Common Leaf Diseases of Flue Cured Tobacco

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INTRODUCTION

Tobacco is susceptible to numerous diseases, and almost all diseases will result in some sort of leaf symptoms. Black shank, root knot nematodes, and other diseases that cause malfunctions of roots and lower stems will cause leaf discoloration indirectly, usually in definite patterns on leaf margins and between major veins. Discoloration results when water and nutrient transport from the soil is impeded. Diseases included in this publication, are those that cause damage to the leaf directly by infecting the leaf itself, thereby causing distinct spots, blights or mosaic patterns. Spots may be aggregated (grouped) or randomly dispersed depending on the organism.

Three types of organisms cause leaf diseases that occur commonly on tobacco in Florida: First, fungi are organisms without chlorophyll, with microscopic spores and with microscopic threads called hyphae. Numerous spore types can be produced. Those involved with infection are called sporangia or conidia, and are produced in abundance. Blue mold can produce millions of sporangia on a leaf. The size of one of those spores is 1/900 of an inch. Secondly, bacteria are microscopic organisms that are simple rod-shaped cells that reproduce by divisions of cells. Bacteria which cause plant diseases lack chlorophyll, and generally are about 1/12,000 of an inch long. Thirdly, viruses mentioned herein are non-cellular and are composed of protein and nucleic acids only. They reproduce in living plant cells by redirecting cellular functions of the plant. An average tobacco mosaic particle is 1/90,000 of an inch long.

Blue Mold

Blue mold is caused by the fungus *Peronospora tabacina* In the United States blue mold is a problem only on tobacco. Blue mold had been considered to be primarily a problem in the plant bed where total loss of plants has occurred when not controlled. However, since 1979, blue mold has become epidemic in the field in the United States in some years. Extremely wet and cool conditions provide favorable conditions for fungus development, spread, and infection. Spore production can occur from 46-86°F. Temperatures above 86°F or below 46°F restrict spore production. The time from infection to sporulation is typically from 4 to 15 days, but can be considerably longer depending upon day and night temperatures, variety, and strain of the fungus. Night temperatures from 50 to 65°F and daytime temperatures from 70-85°F are ideal for disease development. It is important to remember that during most years in Florida ideal temperatures for blue mold occur during much of the early part of the tobacco growing season. Thus, rainfall and irrigation tend to strongly influence blue mold.

Blue mold causes variable symptoms. In young plants, leaf yellowing and cupping occur (Fig. 1). Eventually leaves will turn brown and the plant may die. In the plant bed somewhat circular patches of plants will be infected, with disease spread away from these areas. As plants get larger, various degrees of systemic infection can occur.

Prior to the time of stem elongation after transplanting, a severe systemic infection can occur. Leaves become distorted and yellowed (Fig. 2). Vascular discoloration in the form of brown streaks, can occur as well as excessive suckering (Fig. 3). Where infection occurs on established, growing plants in the field, leaf spots of various sizes and shapes occur. Usually the spots begin with a yellow area and then turn brown (Fig. 4). Fresh sporulation will appear white to grey-blue (Fig. 5). As the fungus ages, the downy growth will become light brown in color and is located primarily on the lower leaf surfaces.

CONTROL of blue mold can be accomplished with chemical and cultural methods. For chemical control, contact your county Extension agent for up-to-date recommendations. Cultural controls include: (1) Use transplants produced in northern Florida; preferably grow your own plants in open non-shaded areas. Plants from south Florida grown outdoors used to be commonly infected with numerous diseases including blue mold. Greenhouse-produced plants in south Florida in recent years have had no blue mold. (2) Do not seed the transplant bed prior to January 10. The use of a plastic cover maintains heat for accelerated plant growth, and temperatures above 86°F inhibit blue mold development. (3) Avoid use of excessive amounts of nitrogen. (4) Irrigate beds when needed. Excessive irrigation will create favorable conditions for blue mold especially when coupled with high rainfall amounts. (5) Inspect fields and beds routinely. Inspect near high trees, hedge rows and low areas as blue mold usually begins in such areas first. (6) Destroy old plants in the bed immediately after successful transplanting is complete. Cut and plow down stalks in the field immediately after harvest. Plow down reduces inoculum of several diseases for the following season.

Brown Spot

Brown spot is caused by the fungus *Alternaria alternata*. Tobacco is considered to be the only host for this fungus, although tomatoes, peppers, and certain weeds have been infected in some experiments. Brown spot occurs on plants in the field primarily from topping time through the harvesting period. Brown spot can occur from 59 F - 86°F. Wet weather is conducive for disease development. Brown spot lesions occur primarily on lower leaves, progressing to upper leaves. Suckers, petioles, seed capsules, and stems may become infected in some situations. Spots begin as a pinpoint area with a tan center, surrounded by a brown ring. A yellow halo may also be evident at this time. Later, the spot enlarges up to 1 1/2 inches in diameter at which time concentric rings are seen within the brown spot (Fig. 6). A diffuse yellow area usually surrounds the spot. The yellow area is caused by a toxin produced by the fungus.

CONTROL of brown spot is achieved by growing a vigorous, well-fertilized, healthy plant. Brown spot is more apt to be a problem on poorly managed tobacco. Specifically, low potassium levels, nematode injury and other harmful factors make plants susceptible to infection. The use of proper rates of MH for sucker control reduces brown spot. Delayed flower stalk removal (topping) can result in increased amounts of brown spot. If brown spot becomes a serious threat, advance harvesting of lower leaves to minimize loss. A few varieties have some resistance to brown spot.

Frogeye Leaf spot

Frogeye leaf spot is caused by the fungus, *Cercospora nicotiane*. Typically, it has not been a disease of commercial importance in that it occured late in the season in Florida. In fact, some people equate the presence of frogeye leaf spot with ripe and quality tobacco. Frogeye leaf spot is more likely to be common on later-maturing tobacco. However, in recent years, frogeye leaf spot has increased to damaging levels in some plantings. If tobacco were grown through the latter part of the summer, frogeye leaf spot could be a problem. Frogeye can oc-

cur in leaves at any time during the season. Spots vary in size from a pinpoint to slightly over 1/2 in. Spots 1/8 to 1/4 inch are common. Frogeye leaf spots are sunken, somewhat round, white in the center when mature and delineated by a distinct brown-purple border ring. The ring may encompass most of an individual spot in some situations (Fig. 7). No controls are available.

Angular Leaf spot (Blackfire)

Angular leaf spot is caused by the bacterium, *Pseudomona syringae* pv. *angulata.* Tobacco is considered to be the primary host for this bacterium, but numerous other plant species (cowpeas, soybean, tomatoes, peppers) have been infected experimentally. This bacterium can survive in tobacco stubble, dry leaf, or manufactured tobacco. It survives also on roots of pasture, weed, and crop plants such as tobacco, wheat, rye, barley, vetch, chickweed, shepherds purse, lespedeza, clover, ragweed, and oxalis. Spread of the bacterium occurs primarily by wind-driven rain, rain splash, or irrigation. Infection of leaves occurs through wounds or natural plant openings such as stomates. Bacterial cells enter into such openings and within 2 - 7 days, leaf spots develop. The shorter incubation period of two days occurs when plants are exposed to excess rain or irrigation. Angular leaf spot can develop at any temperature suitable for growth of tobacco. Symptoms of angular leaf spot are often diagnostic in the field (Fig. 8). Distinct angular, dark, vein-limited spots occur on a leaf, often in an aggregated pattern. Laboratory diagnosis may be necessary in many situations.

CONTROL of angular leaf spot is difficult but certain measures used collectively will reduce this disease: (1) Rotate the plant bed and field sites with pasture crops. (2) Plow down plant bed and field sites during the previous fall so that plant roots are well decomposed. (3) Use disease-free transplants. (4) Avoid high amounts of nitrogen or lime as these materials predispose tobacco to infection. (5) Cut down and plow down plant beds and fields immediately after harvest.

Viral Diseases

Tobacco mosaic virus (TMV), Potato virus Y (PVY), Tobacco etch virus (TEV), Tomato spotted wilt virus (TSWV) and Cucumber Mosaic virus (CMV) occur in tobacco in Florida. All five viruses can infect numerous other hosts including peppers, tomatoes, eggplants, potatoes, black nightshade, and numerous other weed and crop species.

Incubation of TMV may take 2-3 days for fast-growing plants. Numerous other variables can influence the length of the incubation period. The incubation period for PVY is about 7 days. The incubation period for TEV can vary between 4 to 10 days.

Symptoms of TMV may be masked at temperatures above 80°F or below 50°F. Spread of TMV is primarily mechanical. Plant sap from an infected plant, if moved via people or equipment to a healthy plant, can spread this disease. Thus, any kind of field operation can cause spread of TMV. TEV, PVY and CMV are spread primarily by aphid feeding. Aphids may be wind-borne or fly to a field from adjacent fields or hedge rows. Aphids in a field may have originated many miles from your field. Five seconds of feeding is all that is necessary for the aphid to attain or transmit the virus. This is why insecticide sprays are not recommended for virus control; the aphid can transmit the virus before being killed.

Viral symptoms are variable and positive identification in the field is not recommended. Tobacco mosaic virus usually appears as an overall checkering (variegation) of shades of greens and yellows (Fig. 9). Plants are often stunted when infected with TMV. Potato virus Y often results in a vein-banding symptom (Fig. 10). Tobacco etch virus often has white to brown etchings as one of the symptoms (Fig. 11). CMV causes stunting, severe leaf narrowing and leaf puckering and distortion (Fig.12). For informa-

tion on Tomato spotted wilt virus (TSWV), see University of Florida Circular 914.

CONTROL of viruses on tobacco is difficult. However, certain controls should be used on a routine basis: (1) Grow your own transplants; transplants produced outdoors in south Florida are often infected with virus. (2) Eliminate weed hosts such as ground cherry, black nightshade, or jimsonweed. (3) Isolate tobacco fields from plantings of peppers, tomatoes, potatoes, or eggplants. (4) Do not allow aphids to become established in transplant beds. (5) Do not use tobacco products prior to or during field operations associated with tobacco. (6) Do not prune roots when cultivating. (7) Use crop rotation. (8) Do not top plants obviously infected with TMV; rogue them when they first appear and do not handle other plants after doing so. (9) Cut, disk, and plow down fields and transplant beds immediately after harvesting. Recently some varieties have been developed that possess resistance to PVY, TEV or TMV. Recently, a couple of pesticides have been labeled that suppress development of TSWV.

Weather Fleck

Weather fleck is caused by toxicants in the air, with ozone being the primary agent. Ozone is a natural component of our atmosphere. However, ozone can originate by ultraviolet radiation reacting with certain pollutants arising as exhausts generated from engines, furnaces, or other mechanical devices. Ozone enters plants through stomates (breathing pores) occurring on either side of a leaf surface. Senescing or rapidly expanding leaves are less susceptible than younger leaves. Damage will tend to be most severe on turgid (swollen) leaves due to heavy rains, irrigations, poor drainage, high humidity, or other variables that increase turgor pressure (water pressure) within the plant. Symptoms include white to tan etching on leaves (Fig. 12). These symptoms can be confused with virus symptoms.

CONTROL is achieved primarily by avoiding excess moisture situations, by good drainage in the soil, and by avoidance of excessive irrigation.

Figure 1. Blue mold in tobacco seedlings.

Figure 2. Systemic blue mold in transplanted tobacco.

Figure 3. Inner stem symptoms of systemic blue mold.

Figure 4. Leaf spots caused by blue mold.

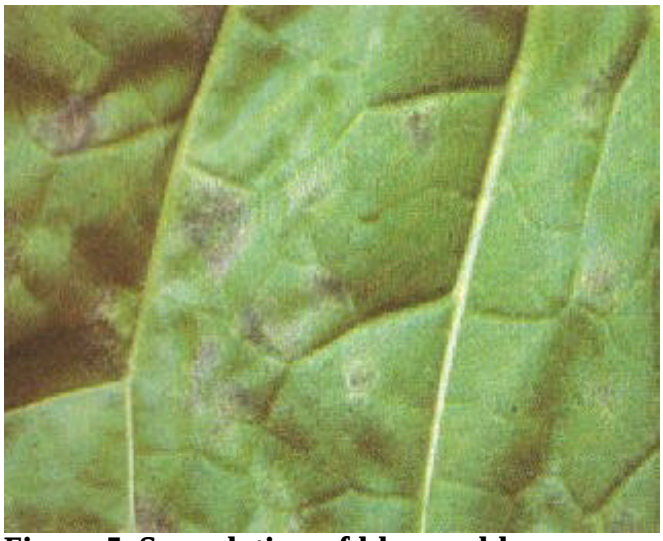

Figure 5. Sporulation of blue mold.

Figure 6. Brown spot.

Figure 7. Frogeye leaf spot.

Figure 8. Angular leaf spot.

Figure 9. Tobacco mosaic virus.

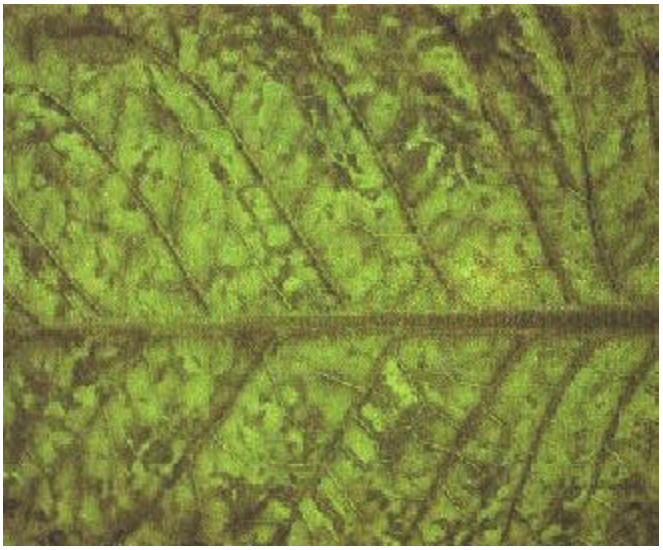

Figure 10. Tobacco mosaic virus and potato virus Y.

Figure 11. Tobacco etch virus.

Figure 12. Cucumber mosaic virus

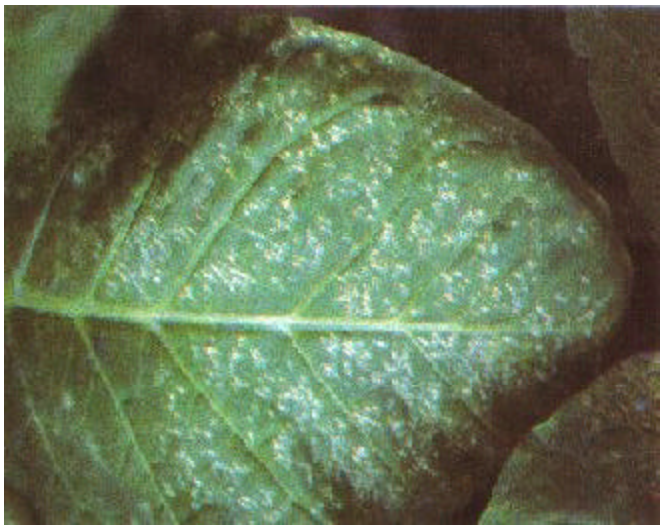

Figure 13. Weather fleck.