

A grapefruit block with a Casuarina windbreak from Salta in northwest Argentina.

# By Jim Graham, Bill Castle and Tim Spann

The citrus canker eradication program ended in January 2006 and the new Citrus Health Response Plan does not require removal of affected trees. Thus, growers should use their best judgment in managing canker. Losses under Florida conditions are likely to be substantial and indications are that canker will be very difficult to control on highly susceptible grapefruit and the most susceptible early orange varieties.

Presently, shipment of Florida-grown citrus to other citrus-producing states is prohibited even if the fruit have no symptoms. New regulations allow asymptomatic fruit to be shipped to other non-citrus producing states regardless of whether canker is present in the grove or not. Grove inspections can be used to keep symptomatic fruit out of packed cartons if fruit originates from cankerexposed groves. However, if canker incidence on fruits in a block is greater than 2 to 5 percent, the Argentina experience is that it will be difficult to eliminate all canker-affected fruit by culling in the packinghouse.

Canker is mostly a leaf and fruit spot disease, but when conditions are favorable, it causes defoliation and fruit drop. Fruit are particularly susceptible to bacterial penetration, beginning at about 3/4 inch in diameter when the stomates on the fruit surface open. Oranges or tangerines remain susceptible during the first

# **Report from Argentina...**

Observations on the effect of windbreaks on canker incidence on fruit in a grapefruit grove in Salta Province, Argentina

# By Beatriz Stein, Hernan Salas and Jacqueline Ramallo

The grapefruit grove had windbreaks of *Casuarina cunninghamiana*, approximately 36 feet tall, that were established at the same time as the grapefruit trees. Windbreaks were located on all four sides of three blocks in a double row with 6.5 feet within rows and 10 feet between rows. The distance from the windbreak to the first row of grapefruit was 30 feet.

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*Figure 1.* The percentage of fruit with canker at the end of season was evaluated for row No. 1, the row next to the north windbreak; No. 35 in the middle of the block; and No. 70, the row next to the south windbreak. The prevailing wind was from the southeast (row 70) to the northwest (row 1). Blocks did not receive copper sprays.

60 to 90 days and grapefruit for 120 days. Infection after that time may result in the formation of small and inconspicuous pustules. Most short-distance spread of canker bacteria is by wind and rain, that is, within trees or to neighboring trees. Consequently, canker is more severe on the side of the tree exposed to wind-driven rain.

## **WINDBREAKS**

Windbreaks are the single most effective means of reducing bacterial infection.

The vast majority of fruit infection occurs by wind-blown rain. Winds of 18 to 20 mph are needed to force bacteria into the stomatal openings on leaves and fruit. Windbreaks are shown to reduce wind speed for a distance of about 10 times the height of the windbreak. That is, a 30-foot tall windbreak will slow air movement for about 300 feet. Research from Argentina demonstrates that windbreaks greatly diminish the incidence of canker on fruit depending on the distance of trees from the protected sides of the block (see Figure 1 in accompanying sidebar).

The need for and the distance between windbreak rows will depend on the destination of the fruit, fresh or process market, and the susceptibility of the variety. For fresh market grapefruit, it is likely that each 5- to 10-acre block will need to be surrounded by a perimeter windbreak. For groves of less susceptible varieties, a windbreak down the row about every 300 feet may be sufficient. In situations where some protection already exists and/or tolerant varieties are grown for processing, use of windbreaks may be unnecessary. For more information on the selection of plant species and windbreak design, go to www.crec.ifas.ufl.edu/extension/ windbreaks/index.htm.

## **COPPER SPRAYS**

Copper products are quite effective in preventing infection of fruit, but much less effective for reducing leaf infection or spread of the disease. Application of copper to young leaves protects against infection, but the effect is soon lost due to rapid increase in the leaf surface area. Fruit grow more slowly and are easier to protect. Orange fruit is susceptible to infection from 3/4 inch in diameter until they develop resistance in mid- to late July. Grapefruit are susceptible from 3/4-inch diameter to full expansion in late September to mid-October. Infection through wounds can occur at any stage of fruit growth.

#### **PROCESSING ORANGES**

Infections of oranges that occur from May to July can cause premature fruit drop. With endemic canker, three copper sprays are recommended for early oranges grown at 21-day intervals - mid-May (3/4-inch stage), a second in early to mid-June, and the final one in early July or when fruit have reached about 1-1/2 inch diameter. For less susceptible Valencias and midseason varieties, two applications should be sufficient — beginning in mid-May (3/4-inch stage) and in early June. Varieties of early oranges grown for higher color score (Earlygold, Westin, Ruby, Itaborai) are more susceptible and will probably require additional copper sprays beyond July.

#### **FRESH GRAPEFRUIT**

Programs for fresh fruit are more complex, but many copper sprays are already used on these varieties. For fresh market grapefruit, a low rate of copper should be added to the spray of spring flush for scab. The subsequent copper sprays for melanose control should also control canker, but additional applications will be required every 21 days until they are fully grown in October.

It is suggested that copper be substituted for fungicides such as stobilurins that do not control canker. Petroleum oil or other adjuvants can be combined with copper, but do not improve the control compared to copper alone. Surfactants that increase the wetting of the leaf surface should be avoided as they may also increase bacterial penetration of the fruit surface.

#### **SPECIALTY FRUIT**

Most tangerines are fairly tolerant to canker. Programs used for control of Alternaria on Minneolas and Murcotts should also protect against canker, but copper will have to be used in each spray instead or in combination with strobilurin fungicides. Navel oranges are more susceptible to canker and will probably need to be sprayed every 21 days from late April to mid July. Fallglo is more tolerant and probably three sprays — one each in May, June and July — should suffice.

# COPPER RATES AND FREQUENCY OF SPRAYS

Spray programs for young fruiting trees may have to be adjusted as more experience is gained. Rates of copper products depend on the expected length of protection and the weather. As little as 0.5 to 1.0 lb of metallic copper will protect spring flush growth or fruit during the dry spring season. However, in the rainy season, more than one pound of metallic copper may be required to protect fruit for three weeks. Copper usage should be minimized as much as possible since this metal accumulates in soil and may cause phytotoxicity to the fruit peel or create environmental concerns.

## **LEAFMINER CONTROL**

Leafminers do not spread canker, but extensive invasion of leafminer tunnels by the bacterium greatly increases inoculum levels, making the disease difficult to control. Leafminers are not usually a problem on the spring flush, except on grapefruit, and no control may be needed at that time. Leafminer control on the first summer flush can reduce disease pressure considerably. Because late summer flushes tend to be more sporadic, effective control on these flushes is more difficult.

#### **NON-BEARING TREES**

Young fruiting trees with canker are at the most susceptible stage of tree development (maximum flush per canopy volume). Leafminer control is essential on young trees of all varieties to control canker. Since 2006, we have documented the reduction of canker on young trees by an Admire drench applied once at the beginning of the growing season. When control of canker by Admire is not principally attributed to leafminer control, our research has determined that a breakdown product of Admire in the tree induces systemic acquired resistance (SAR) to canker in the foliage that reduces disease. Admire loses effectiveness on trees more than 6 feet in height because the size of the tree reduces the concentration of the product in the tree based on the maximum allowable drench rate per acre.

The recommended schedule of Admire for canker control on newlyplanted orange trees through the third season is the same as for leafminer and psyllid control. Highly susceptible grapefruit and early oranges will require, in addition to Admire, copper sprays to protect growth flushes (21-28 days, metallic copper rate from 0.5-1.0 lb per acre).

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