

Introduction:

Late blight is one of the most serious potato diseases known to potato growers. Late blight of potato, caused by *phytophthora infestans* (Mont.) De Bary, was responsible for major potato crop failures in Ireland in 1845, resulting in severe famine. Since then, farmers have been dealing with the fungus both in potatoes and tomatoes as well as other related crops. The first spread of the fungus to most areas around the world involved a single mating type, A1, which could not reproduce sexually. However, in the 1980's the movement of A1 and A2 mating types from Mexico to Europe and United States occurred. In 1993, the A2 mating type was found in British Columbia. By 1996, the A2 mating type was found in all Canadian provinces and a new A1 genotype was found in British Columbia. This is a serious concern to the potato industry since many of the new strains of the fungus are more aggressive and developed metalaxyl resistance.; a highly favoured fungicide with curative properties. Finally, the occurrence of both the A1 and A2 mating types in potato fields lends itself to the possible production of **oospores** which can survive in the soil outside of plant or tuber tissue.



Figure 2 Early Blight lesions



Figure 3 Botrytis Gray Mould lesion

Symptoms:

Late blight development can affect all parts of the potato plant. Disease development traditionally occurs during the first week of July on Prince Edward Island. Airborne spores of the fungus can infect leaves, stems or flower parts. However, the A2 mating type infection develops more lesions on the stem and flower parts rather than the leaves. Lesions on the leaves and stems are similar to those associated with Early Blight (Figure 2) and Botrytis Gray Mould (Figure 2).



Figure 4 Late Blight lesions

The lesions can be irregular to round in shape appearing water soaked and dark brown to purplish in colour (Figure 3) with green halos at the lesion margins (only develops under dry conditions). In humid, wet conditions, or during a heavy dew, a white, fluffy mildew of spores can be seen only on the underside of the leaves and at the lesion margins (Figure 4). Potato stem infections appear as dark green to black lesions (Figure 5). They develop at the stem and petiole junctions eventually causing the plant to wilt and die. In tubers, the exterior tubers' skin at first



Figure 5 Late Blight mildew

Figure 4 Late Blight mildew is discoloured brown to purple and is leathery; later there is an internal, granular-brownish dry rot (Figure 6). If the rot is wet, it is usually due to other pathogens such as pink rot and/or bacterial soft rot involved in the disease syndrome (Figure 7). In a growing season with a high risk, these tuber symptoms can develop in the field and progress throughout the storage period.



Figure 6 Late Blight stem lesion



Figure 7 Pink Rot & Late Blight



Figure 8 Late Blight

Life Cycle:

The late blight fungus is not known to overwinter in the soil, therefore, infected tubers is where the disease starts. **The most important source of infection is from potato cull piles and volunteers where diseased tubers have been dumped.** On PEI late blight infections are usually due to airborne spores from diseased cull piles, or from the rare occurrence of infected volunteer plants and planted seed. In cull piles, it is not necessary for the tubers to sprout to spread late blight spores. If a tuber is infected with late blight, the fungus will sporulate directly on the surface of the infected tuber thus spreading the fungus to a new crop. Planting diseased seed is also a source for inoculum when weather conditions are moist and temperatures are 13°C to 16°C. The fungus on the infected tubers produces spores on the surface that can grow up the shoot from an infected seed piece and sporulate at ground level. The spores are then carried by wind and rain from several to hundreds of kilometers. These spores do not need an entry point into a potato plant or tuber but rather can move into unprotected plant tissue or the tubers' breathing pores or stem ends. Under wet conditions, the spores can live up to 48 hours. Here on PEI, we have ideal conditions for the development and spread of the fungus. Spores are produced rapidly within a temperature range of 13°C to 16°C in the presence of moisture. The ideal conditions for a severe outbreak of the disease would be night temperatures of 13°C accompanied by fog, rain, or a heavy dew, followed by day temperatures of 16 to 24°C. The survival of the organism depends on living plant tissue such as leaves and tubers. In the fall, potato plants need to be completely dead prior to harvesting. If the plants are dead, then the fungus is dead.