

**APHIS-Approved Fungicides for *Elsinoë australis*,
Causal Agent of Sweet Orange Scab (SOS)
For Use in Plant Nurseries**

Citrus spp. and *Fortunella* spp. nursery stock from SOS quarantined areas can move with a limited permit interstate to non-commercial citrus-producing States provided that ***all conditions of the SOS Federal Order are met***, including scheduled nursery inspections and pre-shipment inspections to verify absence of SOS, and the plants are treated with an APHIS-approved fungicide. **Treatment of nursery stock with fungicides alone, is not a substitute for all the additional requirements of the Federal Order. Nursery establishments must have a signed compliance agreement with APHIS.**

All fungicides that are used must be registered for use in the State in which they are being applied. The treatment must be applied in accordance with all label directions. Applications must be made within the confines of a nursery that has a signed compliance agreement with APHIS. Precautions must be taken to prevent spray drift, contamination of water, and contact with all wildlife, including federally protected species.

Fungicides registered for managing *Elsinoë australis*, the causal organism of SOS, have different modes of action. Although all fungicides work best when applied prior to disease onset, some offer protection only when applied pre-infection (protectant), while others offer some level of control when applied post-infection.

- Copper-based active ingredient products such as Kocide, TopCop, and others are examples of fungicides that prevent spore germination and provide a protectant effect. They are not effective protection if plant tissues are already infected with the fungus prior to application.
- Strobilurin active ingredient products such as Gem and Headline prevent fungal spore germination and consequently host penetration, but again do not protect nursery stock from SOS once tissues are infected.
- As a general rule, products with triazole active ingredients prevent further development of established infections and may also suppress sporulation. The fungicides Enable, BannerMaxx, Bumper EC, Orbit, ProCon-Z and Tilt are expected to provide this effect to varying degrees. These fungicides are important to nursery production but their use alone, on nursery stock that is infected with SOS, will not qualify plants for interstate shipment.
- Mixing strobilurin and triazole products, or using a premix product, provides the greatest control potential due to the dual mode of actions consisting of enhanced residual activity from strobilurins, and greater in-plant movement from triazoles.

Table 1. Fungicides for managing Sweet Orange Scab on Citrus Nursery Stock

Active Ingredient	Product Name	Company	FRAC ³ Group	Re-entry Interval (hours)
Copper hydroxide	Kocide 3000 ^{1,2}	Dupont	M1	24
Copper sulfate + sulfur	TopCop w/sulfur ²	Stoller	M1+M2	24
Fenbuconazole	Enable ²	Dow	3	12
Propiconazole	BannerMaxx	Syngenta	3	12
Propiconazole	Bumper EC	Makhteshim	3	12
Propiconazole	Orbit	Syngenta	3	12
Propiconazole	ProCon-Z	Loveland	3	12
Propiconazole	Tilt	Syngenta	3	12
Trifloxystrobin	Gem ²	Bayer	11	12
Pyraclostrobin	Headline ²	BASF	11	12

¹Phytotoxicity may occur on young tender flush in greenhouses and shade houses.

²Specifically lists control of *Elsinoë fawcettii*, causal organism of Citrus scab on the label.

³FRAC, Fungicide Resistance Action Committee

Note: Table is used for illustrative purposes only and list of products is not exhaustive. Product inclusion does not infer endorsement by USDA APHIS. Always read and follow label instructions. The products listed are registered for use in the following citrus producing states: AL, AZ, CA, FL, GA, LA, MS, TX

References:

USDA APHIS PPQ. 2010. Survey and Treatment of Nurseries from Known Sweet Orange Scab (*Elsinoë australis*) Infested Areas. Personal communication, C. Hollingworth to L. Evans-Goldner, on file with USDA APHIS PPQ EDP.

USDA APHIS PPQ, December 2010. Federal Domestic Quarantine Order. *Elsinoë australis* Bitanc. & Jenkins, Causal Agent of Sweet Orange Scab (SOS).
http://www.aphis.usda.gov/plant_health/plant_pest_info/citrus/sweet_orange.shtml

USDA APHIS PPQ, March 2011. Federal Domestic Quarantine Order. *Elsinoë australis* Bitanc. & Jenkins, Causal Agent of Sweet Orange Scab (SOS).
http://www.aphis.usda.gov/plant_health/plant_pest_info/citrus/sweet_orange.shtml