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Citrus Scab[1]

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Citrus scab, caused by the fungus *Elsinoe fawcetti* Bitanc. and Jenk., affects the fruit, leaves, and twigs of susceptible varieties of citrus. This disease should be controlled primarily on fruit intended for the fresh market. Scab is a serious problem on only some varieties. It can be particularly severe on lemons, Temples, and Murcotts and on Minneola tangelos. It is often a problem on grapefruit, but rarely occurs on round oranges. Sweet orange is generally only infected if trees are located very close to infected trees of other varieties.

Symptoms

Scab symptoms can appear on leaves as early as 4 days after infection. The disease starts as small, pale orange, usually somewhat circular, elevated spots. As the leaves develop, these infections become well-defined warts or protuberances on one side of the leaf, often with a conical depression on the opposite side (Figure 1). The lesions may be single or irregularly grouped. The crests of these wart-like growths usually become covered with a scabby, corky tissue pale in color (Figure 2), but sometimes dark if colonized by other fungi. The infected spots often run together and cover large areas with a corky, scab growth. Badly infected leaves become crinkled, distorted, and stunted having very little resemblance to normal foliage. The characteristic effects of the scab disease on twigs are the development of small masses of similar corky outgrowths on the surfaces.

Figure 1. Raised conical lesions of citrus scab on grapefruit leaves with conical depressions on the opposite side.

Scab symptoms on fruit can appear 7 days after infection. The disease starts on the fruit by forming irregular scabby spots or caked masses which vary from cream-colored to pale yellow in young fruits (Figure 3) to drab or olive-gray with age. This change

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Figure 2. Tangerine leaf severely affected by scab.

in color is accentuated by saprophytic fungi growing on the surface of the scabby tissue. Fruits severely attacked when very young often become misshapen, with predominant warty projections (Figures 3, 4) or conical growths extending from the surface, especially on Temples. On grapefruit, infected areas tend to flatten out, resembling windscar injury (Figures 5, 6). On tangelos, lemons, and sour orange, the scabby areas are at the tip of blister-shaped projections on the rind.

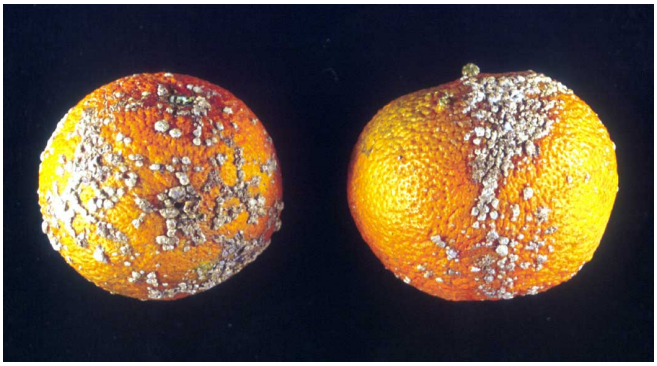

Figure 3. Raised scab lesions on mature Temple fruit.

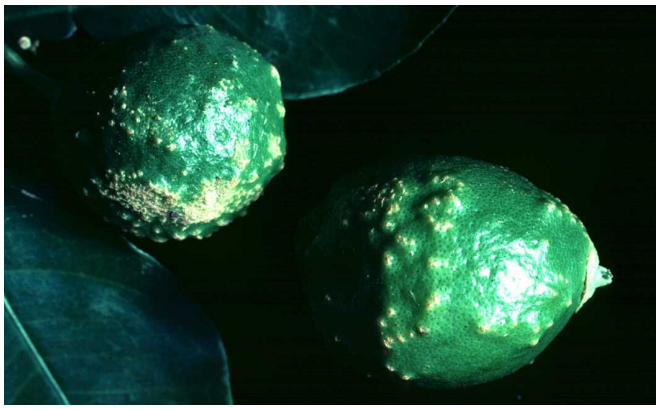

Figure 4. Raised scab pustules on young grapefruit.

Figure 5. Flatter scab lesions on mature grapefruit.

Figure 6. Close-up of scab lesions on grapefruit.

Disease Cycle

Tissues are susceptible to scab only while young. Leaves become immune to infection in only a few days, whereas fruit remains susceptible for up to 2 months. The number of spores available to infect susceptible tissues determines the number of lesions produced.

Water is the most important single factor affecting the severity of the disease, and is involved in spore production, dissemination, and germination. Spores are dispersed by rainfall or irrigation and to some extent by wind. Dews can result in heavy spore production. The optimum temperatures for spore formation, germination, and infection are 75-82°F (24-28°C). However, infection can still occur at temperatures below 75°F (24°C) if wetting periods are long.

Spores that infect young fruit arise from old, though still active, overwintering lesions on the fruit or leaves and/or from any scab infections that have developed on the new spring flush. Lesions on new shoot growth can build up inoculum very rapidly if there is sufficient rain or overhead sprinkler irrigation during the critical period of leaf expansion. The frequency and duration of wetting, and not temperature, have a major influence on inoculum production. Spores are dispersed mainly by splashing water. Leaves are most susceptible as they emerge from the bud, and they become immune by the time they have reached about 1/4 of their final width. Fruit remains susceptible for up to 8 weeks or until late May during a year of normal bloom.

Spores of *E. fawcetti* require only short periods of wetting to germinate and cause infection. A minimum period of wetting of only 2 to 3 hours is necessary for infection by freshly released spores. Therefore, periods of wetting following cold-front-induced rainfall are often long enough to permit infection. The generally higher incidence of scab in groves located in low-lying areas, as compared with more elevated areas, is considered to be due to the heavier dews in such areas which assist spore production.

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 growth flush tissue causes insufficient injury to affect the tree growth, but it has significance in providing overwintering inoculum for the following year. It is impractical to try to control scab on the summer growth flushes by fungicide treatments.

Disease Management

Sprays intended for scab control are justified primarily for those groves that have a recent history of the disease. If the disease has been very severe before, it is usually desirable to prevent a buildup of inoculum on any shoot growth that develops prior to bloom as such infections can rapidly increase the amount of inoculum available to infect fruit. Traditionally, two to three fungicide applications have been made for scab control. The first is applied in early spring when the flush has emerged about 2-3 inches. This application can be omitted if there were very low levels of scab in the previous year. The second application is made at petal fall. A third spray is applied about 3 weeks later to control scab and melanose.

Scab becomes less of a problem as trees grow older, but routine spraying will often continue to be necessary, particularly on the more susceptible varieties, such as Minneola tangelos, Murcotts, Temples, Page tangelos, and lemons. Fungicide information can be found in the *Florida Citrus Pest Management Guide*.

Where feasible, it is advisable to irrigate scab susceptible varieties very thoroughly immediately before growth commences in the spring if overhead irrigation is used. It may then be possible to delay the next irrigation until after the new flush has expanded sufficiently to become resistant to infection. In any event, irrigation should be kept to the minimum commensurate with tree requirements.

If foliage from the previous season is severely affected, light hedging may be advisable to reduce inoculum. With grapefruit, it may be helpful to harvest the fruit prior to the spring flush if fruit is severely damaged. This practice can also lower inoculum levels for the next season's fruit.