabama farmer, and these bulletins could be published in much larger editions and on a wider range of subjects than at present.

#### Staff.

The Experiment Station has been fortunate in the past year in having few changes in the Station staff. Mr. L. W. Shook was transferred from the position of Assistant in Animal Industry to work in Sumter county, conducted by this Station in co-operation with the Bureau of Animal Industry of the U. S. Department of Agriculture. He was succeeded by E. R. Eudaly, a graduate of the Texas Agricultural and Mechanical College. In the latter part of the year Mr. N. E. Bell, Assistant in Chemistry, resigned to enter the employ of the Bureau of Soils.

#### Agricultural Department.

In order to reach correct conclusions regarding agricultural practice, field experiments must be repeated through a series of years. Hence, most of the field experiments conducted on the Experiment Station farm at Auburn in 1910 were repetitions of earlier work.

The work which has required a large amount of the time and pains of the experimenting staff is that in breeding or improving cotton, corn, and oats. Satisfactory progress has been made in each of these lines in improving the plants under consideration, and a large mass of accurate data has been accumulated, which, when published, should afford a clearer insight into some of the problems of plant breeding,



and serve to formulate methods of procedure that can be followed by other plant breeders. In breeding cotton, more work has been bestowed on the Cook variety than on any other. However, much attention has been paid to the crossing of a number of varieties. The object, both in improving the Cook variety and in endeavoring to originate new varieties by hybridization, has been chiefly to evolve a variety better suited to boll weevil conditions than are any of the varieties now generally grown.

In the strains of Cook, which have been carefully bred up for four years, much improvement is noticeable in the form and productiveness of the plant and in certain strains progress has also been made in uniting earliness, fair size of boll, and in some strains increased length of lint, with the productiveness which has been sought in all work with this variety.

During the past year the systematic breeding of the Poulnot variety was undertaken with the hope of engrafting earliness on this variety, which is otherwise quite promising.

The special susceptibility of Cook cotton to the attack of boll rot has been an obstacle to its improvement. Beginning in 1910 a new method of handling the crop has been started and selections made with special reference to breeding a strain more nearly resistant than ordinary Cook to this serious disease. Elaborate records have also been made relative to the amount of boll rot on all of the different varieties of cotton grown on the Station farm.

The varieties of corn with which breeding work has been in progress for several years are Experiment Station Yellow, Henry Grady, and Mosby.

With oats the bulk of the breeding work has been done with the Red Rust Proof variety, though other varieties and various hybrids of our own making have received attention.

Except for Experiment Station Yellow corn, the improvement of which has now gone far enough to permit of its distribution to a limited number of farmers who will agree to grow it in careful tests in comparison with other kinds, the work of improvement will have to proceed for at least another year before it will be advisable to enter on any general distribution of seed.

In addition to plant breeding, some of the most important lines of experiments in progress during the year 1910

in the agricultural department are the following:

Cotton, relative fertilizing values of ground phosphate rock and acid phosphate.

Cotton, effects of planting heavy and light seed.

Cotton, continuation of the study of varieties.

Cotton, local fertilizer experiments.

Cotton, best time for applying nitrate of soda.

Corn, variety and culture experiments.

Oats, variety and culture experiments.

Crimson clover, variety and culture tests, and fertilizing value.

Cowpeas, variety tests.

Sorghum, variety tests.

Relative amounts of food produced by various crops suitable for hogs.

Soybeans, variety and culture experiments.

A study of numerous forage plants, including alfalfa, vetches, clovers, kudzu, and grasses.

Experiments in the manufacture on the farm of drain tile from cement and sand.

Rotation of crops.

Wheat, tests of varieties and mixtures.

Respectfully submitted,

J. F. DUGGAR,

Director and Agriculturist.

## REPORT OF THE CHEMIST.

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B. B. Ross.

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

Sir:

I herewith submit the following report with regard to the extent and character of the work of the Chemical Department of the Experiment Station for the past year:

The work of this department embraces investigations carried out under the provisions of the original Hatch act and of the Adams act, inspection work performed under police regulations which provide for the analysis of fertilizers, feed stuffs, illuminating oils, etc., while analyses are also made of many samples of miscellaneous materials sent in from all sections of the State.

The reports submitted by Dr. J. T. Anderson and Prof. C. L. Hare furnish information with regard to the progress of the work that is being conducted by them under the provisions of the Adams and Hatch acts, while a considerable amount of analytical work has been done in connection with experiments and investigations conducted by other departments of the Experiment Station.

The investigations being carried out with a view to noting the effects of seed selection upon the quality of the cotton seed produced from season to season are of interest on account of the economic aspect of the subject, as cotton seed and cotton seed products at present constitute such an important proportion of the total value of the cotton crop. If results at all similar to those that have been secured elsewhere in corn breeding can be attained in the production of cotton seed particularly rich in oil or in protein, the possibility of still further increasing the value of the by-products of the cotton crop becomes apparent.

Additional work has been done in connection with investigations as to the availability of basic cinder or slag obtained as a by-product from the manufacture of steel by the basic open-hearth process, though as yet there is some lack of agreement between laboratory and field tests as to the availability of the phosphoric acid in this material.

Further work in the investigation of this question is contemplated during the present year.

The fertilizer work of the past season showed an increase of about 10 per cent over that of the preceding year, and although the feed stuff law enacted in 1909 was practically inoperative, owing to defects in the law, a considerable number of samples were analyzed during the past year, while many samples of food materials for human consumption were also subjected to analysis in this laboratory.

In addition to the analytical work above outlined, this laboratory has also made analyses of a large number of specimens of miscellaneous materials forwarded from various localities in the State, including soils, marls, phosphates, ores, waters, etc.

Very respectfully,

B. B. ROSS,  
Chemist.

## REPORT OF VETERINARIAN.

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C. A. Cary.

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

Sir:

I respectfully submit a synopsis of the work of the Veterinary Department for 1910:

The influences of cotton seed meal on the health of the various organs of the body of pigs and horses, when fed cotton seed meal alone or in combination with other feeds, have been studied. This work requires time and repeated tests. It also requires numerous and tedious blood examinations, careful preparation of tissues for sections so that the pathological changes may be studied and recorded. While the toxic ingredient of cotton seed meal is said to have been determined, in so far as possible we aim to record all symptoms and microscopical changes in organs.

A study of the infections of cow's udders and the pathological changes is being continued. This requires numerous bacteriological analyses, and numerous sections and examinations of parts of a number of udders which are variously and differently diseased. The ways of infection, the influence of the morbid changes on milk secretion are considered. We had some opportunities to get records on the effects of peanuts, as a single ration, on hogs and pigs. This line of work is demanding attention on account of extensive use of the peanut as a hog feed and the rather common occurrence of a disease associated with, or caused by, the peanut. Observations on Osteo-porosis are made as cases are presented and chief aim is to find the cause of this obscure disease.

The sanitary question on farms, especially in dairies and dairy barns are studied. The infection of pens, soils, etc., by the careless handling of carcasses, manures and waste farm products is noted and studied. A study of the prevalence of animal parasites in domestic animals is made, and of necessity the work is slow because of lack of funds and workers who are able to push it.

The Farmers' Institutes during 1910 were not as numer-

ous as they were during 1909. But the sections of the state visited were somewhat more inaccessible, thus requiring more time and funds.

#### During 1910.

Farmers' Institutes held in Alabama.....	25
Number of counties visited .....	21
Number of Sessions .....	45
Average attendance at each session .....	71
Total Attendance .....	3186

The Round-Up Farmers' Institute and Summer School for Farmers was held at Auburn during the last week in July. There were 63 lectures and demonstrations given, beginning at 8 a. m. and ending at 10 p. m. every day. The enrollment for the Round-Up Institute was 835. For the second time the Institute had special lectures for women. These lectures were delivered by women on domestic art and science and on health and home life. These lectures were well attended and were attractive, interesting, and profitable.

C. A. CARY,  
Veterinarian and Director of Farmers' Institutes.

REPORT OF CHEMIST OF SOILS AND CROP  
INVESTIGATION.

J. T. Anderson.

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

Sir:

The following report of the work done by this department during the year 1910 is respectfully submitted.

With the exception of about five months given, as usual, to the state fertilizer work, our attention was devoted entirely to the prosecution of the Adams Project, the determination of soil requirements by the analysis of the cotton plant.

The methods of investigation heretofore employed, with two or three important modifications, were continued, namely, the observation of the simultaneous effect of fertilization on the composition of the plant and on the crop yield. The latter effect was determined in all cases by cultivation in open plots; the former, the effect of fertilization on the composition of the young plant, by the analysis of plants drawn from the open plots, as well as of plants grown in the same soil in wire baskets, the soil in the latter case being subjected to the same system of fertilizer treatment as in the plots. Previous to 1910 our plot tests were conducted in co-operation with the agricultural department of the station, all the material for our use being obtained from selected correspondents of that department who were engaged in The Co-operative Soil Test Experiments. In 1910 some material changes in the methods of fertilization were made in these Co-operative Soil Test Experiments, which made it necessary for us to look elsewhere for our material. The services of some 8 or 10 independent co-operators in different parts of the State were secured for our work and instructions sent them as to the manner of conducting the experiments. Samples and data from these correspondents are now being worked up in the laboratory.

The sand culture experiments in clay cylinders imbedded in the ground for studying the effect of fertilization on the composition of the plant, were continued.

Another use for imbedded cylinders was found during

the season of 1910. Realizing the difficulty of securing reliable co-operation in conducting Plot Tests in many cases where co-operation was essential, it was thought that the soil to be tested might readily be transported and placed in imbedded cylinders for the tests, our experience having demonstrated that the cotton plant may be grown normally to maturity in such cylinders of suitable size. While the cylinder method as a substitute for the Plot Method has its disadvantages, its many advantages are obvious. Three types of soil were selected and a set of 12 cylinders for each type was provided. The foundation or subsoil was the same for the entire group of 36 cylinders. Each set of cylinders was then filled to a depth of 8 inches with its own type of soil. In the application of fertilizers to the individual cylinders of each set the same scheme was followed as has been employed in the plot tests. All other details observed in the plot method have been applied to the cylinder method, and the analytical results, thus far obtained, conform strikingly to those of the older method.

The assistant in this department, Mr. Bell, resigned in September and the vacancy thus created has not yet been filled. It is hoped that a suitable man may soon be found, that the work may go on again without interruption.

Respectfully submitted,

JAS. T. ANDERSON,  
Chemist, Soils and Crop Investigation.



REPORT OF PHYSIOLOGICAL CHEMIST.

C. L. Hare.

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

Sir:

The work in this department during 1910 was, as in 1909, concerned with two main investigations.

1. The experiment of breeding cotton in an effort to increase the oil content of the seed was so far successful that some of the strains bred for three years showed a material gain in percentage of oil. These same strains, continued in 1910, suffered seriously during their growth from anthracnose which may necessitate the elimination of these high oil strains and the introduction of others which will in turn have to be bred up to the point attained by those originally used in the experiment. This is an illustration of the many problems that must be met and solved before a high oil cotton can be bred without sacrificing yield or quality.

2. During the year there was published a preliminary paper treating of the influence of feeds upon the properties of lard.

There have been obtained some striking results illustrating extremes of oiliness and hardness of lards produced from different feeds.

This investigation, with the scope enlarged, is being continued.

Respectfully submitted,  
C. L. HARE.

## REPORT OF ENTOMOLOGIST.

W. E. Hinds.

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

Sir:

The following report relates to the work of the Department of Entomology in the Experiment Station for the fiscal year 1910.

Work during the past year has continued mainly along the lines inaugurated during 1909. There has been no change in the working force. Mr. W. F. Turner, as Assistant, has given nearly all of his time to the routine station work, and especially to the Adams Fund investigation projects.

### Correspondence.

Inquiries regarding the control of insect pests have increased during the past year, indicating that there is a general advance in agricultural and horticultural information along these lines. The entomologist has received and answered more than 1,500 letters during the past year.

### Publications.

During the year 1910 the department of Entomology has issued the following publications in the Station Series: Circular No. 5, Boll Weevil Advances in Alabama. Circular No. 6, Fighting the Boll Weevil. Circular No. 7, Destroying the Boll Weevil by Clean Farming. Press bulletin No. 37, The Mexican Cotton Boll Weevil. Press Bulletin No. 38, Boll Weevil Enters Alabama. Press Bulletin No. 39, The Falling of Cotton Squares. Press Bulletin No. 40, Destroying Rice Weevils in Corn. Press Bulletin No. 42, The Boll Weevil Area in the United States. This publication shows the area of 1910 infestation, and is the basis for applying quarantine regulations against the weevil.

Besides these regular station publications, two articles reporting results of the Adams Fund project work have been published in the Journal of Economic Entomology. One of these dealt with general results of fumigation work for the control of insects in stored grain, the other with

materials which may be, or are frequently used in the construction of fumigation outfits. Besides these, a third article dealing with the life history of the rice weevil in corn has been presented before the American Association of Economic Entomologists, and will shortly appear in the *Journal of Economic Entomology*. Several articles on economic entomological subjects have been printed in the *Southern Farm Gazette*, and the *Southern Ruralist*, besides a large number of newspaper articles in the daily and weekly press, giving information relative to the boll weevil advance, and advising the people as to the best way to meet the situation. Mr. W. F. Turner has published a paper on the Control of Cucumber and Cabbage Insects, appearing in the Report of the Alabama State Horticultural Society for 1910, issued by the State Department of Agriculture and Industry, Serial No. 36.

#### **Public Addresses.**

In order to supply the imperative demand for lectures on the cotton boll weevil, it has been necessary to refuse numerous requests for addresses at farmers' institutes. More than a dozen addresses dealing with the boll weevil, many of them illustrated with stereopticon views, have been given in Alabama during the past year, and one at Atlanta, Ga. The expense for these trips has been met by the State Department of Agriculture, or by the society making the request.

#### **The Mexican Cotton Boll Weevil.**

As had been expected the Mexican Cotton Boll Weevil, in its eastward advance, crossed the western boundary line of Alabama, in Mobile County toward the end of August, 1910. The first specimens of the pest to be found in this state were taken at Wilmer, Ala., by the writer, on Sept. 3d. During the following six weeks the advance of the pest continued until about the middle of October. The line was found to enter the County of Choctaw, slightly south of Meridian, Miss., and extending in a southeasterly direction, including also small parts of Clark and Monroe, and all of Washington, Mobile, and Baldwin Counties within the line of 1910 infestation. Fortunately, in many respects, killing frosts occurring during the closing days of October put an end to the weevil's advance.

The coming of the boll weevil has awakened an intense

interest among the cotton planters of the state, and they are now in a position to accept and adopt recommendations for improved methods, such as would not heretofore have appealed to them. Large numbers of insects, mistaken for the boll weevil, are being sent for identification, and information requested.

#### **Fair Exhibit.**

In connection with the exhibit placed by the Experiment Station with the Montgomery State Fair, the Department of Entomology showed particularly by specimens, photographs, charts, etc., the boll weevil and insects mistaken for it, the fundamental steps which should be adopted in fighting the weevil, formulae for insecticides, and similiar subjects.

#### **Adams Fund Investigations.**

Much time has been devoted to a pursuance of the investigation announced in our last report regarding the rice weevil. Much entirely new information as to facts in the life history has been gathered, and the more important of these facts reported as mentioned under publications. Further progress has been made also in the matter of fumigation. Owing to practical difficulties to be found in applying fumigaton for the control of the rice weevil in stored corn under ordinary farm conditions, we are testing other means of a control, and hope to find some practical method which may be readily applied under usual conditions with little expense.

Respectfully submitted,

W. E. HINDS,  
Entomologist.

## REPORT OF PLANT PHYSIOLOGIST.

F. E. Lloyd.

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

Sir:

I beg leave to submit the following annual report as Plant Physiologist of the Alabama Agricultural Experiment Station, being a report of the second complete year of my tenure of that office.

A year ago, I stated that the preparation of my monograph on the guayule, (*Parthenium argentatum*), a desert rubber plant of Northern Mexico, was completed. This will shortly appear as Publication 139 of the Carnegie Institution of Washington. As a logical continuation of this work, the guayule and several of its congeners are being studied continuously in their relation to soil and climatic conditions at Auburn, while, at the courtesy of the Carnegie Institution of Washington, two of the species, the guayule and the mariola, are under observation at the Desert Botanical Laboratory, Tucson, Ariz. The data accumulating will afford material for a study of acclimatization.

My study of the development of the fruit of the date (*Phoenix dactylifera*), begun as a portion of an Adams Fund project at the Arizona Agricultural Experiment Station, has been completed. One of the primary objects of this study was to gain light on the role of tannin, which in this fruit and in the persimmon is a predominant factor in its relation to the ripening process, but the behavior of other foods (starch, reserve cellulose, oil especially) were also studied, during the whole embryonic period. Among the results of major interest, it was found that, judging from their physiological relations, there are two kinds of tannin; one being used as a food material, probably for the building up of the reserve cellulose in the endosperm, thus affording support to the recently-published view of van Wisselingh based on *Spirogyra*; the other is not a plastic material, but is secreted within certain cells of the seed coats and carpel where it remains permanently, after the fashion of an excrete.

I have also found that there is no segregation of tannin during the ripening process, and this result was extended to the persimmon, (*Diospyros*), though the contrary view has been held. The work has been published under the title "The development and nutrition of embryo, seed and carpel in the date, *Phoenix dactylifera*, L." in the 21st Annual Report of the Missouri Botanical Garden, and reprinted for limited circulation.

My work on the date naturally led me to a consideration of the persimmon, with particular reference to the behavior of the tannin-cells during ripening. As is well known, the great need of the persimmon grower is the ability to process persimmons after the fashion of the Japanese, and it was deemed that a more precise knowledge of the role of the tannin would contribute toward this end. I have found that the disappearance of astringency during ripening is due to the union of the tannin with a second colloid body, also secreted within the tannin-cell, to form an insoluble and imputrescible colloid-compound. It has also been shown that there remains a certain amount of soluble tannin and I have shown that this, under certain conditions, escapes from the tannin-cell and unites with a substance, probably pectose, which is derived by digestion of the middle lamella. These views harmonize with certain observations of Vinson on the heat relations of ripening in the date, and throw light on the data obtained by Bigelow, Gore and Howard, on the persimmon, thus enabling us to understand better the nature of the ripening process in these fruits. It may be added that the recently published work of Gore on the relation of carbon dioxide to ripening in the persimmon, following on Prinsen-Geerligs' results on the banana, will lead, I believe, to a solution of the method of processing fruit in a practical way. My own studies have in part appeared under the title, "The behavior of tannin in persimmons, with some notes on ripening," and are in part ready for the press in the form of two additional papers, (1) "The artificial ripening of persimmons," read at the last annual meeting of the Alabama Horticultural Society, and (2) "The nature of the tannin cell in the persimmon, *Diospyros*."

The Adams Fund project on transpiration and allied phenomena in the cotton has progressed. It was found very difficult to get material to grow well in the Department greenhouse on account of the inadequate heating and

lack of suitable assistance, the fact being that the personnel of the department is not commensurate with the demands made on it. The present winter's experience has been no better in spite of an earnest endeavor to take advantage of our facilities as they stand. Field methods of studying transpiration and correlated phenomena have therefore received major attention, and for this purpose I spent a month, at my own charges, at the Desert Botanical Laboratory, getting data on the rate of transpiration, by comparative volumetric and gravimetric methods. It was found that the discrepancy between the results obtained by these methods is not fortuitous, but a regular one, the ratio between them reversing during night and day. The difference is believed to be due in part to the difference in the water content of the leaf. Some data, obtained during September and October on the cotton at Auburn, appear to align themselves with this conclusion. Synchronous observations on the atmometer (of Livingston), insolation-thermometer, anemometer, thermometer and plant pieces have also been made with the hope of elaborating field methods for the comparative study of transpiration. My results have been in part reported in a paper "The relation of transpiration to the water content of leaves," presented at the recent meeting of the Botanical Society of America. Mr. C. S. Ridgway has assisted me in this work.

Some progress has been made on methods for the study of the relations of fumigation to the physiological condition of the plant, with special reference to the condition of the stomata and to the water content, but the condition of the greenhouse has also interfered with this work.

The history of the pecan-scab in a single orchard, that of Mr. T. W. Oliver, Montgomery, Ala., has been followed with the co-operation of Mr. C. S. Ridgway, throughout the year. It has come to light that the unfruitful condition in this orchard is, to a large degree, not due to the pecan-scab organism. A brief bulletin of information treating of this organism has been published.

The following is a list of publications from the Department.

(1.) The development and nutrition of the embryo, seed and carpel in the date, *Phoenix dactylifera* L. Ann. Rep. Mo. Bot. Garden, vol. 21: pp. 103-164, 4 plates. Dec. 22, 1910.

(2) Guayule (*Parthenium argentatum* Gray). A rubber

plant of the Chihuahuan Desert. Carnegie Institution of Washington, Publication 139. (In press).

(3) The behavior of tannin in persimmons with some notes on ripening. *The Plant World*, vol. 14: pp. 1-14. 1 plate. Jan. 1911.

(4) Some Alabama Plant Diseases, Bulletin No. 32, Ala. State Department of Agriculture. (With C. S. Ridgway and H. J. Chatterton). March 15, 1910. pp. 22.

(5) "El Guayule y su propagacion." (A Review.) *Am. Rev. Trop. Agri.* vol. 1: pp. 251-256. Aug.-Sept. 1910.

(6) Outline for the course in Botany, in a Manual for the County High Schools of Alabama. Montgomery, Ala. 1910.

(7) Plants and the Soil, 6th Ann. Rep. Ala. Soc. Ala. State Dept. Agri. Bull. 36. pp. 129-141. 1910.

(8) On the best method of teaching High School Botany. Proc. 29th. Ann. Session Ala. Ed. Assoc. pp. 244-251. 1910.

(9) Review of Spalding's Distribution and Movements of Desert Plants. *Science* n. s. 31: 863-866. June 3, 1910.

Respectfully submitted,

FRANCIS ERNEST LLOYD,

Plant Physiologist.



## ANIMAL INDUSTRY DEPARTMENT.

D. T. Gray.

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

Sir:

Two bulletins have been issued from the Animal Industry Department the past year. Bulletin 150 has to do with the question of "Raising Beef Cattle in Alabama." In bulletin 151 is found a report of the progress of the co-operative beef feeding work in Sumter County.

The work of the Department has been enlarged some during the past year, but, in the main, the experimental work continues as was reported in the last annual report. The present work of the Department may be summarized as follows:

### **With Swine.**

1. To study the results of finishing swine by dry lot methods as compared to the method of using green pasture crops. The last three years' work is now being prepared for publication.
2. To study the subject of hardening flesh and lard after it has been rendered soft as a result of the animals' having grazed green crops.
3. To note further the toxic effort of feeding cotton seed meal to hogs.
4. To learn the effect of some of the Southern swine feeds upon the frame work of the body.
5. To determine the most profitable amount of grain to feed with such green pastures as soy beans, peanuts and rape.
6. To study the question of home-curing of meats. A new smoke house has been erected for the work.

During the year an experimental hog farm has been established in Sumter County. This part of the hog work of the Department is being done in co-operation with the Bureau of Animal Industry of Washington. At the present time about 200 hogs are being used in the work.

### **With Beef Cattle.**

The co-operative beef work with the Bureau of Animal

Industry at Washington is going forward in an exceedingly satisfactory manner. Since the last report the work has been materially broadened. A second experimental farm has been established and a trained man, Mr. L. W. Shook, is on the farm and has immediate charge of all the experimental work. The main questions involved now are:

1. To study the methods of carrying mature beef steers through the winter months, when the object is to fatten them on pasture the following summer. 125 steers are being carried through the winter at the present time.

2. To determine the profits, if any, in supplementing the summer pastures with certain cotton seed by-products in finishing cattle for the summer and fall market. Almost 200 steers were used in the work last summer.

3. To study the question of fattening calves during the winter months on dry feeds. At the present time 150 calves are being used in these tests. They will be sold in March.

4. To determine the most profitable amount of cotton seed cake to feed steers while they are being finished on pasture.

5. To compare silage, cotton seed hulls and Johnson grass hay for finishing cattle in the winter time. The test was completed last March. 60 head of cattle were fed.

6. To determine the most profitable manner of making and saving barn yard manures when cattle are fed cotton seed meal and hulls. 60 steers are being used in the test.

7. To determine the cost of raising a beef calf in Alabama. A breeding herd of about 60 cows is being used in the test.

#### **With Sheep.**

The work with sheep continues about as reported in the last annual report. The most important points under consideration now are:

1. Early lamb production.

2. A comparison of Alabama feeds, including silage, for carrying the ewe through the winter months.

Very respectfully submitted,

DAN T. GRAY.

## REPORT OF THE HORTICULTURIST

P. F. Williams.

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

Sir:

I respectfully submit the following report for the year ending December 31st, 1910.

### **Adams Investigation.**

This work was continued the past year and considerable progress has been made. About 2,000 crosses of promising peach varieties were made and there were 763 set fruits resulting from these crosses. About 350 of these fruits produced perfect pits. These have been planted with a view of obtaining crosses or new varieties resistant to Brown Rot. Several varieties of peaches have been placed in the new greenhouse where the temperature may be controlled during the cross pollinating work.

### **Greenhouse.**

A new greenhouse was added during the summer, this new house being 22 x 100 feet. Three sections of this have been given up to the Adams project. Seven sections will be devoted to miscellaneous vegetable work.

### **Citrange Investigations.**

Mr. E. W. Lumpkin, a senior, has taken up this work and from a considerable number of crosses made with pollen from grape fruit, kumquat, ruby and common sweet orange on Citrus Trifoliata, 66 matured fruits were gathered and sent to Washington where the seeds from these crosses are being germinated in the forcing houses of the Bureau of Plant Industry. There is a growing interest in these hardy citrus fruits, and we shall continue this phase of the work another season.

### **Hatch Experiments.**

The forcing of tomatoes under glass has been continued to check the result of the previous season and a few new varieties have been added. This work has been greatly

facilitated by the erection of the additional greenhouse.

Excellent results have been obtained with variety and fertilizer tests with cabbage, Irish potatoes, beans, kohlrabi, turnips, and lettuce. This work is being duplicated and increased with a view of publishing results during the coming year.

The crops of peaches, pears, and apples have been the finest recorded during the past year.

Valuable data have been obtained in connection with the combatting of insects and fruit diseases. A bulletin is in preparation dealing with **self boiled lime sulphur and its use**.

The department purchased a small canning outfit during the summer and demonstrations were conducted at the Farmers' Summer School and with students, showing the method of canning fruits and vegetables.

### Library.

Prof. R. S. Mackintosh donated to the office a splendid collection of State Horticultural Society proceedings consisting of 137 volumes. The larger number of these reports are those of the Illinois, Iowa, Wisconsin, and Missouri Societies.

### Publications.

Last spring I wrote a bulletin on pecans, which appeared as Serial No. 34 of the State Department of Agriculture.

### Nursery Inspection.

I have been ably assisted in carrying on the State Nursery inspection work the past summer by the Assistant Horticulturist, Mr. J. C. C. Price, and Mr. R. U. Blasingame. This work is crowding the regular station work, and now that the boll weevil has entered the State, it will be impossible to carry out the work covering both the nursery inspection and boll weevil regulations without additional assistance and additional funds.

The list of State nurserymen and those of other States doing business in Alabama follows:

### Certificates Issued 1910-11.

#### I. Alabama Nurserymen.

1. Chase Nursery Co., Huntsville and Chase.
2. Rolfe Nursery Co., Huntsville.
3. Oak Lawn Nurseries, Huntsville.

4. Frasier Nursery Co., Huntsville.
5. Horsh, Sugg Nursery Co., Gladstone.
6. Huntsville Wholesale Nurseries, Huntsville and Gladstone.
7. J. O. Kelly & Sons Nursery Co., Jeff.
8. Welch Nursery, Madison.
9. J. P. Jones, Nursery, Fabius.
10. Cullman Nurseries, C. S. Biggers, Cullman.
11. J. H. Parker & Sons, Vinemont.
12. R. W. Pullen Nursery, Blountsville.
12. Colmant Nurseries, Birmingham.
14. Carlos Reese, Birmingham.
15. Gravlee Nurseries, Newtonville.
16. W. L. Owen, Nursery, Ashland.
17. J. B. Earnest, Roanoke.
18. Rosemont Gardens, Montgomery.
19. C. Ravier & Sons, Mobile.
20. Irvington Nursery, A. H. Daves, Prop., Irvington.
21. J. S. Gaylord, Barnwell.
22. Eagle Pecan Co., Pittsview.
23. Industrial School Gardens, Mobile.
24. Little Gem Floral Garden, Mobile.
25. Orchard Hill Nursery Co., Cullman.
26. Deer Park Nursery, Deer Park.
27. L. Thublin, Mobile.
28. J. P. Brown, Carney.
29. Wakefield Nurseries, Wm. Wake, Flomaton.
30. Eufaula Pecan Co., Eufaula.
31. Lipp Nursery, Roanoke.
32. W. D. Summerfield, Birmingham.
33. Waverly Nursery, Paul Hoffman, Waverly.
34. Roseview Nurseries, F. E. Welch, Chunchula.
35. Cusseta Nurseries, W. L. Morris, LaFayette.
36. Glen Iris Nurseries, G. E. Luffman, Birmingham.
37. Mrs. C. R. Long, Montgomery.
38. Fernhill Greenhouse, H. L. Van Trott, Montgomery.
39. E. H. Williams, Montgomery.
40. H. W. Luther, Ensley.
41. Shadrick Stephinson, Russell.
42. Joseph W. Everetts, Decatur.
43. Birmingham Landscape & Nursery Co., Elyton.

## II. Alabama Dealers.

1. C. H. Kennedy, Arley.
2. Colmant Nurseries, Birmingham.
3. J. M. Joiner, Wedowee.
4. John H. Draime, Citronelle.
5. J. J. Holmes, Montgomery.
6. R. L. McCarley, Scottsboro.
7. A. B. Webb, Scottsboro.
8. W. F. Propst, Oakman.
9. E. Day, Birmingham.
10. Geo. E. Luffman, Birmingham.
11. M. M. Dawson, Montgomery.
12. Homer N. Sneed, Pronto.
13. John B. Stroud, Pass Christian, Miss.

14. G. W. DeVaughn, Prichard.
15. A. Swift, Fairhope.
16. J. B. Adams, Pass Christian, Miss.
17. A. M. Troyer, Fairhope.

### III. Nurserymen Outside The State.

1. The Stark Bros., Nursery & Orchard Co., Louisiana, Mo.
2. P. J. Berckmans Co., Augusta, Ga.
3. The Frank H. Wild Floral Co., Sarcoxie, Mo.
4. Southern Nursery Co., Winchester, Tenn.
5. Pike Co. Nurseries, McElveen & McLendon, Concord, Ga.
6. H. M. Simpson & Sons, Vincennes, Ind.
7. Bluhm Nursery Company, Smithville, No. 6, Tenn.
8. Mount Hope Nursery, Moss & Allen, Smithville, Tenn.
9. Griffing Brothers Company, Macclenny, Fla.
10. The Morris Nursery Co., Westchester, Penn.
11. Tennessee Wholesale Nurseries, Winchester, Tenn.
12. Center Grove Nursery, R. L. Cantrell, Smithville No. 5, Tenn.
13. Dreer Nurseries, Henry A. Dreer, Inc., Riverton, N. J.
14. Turkey Creek Nurseries, C. F. Barber, Propr., Macclenny, Fla.
15. Commercial Nursery Co., Winchester, Tenn.
16. Munson Nurseries, T. V. Munson, Mgr., Denison, Texas.
17. Rood Pecan Groves, Albany, Ga.
18. Continental Plant Co., Kittrell, N. C.
19. T. S. Hubbard Co., Fredonia, N. Y.
20. Wild Bros. Nursery Co., Sarcoxie, Mo.
21. Concord Nurseries, Smith Bros., Proprs., Concord, Ga.
22. Excelsior Nurseries, G. H. Miller & Son, Proprs. Rome, Ga.
23. Geo. S. Josselyn, Fredonia, N. Y.
24. Upson Nurseries, A. D. Williams, Propr., Yatesville, Ga.
25. Easterly Nursery Co., Cleveland, Tenn.
26. Lewis Roesch & Son, Fredonia, N. Y.
27. W. W. Thomas, Anna, Illinois.
28. Knoxville Nursery Co., Knoxville, Tenn.
29. Simpson Nursery Co., Simpson Bros., Proprs., Monticello, Fla.
30. The Storrs & Harrison Co., Painesville, Ohio.
31. Old Dominion Nurseries, W. T. Hood, Propr., Richmond, Va.
32. Ellwanger & Barry, Rochester, N. Y.
33. Cedar Hill Nursery Co., Winchester, Tenn.
34. Jackson & Perkins Co., Newark, N. Y.
35. J. Van Lindley Nur. Co., Pomona and Kernersville, N. C.
36. Thomas Meehan & Sons, Drésher, Penn.
37. Biltmore Nurseries, Biltmore, N. C.
38. Perry Nursery Company, Rochester, N. Y.
39. Union Nursery Co., Smithville, Tenn.
40. Bremen Nursery, J. T. Anderson, Propr., Bremen, Ga.
41. Mount Arbor Nurseries, E. S. Welch, Propr., Shenandoah, Ia.
42. Joe Shadow Nursery Co., Winchester, Tenn.
43. M. L. Spivey, Lynnville, Tenn.
44. W. N. Scarff, New Carlisle, Ohio.

45. J. G. Harrison & Sons, Berlin, Maryland,
46. J. L. Westbrook, Temple, Ga.
47. Fallriver Nursery, Fallriver, Tenn.
48. Valdesian Nurseries, Bostic, N. C.
49. Bobbink & Atkins Nurseries, Bobbink & Atkins, Rutherford, N. J.
50. Wagner Park Conservatories, Sidney, Ohio.
51. Miner & Miner, Sheriden, N. Y.
52. Glenn Cliff Nursery, Winchester, Tenn.
53. The Toomsaba Nurseries, Toomsaba, Miss.
54. Wm. Warner Harper, Chestnut Hill, Penn.
55. The Donaldson Co., Warsaw and Sparta, Ky.
56. Summit Nurseries, Miller & Gossard, Props., Monticello, Fla.
57. Monticello Nurseries, The Standard Pecan Co., Monticello, Fla.
58. Franklin Davis Nursery Co., Mullikin, Md.
59. Smithville Nursery Co., Smithville, Tenn.
60. Oakland Nurseries, Columbia, Tenn.
61. Keltonburg Nursery, C. A. Cantrell; Smithville No. 3, Tenn.
62. Thomas Meehan & Sons, Inc., Germantown, Penn.
63. Greensboro Nurseries, Greensboro, N. C.
64. The J. Steckler Seed Co., New Orleans, La.
65. Prosperity Nursery, Redman Bros., Smithville No. 3, Tenn.
66. The Wm. H. Moon Co., Morrisville, Penn.
67. Glen Saint Mary Nurseries Co., Glen Saint Mary, Fla.
68. Cureton Nurseries, Austell, Ga.
69. C. Forkert, Ocean Springs, Miss.
70. United States Nursery Co., Roseacres, Miss.
71. Tullahoma Nursery, Tullahoma, Tenn.
72. Chattanooga Nursery Co., Chattanooga, Tenn.
73. Arcadia Nurseries, J. H. Girardeau, Jr., Prop., Monticello, Fla.
74. R. A. Eubank, Prospect Station, Tenn.
75. The Bechtel Pecan Nurseries, Ocean Springs, Miss.
76. G. M. Bacon Pecan Co., DeWitt, Ga.
77. Hartwell Pecan Nurseries, S. W. Peek, Propr., Hartwell, Ga.,
78. Forest Nursery & Seed Co., J. H. Boyd, Propr., McMinnville, Tenn.
79. Peter Henderson & Co., Proprietors, Jersey City, N. J.
80. The Shenandoah Nurseries, D. S. Lake, Prop., Shenandoah, Ia.
81. Schmidt & Botley, Springfield, Ohio.
82. Will F. Halladay, Decherd, Tenn.
83. The Sneed Wholesale & Retail Nur., J. F. Sneed, Mgr., Tyler, Texas.
84. Big Four Nursery Co., L. P. Potter & Sons, Smithville, No. 1, Tenn.
85. Foster & Griffith, Fredonia, N. Y.
86. Cumberland Nurseries, Winchester, Tenn.
87. The D. Hill Nursery, Co., Inc., Dundee, Ill.
88. Pecan Grove Farm Nursery, J. B. Wright, Propr., Cairo, Ga.

89. James Brodie, Biloxi, Miss.,
90. John B. Stroud, Pass Christian, Miss.
91. Southern Nut Tree Nursery, C. A. Rouzer, Mgr., Thomasville, Ga.
92. The Ramsey Pecan Co., Ocean Springs, Miss.
93. Hoopes Bros. and Thomas Co., Westchester, Penn.
94. R. L. Eaton, Monticello, Fla.
95. Jefferson Nursery Co., Proprietors, Monticello, Fla.
96. The Corinth Nurseries, Corinth, Miss.
97. The Newton Nurseries, Newton, Miss.
98. Fairview Nursery Co., Winchester, Tenn.
99. The Peachwood Nurseries, State Line, Miss.
100. The Alvin Japanese Nur., S. Arai, Mgr., Alvin, League City & Mykawa, Tex.
101. Eastern Nurseries, Holliston, Mass.
102. B. W. Stone & Co., Thomasville, Georgia.
103. J. W. Adams & Son, Springfield, Mass.
104. Chas. R. Fish & Co. Worcester and Auburn, Mass.
105. Stuart Pecan Co., Miss W. B. Stuart, Mgr., Beaumont, Texas.
106. John Lightfoot, East Chattanooga, Tenn.
107. Barnesville Nursery Co., Stafford & Howard, Barnesville, Ga.
108. Fairview Nurseries, J. E. Sweet, Naylor, Ga.
109. The Paper Shell Pecan Nursery, LaFayette, La.
110. Spring Hill Nurseries, Peter Bohlender & Son, Tippecanoe, O.
111. German Nurseries, Carl Sonderegger, Beatrice, Nebr.
112. The American Rose and Plant Co., Springfield, Ohio.
113. The American Crescent Nursery Co., Council Bluffs, Iowa.
114. Rich Land Nurseries, Rochester, N. Y.

Yours very truly,

P. F. WILLIAMS,  
Horticulturist.