IMPORTANT POTATO FUNGAL INFECTIONS AND HOW TO TREAT THEM

Hamrayeva Dilnavoz Uchqun qizi
Doctoral Student, Tashkent State Agrarian University

ABSTRACT--
Potatoes, first cultivated in the Andes of South America 2,000 years ago, are a major food crop with a 15 times greater yield than cereals. They offer more energy, protein, and amino acid lysine than other single food crops. Potatoes grow well in various climates and soil types but are sensitive to aeration and drainage. They are essential for nutrition as they are low in salt, fiber, and vitamins B, C, and B. 72% of potatoes are used as food, vegetables, wafers, mashed potatoes, chips, soups, and fuel for alcohol. The potato crop is prone to numerous biotic and abiotic illnesses, including salt, high temperatures, acidic pH, and zinc shortage. Excessive nitrogen application reduces starch content, postpones maturity, and increases the risk of peeling and bruising during harvest. Low fertility or water stress may make potato crops more vulnerable to certain illnesses. Most damaging potato crop diseases are leaf roll, ring rot, and late blight, which can completely destroy a crop if not controlled. Fungal diseases, such as common scab, black scuf, dry rot, and wilting, contribute to yield losses.

KEY WORDS: ***p****otatoes, crop, potatoes, food, vitamins, fungal, diseases, control, plants*----------------------------

INTRODUCTION

Potatoes were first cultivated in the Andes of South America 2,000 years ago. Only eight species of potatoes (Solanum tuberosum L.) belong to the genus Solanum. species are grown all over the world. The edible Potatoes have become a major component of food crop other than cereals as it may supply 15 times greater yield than cereals. Compared to other single food crops, potatoes offer more energy and protein, as well as the necessary amino acid lysine. Although potatoes grow well in a variety of climates (tropical, subtropical, and temperate) and soil types (from light sands to heavy clay loam), they are sensitive to aeration and drainage. Water (80%), carbs (20%), minimal fat (0.1%), amino acids, minerals (2%) and potassium are all present in its tuber. According to Walt and Merill (1963), potatoes are essential for their nutrition since they are low in salt, fiber (0.6%), and vitamins B, C, and B2. 72% of potatoes are used as food, vegetables, wafers, mashed potatoes, French fries, chips, soups, and fuel for alcohol. The potato crop is tiny (30-100 cm), vegetatively propagated, and mature plants develop from the tuber's bud (eyes). The size of the tuber depends on the cultivar and age of the plants, and tuber production begins during the flowering stage and concludes throughout the fruit stage. Conventional breeding is hampered by traits such as high heterozygosity, male sterility, self-incompatibility, and tetrasomic inheritance. The primary factors in traditional breeding techniques are crossing for recombination, mutation, and selection. Since it takes six to eight years to choose a suitable variety from 100,000 seedlings, selection is not a reliable criterion.

The potato crop is prone to numerous biotic and abiotic illnesses. The primary abiotic factors affecting potato production include salt, high temperatures, acidic pH, and zinc shortage. Excessive nitrogen application reduces starch content, postpones maturity, and increases the risk of peeling and bruising during harvest.

Low fertility or water stress may make potato crops more vulnerable to certain illnesses. While wilting is more severe when soil moisture levels are low, high soil moisture is favorable for fungal growth and dissemination.

Numerous nematodes, bacteria, fungi, and plant viruses have been identified as major potato pests. The most damaging potato crop diseases are leaf roll, ring rot, and late blight, which can completely destroy a crop if appropriate control measures are not taken. Fungal diseases, which are divided into foliar, soil, and tuber diseases, are a major contributor to yield losses. Common scab, black scuf, dry rot, and wilting are significant fungal diseases, whereas late, early, and Phoma blight are foliar diseases. This review offers the awareness and control of significant fungal potato sickness (Table 1)

Phytophthora infestans is the source of late blight, which is initially classified as a destructive disease of the potato crop that results in dry or wet tuber rot. Its remarkable capacity to adapt to a broad range of environmental conditions where potato cultivation takes place led to its initial observation in Europe. It is among the primary causes of its considerable prominence among potato illnesses.

It is well-known for triggering the most severe Irish Potato Famine in history. After the British brought the potato to the subcontinent, indications of it were initially seen in the Nilgiris Hill, and Assam, Bengal, and Bihar all reported outbreaks. When favorable moisture and temperature conditions prevail, the initial infection frequently happens shortly after the plants emerge, despite its name. The favorable temperature promoted the fungus's growth. The fungus grows so quickly that it can destroy the entire plant in two weeks. It damages stems, leaves, and tubers; on potato plants, water-soaked patches were seen. The virus can overwinter in contaminated potatoes (one-fourth to one-half inch below the skin), and favorable climatic conditions increased the formation of sporangiophores with many lemon-shaped sporangia.

Table 1: **Important fungal disease of potato and their management (Muhammad Fahim Abbas)**

Disease name	Causal organism	Management
Late blight	*Phytophthora infestans*	Certified seed and host resistance
Early blight	*Alternaria solani*	Crop rotation and chemical treatment
Wart disease	*Synchytrium endobioticum*	Soil treatment, crop rotation and removal of plant debris
Stem canker and black scurf	Rhizoctonia solani	Chemical and biological control
Powdery scab	*Spongospora subterrannea*	Resistance cultivars and cultural practices
Pink rot	*Phytophthora erythroseptica*	Proper drainage
Silver scurf e	*Helminthosporium solani*	Chemical treatment and proper storag
Watery wound rot	*Pythium ultimum* and *P. debaryamum*	Proper storage
Gangerene	*Phoma exigua*	Chemical treatment
Dry rot	*F. coeruleum*, *F. eumartii*, *F. oxysporum* and *F. sulphureum*	Chemical and biological control
Skin spot	*Polysecytalum pustulans*	Cultural and chemical control
Wilting	*Verticillium alboatrum*	Crop rotation and resistance cultivars
Charcoal rot	*Macrophomina phaseolina*	Crop rotation, proper nutrition and drainage

High temperatures encourage the growth of mycelial cells, while high humidity (90%) is essential for sporangia germination. Eight to twelve biflagellate motile zoospores are released in moist and chilly weather. These spores can infect potato tubers close to the soil surface and can enter tissue directly. Premature plant mortality from foliage infection decreased yield, and infected tubers began to decompose in fields and stores. Reducing foliar and tuber infections is essential for managing late blight effectively, and cultural methods are highly effective in lowering the primary inoculum.

Synchytrium endobioticum is the cause of potato wart disease. Since its initial report in Hungary the disease has grown to pose a major danger to potato production in temperate regions, including Europe, North and South America, South Africa, and the Subcontinent.

When a potato plant responds to ward disease, it may show protuberences on tubers, stolons on stems, leaves, flowers, and not on roots, or rough, warty outgrowths (spherical, spongy, and mushy). Motile zoospores are dispersed by soil moisture and potato tubers, whereas resting spores spend the winter on infected seed tubers or soil. More zoospores were created by Sporangia, which stay alive for 30 years after fusing in pairs and releasing into the soil.

The key to managing the disease is preventing the introduction of disease material; once an infection has been documented, control of the disease is impossible. Reducing the accumulation of inoculum requires extended crop rotations, soil treatment, periodic assessments, and the removal of diseased plant debris. Although soil fungicides can eradicate the disease, they are expensive, and the key to effectively managing wart disease is host resistance.

The disease's causative organism, Rhizoctonia solani, lowers the market value of tubers, causes brown cankers to develop on the underground stem, and causes aerial tubers in addition to rolling and withering of the leaves. Dark brown or black sclerotia can be seen on mature tubers during the humid summer months, and stem canker forms somewhat above ground level. Weakened stems were formed by infected tubers, and during a severe illness, tubers will not sprout. The upper leaves roll over, and the soil, plant detritus, and sick tubers serve as a place to overwinter.

There is always a potential of disease development when contaminated tubers are planted, and the likelihood of a severe infection is decreased by healthy tubers. Because of the large range of hosts, management relies on treating the soil, crop, and seed correctly. Fungicides like carboxin, benomyl, thiabendazole, and pencycuron work very well on clean tubers with margosa cake. For the treatment of disease, antagonistic fungi and bacteria such as Trichoderma harzianum, T. viride, Rhizoctonia, and Bacillus subtilis have been found. The disease (Helminthosporium solani) only affects tubers that have smooth, leathery skin close to the heel end. Due to moisture loss, potato tubers with a silver shine (known as "silver scurf") and shrivel tubers were noticed. The primary infection is caused by infected tubers, which enter through the lenticels and periderm of the skin. The ideal temperature range for pathogen development is 2-31 C. Mature potato tubers that are born in the soil may have severe illness, and storage may also reveal serious infection. Chemical treatment and storage below 3°C with 90% humidity are recommended for tubers. Applying pentachloronitrobenzene to the soil could be advantageous. It is brought on by the pathogen Polyscytalum pustulans, which can infect every part of the earth and cause light brown lesions on stems, stolons, and roots. Spots develop on infected tubers during prolonged storage, and the disease overwinters in the soil and tubers before spreading to the plant's underground portions. Contaminated tubers do not exhibit disease symptoms when harvested, but after storage, spots are visible. This disease spreads to healthy potato tubers through airborne conidia if the diseased tubers are not preserved appropriately.

The market value of potato tubers is decreased by skin patches on their surface, and this virus also inhibits the sprouting of infected tubers. Fungicide use before to storage and cultural practices in the field are useful strategies for managing this illness.

REFERENCES

1. *Irshad, G., & Naz, M. F. A. F. (2014). Important fungal diseases of potato and their management–a brief review. Mycopath, 11(1).*
2. *Gao, A. G., Hakimi, S. M., Mittanck, C. A., Wu, Y., Woerner, B. M., Stark, D. M., ... & Rommens, C. M. (2000). Fungal pathogen protection in potato by expression of a plant defensin peptide. Nature biotechnology, 18(12), 1307-1310.*
3. *Arora, R. K., & Khurana, S. P. (2004). Major fungal and bacterial diseases of potato and their management. In Fruit and vegetable diseases (pp. 189-231). Dordrecht: Springer Netherlands.*
4. *Termorshuizen, A. J. (2007). Fungal and fungus-like pathogens of potato. In Potato biology and biotechnology (pp. 643-665). Elsevier Science BV.*
5. *Adolf, B., Andrade-Piedra, J., Bittara Molina, F., Przetakiewicz, J., Hausladen, H., Kromann, P., ... & Secor, G. A. (2020). Fungal, oomycete, and plasmodiophorid diseases of potato. In The potato crop: its agricultural, nutritional and social contribution to humankind (pp. 307-350). Cham: Springer International Publishing.*
6. *Lu, L., Yin, S., Liu, X., Zhang, W., Gu, T., Shen, Q., & Qiu, H. (2013). Fungal networks in yield-invigorating and-debilitating soils induced by prolonged potato monoculture. Soil Biology and Biochemistry, 65, 186-194.*
7. *Rivero, M., Furman, N., Mencacci, N., Picca, P., Toum, L., Lentz, E., ... & Mentaberry, A. (2012). Stacking of antimicrobial genes in potato transgenic plants confers increased resistance to bacterial and fungal pathogens. Journal of biotechnology, 157(2), 334-343.*