CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Rose Rosette *Emaravirus*

Current Pest Rating: None

Proposed Pest Rating: C

Comment Period: 09/27/2019 through 11/11/2019

Initiating Event:

Foundation Plant Services (FPS) in Davis, CA reported receiving rose plants from a wholesale rose nursery in Wasco, CA, in August 2017. Two plants showed symptoms of rose rosette disease, were tested, and found positive for rose rosette emaravirus (RRV) using a modified RT-qPCR method. When examined microscopically, the eriophyid mite which vectors RRV, *Phyllocoptes fructiphilus*, was found. They also received three plants from two residents that were neighbors in Bakersfield, CA which also tested positive for RRV. The virus detected in the residential plants did not have the same genotype as the virus found in the nursery plants, suggesting they are the result of two separate introductions of RRV (Farrar, 2018). A first report of rose rosette virus in California was published by the plant pathologists at FPS in February 2019 (Al Rwahnih et al., 2019). The present status of this pathogen in California is evaluated and a permanent pest rating is proposed herein.

History & Status:

Background: Rose rosette emaravirus is vectored by a wind-dispersed eriophyid mite, *Pyllocoptes fructiphilus*, (Di Bello et al., 2015a; Laney et al., 2011) and causes Rose Rosette Disease (RRD). RRD is endemic to North America and was first described in Canada, Wyoming, and California in the 1940s. In 1940, Conners (1941) observed a ‘‘Witches’ Broom (?virus)’’ symptom with a greatly increased number of spines affecting canes of an unnamed species of rose in Morden, Manitoba. Keifer (1940) reported the presence of the eriophyid mite *P. fructiphilus* on *Rosa californica* in California. Thomas and Scott (1953) reported receiving diseased specimens of *Rosa rubrifolia* grown as an ornamental from Lander, WY, in 1941. In 1942, the same authors reported a specimen collection with similar symptoms from ‘‘a native rose, possibly *Rosa pisocarpa”*, near Carrville in a mountainous area of Trinity County, CA. By the late 1960s, RRD symptoms were found in Mono County, CA on the native rose *Rosa woodsii* var. *ultramontana* (Wagnon and Nichols, 1966, 1970). In 1966, Keifer found *P. fructiphilus* on *R. woodsii* and was the first to suggest this mite could be a vector of the rose disease associated with the witches broom.

RRD usually results in plant death (Olson et al., 2015; Windham et al., 2014). The pathogen and its vector have spread from western to eastern North America through naturalized stands of *Rosa multiflora*. This rose is native to eastern China, Japan, and Korea, and is very susceptible to RRD. It was introduced into North America in the 1800s for use as a rootstock, and for wildlife, erosion control, ‘‘living fences,’’ and informal hedges (Amrine, 2002; Hindal et al., 1988; Hong et al., 2012). *R. multiflora* soon spread from the original plantings and is now listed as a noxious weed in at least 10 states (Amrine and Stasny, 1993). The RRD epidemic has spread from naturalized *R. multiflora* to garden roses in nurseries, and home and commercial landscapes where losses have been high (Pemberton and Karlik, 2015). The occurrence of the disease in poorly managed landscapes where plants are not scouted and rogued have no doubt contributed to the spread (Olson et al., 2015; Windham et al., 2014).

Hosts: Rosa multiflora, a weedy invasive rose*, R. rugosa, R. bracteata, R. rubiginosa, R. woodsii, Rosa* sp. including most cultivated varieties of roses including climbers, hybrid teas, floribundas, miniatures, antique or “old-fashioned roses”, knockouts and carpet roses (Thomas and Scott, 1953; EPPO, 2018).

Symptoms: Symptoms caused by RRD may vary according to climatic conditions and type of rose, but they can include the development of witches’ brooms, excessive thorn production, excessive lateral shoot growth, rapid stem elongation, thickened and succulent stems, leaf proliferation and malformation, mosaic patterns on leaves, bright red pigmentation, deformed buds and flowers, and lack of winter hardiness. Infected plants lose their aesthetic value and gradually display a general decline leading to plant death. A few weeks to months after infection, plants will begin to develop symptoms of RRD (Laney et al., 2011). Infected plants usually die within 1 to 5 years and can be increased in their susceptibility to other diseases. It is also noted that these symptoms may be confused with herbicide damage, however, excessive thorniness and unusual red pigmentation do not usually occur with herbicide injury. Most herbicides are non-selective, so other plants in the area may also show unusual symptoms of distortion and discoloration (Davenport, 2013; Pemberton et al., 2018).

Transmission: The pathogen is transmitted by grafting (Thomas and Scott, 1953; Doudrick et al., 1987; Di et al., 1990) or by the feeding of the vector eriophyid mites (Amrine et al., 1988). The mite is microscopic and tends to hide in buds, on open flowers and sepals, at the base of shoots, at leaf axils, or under leaf scars (Bauchan et al., 2019). Kassar and Amrine (1990) demonstrated that mites survive only on green living tissue and Zhao (2000) reported that mites develop only on tender rapidly growing shoots and are disseminated aerially. Di Bello et al. (2015a) reported the presence of RRV in rose eriophyid mites and conclusively demonstrated eryophid mite transmission of the virus that causes RRD.

Rose rosette virus does not appear to be transmitted mechanically, although disinfesting all tools used on infected roses may be a useful precautionary effort against moving the eriophyid mites. The virus does not survive in soil but may survive in living rose roots in the soil, so all roots should be removed from the soil when infected roses are removed (Laney et al., 2011). The eryiophid mite can be spread by the wind and it also is possible that it can disperse through phoresy (attaching itself to insects). As a result, the distribution of the eryiophid mite and RRD is expanding. Humans can also vector the virus

through grafting. Infective eriophyid mites can also be carried to new sites on gloves, clothing, or tools (Davenport, 2013). Both the mite and virus are specific to roses (*Rosa* sp.); no other hosts have been identified. The virus may be inactive during the winter, but symptoms will appear on new growth emerging in the spring.

Damage Potential: RRD is a lethal disease of roses. Roses are one of the most economically important ornamental plants in North America. Losses of commercial and residential plantings from the Great Plains to the East Coast have been high and are increasing (Ong et al., 2015; Pemberton and Karlick, 2015; Pemberton et al., 2019).

Worldwide Distribution: Asia*: India*; North America*: Canada* (Manitoba, Ontario), *United States* (Alabama, Arkansas, California, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, West Virginia, Wisconsin, Wyoming) (EPPO, 2019)

Official Control: Rose rosette virus is a quarantine pest for Morocco and on the EPPO A1 list of quarantine organisms (virus and vector, added in 2018). It is on the harmful organisms report for Georgia, South Africa, Japan, Namibia and Shri Lanka (USDA PCIT accessed 6/11/19). There is no official control in the United States.

California Distribution: Reports of the presence of the vector and symptoms of RRD in California date back 80 years (Keifer,1940, 1966; Thomas and Scott, 1953; Wagnon, 1966, 1970). Recently published reports are from nursery plants and residential areas of Kern County (Al Rwahnih et al., 2019; Farrar, 2018). The website *roserosette.org*, hosted by the Center for Invasive Species and Ecosystem Health at the University of Georgia, has a distribution map which shows detections of RRV in Modoc, Trinity, Sacramento, Mono, Tulare, Kern, Orange and San Diego counties. These were verified by the Oklahoma State Plant Disease and Insect Diagnostic Lab, University of Georgia, Texas Plant Disease Diagnostic Laboratory, or Foundation Plant Services in Davis, CA.

California Interceptions: None

The risk **Rose Rosette Virus** would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** There are no known limiting environmental conditions for the disease or the vector and it could establish everywhere host plants grow.

   Evaluate if the pest would have suitable hosts and climate to establish in California.

   Score:**3**

- Low (1) Not likely to establish in California; or likely to establish in very limited areas.
- Medium (2) may be able to establish in a larger but limited part of California.
- High (3) likely to establish a widespread distribution in California.

2) **Known Pest Host Range:** The host range of rose rosette virus is limited to roses.

Evaluate the host range of the pest.

Score: 1
- Low (1) has a very limited host range.
- Medium (2) has a moderate host range.
- High (3) has a wide host range.

3) **Pest Reproductive Potential:** The vector spreads with the wind and with infected budwood used for grafting of ornamental roses, and over wider areas by infecting and infesting naturalized *Rosa spp.*

Evaluate the natural and artificial dispersal potential of the pest.

Score: 3
- Low (1) does not have high reproductive or dispersal potential.
- Medium (2) has either high reproductive or dispersal potential.
- High (3) has both high reproduction and dispersal potential.

4) **Economic Impact:** This pathogen cause significant damage, including death, of its host. There is no treatment once the plants are infected and they need to be destroyed immediately to reduce inoculum.

Evaluate the economic impact of the pest to California using the criteria below.

Economic Impact: A, B, E
A. The pest could lower crop yield.
B. The pest could lower crop value (includes increasing crop production costs).
C. The pest could trigger the loss of markets (includes quarantines).
D. The pest could negatively change normal cultural practices.
E. The pest can vector, or is vectored, by another pestiferous organism.
F. The organism is injurious or poisonous to agriculturally important animals.
G. The organism can interfere with the delivery or supply of water for agricultural uses.

Economic Impact Score: **3**
- Low (1) causes 0 or 1 of these impacts.
- Medium (2) causes 2 of these impacts.
- High (3) causes 3 or more of these impacts.

5) **Environmental Impact**: Evaluate the environmental impact of the pest on California using the criteria below.

Environmental Impact: E

A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.
B. The pest could directly affect threatened or endangered species.
C. The pest could impact threatened or endangered species by disrupting critical habitats.
D. The pest could trigger additional official or private treatment programs.
E. The pest significantly impacts cultural practices, home/urban gardening or ornamental plantings.

Environmental Impact Score: 2

- Low (1) causes none of the above to occur.
- Medium (2) causes one of the above to occur.
- High (3) causes two or more of the above to occur.

Consequences of Introduction to California for *Rose Rosette Disease:*

Add up the total score: **12**
-Low = 5-8 points
-Medium = 9-12 points
-High = 13-15 points

6) **Post Entry Distribution and Survey Information**: There are observations of Rose rosette disease in California that go back to 1940. Detections have been documented by University diagnostic labs and Foundation Plant Services in 8 California counties

Evaluation is 'High'.

Score: -**3**
-Not established (0) Pest never detected in California or known only from incursions.
-Low (-1) Pest has a localized distribution in California or is established in one suitable climate/host area (region).
-Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.
-High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.

7) **The final score is** the consequences of introduction score minus the post entry distribution and survey information score

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information* ***= 9***

Uncertainty:

Testing for RRD requires advanced diagnostic laboratory techniques. If easier testing methods are developed, its likely that many more counties will have confirmed detections.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Rose Rosette Virus is C*.**

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Responsible Party:

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***Comment Period: 09/27/2019 through 11/11/2019**

***NOTE:**

You must be registered and logged in to post a comment. If you have registered and have not received the registration confirmation, please contact us at plant.health[@]cdfa.ca.gov.

Comment Format:

- Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

  Example Comment:

  Consequences of Introduction: 1. Climate/Host Interaction: [Your comment that relates to "Climate/Host Interaction" here.]

- Posted comments will not be able to be viewed immediately.

- Comments may not be posted if they:

  Contain inappropriate language which is not germane to the pest rating proposal;

  Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;

  Violates agency regulations prohibiting sexual harassment or other forms of discrimination;

  Violates agency regulations prohibiting workplace violence, including threats.

- Comments may be edited prior to posting to ensure they are entirely germane.
- Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.

Proposed Pest Rating: C
