Peach Rust[1]

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Introduction

Peach rust is a fungal disease commonly found on the leaves of peach trees and occasionally on their twigs or fruit. In cooler, less-humid climates, the disease rarely becomes a management concern. However, Florida's frequent summer rainfall can provide favorable conditions for fungal diseases like peach rust. Orchards with severe symptoms can suffer significant economic losses due to defoliation, premature bloom, and early budbreak in late autumn, all of which may reduce the cropping potential for the subsequent season.

Tranzschelia discolor causes rust disease in peach. The fungal pathogen is spread by airborne spores, which depend on moisture for infection. Peach trees are most susceptible to new infections and symptom development when water from precipitation or irrigation remains on leaves for extended periods of time. All currently available cultivars of peach in Florida are susceptible to the disease (Adaskaveg et al. 2012). Management practices such as sanitation, scouting for disease, and fungicide applications can help reduce the adverse impacts of this disease.

Shoot and Leaf Symptoms

The pathogen can survive in twig cankers or on leaves with rust that remain on trees through winter; in spring, they produce spores to start an epiphytotic. However, in Florida, twig cankers are not common. Spores germinate with adequate moisture, and water-soaked lesions develop after petal fall on 1-year-old fruiting wood. These lesions swell and rupture to form cankers that appear as blisters with splits measuring up to ¼-inch long that run lengthwise along the bark. Cankers are typically found on the upper, reddish side of the twig and can be seen with a 20x hand-held magnifying lens (Adaskaveg et al. 2012).

A few days after the lesions emerge, rusty brown, powdery masses of spores (urediniospores) are produced in the cankers. If these masses of spores are found, it is best to confirm the disease by sending a plant sample to a local diagnostic clinic, as cankers may otherwise be confused with hail damage or large lenticels (Adaskaveg et al. 2000).

Leaf lesions are the most common symptoms of peach rust observed in Florida and usually develop after cankers form in the spring. Leaf lesions can continue to develop through the summer and into the fall, increasing disease severity (Adaskaveg et al. 2012). The earliest leaf lesions are found in the immediate proximity of twig cankers because moisture from precipitation or irrigation splashes the spores onto nearby leaves. Initially, lesions develop as pale yellowish-green spots on both upper and lower surfaces of a leaf. As the disease progresses, lesions on the upper surface of the leaf become bright yellow, angular spots (Figure 1). As the lesions mature, they become necrotic, leading to defoliation. Lesions on the lower surface of the leaves develop rust-brown spore masses similar to those observed

1. This document is HS1263, one of a series of the Horticultural Sciences Department, UF/IFAS Extension. Original publication date June 2015. Visit the EDIS website at http://edis.ifas.ufl.edu.

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on twig cankers. Finally, at the end of the growing season, leaf lesions may turn dark brown to black as they produce overwintering structures (Adaskaveg et al. 2000).

Early-season leaf infections can give rise to premature defoliation, reduced yields, and a high number of fruit infections at harvest (Adaskaveg et al. 2012). In Florida, defoliation leading to premature flowering is the main concern because it reduces yields in the following year.

Figure 1. Peach rust leaf symptoms showing small yellow necrotic areas (left), and rust-colored fungal spores on the leaf underside (right).
Credits: M. Olmstead

Fruit Symptoms

Fruit lesions may develop during the growing season following leaf symptoms; however, fruit lesions are not often observed in Florida because our varieties are early-maturing. If later-maturing varieties are grown, fruit lesions may be observed. On immature, yellow or green fruit, lesions first develop as small, brownish spots (about 0.1 inch diameter) with green halos (Figure 2). When the fruit matures and develops darker skin color (blush), these lesion halos become greenish-yellow. The lesions are sunken and extend several millimeters into the fruit (Adaskaveg et al. 2012). Numerous infections may develop on each fruit, and these can lead to secondary infections by other fungal species and cause fruit decay.

Fruit symptoms may resemble damage caused by stink bugs, so it is important to confirm the diagnosis of rust by sending a plant sample to the UF Plant Diagnostic Disease Center to be tested for rust spores.

Disease Cycle

The life cycle of *T. discolor* includes multiple spore stages that develop on two different hosts (Figure 3). The spore stages are urediniospores, teliospores, basidiospores, and aeciospores (Adaskaveg et al. 2000). The asexual urediniospores may overwinter in stem cankers and in pustules on leaves that remain from the previous season in mild years. The sexual life cycle is also known to occur when overwintering teliospores that are formed on a peach tree during the growing season germinate to produce basidiospores capable of infecting alternate hosts, the identity of which are unknown in Florida. Aeciospores are then produced on alternative hosts that can reinfect a peach tree and produce rust lesions with urediniospores in the spring (Adaskaveg et al. 2000).

The importance of the two spore cycles for initial inoculum production in Florida is not well understood, and alternate hosts may not be as important as in other peach production areas; however urediniospores from leaf lesions and possibly twig cankers are produced in abundance and are responsible for secondary spread to peach leaves. Urediniospores are disseminated by wind. Splashing from rainfall and higher wind velocity result in increased numbers of airborne spores (Adaskaveg et al. 2000). Under favorable environmental conditions, rust disease symptoms can become severe following repeated infection cycles on leaves and fruit.

Figure 2. Typical fruit lesions on mature fruit, which is atypical for peach production in Florida.
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Management

Peach rust is managed with a fungicide treatment in spring. If the problem was severe the previous year, several fungicide treatments may be necessary in spring as soon as the trees leaf out; however, management for peach scab often will be effective for peach rust. Because damp conditions favor rust development, angle sprinklers to avoid wetting the foliage. Drip irrigation is best because it does not increase the humidity in the orchard as much as sprinkler or microsprinkler irrigation does (Rouse and Roberts 2000).

To be effective, treatments must be started before rust symptoms are severe, and multiple applications of fungicides with different modes of action may be required to achieve acceptable disease control during conditions favorable for the disease favorable conditions. Although all commercial varieties can get peach rust, scouting the most susceptible varieties may help producers detect the disease earlier.

Treatment with sulfur is cost-effective and acceptable for use in an organically certified crop. Do not apply sulfur at high temperatures (>90°F) because this may cause burning symptoms on leaves. Sterol inhibiting fungicides (Fungicide Resistance Action Committee [FRAC] code 3 below) are systemic options that are efficacious and generally more expensive than sulfur (Rouse and Roberts 2000). Products with active ingredients in the quinone outside inhibitor (QoI, FRAC group 11) and succinate dehydrogenase inhibitors (SDHI, FRAC group 7) listed below have the greatest potential efficacy. Systemic and site-specific fungicides should be tank-mixed or rotated according to the specific product labels to reduce the likelihood of fungicide resistance. See Table 1 for additional product, rate, and timing information.

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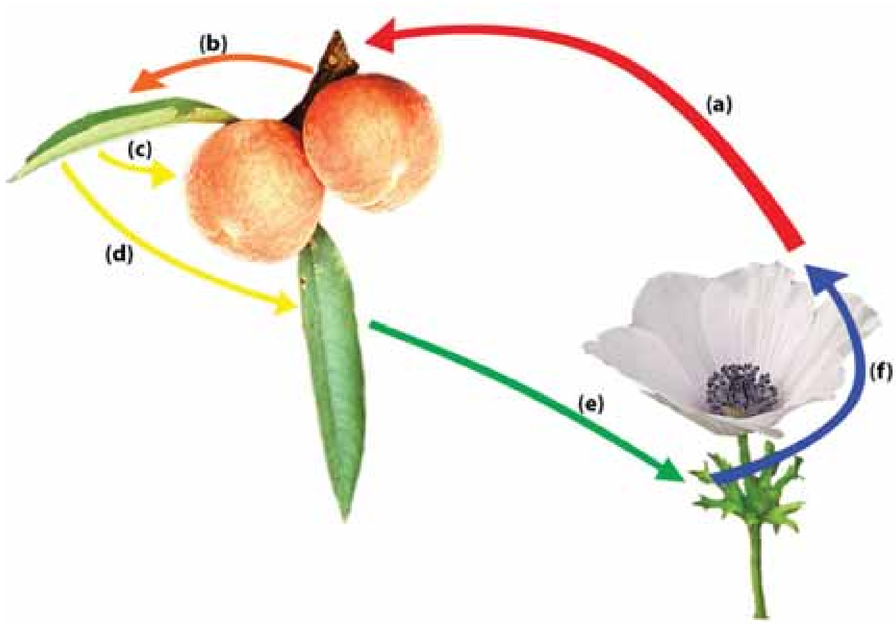

Figure 3. Path of *T. discolor* between peach and an alternate host, poppy anemone: a) aeciospore infects peach twig; b) urediniospores move from twig to leaf; c) urediniospores move from leaf to fruit; d) other urediniospores on leaf develop teliospores, which are overwintering structures; e) overwintering structures produce basidiospores, which infect the alternate host; f) aeciospores are produced on poppy anemone, which restart the cycle.
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Table 1. Fungicide product, rate, and timing information

Material	FRAC Code (2015)	Rate/Acre	Effectiveness[z]	REI/PHI	Remarks
sulfur	M2	18 lbs./100 gal	++	24 hrs./0 days	
Chlorothanil					
Bravo Weather Stik	M5	3–4 pts.	+++	12 hrs./do not apply after shuck split	Chlorothalonil provides 14–21 days of scab control. Chlorothalonil is not labeled for use after shuck split, but can be used after harvest. Chlorothalonil and captan are severe eye irritants. Although the restricted-entry interval expires after 12 hours, for 7 days after use, entry is permitted only when the following safety measures are provided: 1. At least one container designed specifically for flushing eyes must be available in operating condition at the mandatory WPS-required decontamination site. 2. Workers must be informed, in a manner they can understand: • that residues in the treated area may be highly irritating to their eyes. • that they should take precautions, such as refraining from rubbing their eyes, to keep the residues out of their eyes. • that if they do get residues in their eyes, they should immediately flush their eyes using the eyeflush container that is located at the decontamination site or using other readily available clean water. • how to operate the eyeflush container.
Bravo Ultrex WDG		2.8–3.8 lbs.			
Equus 720 or ECHO 720					
Captan					
Captan 50W	M4	4–6 lbs.	+++	24 hrs./0 days	
Captan 80WDG		2.5–3.75 lbs.			
Captec 4L		2–3 qts.			
Azoxystrobin					
Abound	11	9.0–15.5 fl. ozs.	++++	4 hrs./0 days	
Tebuconazole					
Tebuzol 45DF	3	4 oz.	++	12 hrs./0 days	For peaches only, 9.0–15.5 fl. ozs. can be used for scab control. For scab, begin applications at petal fall and continue at 7–14 day intervals per label. Do not apply more than two sequential applications of Group 11 fungicides before alternation with a fungicide that is not in Group 11. For optimal resistance management, use Abound only once per year and follow up with chlorothalonil at shuck split. On larger trees, the per acre rate may be increased to 8 oz. of Tebuzol.
Orius 20AQ		10.75–17.2 oz.			
Tebuconazole plus **trifloxystrobin**					
Adament 50 WG	3 + 11	4–8 oz.	+++	12 hrs./24 hrs.	
Fenbuconazole					

Material	FRAC Code (2015)	Rate/Acre	Effectiveness[z]	REI/PHI	Remarks
Indar	3	2 oz.	++	12 hrs/0 days	
Difenoconazole plus **cyprodinil**					
Inspire Super	3 + 9	16–20 fl. oz.	+++	12 hrs/0 days	
Pristine	11 + 7	10.5–14.5 oz	++++	12 hrs/0 days	
QoI/SDHI mix: **pyraclostrobin** plus **fluxapyroxad**					
Merivon Xemium	11 + 7	4–6.7 fl oz	++++	12 hrs/0 days	Under certain conditions, mixtures of Merivon Xemium with adjuvants, additives and/or other products may cause crop injury, particularly to fruit within two weeks of harvest. DO NOT use Merivon Xemium with: • Emulsifiable concentrate (EC) or solvent-based formulation products. • Crop oil concentrate (COC), methylated seed oil (MSO) adjuvants.
penthiopyrad					
Fontelis	7	14–20 fl oz	++	12 hrs/0 days	

[z]Effectiveness ratings range from +, slightly effective, to ++++, highly effective.

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