

ROSE ROSETTE DISEASE: DEMYSTIFIED

What do we know and what don't we know?

Rose rosette disease has been more prominent in the Dallas-Fort Worth area the past 2 years. It has also caught the attention of many people who grow and enjoy roses as well as landscapers who have to take care of them. There is also quite a bit of information on the internet, and from various factsheets, guidance documents and voices from media. So what do we know and what don't we know about this disease?

The following is a quick review of the information from various peer-reviewed articles from scientific journals. It is to summarize what we know thus far.

Symptoms of witches broom were described in the 1940s on roses in Manitoba, Canada (Conners, 1941). In the US, rose plants with similar symptoms were described from Wyoming observed in 1942 (Thomas & Scott, 1953) and subsequently found in other states in the US. In Texas, this "disease" was reported by Dr. G. Philley in 1990 (East Texas). It was found in the Dallas-Fort Worth area in the mid-1990s and has become more prominent there in the last 2-3 years (2011-2013).

Symptoms associated with this problem include witches broom, malformed flowers and leaves, excessive leaf growth, excessive thorniness, red discoloration, lateral shoot elongation, flattened stems, and enlarged stems. However, symptoms are variable on different roses. For example, red shoots do not occur in some ornamental rose varieties and there is a lack of excessive thorns on multiflora roses.



What causes rose rosette? Is it mite damage or phytoplasma or a virus?

- **Eriophyid mites**

Transmission experiment using eriophyid mites collected from asymptomatic roses did NOT result in appreciable rose rosette symptoms (Armine et al, 1988). Therefore it is unlikely that the eriophyid mite feeding can cause the observed damage symptoms all by itself.

- **Phytoplasma**

Phytoplasma (major candidate for a long time). Research articles from various parts of the world demonstrated the presence of a phytoplasma (from the aster yellows family) causing phyllody symptoms (rose rosette-like symptoms): Poland (Kaminska et al, 2001), India (Chaturvedi et al, 2009) and China (Gao et al, 2008). Currently, there are no reports of phytoplasmas in symptomatic roses in the US. Additionally, rose rosette symptoms persisted in an experiment where symptomatic plants were treated with antibiotics (Epstein & Hill, 1995). Antibiotics should have killed or suppressed the phytoplasma.

- **Virus**

In 2011, a research group from the University of Arkansas reported the detection of a new virus, specifically an Emaravirus (negative strand RNA virus), in symptomatic roses. They were able to detect this virus in 84 out of 84 symptomatic plants that were tested (Laney et al, 2011). This study also resulted in a genetic (PCR) test to detect the virus. However, the procedure can be tedious. Several diagnostic clinics, including the Texas Plant Disease Diagnostic Lab, are currently testing and validating a modified detection method to ensure consistent detection success and ease of use. The Oklahoma Plant Disease and Insect Lab and the Texas Plant Disease Diagnostic Lab are two NPDN-affiliated labs that have capabilities to test for RRV using PCR methods.

What is so bad about a virus?

There is NO effective method to treat a virus on an infected plant. There is the possibility that the virus is systemic and NOT a localized infection. When symptoms are only observed on part of the plant, the disease may be localized or it may be systemic but remaining asymptomatic on other parts of the plant. Pruning out the infected part may eliminate the pathogen if the infection is localized, but if systemic, the infection will persist and continue to affect the plant. Additionally, mites carrying the virus can continue feeding on all parts of the rose and carry the virus to uninfected rose tissues.

What has been done to see how rose rosette disease is transmitted or could be transmitted?

- **Grafting Experiments** (Thomas & Scott, 1953; Epstein & Hill, 1995; Armine et al., 1988).

The grafting experiments conducted on many different roses did not always result in transference of the rose rosette symptoms. It appeared that there may be some influence due to species and plant tissue age. Transmission of the disease was reported to be more efficient on rapidly growing tissue.

- **Eriophyid mite, *Phyllocoptes fructiphilus*** (Allington et al. 1968, Armine et al, 1988).

To test the ability of the mites to transmit the disease, researchers took mites from plants with symptoms (infected plant) and introduced them onto "healthy" plant material. This did not always result in transmission of the disease but provided some information that suggested that the eriophyid mites can effectively transmit the disease for a short period of time (~ 10 days). Experiments using eriophyid mites harvested from "healthy" plants and transferred to "healthy" plants did not result in rose rosette symptoms suggesting that mite damage alone does not cause the observed symptoms.

- **Mechanical transmission experiments**

These experiments were performed to ascertain whether pruning practices might transmit the disease. Leaf sap and juice, made by grinding infected plant parts that were rubbed on leaves of healthy plants did not result in rose rosette symptoms (Allington et al, 1968). Other experiments using contaminated razor blades to wound healthy plants also did not result in rose rosette symptoms. Stab inoculation, using a contaminated needle to wound healthy plants, resulted in rose rosette symptoms showing up 2 out of 120 tries (Epstein & Hill, 1995). Based on this information, we can conclude that mechanical transmission is possible but highly unlikely.

How does the mite spread?

It is possible that the mites could walk from one plant to the next if plant parts are touching. Longer distance movement is BELIEVED to occur passively by wind (Keifer, 1975; Epstein et al., 1997) or by "piggy-backing" on other insects (Shvanderov 1975).

Do we know conclusively that the eriophyid mite is transmitting the rose rosette virus?

No. There has not been any published study that clearly demonstrates that the eriophyid mite (*Phyllocoptes fructiphilus*) actually carries the rose rosette virus. Evidence from mite transmission studies suggest that the eriophyid mites are carrying and transmitting some disease-causing agent from the diseased plant.

Can the virus move through root grafts?

The more apt question is whether adjacent roses will graft their roots together. Many have said that this is unlikely, but Golino et al (2005) demonstrated possible root grafting by using an herbicide on a plant and looking at mortality of adjacent roses. An experiment where researchers grafted pieces of roots from an infected plant onto a healthy rose resulted in rose rosette symptoms on the new plant, suggesting that root tissue can harbor the virus (Armine et al, 1988). If the virus is systemic and can get into the roots, there is the possibility the virus can move to adjacent plants or new plants through the root graft. This is a theory and has not been scientifically substantiated.



Why can't I leave it alone and see if it recovers?

Sometimes rose rosette disease does not kill the rose but stunts it. Although there is the possibility that it may recover on its own, it is highly unlikely and the infected rose can serve as a virus reservoir. Eriophyid mites can theoretically acquire the virus from a diseased plant and transmit it to other roses.

How is this disease currently identified and/or confirmed?

Diagnosis is currently done with one or more of the following methods:

- Field identification based on symptom expression: issues include reliability of symptoms since herbicide damage, environmental conditions (abiotic) and damage by certain insects can result in mimics.
- Presence of eriophyid mite concurrent with the presence of disease symptoms.
- Electron microscopy to look for virus-like particles and soluble, membrane-bound particles (DMPs) (Rohozinski et al, 2001; Ahn et al, 1996; Silvestro & Chapman, 2004).
- PCR analysis utilizing molecular methods to detect the virus (see more below)

Are my roses "clean" if the genetic (PCR) detection test is negative?

Not necessarily. The detection assay is used to detect the presence of the virus on the sample. Typically, only a small portion of the plant is sampled and processed for the PCR test. Symptomatic plant tissue is the primary candidate that is used for the detection assay. Also, we do not know the extent of the virus distribution in the plant. It is possible that the sample we processed may contain no viruses or viruses below our detection limit of the test. Therefore, if infection is suspected, additional sampling should be considered along with continued monitoring for symptoms and mites.

Based on the current information about rose rosette disease and its presumed vector (as of August 2013), it is our opinion that the best management practices to deal with rose rosette disease are:

1. Removal of confirmed and/or symptomatic plants early after observation.
2. Treatment of adjacent plants with miticide to reduce probability of transmission by eriophyid mites. Please note: this will not stop the virus, if it is already in the plant.
3. Constant monitoring (weekly) for symptoms and rapid action when and if symptoms are observed.
4. If desiring to replant with roses, it is advisable to remove all diseased plant roots from the soil before replanting in same area. This is a prudent precaution even though it is unlikely that the virus would spread this way.

Do not take our word – Check the sources.

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