

## Silver Scurf Management – Post-Harvest

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Silver scurf caused by the fungus *Helminthosporium solani* causes grey to silvery blotches on the surface of potato tubers. There is no internal damage or rot associated with infection by this pathogenic fungus, but the affected skin has a silvery sheen and can be unappealing to the consumers of fresh marketed potatoes. This disease actually has two distinct phases. One phase occurs while the tubers are still in the field and results in infected areas that are generally on or near the stem end of the tuber. These blemishes are called “primary lesions.” The other phase is the result of fungal conidia produced within the primary infections spreading locally or through the ventilation system while the tubers are in storage. The usually smaller lesions that are the result of this process are called “secondary lesions.” Secondary lesions occur anywhere on the tuber and can be so numerous as to cover virtually the entire surface of the tuber. Secondary spread may be greater under warm and moist conditions (e.g. condensation) in storage. In storage, these infected tubers lose water at a greater rate compared to healthy tubers due to the disruption caused in the periderm (skin) by the pathogen. Infection is limited to the skin.

Since there are two components or phases to silver scurf infection, the field or primary infection component and the storage or secondary component, managing silver scurf requires an integrated approach combining both field and storage tactics.

The following list includes a few suggestions to help reduce silver scurf:

1. Plant seed with a low level or preferably no incidence of silver scurf
2. Use an effective seed treatment
3. Harvest tubers as soon as skins have set; avoid delays in harvest after vine kill
4. Clean and sanitize storage facilities
5. Apply an effective post-harvest product
6. Manage for proper storage conditions – avoid condensation

Reliance on one method alone will not be effective. The combined use of all these practices may not provide adequate control, particularly in smooth skinned cultivars.

### *Storage Conditions and Silver Scurf*

*Condensation.* Avoid condensation on the stored crop. Condensation often equates to the formation of free moisture on the surface of the tuber. Research has shown that condensation on the tuber surface even for 1 hour increased silver scurf sporulation. Additional research has demonstrated that significantly higher levels of silver scurf occur in the presence of free moisture. Severities were as high as 6.5 in the presence of free moisture compared to only 5.0 when no free moisture was present (ratings performed on a 1-10 scale with 1=0 and 10=100% coverage).

Condensation occurs when temperature differentials occur in the air circulating within the storage facility. If any of the air drops below the dew point, condensation will be the inevitable result. The "dew point" is defined as the temperature at which water vapor condenses at the same rate that it evaporates, which is just a more complicated way of saying the air is saturated with moisture or is at 100% relative humidity. This means that the air simply cannot hold any more water vapor and any further cooling of the air means that condensation will be the result. Localized areas within a storage facility where some of the air becomes cooled below the dew point can occur frequently.

In any situation where there is a significant difference in potato or surface temperature (i.e. wall, ceiling, structural element, etc.) and air temperature within a humid storage, there is the potential for condensation to occur. This potential makes it very important to monitor and integrate the temperature of the crop into your ventilation system operation and storage management plans. Condensation that occurs on the interior of the storage, especially ceilings, beams or walls, can drip free water onto the stored potatoes below. Just remember that warmer air holds more water vapor than cooler air, so if the warm air around the surface is quickly cooled, water may condense out if the temperature of the surface is below the dew point of the surrounding air.

*Holding Temperatures.* In general, cooler storage temperatures will decrease the potential for disease development. Recently, there has been a change in storage management protocols related to fresh market potatoes due to the use of the stored crop for production of dehydrated products. For this type of use, the potatoes must be stored in such a way that the reducing sugars remain within levels acceptable for processing. This practice has prompted the holding of fresh potatoes at warmer temperatures (42 to 45°F), but raised the question of whether or not these warmer temperatures would impact silver scurf in storage. A three-year research study at the University of Idaho evaluating a yellow-skinned variety (year 1) and Russet Norkotah (year 2 and 3) showed no considerable impact on percent silver scurf incidence or severity of silver scurf when potatoes were stored at 40, 42, 45, and 48°F.

*Relative Humidity.* Lower relative humidity in storage can retard the spread of silver scurf in storage, but studies have shown that to be effective the level needs to be below 85%RH. Lowering humidity is not a recommended practice for managing silver scurf in storage. Crop shrinkage will be greater at lower relative humidity conditions

*Sanitation.* Storage cleaning and disinfection is important, especially to minimize disease carryover from one season to the next. Previous research showed that silver scurf conidia survived on foam insulation and soil floors for at least 9 months and in plywood and sheet metal for 3 months. Follow the steps for cleaning and disinfecting storage facilities outlined in the University of Idaho Extension Bulletin CIS 1180 titled "Cleaning and disinfecting potato equipment and storage facilities" located at <http://extension.uidaho.edu/kimberly/2013/04/storage-management/>

*Application of post-harvest product.* For over 12 years, researchers from the University of Idaho, Oregon State University and Miller Research have been evaluating the efficacy of different chemistries to be used as post-harvest sprays to control silver scurf on naturally infected tubers in storage. Research over the last 11 years has shown that azoxystrobin or azoxystrobin-based products sprayed on potatoes prior to storage can be effective in reducing spread of silver scurf during the storage season. Combining 11 years of results showed an average of 36% silver scurf incidence in the non-treated controls stored 3 months compared to 11% silver scurf in tubers treated with azoxystrobin based products. After 6 months silver scurf incidence was 42% and 10% for non-treated and treated tubers, respectively. The recently registered product Stadium™ (Syngenta) contains azoxystrobin and is a good tool to add to the silver scurf control toolbox.

Phosphorous acid (phosphite) products have also shown efficacy against silver scurf. These products, tested since 2006 at the labeled rates for late blight and pink rot control, have proved to be surprisingly effective on silver scurf. Non-treated controls showed 45% silver scurf incidence after 3 months of storage compared to only 13% silver scurf incidence in tubers treated with phosphorous acid based treatments. Longer term storage (6 months) resulted in disease incidence of 30% in the non-treated and 16% in the treated tubers. Research also indicated greater consistency in phosphorous acid control of silver scurf when applied at the 12.8 fl. oz/ton rate and a volume of 0.5+ gal/ton. Lower rates and volumes may not be as effective. No significant differences were observed between the two commonly used phosphorous acid based products (Resist 57 and Phostrol). Post-harvest use of phosphorous acid can also be added to the silver scurf toolbox.

### ***Field Conditions and Silver Scurf***

Utilizing an effective seed treatment and a post-harvest product can significantly reduce the level of silver scurf at harvest and in storage. A 1-year study compared a standard seed treatment (6% mancozeb dust) to a premium program (CruiserMaxx® Potato Extreme seed treatment; Quadris® in furrow; Quadris Top® foliar) on silver scurf level after storage of Russet Norkotah potatoes. At harvest, potatoes from both programs were treated with and without a post-harvest application of Stadium™. The standard program with no post-harvest treatment yielded tubers with a 47% incidence of silver scurf. In comparison, the standard program with the addition of a post-harvest application of Stadium™ resulted in 14% incidence. This demonstrates the efficacy of the post-harvest application to minimize silver scurf in storage. If only the premium field program was used, there was 14% silver scurf incidence after storage. That is a comparative difference of 47% versus 14% silver scurf incidence if emphasis is strictly placed on managing silver scurf with field-applied treatments. Finally, if both a premium field program and a post-harvest application were used, the level of silver scurf after storage dropped to 1%. Theoretically, it should be possible to lower the level of silver scurf from 47% to 1% by combining field fungicides with a post-harvest fungicide application.

Additional studies were performed to investigate the potential of phosphorous acid as a seed treatment and an in-furrow application. Some seed treated with phosphorous acid showed delayed emergence and silver scurf was not controlled on the daughter tubers. The lack of disease control and the potential for crop damage indicate that phosphorous acid should not be used as a seed piece or in-furrow treatment for silver scurf control. The greatest efficacy of

phosphorous acid against silver scurf occurred when it was used as a post-harvest spray application.

## **Conclusions**

Managing silver scurf requires an integrated approach that uses all management tools available to a grower. Buying seed with a low level of silver scurf, treating with an effective seed treatment, cleaning and disinfecting storages, applying an effective post-harvest treatment, and avoiding condensation in storage are all effective tools. Using these tools and others in an integrated manner will help minimize the effects of silver scurf of the stored crop. A complete reference on the biology and management of this disease can be found in the Tri-State Extension Bulletin Silver Scurf Management in Potatoes (PNW 596), available for free online at either Oregon, Washington or Idaho Extension publication web sites.