

CONNECTICUT
AGRICULTURAL EXPERIMENT STATION
NEW HAVEN, CONN.

Report of the Director
For the
Year Ending October 31, 1923

The Bulletins of this Station are mailed free to citizens of Connecticut who apply for them, and to other applicants as far as the editions permit.

CONNECTICUT AGRICULTURAL EXPERIMENT STATION

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January, 1924.

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Forestry.	WALTER O. FILLEY, <i>Forester in Charge</i> . A. E. MOSS, M.F., <i>Assistant Forester</i> . H. W. HICOCK, M.F., <i>Assistant Forester</i> . MISS PAULINE A. MERCHANT, <i>Stenographer</i> .
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Soil Research.	M. F. MORGAN, M.S., <i>Investigator</i> .
Tobacco Sub-station at Windsor.	C. M. SLAGG, M.S., <i>in Charge</i> .

Report of the Director

FOR THE YEAR ENDING OCTOBER 31, 1923

To the Board of Control of the Connecticut Agricultural Experiment Station:

For the first time it becomes my duty to prepare the annual report of the operations of the Station. By far the most important event of the year has been the resignation on July first of Dr. E. H. Jenkins, under whose guidance the Station has attained so enviable a reputation both at home and abroad. It seems fitting to include here an excerpt from the editorial pages of the Experiment Station Record for July of this year:

"The entire active career of Dr. Jenkins is centered in a single institution. This is a remarkable fact when the number of changes in most of the stations during the early years is considered, and the extent to which the workers transferred from one institution to another. He went to the Connecticut State Station as assistant chemist in 1877, when it was transferred from Middletown to New Haven. This was after his graduation from Yale and return from a year's study at the University of Leipzig. He was one of the two chemists who with the director, Dr. S. W. Johnson, formed the entire staff of the station. He has been continuously in its service from that time to the close of June, a period of nearly forty-seven years. In 1883 he became vice-director, and on the retirement of Dr. Johnson in 1900 he succeeded him as director. Since the consolidation of the administrative control of the State and Storrs Stations in 1912, he has served as director of both, and has rendered a valuable service in coordinating their activities in such a way as to avoid needless duplication and make them better meet the needs of the State.

Including his period as vice-director, Dr. Jenkins' executive duties have covered a span of forty years, while his entire period of service is not only the longest at a single institution of any worker now living but exceeds that of any surviving member of the station forces. To few men is the opportunity given for a comparable period in which to formulate and carry into execution plans for the consistent development and upbuilding of a research institution."

In assuming the duties laid down by Dr. Jenkins, I have a keen sense of the honor and responsibility which you have placed upon me and it is with great pleasure and gratitude that I record the constant readiness of Dr. Jenkins to advise and encourage and likewise the cordial and loyal support of the entire staff.

Since Dr. Jenkins' resignation did not take effect until July first, more than half of the year has been under his administration. This report, however, covers the entire station year ending October 31, 1923.

CHANGES IN STAFF

In addition to the changes in administration mentioned above, the following resignations and appointments have taken effect:

Resigned:

Mr. Samuel T. Sealy, Deputy in charge of Mosquito Elimination, April 1, 1923.

Mrs. Alta Moss Storrs, Secretary in the Analytical Laboratory, June 1, 1923.

Dr. George H. Chapman, In charge of Tobacco Sub-Station, August 1, 1923.

Appointed:

Mr. R. C. Botsford, Deputy in Charge of Mosquito Elimination, July 1, 1923.

Miss Mabel Bacon, Secretary in the Analytical Laboratory, June 1, 1923.

Prof. M. F. Morgan, M.S., Investigator in Soils, July 20, 1923.

Miss Mary E. Bradley, Secretary to the Director, August 1, 1923.

Mr. C. M. Slagg, M.S., In Charge of Tobacco Sub-Station, August 1, 1923.

PUBLICATIONS

The annual report of the Station for the year ending October 31, 1922 (507 pages), with the exception of 32 pages of reports by the treasurer and director and the index, consisted of the following **Bulletins**:

- No. 240. Report on Food Products and Drugs (1922), Part I.
- 241. Fertilizer Report for 1922.
- 242. Report on Commercial Insecticides and Fungicides (1922).
- 243. Report of the Director for the Year Ending October 31, 1922.
- 244. Spray Calendar (1923).
- 245. Results of Dusting versus Spraying in Connecticut Apple and Peach Orchards in 1922.
- 246. The Apple and Thorn Skeletonizer.
- 247. Twenty-Second Report of the State Entomologist (1922).
- 248. Report on Food Products and Drugs (1922), Part II.
- 249. Report on Commercial Feeding Stuffs (1922).

The report also contains the First Report of the Tobacco Sub-Station at Windsor, Connecticut, and the following bulletins of the Sub-Station:

- No. 1. Condensed Recommendations for the Control of Wildfire (January, 1922).

2. Wildfire of Tobacco in 1922 (January, 1923).
3. Experiments in the Curing and Fermentation of Connecticut Shade Tobacco (February, 1923).

Besides the above, the following **Circulars of Immediate Information** were published:

- No. 19. Winter Pruning of Fruit Trees. (March 14, 1923.)
20. Dormant Sprays on Orchard Trees. (March 21, 1923.)
21. What are Good "Seed" Potatoes? (April 5, 1923.)
22. The Pink Spray for Apple Orchards. (May 1, 1923.)
23. Diseases Carried by Seed Potatoes. (May 1, 1923.)
24. The Calyx Spray for Apples, Pears and Quinces. (May 21, 1923.)
25. The European Corn Borer Quarantine. (May 28, 1923.)
26. The Apple and Thorn Skeletonizer. (August 15, 1923.)
27. Registration of Bees. (Sept. 15, 1923.)

Following is a list of **Journal papers** and other publications by staff members:

The Potency of Some Commercial Vitamine Preparations.

By E. M. Bailey. Read at a meeting of New England Food and Drug Control Officials, Portsmouth, N. H.

A Modified Test for Phthalates.

By R. E. Andrew. *J. Ind. & Eng. Chem.*, 15, 8, 838. (Aug. 1923).

Quantitative Aspects of the Role of Vitamine B in Nutrition.

By T. B. Osborne and L. B. Mendel. *Jour. Biol. Chem.* (1922) LIV, pp. 739-752.

Eggs as a Source of Vitamin B.

By T. B. Osborne and L. B. Mendel. *Jour. Am. Med. Assn.* (1923) LXXX, pp. 302-303.

Kidney Hypertrophy Produced by Diets Unusually Rich in Protein.

By T. B. Osborne, L. B. Mendel, E. A. Park and D. Darrow. *Proc. Soc. Exp. Biol. and Med.* (1923) XX, pp. 452-453.

A Product of Mild Acid Hydrolysis of Wheat Gliadin.

By H. B. Vickery. *Jour. Biol. Chem.* (1923) LVI, pp. 415-428.

Ocular Manifestations of the Rat which Result from Deficiency of Vitamin A in the Diet.

By A. M. Yudkin. *Jour. Am. Med. Assn.* (1922), LXXIX, pp. 2206-2208.

Pathogenesis of the Ocular Lesions Produced by a Deficiency of Vitamin A.

By A. M. Yudkin and R. A. Lambert. *Jour. Exp. Med.* (1923) XXXVIII, pp. 17-24.

Changes in the Paraocular Glands Accompanying the Ocular Lesions which Result from a Deficiency of Vitamine A.

By R. A. Lambert and A. M. Yudkin. *Jour. Exp. Med.* (1923) XXXVIII, pp. 25-32.

Connecticut Vegetable Diseases in 1922.

By G. P. Clinton. *Rept. Conn. Veg. Growers' Assn.* (1922) pp. 69-74.

Connecticut Fruit Troubles in 1922.

By G. P. Clinton. *Proc. Conn. Pom. Soc.* (1922) pp. 10-13.

The Aleyrodidae and Coccidae of Connecticut.

By W. E. Britton. *Conn. Geol. & Nat. Hist. Survey* (June, 1923) Bulletin No. 34, 48 pp.

The Apple and Thorn Skeletonizer.

By W. E. Britton. *Proc. 32nd Ann. Meeting Conn. Pom. Soc.* (1923) p. 21.

- Rapid Spread of the Apple and Thorn Skeletonizer, *Hemerophila pariana* Clerck.
By W. E. Britton. Jour. Econ. Ent. (April, 1923) Vol. 16, p 207.
- The Gipsy Moth. Proceedings of Conference at Albany, N. Y. Nov. 16, 1922.
By W. E. Britton. N. Y. State Dept. Agric. Bull. 148 (Dec., 1922) p. 44.
- Swarms of Aphids.
By W. E. Britton. Jour. Econ. Ent. (Aug. 1923), Vol. 16, p. 395.
- Report of Committee on Injurious Insects.
By W. E. Britton. Conn. Pom. Soc. Proceedings (1923) p! 5.
- The Arbor-Vitae Leaf-Miner.
By W. E. Britton. Tree Talk, Vol. 5, No. 2 (1923) p. 24.
- The Work of the State Entomologist.
By W. E. Britton. Hartford Daily Courant (Oct. 21, 1923).
- Insects Attacking Vegetable Crops in 1922.
By W. E. Britton. Rept. Conn. Veg. Growers' Assn. (1922) p. 83.
- The Hemiptera of Connecticut.
By W. E. Britton *et al.* Conn. Geol. & Nat. Hist. Survey Bull. 34 (June, 1923), 807 pages, 169 figs., 20 plates.
- Comparative Results of Spraying and Dusting on Apples and Peaches.
By M. P. Zappe and E. M. Stoddard. Proc. Conn. Pom. Soc. (1923) p. 30.
- Work with the Control of the European Red Mite in 1922.
By Philip Garman. Proc. Conn. Pom. Soc. (1923), p. 13.
- Notes on the Life History of *Clastoptera obtusa* and *Lepyronia quadrangularis*.
By Philip Garman. Annals Ent. Soc. of America, Vol. XVI (June, 1923) p. 153.
- A Report on Double-Crossed Burr-Leaming Corn Grown in 1922.
By D. F. Jones. A mimeographed circular. (April, 1923).

PHYSICAL EQUIPMENT

During the year a number of pieces of much needed apparatus were purchased for the laboratories, including three special microscopes and a potentiometer. Two insectaries were erected and repairs made to the Station property on Huntington Street. Two fireproof safes for records and other office equipment were also added.

About 900 volumes were added to the library, which now includes over 10,900 volumes and an unusual equipment of scientific journals.

The inventory of June 1, 1923, shows:

Value of buildings and lands.....	\$295,275.00
Value of contents.....	103,746.55
Total.....	\$399,021.55

CONTROL AND SERVICE WORK

Since the founding of the Station, control and service work has been one of its functions. From time to time, duties of this nature have been added by the General Assembly, most of them

under special acts, and the administration of these has been maintained separate from the main operations or research proper.

Thus the Station administers entirely or in part the fertilizer, feed, food and drug, and insecticide control; the certification of Babcock glassware; the gipsy moth control; orchard and nursery inspection; apiary inspection; mosquito elimination and the white-pine blister-rust eradication; and the examination and certification of tree surgeons.

The chemical laboratories are at the service of residents of the State for the examination of fertilizers, feeding stuffs and drug products, when such information may be considered of public value and interest when published in the Station reports. Plant disease specimens, insects, weeds and similar material may also be sent to the Station for identification and advice on control. Questions regarding livestock management should usually be addressed to the Storrs Station, but on other matters this Station stands ready to render help and advice. Requests for analysis of drinking water should be addressed to the State Department of Health.

REPORTS OF DEPARTMENTS.

ANALYTICAL CHEMISTRY.

Dr. E. M. Bailey in charge.

1. During the year, in accordance with the provisions of the Statutes, about 860 samples of fertilizers have been examined, the results reported to the purchasers or others interested, and the complete data finally classified and prepared for publication.

2. Three hundred and seventy-one samples of commercial feeding stuffs and other fodder materials have been examined. This number includes analyses of certain field crops connected with experimental projects at this Station and at Storrs.

3. Over 2,500 samples of food products and drugs have been analyzed. While this is largely for purposes of control, many examinations have been made for the information of physicians, dietitians and others interested in dietetics; thus a number of unusual vegetable foods have been analyzed for Dr. W. A. Orton of the Bureau of Plant Industry, U. S. D. A., who is interested in new foods which may be utilized for the purpose of adding variety to the rather limited diet of diabetic patients.

4. A bulletin on insecticides and fungicides has been published which includes scattering analyses made in previous years and results of a rather complete survey of the market made in 1922. The new work of the past year has been chiefly upon samples

submitted by the departments of Entomology and Botany of this Station. About fifty samples have been examined, which number includes miscellaneous materials related to the subject.

5. Nearly 4,300 pieces of Babcock glassware have been inspected for accuracy of calibration and for conformity to other standard specifications.

Aside from essentially routine work, some time has been given to studies of methods and their applications. These include the determination of ammonia in eggs, the determination of nicotine in tobacco and tobacco products, the determination of fat in ice cream and the determination of starch and sugar in presence of gums and mucilages. An improved method for the detection of phthalates in alcoholic solutions has been devised and the details of the method have been published as noted in the list of publications.

Collaboration with the Association of Official Agricultural Chemists has been continued; also the laboratory has engaged in the coöperative programs of the American Oil Chemists Society and the F. S. Royster Guano Company, which involves the analysis of check cottonseed meal and mixed fertilizers.

The chemist in charge has assisted Dr. E. P. Joslin in the revision of his text on Treatment of Diabetes Mellitus by preparing a revision of tables of composition of normal foods and of so-called diabetic and special foods. He has continued to serve as a consultant to the Council on Pharmacy and Chemistry of the American Medical Association on subjects pertaining to diabetic and special foods; also as a member of the Joint Committee on Definitions and Standards for food products and drugs. Mr. Andrew has acted as referee on methods for analysis of tea for the Association of Official Agricultural Chemists.

BIOCHEMISTRY (PROTEIN RESEARCH)

Dr. T. B. Osborne in Charge.

The work of the department is supported in part by a grant from the Carnegie Institution of Washington, D.C. In the study of problems of nutrition, we are favored by the collaboration of Dr. L. B. Mendel of Yale University. The active projects may be discussed as follows:

1. Study of the proteins of green plants has been continued and the scope of these investigations extended to attempts to learn the nature of the nonprotein substances with which they are associated.

Methods have been developed whereby it is possible to obtain large quantities of the fluid present in the vacuoles of the cells apart from the semisolid cytoplasm and subsequently to obtain

the latter, likewise in relatively large quantities, free from the cell walls and other supporting structures of the plant.

Studies of these two parts of the plant cell are being made in the hope that they may contribute to the scanty knowledge which scientists now have respecting the chemistry of the cell. Investigations in this field are essential for further progress in the study of many of the problems of the nutrition of animals and plants, as well as of those of plant physiology and plant pathology.

2. The relation of the chemical constitution of the diet to the development of rickets has been studied in coöperation with Dr. Park of the Medical School of Yale University. A combination of purified food constituents has been discovered which has indicated the part played by each in the development of this disease. Work in this field is still in progress, the purpose being to determine more precisely the effect of the various constituents of food on the development of bones.

3. Studies of the relation of vitamins to nutrition are being continued.

4. The feeding experiments, referred to in the report for last year, respecting the part played by proteins, carbohydrates and fats, have been continued and the results embodied in a paper now in press.

5. Studies of the effect on the eye of a deficiency in the diet of the fat-soluble vitamin have been continued in coöperation with Dr. A. M. Yudkin, ophthalmologist of the School of Medicine of Yale University.

6. The studies of the effect of diet on fertility, which last year were undertaken in collaboration with Dr. Mason of Professor Harrison's department of Yale University, have been continued with striking and important results, some of which will soon appear in print.

7. Further work on the relation of the chemical structure of the proteins to their nutritive value has been begun.

8. A new edition of "The Vegetable Proteins" has been prepared and the subject brought down to date. This volume summarizes a large part of the work done in this department during past years and also includes that done by others in this field of study.

BOTANY.

Dr. G. P. Clinton in charge.

The work of the department may be summarized as follows:

1. **Experiments on Fertilization of Peaches.** This problem has been continued without change. Nitrate of soda seems to give most satisfactory results.

2. **Mosaic of Plants.** An intensive study of mosaic diseases of plants, with Dr. McCormick, has been made. This included infection experiments out of doors and in the greenhouse; a critical and prolonged microscopic study of the leaves of infected tobacco, etc.; and a chemical study, with help of Dr. Bailey's department, of healthy and mosaic tobacco leaves. We believe we now know as much about this disease as any one, but the cause still remains a mystery.

3. **North American Ustilaginales.** A beginning has been made on the publication, as an addendum to this volume, of such new species, hosts and distributions of the smuts as have come to light since the former publication. This work has taken considerable time, and much remains yet to be done before its completion.

4. **Rusts of Connecticut.** In connection with W. R. Hunt, a graduate student in botany at Yale, a monograph of the Rusts of Connecticut has been started. Mr. Hunt took the material collected by Dr. Clinton during his twenty years' connection with the Station and prepared it for his master's degree. During the summer he was employed by the Station for two months on similar work. A special effort was made to add to these collections during the year. The material has now all been determined, and includes between 125 and 150 species represented by over one thousand specimens.

5. **Plant Disease Survey.** The plant disease survey of the State for the Station and the U. S. Department of Agriculture has been continued. Card indexes of all observed diseases, their prevalence, distribution, etc., have been made, and preliminary reports made to the government at various times during the summer. The final report covering all diseases is now being completed.

6. **Comparison of Dusts and Sprays on Apples, Peaches, Potatoes and Celery.** Most of the work is carried on jointly with the Entomology Department and includes studies of the effectiveness of various dusts and sprays as controls for all of the common pests of these crops. In the main, it is conducted at the Station farm at Mount Carmel, but some outside orchards are resorted to when larger areas are needed. The results with dust on apples were more favorable this year than formerly, probably because of the dry weather.

7. **Selection of Sweet Corn for Disease Control** has been continued at the farm of Charles R. Treat in Orange. An unfavorable season produced a poor seed crop.

8. **A Continuation of the Study of *Thielavia basicola*.** Forty-two one-ascospore cultures were obtained through the process of treating the ascospores with pepsin, thereby causing them to germinate. These ascospore strains were crossed with the

ordinary chlamydospore-endospore strains with the result that numerous perithecia were formed. Following a suggestion made by Prof. Thaxter of Harvard, an ascospore strain was crossed with several other fungi with the result that cross with *Cladosporium* produced perithecia as abundantly as with the chlamydospore-endospore strains of *Thielavia basicola*. This raises the question whether the production of perithecia with *Thielavia basicola* may not be due to the parasitism of the one fungus upon the other rather than the result of sexuality of the two strains. Crosses with other fungi will have to be made, particularly with *Thielaviopsis*.

During the year, 100 specimens of fungi and weeds sent in by various correspondents have been identified.

There have been added to the herbarium 656 specimens, mostly in exsiccati.

Several hundred specimens of fungi were collected in the State but not finally determined.

The testing of seed for residents of the State involved 463 germination and 30 purity tests.

ENTOMOLOGY.

Dr. W. E. Britton in charge.

Dr. Britton also holds the position of State Entomologist, which entails responsibility for considerable control and inspection work.

CONTROL.

1. During the year there were inspected 114 nurseries, 179 cases of imported nursery stock, 31 orchards and 725 apiaries. The Insect Pest fund was increased by the last General Assembly to \$15,000 per year.

2. The Gipsy Moth work has continued unabated. No extensive spread occurred, but the constant efforts of a crew of twenty-five men were required to hold it in check. The U. S. Department of Agriculture is coöperating in this fight. The annual appropriation was increased to \$50,000.

3. Mosquito Elimination was handicapped by the change of the Statute, throwing the entire expense of maintenance on the State, but the funds were not increased. The State stands in a way to lose much of its present investment in drainage works if funds for necessary repairs are not soon provided.

INVESTIGATION.

1. A study of the plum curculio on apple has been undertaken during the year. This is a serious pest in this region and there is much to be learned of its habits and control.

2. Further tests of paradichlorobenzene to control peach borer are showing promising results.

3. The dusting and spraying experiments mentioned under BOTANY were continued, chiefly to try out the new dust preparations.

4. Studies on the European red mite have been continued and a bulletin prepared by Dr. Garman, summarizing the results of four years.

5. The control of foul brood of bees is being studied in a small way. It is hoped that this can be made more active.

6. A study of the raspberry fruit worm, covering three years, has been completed and a bulletin prepared by Mr. Walden.

7. Dr. Garman has completed a monograph on the Dragonflies of Connecticut, to be published by the Connecticut Geological and Natural History Survey.

Dr. Britton organized and edited, and in part prepared, *The Hemiptera of Connecticut*, published during the year as Bulletin 34 of the Connecticut Geological and Natural History Survey.

FORESTRY.

Mr. W. O. Filley in charge.

The work of the Forestry Department is very largely on long-time projects and it is seldom that one can be considered completed. During the past twelve months, progress has been made on certain projects, but none have been brought to completion.

1. **Experimental Forest Plantations at Rainbow.** No planting was done during the year. Much needed cleaning of the older plantations was practically completed last spring, and the entire tract is in better shape than for several years past.

The necessary studies were completed for a progress report and guide to the plantations, which will be published during the coming winter.

2. **Experiments in Thinning White Pine at Shaker Station.** Measurements were taken in the late fall, and not completed in time for this report, but will be included in that of next year.

3. **Experiments in Thinning Hardwoods at Quassipaugh Lake.** No measurements until 1927.

4. **Studies of White-Pine Needle Blight.** On account of heavy snows and bad roads, no attempt was made to make further study of conditions at Enfield. Casual observations throughout the State indicated considerable of the so-called needle blight following several hot dry days in June.

5. **Distribution of Planting Stock.** As in previous years, an effort was made to assure a supply of planting stock for Con-

necticut land owners at reasonable prices by placing an advance order with a commercial nursery. There were no transplants available, but 475,000 two-year seedlings were distributed on 85 orders.

6. **Woodlot at Mount Carmel Farm.** Aside from necessary freeing of planted stock and removal of some of the overwood, nothing has been done in the woodlot.

7. **Willow Culture at Mount Carmel Farm.** The two holts were continued, but one will be pulled up next spring. About 10,000 cuttings will be available for distribution, and an effort will be made to place them where they can be observed from time to time.

8. **Control of White-Pine Blister-Rust.** From May to October, 1923, a total of over 13,000 acres in Litchfield County was freed from wild ribes, about 286,000 bushes being pulled up. This work was all on a coöperative basis. The town of Canaan appropriated \$500; citizens of Salisbury have promised to raise \$3,500 for two years' work; and citizens of Cornwall had raised \$1,750 the previous year. Four crews were therefore employed in these towns. The American Brass Company assumed the cost of labor for eradication in its pine plantations in the vicinity of Torrington, and the State furnished a foreman for two months. One land owner in Litchfield also assumed the labor cost for eradication in his pine lands, the State supplying a foreman for about two weeks.

Another season's work will be necessary in both Salisbury and Canaan. Cornwall is practically completed, although a few weeks' work will be necessary next spring. The State appropriation of \$15,000 for the two-year period appears to be adequate when supplemented by the funds contributed by towns or individuals.

Educational work throughout the State has been continued in coöperation with the Bureau of Plant Industry. Three educational agents were employed during the year, but one resigned on August first to take a position elsewhere, and his successor has not yet been appointed. The pine areas in the northern part of the State have been pretty well covered; pine owners have been personally interviewed, and their holdings scouted for the rust. New infections have been located on pine in three towns outside of Litchfield County: Simsbury, Farmington and Ellington. These infections will be carefully watched and the owners urged to coöperate with the State in eradicating the Ribes. During the coming winter, scouting and educational work will be continued in the southern half of the State.

On the whole, the situation is encouraging, especially as studies made this fall indicate very little spread of the disease in those areas from which Ribes were eradicated from 1916 to 1921. The

problem is still one of cleaning up Litchfield County, as the isolated infections in other parts of the State are much more easily taken care of.

9. **State Park and Forest Commission.** This is really a project for the establishment of State parks and State forests, in which the Agricultural Experiment Station coöperates by allowing its forester to serve as a member of the Commission. As treasurer of the Commission and as a member of all its standing committees he is at present fairly active in determining the policy of the State regarding both State parks and State forests.

10. **Studies of Forest Plantations.** These have been carried on throughout the year by the Blister Rust agents, who are in a position to locate and report on all such plantations, in connection with their other work. It is hoped to complete this study in time to include the results in a bulletin on "Forest Planting", to be published during the coming year.

11. **Soil and Land Survey.** During the summer and fall of 1923, the Forestry Department has coöperated in a soil and land survey which was undertaken experimentally in the towns of Lebanon and New Milford. The assistant foresters, Mr. Moss and Mr. Hicock, have both been employed in this work and have helped to develop methods and technique of mapping surface cultures which may be applied to other parts of the State if the survey is continued.

The department is frequently called on to inspect and give advice on the management of woodland, and illustrated lectures on forestry are in great demand. The people of Connecticut have not as yet fully realized the importance of forestry in a State including so much non-tillable land. Educational work is therefore still necessary until the regular extension forces take it up.

GENETICS (PLANT BREEDING)

Dr. D. F. Jones in charge.

The investigations in this field are listed as follows:

1. The inheritance of characters in corn.
2. The effect of inbreeding and crossing in corn.
3. The improvement of naturally cross-fertilized plants by selection in self-fertilized lines.
4. Methods of improving the naturally self-fertilized tobacco plant.

Double-crossed Burr-Leaming corn has continued to give increased yields of grain as compared with the highest yielding varieties grown at the Experiment Station farm at Mount Carmel. This new kind of corn is the result of combining by cross-fertiliza-

tion four inbred strains derived from two varieties, Burr's White Dent and Leaming. The result is a hybrid type which gives a remarkably productive growth for the first year due largely to the fact that practically every plant makes a good ear. This yield is not maintained in the following years. Only crossed seed is recommended for planting. This seed is being produced in Connecticut and the amount of seed available is being increased as rapidly as possible.

Double-crossed Burr-Leaming requires from 120 to 140 days to ripen properly for husking. It is a large-growing variety which stands up well in the field and should not be planted too thickly. The yield of this corn in bushels of dry shelled grain per acre, compared with the five varieties which yielded the most in each of the five years tested, is as follows:

	1918	1919	1920	1921	1922
Double-crossed Burr-Leaming.	116	88	55	95	63
Average of five highest-yielding varieties.....	82	64	47	81	54

Better strains from the same source are now being substituted for some of the weaker ones formerly used, with the expectation that the yield of Burr-Leaming corn will be increased and the production of the seed will be made easier.

Other methods of combining the inbred strains are being tried out with the aim of simplifying the production of hybrid seed.

A number of the best inbred strains, selected for five years from four of the highest-yielding Connecticut varieties of dent and flint corn, were tested the past season for the purpose of making a high-yielding, high-quality and earlier-ripening corn than Burr-Leaming, suitable for husking in nearly all parts of this State and for silage in northern New England.

Inbred strains of Evergreen and Golden Bantam sweet corn have been selected for canning purposes, and crosses between these strains are now being tested. It is expected that the uniform production, even size of ears and simultaneous ripening of practically all plants will make crossed corn even more valuable for canning purposes than for field corn.

The method of corn improvement, outlined above and spoken of as "selection in self-fertilized lines" is also being applied in a preliminary way to alfalfa and clover and to some of the small fruits. In the former, particular attention will be given to the production of a long-lived, winter-hardy alfalfa and a clover resistant to mildew. The discovery of a few red clover plants entirely free from mildew in a field badly infected gives encouragement that a mildew-free clover variety is possible.

Technical studies, of interest only to investigators, are being confined to the inheritance of disease resistance and of abnormal-

ities, with particular regard to sterility; the obtainment of complete homozygosity in a naturally cross-fertilized species; and the linkage of hereditary factors.

Round Tip tobacco, originated by this department, is rapidly increasing in popularity. Breeding work is being continued at the Tobacco Sub-Station with some of the other types of tobacco.

SOILS.

Mr. M. F. Morgan in charge.

A moderate increase in the State funds for maintenance made possible the undertaking of certain soil studies in which Dr. Jenkins had long been interested. These include certain problems of tobacco soils which are to be undertaken next summer. However, since the funds were not available until July 1, 1923, the present season was devoted to that other most pressing problem:

A Study of the Soil Resources of Connecticut.

Two areas, Lebanon and New Milford, were intensively studied from every possible angle, the data thus assembled forming the basis of studies planned this winter on methods and future program. So far the work gives promise of great usefulness to the State and to soil science.

TOBACCO SUB-STATION AT WINDSOR

Mr. C. M. Slagg in charge

During the 1923 session of the General Assembly, a bill was passed increasing the annual appropriation for the Tobacco Sub-Station from \$5,000 to \$10,000, thus providing adequate support for the work. An experimental tobacco barn, 32 by 128 feet, has been erected. This barn is divided by three inside partitions into four compartments, each of which is fitted with a different type of ventilation.

At the present time there is also in course of erection a main building, designed to include sorting and packing rooms, tobacco curing rooms, an office and a laboratory, with a small greenhouse adjoining. This building is being constructed and equipped jointly by The Connecticut Agricultural Experiment Station and the Connecticut Valley Tobacco Improvement Association.

On August 1, 1923, Dr. George H. Chapman resigned his position of Research Director and Secretary of the Connecticut Valley Tobacco Improvement Association and Director of the Tobacco Sub-Station. Mr. C. M. Slagg, of the Office of Tobacco Investigations of the United States Department of Agriculture, was secured by the Association to serve as their Research Director and Secre-

tary, and was later appointed "In charge of the Tobacco Station" on the Station staff.

Experiments under way at the Tobacco Station may be grouped under the following heads:

1. Fertilizer tests: Varying forms and amounts of nitrogen, phosphoric acid, potash, sulphur, magnesium and chlorine; a study of fractional applications of commercial fertilizer mixtures; and a comparison of cow and horse manure.
2. Varietal and strain test of Havana, Broadleaf, Shade Cuban and others.
3. Culture studies (Roundtip) 13 and 15 inch spacing in the row; the use of Thermogen paper; treatment of shade cloth in various ways to increase its utility.
4. Tobacco diseases, including the study of brown and black root-rots of tobacco, especially the effect of rotation.

On July 30, 1923, a field day was held. Approximately five hundred growers were in attendance to see the various field tests in progress.

The brown root-rot rotation plot tests, the magnesium, sulphur and chlorine plot test, and part of the variety and strain tests are coöperative with the Office of Tobacco Investigations, and the cloth preservative tests are in coöperation with the Bureau of Chemistry of the United States Department of Agriculture.

MOUNT CARMEL FIELD DAY

On August 7th a most successful field day was held at the Mount Carmel Farm. Among new and interesting features were a demonstration of garden tractors and a kindergarten for the care of children.

Respectfully submitted,

W. L. SLATE, JR.,
Director.

**A List of Reports and Bulletins that are available to those
who apply for them.**

BULLETINS.

138. Commercial Feeding Stuffs in the Connecticut Market.
141. Commercial Feeding Stuffs in the Connecticut Market.
155. The Elm Leaf Beetle.
156. Cotton Seed Meal as a Fertilizer.
160. Clover Seed in the Connecticut Market.
169. The Leopard Moth. (Summary.)
170. The Trade in Cotton Seed Meal.
177. The Apple Tree Tent Caterpillar.
180. Studies on the Tobacco Crop of Connecticut.
182. The Brown-Tail Moth.
186. The Gypsy Moth.
191. Tests of Soy Beans, 1915.
192. Observations on Alfalfa.
193. Tests of Soy Beans, 1916.
194. Manure from the Sea.
195. Insects Injuring Stored Food Products in Connecticut.
198. Domestic Supplies of Potash.
200. Report on Food and Drug Products, for 1917.
201. Food Fats and Oils.
202. An Experience in Keeping Poultry in the City.
203. Report of the Entomologist, for 1917.
204. Report on Commercial Fertilizers, for 1917.
206. Report on Commercial Feeding Stuffs, for 1917.
209. Report on Commercial Fertilizers, for 1918.
210. Report on Food and Drug Products, for 1918.
211. Report of Entomologist, for 1918.
212. Report on Commercial Feeding Stuffs, for 1918.
213. Condensed Milk, Malted Milk, Milk Powder.
214. Report of Botanist, for 1917 and 1918.
215. The Food Value of Milk.
217. Report on Commercial Fertilizers, for 1919.
218. Report of Entomologist, for 1919.
219. Report on Food and Drug Products, for 1919.
220. Report on Diabetic Foods.
221. Report on Commercial Feeding Stuffs, for 1919.
222. New or Unusual Plant Injuries and Diseases Found in Connecticut,
1916-1919.
223. Report on Commercial Fertilizers, 1920.
225. A Study of the Bulb Mite.
226. Report of the Entomologist, for 1920.

227. Report on Food and Drug Products, for 1920.
228. Connecticut Round Tip Tobacco.
229. Report on Commercial Feeding Stuffs for 1920.
230. The Grass-Feeding Frog-Hopper or Spittle-Bug.
231. Report of the Tree Protection Examining Board.
232. Report of the Director for the Year ending October 31, 1921.
233. Report on Commercial Fertilizers, for 1921.
236. Report on Food and Drug Products, for 1921.
237. Control of White-Pine Blister Rust in Connecticut.
238. Report on Commercial Feeding Stuffs, for 1921.
239. Wildfire of Tobacco in Connecticut.
240. Commercial Vitamine Preparations.
241. Report on Commercial Fertilizers, for 1922.
242. Report on Commercial Insecticides and Fungicides, 1922.
243. Report of the Director for the year ending Oct. 31, 1922.
245. Results of Dusting vs. Spraying in Connecticut Apple and Peach Orchards in 1922.
246. The Apple and Thorn Skeletonizer.
247. Report of Entomologist, for 1922.
248. Report on Food and Drug Products, for 1922.
249. Report on Commercial Feeding Stuffs, for 1922.
250. Report on Commercial Fertilizers, for 1923.
251. The Raspberry Fruit Worm.
252. The European Red Mite.
253. Better Forests for Connecticut.
254. Report of the Director for the year ending Oct. 31, 1923.

REPORTS.

Beginning with the year 1877 and ending with 1916 the Station issued Annual Reports. Of these the following are out of print: 1877-1880 inclusive, 1882, 1883, 1885, 1886, 1887, 1889-1892 inclusive, 1895-1906* inclusive.

Commencing with the year 1917, the annual reports include all regular bulletins; they are issued in parts and each part bears a bulletin number.

*Of some other reports the Station has but a limited number, which are reserved to complete library sets.