

FUNGAL FOLIAR DISEASES - A REFRESHER

By Megan Dewdney

February is the time to start thinking about fungal disease control for the upcoming season. Protecting the spring flush to sustain high yields is important. Fungal foliar diseases are most important for those producing fresh market citrus because of fruit blemishes, but some diseases like greasy spot are a concern for all growers. These days when Huanglongbing (HLB) is everyone's major concern, fungal foliar diseases can seem like a minor problem. But it must be remembered that fungal foliar diseases can weaken a tree through defoliation and cause fruit drop, further lowering yields. Defoliation can lead to an increase in the number of flushes over the summer when it has become important to manage the trees for a reduced number of flushes to make them less attractive to psyllids.



Greasy spot symptoms on grapefruit leaves

GREASY SPOT

Greasy spot, caused by *Mycosphaerella citri*, is a problem on all citrus cultivars for both processing and fresh market fruit. Ascospores (sexual stage spores) are produced in the leaf litter during the winter months. Change in irrigation practices to micro-sprinklers has caused the ascospore release period to take place earlier in the spring than historically — a phenomenon previously documented by Pete Timmer, retired University of Florida plant pathologist. The majority of ascospores is now ejected between April and June. Despite the earlier ejection period, the

epiphytic growth (on the surface of the plant) and infection conditions are still optimal between June and September with warm and humid summer nights. Just before this period is when the fungus is most vulnerable, which suggests the best spray timing. Once the fungus has become well established within the leaf tissue, control becomes difficult.

In these times when many growers also need to control citrus canker, the use of copper for greasy spot is being promoted in favor of other products in an attempt to minimize production costs. Copper also has a greater residual effect on fruit than most other products. Because the *M. citri* is present on the underside of the leaf, slower tractor speeds (2.5 mph) and higher spray volumes (250 gallons/acre) are

recommended when spraying for greasy spot than for other diseases or pests to ensure good coverage. On processing Valencias, a single application of copper or copper and oil when applied in mid-May to June will give sufficient control providing the disease was not severe the year before. On more susceptible cultivars such as grapefruit or early season oranges, at least two copper applications will be necessary at mid-May to June and after the summer flush is expanded. For fresh fruit where rind blotch has been problematic, a third application may be necessary in August. If canker is not a problem or insufficient greasy spot control is achieved with copper, the horticultural oils, strobilurin fungicides (Abound, Gem or Headline) or fenbuconazole (Enable) are still very good options for one application, especially for the May-June timing.

MELANOSE

Melanose can be problematic on all citrus cultivars but is especially severe on fresh grapefruit. Since the inoculum from *Diaporthe citri* (aseexual stage *Phomopsis citri*) is found in dead twigs,



Melanose on grapefruit

groves that are less than 10 years old generally do not have serious problems with melanose. The fungus is able to produce asexual spores (known as conidia) in flask-shaped pycnidia embedded in the wood. Spores are produced on infected twigs from the previous season or twigs that were healthy when they died and subsequently colonized. Because conidia are produced in dead wood, the disease can be especially bad in years where a freeze has killed many small branches. If HLB-infected trees are not removed and left to decline, they will also become sources of spores in a grove. Conidia ooze from the opening of the pycnidia in a tendril during periods of high humidity or rain and are splashed onto susceptible young leaves and fruit.

Ten to 12 hours of leaf wetness, which is not uncommon in Florida especially in the center of a canopy, are required for an infection to take place if temperatures are between 70-80°F (21-27°C). Longer leaf wetness periods of up to 24 hours are needed if temperatures are cooler. No spores are produced from infections that occur on the leaves and fruit. Copper is the most economical option for melanose control because of the long residual activity, but residues decline with fruit expansion and rainfall. Residue levels can be estimated using the copper model available for download at http://www.crec.ifas.ufl.edu/crec_websites/fungal/dmodel.htm.

April is usually a dry month and fruit is expanding rapidly, so most melanose sprays are not initiated until mid-late April. For less susceptible

cultivars such as oranges and tangerines, one or two applications are usually sufficient for control unless there is substantial dead wood in a grove. For more susceptible fresh market grapefruit, melanose sprays should be initiated when the fruit are $\frac{1}{4}$ to $\frac{1}{2}$ inch. On average, copper applications are continued every three weeks until the fruit become resistant in early July. If copper is applied in early June, it can also serve as the first greasy spot application. If there is concern about fruit burn with copper in hot weather, strobilurin fungicides give good control, but should never be used more than twice in a row or in a season for melanose because of possible development of resistance to the fungicide.



Alternaria brown spot on Minneola

ALTERNARIA BROWN SPOT

Alternaria alternata is most problematic on fresh market tangerines and tangelos where it can cause blemishes in addition to considerable fruit and leaf drop in severe situations. Occasionally alternaria is a problem for grapefruit as well. Low regions in groves generally have more problems with Alternaria brown spot (ABS) because of longer leaf wetness periods. Conidia are produced on infected leaves in the canopy, twigs, recently fallen leaves and last season's fruit that are still on the tree. Spores become airborne when there is a sudden change in the humidity or a rain event greater than 0.1 inch (2.5mm). Leaf infection can occur in as little as four to six hours, but disease severity

increases with longer wetting periods. Optimum temperatures for infection are 73-80°F (23-27°C), but infection can occur at any temperature between 63-90°F (17-32°C).

Copper and strobilurin fungicides are available for ABS control. A first application should be made when the spring flush is $\frac{1}{4}$ to $\frac{1}{2}$ expanded. In a particularly bad year, another spray at full expansion may be necessary. A petal fall spray will be needed and a strobilurin is recommended at this point, especially if

there are also problems with scab. If rains are frequent in April and May, sprays may be needed every 10 days but as few as once a month is possible in a dry year and on more tolerant cultivars. Two spray applications are typically required in June because of frequent rain and by mid-July, the fruit become resistant. In most cases an attempt to reduce the number of applications based on grove disease history and weather forecasts is desired. The Alter-Rater, a disease forecasting

model, has been developed for this purpose and is available on the same web site as the copper model.

It is important to mention that a case of *A. alternata* resistance to strobilurins has recently been documented on citrus in Florida. Restricted use of strobilurin to the limit indicated on the label is important and never use strobilurins more than three times per year or apply strobilurins more than twice in a row. Once resistance has developed, the only remaining control options for ABS are copper and ferbam.

CITRUS SCAB

Citrus scab is a concern for fresh market citrus only because it is unsightly. The scab affects Temples,



Citrus scab on Temples

Murcotts, tangelos, some tangerine hybrids and grapefruit. Conidia are produced in one to two hours on the scab pustules that occur on leaves and fruit. Infection can occur in another three to four hours. Spores are splashed relatively short distances by rain or overhead irrigation, usually within a tree. Depending on the disease severity of the previous season, two or three sprays may be needed for scab. For adequate scab control in an affected block, a spray at petal fall and another approximately three weeks later are needed. With high disease severity, an additional spray at $\frac{1}{4}$ spring flush expansion will improve control. Copper is only moderately effective for citrus scab and is best used for the last spray.

Strobilurins, ferbam or fenbuconazole are recommended for the spring flush or the petal fall sprays, but not for both because of resistance concerns.

Further information on the control and biology of all of the fungal foliar diseases is available on the CREC Web site as well as in the 2009 Florida Citrus Pest Management Guide and EDIS (<http://edis.ifas.ufl.edu/>). The Florida Citrus Pest Management Guide can be purchased from your local county extension agent or is on-line for no charge at <http://www.crec.ifas.ufl.edu/extension/pest/index.htm>.

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