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.

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 not listed, are examples of fungicides that prevent spore germination and strictly provide a protectant effect. They are not effective at preventing infection if plant tissues are infected with the fungus prior to application as they adhere to plant tissues by means of surfactants and adjuvants.
- Strobilurin active ingredient products such as Gem and Headline prevent fungal spore germination and consequently host penetration, but provide little effect after tissues are colonized. These products have trans-laminar, albeit systemic, movement within plant tissues.
- As a general rule, products with triazole active ingredients prevent further development of established infections and may also provide some anti-sporulant activity. Enable, BannerMaxx, Bumper EC, Orbit, ProCon-Z and Tilt are expected to provide this effect to varying degrees.
- 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

[1]Phytotoxicity may occur on young tender flush in greenhouses and shade houses.
[2]Specifically lists control of *Elsinoë fawcettii,* causal organism of Citrus scab on the label.
[3]FRAC, 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* *B*itanc. & Jenkins, Causal Agent of Sweet Orange Scab (SOS). http://www.aphis.usda.gov/plant_health/plant_pest_info/citrus/sweet_orange.shtml