Silver Scurf Control in Potatoes

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Introduction

Silver scurf is caused by a fungus, *Helminthosporium solani*, a relatively new problem related to potato production in North America. It wasn't until the early 1990's that this fungus was identified as being a serious issue, particularly in storage. This fungus causes a surface blemish issue, resulting in the tubers looking "dirty". *H solani* likely attacks all potato cultivars but is most important on those that are fresh marketed. Smooth skin types appear to be more susceptible than russet types. While silver scurf infects potatoes in the field, the greatest damage occurs in storage, particularly with increasing time in storage, and is especially visible on smooth skin cultivars.

Symptoms and Damage and life cycle

Silver scurf infects the epidermis of the potato, giving the tuber a silvery appearance that can not be washed off. With time in storage, some cracking of the epidermis occurs which may also affect the weight of the pile through moisture loss. While the greatest problems occur in storage, primarily a result of spores spreading from tubers infected in the field, red and yellow cultivars can have significant infection and damage at harvest.

Close up evaluations of tubers with a microscope reveals "Christmas tree" like structures which are conidiophores (the structure where conidia or spores are produced) with branches that are the actual spores of the fungus. These spores are easily dislodged and moved in the air system of a storage unit. These spores, given high enough humidity and time, are what cause problems in storage since they spread and cause new infections. Given enough time, more spread occurs and what started out to be only a small number of tubers originally infected results in most tubers with some infection, sometimes heavy.

Care must be taken not to confuse silver scurf with black dot (*Colletotrichum coccodes*). Over the last year or two, substantial black dot infections have been seen on tubers being evaluated for silver scurf. While silver scurf forms the "Christmas tree" type spore structures, black dot does not, but rather shows a darkened skin and under a microscope, small dark irregular shaped bodies called sclerotia are seen, sometimes having projections called setae.

Where Does Silver Scurf Come From?

There has been considerable work done in resent years to answer this question. The answer is simply…seed. We have known for some time that some seed lots are highly infected. Planting these highly infected seed pieces resulted in high infection rates of daughter tubers. Seed with a higher infection severity has a greater likelihood of increased incidence on the daughter tubers.

There does not seem to be a relationship between infected seed and regional origin of the seed. All seed states potentially produce seed with silver scurf infection. What is likely the most important consideration is how the seed grower managed the disease. Research has shown that in a normal sequence of seed expansion over the course of three years, incidence of silver scurf increases. This is likely due to the seed grower not practicing good sanitation techniques with equipment, but most importantly, not keeping the different seed lots and generations separated during storage. In other words, by placing generation 2 seed with a little silver scurf in the same storage as a nuclear lot, allows spores to move from the infected lot to the clean lot.

Soil can be a source of daughter tuber infection but not a likely source. Research has shown that silver scurf spores apparently do not survive in soil for long, probably not beyond two years. Therefore, in the Columbia Basin where generally 3 or more years separate potato crops, soil borne spores infecting daughter tubers are not important.

Control

Management of silver scurf cannot be done by a single approach but can be successfully accomplished using all of the methods described below.

Seed. Silver scurf issues start with infected seed. If you are a commercial grower and uncertain if the seed you are purchasing is free of silver scurf, have it tested. Each year we find lots that have little or no infection while many lots have high infection levels.

Seed growers should always keep seed lots separate in storage because different lots may have different levels of silver scurf infection, regardless of generation. While this creates difficulties of needing different storage space than currently available, this is the only way to insure that an infected lot does not contaminate a clean lot.

Crop rotation. Research has shown that *H. solani* does not survive long periods in soil. Therefore, practicing crop rotation, by not planting potatoes for at least two years or more in the same field, will greatly reduce the chance of daughter tuber infection.

Seed treatments. Specific seed treatments have been found that reduce silver scurf infections substantially. The two most common is TopsMZ and Maxim. Using TopsMZ at the 8oz rate/cwt, or Maxim (8 oz/cwt), MaximMZ (8oz/cwt), or liquid Maxim (0.04 fl oz/cwt) and have all been shown to provide good silver scurf control. The added use of MZ is recommended as a means to control Late Blight and reduce the likelihood of the development of fungicide resistance. The use of these seed treatments does not allow the use of highly infected seed. In other words, while these seed treatments do a great job in reducing silver scurf, they will not prevent all infection of daughter tubers, particularly if the seed was highly infected.

Sanitation. Seed growers should always disinfect equipment between lots to kill spores left behind from the previous lot. Storage buildings should also be disinfected between storage years. Silver scurf spores have been reported to survive on debris and on walls of storages from one year to the next. Commercial growers should practice the same techniques.

Harvest. Potatoes should be harvested as soon as skins have been adequately set. Leaving fields unharvested beyond skin set will encourage higher levels of infection in the field.

Storage. Considerable losses can occur in storage. How much disease develops depends on storage conditions, amount of infection on tubers when placed into storage, and how long tubers are stored. As a general rule, cooler temperatures and lower humidity are good ways to reduce development of silver scurf in storage. However one can only reduce the temperature so far and reducing humidity for a short duration may be acceptable but long term, reduced humidity can cause pile shrinkage and pressure bruises. Therefore the best management opportunities rely on knowing how much infection is in the potatoes and relate that to the time they will be stored. Representative tubers from each seed lot going into storage should be assayed for silver scurf. This can be done by digging tubers just before kill down from all seed lots planted and have them assay for silver scurf. High infection lots can be placed together into the same storage whereas lots with little or no infection could be placed together in a separate storage. Knowing the amount of infection of all lots in a storage can provide significant information as to how long they might be stored without large scale secondary infection. Research has shown that large amounts of secondary spread of this disease does not generally occur in Russet Norkotah before the end of January, given a normal storage environment. This time period apparently is what is needed for the silver scurf infected areas on tubers that went into storage to produce spores (conidia) that move through the pile via the air system, and infect new potatoes. Therefore even heavily infected lots can be stored until about that time. Low risk lots (those with little or no infection at the beginning of the storage season) can be stored as long as May or more, given a normal storage environment, but periodic checking of the storage and assaying for silver scurf levels is important.

In storages intended for long term storage, never open the storage up and remove some tubers and then close again. Major losses have occurred in these situations apparently due to the dislodging of conidia by equipment and air currents which serves to spread the disease throughout the pile.

The use of ozone, hooded ozone, and chlorine dioxide products has not been shown to be effective in controlling silver scurf in storage.

Future control possibilities. For the last several years we have been looking at how to control silver scurf in storage. At least one product (Quadris) has been shown to be highly effective when very small levels are applied in small amounts of water as the tubers are going into storage. An IR-4 program is currently underway to test residue levels and hopefully this product, in combination with another product for disease resistance management, will be registered for this use in the near future. This would be for commercial growers only.

Better control opportunities need to be provided to seed growers, particularly since this is where the silver scurf problem is originating. We are working on this issue by looking at a combination of products that could be used when seed tubers are entering storage. A tank mix will be necessary for seed growers to reduce the risk of resistance development by *H. solani*. We hope to have a procedure perfected and registered in the next few years.

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