A review of important potato diseases and their management

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Abstract

The article provides information on the disease Phytophthora infestans of potatoes. Phytophthora infestans persists between potato crops as mycelium in infected tubers or tomato fruit in the absence of the oospore stage. Sporangia may be developed on diseased tubers or new volunteer sprouts that appear the following spring if they are left behind at harvest or thrown at the boundaries of fields. Sporangia sporangia sporangia sporangia sporangia sporangia sporangia Seed potatoes can become infected, resulting in stem lesions that can kill the plant freshly cut seed tuber surfaces are particularly vulnerable to infections from airborne spores in contaminated storage facilities. Local infection can arise if infected seed is planted.

Keywords: phytophthora, potato, iseases, management, zoospores, fungal

Introduction

M. J. Berkeley named Phytophthora infestans Botrytis infestans in the 1840s. Phytophthora infestans is a member of the oomycetes, a group of organisms also known as "water molds." Oomycetes are fungus that are more closely linked to brown algae than real fungi. The nuclei are diploid and the mycelium is hyaline and coenocytic. The majority of fungus are haploid. Eva Sansome, a plant geneticist, was the first to characterize Phytophthora's diploid life cycle. Peronosporaceae is the family name for this group of organisms, which belongs to the Kingdom Stramenopila of the eukaryotes. Although they share many biological, ecological, and epidemiological traits with fungal plant pathogens, oomycetes are no longer regarded members of the Kingdom Fungi.

On sporangiophores, Phytophthora infestans forms sporangia, or sac-like structures. The sporangiophores are ambiguous and complex (i.e., they grow and produce sporangia continuously). The sporangia's air distribution is aided by these stalk-like appendages. One of the rare species in the Phytophthora genus that has evolved to air dispersal is Phytophthora infestans. Sporangia can be disseminated to surrounding fields, but because to desiccation and exposure to solar radiation, they rarely survive long-distance transit. Because the disease can spread from field to field if fields are left untreated, it is classified as a community disease.

After roughly two hours in cool, damp conditions, zoospores develop and emerge (Figure 1) from the sporangia. In warmer climates, sporangia can act as a single spore and germinate on their own (Figure 2). Zoospores are biflagellate (have two flagella) (Figure 3), with one tinsel and one whiplash flagellum pointed anteriorly and posteriorly, respectively. Zoospores encyst and infect the plant after swimming on the surface of the host plant.

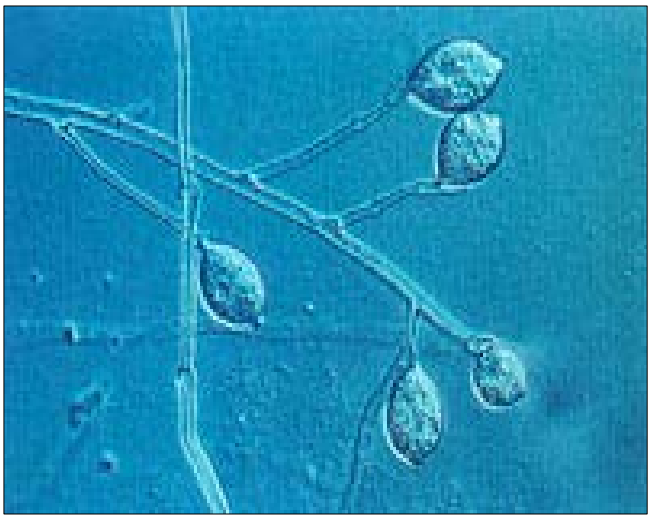

Fig 1: Compound sporangiophore

Fig 2: Germinating sporangia

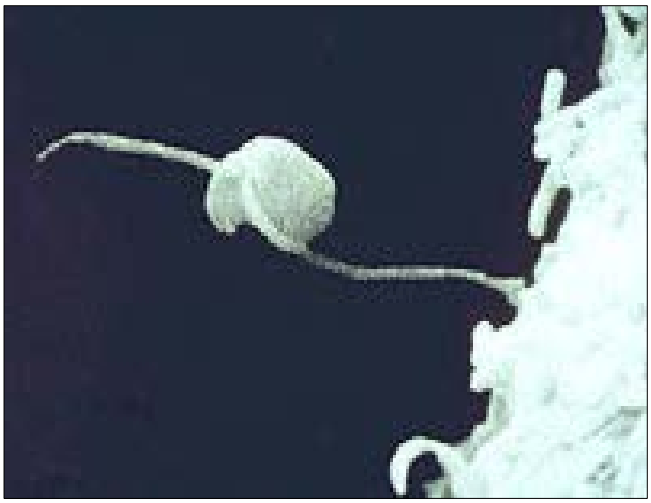

Fig 3: Zoopsore with biflagellate flagellum and sporangia (Jean Ristaino, Gail L. Schumann, Cleora J. D'Arcy)

Phytophthora infestans persists between potato crops as mycelium in infected tubers or tomato fruit in the absence of the oospore stage. Sporangia may be developed on diseased tubers or new volunteer sprouts that appear the following spring if they are left behind at harvest or thrown at the boundaries of fields. Sporangia sporangia sporangia sporangia sporangia sporangia sporangia Seed potatoes can become infected, resulting in stem lesions that can kill the plant (Figure 4); freshly cut seed tuber surfaces are particularly vulnerable to infections from airborne spores in contaminated storage facilities. Local infection can arise if infected seed is planted. The virus spreads by moving through infected tuber tissues, and clonal lineage asexual reproduction is common (see Disease Cycle) (Figure 5).

The most important environmental elements influencing late blight development are temperature and moisture. When the relative humidity is below 90%, sporangia grow on the lower leaf surfaces and infected stems. Sporulation can occur at temperatures ranging from 3 to 26 degrees Celsius (37 to 79 degrees Fahrenheit), however the ideal temperature range is 18 to 22 degrees Celsius (64 to 72 degrees Fahrenheit). Sporangia germinate in a germ tube at a temperature of 21-26°C (70-79°F). sporangia produce 6 to 8 zoospores that require water to swim at temperatures below 18° C (65°F). Each zoospore has the ability to start an infection, which explains why the sickness is more severe in cool, damp environments. Late blight outbreaks can occur when cool nights, warm days, and extended moist conditions from rain and fog occur, causing entire potato crops to be destroyed in less than two weeks. In poorly managed storage spaces (Figure 4) with too much humidity, the disease can sporulate on infected tubers. Condensation causes water droplets to form on the surface of infected tubers, which can cause the pathogen to generate sporangia and infect surrounding tubers, resulting in the soft rot bacterium destroying the entire pile.

Fig 4: Potato seedling

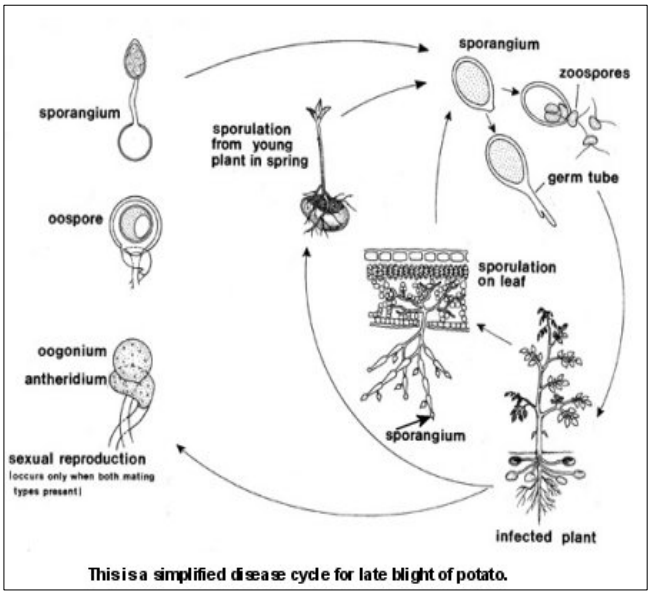

Fig 5: disease cycle with stem lesions (Jean Ristaino, Gail L. Schumann, Cleora J. D'Arcy)

Disease Management. Cultivars: While no potato cultivar is resistant to all P. infestans lineages, certain cultivars are more resistant than others. Even low levels of resistance may considerably lower disease severity if the climate in which the potatoes are produced is generally dry. Improved host resistance can also be paired with timely foliar fungicide applications to boost disease control. Transgenic potatoes containing genes from wild Solanum species have been created, and these transgenic potatoes require less fungicide sprays and are more environmentally friendly than weekly spraying.

Conclusion

Moisture levels in the crop canopy can be reduced with proper drainage and air movement. Avoid fields that are surrounded by trees and lush vegetation. The ease and frequency of fungicide applications may be influenced by the geometry of the field**.**

To manage late blight, two to three year rotations to non-host crops are recommended. Aside from potatoes and tomatoes, late blight is known to affect a variety of weeds and ornamental plants in the Solanaceae family, including nightshades. If oospore generation becomes common, rotation plans may need to be adjusted to accommodate this new inoculum source. The disease persists in infected tubers, which disintegrate quickly, while oospores can live for years in the soil**.**

Tubers infected during the previous season are the most important source of early inoculum in the absence of oospores. Cull piles and tubers left in the field at harvest may contain surviving tubers. Culled potatoes should be left to freeze on the surface, hauled to a landfill, or buried at least 1 m (3 feet) deep.

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