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Rose Rosette Disease

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Introduction

Rose rosette disease (RRD) is a serious disease problem of cultivated roses, and over the past two decades RRD has become the most important rose disease in North America. RRD is caused by *Rose rosette virus* (RRV). RRD leads to stunting, decline and death of roses, yet there are no easy, economical or particularly effective management tactics for RRD. Currently, the major rose cultivars available to growers are susceptible to RRD. It has long been known that the *Rose rosette virus* was vectored and transmitted by an eriophyid mite, *Phyllocoptes fructiphilus*; however, recently a second eriphyid mite species, *Phyllocoptes arcani* was also identified as a vector and transmitter of *Rose rosette virus*.

Symptoms

Symptoms of RRD are highly variable, depending on the species or cultivar of rose affected. This variability can complicate diagnosis. Some of the more recognizable symptoms include rapid elongation of new shoots (fig. 1), followed by development of witches' brooms or clustering of small branches (fig. 2). Leaves in the witches' broom are small, distorted, and may have a conspicuous red pigmentation (fig. 3); however, red pigmentation is not a consistent symptom. Canes on some species or cultivars develop excessive growth of unusually soft and pliable red or green thorns that may stiffen later (fig. 4). When this symptom is present, it is diagnostic for RRD.

Figure 1. Leaf reddening and distortion (Photo by M.A. Hansen, Virginia Tech)

Figure 2. Clustering of small branches (witches' broom). (Photo by M. A. Hansen, Virginia Tech)

Figure 3. Distorted/stunted leaves. (Photo by M. A. Hansen, Virginia Tech)

Figure 4. Excessive thorniness on swollen stem. (Photo by M.A. Hansen, Virginia Tech)

Figure 5. Deformed flowers. (Photo by M.A. Hansen, Virginia Tech)

Figure 6. Glyphosate injury on new growth in spring. (Photo by M. A. Hansen, Virginia Tech)

When all of the above symptoms are present, diagnosis is relatively straightforward. However, a diseased plant may exhibit few of these symptoms, especially in the early stages of the disease. By the time symptoms are severe and recognizable, the disease is likely to have already spread to neighboring roses.

Some symptoms, such as leaf coloration, may be subtle. Although some diseased plants develop very obvious red pigmentation, others exhibit a less striking reddish-pink color on leaf undersides or along the margins of otherwise green leaves. Because the new leaves of many rose cultivars normally have reddish pigments, it may be difficult to determine whether the reddish color is abnormal or not. Therefore, it is important to continue to monitor symptoms on suspect roses. On RRD-diseased plants, the reddish color does not go away, whereas on healthy plants, the reddish color usually disappears as the leaf matures.

The witches' broom symptom is not necessarily diagnostic for rose rosette disease. This symptom can also occur in response to certain types of herbicide injury. For example, if glyphosate, the active ingredient of the herbicide Roundup, contacts green tissue of rose plants in the fall, it is translocated to the buds, and symptoms do not become evident until those buds emerge the following spring. Witches' brooms with yellow, narrow leaves on clusters of shoots are typical of glyphosate injury (fig. 6). The commonly used broadleaf herbicide 2,4-D can also cause leaf distortion on roses. Unless plants are injured again, herbicide injury symptoms should disappear by the following year.

Other symptoms of rose rosette disease that may be expressed include:

- Blackening and death of the canes on some cultivars.
- Short internodal distances.
- Blind shoots (shoots that do not produce a flower) that remain blind.
- Greater sensitivity of reddish purple tissue to frost.
- Roughened, "pebbly" texture to leaves.
- Increased susceptibility to the fungal disease, powdery mildew. This is especially evident when nearby roses known to be highly susceptible to powdery mildew do not develop signs of this disease.

History of Rose Rosette Disease

Symptoms that were undoubtedly due to rose rosette disease were described in the United States as early as 1941. Spread of the disease in the U.S. was linked to the history of the multiflora rose, an exotic plant that was introduced from Japan in 1866 as a rootstock for ornamental roses. During the 1930s through the 1960s, planting multiflora rose was recommended for erosion control, as a bird sanctuary and food source, as a living fence for cattle, for strip mine reclamation, and as a highway crash barrier. This recommendation ultimately backfired because multiflora rose can produce a million or more seeds per plant and propogate itself vegetatively. It quickly spread and is now declared a noxious weed in several states.

Disease Cycle

RRV has been shown to be vectored and transmitted by two eriophyid mite species, *Phyllocoptes fructiphilus* and *Phyllocoptes arcani*; it can also be spread through grafting. The wild multiflora rose (*Rosa multiflora*) is very susceptible RRD and is a common source of inoculum for new infections. Cultivated roses planted downwind of infected multiflora rose are especially at risk because the mite vectors travel on wind currents from infected to healthy roses. Some growers have observed symptoms on previously healthy plants within four weeks of being planted downwind from diseased multiflora rose.

RRV is not soil-borne, so it is possible to successfully plant healthy roses in beds where diseased plants have been removed. However, because the pathogen is systemic in infected plants, the virus may persist in RRV-infected root pieces that remain in the soil. If plants regrow from these old root pieces, as multiflora rose is apt to do, they can serve as an inoculum source for healthy plants. Therefore, it is important to thoroughly remove symptomatic plants and ensure that infected plants are not allowed to regrow from old, infected root pieces.

Control

No effective control is available for RRD in existing infected rose plants, but the disease may be prevented from spreading to healthy plants by using a combination of the following approaches.

Resistance

Host resistance to RRD would be the simplest management tactic to avoid this devasting rose disease and research is ongoing to identify sources of resistance to RRD to use in breeding aesthecially-acceptable, RRD-resistant roses for cultivation. Recent research efforts have demonstrated that commercially available rose cultivars are all susceptible to RRD to varying degrees. Since cultivation of roses is highly valued and rose production is important to the horticultural industry, the research and development of RRD-resistant roses is expected to be ongoing.

Cultural Control

Early detection of the disease is the key to effective cultural control. Any suspect roses should be removed and destroyed immediately or monitored for continued symptoms and removed as soon as presence of RRV is ascertained. In some areas, burning is permitted and can be used to destroy diseased plants. If burning is not allowed in the area, plants should be bagged and removed. Diseased plants that have been uprooted should not be allowed to remain in the vicinity of healthy roses because they can continue to serve as a source of inoculum.

If possible, *R. multiflora* plants — which frequently serve as the source of inoculum — should be eliminated from the immediate vicinity (100-meter radius) of rose nurseries and gardens. Locations where individual multiflora rose plants have been removed should be monitored for regrowth, and any regrowth should be removed and destroyed. Multiflora rose over larger areas is difficult to control and complete removal may not be practical.

To prevent infection of new transplants, avoid planting cultivated roses downwind of known multiflora rose plantings where the cultivated rose transplants are more susceptible to invasion by the mites. Space plants so that canes and leaves do not touch each other. Eriophyid mites do not have wings and must crawl from plant to plant. Proper spacing makes it more difficult for the mites to move within a planting. Alternatively, consider mixed plantings (roses with non-rose plants) to mitigate the risk of RRD spread by the eriophyid mite vectors. Additionally, avoid using leaf blowers near roses, which may spread the eriophyid mite vectors to healthy roses. Promote plant health and vigor by irrigating during periods of drought, maintaining fertility, and controlling other diseases.

Chemical Control

Although there is no compound that will directly control RRV, effective control of mites with certain miticides can reduce the risk of spread. Be aware that miticides registered for control of spider mites do not control the eriophyid mites that transmit RRD. Some researchers have obtained reasonable control with either carbaryl or bifenthrin insecticides; however, mites are very small and it can be difficult to get complete coverage. Also, use of carbaryl to control eriophyid mites can lead to outbreaks of spider mites. There are miticides containing the active ingredient abamectin that are registered for control of both eriophyid and spider mites on roses.

Use of miticides in the absence of cultural controls is not recommended. One way to use a miticide as an additional tool in a control program is to focus sprays on roses that surround spots where RRD-diseased roses have been removed. These are the most likely plants to which mites from within a planting would have moved. Spraying every two weeks from April until September should significantly reduce the mite population and the risk of transmission. Additional sprays may be needed during hot, dry weather when eriophyid mites are most active.

Diagnosing the Disease

The Virginia Tech Plant Disease Clinic can diagnose this disease and other plant diseases. Refer to the Plant Disease Clinic website (https://bit.ly/VTplantclinic) for the current diagnostic form, fees, and instructions on collecting an appropriate diagnostic sample and submitting samples to the Plant Disease Clinic.

Resources

Amrine, J. W., Jr., and D. F. Hindal. 1988. *Rose Rosette: A Fatal Disease of Multiflora Rose*. West Virginia University Circular 147. Morgantown: West Virginia University.

Amrine, J. W., and S. Zhao. 1998. "Research on Aerial Dispersal of *Phyllocoptes fructiphilus (Acari: Eriophyidae)*, Vector of Rose Rosette Disease." *American Rose,* March 1998, 28-29.

Di Bello, P. L., Ho, T., & Tzanetakis, I. E. 2015. The evolution of emaraviruses is becoming more complex: seven segments identified in the causal agent of Rose rosette disease. Virus research, 210, 241–244. https://doi.org/10.1016/j.virusres.2015.08.009.

Druciarek, T., Lewandowski, M., & Tzanetakis, I. 2023. Identification of a Second Vector for Rose Rosette Virus. Plant disease, 107(8), 2313–2315. https://doi.org/10.1094/PDIS-11-22-2686-SC.

Laney, A. G., K. E. Keller, R. R. Martin, and I. E. Tzanetakis. 2011. "A Discovery 70 Years in the Making: Characterization of the Rose Rosette Virus." Journal of General Virology 92:1727-32.

Peck, A. 2007. *Rose Rosette: A Web Book.* Updated May 2007. www.rosegeeks.com.

Windham, M. T., Evans, T., Collins, S., Lake, J. A., Lau, J., Riera-Lizarazu, O., & Byrne, D. H. 2023. Field Resistance to Rose Rosette Disease as Determined by Multi-Year Evaluations in Tennessee and Delaware. Pathogens (Basel, Switzerland), 12(3), 439. https://doi.org/10.3390/pathogens12030439.

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