

# NEW RUSTS OF RED CEDAR AND THEIR RELATION TO APPLE CULTURE IN TENNESSEE

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Many people are familiar with the common cedar rust, *Gymnosporangium junipere virginiaene*, as it protrudes its jelly-like spore horns from mature "apples" on red cedar trees (Figure 1, number 2) during rainy periods in April and May. It is also known that spores from "cedar apples" produce rust infections on various species of wild crab apples and on certain varieties of cultivated apples. Infections may occur on the leaves, twigs, or fruits. Data collected on cultivated apples in various sections of the country indicate that some varieties are susceptible to infection, while others are quite resistant. This is well illustrated in a certain commercial orchard in East Tennessee where Golden Delicious trees were almost defoliated by leaf



Fig. 1. The Red Cedar Stage of the Two Rusts of the Apple. *Gymnosporangium germinale* is here numbered 1 and *Gymnosporangium junipere-virginiaene*, 2.

in noticing them, for they know that such infection throws the fruit into the cull class.

A case of fruit infection in the summer of 1929 in a commercial orchard in West Tennessee led the writer to look further into the rust problem in this state. The peculiar circumstance in this case was

infection caused by the common cedar rust while Grimes Golden in adjoining rows, exposed to the same infection, had lost practically none of their leaves. Premature defoliation of cultivated apples results in great economic loss since infected trees do not make the growth nor set the fruit buds that they would if the leaves were retained throughout the season. As a rule, growers pay little attention to leaf infection, but when rust infections occur on the fruit, they are prompt

the heavy fruit infection of the varieties, Red Delicious and Red Winesap (Figure 2) which were considered resistant to the common cedar rust (Figure 3). This at once caused the writer to suspect that these infections were due to another species of rust but it was not until later in the season when the fungus had developed the spore stage in the apple fruits that the identity of the organism was definitely established as the quince rust, *Gymnosporangium germinale*.

Thomas and Mills (1929) had shown that the common cedar rust, *Gymnosporangium juniper virginiana*, was not the only species associated with fruit infection in New York state, since they also found fruit infection caused by *Gymnosporangium germinale*. Up to that time, *Gymnosporangium germinale* had been reported on various



Fig. 2. Red Winesap Apple Fruits Attacked by the Quince Rust Fungus, *Gymnosporangium germinale*.

species of Amelanchier, and Crataegus, but its chief alternate host was *Cydonia vulgaris*. For this reason it was commonly known as the quince rust. The fact that

quinces are not extensively grown in Tennessee curtailed the opportunities for observing *Gymnosporangium germinale* on this cultivated host, and the additional fact that this fungus as it occurs on red cedars (Figure 1, number 1) is less conspicuous than other rusts, rendered its presence easily overlooked.

By the fall of 1929, it was definitely established that the rust on Red Delicious and Red Winesap fruits in West Tennessee was the same as that attacking similar varieties in New York state and in Indiana, *i. e.*, the quince rust, *Gymnosporangium germinale*. Later the owner of this orchard was able to supply records proving that this parasite had caused a loss of about 800 bushels of apples which would have had a market value of \$2.00 per bushel at current market prices.

Leaf infection due to common cedar rust was also present in this orchard. An examination of the surrounding area disclosed red cedars bearing cedar apples within a few rods of some of the apple trees. It was suspected that these cedar apples were also infected with quince rust but an inspection trip in January, 1930, failed to locate definite cankers on any of these cedar trees. There were only a few red cedars near the orchard and they had small value as compared with apples in the commercial orchard. The case afforded an opportunity of testing the practicability of removing red cedars

to protect the apples from both common cedar rust and quince rust. When the proposition was explained to the orchardist, he was willing to take almost any necessary measures rather than have a recurrence of his 1929 losses. In fact, this grower was so desirous of results that he put men to work cutting down all red cedars within a half mile of his orchard on the same day the proposition was explained to him. Fortunately, he either owned the land in this radius, or was able to get the co-operation of his neighbors in removing the trees.

The spring of 1930 was favorable for rust infection. The effect of this rust-control experiment was watched with interest. As the season advanced, the orchardist reported that his fruit appeared to be free from infections such as occurred in 1929. Observations

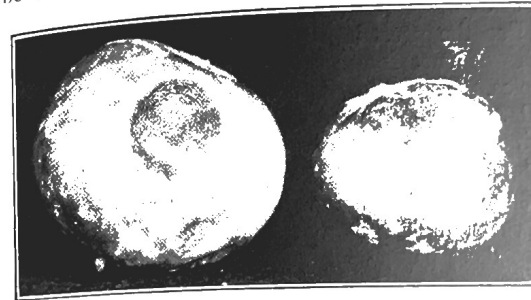


Fig. 3. Early Harvest Apple Fruits Attacked by the Common Cedar Rust Fungus.

made during the spring and early summer indicated that there was practically no fruit infected with quince rust. The grower considered the rust control so effective that he reported it at the State Horticultural

Society meeting in January, 1931. The problem of applying such methods of control would not be so simple in all sections of Tennessee but the presence of quince rust is an added argument in favor of destroying red cedars where the importance of apple orchards justify such control measures.

Another angle of the problem in which the writer is interested is the possible presence of the various rusts in relation to the varieties recommended for planting in a given section. More data are needed on this point, especially in regard to quince rust. To date the only definite records of the presence of this rust are from Madison, Jefferson, Sevier, and Knox Counties. The Knox County records are from two collections made during April, 1931. Such wide distribution makes one suspect that quince rust occurs rather generally throughout the State. If that is the case, care should be used as to the varieties of apples recommended for planting. Until 1929, growers were advised to set Red Delicious and Red Winesap as late varieties resistant to cedar rust. In the light of present knowledge as to what quince rust can do to the fruits of these varieties, such advice is subject to radical revision. At least definite information regarding varieties of apples for a given section should be based on a survey

made to determine whether quince rust occurs near the proposed orchard site.

In looking for quince rust the writer has found a third species of rust, *Gymnosporangium nidus-avis*, on red cedars in Jefferson and in Knox Counties in East Tennessee. This rust is similar to the quince rust, *Gymnosporangium germinale* in producing limb cankers instead of cedar apples like the common cedar rust. However, *G. nidus-avis* differs from *G. germinale*, in that it is found on much larger limbs and on the trunks of red cedars. Here it often deforms the tissues and produces marked witches broom growths. This rust appears to seriously injure the red cedars. The larger cankers formed by this rust and the more abundant development of spore horns, makes *G. nidus-avis* readily detected. The known alternate hosts of *G. nidus-avis* are species of Amelanchier and the cultivated quince, *Cydonia vulgaris*. For the present, therefore, it may be assumed that this third species of rust found on red cedars in this state is not a menace to apples. The writer is conducting cross-inoculation experiments with all three of these rusts on cultivated apples, wild crab apples, and quinces. The results of these experiments will be reported at a later date.

In New York State and in Indiana detailed studies are being conducted on these rusts, indicating that Tennessee is not alone in need of knowledge of these parasites in relation to commercial apple culture.

To further such studies in this state, the writer would appreciate the co-operation of the members of the Tennessee Academy of Science. He would especially be glad to receive reports on the occurrence of these new rusts in various sections of this state. If specimens can be obtained and sent to the writer, they will greatly aid in accurate identification of species.

#### BIBLIOGRAPHY

Thomas, A. G. and Mills, 1929. Three rust diseases of the apple. Cornell Memoir No. 123.