VIRGINIA

PLANT PATHOLOGY SPECIALIST 1929

ANNUAL REPORT

Index

		Page
6 f 2	Conferences	22
6 f 7	Paln of work	3-7
6 h 3.212	Corn show	9-13
8 a 3.4	Selection	8
8 a 3.5	Seed testing	14-15
14 a 1	Barley smut	38, 45, 54
14 a 2	Ear and root rot	8, 19
14 a 3	Oat smut	45, 54
14 a 5.11	Barberry eradication	55-56
14 a 5.2	Wheat smut	38, 54
14 a 5.3	Wheat scab	43-44, 54
14 c 4.3	Raspberry anthracnose	58
14 d 1	Wild fire	21
14 d 2	Leaf spot	21
14 d 4	Seed treatment	22
14 e 10	Cucumber mosaic	59
14 f	Plant disease survey	58
X 14 j	Plant bed sterilization	22

ANNUAL REPORT

For

PLANT PATHOLOGY

Project No. 17,

From

Dec. 1, 1928 - Dec. 12, 1929.

Blacksburg, Virginia
December 14, 1929.

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

Dear Sir:

I hereby submit a report of the work in extension plant pathology for the year starting December 1, 1928, and ending December 12, 1929.

Respectfully,

James Godkin

James Godkin,
Extension Plant Pathologist.

INDEX

	Page
Personnel	1
Introduction	1
Plan of Work	3-7
Explanation of subprojects	8
Utility corn class at State Corn and Grain Show	9-12
Summary of Corn Rot Diseases	17
Tobacco Disease Conference	28-31
Summary Tobacco Diseases	32
Losses resulting from cereal smuts	47
Type Press Articles	50-53
Summary cereal smut diseases	54
Summary of barberry eradication	56
Cabbage disease control	57
Raspberry anthracnose control	58
Plant Disease Survey	58
Cucumber mosaic control	59
Statistics of travel	61

Personnel

The Extension Plant Pathologist was the only person employed full time doing plant pathological work during the year, although Dr. S. A. Wingard and Mr. R. G. Henderson, of the Department of Botany and Plant Pathology, made occasional trips in the interest of plant disease control.

Introduction

It is the policy of the Department of Botany and Plant Pathology to carefully outline, organize and carry out in so far as possible such projects as meet the particular economic needs of the counties for which they were planned. In accord with this policy the following sub-projects were undertaken during 1928:

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

(2) The control of wildfire, blackfire and mosaic diseases of tobacco.

(3) The control of cereal smuts.

(4) Eradication of the native barberry bush.

(5) The use of wilt-resistant strains of cabbage seed.

(6) Raspberry anthracnose control.

(7) Plant disease survey.

(8) Cucumber mosaic control.

All of these subprojects with the exception of the one on cucumber mosaic control have been continued from past years. The idea of the Botany and Plant Pathology Department is that these subprojects shall fit into a long-time program of work. The goal of our plant disease program is to aid in every possible manner the carrying out of approved methods for controlling and

preventing Virginia's economic crop diseases.

An outline plan of work for 1929 follows.

Virginia Polytechnic Institute
Extension Division
J. R. Hutcheson, Director

OUTLINE OF PLAN OF WORK FOR PLANT DISEASE
CONTROL PROJECT 1929-1930

I Subproject - The control of root, stalk and ear rot diseases of corn.

A. Facts determining the work undertaken.

1. Demonstrations of seed corn testing have shown 15% of corn used for seed by the average grower unfit for planting.
2. Root, stalk and ear rot diseases cause annual loss of 4 to 6 per cent of the crop.

B. Procedure - advisory and educational as follows:

1. Individual and community germinators
   a. Testing for germination and disease with five county agents and sixty individual growers
2. Correct methods for crop rotation and seed selection
   a. In cooperation with Agronomy Department, five county agents and sixty individual growers
3. Correct methods for curing and storing
   a. In cooperation with Agronomy Department, five county agents and sixty individual growers
4. Dust treatment of seed
   a. Only advised with best seed obtainable
   b. Six demonstrations in different counties
5. Field observations and yield data
   a. On 25 individual farms in 5 different counties
6. Available literature
   a. Extension Bulletin No. B-148
   b. Extension Bulletin No. 101
   c. Farmers' Bulletin No. 1176
   d. Illinois Agr. Exp. Sta. Bulletin No.255
   e. Illustrated lecture

II Subproject - The control of wildfire, blackfire and mosaic diseases of tobacco

A. Facts determining the work undertaken

1. Annual losses from blackfire, wildfire and mosaic diseases have amounted to several millions of dollars.

B. Procedure - Treating seed and cultural practices as follows:

1. Blackfire and wildfire disease control
   a. Seed selection from disease-free pods
   b. Seed disinfection with bichlorides of mercury
      (1) At the college for ten growers
      (2) At the State Dept. of Agriculture 200 lots varying from an ounce to 1 pound in size for 200 growers
   c. Location of plant bed on new ground each year
   d. Use of new cloth for plant bed each year
   e. Advice against the use of natural leaf tobacco while working around the plant bed
   f. Examination of plants at transplanting time to discard all diseased plants.
   g. Avoiding contamination of plants at transplanting time
   h. Spraying or dusting plants in plant bed with 4-4-50 Bordeaux mixture
   i. Inspection of field after transplanting
   j. Keeping tobacco off fields which have produced a tobacco crop the previous year

N.B. The importance of these measures will be stressed with all agents and growers in tobacco producing counties. Plant bed and field inspection will be carried on in at least [illegible] counties. All tobacco growers will be reached by correspondence. Six meetings are planned at which times colored lantern slides will be used pointing out the differences in the major tobacco diseases.

2. Mosaic diseases
   a. Use of insect proof canvas
      (1) To keep out insect carriers of the disease
   b. Keep down weeds near the plant bed
      (1) Many weeds are hosts for the disease
   c. Pull out and destroy diseased plants in plant bed
   d. Avoid topping and suckering diseased and healthy plants at the same time
   e. Avoid the use of tobacco around plant beds
   f. Proper cultivation and fertilization methods

N.B. The importance of these measures will be stressed as in the case of blackfire and wildfire diseases.

3. Available literature
   a. Extension Bulletin No. 90
   b. Extension Bulletin No. 110
   c. Extension Circular No. P-235
   d. Experiment Station Bulletin No. 228
   e. Experiment Station Technical Bulletin No. 25

N.B. A conference on tobacco diseases including workers from all States growing tobacco is being initiated by the Agr. Experiment Station pathologist and this Department. This conference will probably be held in Washington early in December.

III Subproject - The control of cereal smuts

A. Facts determining the work undertaken

1. Cereal smuts have caused annual losses of two millions of dollars more or less in the past

B. Procedure - Demonstrations of the control of smuts of wheat, barley and oats as follows:

1. Wheat smuts.
   a. Stinking smut
      (1) Copper carbonate dust treatment
         (a) Demonstrations in ten counties
         (b) Combination cleaning and treating machines in two counties
   b. Loose smut
      (1) Hot water treatment
         (a) Six demonstrations
2. Barley smuts
   a. Hot water treatment
      (1) Two demonstrations
3. Oat smuts
   a. Smuttox - three demonstrations
   b. Caresan - three demonstrations
4. Available literature
   a. Extension Circular No. P-210
   b. Extension Circular No. P-256
   c. U.S. D. A. Miscellaneous Circular No. 76

IV Subproject - Eradication of the native barberry bush

A. Facts determining the work undertaken

1. Black stem rust a serious factor in southwest, Va. wheat production
2. The native barberry bush propagates and spreads black stem rust

B. Procedure - Demonstrations in eradication of bayberry bushes as follows:

1. Applications of common salt
   a. Three demonstrations
      (1) In eradicated areas yield has been increased six bushels to the acre.
2. Available literature
   a. U.S.D.A. Circular No. 332

V Subproject - The use of wilt-resistant strains of cabbage seed

A. Facts determining the work undertaken

1. Wilt or "Yellows", the most serious disease of cabbage in southwest Virginia counties.

B. Procedure - Procuring resistant varieties from the Wisconsin Agricultural Experiment Station

1. Distribution of seed to growers through southwest Virginia Cooperative Association
   a. Seventy pounds of seed, more or less, to be distributed
   b. Comparison of yields of resistant and non-resistant sorts
2. Available literature
   a. Experiment Station Bulletin No. 326
   b. Journal of Agr. Res. Vol. XXX, No. 11

VI Subproject - Raspberry anthracnose control

A. Facts determining the work undertaken

1. Anthracnose the most serious disease of raspberries in State

B. Procedure - Spray demonstrations of control as follows:

1. One demonstration in Montgomery County
   a. Two spray applications
   b. Comparison of control with non-sprayed
2. Available literature
   a. Extension Division Circular - Spray Schedule for Raspberry Diseases

VII Subproject - Plant Disease Survey

A. Facts determining the work undertaken

1. To appreciate economic importance of diseases of State
2. To furnish research worker with information from field

B. Procedure - Field surveys

1. Cereal diseases
   a. Percentage counts in the field
2. Field crops
   a. Estimate of losses

VIII Subproject - Cucumber mosaic control

A. Facts determining the work undertaken

1. Mosaic - a serious disease of cucumbers in certain sections.

B. Procedure - Eradication of weed hosts carrying the disease

1. Three or four demonstrations
   a. Roguing in and around fields during season.

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 five years according to the following general method 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 brought up to date in Extension Bulletin No. 101, entitled, "The Control of Corn Rot Diseases by Germinator Selection." Methods are fully described in this bulletin (See Annual Report for 1927). The improved rag-doll method is described further and at length on page 2 of the Annual Report of this Department for 1925. Reference is made to the 1925 report for this information. Illustrations of methods and results may be found following the discussion of this subproject in the 1924, 1925 and 1926 reports for this Department also

During the past five years, and especially the years 1926, 1927, 1928 and 1929, crop rotation and the selection of seed ears of corn in the field have been stressed. Specialists of the Agronomy and Plant Pathology Departments have given special personal instruction in field selection to those growers who have been practising germinator selection. Field selection has been considered equally as important a step in procuring good seed corn as germinator selection.

Correct methods of curing and storing have also been emphasized as additional important factors in the production of seed corn and in the control of diseases of the root rot type. Additional field

observations have been made and yield data taken during the 1929 season.

The work on this subproject really started with the utility corn class of the State Corn and Grain Show held in Leesburg, Loudoun County, during the latter part of January. Loudoun County is one of our best corn producing sections. A brief report of this work follows:

Results of Germination Tests of Corn Entered in Utility Class State Corn and Grain Show at Leesburg, Virginia, January 24 and 25, 1929.

System of Scoring

The system of scoring was the same as that employed in 1928, each ten-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 1928.

Results with White Corn

There were 28 entries, totalling 280 ears. The scores for the individual lots are shown in Table 1. The highest score was 39.5, the lowest 28.0, and the average for all 28 lots, 32.08. Of the 280 ears, ten were good or free from disease, 267 medium or slightly diseased, and 3 badly diseased. The percentages were 3.5 free from disease, 95.3 slightly diseased, and 1.2 badly diseased. The highest number of disease-free ears in any individual lot was two. The

average percentage germination was 98.44. There was a total of 22 dead kernels in 17 lots, seven lots having 1, five lots having 2 and five lots having 3 dead kernels, respectively.

Table 1. Germination record of individual lots of white corn at Logsburg, January 24 and 25. (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
1	32.0	0	10	0	15	32.0	0	10	0
2	33.5	1	9	0	16	30.5	0	10	0
3	32.0	0	10	0	17	32.5	0	10	0
4	33.5	1	9	0	18	32.0	0	10	0
5	32.5	2	8	0	19	32.5	0	10	0
6	32.0	0	10	0	20	32.0	0	10	0
7	32.0	0	10	0	21	32.5	0	10	0
8	30.5	0	10	0	22	33.5	1	9	0
9	31.5	0	9	1	23	32.0	0	10	0
10	32.5	0	10	0	24	32.0	0	9	1
11	33.5	1	9	0	25	33.0	1	9	0
12	31.5	1	8	1	26	33.0	0	10	0
13	32.5	0	10	0	27	32.5	0	10	0
14	32.0	1	9	0	28	33.0	1	9	0
					29	32.00	10	267	3
					Total	Average	Total	Total	Total

Results with Yellow Corn

There were 30 entries, totalling 300 ears. The scores for the individual lots are shown in Table II. The highest score was 36.5, the lowest 29.5, and the average for all 30 lots, 32.7. Of the 300 ears, 18 were good or free from disease, 274 medium or slightly diseased and 8 bad or badly diseased. The percentages were 6.0 free from disease, 91.1 slightly diseased, and 3.0 badly diseased. The highest number of disease-free ears in any individual lot was 3. The average percentage germination was 96.1. There was a total of 50 dead kernels in 16 lots, seven lots having 1, two lots having 2, three lots having 3, two lots having 6, one lot having 7, and one lot having 11 dead kernels.

respectively.

Table II. Germination record of individual lots of yellow corn at Loudsburg, January 24 and 25, 1929. (An ear in which all kernels were good was classed as good. An ear in which 5 kernels or less were diseased was classed as medium; an ear in which 6 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
1	34.0	1	9	0	16	32.0	0	9	1
2	34.0	2	8	0	17	32.0	1	9	0
3	33.5	0	10	0	18	32.5	1	9	0
4	29.5	3	5	2	19	32.0	0	9	1
5	32.0	2	7	1	20	32.5	0	10	0
6	34.0	1	10	0	21	36.0	1	9	0
7	31.5	0	10	0	22	32.0	0	10	0
8	30.0	0	10	0	23	32.0	0	10	0
9	32.5	2	7	1	24	33.5	0	10	0
10	32.0	0	10	0	25	35.0	0	10	0
11	32.0	0	10	0	26	34.0	0	10	0
12	33.0	0	10	0	27	34.0	1	9	0
13	33.5	0	10	0	28	34.0	1	9	0
14	31.5	0	10	0	29	36.5	1	9	0
15	31.5	0	10	0	30	30.5	1	8	2
					30	32.7	18	274	8
					Total	Average	Total	Total	Total

Table III. Comparison of Germination Tests of White and Yellow Corn

Color	Average Score	Percentage of Ears: Disease-free	Slightly diseased	Badly diseased
White	32.08	3.5	95.3	1.2
Yellow	32.70	6.0	91.1	3.0

Table IV. Comparison of Germination Tests of White and Yellow Corn for 1922, 1923, 1924, 1925, 1927, 1929

Color	Year	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	85.8	7.7
White	1926	Not recorded			
White	1927	30.39	7.24	87.2	5.51
White	1928	Not recorded			
White	1929	32.06	3.5	9525	3.0
Yellow	1922	15.2		Not recorded	
Yellow	1923	23.8	27.7	44.1	28.2
Yellow	1924	28.1*	7.9	87.9	4.2
Yellow	1925	32.8	16.6	78.8	4.4
Yellow	1926	Not recorded			
Yellow	1927	30.85	17.77	72.2	10.0
Yellow	1928	Not recorded			
Yellow	1929	32.7	6.0	91.1	3.0

*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, 1925, 1926, 1927, 1928 and 1929 was 40. The actual averages for 1925, both the white and yellow corn, are reduced by one-eight as in 1924.

Summary and Conclusions.

In 1925 there was a marked improvement in the quality of the corn entered in the Utility class over that entered the three years previous to this, (1922, 1923 and 1924). This improvement was due largely to the greater care exercised by the growers, exhibiting during these years, in the selection of healthy and vigorous ears of seed corn.

The corn exhibited in the Utility class in 1927 was not equal in quality to that exhibited in 1926. This is an important fact if we consider that the corn exhibited in this class has shown a gradual improvement each year to 4o 1927. In this year, 51 kernels

out of the 90 yellow ears exhibited failed to germinate, and 69 kernels out of the 290 white ears exhibited failed to germinate. In 1929 there were 50 kernels out of the 300 yellow ears exhibited which failed to germinate, and 35 kernels out of the 280 white ears exhibited which failed to germinate. Corn improvement work is a slow and gradual process and any let-up in an improvement program may offset much of the good already accomplished. Off-seasons, like 1927 and 1929, produced quantities of inferior corn in the State. Recommended practices for the production of seed corn will accomplish much good; in fact, it is very essential that they be followed each year if good seed corn is to be produced.

For at least three years Loudoun County has ranked as one of the best in the State, at least as to results accomplished in corn improvement work. Two corn growers of this county have reputations as good corn producers outside of the State. Germinators have been operated in every section of the county and at the Agricultural High School located at Lincoln a community germinator is run for the growers of the section during January, February, and March. County Agent, Advisory Council, Agricultural high school teachers and the grower all cooperate to make the slogan "Better seed corn" a reality. At least twenty growers in Loudoun county have been permanently benefited by this program during the last four years. An improvement in the quality of corn has been noted each year over the previous year for the past four years in the county as a whole.

Again at Manassas, Prince William County, the work was continued. The community germinator at the agricultural high school was operated in addition to another run at the county agent's office. The best growers of the county still avail themselves of the opportunity to engage in this project.

This project was also continued in the following counties jointly with the Botany Department: Appomattox, Augusta, Fauquier, Botetourt, Henrico, Mecklenburg, Pittsylvania, Rockbridge, Orange and Shenandoah. Club boys continue to play an important role in the advancement of this project.

One additional county (Washington) not reported in last year's report initiated work on this project last year under the supervision of County Agent S. B. Penn. A brief report of this work

follows, which follows out our scheme when the work is started for a county.

System of Scoring and Judging

Each ear was tested for germination and the presence of diseases. Three classes were made as follows: Good, Medium and Bad. An ear in which all kernels were good or having bright, shining embryos was classed as good. An ear in which 3 kernels or less were diseased or showed lack of germination was classed as medium. An ear in which three or more kernels proved to be diseased or showed lack of germination was graded as bad. The kernels in most cases were split open with a knife in order to examine the germs or embryos. The type of corn was Casey's pure bred, belonging to Mr. Bushman of Glade Springs, and the germination tests showed it to be a very good lot of corn. The readings were made nine days after the samples were placed in the germinator. This entire lot of corn was grown from seed which had been certified the year before. Three portions of the entire lot had been stove dried.

Tier No.	Row No.	Roll No.	Good Ears	Medium Ears.	Bad Ears.
4	-	1	8	10	5
3	-	1	5	13	3
3	3	2	7	14	4
3	3	3	5	10	5
3	3	1	3	10	3
3	2	4	4	7	1
3	2	5	0	7	3
3	2	4	4	10	3
2	3	1	3	9	3
2	3	2	4	16	0
2	3	3	7	13	2
2	3	4	10	12	3
2	2	1	6	8	0
2	2	2	7	16	1
2	2	3	5	17	0
2	2	1	3	14	3
2	2	2	3	6	3
2	2	3	4	12	4
2	1	1	7	15	2
1	1	3	3	9	4
1	1	4	0	6	12
1	1	1	2	8	2
1	1	2	3	11	0
1	1	3	4	12	3
1	1	4	1	11	3
1	1	1	2	7	3
1	1	2	3	10	2
1	1	3	4	12	1
1	1	4	1	8	14
1	1	1	2	5	6
1	1	2	3	10	7
1	1	3	4	11	1
			178	345	107

Summary of Corn Rot Disease Work

Number of ears of corn tested in Loudoun, Prince William, Appomattox, Augusta, Fauquier, Botetourt, Henrico, Mecklenburg, Pittsylvania, Mecklenburg, Bedford, Orange, Shenandoah and Washington Counties and at the Utility Corn Exhibit of the State Corn and Grain Show	45,000
Number of plantable ears	40,000
Number of non-plantable ears	5,000
Percentage of plantable ears	88.8
Percentage of non-plantable ears	11.2
Number of farmers for whom seed was tested and diseased ears culled out	250
Number of counties in which field inspections were made and in which farmers were instructed in field selection	7
Number of press articles written	15
Number of talks given	10

Photograph No. 1 - Field of ensilage corn, Orange County, grown from field and germinator selected seed. An excellent stand. County Agent T. F. Curtis and his car at left. Picture taken from the roof of a nearby outhouse.

A type press article pertaining to seed treatment work in the control of certain diseases of corn.

Treating Seed Corn for the Control of Fungous Diseases

Several dust compounds now on the market have given promising results in the control of root, stalk, and ear-rot diseases of corn. After following such recommended practices as field selection, proper curing and storing and germinator testing, the grower can at best only separate his corn into some such classes as the following:

1. Nearly disease-free seed
2. Seed that germinates well, but carries some infection from diseases
3. Badly diseased seed

The grower will find it advantageous to treat seed falling into the first two classes. The dust treatments offer many advantages to the corn grower, as compared to the liquid treatments, because they are much more easily applied and there is less danger of injury to the seed before it is planted with the liquid treatments, care must be taken to dry the seed properly before planting. Dust fungicides probably offer more protection to the seed from molds in the soil than the liquid treatments.

Three companies offer seed corn dust fungicides for sale on the market. The active ingredient in all of these is mercury, ranging from 3 to 7 per cent, mixed with some inert filler. In each case, only 2 ounces are required per bushel, which makes the cost per acre for seed treatment material about 3 cents. The labor cost involved in treating is also low, especially when we realize that the treat-

ing can be done any time during the slack season of the year. The satisfactory products on the market are:

Bayer Dust - Bayer Company, Inc., New York

Merko - Pittsburgh Plate Glass Company, Corona Chem. Div., Milwaukee, Wisconsin

Semesan Jr. - E. I. DuPont de Nemours Company, Wilmington, Delaware.

It must be remembered that corn seed treatments cannot be expected to take the place of good seed selection, proper storage and constructive breeding. Neither can they take the place of an accurately conducted germination test in selecting corn of good vigor. Seed treatments will not always be followed by an increase in yield, nor will they bring dead seed to life or take the place of proper soil management. The greatest actual increases in yield following seed treatments usually have occurred on the more productive soils, with the better strains of corn and on the earlier planted crops.

These dust disinfectants are poisonous, and a mask should be worn over the nose and mouth while making the treatments, or work in the open, keeping on the windward side of the machine. Treated seed should not be fed livestock or milled for feed of any kind.

Subproject No.2 - The control of blackfire, wildfire and mosaic diseases of tobacco consisted of practices followed in 1925, 1926 and 1927. More stress was laid on the control of the mosaic disease in 1929 than in previous years. Intensive work in our chief tobacco growing counties on the control of these major diseases has greatly improved the tobacco situation. Blackfire, wildfire and mosaic diseased were found present to a considerable extent, however, in some of our chief tobacco producing counties. Complete information on methods of seed treatment and subsequent care of plants in the plant bed may be found on page 38 of the 1925 report for this Department. These recommendations have been supplemented in 1929 by other recommendations as briefly stated in the outline plan of work found at the beginning of this report. In the main the plan adopted at the beginning of the year has been adhered to.

One hundred and fifty-three plant beds, totalling 22,650 square yards were inspected for the presence of disease in the following counties: Mecklenburg, Halifax, Charlotte, Prince Edward, Buckingham, Bedford, Dinwiddie, Amelia, Appomattox, Campbell, Pittsylvania, Washington and Amherst. Blackfire or angular leaf spot was found in the following counties: Mecklenburg, a trace in two beds; Prince Edward, considerable in one bed; Appomattox, a slight amount in one bed; Pittsylvania, considerable in six beds; Washington, considerable in seven beds; Bedford, considerable in three beds. We also found this disease present in the field in Prince Edward and Brunswick counties in slight amounts. One case of wildfire was found in Pittsylvania county, about 25% of the plants in the bed being infected. The mosaic disease was observed in all counties visited. As in past

years it was found in 1929 that in all cases where blackfire and wildfire diseases were observed, no seed treatment had been practiced. In addition to this other, practices regarding proper seed bed management had not been carried out.

One outstanding case of a grower religiously carrying out recommended practices for seed bed management in Bedford county has resulted in the elimination of Blackfire from this grower's tobacco crop. This condition has continued in spite of the fact that there have been epidemics of this disease in Bedford county from time to time in the past. (See illustration at end of this subproject. Special intensive work on disease control through seed treatment and proper seed bed management was carried on with twenty-five growers of Amelia county. Personal service work has been rendered in the control of such minor diseases of tobacco as wilt, root rot and ring spot in Charlotte, Prince Edward and Brunswick counties. (See illustrations at end of subproject). An illustrated lecture on tobacco diseases has been prepared and given in connection with the work county agents' meetings of the growers in the following counties: Campbell, Pittsylvania, Bedford and Washington. Two hundred and ten lots of seed varying from an ounce to one pound in size have been treated for the growers. Ten of these lots were treated at the college and two hundred at the State Department of Agriculture.

Members of the Plant Pathology Department have for a long time felt the need of standardization of recommendations for the control of tobacco diseases. We believed that this was necessary to make the field pathologist's work more effective. With this idea in mind a conference on tobacco diseases was recently held at the Harrington

hotel, Washington. Forty representatives from fourteen States, the U. S. D. A. and one foreign country attended. Each State prepared a list of questions and submitted them for discussion at the conference. The list of questions submitted from Virginia follows:

Questions on Tobacco Diseases of Virginia for the Tobacco Conference to be Held in Washington, D. C., December 10,11,12, 1928

The Virginia tobacco diseases of major economic importance are angular leaf spot (blackfire), drought spot, mosaic, ring spot and frenching. Those of minor economic importance are wildfire, black root rot, bacterial wilt, frog-eye leaf spot, sorehin and brown root rot.

Considerable doubt has been expressed from time to time regarding the actual value of certain recommended methods in the control of such diseases as wildfire and angular leaf spot (blackfire) of tobacco. Varied results have been reported from the use of seed disinfectants and also from plant bed and field sanitation. This, no doubt, has been due to the fact that wildfire and angular leaf spot, which are bacterial diseases, are often confused with the physiological or nutritional leaf spots. So long as this condition exists, the results reported by different workers are bound to be at variance. A positive diagnosis of the disease being studied,is, therefore, very important.

In Virginia angular leaf spot and blackfire are used synonymously to designate the bacterial leaf spot caused by Bacterium angulatum. In Kentucky angular leaf spot is used to designate the

bacterial leaf spot and blackfire to designate a physiological leaf spot. This will naturally lead to confusion. It is important, therefore, that a definite terminology be adopted.

Wildfire in Virginia is apparently of minor importance. How important is this disease in other States? In 1928 wildfire was found in only one field in Virginia, and in 1929 wildfire infection was found in only one plant bed and this was on the same farm from which infection was reported in 1928. On the other hand, angular leaf spot has been very general every year and caused heavy losses in 1928, and was found universally in plant beds in 1929. We would like to know what results others have obtained through the use of seed disinfectants, new canvas and frames on plant bed, sprays and dusts on plant beds, and plant bed and crop rotations in the control of these diseases.

Mosaic is prevalent in all sections of the State. Infection often runs as high as 75% in certain fields. As a rule, however, the infection shows up late in the season and the grower does not realize that it is causing any loss. To what extent does mosaic infection effect the yield and quality of tobacco? What are the most satisfactory control measures for mosaic?

Frenching is very common in Virginia during certain seasons. This disease often shows up in fields where it cannot be accounted for on the basis of any of the theories now advanced as to its cause. Are there any satisfactory methods of prevention? What effect does this disease have on the curing of the crop?

Ring spot is very general in occurrence in Virginia and with its wide host range promises to become of great economic importance. To what extent does this disease occur in other States? What is the source of infection?

The physiological leaf spots are apparently very common in Virginia. What we designate as drought-spot falls in this class. We are at sea regarding the diagnosis, cause, and control of this group of leaf spots. We would like to know the experiences of workers in other States in connection with this group of diseases.

What are the most satisfactory methods of controlling black root rot (Thielavia)?

What is the cause of brown root-rot of tobacco? What is the most satisfactory means of control?

We should like to recommend that this tobacco conference be made an annual affair. We feel that it can be made the clearing house for both research and extension work.

The object or purpose of the convention is set forth in the following letter of Dr. Garner, Principal Physiologist in Charge of Plant Nutrition work for the U. S. D. A.

UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Plant Industry

WASHINGTON

Tobacco and
Plant Nutrition

November 8, 1929.

Mr. James Godkin,
Virginia Polytechnic Institute,
Blacksburg, Virginia

Dear Mr. Godkin:

As a result of correspondence between the Directors of Research and Extension Work of the Department of Agriculture and the Experiment Station and Extension Directors of 15 of the principal tobacco growing States it has been agreed that a conference on tobacco diseases and nutritional problems will be held in Washington at the Harrington Hotel, December 10, 11, and 12, 1929. We are pleased to hear that you plan to attend and take part in this.

The objects as developed in the preliminary correspondence are in general as follows:

1. To review the known facts with regard to tobacco diseases including nutritional troubles in the light of present investigations.
2. To outline the needs for further research.
3. To develop uniform extension programs based on the above discussions for the several tobacco diseases and areas in which they occur.
4. To consider extension methods which may be advantageously used in conducting tobacco improvement projects.

The topics which have been emphasized by our correspondents as being especially worthy of consideration, are, for the most part, covered in the following outline:

I. The situation
   A. Relation of disease to production and quality
   B. Distribution of tobacco diseases
   C. The nutritional problems

II. Seed bed sanitation
   A. Seed treatment and after treatment
   B. Location of seed beds
   C. Sterilization of soil, covers, and frames
   D. Spraying and dusting seed beds
   E. Weeding and handling of plants before and during transplanting.

III. Influence of fertilizers and green manures
A. The deficiency troubles
B. Injurious effects of certain elements
C. Form and quality of nitrogen

IV. Field sanitation and care of plants in the field
A. Summary of principles of control for
1. mosaic
2. the leaf spot diseases
3. the root rots
B. Relation of cropping systems to disease
C. Spread of disease by cultivation and topping
D. Roguing in the field

V. Selection and breeding strains of tobacco

VI. Disease in curing and storage and in manufacturing plants

Following discussion along the lines indicated above, which will probably require one-and-a-half to two days, consideration will be given in groups to plans for future research and extension work.

Word comes from Virginia that those expecting to attend are preparing a brief written statement concerning the scope, status and future needs of the tobacco disease and nutritional activities (research and extension) in their State. They suggest that a similar statement (not more than two pages) be prepared for each State by representatives attending and for the Department of Agriculture. Such statements would undoubtedly be helpful in clarifying and shaping procedure. These should be in our hands not later than December 1 in order that mimeographed copies may be available at the meeting.

The Harrington Hotel, corner 11th and E. St., N. W. will be headquarters for the group and all conferences will be held here. Arrangements have been made with the management for reduced rates. Reservations may be made by addressing the hotel direct, mentioning the tobacco conference.

The meeting will open 9:00 a.m. December 10.

Very truly yours,

(Signed) W. W. Garner

Principal Physiologist in Charge
Tobacco and Plant Nutrition.

8130

An organization committee was appointed preceding the conference. Much credit for the success of the conference is due to Mr. F. C. Meier, Extension Plant Pathologist of the U. S. D. A. and Mr. Garner, Physiologist also of the U. S. D. A. A list of the permanent committees appointed follows.

CONFERENCE ON TOBACCO DISEASES AND NUTRITIONAL PROBLEMS

Permanent Committees

I. Organization:
P. J. Anderson.
W. W. Garner
E. C. Hoss.
V. D. Valleau.
James Godkin

II. Nomenclature:
R. J. Haskell.
C. P. Clinton.
V. D. Valleau.

III. Seed Bed Management:
S. A. Wingard.
W. S. Beach.
S. C. Lehman.
R. A. Jehle.

IV. Field Management:
W. B. Hutcheson.
C. D. Sherbakoff.
J. P. Jones.
E. C. Westbrook.

V. Curing and Fermentation:
James Johnson.
Otto Olson.
J. E. Hutson.

VI. Physiological and Malnutritional Diseases:
J. H. Mulvey
C. M. Armstrong
D. M. Morgan

VII. Extension:
F. C. Meier
A. L. Pierstorff
G. W. Fant

The conference which was held from December 10 to December 12 was well worthwhile. The program and list of those in attendance follows:

CONFERENCE ON TOBACCO DISEASES AND NUTRITIONAL PROBLEMS
A Ball Room, Harrington Hotel, Washington, D. C.
December 10 - 12, 1929.

Tuesday, December 10, 9:00 a.m. - Roll Call - Registration - Distribution of Advance Statements.

Introductory Remarks - A.F. Woods, Director of Research Work, U. S. Department of Agriculture.

Discussion will in general follow the outline given below:

Tuesday, Dec. 10, 9:30 a.m. I. The Situation
- A. Relation of disease to production and quality.
- B. Distribution of Tobacco diseases.
- C. The nutritional problems.

10:30 a.m. II. Seed Bed Sanitation
- A. Seed treatment and after treatment.
- B. Location of seed beds.
- C. Sterilization of soil, covers, and frames.
- D. Spraying and dusting seed beds.
- E. Weeding and handling of plants before and during transplanting.

1:00 p.m. Adjourn for Lunch.

2:00 p.m. III. Influence of Fertilizers and Green Manures
- A. The deficiency troubles.
- B. Injurious effects of certain elements.
- C. Form and quality of nitrogen.

Wednesday, Dec. 11, 9:00 a.m. IV. Field Sanitation and Care of Plants in the Field
- A. Summary of principles of control for
  1. mosaic
  2. the leaf spot diseases
  3. the root rots.
- B. Relation of cropping systems to diseases
- C. Spread of disease by cultivation and topping.
- D. Roguing in the field.

11:00 a.m. V. Selection and Breeding
12:00 VI. Diseases in curing and storage and in manufacturing plants.
2:00 p.m. Group Meetings.

Thursday, Dec. 12, 9:30 a.m. Group Meetings.

1:00 p.m. Conference will meet in a body for discussion of reports from group meetings.

ATTENTION: Tobacco Conference Dinner - Tuesday December 11, 6:00 p.m. Harrington Hotel.

In Attendance Tobacco Conference

Name	Title	Where From
W. W. Garner	Principal Physiologist	U. S. D. A.
F. C. Meier	Ext. Plant Pathologist	U. S. D. A.
J. P. Jones	Asso. Prof. Agronomy	Amherst, Mass., M.A.C.
Henry K. Stooge,	Agronomist	Office of Experiment Stations, U.S.D.A.
W. B. Peagy	Tobacco Specialist	University of Maryland
J. B. S. Norton	Plant Pathologist	University of Maryland
C. V. Knightlinger	Agent B.P.I. Tobacco and Plant Nutrition	Amherst, Mass.
C. W. Bacon	Physiologist, B.P.I.	Tobacco and Plant Nutrition
U. Ojima	Agricultural Chemist of	Government of Monopoly Bureau of Japan
W. M. Lunn	Associate Agronomist	U. S. Department of Agr.
J. H. Garr	Agent, Office of tobacco	Investigations, U.S.D.A., Georgia Coastal Plains Exp. Station, Tifton, Ga.
S.A. Wingard,	Plant Pathologist	Va. Agr. Exp. Station Blacksburg, Virginia
James Godkin	Plant Pathologist	Extension Division, Blacksburg, Virginia
D. E. Brown	Principal Scientific Aid	U.S. Dept. of Agriculture
Hideo Tsukada	Bureau of Monopolies Tobacco Expert	Japanese Government
J. E. McMurtrey,	Jr. Assoc. Physiologist,	U. S. Department of Agr.
W. S. Beach	Assoc. Plant Pathologist	Pennsylvania State College.
P. S. Rusher	Agricultural Extension	Lancaster, Pennsylvania
Otto Olson	Assoc. Agronomist, U.S.D.A.	Pennsylvania
R. A. Jehle	Specialist in Pathology	University of Maryland
Nicholas Schmitz	Extension Agronomist,	State College Pennsylvania
T. B. Hutcheson	Agronomist, Va. Experiment	Sta., Blacksburg, Virginia
T. C. McIlvaine	Agronomist, West Virginia	Expt. Sta. Morgantown, W. Va.
J.E. Butson	Agr. Economist	U. S. Dept. of Agriculture
A. L. Pierstorff	Extension Pathologist	Ohio State University
W. D. Valleau	Extension Pathologist	Kentucky Experiment Sta.
T. L. Copley	Tobacco Station	Chatham, Virginia

R. P. Thomas	Soil Technologist	College Park, Maryland
D. E. Haley	Prof. of Soil and Phyto-Chemistry	Penn. State College
E. F. Morgan	Chief Agronomist,	Conn. Agr. Exp. Sta. New Haven, Conn.
James Johnson	Univ. of Wisconsin and U.S.D.A.	Madison, Wis.
W. B. Ogden	Instructor of Horticulture	University of Wisconsin Madison, Wisconsin
R. E. Currin, Jr.	N. C. Dept. of Agr.	Rocky Mount, N. C.
R. E. Currin	Pee Dee Station Supt.	Florence, S. C.
C. H. Armstrong	Botanist and Pathologist	Clemson College, S. C.
S. G. Lehman	Plant Pathologist	Raleigh, N. C.
C. D. Sherbakoff	Plant Pathologist	Knoxville, Tenn.
O. W. Mann	Exp. Plant Pathologist	Raleigh, N. C.
L. C. Moss	Agronomist	Oxford, N. C.
J.F. Buttock	Assoc. Tobacco Spec.	Oxford, N.C.
J. M. Purdom	Asst. Agr. Agt. A&L RR	Co., Jacksonville, Fla.
E.C. Westbrook	Tob. Spec. State Col.	Athens, Ga.
W. F. Pate	Nat'l. Fertilizer Assoc.	Raleigh, N. C.
George L. Mundel	Asst. Prof. Plant Path.	Pennsylvania State Col.
E. M. Floyd	Tob. Ext. Spec.	State Coll. Raleigh, N. C.
J.E. Owens	Extension Agronomist	Storrs, Connecticut
C. O. Jensen	Asst. in Phyto-Chemistry	State College, Pa.
E. S. Haskell	Grop. Plant Res. Foundation	Washington, D.C.
W. B. White	U. S. Department of Agr.	Washington, D. C.
E.W. Barre	Director, South Carolina Experiment Station	Clemson College, S. C.

Summary of Tobacco Disease Subproject

Two hundred and ten lots of seed varying in size from an ounce to a pound were treated at the College and the State Department of Agriculture, Richmond. One hundred and fifty-three plant beds, totalling 22,650 square yards were inspected for the presence of disease in thirteen tobacco producing counties.

Special intensive work on seed treatment and seed-bed management was done in cooperation with twenty-five growers of Amelia County, the County Agent and Extension Plant Pathologist.

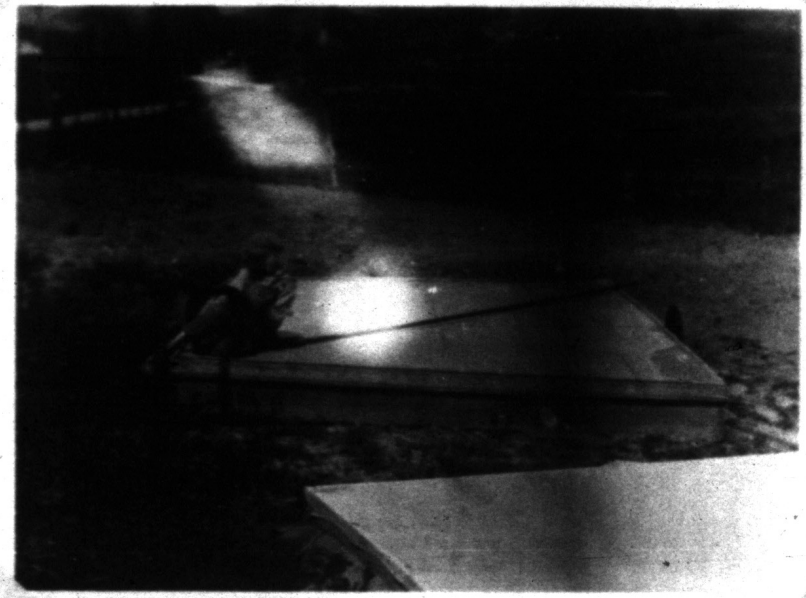
Thirty press articles were prepared and an illustrated lecture shown in four tobacco growing counties. An excellent conference initiated by the Maryland and Virginia Plant Pathology Departments was held in Washington and attended by forty representatives from fourteen States, the U. S. D. A. and one foreign country.

Intensive work on the tobacco disease situation has greatly improved the quality of the Virginia tobacco crop during the last two years more especially.

Photograph No.2 Tobacco plant bed in Bedford County. Seed treated by County Agent E.S. Hylton. Proper methods of seed bed management practised. No diseases present.

Photograph No. 3 - Tobacco plant bed in Washington County. Soil treated by steam and seed for disease control. No diseases present.

Liberty Onion Co.



Photograph No. 4 - Pan and steam connection used for sterilization of tobacco plant beds, Washington County.

Photograph No. 8 - Tobacco field infected with Granville wilt. Brunswick County. County Agent E. H. Matthews at left. Growers at right.

Photograph No. 6 - Group of Plant Pathologists, Agronomists and others attending tobacco disease conference held in Bahrighat, December 10-12, 1959.

Subproject No. 3 - Cereal smut control in 1929 consisted of a similar program to that followed in 1927 and 1928. The control of smuts of wheat, oats and barley was emphasized more especially. For detailed descriptions and explanations of the various methods advocated by this Department see pages 16-32 of the 1926 report for the department. Special efforts of the department were again put forth in 1929 as in the previous three years to help small grain growers of the State in preventing cereal smuts. County Agents, Millers, Agricultural high school instructors, local farm bureaus and Agricultural Advisory boards were urged to cooperate in this work. For the past three years efforts of these individuals and organizations have resulted in practically eliminating epidemics of smuts attacking these crops. Supplementary letters, letters of explanation together with recommended treatments were mailed out to Millers, County Agents and others interested in this work. More attention was given to newspaper work in cereal growing areas of the State. Questionnaires were sent out to all County Agents, Millers and Agricultural high school instructors after harvesting to ascertain losses from smuts, and the amounts of materials used for prevention work in the cereal crops.

Special attention was given to the use of other chemical dusts advocated for the control of cereal smuts. Materials were furnished as follows:

Sixty pounds of ceresan for use in Botetourt County.

Sixty pounds of ceresan for use at the Virginia Seed Service, Richmond.

Ten pounds ceresan for use in Campbell County.

Ten pounds ceresan for use in Loudoun County.

Ten pounds ceresan for use in Charlotte County.

The above materials were furnished by the Bayer-Semesan Company and have been used on the barley and wheat crops planted this fall. Semtox furnished by the Cresselli Chemical Company of Cleveland, Ohio, has given excellent control on oats planted in Albemarle and Loudoun counties.

Some of our sodsmen are carrying on excellent work in the treatment of small grains for smut prevention. For example 15,000 bushels of wheat, oats and barley have been treated this fall by T. W. Woods and Sons of Richmond. A small charge was made per each bushel of grain treated. (See illustrations at end of sub-project). We have estimated the value of this work at $150,000 to those growers having seed treated and the communities affected.

The following is a type circular calling attention to cereal smut prevention.

Blacksburg, Virginia

July 22, 1929

Dear Sir:

We would like to call your attention to the fact that the campaign for the control of stinking smut in wheat should be carried on as vigorously this fall as in previous years (1926, 1927, and 1928). You will note in the enclosed table, (showing the percentage of smutty wheat received at some important markets) that the per cent of smutty cars received on the Baltimore and Philadelphia markets has been on the increase.

We believe that more adequate measures for cleaning the grain before treatment should be stressed than heretofore. Thorough cleaning of the grain makes the treatment for smut control more effective. Copper carbonate still offers the best means of controlling stinking smut of wheat, but it will not effectively control the smuts of barley and oats. "Ceresan" and "Semtox", two dust compounds, will control the smuts of oats and the covered smut of barley. "Ceresan" is manufactured by the Bayer-Semesan Company, 105 Hudson Street, New York, N. Y., and "Semtox" by the Grasselli Chemical Company, Cleveland, Ohio.

For further information write the Department of Plant Pathology, V.P.I., Blacksburg, Virginia.

Thanking you for your cooperation in this matter in the past, I am

Very truly yours,

Director of Extension Division.

LOSSES DUE TO HEAT SHOCK ON KANSAS CITY MARKET JULY 1926 AND 1928

July	1926 Total Loss	1926 Total Cars	1926 Av. Loss Per Car	1928 Total Loss	1928 Total Cars	1928 Av. Loss Per Cars
1	$ 592.54	128	$ 4.63			
2	439.81	194	2.26	NONE	46	NONE
3	264.66	97	2.81	$ 61.88	115	$ .54
4						
5				160.55	176	.91
6	1938.19	454	4.26	222.33	216	1.05
7	956.11	240	3.98	146.12	152	.96
8	1255.54	193	6.51			
9	1541.67	237	6.50	1192.49	534	2.23
10	884.33	166	4.37	228.94	488	.46
11				806.65	879	2.09
12	3907.33	459	8.90	723.09	350	2.15
13	1676.05	313	5.99	725.26	270	2.94
14	2748.09	264	10.39	1215.11	331	3.67
15	2447.30	284	8.62			
16	3161.62	388	8.80	1801.84	635	2.36
17	1728.15	224	7.72	2218.19	359	6.18
18				1088.57	308	3.52
19	5932.29	784	8.06	1576.05	897	3.45
20	6795.02	436	15.58	1858.24	428	3.62
21	7749.45	495	15.66	1215.51	423	2.87
22	5456.39	422	13.57			
23	5167.72	427	12.66	3427.73	974	3.52
24	5020.62	491	11.85	2776.15	600	4.63
25				1822.86	453	4.02
26	11179.11	914	12.25	1054.95	383	2.75
27	7080.45	510	13.88	1078.48	515	2.09
28	5561.79	372	14.95	734.89	441	1.67
29	5282.42	468	11.51			
30	4631.64	340	13.62	1902.81	720	2.64
31	4864.00	368	11.91	900.38	597	1.51

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

PERCENTAGE OF SMUTTY WHEAT RECEIVED AT SOME IMPORTANT MARKETS*

(Crop year begins July 1, Ends June 30 1928 includes July thru September)

	1923	1924	1925	1926	1927	1928
	%	%	%	%	%	%
Astoria, Oregon	53	69	39-17	36-30	49-21	17-5
Baltimore, Maryland	1	2	2	8	8	33
Bozeman, Montana	12	20	17	34	43-8	47-6.3
Denver, Colorado	22	26	35	25	17	8
Detroit, Michigan	0.4	4	11	8	10	4
Duluth, Minnesota	9	8	17	15	14	13
Enid, Oklahoma	1	3	1	10	11	6.4
Ft. Worth, Texas	9	7	1	A	16	3
Galveston, Texas	5	8	1	7	11	11
Great Falls, Montana	15	21	12	17	20-4	32-17.3
Hutchinson, Kansas	3	6	4	22	9	6
Indianapolis, Ind.	4	7	2	6	21	4
Kansas City, Kansas	8	12	10	22	12	7
Kansas City, Mo.	15	17	14	A	18	14
Lawrenceburg, Ind.	7	30	30	45	19	
Los Angeles, Calif.	21	12	15	16	15	13
Minneapolis, Minn.	0.1	A	0.4	12	11	13
Ogden, Utah	14	22	30	33	34	32
Omaha, Nebraska	14	25	40	40	21	29
Philadelphia, Pa.	4	3	10	8	27	
Portland, Oregon	46	60	30	42	40-17	19-6
St. Louis, Mo.	3	4	2	7	11	5
Seattle, Wash.	35	41	24	25	38	17
Spokane, Wash.	15	18	16	A	20-7	22.3
Superior, Wisconsin	0.2	30	15	1	14	16.3
Tacoma, Wash.	42	58	30	35	31	14
Topeka, Kansas	9	5	A	A	11	19
Wichita, Kansas	0.2	1	1	1	3	3

*The percentage equals the precent of smutty cars of all the cars handled.

NOTE: Where two figures are given for per cents., the second shows the percentage of cars which graded over 1/2% smut.

(A) No records.
(B) Includes only July and August.

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

Wheat scab has been causing heavy losses to Virginia's wheat crop for the past two years and special stress has been given to its control during the fall months (September, October and November). The following circular explains in brief our recommendations on the control of wheat scab and oat smuts.

Blacksburg, Virginia
Sept. 5, 1929.

Dear Sir:

For several years past heavy losses have occurred to Virginia's cereal crops as a result of wheat scab, and the smuts of oats and barley. It is difficult to completely control wheat scab, nevertheless, if certain recommendations are carried out, the damage resulting from it can be greatly reduced.

The new dust treatments (Ceresan and Semtox) have given good results for several seasons in the control of smuts of oats and covered smut of barley.

We are enclosing the latest and best information now available for the control of the diseases here enumerated. We trust these recommendations will prove of value to you during the fall sowing.

Very truly yours,

Director of Extension Division.

HOW TO CONTROL WHEAT SCAB

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

Scab, sometimes called Fusarium blight, is a disease attacking wheat, barley, rye and oats. For several years past this disease has been causing heavy losses to Virginia's wheat crop. The disease attacks the wheat heads, and is also carried on the seed where it infects the young seedlings, resulting in thin stands. It also attacks corn, on which it does great damage as a rot-producing disease. The fungus causing the disease lives over winter in the diseased corn stalks and when wheat follows corn frequently an abundance of wheat scab results.

Two forms of the disease are usually evident; namely, seedling blight and head blight. Seedling blight appears when scabbed kernels are used as seed or when poor seed is used on infested soil. The head blight appears after flowering when a pink or salmon color occurs as a result of the fungus in parts of the blighted head between the glumes and at the base of the spikelets. The parasite attacks the seedling during germination and a poor stand results which the grower often attributes to poor seed, unfavorable weather conditions, or other causes.

Wheat scab is difficult to control completely, but the losses caused by it can be greatly reduced. The use of well-prepared clean land, and high-grade cleaned and treated seed will reduce considerably the losses from this disease. The old stalks of corn and straw of grains and grasses in the field and adjoining areas should be removed or carefully plowed under. This is essential because the wheat scab parasite lives over winter on such material and attacks the wheat crop that follows. If it is necessary to use wheat with scabbed kernels

in it, the grain should be cleaned thoroughly with a fanning mill in order to blow out all of the scabbed kernels and shriveled grain. It also is advisable to treat the seed with copper carbonate which will kill any spores or germs of the disease on the outside of the seeds.

HOW TO CONTROL OAT SMUTS AND COVERED SMUT OF BARLEY

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

Ceresan, a new dust treatment, has given good results in the control of loose and covered smuts of oats and the covered smut of barley. Loose smut in certain varieties of six-row winter barley may also be controlled by this material. The use of chemical dusts in the control of cereal smuts is rapidly replacing the old bluestone and formaldehyde treatments, being more popular because there is no soaking or wetting of the grain and no injury to germination.

Directions for the use of Ceresan. Apply the Ceresan only as a dust, using three ounces of the material (three heaping tablespoonfuls) to each bushel of grain. Fill an old milk can, open-headed steel drum, barrel-type butter churn or home-made or commercial rotary mixer not more than half full of seed and add the required amount of Ceresan. Close the container or mixer tightly and shake or rotate it slowly for from three to five minutes, or until the seed is thoroughly coated. Remove the treated seed which is then ready for prompt planting.

Ceresan may be obtained locally or from The E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware.

Smuttox, another chemical dust is effective in the control of oat smuts and may also be obtained locally or from The Grasselli Chemical Company, Cleveland, Ohio. The method of application of Smuttox is similar to that of Ceresan.

Caution. These dusts are poisonous if taken internally. If the dusts are inhaled in quantity they may cause irritation. A wet handkerchief placed over the nose and mouth during the treatment will prevent this. If large quantities of grain are to be treated, it is advisable to use a single type of dust mask. Several types of these masks may be procured on the market.

Copper carbonate is still the most effective material to use in the control of stinking smut of wheat, but it will not effectively control the smuts of oats or barley.

Average of County Agents, Millers and Agricultural High School Instructors reports on the stinking smut situation as reported by them in Virginia for the 1929 Season.

County	County Agent	Loss in dollars	Pounds of copper carbonate distributed or used.
Goochland	W.R. Gordon	3,210	300
Prince William	P.B. Cox	3,357	189
Loudoun	J.R. Lintner	62,250	300
Buckingham	J. C. Hamner	15,000	500
Nottoway	R. B. Oliver, Jr.	2,800	300
Henrico	L. M. Walker, Jr.	8,125	
Shenandoah	C. C. Dickinson	40,000	4,200
Orange	T. T. Curtis	14,460	200
Grayson	D. T. Painter	1, 877	
Pittsylvania	J. R. Stone	27,000	2,140
Craig	W. O. Martin	1,575	
Mecklenburg	H. H. Williams	7,425	75
Essex	D. H. Crosby	4,000	250
Washington	S. B. Shanks	14,000	
Albemarle	T. O. Scott	9,750	
Pulaski	E. C. Grigsby	5,900	20
Spottsylvania	W. M. Linthicum	20,000	
Amelia	C. W. Richards	5,530	
Culpeper	J. C. Miller	19,800	300
Amherst	C. R. Ross	9,150	50
Botetourt	J. S. Wills	3,035	
Lunenburg	E. C. Stokes	485	300
Appomattox	R. R. Hudgins	5,945	160
Giles	T. E. Starnes	300	50
Dinwiddie	B. F. Bedwell	2,330	15
Bath	J. L. Montague	715	20
Sussex	J. B. Cole	95	4
Lancaster	C. C. Chase	472	100
	Total loss -	279,976	Total lbs. Copper Carbonate 9,872

The preceding estimates on losses have been based on figures obtained from Virginia Farm Statistics for 1928 - Bulletin No. 6. Seedsmen of the State used approximately 2,500 additional pounds of copper carbonate in seed treatment work.

Additional losses resulting from smuts for 1929 were approximately as follows - Barley smuts $61,000, and oat smuts $125,000.

In further figuring losses the price per bushel of wheat, oats and barley was taken on quoted market prices for December 16, 1939. There has been less criticism of copper carbonate this year than in previous years. This is true also of other dusts.

A supplementary field survey of forty-one wheat fields totalling 560 acres was made in the following counties: Loudoun, Dinwiddie, Amelia, Charlotte, Prince Edward, Appomattox, Campbell, Pittsylvania, Rockbridge, Prince William, Rappahannock, Shenandoah and Wythe. Percentages from a trace up to ten per cent of stinking smut were found in these fields. There was a trace of loose smut in all fields and in a few instances this disease ran as high as three per cent. There was an average of ten per cent scab in all fields examined. The average of stinking smut would be about 1.5 and the loose smut about the same for the fields examined. Five barley fields, examined in Rockbridge County and totalling seventy acres showed an average of 15 per cent covered smut and 2 per cent loose smut. One two acre field examined in Charlotte County showed 35 per cent covered smut and 4 per cent loose smut.

Four H Club projects played an important role in the success of this subproject, many of the boys carrying on projects with wheat included the disease control feature in their projects. This was especially true in the Valley and in Southwest Virginia.

Newspapers cooperated with us splendidly. This was also true of the State's leading seedsmen. (See illustrations at end of subproject.)

Photograph No. 7-- Showing barley field of Mecklenburg County with County Agent H. H. Williams at left and grower at right. Seed from this field was treated in the fall of 1929 with Ceresan for smut prevention. After treatment the seed was sold to reliable growers in the County. Certified barley is the aim here.

The following are a few of the type press articles treating of this subject.

Richmond Times-Dispatch

Treating Plant to Save Seeds—The treating plant for pre-planting preservation of seeds installed in the Wood Warehouse. Two motor driven barrels mix the grain and dust. The masked worker is shown at the right. Masks are necessary for the dust is poisonous.

Treatment Of Crops For Control Of "Smuts" Is Aid To Farmers

Preplanting Devise, as Practiced at Richmond Division, Helps Many Seed-Born Diseases, V. P. I. Pathologist Shows

An outstanding service for Virginia farmers, according to James Godkin, plant pathologist at V. P. I., recently interviewed at the T. W. Wood warehouse, is the treatment of wheat, oats, barley and rye for the control of "smuts," a cereal pest that yearly injures the crops of Virginia planters.

Preplanting treatment, as practiced at the Richmond plant, helps to control many seed-borne diseases. Commenting on the work of the Virginia Crop Improvement Association, Mr. Godkin said: "This association, which is one of the projects of the Virginia Polytechnic Institute agricultural extension service, includes in its program the improvement and certification of crops such as peanuts, potatoes, cotton, wheat, rye, oats, barley, corn and soybeans." He also said that certified seed are seed which are guaranteed to be pure; that is, free from mixtures, adapted to Virginia conditions, high yielding and containing less than 1 per cent of seed-borne diseases, controllable by recommended practices, and by the way, certified seed are yielding from five to nine bushels more per acre than the ordinary run of seed.

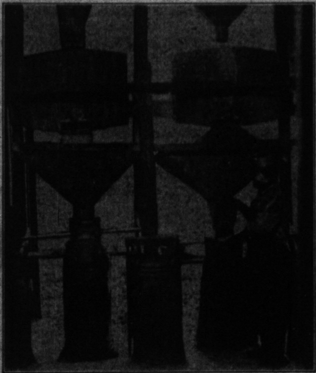
"One of the most important factors in the production of good seed is the control of seed-borne diseases," said Mr. Godkin. "The smuts of wheat, oats, barley and rye for the past five years in Virginia have caused annual losses of at least two million dollars. This loss is an absolute waste, which can be eliminated by simple, cheap and efficient dust treatments of the seed before planting with the following chemical formulas: Copper carbonate for wheat smuts, and formeen for the smuts of barley, oats and rye. All of our State agricultural experiment stations have found these treatments to be efficient and reliable.

"About four years ago our State Agricultural College appealed to the seedsmen of the State to treat seed for our farmers, and, as a result, T. W. Wood & Sons, of Richmond, started this pioneer work for Virginia and the entire South. During the first year of operation they treated 5,000 bushels of wheat for farmers about the State. During the present season this firm enlarged their treating plant, and as a result will treat at least 15,000 bushels of wheat, oats, barley and rye for Virginia farmers."

"Through this excellent piece of co-operative work with our State Agricultural College a saving of at least $150,000 has been realized by those farmers who used seed grain treated at this plant. Agricultural leaders at Washington and in other States who are in a position to know have pronounced this an excellent piece of agricultural extension serving work. The demand for treated seed is growing and as this demand increases the plant at the Wood warehouse will be enlarged and this firm will undoubtedly always be in a position to offer small grains properly and thoroughly treated for smut prevention."

THE ROANOKE TIMES, ROANOKE, VIRGINIA: SUNDAY MORNING, OCTOBER 13, 1929.

Treating Seed To Prevent Smut



Cereal Smuts Cause Tremendous Damage To Virginia Grain Crops

(Prepared by V. P. I. Extension Dept.)

Cereal Smuts and the Evolution of the Dust Treatment in Their Prevention.

Probably no more interesting story or study can be found in the plant kingdom than that of the cereal smuts. Their history dates back to the ancients, and many of the plagues, pestilences and blights mentioned in the Bible as attacking the grain crops were no doubt due to these parasitic fungi now known as the "Smuts." The black sooty masses produced by them are well known to the grower who produces wheat, oats, barley, rye, millet, sorghum, corn and a vast host of other field and garden crops. Take for instance smut in onion which is as well known as the onion itself and is as well known to the producer of onions in the New England, the middle-western and the far western states as any form of plant parasite we have. Onion smut as well as the smuts occurring on other economic plants is known because of the black masses of germs or spores it produces on the onion and because of the great reductions in yield as a result. So it goes with all of the smuts attacking our economic crop plants.

900 Different Types.

We could go on to fill a large volume which would deal entirely of a description of smuts only. Suffice it to say that there are at least 900 common smuts in North America attacking different genera of plants and including a large number of weed as well as the cultivated plants. No two of these smuts are alike. For example, the corn smut is different from the smuts attacking wheat i. e. the corn smut organism will not attack wheat, nor will the wheat smut organism attack corn. It is unfortunate for the grower that there is such a variation among this type of parasites, since a large number of control measures must be used in their control.

The damage resulting from smuts is at once appalling. For example during the past five years smuts of wheat, oats and barley have caused losses of at least ten million dollars to these crops in Virginia. To the country as a whole the annual loss resulting from cereal smuts is conservatively placed at one hundred million dollars. What a waste of wheat, oats, barley and rye. Wheat enough to make four million barrels of flour, oats enough to feed one million horses, and barley and rye enough to make four hundred thousand barrels of wheat flour substitutes. Add to this the fact that animals do not relish or grow fat on a smutty breakfast in the form of the grain crop and that humans are frequently made sick in harvesting a smutty crop of grain.

Cereal smuts are a waste since recent research on the part of agricultural experiment stations in this country has given to the grower dust treatments for the control of stinking smut of wheat, covered smut of barley, oat smuts and smut of rye. However, there is yet no seed treatment known to control corn smut. Today instead of using the old wet Bluestone and Formaldehyde methods we have such dusts as the following: Copper carbonate for the control of stinking smut of wheat, ceresan for the control of covered smut of barley and the oat smuts as well as smuttox which controls oat smuts also. Ceresan is a mercuric dust while smuttox is a formaldehyde dust. All of these dusts are cheap, easy to apply and efficient in the control of the smuts attacking the crops mentioned. Two ounces added to a bushel of grain and thoroughly mixed gets the smut. But some say that the weather causes smut, not so if we kill the germ or spore which must be present if we are to have smut. It is true, however, that wet weather aids in the development of smut when the organism or germ is present.

The evolution of the dust treatment work for the past few years has been both interesting and far reaching in its effect. "Necessity is indeed the mother of invention."

Richmond Times-Dispa

Cereal Smuts And Evolution Of Dust Treatment Expounded

By James Godkin,
Plant Pathologist V. P. I. Extension Division.

Probably no more interesting story or study can be found in the plant kingdom than that of the cereal smuts. Their history dates back to the ancients, and many of the plagues, pestilences and blights mentioned in the Bible as attacking the grain crops were no doubt due to these parasitic fungi now known as the "smuts." The black dusty masses produced by them are well known to the grower who produces wheat, corn, barley, rye, millet, sorghum, corn and a vast host of other field and grain crops. Take for instance "smut" in onion which is so well known as the onion lice to the producer of onions in the New England, the Middle-Western and far Western States as any form of plant parasite we have. "Onion smut" as well as the smuts occurring on other economic plants is known because of the black masses of germs or spores it produces on the onion and because of the great reductions in yield as a result. So it goes with all of the smuts attacking our economic crop plants.

We could go on to fill volumes dealing entirely of a description of the different kinds of "smuts" only. Suffice to say that there are at least seventeen "smuts" in North America attacking different genera of plants and including a large number of weed as well as the cultivated plants. But two of these "smuts" are alike. For example, the "corn smut" is different from the "smuts" attacking wheat, i. e., the "corn smut" organism will not attack wheat, nor will the "wheat smut" organism attack corn. It is perhaps unfortunate for the grower that there is such a variation among this type of parasites, since a large number of control measures must be used in their control, because of this

"The evolution of the dust treatment work for the past few years has been both interesting and far reaching in its effect. 'Necessity is indeed the mother of invention.'

Growers in Virginia may even buy treated seed. In this way frequently a grower cannot, or does not, wish to be bothered by treating his own seed, but he would be glad to pay the difference if he could get somebody else to do the treating for him and know that a good job was being done. A checking has shown that certified seed has been procured by using seed treated in this way. To date 10,000 bushels of grain have been treated in this manner, which is sufficient testimony to the popularity of this type of work.

As a closing suggestion to the readers of The Times-Dispatch we would like to say that there was too much "smut" in wheat, barley and oats, generally speaking, for Virginia in 1926. We have found fields of oats running as high as 40 per cent "smut" this year, and barley fields running as high as 60 per cent, as well as "smut" in wheat everywhere in the State. Seed treatment is the only insurance against a smutty crop. Don't take any chances; either treat all wheat, barley or oats to be planted before sowing or obtain seed which has been treated. The smut stockman insures his cattle and barns against lightning; the Western grower insures his grain against both hail and "smut" disease, and the tobacco grower of the Connecticut River Valley insures his tobacco against hail. Seed treatment is the cheapest insurance against "smut." Don't take any chances; one "smut" ball when broken up is sufficient to thoroughly infect one bushel of grain. We can realize this when we understand that one "smut" ball contains from six to seven hundred thousand spores of germs.

The average loss from "smuts" is at once appalling. For example, during the past five years "smuts" of wheat, oats and barley have caused losses of at least $10,000,000 to these crops in Virginia. To the country as a whole the annual loss resulting from cereal smuts is conservatively placed at $100,000,000. What a waste of wheat, oats, barley and rye! Wheat enough to make 4,500,000 barrels of flour, oats enough to feed 1,000,000 horses, and barley and rye enough to make 450,000 barrels of wheat flour substitutes. Add to this the fact that animals do not relish or grow fat on a smutty breakfast in the form mixed with the grain crop and that humans are frequently made sick in harvesting a smutty crop of grain.

To further illustrate, in 1922 the wheat crop produced in the United States would have filled a freight train consisting of a continuous string of cars extending end to end from New York City to San Francisco. The "smut" crop produced on wheat for this same year would have filled a freight train consisting of a continuous string of cars extending end to end from New York City to Cleveland. Cereal "smuts" are a waste because recent research on the part of agricultural experiment stations in this country has given to the grower dust treatments for the control of "stinking smut" of wheat, "covered smut" of barley, oat "smuts" and "smut" of rye. However, there is yet no seed treatment known to control corn "smut." Today instead of using the old wet bluestone and formaldehyde methods we have such dusts as the following: Copper carbonate for the control of stinking smut of wheat; ceresan for the control of covered smut of barley and the oat "smuts," as well as smutten, which controls oat "smuts" also. Ceresan is a mercuric dust, while smutten is a formaldehyde dust. All of these dusts are cheap,

How to Control Oat Smut, Covered Smut of Barley And Treat Wheat Scab

By the Plant Pathology Department, Extension Division, Virginia Polytechnic Institute, Blacksburg, Virginia

Ceresan, a new dust treatment, has given good results in the control of loose and covered smuts of oats and the covered smut of barley. Loose smut in certain varieties of six-row winter barley may also be controlled by this material. The use of chemical dusts in the control of cereal smuts is rapidly replacing the old bluestone and formaldehyde treatments, being more popular because there is no soaking or wetting of the grain and no injury to germination.

Amount and Directions for Using

Directions for the use of Ceresan. Apply the Ceresan only as a dust, using three ounces of the material (three heaping tablespoonfuls) to each bushel of grain. Fill an old milk can, open-headed steel drum, barrel-type butter churn or home-made or commercial rotary mixer not more than half full of seed and add the required amount of Ceresan. Close the container or mixer tightly and shake or rotate it slowly for from three to five minutes, or until the seed is thoroughly coated. Remove the treated seed which is then ready for prompt planting.

Ceresan may be obtained locally from druggists or seed dealers, or in quantities from The E. I. du Pont de Nemours & Company, Inc., Wilmington, Delaware.

Semtox, another chemical dust is effective in the control of oat smuts and may also be obtained locally or from The Grasselli Chemical Company, Cleveland, Ohio. The method of application of Smuttox is similar to that of Ceresan.

Precaution in Using

Caution. These dusts are poisonous if taken internally. If the dusts are inhaled in quantity they may cause irritation. A wet handkerchief placed over the nose and mouth during the treatment will prevent this. If large quantities of grain are to be treated, it is advisable to use a simple type of dust mask. Several types of these masks may be procured on the market.

Copper carbonate is still the most effective material to use in the control of stinking smut of wheat, but it will not effectively control the smuts of oats or barley.

How To Treat Wheat Scab

Scab, sometimes called Fusarium blight, is a disease attacking wheat, barley, rye and oats. For several years past this disease has been causing heavy losses to grain growers in Southeastern States. The disease attacks the wheat heads, and is also carried on the seed where it infects the young seedlings, resulting in thin stands. It also attacks corn, on which it does great damage as a rot-producing disease. The fungus causing the disease lives over winter in the diseased corn stalks and when wheat follows corn frequently an abundance of wheat scab results.

Two forms of the disease are usually evident, namely, seedling blight and head blight. Seedling blight appears when scabbed kernels are used as seed or when poor seed is used on infested soil. The head blight appears after flowering when a pink or salmon color occurs as a result of the fungus parts of the blighted head between

plumes and at the base of the spikelets. The parasite attacks the seedling during germination and a poor stand results. Poor seed bed preparation, unfavorable weather conditions, or other causes.

Damage Can Be Greatly Reduced

Wheat scab is difficult to control completely, but the losses caused by it may be greatly reduced by using well-prepared, clean land, and high grade cleaned and treated seed will reduce considerably the losses from this disease. The old stalks of corn and all grains and grasses in the field and adjoining areas should be removed or carefully plowed under. This is essential because the wheat scab parasite lives over winter on last crop that it attacked. Crop rotation should be followed. If it is necessary to sow wheat with scabbed kernels in it, the grain should be cleaned thoroughly with a fanning mill in order to blow out all of the scabbed kernels and shriveled grain. It also is advisable to treat the seed with copper carbonate which will kill any spores or germs of the disease on the outside of the seeds.

Summary of Cereal Smut and Scab Work

Four thousand supplementary letters and letters of explanation including circulars setting forth the treatment of the control of stinking smut of wheat, oat smuts, barley smuts and wheat scab were mailed to county agents, millers, teachers, cooperatives and seedsmen of the State during the 1929 season. Additional treatment cards and circulars were also put out on request. Newspaper articles were prepared for all of the newspapers of the State. Questionnaires were also sent to the above individuals and organizations ascertaining losses due to cereal smuts and the amounts of chemical dusts used in smut prevention work which was as follows:

Copper carbonate ----------12,000 pounds.

Ceresan .v----------- 500 pounds.

T. V. Wood & Sons, Seedsmen of Richmond treated 15,000 bushels of wheat, oats and barley for their constituents during the 1929 season. The Smith Seed and Feed Company of Danville treated another 500 bushels, mostly wheat during the fall season of 1929. Losses have been greatly reduced in 1929 as compared to the 1927 and 1928 seasons. A conservative estimate of saving to the growers of the State as a result of this work in 1929 would be right at one-half million dollars. The fact that there is little or no criticism to the use of dust treatments for the prevention of cereal smuts (stinking smut of wheat, covered smut of barley and oat smuts) shows how well the use of these materials has been sold to our small grain growers. Field surveys have enabled us to estimate losses and to better recommend control practices for twelve counties. Every

cereal producing county of the State was benefited by work accomplished thru this subproject. Chemical dusts are proving more popular in the control of oat smuts and covered smut of barley. Intensive work on the control of wheat scab was initiated during the 1929 season in cereal producing counties. We soon hope to have combination cleaning and treating machines operating in Orange, Henrico and Shenandoah counties. The advent of dust treatments has been largely responsible for the success of this work in recent years. We have no demonstrations in the control of loose smuts of wheat and barley for 1929 by the hot water method but otherwise this project has accomplished about as much as we could have hoped for.

Subproject No. 4 - Eradication of the native barberry in southwest Virginia counties (Wythe, Smith, Grayson) showed progress in 1929. There are still no available funds for this work. The situation in Wythe county gives indications that something may be accomplished there in the way of eradication with salt or other recommended practices. The scope of work of Wythe's County Agent is limited in that this pertains to dairy problems only. In a letter to the Extension Plant Pathologist treating on the smut situation for Wythe County he writes as follows: "I wish that we could do something here with this small grain question. It is pitiable to see man work so hard with such unpromising seed and really not be in a position to get a worth while crop."

The Extension Plant Pathologist made one trip to Wythe County and one to Pulaski County in the interest of this work. At this time fields were visited in black stem rust areas to ascertain the

seriousness of the situation. Dr. E. C. Stakman, Plant Pathologist from the University of Minnesota and Mr. Lynn D. Hutton in charge of barberry eradication for the U. S. D. A. visited the Valley of Virginia and Southwest Virginia before wheat harvest during the 1929 season. They report that the severity of rust increased as they went southwestward from Roanoke, and that it does not seem unlikely that much of the rust which is produced early near barberry bushes may be blown northward for several hundred miles. They suggest three lines of work as follows: (1) The effect of fertilizers on the development of rust. (2) The study of rust resistant varieties. (3) A vigorous educational campaign should be initiated to teach farmers the necessity of eradicating barberries from the immediate vicinity of their fields.

Summary of Barberry Eradication

Heavy losses due to black stem rust occurred in Wythe, Washington and Pulaski counties during the 1929 season. Eradication of the native barberry bush in the vicinity of wheat fields in these counties would reduce these losses. The severity of rust increased southwestward from Roanoke. Money could be well spent in a vigorous educational campaign to teach growers the necessity of eradicating barberries from the immediate vicinity of their fields. Mr. Alfred Hunt, County Dairy Agent of Wythe County, reports that something should be done to relieve the situation. In the past this Department has increased the yield six bushels to the acre thru eradication of the native barberry bush in Wythe County. The situation has been worse in Wythe County than in any of the other counties

named. It is difficult to work in Wythe County because the Agent does not have free rein in the selection of projects since he is employed to do dairy work only.

Subproject No. 5 - The use of wilt-resistant strains of cabbage seed. Cabbage disease control is still confined largely to the "yellows disease." This is true for the southwest Virginia cabbage growing section. In addition to the use of resistant sorts to control the "Yellows disease" additional work has been done on seed treatment to control seed-borne diseases. Wythe and Smyth counties benefit most from this work.

The Farmers Cooperative and the Southwest Virginia Cooperative Exchange of Atkins and Rural Retreat respectively report on the wilt resistant sorts used as follows:

Copenhagen - - - - -	100 lbs.
All Head Early - - -	85 lbs.
All Season - - - - -	217 lbs.
Danish - - - - - - -	153 lbs.
Late Flat Dutch -	10 lbs.
Globe - - - - - - -	29 lbs.
Total	574 lbs.

Plans are laid early each fall for securing seed for the following year's crop. At this time cooperative associations, the county agent of Smyth County and the Extension Plant Pathologist negotiate with the agencies handling wilt resistant seed of the varieties desired by the producers of Southwest Virginia.

Subproject No. 6 - Raspberry Anthracnose Control. Work on this subproject was conducted as in 1927. (See page 52 of the annual report of this Department for 1926). Two demonstrations were put on in Montgomery County with blackraspberry, the plots of one acre and one-half acre in size. Two lime sulfur applications of 1-10 and 1-40 strengths plus calcium caseinate sticker were applied as follows in the spring just as the leaves were unfolding and one week before blooming.

Yields were increased ten percent over the preceding years crop and fifteen percent over the checks.

Subproject No. 7 — Plant Disease Survey work was conducted much the same as in previous years. Tobacco plant bed inspections were carried out in thirteen tobacco counties. Blackfire (Angular leaf spot) was found occurring universally in plant beds. Wildfire was observed in only one county. Granville wilt was observed in one county and causing 15 per cent damage to the crop. Ring spot was observed in Halifax and Prince Edward counties and causing 25 per-cent of infection of plants in the field. Mosaic was observed in most of our tobacco producing counties running as high as 75 per-cent infection in certain fields.

Wheat fields were examined in 14 counties and loose smut was found in all fields running from 1/2 up to 3 percent in individual fields. Stinking smut was found in Loudoun, Shenandoah, Prince William, Wythe and Rappahannock counties. This disease ran from a trace up to 10 percent in one field of Rappahannock County. Leaf rust ran on an average of 40 percent for all fields and scab 10 percent for all fields.

Black stem rust ran from 5 percent in the valley counties up to 80 percent in Wythe County with an average of 50 percent for Wythe and Washington counties. A trace of nematode was found in wheat fields of Loudoun, Prince William, Rappahannock and Shenandoah counties. Ergot on wheat was found in one field of Rappahannock County. The percentage was only a trace. Covered smut of barley ran on an average of 15 percent infection in fields of Rockbridge and Charlotte counties. The average percentage of loose smut for these counties was about 5.

Downy mildew ran on an average of 25 percent infection for Prince Edward County and 50 percent for Norfolk County.

Leaf spot of alfalfa was general in occurrence thruout the tobacco growing counties and as a rule caused only slight damage.

Cotton anthracnose ran on an average of 10 percent infection in fields of Nansemond County. Angular leaf spot was general in occurrence but as a rule caused only minor damage. One heavy infection of sooty blotch was observed in Halifax County on crimson clover.

Heavy infections of anthracnose on raspberry were found in Montgomery, Appomattox and Prince William counties.

Subproject No. 8 - Cucumber mosaic control. Work on this subproject was initiated two years ago. Severe losses from this disease in Eastern Virginia during the past few years have caused many growers to discontinue growing cucumbers.

During the 1929 season four demonstrations were staged in the Norfolk area. Procedure was as follows: Cucumbers were not to be

planted continuously on the same land. The fields were to be located at a distance from the farm buildings and vegetable gardens.

The main method used in the control of the disease was thru the eradication of wild host plants , chief of which occurring in the Norfolk section, is Pokeweed.

Beginning May 1, six trips were made to the Norfolk area by the Extension Plant Pathologist, during which time 2,000 pokeweeds were eradicated in the vicinity of cucumbers grown by four demonstrators. The total acreage of cucumbers grown by these demonstrators was 100. Removal of the pokeweed plants was brought about by County Agent F. L. Portlock, the growers and Extension Plant Pathologist. Care was exercised to have the pokeweeds eradicated by the last of July. Mosaic was reduced to a minimum by these practices in the areas specified during 1929. In connection with this work it is hoped that a general spray program will be followed during 1930 in addition to weed host eradication.

Statistics of Travel

During the year 1929, November 1, 1928 to November 1, 1929, the Extension Plant Pathologist spent 168 days in the field and 192 days in the office. A total of 10,440 miles have been covered by rail and a total of 4,950 miles by auto or other means of conveyance. Plant pathological project work has been carried on with 30 county agents and 15 Smith-Hughes High School teachers. In addition to this project work was carried on in two counties having no agents. Sixty-nine field meetings have been held with a total attendance of 1,170 and 37 demonstrations put on. Four conferences were attended, two at Washington, D. C. on tobacco diseases and two at the Norfolk Truck Station on cucumber and sweet potato diseases. 1,400 letters were dictated and 1,647 circular letters, 100 circulars and 1,695 bulletins sent out at different times during the year.

Potato Onion Skin