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LEAF MOLD AND POWDERY MILDEW OF TOMATO

Although many diseases occur on tomato, leaf mold and powdery mildew have represented significant challenges to Connecticut growers during the past few years. While leaf mold has been around for many years, powdery mildew is a new disease for the state and was first identified in greenhouse tomatoes in 1995 and in field tomatoes in 1996. Both diseases are primarily problems for greenhouse production but they can occur in the field under cool, cloudy conditions such as we experienced during the 1996 growing season.

LEAF MOLD

Leaf mold is primarily a disease of greenhouse tomatoes although it can occur in the field during cool, humid conditions. Most serious under humid greenhouse conditions and in poorly ventilated plastic houses, the fungus infects plants grown in soil as well as in hydroponic production. Tomato is the only plant affected by this disease. The actual relationship between disease severity and yield loss is still unclear. However, in one study, significant decreases in yield were detected 6 weeks after 50% of the foliage was symptomatic.

A. Causal Agent: *Fulvia fulva* (*Cladosporium fulvum*) 12 races

B. Symptoms:

Symptoms usually only occur on the foliage. Older leaves are infected first and the fungus moves progressively up the plant on the younger leaves. Initial leaf symptoms appear as pale yellow or green areas or spots with indefinite margins. These are often first visible on the upper leaf surface. When infection is severe, these spots can coalesce and the entire leaf is killed. Diagnostic symptoms develop on the lower leaf surface when the fungus sporulates and gives the infected area an olive-green, velvety appearance. Infected leaves eventually brown, curl, wither, and drop prematurely. Defoliation gradually progresses up the plant as the fungus spreads to younger leaves.

Symptoms can occasionally develop on petioles, stems, peduncles, blossoms, and fruit. Infected blossoms are usually killed before fruit set. Green and ripe fruit can be infected and develop a dark, leathery rot on the stem end. Infected fruit may also be lopsided and have blackened furrows.

C. Factors for Disease Development:

- relative humidity levels >85%
- free water on leaf surfaces

-- optimum temperature: 22-24 °C (germination occurs 5-35 °C)

D. Pathogen Survival:

- as a saprophyte on crop residue or as conidia or sclerotia in soil
- as conidia or spores (can survive at least one year without a host or under adverse conditions)
- as a contaminant of seed

E. Management Options (Greenhouse)

1. Culture-

- a. maintain adequate row and plant spacing
- b. avoid excessive nitrogen fertilization
- c. maintain relative humidity levels below 85%
- d. promote good air circulation, especially in plastic houses

2. Sanitation-

- a. scout for disease
- b. prune and remove diseased plant material (don't carry through house)
- c. following harvest, all plant debris should be removed and production areas should be thoroughly cleaned

3. Resistance-

- a. susceptible cultivars can be grown when relative humidity levels are carefully maintained below 85%
- b. resistant cultivars: Race 5 (Caruso, Capello, Cobra)
Races 1 & 2 (Jumbo, Dombito)
[resistance may be of limited use in some circumstances since at least 12 races of the fungus]

4. Chemical-

- a. fungicides should be applied as soon as symptoms are evident
- b. among the compounds registered for use are: maneb and copper compounds

F. Management Options (Field)

1. Culture-

- a. maintain adequate row and plant spacing
- b. avoid excessive nitrogen fertilization
- c. early planting may help to reduce disease severity
- d. staking and pruning helps to increase air circulation

2. Sanitation-

- a. scout for disease and rogue infected plants as soon as detected

3. Resistance-

- a. ??? (not considered an important disease for breeding field tomatoes)

4. *Chemical-*

- a. fungicides should be applied as soon as symptoms are evident
- b. among the compounds registered for use are: chlorothalonil, maneb, mancozeb,
and copper compounds

POWDERY MILDEW

Powdery mildew represents a new and potentially serious threat to both greenhouse and field production of tomatoes in the Northeast. We first identified this new disease for Connecticut on greenhouse tomatoes from New Haven County in March 1995. The first occurrence on field tomatoes was identified in August 1996 in New Haven County. Our present concerns with this disease are for its management since the compounds that are currently registered only provide effective control when the disease is recognized at low levels of infection. We also have concerns about the apparent broad host range of the fungus. Since we are still learning about this disease, there are significant questions about carry-over and spread of the disease between diverse hosts and from crop to crop.

A. Causal Agent: *Erysiphe sp.*

B. Symptoms:

Symptoms first appear as light green to bright yellow spots on the upper surface of the leaf. These spots usually don't have very distinct margins and gradually become more noticeable as they develop the white, powdery appearance typical of powdery mildews. However, this is where this disease differs from most other powdery mildews that we encounter. The powdery mildew of tomato is apparently much more aggressive than other mildews. Once leaves are infected, they quickly brown and shrivel on the plant. This rapid death of infected leaves and defoliation of plants is not typical of most mildews. The fungus is readily spread to nearby leaves or plants since abundant spores are produced and are easily carried by air currents or production activities in the house.

C. Factors for Disease Development:

- relative humidity levels > 50% (optimum RH > 90%)
- free water on leaf surfaces **not** necessary
- temperature range: 10-35 °C (best below 30 °C)

D. Characteristics of the Pathogen:

- *very broad host range* including rosemary, pepper, eggplant, many bedding plants (we are still adding to this list)
- *very aggressive*, different than most other powdery mildews

E. Pathogen Survival:

- in weed hosts as mycelium
- in living plants between crops

F. Management Options (Greenhouse):

1. Culture-

- a. maintain adequate row and plant spacing
- b. maintain relative humidity levels below 85%

c. promote good air circulation, especially in plastic houses

2. Sanitation-

- a. scout for disease
- b. prune and remove disease plant tissues (don't carry through house)
- c. following harvest, all plant debris should be removed and production areas should be thoroughly cleaned

3. Resistance-

- a. ????
- b. resistance not documented (susceptible cultivars include Caruso, Match, Trust)

4. Chemical-

- a. controls should be applied as soon as symptoms are first observed
- b. early control is *critical!!!* currently labelled products will **not** control the disease once it is widespread or has reached epidemic status
- c. among the compounds available are: paraffinic oils, bicarbonates, and copper compounds

G. Management Options (Field):

1. Culture-

- a. maintain adequate row and plant spacing
- b. staking and pruning helps to increase air drainage

2. Sanitation-

- a. scout for disease and rogue infected plants as soon as detected

3. Resistance-

- a. ????
- b. resistance not documented
susceptible tomato cultivars include Better Boy, Celebrity, Rutgers, Whopper, Better Beef, Ultra Magnum, Ultra Sweet, Yellow Brandywine; cherry types Matts Wild Cherry and Sweet Chelsea; plum types Roma and Super San Marzano
- c. fungus also infects other hosts including eggplant and tobacco; weed hosts include nightshade

4. Chemical-

- a. controls should be applied as soon as symptoms are first observed
- b. among the compounds available are: azoxystrobin, chlorothalonil, potassium bicarbonate, and paraffinic oils

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