V I R G I N I A

PLANT PATHOLOGY SPECIALIST ANNUAL REPORT 1925

James Godkin

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2.

ANNUAL REPORT

For

PLANT PATHOLOGY

Project No. 17.

From

Dec. 1, 1924 - Nov. 30, 1925

James Godkin

Blacksburg, Virginia
December 15, 1925.

John R. Hutcheson,
Director of Extension,
Virginia Polytechnic Institute,
Blacksburg, Va.

Dear Sir:

I hereby submit a report of the extension work in plant pathology for the full year, starting December 1, 1924, and ending November 30, 1925.

Respectfully,

James Godkin,
Extension Plant Pathologist.

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Personnel

The Extension Plant Pathologist, as in 1924, was the only person employed full time doing plant pathological work. Dr. P. D. Proctor, Mr. S. A. Wingard and Mr. C. E. Price, all of the Department of Plant Pathology, made occasional trips about the State for the study of tomato, cereal and tobacco diseases.

Introduction

It is still the policy of the Plant Pathology Department to carefully outline, organize and then carry out such projects as meet the particular economic needs of the counties for which said projects were planned. Therefore, following this policy, the following subprojects were undertaken:

(1) The control of root, stalk and ear rot diseases of corn

(2) The control of cereal smuts

(3) The control of wildfire and blackfire diseases of tobacco

(4) The control of tomato diseases with special reference to late blight and leaf spot

(5) The control of cabbage yellows by the introduction of resistant varieties

(6) Seed potato production consisting of spray demonstrations of the control of potato diseases, and field inspections to determine the presence of disease for purposes of certification

(7) Raspberry anthracnose control

(8) The native barberry and its relation to the spread of black stem rust of cereals in southwest Virginia

(9) Plant Disease Survey.

All of these subprojects are being continued from past years. It was the plan of the Plant Pathology Department to have these subprojects fit into the Five-Year Program of work developed and emphasized by the Extension Division in 1923 and 1924. This means that we are striving toward the goal of aiding in every possible way the carrying out of improved methods of disease control.

Explanation and Results of Subprojects

Subproject No. 1 - The control of root, stalk and ear rot diseases of corn has been conducted during the past three years according to the following general methods of procedure:

(1) Improved rag-doll method of germination

(2) Recommended methods for crop rotation and seed selection

(3) Proper curing and storing of seed corn

(4) Field observations and yield data.

Methods of procedure for this subproject have been briefly described in Extension circular E-148, entitled "A New Corn Germinator." It is planned to write a more up-to-date treatise on this subject for 1926.

The improved modified rag-doll is fully described on page 2 of the annual report of this department for 1923. Reference is made to the 1923 report for the complete description of this method, and to the illustrations following the treatment of the subproject. (Note illustrations following subproject discussion.)

The importance of crop rotation and selection of seed ears in the field have been further emphasized in 1925. Growers have been urged to field select as a necessary and additional step to be taken along with germinator selection.

Proper methods of curing and storing of corn are being further stressed as important factors in the control of diseases. As in 1924 we advocated in 1925 storing in such a manner as to provide for a rapid, uniform and thorough drying of the ears.

Field observations have been carried out in additional counties of the State during the 1925 season. Further yield data have also been procured in the past season.

The work on this subproject started with the Utility Corn Show which was held in January at Roanoke. A brief summary of this work follows with tables and comparisons of the corn exhibited in 1922, 1923 and 1924.

Results of Germination Tests of Corn Entered in Utility Class at Roanoke, Virginia, 1925

The readings were made on January 23, after 6 days incubation at a temperature of 80° F. The dolls were in excellent condition for reading at this time.

System of Scoring

The system of scoring was the same as that employed in 1924, each 10-ear exhibit being represented by 80 grains on the germinator. A perfect score consisted of 40 points, and each grain was valued at one-half point, and each ear at 4.0 points. A deduction of one-half point was made for each grain that showed no germination, weak germination, or the presence of disease. This method of scoring also is the same as that employed in 1924.

Results with White Corn

There were 118 entries, totaling 1180 ears. This is forty-two more lots than were entered in 1924. The scores for the individual lots are shown in table 1. The highest score was 36, the lowest 18; the average for all 118 lots 31.25. Of the 1180 ears, 100 were good, or free from disease, 999 were medium, or slightly diseased, and 81 bad or badly diseased. The percentages were 8.4% free from disease; 83.81 slightly diseased, and 7.72 badly diseased. The highest number of disease-free ears in any individual lot was three.

Table 1 - Germination record of individual lots of white corn at Roanoke, 1925. (An ear in which all kernels were good was classed as good; an ear in which 3 kernels or less were diseased was classed as medium, and an ear in which 4 or more kernels were diseased was graded as bad.)

Lot No.	Score	Good ears	Medium ears	Bad ears	Lot No.	Score	Good ears	Medium ears	Bad ears
128	32.0	0	10	0	122	34.0	1	9	0
127	32.0	2	8	0	109	33.5	2	8	0
126	34.5	2	8	0	125	33.0	2	7	1
130	35.0	1	9	0	107	32.0	2	8	0
137	34.5	2	8	0	123	20.5	0	6	4
145	35.0	3	7	0	143	34.5	2	8	0
619	18.0	0	5	5	A-9	31.5	0	9	1
113	31.5	0	10	0	138	29.5	0	8	2
110	31.5	1	9	0	104	28.5	0	10	0
102	30.5	1	9	0	118	31.0	0	10	0
100	31.0	0	10	0	108	31.0	1	8	1
99	29.0	0	9	1	105	35.5	3	7	0
A-5	30.5	0	9	1	133	34.0	1	9	0
A-8	26.0	0	7	3	116	24.5	0	6	2
A-6	36.0	2	8	0	141	29.5	1	9	0
121	28.0	0	8	2	121	28.0	0	8	2
A-3	28.0	1	6	3	136	29.5	0	8	2
129	34.0	1	9	0	134	30.5	0	10	0
120	33.5	1	9	0	124	28.0	0	9	1
112	34.5	0	10	0	144	25.0	0	7	3
114	34.0	2	8	0	A-7	29.5	0	10	0
111	35.0	3	7	0	A-8	28.0	0	7	3
106	33.5	1	9	0	A-6	36.0	2	8	0
701	35.0	2	8	0	A-9	31.5	0	9	1
101	34.5	1	9	0	A-5	30.5	0	9	1
A-2	33.0	2	6	2	A-3	28.0	1	6	3
A-4	34.5	1	9	0	132	30.5	1	8	1
A-1	34.5	1	9	0	138	28.0	0	8	2
801	31.0	0	10	0	131	30.0	0	9	1
108	31.0	1	8	1	140	28.0	1	8	1
103	33.5	3	7	0	139	23.0	0	7	3
105	34.0	0	10	0	101	34.5	1	9	0
133	34.0	1	9	0	115	31.0	1	7	2
136	35.5	2	8	0	142	33.0	1	9	0
122	34.0	1	9	0	106	33.5	1	9	0
109	33.5	2	8	0	111	33.0	3	7	0
119	34.5	0	10	0	114	34.0	2	8	0
140	28.0	1	8	1	112	34.5	0	10	0
139	23.0	0	7	3	120	33.5	1	9	0
702	29.5	0	10	0	129	34.0	1	9	0
132	30.5	1	8	1	128	32.0	0	10	0
130	28.0	0	8	2	127	32.0	2	8	0

Table 1 - continued.

Lot No.	Score	Good ears	Medium ears	Bad ears	Lot No.	Score	Good ears	Medium ears	Bad ears
121	30.0	0	9	1	126	34.5	2	8	0
141	29.5	1	9	0	138	33.0	1	9	0
116	26.5	0	8	2	137	34.5	2	8	0
127	27.0	0	7	3	145	35.0	3	7	0
115	31.0	1	7	2	143	34.5	2	8	0
A-7	29.5	0	10	0	701	35.0	2	8	0
124	28.0	0	9	1	117	27.0	0	7	3
134	30.5	0	10	0	110	31.5	1	9	0
142	33.0	1	9	0	102	30.5	1	9	0
801	31.0	0	10	0	100	31.0	0	10	0
A-1	34.5	1	9	0	99	29.0	0	10	0
A-4	34.5	1	9	0	107	32.0	2	8	0
A-2	33.0	2	7	1	104	28.5	0	10	0
135	35.5	2	8	0	118	31.0	0	10	0
702	29.5	0	10	0	619	18.0	0	5	5
113	31.5	0	10	0	123	20.5	0	6	4
119	34.5	0	10	0	105	34.0	0	10	0
					118 Total	31.23 Ave.	100 Total	999 Total	81 Total

Results with Yellow Corn

There were 18 entries, totaling 180 ears. This made 16 less lots than were entered in 1924. The score for the individual lots are shown in table 2. The highest score was 36.5, the lowest, 28.5; and the average for all 18 lots 32.58. Of the 180 ears 30 were good, or free from disease; 141 medium, or slightly diseased, and 8 bad or badly diseased. The percentages were 16.66 free from disease, 78.33 slightly diseased, and 4.44 badly diseased. The highest number of disease-free ears in any individual lot was 5.

Table 2 - Germination record of individual lots of yellow corn at Roanoke, 1925. (An ear in which all kernels were good was classed as good; an ear in which 3 kernels or less were diseased was classed as medium; an ear in which 4 or more kernels were diseased was graded as bad.)

Lot No.	Score	Good ears	Medium ears	Bad ears
211	26.5	0	8	2
210	30.5	1	9	0
209	30.5	0	9	1
208	29.5	0	9	1
214	31.0	2	7	1
215	30.0	3	5	2
206	34.5	2	8	0
205	33.0	2	8	0
204	36.0	3	7	0
201	32.5	0	10	0
202	33.5	1	9	0
213	36.5	5	4	0
212	33.5	1	9	0
B-3	35.0	2	8	0
B-4	35.5	4	6	0
207	32.0	0	10	0
B-1	32.5	2	7	1
B-2	35.0	2	8	0
18 Total	32.58 Average	30 Total	141 Total	8 Total

Table 3 - Comparison of germination tests of white and yellow corn.

Color	Average score	Percentage of ears: Disease-free	Slightly diseased	Badly diseased
White	31.25	8.47	83.81	7.72
Yellow	32.58	16.66	78.88	4.44

Table 4 - Comparison of germination tests of white and yellow corn for 1922, 1923, 1924 and 1925.

Color	Average score	Percentage of ears; Disease-free	Slightly diseased	Badly diseased
White - 1922	10.3		not recorded	
White - 1923	19.4	16.7	41.6	41.7
White - 1924	26.9*	1.8	92.6	5.6
White - 1925	31.2	8.4	83.8	7.7
Yellow - 1922	15.2		not recorded	
Yellow - 1923	23.2	27.7	44.1	28.2
Yellow - 1924	28.1*	7.9	87.9	4.2
Yellow - 1925	32.5	16.6	78.8	4.4

*The averages for 1924 and 1925 have been revised to conform with those of 1922 and 1923. The total points allowed in these years was 35, while the total for 1924 and 1925 was 40. The actual averages for 1925 both the white and yellow corn, are reduced by one-eighth as in 1924. (See report for 1924 of Utility Class.)

Summary and Conclusions

There was still a marked improvement in the quality of the corn entered in the Utility Class in 1925 over that entered the three years previous to this (1922, 1923, and 1924). Table 4 amply proves this assertion. The improvement is still a steady one as shown by the average score for white and yellow corn in 1925. The average score for the white corn in the four consecutive years was 10.3, 19.4, 26.9 and 31.2, and that of yellow corn 15.2, 23.2, 28.1 and 32.5. The gain in general average of white corn in 1925 over 1924 was 4.3 points; while that realized in yellow corn was 4.4 points. In fact, there has been a marked gain in points in both white and yellow corn for each year after the first (1922) that the tests have been made.

Again, this continued and marked improvement is due largely to the greater care exercised by the growers who have exhibited in the past in the selection of healthy and vigorous ears of seed corn. Better methods of curing and storing are also in a measure attributable to this improvement. The proper selection and care of seed corn has been demonstrated throughout the State in the past by the Extension Division specialists and the Crop Improvement Association. This procedure will be continued in 1926 through the cooperative efforts of the specialists of the Extension Division and the Crop Improvement Association. The results of these concerted efforts are most gratifying.

In Loudoun County during the winter and spring of 1928 some of the best work of the year was accomplished, and as a result further valuable data collected. In all, six germinators were operated during the progress of this work in the county. Several newspaper articles were written in connection with the work for the local newspapers. At least six meetings were held about the county during the progress of the work. A brief summary of this subproject in Loudoun County follows.

Germinators operated	Clean	Medium	Bad	Totals
County Agent's office - Leesburg	1849	1187	572	3578
Smith-Hughes High School - Lincoln	4986	1139	1001	7126
Leesburg Cooperative Plant	1655	2601	732	4988
C. M. McCormick, Aldie (Private)	274	28	38	340
George Nous, Leesburg (Private)	1080	1350	4608	7038
F. L. Norman, Upperville (Private)	189	2	29	220
	10,033	6277	6980	23,290

The above records were carefully recorded and the germinator operations supervised by the County Agent, Agricultural High School Teacher, and Extension Pathologist. Three other farmers in this county ran germination tests for about 1500 ears and two of the germinators listed ran tests for others. The records for these were not complete but in all approximately 3000 ears were tested in addition to the number already recorded.

The classification of clean, medium and bad used here is the same as that used at the Utility Corn Show and previously described. Eighty-seven growers used the germinator in the County Agent's office, and 20 ears of corn

were tested for each of these. The Purpose here was to give these men an idea of how their corn would test, and if unsatisfactory, larger lots could be run at later dates. (See illustrations following subproject.)

In addition to the germinators operated during 1925 two like the one operated in the County Agent's office were built by a local lumber company and offered as prizes at the County Fair Utility Corn Show. These will be operated during the season of 1926. (See illustrations following subproject.)

At Getz, Shenandoah County, an interesting piece of work was accomplished with Mr. C. Getz and Mr. C. Jones, Both of these boys are graduates of the Smith-Hughes High School located at Mt. Jackson. They both took agricultural work when in high school. After graduating they went back to their fathers' farms with convictions that they could improve the yield of corn. Accordingly, they built a germinator according to the plans of the one used at the high school. (See illustrations following subproject.) They not only tested their own corn but also the corn for many of the growers of the community. Readings of the germinator were made by the boys under the supervision of Mr. J. P. Graham, Agricultural Teacher, and the Extension Pathologist. A brief summary of the work of these boys follows.

Number medium ears	Number bad ears	Total ears tested
2,446	946	3,392

The classification of clean, medium and bad here again is the same as that used for the Utility Corn Show of 1924 and 1925.

At Manassas, Prince William County, this work was continued from 1924 with some modifications in methods of procedure. Many of the growers who started with the work have realized much in a money way by following methods of corn improvement laid down by specialists of the Extension Division. In this county again the large community germinator was run in the Smith-Hughes Agricultural High School under the supervision of J. H. Pullen, High School Teacher, T. T. Curtis, County Agent, and the Extension Pathologist. Methods of selecting seed corn in the field have been especially emphasized in this county for 1925. Three newspaper articles were run in the local paper of the county during the progress of the work and one community meeting was held in this connection. A brief summary of the work in Prince William County follows.

Number medium ears	Number bad ears	Total ears tested
3,000	600	3,600

Here again the classification of clean, medium and bad is the same as that used for the Utility entries of the corn show of 1924 and 1925.

At Prospect, Prince Edward County, the work on this subproject was initiated on a small scale at the Community High School in cooperation with the Biology Department teacher, County Agent Crawford, and the Extension Pathologist.

One newspaper article was written for the local paper. A brief summary of the number of ears tested follows.

Number medium ears	Number bad ears	Total ears tested
500	75	575

The same classification (clean, medium and bad) was used as heretofore.

In Augusta County this work was carried on at the two Smith-Hughes High Schools of the county located at Fishersville and New Hope. As in other agricultural high schools the work was done largely by the students under the supervision of the teachers and the Extension Pathologist. A brief report for the work carried on at these two schools follows.

Number medium ears	Number bad ears	Total ears tested
500	125	625

In Rockbridge County 500 ears of corn were tested under the supervision of County Agent Lewis and the Extension Pathologist with the following results:

Number medium ears	Number bad ears	Total ears tested
410	90	500

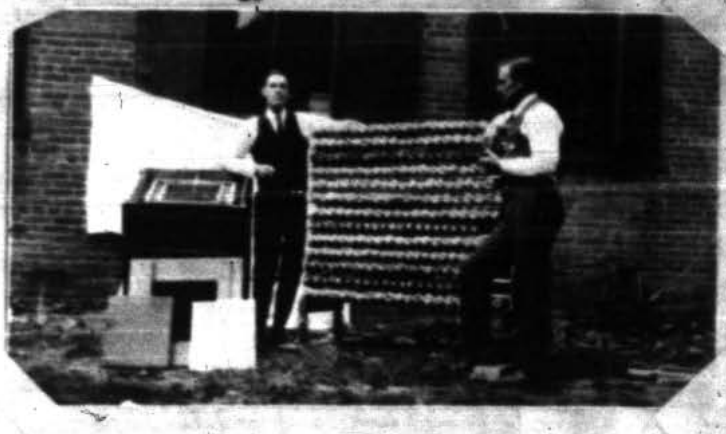
The same classification of clean, medium and bad was used in the above readings as in all of the others, and was after that used in the Utility Show of 1924.

Many counties carried on corn improvement work under the supervision of their County Agents, since it was impossible for the Extension Pathologist to make contacts with all of the counties engaged in this work.

More club boys were added during the past season to the ranks of interested workers in this corn improvement program. In fact, many fathers in 1925 have no doubt been sold to the idea because of the success of the boy with his corn club project. There is really considerable cause for encouragement from the results obtained from corn improvement work during the past three seasons. Starting with three germinators operating in as many counties in the State during 1923, the number has increased to 17 operating in 7 counties during 1925. Besides this number several germinators were operated in the State during 1925 without any supervision from the Extension Pathologist. Field selection, during 1925, was emphasized as being equally important to germinator selection. Records and rag-doll readings are described in the 1923 report.

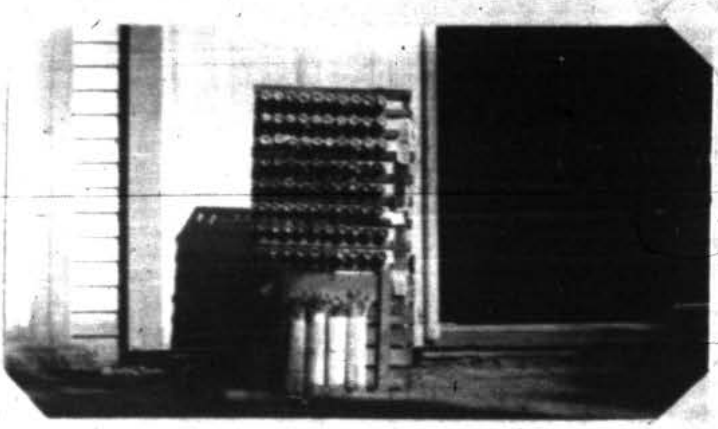
Summary of Corn Root Rot Work

Number of ears of corn tested in Loudoun, Shenandoah, Prince William, Prince Edward, Augusta and Rockbridge Counties, and at Utility Corn Show	36,142
Number of plantable ears	26,876
Number of non-plantable ears	9,266
Percentage of plantable ears	74.4
Percentage of non-plantable ears	25.6
Number of farmers for whom seed was tested and diseased ears culled out	126
Number of counties in which field inspections were made and in which farmers were instructed in field selection	6
Number of press articles written	6
Number of talks given	6



Photograph No. 1 - County Agent Lintner of Loudoun County and grower with germinator, rack and corn.

Photograph No. 2 - Group of growers of Loudoun County at corn germination demonstration.



Photograph No. 3 - Testing exhibits by means of "rag-doll" method. Loudoun County Fair.

Photograph No. 4 - Germinator located at Agricultural High School, Lincoln, Loudoun County.

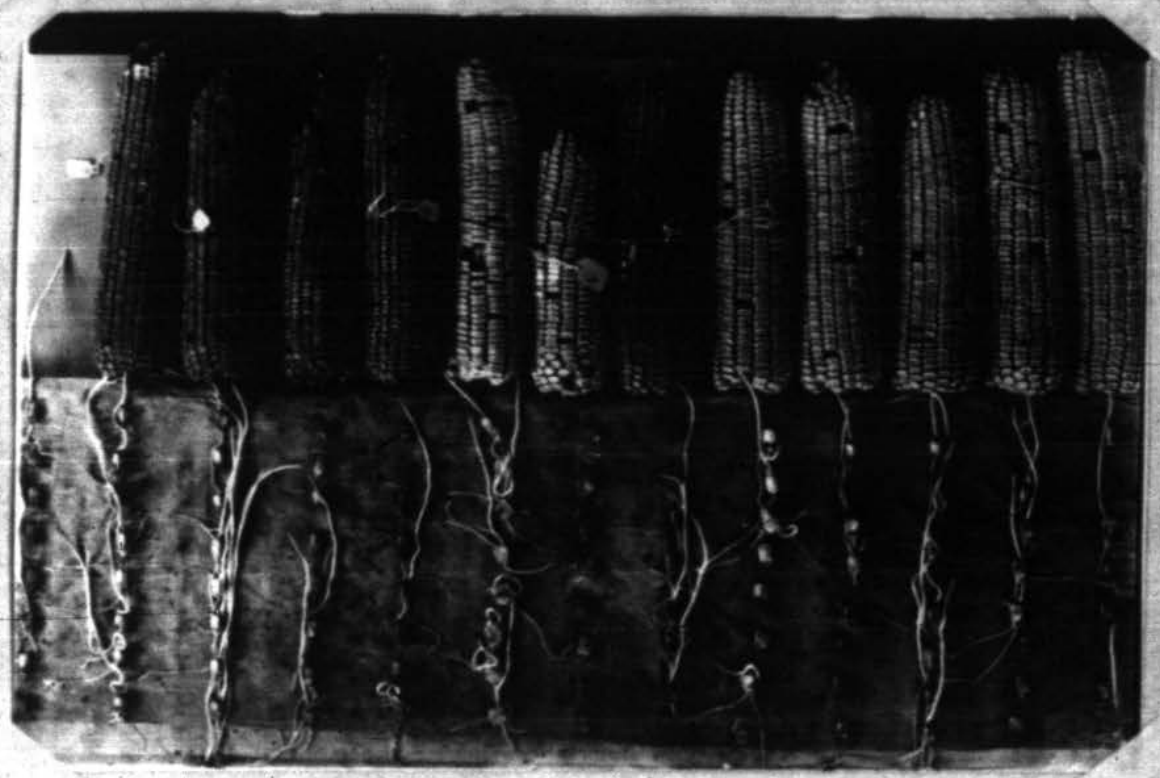
Photograph No. 5 - Showing portion of racks at Agricultural High School, Lincoln.

Photograph No. 6 - High school boys, M. Getz and W. Jones of Shenandoah County with their germinator.

Photograph No. 7 - Germinator of M. Getz and W. Jones with "rag-dolls" ready for reading.

Photograph No. 8 - Stafford County corn, with spotted condition due to unfavorable soil conditions and disease.

Photograph No. 9 - Grower R. James of Spotsylvania County in prize field showing a freak, three ears in one.



Photograph No. 10 - Collection of corn with "rag-doll" germinations. Some of the samples which appeared to be sound did not germinate as well as some of the poorer looking samples.

Photograph No. 11 - Corn germinator used at Corn Show in Roanoke, 1925, showing "rag-dolls" with corn starting to come up over tops. All corn entered in Utility Class was tested in this germinator.

Subproject No. 2 - The control of cereal smuts in 1925 consisted of a program of the best methods in use for the prevention of loose and covered smuts of wheat, barley and oats. The copper carbonate dust method for the control of "bunt" or covered smut of wheat was recommended in preference to any of the wet methods heretofore used. A description of this method follows and is the form received by the wheat growers of the State. Every effort was made by the Plant Pathology Department of V. P. I. to help the grower to control this disease which was very serious in the 1925 crop. County agents and mill men of the State were urged to cooperate in the work, and all of them received copies of the copper carbonate dust treatment for their constituents, together with a supplementary letter from the Director of Extension. About 32,000 of these (letter of explanation and the treatment) were mailed out. After wheat harvest questionaires were sent to all of the county agents and millers of the State in order to ascertain the damage done by stinking smut and the amounts of copper carbonate used for its prevention in the 1926 wheat crop. Copies of these also follow. Tabulated reports from county agents and millers also follow in order. The Orange mills distributed 500 pounds of copper carbonate free to the wheat growers of Orange County.

The copper carbonate dust method is rapidly supplanting the wet methods (formaldehyde and bluestone) elsewhere.

To quote from the Official Record of the U. S. Department of Agriculture for November 11: "Four years' field experience with copper carbonate has demonstrated so many advantages over bluestone and formaldehyde that it is now accepted as the general practice throughout Franklin County, Washington. From 10 acres in this county in 1921 the Washington State area planted with copper carbonate treated seed wheat has grown to about 1,800,000 acres in 1924-25." Such evidence should be conclusive enough, especially when coming from such a wheat producing state as Washington.

How to Control Stinking Smut of Wheat

(Prepared by: Plant Pathology Department, Extension Division, V. P. I., Blacksburg, Va.)

The new, dry treatment of wheat for stinking smut is rapidly taking the place of the bluestone and formaldehyde treatments. It is more popular because there is no soaking or wetting of the grain and no injury to germination. The treatment is a simple one: two tablespoonfulls of copper carbonate dust are thoroughly mixed with each bushel of seed wheat. The wheat may be seeded as soon as treated or it may be stored for future seeding without injury. The treatment will give excellent control of the disease if the following directions are carried out in detail.

First, clean the seed wheat thoroughly in a fanning mill; then place it in a mixer, add two ounces of copper carbonate (two heaping tablespoonfulls) to each bushel of grain, and mix for at least two minutes. It is then ready to be planted or stored as desired.

The copper carbonate dust should be of the type that is manufactured especially for seed treatment. It should analyze at least 50 per cent metallic copper and 90 per cent of it should pass through a 200-mesh screen. Firms which handle material of this type are: Henry Sundheimer, Inc., 103 Park Ave., New York City, California Spray Chemical Co., New York City, John C. Wiarda & Co., Brooklyn, N. Y., and Nichols Copper Co., 25 Broad St., New York City. The price varies, according to the quantity purchased, from about 17 to 25 cents per pound. At the higher price the material costs only 3 cents per bushel of grain.

The mixing may be done in a concrete mixer, a barrel or tumbler churn, or a home-made mixer. A good mixer may be made with a tight box of convenient size. A shaft through the corners of the box will cause an uneven revolution and will insure good mixing. Small lots may be mixed in a tight sack but this method is not so effective and is a rather disagreeable job.

It is probable that copper carbonate will be available for small lot purchases at a number of places in the State. It will be sold by the Virginia Seed Service, Richmond, Va., and by the Growers & Producers Exchange,

Roanoke, Va. Local dealers will undoubtedly be glad to carry the material on request.

Caution. If the dust is inhaled in quantity it may cause irritation. A wet handkerchief placed over the nose and mouth during the treatment will prevent this. If large quantities are to be treated it is advisable to use a simple type of dust mask.

Blacksburg, Va.
October 21, 1925

To The Millers of Virginia:

I am enclosing a letter from Mr. Godkin, of our Plant Pathology Department, which I will appreciate if you will read carefully, and answer at your earliest convenience.

The Extension Division is doing its best to help control stinking smut but cannot do this without full information.

With best wishes, I am,

Very truly yours,

John R. Hutcheson,
Director.

Blacksburg, Va.
October 21, 1925

To The Millers of Virginia:

Because of the prevalence of stinking smut in this year's wheat crop more than the usual annual loss occurred in all the counties of the State where this disease was found.

We wish to obtain the latest and most complete information possible regarding the occurrence of stinking smut in this season's crop, the damage caused and the results obtained through the use of the copper carbonate dust treatment in its control. Will you, therefore, answer and return the following questions at your earliest convenience?

No. 1. What is your estimate of the damage to the wheat crop in your county?

No. 2. How much copper carbonate was sold or distributed by you for use in smut control?

No. 3. What criticisms of the copper carbonate treatment have you heard?

Very truly yours,

James Godkin,
Extension Plant Pathologist.

Blacksburg, Va.
October 21, 1925

To All County Agents:

Because of the prevalence of stinking smut in this year's wheat crop more than the usual annual loss occurred in all of the counties of the State where this disease was found.

We wish to obtain the latest and most complete information possible regarding the occurrence of stinking smut in this season's crop, the damage caused and the results obtained through the use of the copper carbonate dust treatment in its control. Will you, therefore, answer and return the following questions at your earliest convenience?

No. 1. How prevalent was smut in your county this season?

No. 2. What would you estimate the damage to the wheat crop?

No. 3. How much copper carbonate was sold in your county by yourself, farm bureau, drug stores, or other agencies?

No. 4. What criticisms of the copper carbonate treatment have you heard?

Very truly yours,

James Godkin,
Extension Plant Pathologist.

Report of County Agents on Stinking Smut for 1925

County	County Agent	Estimate of damage per cent	Estimate of damage bushels	Pounds copper carbonate distributed	Criticism of treatment
Mecklenburg	H.H. Williams	$1,500	1,000	25	None
Charlotte	H.E. McSwain	3	2,310	none	"
Prince Edward	R.S. Crawford		1,280	100	Trouble to make mixer
Northumberland	C.W. Hubbard	1	780	30	Effect on operator
Essex	D.H. Crosby	20	10,000	25	None
Brunswick	J.B. Lewis	15	5,000	75	"
Culpeper	R.H. Morrison	25	3,180	170	"
Rockingham	C.W. Wampler	10	62,000	1,000	Wheat hard to sow - disagreeable to use
Pittsylvania	H.L. Moore	2	5,500	100	None
Campbell	B. Anderson	5	6,450	none	"
Amelia	C.W. Richards	10	5,000	1	Too hard to use
King & Queen	J. Hutchinson	2	610	none	None
Westmoreland	C. Chase	$2,000	1,230	290	Hard to get, but farmers wanted it
Appomattox	W. Byrne	12.5	8,000	25	None
Shenandoah	G. Dickenson	15	65,000	1,200	Wheat does not go thru drill well
Elizabeth City	H. Lippincott	2	60	2	None
Dinwiddie	J. Bellinger	5	1,500	Couldn't get it	Used liquid methods
Grayson	D.T. Painter		100	5	None
Halifax	C. Bridges	2	5,300	35	"
Hanover	J.C. Stiles	$10,000	6,660	150	Killed some chickens

Total loss - 209,030 bushels
" " - 315,545 dollars

Report of Millers on Stinking Smut for 1928

Name	County	Estimate of damage per cent	bushels	Pounds copper carbonate distributed	Criticism of Treatment
Jefferson Mills	Albemarle	5	6,900	none	None
Buckingham Mills	Buckingham	20	3,220	"	"
Curdsville Mills	"	5		20	"
Kenbridge Mlg. Co.	Lunenburg	5	1,875	none	"
Orange Mills	Orange	20	21,840	800	"
Rocklands Mlg. Co.	"	5		none	"
Galveston Mills	Pittsylvania	15	36,000	250	"
Gretna Roller M.	"	12.5		200	"
Flavo Mills	"	10		none	"
Kerns Brothers	"	15		30	"
Concord Roller M.	Campbell	20	25,000	none	"
H. H. Nicklen	Nelson	5	4,525	"	"
Endless Caverns	Shenandoah	$25,000	16,600	unobtainable	"
A. W. Johnson	Brunswick	$ 1,000	800	none	"
Eagle Rock Mlg. Co.	Botetourt	$ 30	24	"	"
Galts Mills	Amherst	10	7,000	"	"
Slate Mlg. Co.	Halifax	$ 2,000	1,600	25	"
J. N. Strickler	Rockingham	5	41,000	none	"
Big Spring Mill	Montgomery	2	2,300	2	Results unsatisfactory
W. A. Schroeder	Powhatan	5	1,800	45	"
Spring Hill Mills (30 mills in co.)	Augusta	$ 500 (estimate of one miller)	6,000	none	"
E. Gouldman	Westmoreland	10	10,000	"	"
DeBord Mills	Wythe	25	6,000	"	Too much trouble to use
Enterprise Mill	Amelia	5	2,750	"	"
J. C. Sale	Caroline	25	7,000	"	"
J. P. Byrd	"	10		"	"
Page Mlg. Co.	Page	5	12,000	"	"
Loudoun Mills (combined)	Loudoun	5	30,000		"

Totals - 271,365 bushels, or $407,048

N.B. In Shenandoah, Brunswick, Botetourt, Halifax and Augusta Counties percentage estimates were made in dollars. Where more than one miller is named for a county, averages are taken and recorded in the bushels column.

Total damage loss is an average of estimates by county agents and millers, figuring wheat at $1.50 per bushel.

The hot water treatment for the control of loose smut of wheat and barley was again recommended in 1925 as in 1924. Splendid results were obtained in all cases where it was used in the 1924 wheat and barley crops. This treatment is growing in favor among growers of certified wheat and barley. The Extension circular entitled "Loose smut of wheat and its control" was mailed out as asked for. It is interesting to note the increase in the use of this method for loose smut control, due to a careful campaign of education for the past three years. Methods in use for the control of loose smuts of wheat and barley are described at some length in this Extension circular E-210 and the annual report of this department for 1924. Seventy-five circulars were mailed out in 1925.

In a cereal disease survey forty-seven wheat fields were examined in Warren, Nelson, Prince Edward, Prince William, Appomattox, Bedford, Campbell, Henry, Pittsylvania and Halifax Counties for an average of 3.4% loose smut which ran from less than 1% up to 14%. Only two fields examined had less than 1%. Seven fields of barley were examined in these counties also for an average of 3% covered smut and 8% loose smut, which ran from 1% up to 8% for the covered and 4.8% for the loose smut. No field was examined which had less than 1% of either smut. Two oat fields were examined for an average of 3.8% smut. The field survey and percentage estimate of disease present really tells the story after all.

A brief summary of the work follows on loose smut control in wheat and barley as conducted by county agents and Extension Pathologist.

County	Name	No. bushels wheat treated Cert.	Non-cert.	No. bushels barley treated Cert.	Non-cert.	Variety wheat	Barley
Loudoun	J.S. Ward	6					
Botetourt	R. Obenshain	7		25		V.P.I. 131	Tenn. winter
Prince Wm.	S.C. Harley				16		"
"	E.S. Hooker				16		"
Henrico	C.W. Buckels	44				V.P.I. 112	
	Total -	57		25	32		

*In Botetourt County 12 bushels of barley were treated for Kone Brough, 8 bushels for R. P. Obenshain, and 5 bushels for C. L. Gifford.

Germination tests of treated and untreated seed were made and where instructions were carried out no seed injury occurred as a result of the treatment. In all cases special care was exercised in the treatment of the grain with the hot water method, and always the County agent or Extension Pathologist was present even during the time of seeding of the treated grain.

The formaldehyde treatment for oat smut control is an established one and easy enough to handle by the grower of certified oats. Five thousand of the following direction sheets were mailed to oat growers in the State during 1926.

Virginia Agricultural and Mechanical College and Polytechnic Institute and United States Department of Agriculture, Cooperating. Extension Division, John R. Hutcheson, Director. Blacksburg, Virginia.

(Prepared by: Plant Pathology Department, Extension Division, V. P. I. , Blacksburg, Virginia)

There are several methods of treating oats for smut and a great many inquiries have been received as to the best method for the seed grower. In this case it is especially desirable that all traces of smut be eliminated if possible and the soaking method, which is most effective, should be used. This method is as follows:

Prepare a solution of formaldehyde (formalin) by adding one pint of formaldehyde (40%) to 40 gallons of water. For smaller quantities use at the rate of one ounce of formaldehyde to 5½ gallons of water.

Pour the oats to be treated into this solution, using enough of the latter to cover the oats well. Allow the oats to soak for two hours, then drain off the solution, spread the oats out to dry and seed as soon as they are dry enough to run through the drill. Do not carry the grain over night before seeding; treat only as much grain as can be seeded that day. Allowance in seeding should be made for the swelling of the grain in the solution.

The method outlined above will often give complete control of oat smut or will reduce it to a very small amount. This method was used at Blacksburg in 1923 on V. P. I. No. 1

oats with complete success. The portion of the field sown with untreated seed showed 6.9 per cent of smutted heads by count, while not a single smutted head could be found where the treated seed was used. There was no injury to the seed from the treatment.

Formaldehyde can be purchased from the drug store. It is sometimes sold under the name "formalin". It is a solution of formalin gas and usually comes in the 40% strength. It is non-corrosive and the treating may be done in either wooden or metal vessels.

Summary of Cereal Smut Work

Thirty-two thousand circulars on the copper carbonate method of treating wheat for stinking smut control were sent out to all of the millers and county agents of the State. These circulars were followed after wheat harvest by questionnaires to all of the millers and county agents in wheat producing counties of the State, to procure an estimate of the damage caused by stinking smut to the 1925 crop and to ascertain the amounts of copper carbonate used in its control, as well as any criticisms of this treatment. Approximately 10,000 pounds of copper carbonate were distributed among the farmers by county agents, millers and other agencies. It is estimated that this amount could have been doubled if the

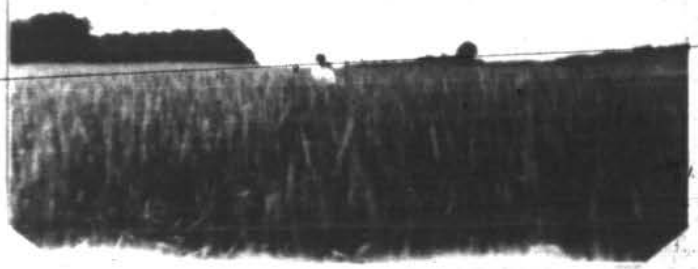
copper carbonate had been available for use when needed. The amount distributed was sufficient to treat enough wheat for the planting of 60,000 acres. As much as 12,000 acres were planted with treated wheat in Loudoun County alone, and Shenandoah County was not far behind this acreage. Eight thousand people were reached through this project by the combined efforts of millers, county agents, the Virginia Seed Service, the Plant Pathology Department of V. P. I. and other agencies within the State. Damage estimates are based on the reports from 20 county agents and 30 millers of the State.

In a survey of 47 wheat fields and 7 barley fields in 10 counties of the State, an average of 5.4% loose smut was found in the wheat and an average of 3% loose and covered smut in the barley fields; 57 bushels of wheat and 57 bushels of barley were treated by the hot water method in 4 counties of the State for 7 men.

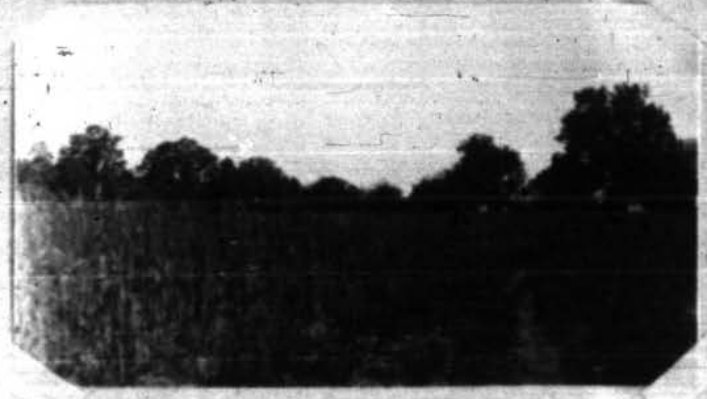
Five thousand copies of directions for treating oat smut were mailed to oat growers of the State.

Photograph No.12 - Field of wheat in Price William County with 8 per cent of loose smut.

Photograph No. 13 - Wheat field in Price William County with 10 per cent of loose smut.



Photograph No. 14 - Wheat field in Price William County with 14 per cent of loose smut.



Photograph No. 15 - Wheat field in Appomattox County. Hot water treated at left, no smut; no treatment at right, 3.5 per cent smut.

Photograph No. 16 - Wheat field Warren County. Hot water treated, no smut.

Photograph No. 17 - Utilization of watering trough for pre-soaking grain, Prince William County.

Photograph No. 18 - Utilization of corn house floor for drying wheat after hot water treatment. Prince William County.

Photograph No. 19 - Apparatus used for copper carbonate dust treatment for "Bunt" control. Prince Edward County.

Photograph No. 20 - Apparatus used for copper carbonate dust treatment. Loudoun County.

Photograph No. 21 - Group of growers at cereal smut meeting. Loudoun County.

Photograph No. 22 - County Agent and group of growers, Orange County, with device for treating wheat with copper carbonate dust.

Subproject No. 8 - Control work on Blackfire and Wildfire diseases of tobacco still consists of (1) the treatment of the growers' seed in the laboratory of the Plant Pathology Department during the winter months and (2). the inspection of both treated and untreated plant beds and fields later in the spring and summer to ascertain the presence or absence of these diseases. Each year less seed is being treated at the College, due partly to lack of assistance, crowded conditions in the College laboratory, and the fact that the growers are being educated to treat their own seed. The method of seed treatment in 1925 was the same as recommended and used in 1924. The complete method of treatment and care of the seed bed were carefully written up in concise form and printed on franked cards as shown on the following page. About 7,000 of these were mailed to county agents, warehouses, growers and other tobacco organizations of the State. These cards were supplemented by Experiment Station Bulletin No. 228 and Extension Bulletin No. 90, both treating tobacco diseases quite fully.

In view of the increase in the number of farmers treating their own seed only 15 lots of seed were treated at the College laboratory. The total amount of seed treated in 1925 was probably in excess of that treated in 1924. Fifty circular letters and 1,000 copies of Extension Bulletin No. 90 were mailed out in connection with the seed treatment phase of this subproject to the tobacco growers of the State.

E-223

Virginia Agricultural and Mechanical College and Polytechnic Institute
and United States Department of Agriculture, Cooperating.
Extension Division, Jno. R. Hutcheson, Director, Blacksburg, Va.

Directions for Control of the Blackfire and Wildfire Diseases of Tobacco

(Prepared by: Department of Plant Pathology, Extension Division, V. P. I., Blacksburg, Virginia.)

Practically every tobacco grower in Virginia has suffered losses from the blackfire and wildfire diseases. Experiments conducted by the Plant Pathology Department of the Extension Division of the Virginia Polytechnic Institute show that these losses can be greatly reduced or completely eliminated by seed treatment and care in preparing and handling the plant bed. The treatment can be made at home by any grower who carefully follows the directions given below.

DIRECTIONS: Procure a small bottle of bichloride of mercury tablets at the drug store. If they can be bought in smaller than bottle lots, one or two tablets will be all that is needed. The tablets usually come in two sizes, one for making a pint of a 1-1000 strength solution, and the other for making a quart of the same strength. Ask for the pint size tablets. Take the tablets home, dissolve one in a little hot water and put in a quart fruit jar. Next fill the jar half full with cold water. Pour the tobacco seed to be treated into the solution, stir occasionally, and let soak for fifteen minutes. After fifteen minutes strain the solution through fine cheese cloth, wash the seed in at least three changes of water, and spread out in a warm (not hot) place to dry.

CAUTION: Do not soak seed more than fifteen minutes, and do not put treated seed back into dirty bags or other containers that have previously been used for this purpose, since in such cases the seed would be subject to re-contamination.

POISON: Corrosive sublimate or bichloride of mercury is a deadly poison when taken internally, but it does not injure the skin. It should be kept away from children and stock. Do not pour the water that has been used in the treatment where any animal can drink it. Extra tablets should be destroyed if they cannot be stored away in a safe medicine chest. Bichloride of mercury corrodes metal and should be used only in glass or wooden vessels.

PLANT BED: The plant bed should be prepared each year on new ground, well removed from old plant beds and fields in which tobacco has been recently grown. No manure, tobacco stalks or other refuse from a recent tobacco crop should be used on the bed. Do not use poles or boards that have been used previously on the plant bed. It is best to use new canvas for the plant bed each year. If necessary to use old canvas, it should be boiled thoroughly for at least an hour. Do not handle diseased plants from a neighbor's plant bed, since infection may be carried on the hands and shoes of workers. Examine the plants at transplanting time, discard all diseased plants, and do not use the apparently healthy plants which are located near infested spots in the plant bed. Spitting tobacco juice on the plant bed should be avoided at all times, as the disease may be spread in this way. Plow up the stubble as soon as the crop is harvested. Fields which have grown a diseased crop the previous year should not be planted in tobacco if other land is available.

In the spring between May 18 and June 4, Dr. F. D. Fromme and the Extension Pathologist examined 142 plant beds in 9 counties of the State. A brief report of their findings follows:

Tobacco Plant Bed Inspection - May 18 - June 4

County	Number of beds examined	Condition of beds examined
Halifax	17	Of the 17 beds 13 were owned by the State Seed Co. In 8 of these 13 beds traces of blackfire were found. In both cases plant beds showing infection were sown to seed procured from the Kentucky Agricultural Experiment Station. All seed was treated with Semesan and Uspulun except that procured from Kentucky.
Pittsylvania	28	Traces of blackfire found in 9 of the 14 beds examined around Chatham. Traces of blackfire found in 3 of the 14 beds examined around Danville. More and better plants around Danville vicinity than around Chatham.
Mecklenburg	10	No blackfire or wildfire found in any of the 10 beds. Considerable injury as a result of flea beetle in practically all of the beds. Plants generally small and scarce in most of the beds.
Henry	11	Trace of blackfire found in 2 of the 11 beds. Flea beetle injury considerable in some beds. Plants scarce in some instances.
Campbell	8	No blackfire observed in any of the beds examined, but one case of wildfire noted in a bed at Gladys. Considerable flea beetle injury in all of the beds observed. Plants scarce and backward.

County	Number of beds examined	Condition of beds examined
Bedford	26	No blackfire or wildfire observed in any of the beds examined. Plants small and scarce in many cases. Flea beetle injury serious in only one or two cases. Plants reported generally short in north section of county.
Appomattox	7	No blackfire or wildfire observed in any of the beds examined. Less flea beetle injury than found in Campbell County.
Prince Edward	14	No blackfire or wildfire observed in any of the beds examined. Plants examined at a time when they were being planted in the field. No scarcity of plants reported. Flea beetle injury not serious.
Nelson	21	Blackfire found in 2 of the 21 beds examined. A real shortage of plants in some sections of the county. Flea beetle injury not serious.

N. B. - Places where blackfire or wildfire were found:

State Seed Co.....South Boston
Substation.....Chatham
R. W. Mustam.....Chatham
C. Chattan.....Dry Fork
T. J. Johnson (owner chewing & spitting tobacco juice on bed when examined).....Dry Fork
H. T. Carter.....Dry Fork
P. Tate.....Kentuk
Jim Joyce.....Spencer, R. F. D.
R. C. Morgan (wildfire).....Gladys
Mrs. J. A. Pettit.....Roseland

Later in the summer about 50 fields were examined for the presence of diseases. One striking case in Mecklenburg County is reported here at some length. The necessity for seed treatment and care of the plant bed is very evident from this report.

An Outbreak of Blackfire - Chase City - August 27, 1925

The farms of five growers reporting blackfire or some similar malady were visited in August with County Agent H. E. Williams and Assistant Agent Carr. All of these five men together procured a carload of Union Star Fertiliser through the Farm Bureau of South Hill. The South Hill Farm Bureau in turn procured the fertiliser from the Robertson Fertiliser Company of Norfolk. An analysis by the State Chemist showed the following:

	Actual	Should be
Average phosphoric acid	9.27	8.00
Water sol. nitrogen	2.03	1.20
Total nitrogen	2.53	2.47
Equivalent to ammonia (NH_3)	2.83	3.00
Potash available	2.81	3.00

"Potash not from high grade sulphate of potash."

Growers and in the order visited were as follows:

1. A. E. Garner, Baskerville; variety of tobacco used was Adcock. No seed treatment practised. Had some "Blackfire" last year he reports. Used the same fertiliser last year, i.e. procured from the same company at any rate. Plant bed on new land this year but not in previous years. Old canvas used. Tobacco out and in process of curing. Plenty of blackfire.
2. W. P. Blalock, Baskerville; variety, Harrison special. Blackfire in plant bed. Seed not treated. Plant bed on new land. Some old and some new canvas used. Plenty of blackfire on tobacco in process of curing.

3. J. D. Elam, Baskerville; variety, White Willow. Seed not treated. Plant bed on new land. Old canvas used for several years. Reports little or no "Blackfire" last season. Twenty acres in field visited and a uniformly bad infection. Plant bed plowed up.

4. J. J. Stone, Baskerville; procured 30,000 plants from J. D. Elam. He reports no "Blackfire." Field visited and some "Blackfire" found on an occasional plant. A Pocomoke fertilizer used.

5. R. B. Barnes, Baskerville. Reports a $5,000.00 loss. Used same fertilizer as J. D. Elam (Union Star Brand). Seed not treated. Variety, Adcock and Gold Leaf. Plant bed located on new land. Old canvas used. Severe infection of "Blackfire" noted in curing tobacco. Reports no "Blackfire" last year.

6. W. H. Elam, Baskerville. Variety Adcock. Seed not treated. Plant bed on new land. Blackfire present and observed in field but not as serious a case as that of J. D. Elam. About 8 acres of Gold Leaf and 48 acres Adcock. Gold Leaf reported not as bad as Adcock. Old canvas used.

Summary

Blackfire observed in fields of J. D. Elam and W. H. Elam. Worse in field of J. D. Elam. All used the same fertilizer (Union Star Brand) except J. J. Stone who used a Pocomoke brand. Blackfire observed in crops of R. B. Barnes, W. P. Blalock and A. E. Garner in process of curing. J. J.

Stone who procured 30,000 plants from J. D. Elam had a trace more or less of blackfire. Varieties used were Adcock, Harrison Special, White Willow and Gold Leaf. Fertilizer was used at the rate of 800 pounds to the acre. Blackfire was found in the plant beds of A. E. Garner and W. P. Blalock.

Experiments carried on later at the College with fertilizer samples procured from the men having blackfire infection failed to produce blackfire in plants grown in the greenhouse. In all cases where the disease was found in the field, no seed treatment was practised, and in general there was a lack of care in the preparation of the beds and attention of the plants later on, or up to the time of setting in the field.

Summary of the Control of Blackfire and Wildfire Diseases

Number of counties in which work was carried on: All tobacco growing counties of the State. Contacts have been made by county agents and the Extension Pathologist in as many cases as time would allow.

Number of farmers for whom seed was treated: At the College 15 and 15 lots of seed.

Number of farmers treating their own seed: Greatly in excess of the number for 1924.

Number of plant beds inspected:.....142 in 9 counties

Number of fields inspected:..... 50 in 9 counties

Number of circular letters sent out:..... 50

Number of bulletins sent out..... 1,000

Number of franked treatment cards sent out..... 7,000

General attitude of farmers in regard to the value of seed treatment: Reports generally favorable as in 1923 and 1924.

Subproject No. 4 - The subproject on tomato disease control was continued along the same lines of procedure as in 1924. The diseases in question are the leaf spot, late blight and wilt. In Giles County and a few other sections of the State, late blight is still the chief trouble of the tomato grower. Several growers have made special efforts to control the late blight with good results.

In Bedford County special attention has been called to the ravages caused by the "sleepy disease" or Fusarium wilt as in 1924. A great many tomato fields have been inspected in this county and other counties during the past three years, and in many of these fields more or less wilt was present. Our only remedy for this disease, namely: the use of resistant varieties, is still being recommended as in the past. Good results were reported in most cases during 1925 as a result of the use of resistant sorts. Considerable seed of the Norton, Norduke, and Columbia was distributed among the growers in 1925 as in 1924.

As in 1924 greater care of the plants in the plant bed was emphasized, again stressing fall plowing as an important factor in the control of leaf spot, and proper care of the plants in the plant bed up to the time of planting in the field. Proper care of plants in the plant bed included a program of dusting with copper lime dust containing a poison for the flea beetle every ten to fourteen days.

Summary of Tomato Disease Control

The use of desirable resistant sorts for Fusarium wilt control was again advised in 1925. Seed of the resistant varieties, Columbia, Norton and Norduke, was distributed among many growers in wilt striken areas of the State. Fall plowing as an aid in the control of leaf spot was urged again in 1925.

Fifty plant beds and forty-five fields were examined during the season of 1925 for the presence of disease.

Photograph No. 23 - Dr. P. D. Fromme, Agricultural Experiment Station; Blacksburg, P. P. McWhorter, Truck Station, Norfolk; D. V. Wiley, Virginia Can Co.; F. C. Lane, Canadian Government, and the Extension Plant Pathologist, studying the tomato disease situation in Botetourt County.

Subproject No. 5 - The control of cabbage diseases during the past three seasons has been confined largely to the "Yellows disease." Here again is another type of disease controlled through the use of resistant varieties. Our efforts in the control of this disease have been undertaken almost entirely within Wythe and Smyth Counties. Several trips were made by the Extension Pathologist to these Counties during the cabbage growing season. A field survey for the presence of the "Yellows" disease showed its presence in certain sections of these two counties.

The resistant All Seasons variety is still proving satisfactory for most of the cabbage growers in southwest Virginia. In 1925 the Southwest Virginia Cooperative Exchange ordered 200 pounds of All Seasons variety, as compared to 65 pounds for 1923, from Wisconsin for distribution among the growers of southwest Virginia.

Another demonstration of the use of resistant and non-resistant varieties on "soil sick" land was staged at Marion during the season of 1925 as in 1924. Five resistant sorts and one non-resistant sort were used in this demonstration. The seed for this demonstration were supplied by the Department of Plant Pathology of the Wisconsin Agricultural Experiment Station as in 1924. The result of the demonstration for the most part showed the resistant varieties standing up against the disease, while the commercial or non-resistant variety proved susceptible to the disease.

Summary of Cabbage "Yellows"

The "Yellows" disease is still being controlled satisfactorily through the use of resistant varieties, and the All Seasons is still the most popular variety of the resistant sorts.

A demonstration of resistant and non-resistant varieties again proved the value of the resistant sorts as in 1924. 200 pounds of the All Seasons variety was purchased in Wisconsin for distribution among the southwest Virginia cabbage growers in 1925, as compared to 65 pounds in 1923.

Photograph No. 24 - A demonstration of resistant and non-resistant varieties of cabbage planted on "boil sick" land at Marion. Note the absence of plants in the non-resistant variety All Head Early.

Photograph No. 25 - A demonstration of resistant and non-resistant varieties of cabbage planted on "soil sick" land at Marion. Note the absence of plants in the non-resistant variety Copenhagen Market.

Subproject No. 6 - The production of good quality seed potatoes has been, in the past, and still is considered one of the most important phases of the vegetable gardening industry of the State. An increased demand for clean and disease-free seed in 1925 makes the problem of the production of strong and healthy seed a more important one than ever before. Again this subproject has been conducted cooperatively by the specialists in Vegetable Gardening and the Plant Pathology Department. The spray calendar for potato disease control has been carefully worked out by the Plant Pathology Department for the past three seasons. Much of the work in connection with this subproject has been carried on at Pennover, Giles County. In the early stages of the development of this subproject, or during 1923, the Extension Pathologist made a trip to Giles County, together with the Vegetable Gardening Specialist. At this time equipment, methods of procedure and spray practise were gone into at some length with the growers.

In 1924 and 1925 the Vegetable Gardening Specialist and assistants carried out the full spray program as recommended and originally outlined by the Plant Pathology Department of the College. Good results have been obtained to date in the control of diseases and Giles County gives promise that it might become a real center for the production of high grade seed potatoes. Proper consideration must be given to the problem of quality seed production.

Subproject No. 7 - The control of raspberry anthracnose consists of two spray applications of lime sulfur solution, known as the delayed dormant application and the pre-bloom application. These recommendations are the same as those of 1924 (See 1924 report, page 57, for complete recommendations). Anthracnose has been found to be prevalent in Virginia wherever raspberries are grown, especially is this true of the black cap varieties.

During the past season two demonstrations in the control of this disease were staged in Loudoun and Montgomery Counties. In Loudoun County the demonstration consisted of a ten-acre patch of the Plum Farmer variety. The first spray was applied on April 10 and 11, the second spray one month later, or May 11 and 12. There was a heavy infection of the disease in this patch. Spraying checked the spread of the disease to the new canes and shoots and there is cause for the belief that anthracnose may be controlled in this patch in two or, at most, three years if the spraying is thorough and timely. The Extension Pathologist was present during the first spray application, aiding in the operations and in an advisory capacity. (See cuts following.)

The second demonstration was staged in Blacksburg, Montgomery County. The variety was a black cap type and the patch was about one-half acre in size. Two spray applications were put on here also as in the Loudoun demonstration. The first application was made on April 2 and the second one a month later, or on May 2. The disease

was checked from spreading to the new shoots and canes and there is reason to believe that anthracnose may be controlled in this patch in two years if the spraying is thorough and timely. The Extension Pathologist was present during the time of both applications, aiding in the operations and in an advisory capacity.

Summary of Raspberry Anthracnose Control

Two demonstrations in the control of anthracnose were staged, one in Loudoun and one in Montgomery County. Promising results were obtained in both cases.

Photograph No. 26 - Ten-acre field of black raspberries, Loudoun County, with severe infection of anthracnose.

Photograph No. 27 - Spraying above field for anthracnose control.

Subproject No. 8 - The native barberry (Berberis canadensis) still plays the important role in the propagation and spread of black stem rust of wheat in Wythe and adjacent counties of southwest Virginia. The Extension Pathologist made 8 trips to Wythe and nearby counties in 1925 in the further study of this problem through field surveys with growers in the stricken areas. In all, eleven days have been spent in Wythe, Smyth, and Pulaski Counties and sixty wheat fields examined in 1925. Two and one-half tons of salt were furnished for additional demonstrations by the Department of Agriculture at Washington. The Virginia Iron, Coal and Coke Company used three tons of salt for the eradication of the barberry on their farms in Wythe County. One fair exhibit was worked up in connection with this subproject and used at the Southwest Virginia Fair held during the latter part of August at Marion, Smyth County. The Agricultural Department of the Norfolk & Western Railroad has contributed to the publicity of this work from time to time during the year.

Brief reports of this work by Dr. F. E. Kempton of the Federal Department of Agriculture at Washington and the Plant Pathology Department of V. P. I. follow.

STEM RUST AND NATIVE BARBERRIES IN VIRGINIA

Progress of The Barberry Eradication Campaign in The 13 Eradication States

The barberry eradication campaign has been in progress in 13 of the north-central, grain-growing states since early in 1918. It is conducted by the Office of Cereal Investigations, Bureau of Plant Industry, United States Department of Agriculture, in cooperation with the States of Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin and Wyoming.

Investigations have been made in other states but eradication has not been attempted elsewhere except in an experimental way. The campaign has made wonderful progress. The first survey of practically all city, village, and rural properties in 786 counties of about 900 counties requiring survey has been made. A necessary second survey and resurvey of certain areas are being carried forward. The first survey has been completed in Indiana, Iowa, North Dakota, South Dakota, Wisconsin and Wyoming, and practically so in Colorado, Minnesota and Nebraska. The results of this survey to December 31, 1924, give a total of 6,358,343 common barberry bushes found on 58,465 properties. Of these, 67,510 properties have been cleared of 5,813,192 bushes. In addition, 2,421,926 seedlings found on this survey were destroyed.

The first survey, however, proved not to be sufficient to get all the bushes. A second survey of some areas is being made and even a third survey may be needed in the areas having many bushes escaped from cultivation.

Resurveys of the properties having bushes are necessary to destroy seedlings and sprouts appearing after the bushes are destroyed. The second survey of 111 counties showed that, of the total bushes found, 92 per cent were found the first survey and 8 per cent were found on the second survey. In resurvey 273,619 sprouting bushes were found. In all surveys 4,607,142 seedlings were found, most of which were destroyed immediately.

This makes a grand total of 11,239,104 common barberry bushes, sprouting bushes and seedlings found. Of this total 10,654,741 have been eradicated in all surveys to December 31, 1924.

The Common Barberry

The common barberry is not native to the United States but was introduced by early colonists and has been spread widely, especially in the northern part of the United States.

It harbors and spreads the black stem rust of grains, the most destructive disease. Losses caused by stem rust average annually over 50,000,000 bushels of all small grains. In years of epidemics the losses have been much greater. In 1916 the loss of spring wheat alone from stem rust was 180,000,000 bushels of wheat.

The eradication campaign has effectively reduced stem rust losses in local areas where barberries have been removed. It is also proving effective in reducing the losses from widespread epidemics which have frequently occurred in the spring-wheat states.

In Ohio, Indiana, Illinois, Iowa and southern Michigan, wherever most of the common barberry bushes have been located and eradicated definite control has resulted. In many local areas it has been possible to locate infected barberries by tracing from light infection to heavy infection until the source of infection was found. Wherever there have been large hedges of common barberries and areas of escaped barberries developed from seeds scattered by birds, local epidemics have usually occurred regularly. In many of these localities small-grain growing has been abandoned as unprofitable. However, after barberries have been destroyed grains have been produced in these same localities without damage from stem rust.

Stem Rust and The Native Barberry - Berberis canadensis Miller

Berberis canadensis Miller, a barberry native to some parts of the Appalachian Mountains of Virginia, West Virginia, The Carolinas and Georgia, has been found to carry and spread stem rust of grains. This species has also been reported as occurring wilt in Missouri. In 1922 and 1923 small areas of these plants were found in Tippecanoe and Carroll Counties, Indiana, and Tazewell County, Illinois.

The general description of this barberry is as follows: Berberis canadensis Miller is an erect shrub which grows to a height of two to five feet under the normal Virginia conditions. As a rule Berberis canadensis is found in clumps and the nature of the bush is to spread by underground root stocks or stolons. The leaves of the bush are green, with slightly unevenly toothed margins. The petal of the inconspicuous yellow flowers is notched at the top. The oval deep red two-seeded berries are borne in short clusters.

In Virginia, damage to grains from stem rust near this species of barberry has been reported from Wythe, Carroll, Pulaski, Smyth, Grayson, Washington and Montgomery Counties. Numerous observations made in Wythe, Carroll and Pulaski Counties show that this barberry becomes heavily infected with stem rust and causes severe losses to nearby grain fields.

Under the direction of the Extension Plant Pathologist of the Virginia Agricultural College, cooperative experiments were placed in Wythe County, Virginia, to determine the best method of eradicating this species of barberry. In addition, an attempt was made to demonstrate the effect of its eradication upon the production of grains in the localities selected. Salt and kerosene were used as killing agents. Salt was the more effective and the more easily obtained. About one-half pound of salt applied to each square foot of surface area was sufficient to kill the bushes. Experiments were placed in three different

localities. In the first locality all barberries were salted in a strip 20 rods wide about a grain field. In the second locality all the barberries were salted in a strip 40 rods wide about another grain field. Similarly all bushes were salted in an area 80 rods wide about a third field.

In the areas where 20-rod and 40-rod strips were cleared of barberries, there was only a slight reduction in the amount of stem rust on the experimental fields. The stem rust which had developed from barberries growing just outside the cleared strips was carried by the wind to these experimental areas. The rust appeared on the experimental fields later than on fields close to barberries. Stem rust was more severe on the sides of the experimental fields nearest remaining barberries.

In the area where most of the barberries were destroyed within a strip 80 rods wide about a grain field, only a small amount of stem rust developed. As a few small barberries adjacent to the field were overlooked complete control was not accomplished.

It is evident, however, from these observations that if these native barberries were eradicated for some distance about grain fields stem-rust losses would be reduced. It seems probable that if a valley or locality were cleared of this barberry, stem rust would be practically eliminated in the cleared area. Observations in Wythe County, Virginia, indicate that Berberis canadensis should be eradicated from grain-growing areas if successful grain production in those areas is to be expected.

The Relation of Barberries to The Development of Stem Rust of Wheat in Wythe County, Virginia

A trip to the Jackson's Ferry and Foster Falls sections of Wythe County was made on June 24, 1924, and a study was made of the relation between the occurrence of barberries and stem rust of wheat. Severe infection of stem rust was found in these localities and also at points along the Lee Highway between Wytheville and Pulaski. The injury was strikingly correlated with the presence of barberries in all cases, and comparative freedom from injury was always associated with the absence of barberries.

Representative samples of wheat, all of the Fulcaster type, were obtained from a number of fields, and these were made up into bundles of uniform size for purposes of comparison. Comparative yields were obtained by threshing 20 heads from each sample and weighing the grain obtained. These yields are recorded in table 1.

A description of the conditions in the various fields is as follows:

Field No. 1, on the farm of George Davis at Foster Falls showed only slight stem rust. It is in a locality where barberries are plentiful, but Mr. Davis, together with his neighbors, Mr. G. S. Williams and Mr. John Rankin, has eradicated all barberries within a half-mile of the field. In one direction they have been eradicated within a mile. Mr. Williams and Mr. Rankin also have good crops

with only slight infection. Mr. Davis' field shows a yield of 12 grams of grain in 20 heads, see table 1, as compared with the average yield of 2.98 grams for the severely rusted fields.

Field No. 2 is within a mile of field No. 1 and is on the farm of the Virginia Iron, Coal and Coke Company at Foster Falls. There has been some salting of barberries on this farm but they are still present in large numbers near the field. Stem rust was very severe and the yield was only 4.5 grams in 20 heads. The grain is noticeably shriveled.

Field No. 3, on the farm of W. D. Sanders at Jackson's Ferry was severely infected, but the injury was intensified by the fact that the wheat had been pastured in the spring and this had delayed maturity. There has been considerable local eradication of barberries on this farm, but the work has not been thorough. A few bushes were found on a rocky place within the field; others occur near some trees within a hundred yards and still others along the border of woods within a quarter of a mile. The wheat was still green at the time of the visit while that in other fields in the locality was harvested or ready for harvest. The yield was only 1.6 grams and the grain was badly shriveled.

Field No. 4, on the Lee Highway, 19 miles from Pulaski, and near the crossroad leading to Max Meadows, was severely rusted as was also field No. 6 which was 15 miles from Pulaski. The yield was 4.1 grams for field No. 4 and 5.8 grams for field No. 6.

Field No. 7, 15 miles from Pulaski, showed moderate stem rust and a yield of 11.7 grams.

Fields 8, 9, and 10, which were 13, 12 and 8 miles from Pulaski, had only slight stem rust with yields of 14, 16.7, and 20.3 grams. No barberries were seen in the vicinity of these fields.

Field No. 11 at Draper, 6 miles from Pulaski, showed no infection and yielded 18.4 grams.

Table 1 - Yields of wheat from fields in Wythe County according to severity of stem rust.

Field No.	Location	Severity of rust	Yield (grams)	Ave. Yield	Per cent reduction
2	Foster Falls	severe	4.5		
4	19 m. from Pulaski	"	4.1		
3	Jackson's Ferry	"	1.5		
6	16 m. from Pulaski	"	5.8	3.98	78.4
7	15 m. from Pulaski	moderate	11.7	11.70	36.4
8	13 m. from Pulaski	slight	14.0		
10	8 m. from Pulaski	"	20.3		
1	Foster Falls	"	12.0		
9	12 m. from Pulaski	"	16.7	15.75	14.4
11	Draper	none	18.4	18.40	0.0

A comparison of the average yield, as well as the individual yields, in the severely infected fields with the yields of the slightly infected and clean fields shows in a very striking way the injury from stem rust. The severely infected fields show an average of only 3.98 grams of grain in 20 heads as compared with 15.75 in the slightly infected fields and 18.4 in the field with no infection. The percentage reduction in the slightly infected fields is 14.4 while that in the severely infected fields is 78.4. The one moderately infected field shows a yield of 11.7 grams and a percentage reduction of 36.4.

A number of oat fields in close proximity to the wheat fields and to barberries were examined but only slight infection of stem rust was found. Rye was practically free from infection, a trace only being seen. Considerable stem rust was found on two grasses which are common in the section, orchard grass, Dactylis glomerata, and cheat, Bromus secalinus.

Summary of Barberry Eradication

Number of trips to Wythe and adjacent counties..... 8

Number of wheat fields examined..... 60

Amount of salt applied in eradication experiments during 1925..... 5½ tons

Amount of salt applied in eradication experiments during 1923 and 1924..... 10½ tons

In areas where the barberry has been eradicated in southwest Virginia the yield of wheat has been increased, thereby proving the value of this work.

Subproject No. 9 - Important and interesting data on disease occurrence was gathered during the 1925 season, as in 1924, through a plant disease survey. The 1925 season was another unusual one in many respects, the degree of severity of diseases being greater for some diseases and less for others as compared to the 1924 season. Blackfire and a trace of wildfire were found in plant beds last spring, and several severe cases of blackfire were observed in the field in Mecklenburg County. Additional cases of corn root, stalk and ear rots, due to fungi and soil conditions were also observed at different times during the season. The status of loose smut of wheat and barley was about the same as in the 1924 season, although there were more cases of the percentage going higher than six per cent for loose smut of wheat than were observed during the season of 1924. Black stem rust was not as severe in southwest Virginia during the past season as in the 1924 season. Stinking smut of wheat was much worse in 1925 than in the season of 1924. Anthracnose of cotton was probably the same as during the 1924 season. The diseases of tomatoes, potatoes and cabbage were in about the same proportion as during 1924. The only serious outbreak of a particular disease was that resulting from "bunt" which was quite general in occurrence over the State and very prevalent in Loudoun, Shenandoah, Rockingham, and Orange Counties.

A crop loss estimate for cereal diseases follows on the succeeding page.

Plant Disease Survey State of Virginia

Crop Loss Estimates for Cereal Diseases

Estimated average percentage reduction in yield due to diseases

Wheat

Scab (Gibberella saubinetii)	.6%
Leaf rust (Puccinia triticina)	1.0
Stem rust (Puccinia graminis)	.3
Bunt (Tilletia tritici & T. laevis)	3.5
Loose smut (Ustilago tritici)	2.0
Black chaff (Bacterium translucens undulosum)	0
Yellow stripe rust (Puccinia glumarum)	0
Other diseases	.5

Barley

Stripe (Helminthosporium gramineum)	.1
Loose smut (Ustilago nuda)	3.0
Covered smut (Ustilago hordei)	5.0
Leaf rust (Puccinia simplex)	t
Stem rust (Puccinia graminis)	t
Yellow stripe rust (Puccinia glumarum)	0
Other diseases	0

Rye

Smut (Urocystis occulata)	0
Ergot (Claviceps purpurea)	t
Leaf rust (Puccinia dispersa)	t
Stem rust (Puccinia graminis)	0
Other diseases	1.0

Oats

Loose & covered smuts (Ustilago avenae & U. laevis)	6.0
Stem rust (Puccinia graminis)	t
Leaf rust (Puccinia coronata)	1.0
Other diseases	1.0

Corn

Smut (Ustilago zeae)	1.5
Leaf rust (Puccinia sorghi)	t
Brown spot (Physoderma zeae-maydis)	0
Root rot (Gibberella, Fusarium)	4.0
Ear rots (Fusarium, Diplodia)	4.0
Other diseases	t

Estimated by: Preece & Godkin

Statistics of Travel

During the year 1925 the Extension Plant Pathologist has spent 202 days in the field and 118 days in the office. A total of 12,980 miles have been covered by rail and a total of 4,456 miles by auto or other means of conveyance. Plant pathological project work of one type or another has been carried on with 24 county agents and 10 Smith-Hughes high school teachers. In addition to this project work was carried on in 4 counties having no agents. Eighteen field meetings have been held with a total attendance of 600, and 10 demonstrations have been staged. Two conferences have been attended at Washington, one of plant pathologists at the meetings of the A. A. A. S., and the other the National Soybean Growers' Association. Two hundred and twenty letters have been dictated and 500 circular letters, 29,710 circulars and 35 bulletins sent out during the year.

Summary of Subprojects

Subproject No. 1 - The control of root, stalk and ear rot diseases of corn. Corn germinators were run in six counties and 36,142 ears of corn tested for 126 farmers. The percentage of plantable ears was 74.4. Field inspections were made in six counties.

Subproject No. 2 - The control of cereal smuts. The work was carried on in 23 counties. Fifty-seven bushels of wheat and 57 bushels of barley were treated for seven men in 4 counties by the hot water method. Thirty-two thousand circulars on the copper carbonate method for "bunt"

control were mailed to millers and county agents. Ten thousand pounds of copper carbonate were distributed among the farmers by county agents, millers and other agencies. This amount was sufficient to treat 60,000 acres; 8,000 individuals were reached through this project. About $400,000 is the estimate of the damage to the wheat crop from "bunt." In a survey of 47 wheat fields an average of 3.4% loose smut was found and an average of 5% loose and covered smut in 7 barley fields. Five thousand copies of directions for treating oat smut were mailed to oat growers of the State.

Subproject No. 3 - The control of blackfire and wildfire diseases of tobacco. The work was carried on in all of the tobacco-growing counties of the State. The number of farmers treating their own seed shows a marked increase over previous years. The grower is being encouraged to treat his own seed and less is being treated each year at the College as a result of this. One hundred and forty-two plant beds and 60 fields were inspected in 9 counties; 1,000 tobacco disease bulletins and 7,000 franked treatment cards were mailed on request to growers, county agents, and tobacco locals.

Subproject No. 4 - The control of tomato diseases. The use of resistant varieties for Fusarium wilt control is still being advised. Seed of such resistant sorts as Columbia, Norton and Nordike was distributed among growers in wilt striken areas on request. Fall plowing is still being advised as an aid in the control of tomato leaf spot.

Fifty plant beds and 46 fields were examined during the 1925 season for the presence of disease.

Subproject No. 5 - The control of cabbage "Yellows" through the use of resistant varieties. The All Seasons is still the most popular resistant sort being grown in southwest Virginia. Two hundred pounds of this variety was purchased in Wisconsin for distribution in this section of the State. This is an increase over previous years.

Subproject No. 7 - The control of raspberry anthracnose. Two demonstrations in the control of anthracnose were staged, one in Loudoun and the other in Montgomery County. Promising results were obtained in both cases.

Subproject No. 8 - The native barberry and its relation to the spread of black stem rust of cereals in southwest Virginia. Sixty wheat fields were examined in 1925 and 5½ tons of salt applied in eradication experiments. The total amount of salt applied in 1923 and 1924 was 10½ tons. Increases in yield were still noted for wheat grown in the eradication areas.