Fungi on my mind

By Megan Dewdney

HLB may be the hot issue, but there are some other more mundane issues that we have to deal with every day. We are approaching the time of year that fungal disease control becomes important for the upcoming season. Other than the blemishes that are particularly important for fresh fruit producers, fungal diseases can cause tree stress through defoliation and, in some cases, fruit drop. Defoliated, stressed trees will not have optimal yields. In addition, any measures that keep yields as high as possible while combating Huanglongbing (HLB) are important. While fungal diseases may not seem so crucial compared to HLB, control is still vital for overall tree health.

GREASY SPOT

Greasy spot, caused by *Mycosphaerella citri*, is a problem on all citrus cultivars and is a concern for processed or fresh market fruit. Greasy spot is unusual because of the epiphytic (on the surface of the plant) growth phase that occurs before infection. Most fungal diseases do not have such a phase. During the epiphytic phase, *M. citri* is most vulnerable to chemical control, but also enables the fungus to infect a large leaf area with relatively few spores. With the advent of microsprinklers, the major ascospore (sexual spores) ejection period now occurs from April to June, when conditions are not favorable for ascospore germination, rather than late June into July. The microsprinklers cause a wetting-drying pattern that accelerates ascospore maturation as well as leaf decomposition. Despite changing the major ascospore ejection period, greasy spot is still problematic most years, since many infections can result from few spores in the summertime when conditions are favorable in June and July.

Greasy spot symptoms on grapefruit leaves.

Copper is an effective and economical choice for greasy spot control, especially in groves with canker. However, if summer temperatures are high and the weather is dry, copper can cause phytotoxicity on the fruit. Application of copper with petroleum oil can also lead to rind defects during the summer months — most problematic for fresh fruit production. Therefore, copper is best applied on moderately warm days without any additives, including petroleum oil, at 2 lb./acre or less. If phytotoxicity is of particular concern, strobilurin fungicides (Abound, Gem, and Headline) or Enable (fenbuconazole) are also effective control options. The strobilurins are most appropriate in late May to early June because they also control melanose. No more than one application of strobilurins should be made within a season to avoid selection for resistant strains of *M. citri*. Enable is especially effective for mid- to late-season control of rind blotch.

Mudcake melanose on a young grapefruit. Note the dead twig just above the fruit which is the source of inoculum.

MELANOSE

Melanose control last year was especially difficult. The freezes in January and February 2009 killed many leaves and twigs. The fungus that causes melanose, *Diaporthe citri* (asexual stage *Phomopsis citri*), rapidly colonizes and sporulates on twigs that die from freeze damage and other causes. The spores (or conidia) are formed inside flask-shaped pycnidia that can be seen with the naked eye on twig surfaces as small black bumps. The many dead twigs allowed the fungus to produce much more inoculum than in a non-freeze year.

D. citri sporulates most rapidly and profusely on small, dead angular twigs that are less than half the diameter of a pencil. Normally, groves under 10 years old would not have much melanose since there are not many dead twigs in the canopy. But in 2009, even newly planted trees had some melanose if they had any dieback from the cold. On top of high inoculum production, the rains arrived in mid-May with a vengeance after a long dry spell at a time when the fruit was most susceptible. These rains not only stimulated flush production on trees, but also resulted in the production and splash dispersal of millions of spores. Spores are oozed from the opening of the pycnidia in a tendril. In Central Florida, the rain was steady for nearly two weeks which did not allow the foliage or fruit to dry, leading to more than adequate wetting periods for infection.

So last year, three factors came together: high inoculum production because of the freezes, rains that occurred when fruit was most susceptible, and extensive rains that dispersed the spores and provided long wetting periods for infection.

Only 10 to 12 hours of leaf wetness, not uncommon in

Florida, are required for infection if temperatures are between 70°F to 80°F (21°C to 27°C). However, melanose is not usually severe unless we have extended periods of leaf wetness. Even longer leaf wetness periods of up to 24 hours are needed if temperatures are cooler. No spores are produced from leaf and fruit infections.

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.

With grapefruit, copper applications are made every three weeks on average until 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 copper phytotoxicity in hot weather, strobilurin fungicides give good control, but should never be used more than twice in a row for melanose because of possible development of fungicide resistance. Strobilurins also do not have as long a residual activity as copper.

ALTERNARIA BROWN SPOT (ABS)

Alternaria alternata is a perpetual problem on fresh market tangerines and tangelos, causing blemishes in addition to considerable fruit and leaf drop with severe infections. Conidia are produced on infected leaves and twigs in the canopy, recently fallen leaves and last season's fruit remaining on the tree. Spores become airborne when there is a humidity change or more than 0.1 inch (2.5mm) of rain. Leaf infection occurs in as little as four to six hours, but disease severity increases with longer wetting periods. Optimum infection temperatures are 73°F to 80°F (23°C to 27°C), but infection can occur at any temperature between 63°F to 90°F (17°C to 32°C).

Alternaria on Minneola fruitlet that will likely cause the drop of this fruitlet.

Strobilurin resistance of *A. alternata* populations was first reported in Florida last year. Since that time, several more groves experiencing control failures with stobilurin fungicides have been reported. The first few groves to report control failure had a history of using the highest label rate of these fungicides many times a season. However, new cases of resistance have been found in groves where label rates were carefully followed. Clearly, fungicide resistance is an issue that should concern anyone producing tangerines and tangelos as it severely limits control options with only copper and Ferbam. The question of resistance and resistance management will be addressed in future articles in more detail than is possible here. While current strobilurin use recommendations will not prevent resistance, they will slow the development. Thus, it is important to restrict strobilurin use to the label limit and never use strobilurins more than three times per year and never apply strobilurins more than twice in a row.

POST-BLOOM FRUIT DROP (PFD)

While post-bloom fruit drop, caused by *Colletotrichum acutatum*, has not been a widespread problem in the last few years, there are some groves that have a problem with this disease each year. The most susceptible cultivars are Navels and Valencia. Conidia of *C. acutatum*, produced on the petals, are splash dispersed by rainfall from infected to healthy flowers. Infection occurs within 24 hours and symptoms are produced within four to five days of the infection event. For a major infection event, several cycles of infection and sporulation need to occur. For infection to occur across the state, a warm, wet winter that allows for inoculum to build up with continued warm wet conditions through bloom is needed. The worst PFD season was during an El Niño in 1997-98. Thus, the 2009-2010 season could be favorable for PFD development as we currently are in an El Nino phase. To help producers determine if a spray is warranted, a model is available at the same link as the melanose copper model.

Control options for PFD have become more limited in the last year with the withdrawal of Topsin M registration for citrus by the EPA. The strobilurin fungicides and Ferbam are still options for control either in combination or alone. Ferbam is not recommended alone as it does not provide enough control but can be used to reduce the potential for resistance and enhance the performance of the other fungicides.

Further information on the control and biology of all the fungal foliar diseases is available on the CREC Web site, as well as in the 2010 Florida Citrus Pest Management Guide and EDIS (http://edis.ifas.ufl.edu/). The Florida Citrus Pest Management Guide can be purchased from the IFAS Bookstore, or is on-line for no charge at http://www.crec.ifas.ufl.edu/extension/pest/index.htm.

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