

NOTES ABOUT RUSTS

(Reprinted and edited article from the 1992 Louisiana Mayhaw Association Newsletter)

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(Editorial note - The taxonomic names for cedar-apple rust, hawthorn rust and quince rust are Gymnosporangium juniperi-virginianae, G. globosum, and G. clavipes, respectively. Their life cycles are quite complex and have many similar characteristics. All three of them require two hosts – a deciduous member of the Rose family (for our point of discussion, mayhaws) and an evergreen (typically the Eastern red cedar) – to complete their disease cycle. Identifying the differences between these rusts on both the deciduous and evergreen hosts require a keen eye and diligent mindset, particularly when symptoms overlap, or there is more than one rust present on an infected individual, or there are occasional deviances from the norm (in host or disease) within a population. In a sense of appreciation for his pioneering work with mayhaws, we share this historical article by the late Mr. T.O. Warren. It is inquisitive individuals like him who benefit common practitioners when they search for answers or challenge existing knowledge. We hope you enjoy his insight from when the article was written.)

After watching the cycles and traits of several rusts over the years, I believe there needs to be further research on the various types of rusts. We tend to inter-mix the rusts incorrectly on plants we sometimes write about and this misleads the reader. I want to take this opportunity to look at the more common rusts we work with.

The three types of rusts I will discuss are hawthorn, quince, and apple cedar rust. Are they the same? Is quince rust and apple cedar rust the same? No, definitely not, as I will explain later. However, I do consider hawthorn rust and quince rust to be one and the same. Apple cedar rust is a rust all to itself.

Assuming hawthorn rust and quince rust are the same, what are their differences? Many people are now growing mayhaws with apples and they see quince rust affecting the mayhaws and other species of hawthorns, while apple cedar rust affects apples, particularly in the South. However, apple cedar rust will also appear on the leaves of some *Crataegus* species. In order to determine the differences between the two rusts, we need to look at nature's results. There are many differences between quince rust and apple cedar rust even though the red cedar is the host plant that over winters both rust spores carrying them into spring.

First, apple cedar rust affects, or infects, the leaves of apples with many brown, orange leaf spots. I have never seen it on apple fruits or the growing shoots of apples, just the leaves. The leaf spots of apple cedar rust do not give off massive spores to color your fingers like quince rust does. Second, quince rust affects the fruits and the stem pedicels of the fruits as well as the tips of the young, growing shoots.

You can find spores of the sporophyte stages of both types of rust on the limbs of red cedars in April and May. This is when quince rust appears to strike. By May, at the peak stage of its

attack, quince rust covers the mayhaw fruits and your hands turn a bright yellow-orange when handling the infected fruits and limb tips. Thousands to untold thousands of spores are given off from the bright yellow-orange spores of quince rust at this time which reminds one of pine pollen. In addition, quince rust creates lesions (galls) on the sides of branches. This usually weakens the limb and will kill the limb if the gall surrounds the limb entirely, like deadening a tree with an axe. Mayhaw lesions are active only one year, unlike the perennial lesions on the alternate cedar host. Apple rust never leaves its results in nature's traits that we can see with our own eyes, other than leaf spots in summer and late fall.

For those of you bothered by quince rust on mayhaws, remember that you must learn the rust cycles and not close the gate when the cows are out. Quince rust attacks the fruits, pedicels of the fruits, and the young tips of the fruits. It distorts the pedicels (fruit stems) to three and four times the normal diameter. The same is true with some fruits which, like the "Gibb" acid used on camellias to have larger blooms, quince rust will adversely affect the cells of the young mayhaw fruit causing rapid cell mutation resulting in odd shapes.

Generally though, the rust gets on the sepals first, near the top of young fruits, and passes into the fruit itself. As a general rule this is the route through which most mayhaws become infected, but not always. The sepals on top of the fruit are on the warm side of the fruit toward the hot sun, which aids spore development. The month of May is the peak sporophyte time when quince rust appears and lots of yellow-orange spores can be seen on the fruits of trees. Rust fungi are one of the lower forms of life requiring water to reproduce. Therefore, it takes around eight hours of dampness and moisture for most fungi spores to germinate. That is why most fungus rots on peaches, etc. are worse after rains.

How do we control rust where the quince rust is present, even if groves do not exhibit rust symptoms? Whether you see it or not, you should spray. Put on the first spray when the bud first starts to swell. The second spray should be applied ten days later or near the time petals fall. Then, ten days later, spray the third time and you should rid yourself of any rust. In other words, spray three times at ten day intervals starting when the bud swells in early spring.

There is a mystery that I have never seen quince rust on the thousands of mayhaw trees in the Pearl River swamps of Mississippi. The host, red cedar, is no where to be found and yet apple cedar rust just covers and eats up the leaves of the swamp crab – *Malus angustifolia*. This is why I think more research is needed on apple cedar rust. Do we have other hosts in addition to the red cedar? From closely and regularly watching apple cedar rust on apples, like on the swamp crab, I am of the opinion that apple cedar rust has a sporophyte stage on leaves in July and late summer to help over winter the spores for spring and summer infections. This is my thinking only, for there have never been cedars in that swamp; i.e. cedars prefer a lime soil, as opposed to the acid soil in the swamp. I see apple cedar rust on apples more often in northern Mississippi than in the southern part of the state.

Here are some actual facts of nature and some things you can do yourself to help distinguish between apple cedar rust and quince rust. I attended a Louisiana Mayhaw Conference and

Field Day at Camp Grant Walker near Pollock, Louisiana April 24, 1994. One of the presenters, Dr. George Philley, Plant Pathologist, Texas A&M University, Overton, Texas, presented an interesting and enlightening program on mayhaws and quince rust. His presentation was based on his years of in-depth research on quince rust and was especially informative to me, for I was so interested in the stages of the rust and wondered if we know all we should about rust. After Dr. Philley's presentation, I had the pleasure of talking personally with him about rust. He stated that there is a lot about rust we do not yet know and I thoroughly agree with him.

His comments and answers to my questions may help you to become, more familiar to distinguish between the two types of rust. I asked Dr. Philley if other cedars or other plants played host to quince rust. His answer was that red cedar was the only host to both quince rust and apple cedar rust. I then asked him if apple cedar rust and quince rust are one and the same. His answer was "no"; he then explained they were two entirely different rusts. I then asked him what the differences were in the two rusts and how could we tell the differences. His response was something that I have never read about or heard about quince rust during my entire life. He said that on red cedars the sporophyte stage on apple cedar rust were round, jelly-like balls that hang from cedar limbs and are filled with apple rust spores. Quince rust on red cedar, he said, produces brown, linear spore lesions that reach sometimes up to several inches long, horizontal like, on cedar limbs. He went on, stating that the lesions are perennial and will emit spores of quince rust from the same area the next years. You can check this yourself by marking the lesion spots on cedars. You can check the two types of rust on cedars the same year. If round, jelly-like balls hang from the cedar limbs, this is the sporophyte stage of apple cedar rust. If it has rather long lesions with brown spores on the cedar limbs going out, horizontal like, this is the sporophyte stage of quince rust. That is far different than the jelly-like ball, sporophyte stage of apple cedar rust.

Let's talk a little about the sprays you can use to control rusts. Zinc sprays like Maneb and Zineb will control the rust with timely sprays (this has been tested on Maneb). Nova is a very good spray to use, but expensive; the price, however, is offset by the fact that you use very little at one time (2 oz. to 100 gallons water). I visited Dr. A. W. Harrison of Woodville, Texas several years ago and he showed me two big mayhaw trees (Big Red and Super Spur) he sprayed with Nova. The fruit was thick in the top of the trees and on the ground, and there was not a speck of rust on any of the fruits. Yet, only forty-five feet away were mayhaw trees that had not been sprayed and they were covered with rust. So, Nova works good just like Maneb does. The government did take Maneb off the market for a while, but you can purchase it again now. Diphane is a liquid form of Maneb you can also use.

Dr. Philley recommends spraying three sprays ten days apart starting at bud swell in early spring. He recommends using Bayleton at the rate of two ounces per 100 gallons of water. He recommends the same for Nova - two ounces per 100 gallons of water. When using Bayleton, allow 45 days pre-harvest. If you use Nova, allow 14 days pre-harvest. At the time we talked, Dr. Philley had not used or tested Rubican. I do not trust Captan or Benlate to control rust. I recommend that you use a rust spray even though rust and rot spores are fungal, not bacterial. Though rare, we do have a blossom blight that is not rust on mayhaws.

I hope this will help you to understand the two rusts and the sprays that can be used to control them. I believe we need more research on the types of rusts. Please let us hear from you if you have done any work on this fungus so that we can continue to learn from our successes and failures.