Managing Alternaria brown spot

By L.W. Timmer, R. F. Reis, S.N. Mondal and N.A. Peres

Canker and greening may be the diseases that are on everyone's minds, but we still have to deal with the many everyday problems of production. Alternaria brown spot is the most serious disease of many popular tangerines and tangerine hybrids such as Minneola and Orlando tangelos, Murcotts, Sunburst, Novas and others. This disease probably requires more intense management than any of the other fungal diseases.

Alternaria brown spot (ABS) is caused by the fungus *Alternaria alternata*. This fungus produces a toxin that is responsible for most if not all of the disease symptoms. ABS causes black, necrotic spots on young leaves that can develop yellow halos as the leaves mature. Sometimes the toxin is translocated up the veins and produces a necrosis of the veinlets that is characteristic of the disease (Fig. 1). On highly susceptible cultivars, entire areas of the leaf may be killed and the leaves may abscise. Young twigs can often be affected. At times, affected leaves drop and infected twigs die back at the tip, leaving twigs in the top of the tree in the form of a shepherd's crook. Spots on fruit vary from small, black specks to lesions with large corky eruptions (Fig. 2).

Sometimes, pieces of tissue dislodge from the lesions, leaving depressed necrotic areas on the fruit. Fruit affected while young often falls and production can be severely affected by this disease.

Fig. 2. *Alternaria brown spot lesions on a Dancy tangerine fruit. Lesions vary from small black specks to large sunken craters.*

ABS is becoming much more widespread in the world by unknown means. We confirmed its presence in Brazil and Argentina in recent years and the disease has become very serious in those countries. It is even a problem in drier climates such as Italy and Spain and it has developed into a severe problem for production of Fortune tangerine in Spain. More recently, we have confirmed the presence of the disease in Peru, where it is severe on Minneolas, and in Iran, where it causes problems mostly for Fortune and Page production.

Tangerine cultivars, including Minneolas, Orlandos, Novas, Lees, Ponkan, Murcotts, Dancy and many others, that are susceptible to ABS carry a gene for susceptibility to the toxin. That gene is dominant and all of the offspring of susceptible parents are also susceptible. Many cultivars developed in Florida were derived from crosses of Dancy tangerine and thus are susceptible to the disease. However, within that group, cultivars may vary in their tolerance of the disease. We have found that we can distinguish the level of susceptibility of cultivars by inoculating leaves of different ages. For example, leaves of Minneola are susceptible even when they are fully expanded and nearly mature, whereas only very young leaves of Novas are susceptible. Thus, we will be able to evaluate any new cultivars emerging from plant improvement programs more effectively.

The disease cycle of ABS is relatively simple. Release of spores produced on infected tissues is triggered by rains or by sudden drops in relative humidity when the dew dries. Those spores become airborne and are carried by wind currents during the day, then deposited on susceptible tissues, where they germinate and infect during dew periods at night. Symptoms appear in as little as one or two days after infection. Spore production begins only after lesions are well developed about 10 days after they first appear and continues for about 40 days thereafter. If leaves fall, spore production continues on lesions

Fig. 1. *Alternaria brown spot lesions on a Minneola tangelo leaf. Note the characteristic necrosis running up the veins.*

for a few days on the grove floor, but then ceases as the leaves decay. Spores can also be produced on fruit and twigs, but are relatively few compared to the production on leaves. However, lesions on fruit and twigs may be important in the overw-inter survival of the pathogen.

In the 2004-05 season, Alternaria pressure was very low and growers found it relatively easy to control the disease in spite of quite favorable weather conditions for disease development in spring and early summer. We suspect that the hurricanes in 2004 stripped many of the leaves and fruit from trees, those tissues decayed quickly, and so there was little inoculum available by spring, making ABS easy to control. We doubt that we will be that fortunate again in 2006 and we will have to be careful to manage the disease well.

With highly susceptible cultivars like Minneolas, some growers have had good luck by planting trees on very wide spacings. That facilitates rapid drying and reduces the disease pressure and also encourages better fruit set. However, many fungicide applications are still needed for good disease control. The Alter-Rater model (http://www.crec.ifas.ufl.edu/timmer/Alterater.html) has proven effective in Florida, worked well for control of the disease on Murcotts in Brazil, and has been used in Spain and Australia as well. That system predicts the best time for sprays based on frequency of rains, duration of leaf wetness, and average daily temperature. Using a threshold level of 50 points, 10 to 12 sprays are recommended to achieve good control for highly susceptible cultivars such as Minneolas.

Usually, a higher threshold and fewer sprays can be used for Murcotts in Florida. However, in Brazil, good control with Murcotts required 10 to 12 sprays. The weather did not appear

to be very different from Florida since the Alter-Rater recommended a similar number of sprays in Florida and São Paulo, but the level of control achieved in Brazil was modest at best. ABS is so severe in some citrus-growing areas in Brazil that it may not be possible to grow susceptible cultivars there. We are not sure if the differences are due to the isolates of Alternaria present there or the selection of Murcott grown.

EFFECTIVE FUNGICIDES

The most effective fungicides for ABS control in Florida are copper products and strobilurin fungicides such as Abound, Gem and Headline. We recommend that copper fungicides form the basis of the program and that strobilurins be substituted whenever weather is hot and dry and there is a danger of copper damage to fruit. Due to the danger of development of resistance, strobilurins should not be applied twice in a row. In Brazil, mancozeb is also used, but it has a short residual and is thus not very effective in disease control. We have found that both copper and strobilurins not only prevent infection, but also greatly reduce spore production. Ferbam was ineffective in reducing sporulation. A single application of a copper fungicide or Headline suppressed sporulation for about 3 weeks (Fig. 3), and after that time, sporulation on lesions dropped naturally even on unsprayed leaves.

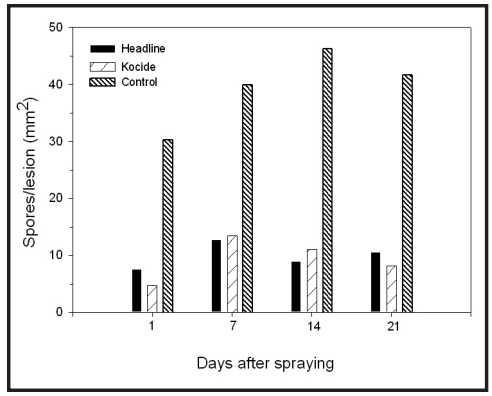

Fig. 3. *Spore production on leaf lesions of Minneola tangelo on leaves sprayed with Kocide, Headline or not sprayed.*

ADVICE FOR 2006

The best advice for the 2006 season is to apply copper or strobilurin fungicides on a schedule determined by the Alter-Rater model. Inoculum pressure may still be slightly less than in earlier years, but a high level of control will be needed for good returns.

The biggest problem will be to select an appropriate threshold for different locations and cultivars. For cultivars that have a low value, a higher threshold can be selected, so that sprays are applied only when conditions are most severe.

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