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2025–2026 Florida Citrus Production Guide: Alternaria Brown Spot[1]

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Alternaria brown spot, caused by the fungus *Alternaria alternata*, affects Minneola tangelos, Dancy tangerines, Murcotts, and less frequently Orlando tangelos, Novas, Lees, and Sunburst. The susceptibility of many newer tangerine cultivars to Alternaria brown spot is unknown at this time. Of the newer cultivars, Sugar Belle® is known to be highly tolerant, but Marathon is at least moderately susceptible and possibly highly susceptible. In rare cases, *Alternaria* may also infect grapefruit. Where severe, the disease results in extensive fruit drop and must be controlled on processing and fresh-market fruit.

Spores of *Alternaria* are airborne. Most spores are produced by lesions on mature leaves in the canopy or recently fallen infected leaves in the leaf litter on the grove floor. Many cultural management practices are helpful in reducing the severity of Alternaria brown spot. When new groves of susceptible cultivars are planted, they should be established with disease-free nursery stock. Trees grown in greenhouses without overhead irrigation are usually free of Alternaria but should be inspected carefully to ensure that no trees have unexpected lesions. Even though spores are airborne, plantings of healthy trees will remain disease-free for long periods. If Alternaria is present from the outset, the fungus builds to high populations during the period of vegetative growth on young trees and subsequently is difficult to control on fruit. When establishing new plantings, it is best to locate susceptible cultivars in higher areas where air drainage and ventilation are good and leaves dry more rapidly. Less vigorous rootstocks, such as Cleopatra mandarin, should be selected rather than vigorous stocks, such as Carrizo citrange. Minneola tangelo groves in low, wet areas have conditions so favorable for Alternaria brown spot that it may be virtually uncontrollable there. Susceptible trees should be spaced more widely than oranges to promote rapid canopy drying. In existing plantings, it is important not to promote excessive vegetative growth. Overwatering and excessive fertilization should be avoided. Light hedging should be done regularly rather than hedging severely but less frequently.

Copper fungicides, Ferbam, Amistar Top, Gem, Headline, Pristine, and Quadris are the registered products that are effective for disease control. Disease favorability varies considerably according to the cultivar susceptibility, the grove disease history, and the environmental conditions each year. Generally, the first spray should be applied when the spring flush is about ¼–½ of full expansion and before

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disease development. In severe cases, another spray may be needed when the flush is near full expansion because, if high levels of infection occur on the spring flush, brown spot becomes difficult to control on fruit. Another spray should be applied shortly after petal fall. Ferbam, Amistar Top, Gem, Headline, Pristine, or Quadris may be the best choice for one or both of these two applications, especially if the grove has problems with both citrus scab and Alternaria brown spot. Thereafter, all sprays should be applied solely to maintain a protective coating on the fruit. During April and May, applications may be needed as often as every 10 days or as infrequently as once per month. Spray intervals should be determined based on the frequency of rainfall and grove disease history. By June, high rainfall and humid nights usually assure an abundant supply of inoculum and favorable conditions for infection. In most cases, two applications will be needed during this month. Copper fungicides may blemish the fruit if applied during hot weather. Thus, Amistar Top, Gem, Ferbam, Headline, Pristine, or Quadris are good substitutes for copper applications as needed from May to July. The fruit generally becomes resistant by early to mid-July, although affected fruit may continue to drop for some time afterward. The scenario described is for difficult cases, and it is sometimes possible to use many fewer sprays.

The preferred method to time fungicide sprays is the ALTER-RATER, a weather-based model. Table 1 indicates the points assigned in the ALTER-RATER model. Brown spot is most severe when rainfall is greater than 0.1 inch, daily leaf wetness duration exceeds 10 hr, and average daily temperature is between 68°F and 83°F. Daily leaf wetness estimations for FAWN stations can be found on the Citrus Advisory System website, under the daily summary tab for each station. Table 2 indicates the suggested thresholds to be applied with the ALTER-RATER. Make a fungicide application when the threshold is reached.

With such frequent sprays, low rates of copper may be used. With average-quality products, usually about 2 lb of metallic copper per acre is needed for each three-week period, or 1 lb if sprays are more frequent. Even lower rates of metallic copper can be used if high-quality products are employed. The copper residue levels over time can be monitored with the use of the Citrus Copper Application Scheduler. More details are available in EDIS publication PP289, "A Web-Based Tool for Timing Copper Applications in Florida Citrus".

Fungicide Resistance

Amistar Top, Gem, Headline, Pristine, and Quadris are all strobilurin-containing fungicides, and Alternaria has been documented to be resistant to strobilurins in most parts of the Florida tangerine production areas. Strobilurin (FRAC 11), DMI (FRAC 3), or SDHI (FRAC 7) fungicides should not be used for Alternaria control more than four times in a season; never use more than two applications of the same mode of action in a row. Gem is slightly less effective for control of this disease and should be used at the high rate where disease is moderate to severe. Ferbam is less effective for Alternaria control than copper, Amistar Top, Gem, Headline, Pristine, or Quadris.

DO NOT APPLY AMISTAR TOP, GEM, HEADLINE, PRISTINE, OR QUADRIS IN NURSERIES. Application of these fungicides in nurseries can result in selection of resistant strains, which are then distributed on nursery stock to groves.

Web Addresses for Links

Citrus Advisory System: http://agroclimate.org/tools/cas/

Citrus Copper Application Scheduler: http://agroclimate.org/tools/citrus-copper-application-scheduler/

EDIS publication PP289, "A Web-Based Tool for Timing Copper Applications in Florida Citrus": https://doi.org/10.32473/edis-pp289-2012

Recommended Chemical Controls

READ THE LABEL.

See Table 3.

Rates for pesticides are given as the maximum amount required to treat mature citrus trees unless otherwise noted. To treat smaller trees with commercial application equipment including handguns, mix the per-acre rate for mature trees in 125 gal of water. Calibrate and arrange nozzles to deliver thorough distribution, and treat as many acres as this volume of spray allows.

Table 1. The number of points assigned to each day with ALTER-RATER according to the environmental conditions on that day. Daily point scores are added until the selected spray threshold is reached.

Rainfall > 0.1 inch	Leaf Wetness > 10 hr	Avg Daily Temp (°F)	Daily Points Assigned
+	+	68–83	11
+	+	> 83	8
+	+	< 68	6
+	–	68–83	6
+	–	> 83	4
+	–	< 68	3
–	+	68–83	6
–	+	> 83	6
–	+	< 68	4
–	–	68–83	3
–	–	> 83	0
–	–	< 68	0

Daily leaf wetness estimations for FAWN stations can be found on the Citrus Advisory System website, under the daily summary tab for each station.

Table 2. Suggested threshold scores to be used in different situations with the ALTER-RATER.

Suggested Threshold Scores	Situation
50	Heavily infested Minneola, Dancy, Orlando, Sunburst; many flatwoods groves, east coast and SW Florida
100	Moderately infested Minneola or Dancy, many Murcotts; ridge and north Florida groves
150	Light infestations, any cultivar; mostly ridge and north Florida groves

Table 3. Recommended chemical controls for Alternaria brown spot.

Pesticide	FRAC MOA[1]	Mature Trees Rate/Acre[2]
copper fungicide	M 01	Use label rate.
Ferbam Granuflo	M 03	5–6 lb. Maximum 3 applications a year, and do not apply more than 7.9 lb (6 lb ai)/acre in a single application.
Amistar Top[4]	11/3	15.4 fl oz. Do not apply more than 61.5 fl oz (0.2 lb azoxystrobin and 0.08 lb difenoconazole)/acre/season for all uses. Do not apply more than 0.5 lb ai/acre/season of difenoconazole. Do not apply more than 1.5 lb ai/acre/season of azoxystrobin. Do not apply more than 3 applications/season. Minimum retreatment interval is 7 days.
Gem 500 SC[3]	11	1.9–3.8 fl oz. Do not apply more than 15.2 fl oz/acre/season for all uses. Do not apply within 7 days of harvest.
Headline SC[3]	11	12–15 fl oz. Do not apply more than 54 fl oz (0.88 lb ai)/acre/season for all uses.
Pristine[4]	11/7	16–18.5 oz Do not apply more than 74 oz/acre/season for all uses, which is equivalent to 1.17 lb a.i./acre/season of boscalid and 0.592 lb a.i./acre/season of pyraclostrobin. Up to 0.88 lb a.i./acre/season of pyraclostrobin can be used. Minimum retreatment interval is 10 days.
Quadris[3]	11	12.0–15.5 fl oz. Do not apply more than 90.0 fl oz (1.5 lb ai)/acre/season for all uses. Minimum retreatment interval is 7 days.

[1] Mode of action class for citrus pesticides from the Fungicide Resistance Action Committee (FRAC) 2024. Refer to chapter 4, "Pesticide Resistance and Resistance Management", for more details.
[2] Lower rates can be used on smaller trees. Do not use less than minimum label rate.
[3] Do not use more than 4 applications of strobilurin fungicides/season. Do not make more than 2 sequential applications of strobilurin fungicides. Do not use in citrus propagation nurseries.
[4] Do not make more than 4 applications of Pristine or Amistar Top/season. Do not make more than 2 sequential applications of Pristine or Amistar Top before alternating to a non-strobilurin, SDHI, or DMI fungicide.