BULLETIN No. 39. JANUARY 1920.

RED CEDAR TREES AND CEDAR RUST

A REPORT OF A CEDAR RUST SURVEY OF AUGUSTA COUNTY, VIRGINIA.

BY

ROY E. MARSHALL, HORTICULTURIST,

AND

F. D. FROMME, PLANT PATHOLOGIST.

VIRGINIA AGRICULTURAL AND MECHANICAL COLLEGE AND POLYTECHNIC INSTITUTE AND THE UNITED STATES DEPARTMENT OF AGRICULTURE, COOPERATING.
EXTENSION DIVISION, JNO. R. HUTCHESON, DIRECTOR.
BLACKSBURG, VIRGINIA.

LD
5655
A761
B78
no. 39
VPI
Spec

Assistance That Can Be Rendered by the Extension Division of The Virginia Polytechnic Institute.

The Extension Division carries the Agricultural College and United States Department of Agriculture to the farmer and farm home. It endeavors to meet their problems in soils and crops, horticulture, dairying, live stock, poultry, agricultural engineering, home economics and community development. This is done by personal visits, meetings, and correspondence of County Farm and Home Demonstration Agents and Specialists, through boys' and girls' and women's club work, cow testing and purebred live stock and other associations and organizations, and the distribution of bulletins, circulars, newspaper articles, etc.

Application for information or assistance with any farm or home problem should be made to the Director of the Extension Division, Blacksburg, Virginia.

Extension Division Staff

Julian A. Burrus ..... *President*
John R. Hutcheson ..... *Director*
W. P. Moore ..... *Assistant Director*
Mrs. M. M. Davis ..... *Acting State Agent*
Chas. G. Burr ..... *State Boys' Club Agent*
Kent Apperson ..... *Assistant Horticulturist*
Frank A. Buchanan ..... *Dairy Husbandman*
Morton O. Cooper ..... *Animal Husbandman*
H. F. Fralin ..... *Assistant Cheese Specialist*
Miss Bessie M. Hodsden ..... *Assistant State Agent*
Miss Hallie L. Hughes ..... *Assistant State Girls' Club Agent*
Miss Jessie Logan ..... *Specialist in Utilization of Dairy Products*
Roy E. Marshall ..... *Horticulturist*
H. S. Merry ..... *Cheese Specialist*
C. A. Montgomery ..... *Assistant State Boys' Club Agent*
Fred A. Motz ..... *Assistant Horticulturist*
W. D. Saunders ..... *(Part Time) Dairy Specialist*
Chas. E. Seitz ..... *Agricultural Engineer*
Miss Grace Townley ..... *Specialist in Home Economics*
A. F. Treakle ..... *Poultry Husbandman*
E. R. Price ..... *Editor*

Red Cedar Trees and Cedar Rust

A Report of a Cedar Rust Survey of Augusta County, Virginia.

By Roy E. Marshall and F. D. Fromme.

At the request of the fruit growers, a cedar rust survey was conducted in Augusta County, Virginia, during the last week in August, 1919.* The purpose was to determine the relation between the severity of cedar rust infection on apple foliage and the number of red cedar trees in the vicinity of orchards.

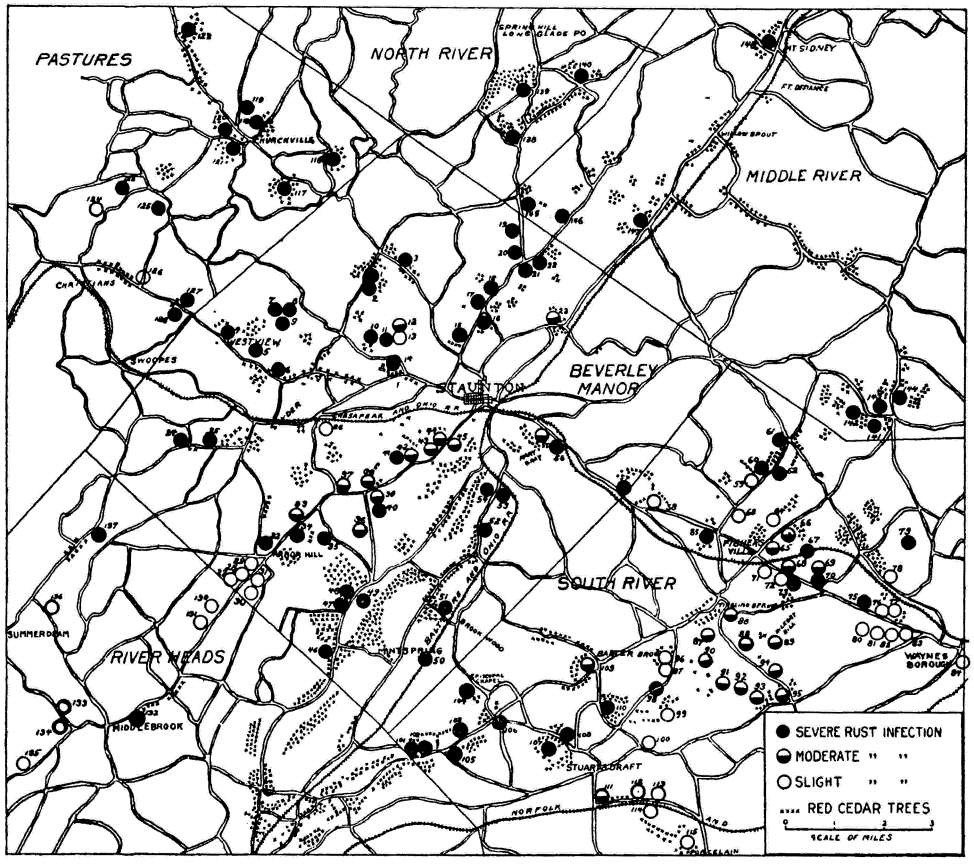
The season of 1919 was unusually favorable for cedar rust infection, and a severe epidemic developed. The losses were intensified by a period of drought in late summer, but this was general for the county, and therefore did not modify the relative losses from cedar rust as presented in this report. There had been some eradication of cedars in the county in former years, and the general impression seemed to be that this work had been of slight value as a protection to apple orchards. The question was raised as to whether removal of cedars is of any direct benefit to the fruit grower. The survey was planned to obtain an answer to this question, to determine whether the severity of cedar rust varies according to the numbers of cedars in the vicinity of the orchards, and whether orchards which are practically free from cedars produce better crops than those with many cedars nearby.

York Imperial is the most susceptible of the commercial varieties grown in the county and the one on which the bulk of the losses are sustained. The survey was, therefore, limited to those orchards which contained trees of this variety of bearing age, and all the data on cedar rust infection and fruit yields were drawn from this variety alone. Of the 148 orchards visited, 113 met these requirements, the remainder being of less susceptible varieties or of non-bearing age. The 113 orchards contained a total of 72,235 trees of the York Imperial variety.

Data were secured in each orchard on the following: severity of rust infection on the foliage, amount of defoliation, size of fruits, vigor of

*The survey was a cooperative project between the Extension Division, the Agricultural Experiment Station, and the Crop Pest Commission. The writers are indebted to Mr. W. J. Schoene for assistance in this work. R. R. Reppert, C. Woolsey, Kent Apperson and J. F. Eheart assisted in making the survey. The work was made possible through the hearty cooperation of the fruit growers in the county.

trees, and number and location of cedars. The degree of infection was expressed as **severe, moderate, slight, very slight**; the number of cedars in the vicinity as **very many, many, few, very few.** The term vicinity, used in this connection, is understood to include the territory within a radius of one mile. The few cases where no cedars were seen within a mile of the orchards are included in the "very few cedars" class. The location of cedars and orchards was plotted on large scale maps.



The accompanying map shows the general facts of the survey. The orchards are numbered and indicated by circles, a black circle showing severe infection; half black, moderate infection; and clear, slight infection. The location of cedars is shown by crosses. A study of the map shows that, in general, there is a very complete agreement between the severity of rust infection and the number of cedars in the vicinity of the orchards. Severe rust infection occurs where there are many cedars in the vicinity, and slight rust infection where there are few or very few

cedars. The apparent contradictions shown on the map are not exceptions to this rule. For example, orchards 13, 29, 58 and 126 are of resistant varieties, and 27, 30 and 31 are recent plantings. The size and location of cedars with respect to wind breaks and topography are important factors as affecting the degree of infection, which cannot be shown on a map of this scale. The rust infection was graded as severe in 66 of the 113 orchards, as moderate in 26, and as slight or very slight in 21. In other words, 81 per cent. of the York Imperial orchards suffered moderate to severe injury from cedar rust.

It is possible here to give only brief summaries of the data secured in the field survey. The relation between cedar trees and cedar rust in the orchards is shown in a conclusive way. This relation was even more evident in the field than can be shown in the data. Every instance of cedar rust injury was traced back to cedars in the vicinity. There was no difficulty in finding them and in most cases they were present in great abundance; sometimes small cedars within the orchards, cedars of all sizes along fence rows and roads, in pastures, woodlots and lawns, and in rough forest land.

Grouping the orchards into four classes with respect to the number of cedars in the vicinity, the following percentages of orchards were found moderately or severely infected with cedar rust: very many cedars, 100; many cedars, 96; few cedars, 56; very few cedars, 11. In other words, 89 per cent. of the orchards in the "very few cedars" class escaped with little or no cedar rust injury, while all of those in the "very many cedars" class were moderately or severely injured.

Using the same grouping with respect to defoliation, the following percentages of the orchards had lost more than five per cent. of the leaves on the date of the survey: very many cedars, 82; many cedars, 73; few cedars, 8; very few cedars, 0. The percentage of defoliation ran as high as 60 in a few of the orchards in the "very many cedars" class, and in the "very few cedars" class none exceeded 4 per cent.

Size of fruit was also estimated in field work, but the harvest data gives a much more reliable basis for calculating the effects of cedar rust from this standpoint.

THE RELATION OF THE SEVERITY OF CEDAR RUST INFECTION TO APPLE LOSSES

Soon after the 1919 apple harvest, a questionnaire was mailed to those fruit growers who were reported in the survey as having 500 or more bearing York Imperial trees for the purpose of securing reports as to the number of barrels of number one, number two and cull apples actually harvested and packed. The minimum size of the apples going

into the two marketable grades and the number of bearing trees from which the yields were obtained were also requested. This questionnaire resulted in 21 reports which were complete enough in detail to be used. Realizing the necessity of securing a greater number of reports to make the results more representative of the actual conditions in the county, additional reports were secured, by personal inquiry, from all the growers possible who had 100 or more bearing York Imperial trees. This resulted in reliable and satisfactory yield and grade records from 44 orchards consisting of 36,985 bearing York Imperial trees from all parts of the county, or approximately one-half of the bearing trees of this variety included in the survey.

The orchards from which the yield and grade data were obtained were classified as in the field survey, as having very few, few, many or very many cedars in the vicinity. For the sake of convenience, these four classes have been assigned letters as noted in the following tabulation which shows the number of orchards and trees in each class on which the data is based.

Orchard Class	Relative Number Cedar Trees within 1 Mile	Number Orchards	Number York Imperial Trees
A	Very few	4	3,200
B	Few	13	12,340
C	Many	13	12,330
D	Very many	9	9,115

THE RELATION OF THE SEVERITY OF CEDAR RUST INFECTION TO YIELDS

The average yield in each class is given and shown graphically below.

Orchard Class	Average yield per tree in bbls.	Graphically Expressed
A	2.66	
B	1.53	
C	.94	
D	.52	

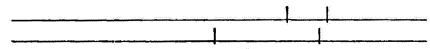
Two of the orchards in class A receive cultural practices which are to be considered much better than the average, but there are several orchards in class B which receive equally good attention. Therefore, it cannot be said that the great differences in yield are, to any appreciable

extent, due to causes other than cedar rust. Again, two of the orchards in class A are located about 18 miles from the other two.

Class B orchards yielded 57% as much as the class A orchards. Class C orchards yielded 61% as much as class B orchards and 35% as much as class A orchards. Class D orchards yielded 55% as much as class C orchards, 33% as much as those in class B, and about 20% as much as those in class A. It is very evident that the yield varies inversely with the number of cedar trees within the vicinity and that the removal of cedar trees has resulted in increased yields of York Imperials in proportion to the completeness of such removal.

THE RELATION OF THE SEVERITY OF CEDAR RUST INFECTION TO GRADES

The average percentage of number one, number two and cull York Imperials for each class was determined and is shown below.

Orchard Class	% No. 1's	% No. 2's	% Culls	Graphically Expressed
A	67.2	7.5	25.3	
B	47.9	24.7	27.4	
C	23.3	32.5	44.2	
D	1.7	6.3	92.0	

In the above graph, the first section of the line shows the relative proportion of number one, the second section the proportion of number two, and the last section the proportion of cull apples, or those that were disposed of to fruit product plants or were unfit for market. The total length of each line represents 100% or all of the crop.

Reading from the top of the column down, it is noted that the proportion of number one, or first grade apples, rapidly decreases as the number of cedar trees in the vicinity increases and that the proportion of cull apples increases as the number of cedar trees increases. Over two-thirds of the apples from the class A orchards were first-grade, a little less than one-half from the class B orchards, less than one-fourth from the class C orchards, and practically none from the class D orchards.

THE RELATION OF THE SEVERITY OF CEDAR RUST INFECTION TO RETURNS

Records of actual cash returns from these orchards were not obtained. Reference to the market reports for the Shenandoah Valley for the seven weeks beginning with the second week in September shows that the average gross returns for number one York Imperials were about

$6.65 per barrel f. o. b. shipping point and that the average price paid for vinegar, evaporator and canning stock was about $1.50 per hundred pounds. For sake of comparison, these values must be established in the orchard rather than at the shipping point, because of the difference in the cost of handling. Allowing liberal charges to cover the cost of picking, packing and hauling and the barrels, it seems fair to consider the number one apples at $5.25 and the number two grade at $4.25 per barrel in the orchards and the culls at 65c per bushel in the orchards. Whether these values are a few cents above or below the average does not matter provided the relative values of the three grades are satisfactory.

The following shows the average gross returns per tree and per acre, assuming 43 trees to the acre (the average for Augusta County), less the charges for handling the crop.

Orchard Class	Average per Tree	Returns per Acre	Graphically Expressed
A	$11.57	$497.51	
B	6.29	270.47	
C	3.27	140.61	
D	1.11	72.15	
Average	$4.45	$191.35	

Compared with class A orchards the loss for class B orchards is over 45%, or $5.28 per tree, that for class C orchards over 71%, or $8.30 per tree, and for class D orchards over 90%, or $10.46 per tree. Class C orchards suffered a loss of 48% as compared with class B orchards; class D orchards a loss of 66% as compared with class C orchards.

A calculation of the returns for the York Imperial variety in all the classes showed an average of about $4.45 per tree. In like manner, the average returns per tree in classes B, C, and D would be $3.77. These returns when compared with class A, or orchards with very few cedars within a mile zone, show a loss from cedar rust of $7.80 per tree, or about 67%, for the county as a whole. The exact number of bearing York Imperial trees in the county is not known but the survey would indicate that there are considerably more than 80,000. Certainly the loss caused by cedar rust in Augusta County in 1919 exceeded a half million dollars. This is based entirely upon the returns from the fruit for that year and does not take into consideration losses resulting in future years because of the greatly weakened condition in which the trees are left.