Citrus Scab

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Cause

Citrus scab, caused by the fungus *Elsinoe fawcetti*, can occur on all varieties of citrus but it is of economic importance for fruit production of lemons, Temples, Murcott, Page, Minneola tangelo and, in some situations, grapefruit. Also, citrus scab on foliage and shoots causes stunting of plants during seedling rootstock production of rough lemon, sour orange, Carizzo citranage, trifoliate orange and Rangpur lime. Scab tends to be more severe in groves located in flatwood areas than those planted on the ridge. Scab occurs rarely on fruit of sweet orange. Sweet orange is generally only infected if trees are situated very close to other infected trees.

The occurrence of scab is dependent upon available inoculum (spores) within the canopy of the tree or nearby trees. Scab pustules on stems and leaves, especially those of the summer flush, provide the main source of overwintering inoculum. Older scab pustules, such as those on any unpicked, inseason fruit, infected the previous spring, provide relatively little inoculum compared to those pustules on summer and fall shoot growth. Apparently, scab pustules lose their capacity for spore production as they age.

In Florida, only the imperfect stage of the fungus occurs and it is called *Sphaceloma fawcetti*. It produces spores on a cushion-shaped structure (acervulus). Spore production requires moisture. Spore production is greatest in the morning following a night with a heavy dew when temperatures are between 70° and 81°F (21-27°C). However, suitable temperatures for some spore production occur in the citrus growing areas of Florida throughout the year.

Two types of spores, colorless and colored, are produced within the acervulus. The colorless spore is dispersed by rain, overhead irrigation, nonfungicidal spray treatments, and perhaps to a limited extent by dew. This spore type can be spread while adhering to windblown water droplets, but its dispersal is mostly within the tree canopy of origin.

Because colorless spores are intolerant of even short periods of drying, they cause no infection unless the shoots or fruit remain continuously wet for a long enough time that allows for spore germination and host penetration.

The colored spore type can be dispersed by water or wind. Wind dissemination of the colored spores over longer distances can be the origin of outbreaks in new areas. Moisture in the form of dew or rain is necessary, even for colored spores, for spore germination and host penetration.

With both colorless and colored spore types, a minimum wetting period of 3 hours is all that is needed after spore dispersal for spore germination and initiation of infection. Germination of spores can occur rapidly from 64° to 86°F (18-30°C) with the optimum temperatures being 70° to 81°F (21-27°C). As wetting periods lengthen from three to eight hours or more, all temperatures between 64°F-86°F provide adequate conditions for spore germination and infection. Temperatures below 70°F and above 81°F are inadequate for spore germination and subsequent infection if the wetting period is less than four hours or less. Infection will not occur on leaves that have become 1/4 of their final width. Fruit rind remains susceptible for as much as 12 weeks after petal fall.

Rainfall is usually infrequent during the spring growth flush. Thus, even though susceptible tissue is present and temperatures are suitable for spore germination and infection, the lack of moisture often limits disease development on spring growth. However, frequent or prolonged irrigation during this critical period greatly increases the chances for infection, thereby increasing the amount of inoculum produced to infect fruit.

Scab can be particularly severe on summer growth flushes. Summer wet periods associated with rain showers and dew are highly conducive for spore germination and infection. Scab occurrence on summer flush tissue causes insufficient injury to affect the tree growth, but it has significance in providing overwintering inoculum for the following year.

Spores survive on the scab pustules for only a few days during dry periods. However, new crops of spores will be produced quite rapidly when pustules are rewetted by rain, irrigation water or dew. One to 2 hours of wetting is all that is necessary to provide conditions suitable for spore production. At least 6 hours of continuous wetting is necessary for spore production, spore dispersal and infection. Many rain showers are too short-lived by themselves to satisfy this six hour requirement. If spores are present because of recent, previous moisture periods, then the probability for disease development is greatly increased. This partially explains why citrus scab is more severe in low lying areas such as flatwood areas where heavier dews occur.

Symptoms

Symptoms occur on leaves, fruit, stems, blossom pedicels (flower stems) and buttons. Young tissue is most susceptible; therefore, look on the newest growth for symptoms. Scab symptoms in leaves and fruit can appear 4 and 7 days after infection, respectively.

Leaf symptoms begin as pinpoint circular protuberances on either side of young leaves. Within a few days after these initial symptoms, these bumps enlarge into projections that are cream to yellow-orange at the tips. As leaves expand these projections become cone shaped (Fig. 1). On the other side of the leaf, corresponding depressions on the leaf are evident (Fig. 2). Severely infected leaves become distorted (Fig. 3).

Fruit symptoms appear as raised, white to buff-colored, abnormal growths on the rind (Fig. 4, 5, & 6). On tangelos, lemons, and sour orange, the scabby areas are at the tip of blister-shaped projections on the rind. On grapefruit, the blister effect is less pronounced and appears mostly as flattened scabby sheets (Fig. 7). Later these scabby areas may become cracked. Extensively damaged fruit may drop off the tree.

Citrus scab is primarily a cosmetic problem affecting fresh market use of fruit, but on highly susceptible varieties (e.g. Temples) the damage can be severe enough to affect production of fruit for processing as well. In seedbeds, scab is important on susceptible rootstocks and cause stunting of seedlings. Because leaves on

all citrus varieties except sweet orange are susceptible, excessive irrigation may create a situation where control of scab may be necessary on scion varieties in the nursery.

Control

Control of citrus scab is necessary primarily on certain citrus varieties destined for the fresh market. Minneola tangelo, Murcotts, Temples, Page and lemons need routine, precautionary, fungicide treatments for scab control. Grapefruit groves should be treated with a fungicide only where scab has appeared previously. Current fungicide recommendations are available in the annually updated Florida Citrus Pest management Guide (SP-43).

Timing of fungicide applications at late dormancy or at bloom or shortly thereafter is designed to reduce spore production while the spring growth flush and newly set fruit are susceptible. Additionally some fungicides, such as Difolatan(no longer available), had a long residual effect and are redistributed, thereby preventing infection on leaves or fruit formed after spraying. In low disease pressure situations, such as where scab was previously light in severity, a single fungicide application at bloom may be sufficient. In high disease pressure situations, such as groves where severe scab occurred in previous years or where spring rains have been abundant, two fungicide applications may be necessary. The first should be applied at a late dormant stage of growth just before anticipated shoot growth with the second applications being four to six weeks later, which would normally be at bloom or shortly after petal fall.

Cultural methods of control will reduce scab severity. Overhead irrigation should be minimized or, if possible, avoided altogether during the critical first 2 to 3 weeks of spring shoot emergence. Remember, leaf tissue of susceptible varieties can be infected by this fungus only up to the time they attain 1/4 of their final width.

Figure 1. Scab projections on leaf.

Figure 2. Scab depressions on leaf.

Figure 3. Leaf distortion caused by scab.

Figure 4. Scab in young Temple fruit.

Figure 5. Scab in mature Temple fruit.

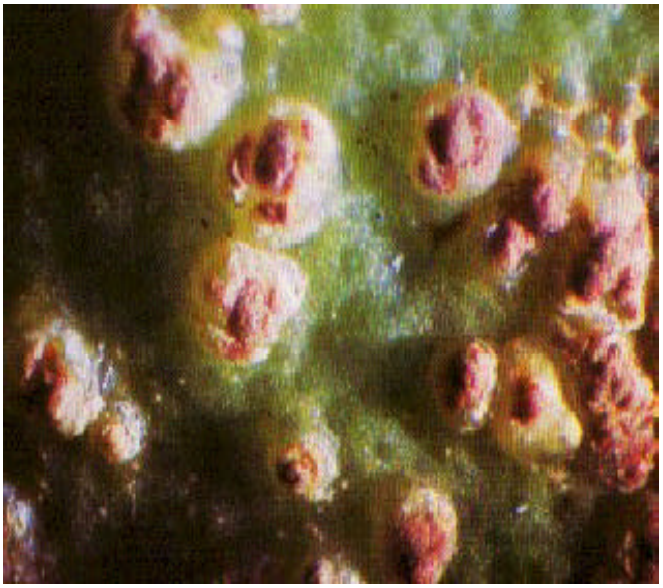

Figure 6. Close up of scab in Temple fruit.

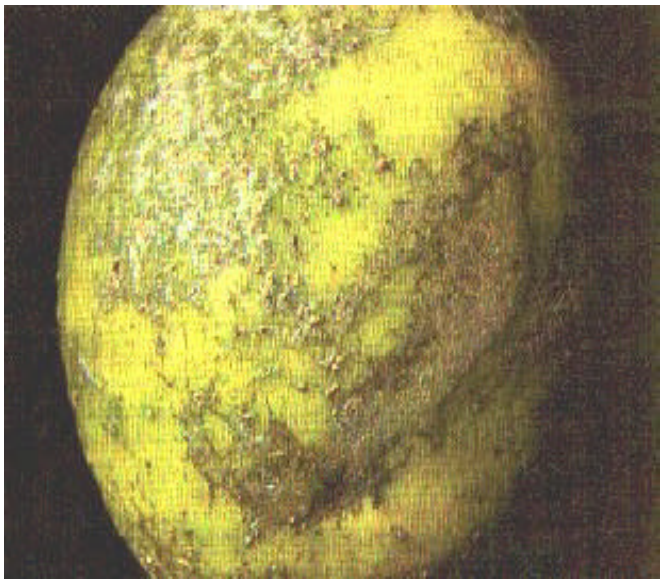

Figure 7. Blister effect of scab on grapefruit next to wind scar damage.