Unravelling Rose Rosette©

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INTRODUCTION

Rose rosette is caused by rose rosette virus (RRV) which is transmitted by the eriophyid mite *Phyllocoptes fructiphilus*. Rose rosette was first observed in 1940 in Manitoba, Canada and in California and Wyoming in 1941. The disease has become widespread in regions of north-central, south-central and southeast USA. The incidence of rose rosette has grown exponentially in cultivated roses in the mid-South USA due to increased use of mass plantings of shrub roses in residential and commercial landscapes.

All cultivated roses (shrub type, hybrid tea, floribunda, grandiflora, and miniature roses) are thought to be susceptible to the disease. Other roses reported to be susceptible are: *Rosa woodsii*, *R. bracteata*, and *R. rubiginosa* (syn. *R. eglanteria*).

Many articles have been written on rose rosette and described the variable symptoms associated with the disease. However, few articles have offered management strategies for combating the disease other than rogueing symptomatic plants. In the few cases where control recommendations have been made (such as the use of miticides); the recommendations were based on observations made for other virus diseases of roses or on virus diseases and/or eriophyid mites on other crops. Published research that has investigated methods for managing rose rosette in different aspects of rose culture (propagation and production nurseries, retail centers, landscape beds, etc.) is limited.

SYMPTOMS OF ROSE ROSETTE VIRUS INFECTED PLANTS

Rose rosette symptoms are complex and variable as plants of the same cultivar may have different symptoms at the same or different location(s). The role that variable genetics within the virus population, environmental influences such as time of season when a plant becomes infected, or plant age at time of infection, is unknown. The variable symptoms associated with rose rosette make diagnosis difficult and rose rosette may be confused with herbicide damage. Often reddening of a rose stem due to rose rosette is difficult to detect among healthy, red young foliage (red flush) of other plants within the rose bed (Fig. 1). However, foliage of roses infected with RRV maintained red pigmentation for the life of the foliage whereas foliage of healthy roses turn green in 3-4 weeks.

Fig. 1. (A) Rose plant symptomatic with rose rosette (arrow) nestled within a bed of asymptomatic and presumably healthy Knock Out® plants. (B) An infected, symptomatic cane within container Drift® roses may go undetected if growers are not vigilant.

In spring and fall, many healthy roses have reddened foliage. When roses are infected with RRV, the foliage may be red throughout the summer (Fig. 2A). Diseased roses may also have strapped (unusually long, thin) leaves. However, in some plants, little red pigmentation is obvious (Fig. 2B). Increased thorniness and flattening of stems (fasciation) is often observed (Fig. 2C), but may be absent in symptomatic tissues (Fig. 2B). Canes may become a large mass of distorted shoots (witches' brooms) (Fig. 2D).

Rose bushes will decline and begin to die from rose rosette 3-4 years after infection (Fig. 3). Large plants in the south may last a few years longer. Cane mortality is usually observed in spring when symptomatic canes fail to push out new foliage since canes with rose rosette symptoms appear to be more susceptible to winter-kill/desiccation. Low starch reserves in symptomatic canes may be responsible for decreased spring growth and ultimately death of plants. Infected roses may have diminished root systems which may be a result of decreased carbohydrate storage. Large commercial plantings or private rose gardens can be decimated by rose rosette if the disease is left unchecked.

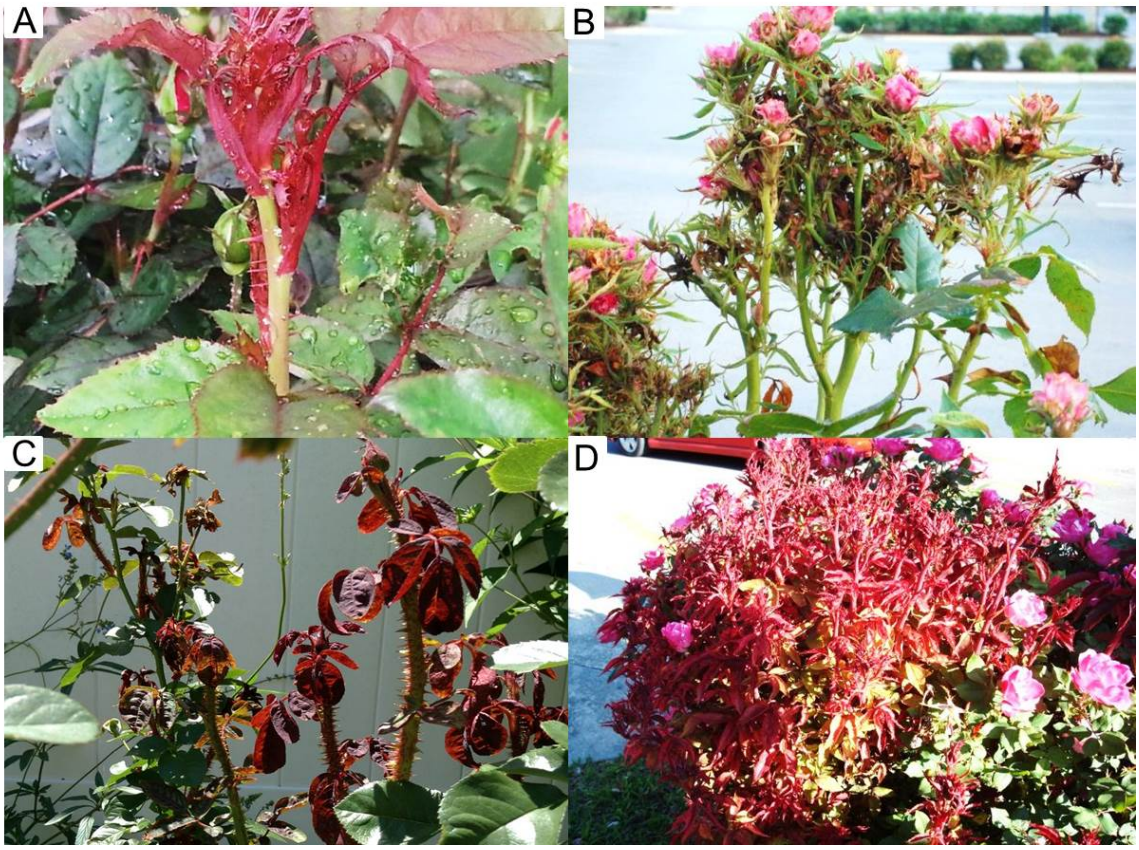

Fig. 2. (A) Reddening of a stem infected with rose rosette; note the thin, elongated leaves and the unusually thickened cane (stem) with increased number of thorns (pickers). (B) In some infected canes, foliage stays mostly green and may or may not display increased thorniness. (C) Increased thorniness is common in many plants symptomatic for rose rosette and may be accompanied with flattened stems (fasciation). (D) Masses of shoot proliferation (witches' brooms) are often associated with plants that are very susceptible or have been symptomatic for more than one year. These witches' brooms may become so large (larger than a bushel basket) that the plant cannot support them and the plant may fall over.

Fig. 3. (A) Death of these rose bushes will occur 12 months to 3 years after first symptoms were apparent depending on age and susceptibility. (B) If left unchecked, rose rosette will destroy entire beds of roses. Spread may appear slow at first due to long latent periods in newly infected plants. It is common for incidence of symptomatic roses to remain low in a large bed of newly planted roses for 1-2 years and in the next year, have nearly all plants become rapidly symptomatic.

SPREAD OF ROSE ROSETTE

Rose rosette virus is transmitted by an eriophyid mite. Although these mites are wingless, they may "balloon" in air currents, as do dust particles, and thus can be spread long distances. However, the closer a rose is planted to a rose infected with RRV, the more likely it is to become infected. In observations in Tennessee, rose beds located near a source of RRV have a pronounced edge effect (the roses nearest the source are more likely to become infected with the disease than roses located on the opposite side of the bed). Distribution of initially infected plants in a large rose bed will appear random if the plants were infected prior to planting or if there is a great distance between the rose planting and the inoculum source of RRV.

MANAGEMENT OF ROSE ROSETTE

Roses should be inspected for symptoms of RRV before being used for propagation or planting. If possible, a PCR test for RRV should be conducted. Most testing is done by the plant diseases diagnostic labs at Texas A&M University and Oklahoma State University. Even if the plants you select for purchase are free of rose rosette symptoms, you should inspect all roses at the nursery. If some are symptomatic, it would be best to buy elsewhere where all roses appear to be healthy. If you observe rose rosette symptoms on a few roses at a nursery, there are likely to be more infected, but asymptomatic (latent infections) roses at that location.

Once roses are transplanted, plants should be inspected regularly for symptoms of rose rosette. Symptomatic plants should be rogued as soon as possible since infected plants may harbor large populations of eriophyid mites that may spread RRV to other roses. Rogued plants should be bagged at the site of removal and not dragged through the garden or left piled near the garden.

At the Beall Family Rose Garden (200 bush garden located within the University of Tennessee Gardens), plants are inspected several times a week for symptoms of rose rosette. Roses are rogued at first observation of symptoms. Over a 5-year period, the garden has annually lost 2 to 4% of its roses to rose rosette. However, no rose adjacent to a rose that was rogued has developed symptoms of rose rosette. Since the garden's plan calls for replacement of 5% of its roses annually to keep the garden up-to-date and "fresh," losses of roses due to RRV have not been noticeable by garden patrons. The key

to success for a management plan based on rogueing is early detection of symptomatic plants and immediate rogueing of diseased roses.

Several publications on the web have suggested using miticides and/or pruning out of symptomatic canes to eliminate RRV or reduce its incidence. There are no research data available to support either of these suggestions although research is underway to determine if these potential management strategies are effective.

Since eriophyid mites "balloon" in the air instead of being active flyers, a barrier placed between a rose planting and a possible source of eriophyid mites and RRV may reduce incidence of RRV in a rose garden. Barriers of *Miscanthus sinensis* (Chinese or Japanese silver grass) will reduce incidence of RRV in plantings of roses when compared with incidence of RRV in rose plantings without barriers.

RESISTANCE TO ROSE ROSETTE VIRUS

Although all known cultivars of roses used commercially are considered to be susceptible to RRV, some species of roses have been reported to be resistant to RRV or transmission of RRV by eriophyid mites. Some rose species have been reported as resistant to RRV. However, these reports have been made by observing roses in gardens and not through replicated testing. Roses that have been reported as resistant are: *R. setigera*, *R. acicularis*, *R. arkansana*, *R. blanda*, *R. palustris*, *R. carolina*, and *R. spinosissima*. The interspecific hybrid, 'Stanwell Perpetual' (*R. spinosissima* and *R.* × *damascena*) is susceptible to RRV (Bruce Monroe, pers. commun.). Therefore progeny of crosses made with resistant roses may not be resistant. There is a critical need to test rose species for resistance to *P. fructiphilus* and rose rosette virus in controlled, replicated experiments. These types of experiments will be conducted over the next 3-5 years by a combined team from Texas A&M University, University of Delaware, University of Tennessee, and Star Roses (West Grove, Pennsylvania).

FUTURE OF ROSES AS IMPACTED BY ROSE ROSETTE VIRUS

More roses will succumb to RRV before short term and long term management plans can be developed growing roses at the propagation, wholesale, retail, and landscape levels. Asymptomatic, infected rose are apparently moving undetected in the nursery trade. Rose rosette will continue to spread into new areas providing the climates in those areas are conducive for supporting populations of multiflora roses or other rose species able to function as a reservoir for both RRV and *P. fructiphilus*. However, a newly funded USDA Specialty Crops Research Initiative grant proposal for developing short and long term measures to combat RRV was recently funded and will combined the multidisciplinary talents of 19 scientists at state, federal, and private labs. Short term strategies to reduce the impact of RRV on the rose industry will be developed while the team works to develop resistant *Rosa* germplasm for use in long term solutions to rose rosette.

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