Late Blight on Potatoes and Tomatoes

Tom Kucharek and Pete Weingartner; Professor - Extension Plant Pathologist, Department of Plant Pathology Gainesville and Associate Professor - Plant Pathologist, Hastings-REC, respectively, University of Florida, 1979, Revised Nov.2000.

Florida Cooperative Extension Service / Institute of Food and Agricultural Sciences / University of Florida / Christine Waddill, Dean

Cause and Symptoms

Late blight is a fungal disease that can devastate a tomato or potato field within two or three weeks if it is not properly controlled. Few diseases spread as quickly as late blight. Thus, it is in your best interest to understand the life cycle of this disease, recognize its symptoms, and know all of the control measures available. Remember, late blight is historic as it was partially responsible for the Irish famine in the 1840's.

Late blight is caused by the fungus *Phytophthora infestans* which thrives when cool and wet weather occurs. Specifically, temperatures between 50 and 80°F. are conducive for disease development when combined with moisture conditions such as rain, fog, heavy dews, or relative humidities above 90 percent. Night temperatures in the mid-fifties with daytime temperatures from the mid-fifties to mid-seventies are ideal for this disease. In order for late blight to occur, the fungus must be present. The fungus grows by hyphae (microscopic threads) inside infected plant tissue.

Once the fungus is in a field via diseased tubers, transplants, etc., spores are produced that are disseminated by wind, rain, and irrigation. Temperatures at the upper range of spore (sporangium) production (upper 60°sto 80°F.) stimulate direct germination of these spores.

Temperatures in the lower range (50 to 70°F.) stimulate the formation of many swarmspores (zoospores) from within the sporangia; this latter situation obviously increases the potential for disease spread.

Where does the fungus come from? For potatoes, seed pieces can harbor the fungus as can cull piles and unharvested, infected tubers from the previous year. Some studies show that this fungus can live over in the soil, but this has not been demonstrated in Florida. For tomatoes, infected transplants can serve as an original source of inoculum. It had been observed prior to 1998 that seldom did a widespread late blight epidemic occur on tomatoes in the Manatee-Ruskin area unless such was occurring in the Immokalee area and Dade County. Thus, growers in the Manatee-Ruskin area should be aware of the late blight situation further south. Similarly, growers in the Immokalee area should be aware of the late blight situation further south. The epidemics that occurred in the early 1990's in Florida were initiated by inocula in seed tubers shipped from northern areas of the United States.

Because the fungus, *P. infestans,* causes late blight on both tomatoes and potatoes, one might assume that late blight on potatoes came from nearby tomatoes or vice versa. This may or may not occur depending on the strain(s) present in the area. Some strains infect only to-

matoes, others infect only potatoes, others infect both tomatoes and potatoes and yet other strains are weakly parasitic on both crops. Confound this with infection of strains dependent upon genes for resistance in the plant and a confusing situation is created. It is your job, as a grower, to observe your fields for symptoms. In the Hastings area a forecasting system, 'Blitecast', issues advisories on late blight for potato growers.

Symptoms may be found on all plant parts of tomatoes or potatoes except roots. If potato seed pieces are infected, the seedling may have dark brown lesions on the stem which can girdle and kill the plant and produce spores which can infect other plants. It is a good idea to identify the cause of seedling disorders to be absolutely sure late blight was not the cause. Upperside leaf symptoms begin as pale green to brown spots with or without a purplish tinge, (Figures 1 and 2).

Often a pale green halo is observed around the spots as they enlarge. On the underside of the leaf, a white mildew ring is present when leaves are wet (Figure 3). These spots merge or expand, giving a blight appearance to the plants (Figure 4). Stems turn brown when infected and later turn black. In dry weather, infected plant parts appear dry and shriveled (Figure 5). Potato tubers become infected by spores from leaves and stems. Initially, a shallow, reddish-brown dry rot occurs on the skin and progresses unevenly into the tuber (Figure 6). Tomato fruit, like potato tubers, will not be infected unless the foliage is infected first. On tomato fruit, green to brown, greasy irregular blotches occur, sometimes encompassing the entire fruit (Figure 7). Later a shriveledcondition with or without a white fungus growth will appear (Figure 7).

Control

Several control measures plus observation are absolute necessities if late blight is to be properly controlled. Tomato growers should purchase disease-free transplants. This is not a seed-borne disease on tomatoes. Observe your fields thoroughly each day, especially when cool and wet weather prevails.

Begin a fungicide spray program at the first sign of disease, or before, if late blight is present in your area in other fields. Ask your county Extension agent about currently recommended fungicides. Volunteer tomato or potato plants should be destroyed.

Potato growers should: 1) Purchase certified, disease-free seed pieces. 2) Prior to planting, seed should be stored in a dry location. 3) When preparing seed pieces or while planting, examine seed pieces for tuber disorders and destroy suspect seed. Ask your county Extension agent about getting a diagnosis of seed piece disorders. Remember, prevention is the key to success. 4) Destroy cull piles. 5) Destroy volunteer potato or tomato plants. 6) Plant resistant varieties. Most red-skin varieties are susceptible. 7) Begin a spray program with fungicides recommended by your county Extension agent if late blight is in your area (other fields included) or weather conditions (see above) are suitable for late blight development. Forecasting systems, like that in the Hasting's area, can help in deciding when to spray. 8) Kill

infected foilage prior to harvest to minimize tuber infection. 9) Storage of potatoes, even for one day, should be under dry and ventilated conditions. 10) Discard infected tubers prior to storage or transit.

Addendum

The fungus *P. infestans* is capable of producing thick walled oospores which allow the fungus to survive in soil or old infected plant debris. However, the presence of two mating types, A1 and A2, must be present together at the same site for mating to occur. Up through 1992, only the A1 mating type existed in Florida. Beginning in 1993, both mating types have been identified in Florida.

With the potential for the late blight fungus to go through a sexual cycle in Florida, the possibility exists that different strains of the fungus will occur. The new strains may relate to increased virulence, survivability, or other characteristics. Further, the presence of oospores in the soil provides another source of inoculum for future epidemics. Prior to 1993, infected seed pieces were considered as the primary source of inoculum.

Figure 1. Late blight lesions in tomato leaflet

Figure 2. (Left) Late blight lesion in potato leaflet.
Figure 3. (Right) Sporulation on underside of potato leaflet.

Figure 4. Advanced late blight symptoms on potato leaf.

Figure 5. Advanced late blight lesion in tomato stem.

Figure 6. Potato tubers with late blight. (Photo by H. Bissonnette)

Figure 7. Tomato fruit with late blight.