

California Pest Rating Proposal for

Tranzschelia discolor (Fuckel) Tranzschel & Litv., 1939

Synonym *Tranzschelia pruni-spinosae* var. *discolor* (Fuckel) Dunegan, 1938

Stone fruit rust

Domain: Eukaryota; Kingdom: Fungi;
Phylum: Basidiomycota; Subphylum: Pucciniomycotina;
Class: Pucciniomycetes; Order: Pucciniales
Family: Uropyxidaceae

Current Pest Rating: C

Proposed Pest Rating: C

Comment Period: 12/07/2020 through 01/21/2021

Initiating Event:

A request for clarification on the rating for *Tranzschelia discolor* came from a County plant pathologist. The risk to California from *T. discolor* is described herein and a permanent rating is proposed.

History & Status:

Background:

Tranzschelia discolor is a rust pathogen, mainly attacking plants in the genus *Prunus*. Almond, peach, and prune are the most susceptible hosts in California, but it also affects apricot, cherry, nectarine, and plum. It is a macrocyclic, heteroecious rust with multiple spore stages that develop on two different hosts. However, the alternate host is not necessary for epidemics to develop on *Prunus*. *Prunus* is the primary host and produces stage II (urediniospores), stage III (teliospores), and stage IV (basidiospores). The alternate host is *Anemone coronaria* which produces stage 0 (spermatia) and stage 1 (aeciospores). Urediniospores are the repeating, vegetative spores and can autoinfect their *Prunus* host. The pathogen can be separated into *formae speciales* (f. sp.), based on host specificity in the uredinial infection stage. Bolkan et al., 1985, showed that the uredinial stages are specific to the

host where they are produced and do not cross-infect. These forms are *T. discolor* f. sp. *persicae* on peach, *T. discolor* f. sp. *dulcis* on almond, and *T. discolor* f. sp. *domesticae* on prune.

Hosts: *Anemone blanda* (Balkan anemone), *Anemone coronaria* (poppy anemone), *Anemone hortensis* (broad-leaved anemone), *Anemone pavonina* (peacock windflower), *Anemone xfulgens* (flame anemone), *Chrysobalanus icaco* (coco-plum), *Prunus americana* (American plum), *Prunus dulcis* (almond), *Prunus armeniaca* var. *armeniaca* (Armenian plum), *Prunus avium* (sweet cherry), *Prunus bifrons*, *Prunus andersonii* (desert peach), *Prunus angustifolia* (chickasaw plum), *Prunus armeniaca* (apricot), *Prunus buergeriana*, *Prunus cerasifera* (cherry plum), *Prunus cerasus* (sour cherry), *Prunus tangutica* (wild peach), *Prunus davidiana* (Chinese peach), *Prunus domestica* (wild plum), *Prunus domestica* subsp. *domestica* (European plum), *Prunus domestica* subsp. *insititia* (damson plum), *Prunus domestica* subsp. *italica* (greengage), *Prunus dulcis* (almond), *Prunus fasciculata* (desert almond), *Prunus fenzliana*, *Prunus hortulana* (hortulan plum), *Prunus japonica* (Japanese cherry), *Prunus mahaleb* (mahaleb plum), *Prunus mexicana* (Mexican plum), *Prunus rivularis* (creek plum), *Prunus persica* var. *nucipersica* (necatarine), *Prunus persica* var. *persica* (peach), *Prunus pumila* (sand cherry), *Prunus salicina* (plum), *Prunus spinosa* (blackthorn), *Prunus subcordata* (Klamath plum), *Prunus tenella* (dwarf Russian almond), *Prunus triloba* (flowering almond), and *Prunus virginiana* (chokecherry) (Farr and Rossman, 2020).

Symptoms: Twig cankers, leaf lesions, and fruit lesions are the common symptoms of the disease.

Twig cankers are where the pathogen overwinters and the spot where the first symptoms in the spring can be seen. Cankers develop on 1-year-old fruiting wood, appearing as blisters and longitudinal splits in the bark about 3 to 6 mm in length. Beginning as water-soaked lesions, the pustules swell and rupture only the epidermal tissue of the twig. Cankers are usually on the upper side of the twig and produce masses of rusty-brown asexual urediniospores. Cankers can persist through 2 growing seasons or until the twigs fully lignify and bark forms over them.

Leaf lesions are initiated from urediniospores released in early spring from the twig cankers, and they can continue to develop through the summer and into the fall. During epidemics, when large numbers of spores lead to many new pustules, defoliation can occur. Initially, infections are pale yellowish-green spots visible on both leaf surfaces. Over time, the lesions become bright yellow and angular, and finally becoming necrotic in the center. Uredinia and urediospores are produced on the lower leaf surface and can be so numerous that the leaf appears rusty brown. At the end of the growing season, some of the leaf lesions may turn dark brown to black as they produce teliospores.

Fruit lesions first develop as brownish spots with green halos on mature, yellow fruit. As the fruit reddens, the halos become greenish-yellow. Large numbers of infections may develop on each fruit, and these can be followed by secondary infections with fungi that cause more extensive fruit decay (Adaskaveg et al., 2000; Ogawa, 1995; Ogawa and English, 1991).

Transmission: *Tranzschelia discolor* has multiple spore stages that can develop on two different, alternating hosts. Both hosts produce airborne spores that depend on prolonged wetness periods of 12-18 hours for infection. Teliospores that develop on *Prunus* spp. late in the season produce basidiospores that can only infect anemones. Aeciospores that are produced on anemones in the spring that can infect only *Prunus* spp.

However, primary inoculum doesn't have to come from anemone, the fungus probably overwinters as mycelia in *Prunus* wood infected during the previous summer or fall. Urediniospores produced from twig cankers then infect nearby leaves, and under favorable environmental conditions, the disease becomes an epidemic due to repeated infections of leaves, twigs, and fruit.

Urediniospores are disseminated by wind, especially at times in the spring and summer when there is rainfall and higher wind velocity. With relatively longer periods of wetting required for infection compared with other fungal pathogens, persistent rainy and wet seasons allow for the build-up of inoculum. This type of spore can be transported long distances by wind (Adaskaveg et al., 2000; Ogawa, 1995; Ogawa and English, 1991).

Damage Potential: Rust infections alter rates of photosynthesis, respiration, and transpiration and cause reduction in overall plant vigor and yield (Agrios, 2005). Peach fruit infections can result in large economic losses. If there is a high incidence of early leaf infections, midseason defoliation of trees and numerous fruit infections at harvest can occur. Infected fruit are rejected or downgraded by packers or processors. Sunken fruit lesions for canning peaches cannot be removed by peeling. Downgraded fruit go for juicing, which decreases the economic returns to the grower. Early and severe defoliation will reduce yields and stimulate the growth of unnecessary new leaves and buds late in the growing season (Adaskaveg et al., 2000; Ogawa, 1995; Ogawa and English, 1991).

Prune trees abscise their infected leaves. Early severe defoliation in Australia was shown to increase early fruit drop or decrease fruit size, and repeated defoliation during the growing season over several years slowly weakened trees and rendered them unproductive (Kable et al., 1984). However, Teviotdale et al., 1994, did not observe these effects during a treatment study of French prunes in Yuba or Tulare counties, where they did not see a deleterious effect of rust infection.

Worldwide Distribution:

Africa: *Algeria, Canary Islands, South Africa.* Asia: *China, Iran, Israel, Japan, Korea, Hong Kong, Oman, Pakistan, Taiwan, Turkey, Viet Nam.* Europe: *Belgium, Bulgaria, Czech Republic, Denmark, Germany, Greece, Norway, Ukraine, United Kingdom.* Oceania: *Australia, New Zealand.* Central America: *Colombia, Costa Rica, Ecuador, Panama.* North America: *Canada, Mexico, United States (California Florida, Georgia, Hawaii, Iowa, Kansas, Minnesota Mississippi, Montana, Oregon, South Dakota, Texas, Washington, Wisconsin).* South America: *Argentina, Brazil, Chile, Uruguay* (Farr and Rossman, 2020).

Official Control: *Tranzschelia discolor* f. sp. *domestica* is on USDA-PCIT's harmful organism list for Korea, *Tranzschelia discolor* f. sp. *persica* is on the harmful organism list for Canada and Korea (USDA PCIT, 2020).

California Distribution: Contra Costa, Fresno, Merced, Orange, Placer, Riverside, San Joaquin, San Luis Obispo, Santa Barbara, Santa Cruz, Stanislaus, Tulare, and Ventura counties (CDFA PDR Database; French, 1989).

California Interceptions: None

The risk *Tranzschelia discolor* would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** This is an obligate pathogen that will be able to survive in climates where its hosts are grown

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 is limited to *Prunus* plus the alternate hosts, *Anemone* spp.

Evaluate the host range of the pest.

Score: 2

- 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 pathogen uses multiple types of spores to reproduce, including an autoinfectious urediniospore that cause multiple, secondary disease cycles. However, they do not cross-infect other *Prunus* spp.

Evaluate the natural and artificial dispersal potential of the pest.

Score: 2

- 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:** Rust pathogens rarely kill their hosts. However, heavy infection can result in twig cankers and significant loss of leaves. Additionally, the fruit can be infected and left unmarketable.

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

Economic Impact: A, B

- 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: 2

- 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: *Tranzschelia discolor* has been reported on native California *Prunus* spp. including desert peach (*P. andersonii*), Klamath plum (*P. subcordata*), desert almond (*P. fasciculata*), and wild almond (*P. fenzliana*) by Lopez-Franco and Hennen, 1990. It also impacts home and urban gardening, plus ornamental plantings of exotic, ornamental *Prunus* sp.

Environmental Impact: A, 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: 3

- 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 *Tranzschelia discolor*: Medium

Add up the total score and include it here. **12**

-Low = 5-8 points

-Medium = 9-12 points

-High = 13-15 points

- 6) Post Entry Distribution and Survey Information:** Evaluate the known distribution in California. Only official records identified by a taxonomic expert and supported by voucher specimens deposited in natural history collections should be considered. Pest incursions that have been eradicated, are under eradication, or have been delimited with no further detections should not be included.

Evaluation is 'high'. *Tranzschelia discolor* is widespread in California

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: (Score)

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

Uncertainty:

None

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Tranzschelia discolor* is C.

References:

Adaskaveg, J., Soto-Estrada, A., Förster, H., Thompson, D., Hasey, J., Manji, B. and Teviotdale, B., 2000. Peach rust caused by *Tranzschelia discolor* in California. UCANR Publications.

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USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PEXD) Harmful Organisms Database Report. *Tranzschelia discolor*. Accessed 10/30/2020

Responsible Party:

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***Comment Period: 12/07/2020 through 01/21/2021**

*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 [permits\[@\]cdfa.ca.gov](mailto:permits[@]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
