POSTHARVEST TREATMENTS TO SUPPRESS SILVER SCURF ON STORED POTATOES

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Abstract

Fungicide treatments were applied to 'Russet Norkotah' *(Solanum tuberosum)* tubers prior to placement in a commercial storage in 1997. Samples were stored for eight months and then rated for silver scurf *(Helminthosporium solani)* development. The experiment was repeated in 1998-99. Silver scurf lesions were observed on nearly one-half of the tubers sampled prior to placement in storage After the storage period, 99 percent of the untreated tubers had silver scurf lesions. The potassium sorbate and Maxim treatments had the lowest percentage of silver scurf-free tubers, but all fungicide treatments produced a larger percentage of lesion-free tubers than the untreated post-storage check treatment. All fungicide treatments, except Mertect, significantly reduced the average tuber surface area covered by silver scurf lesions as compared to the untreated post-storage control.

Introduction

Silver scurf is a disease of potatoes caused by the fungus *Helminthosporium solani.* It causes blemishes and lesions on the skin of the tuber that reduce tuber quality and marketability. Packing houses report increased sorting costs, increased inspection time, and rejected lots at destinations. Processors have difficulty peeling the skin off tubers when symptoms become excessive.

Silver scurf infection can occur in the field or in storage. Primary infection occurs in the field while tubers are attached to the stolons, from spores that have survived either in the soil or on the surface of seed tubers. Secondary infection occurs during harvest and piling operations or from spores moving about in the storage environment (Frazier et al., 1998).

Silver scurf spores can remain viable for extended periods of time on structural materials such as wood and polyurethane. There is evidence that the fungus can live for over nine months in the soil of the storage floor, particularly when the soil contains decaying tubers or other organic matter (Shetty et al., 1997).

Once the tubers are placed in storage, free moisture can increase sporulation and secondary spread of the disease. Free moisture forms inside storages when condensation occurs on ceilings and walls because of poor insulation or improper management of humidity and ventilating systems. Silver scurf pockets often appear in the warmest areas of the pile and also near the bottom vents where moisture tends to accumulate (Frazier et al., 1998).

Treating tubers with a fungicide prior to placing them in storage is one strategy to control the development and spread of silver scurf. Postharvest tuber treatments are only one part of an

integrated program to control the disease. This study was designed to evaluate several postharvest treatments to control silver scurf in storage.

Materials and Methods

1997-98 Experiment. A commercial lot of 'Russet Norkotah' potatoes was identified in a Madras, Oregon field with the potential for silver scurf infection based on field history. Tubers (6-12 oz) for the study were randomly selected on October 3, 1997 from the conveyor belt moving the potatoes from the truck to the storage. A sample of 50 tubers was collected, removed from the storage and checked for the presence of silver scurf by the moist bag method described below. One hundred tubers were immersed in a solution made by combining 1.9 oz of Dithane ST (mancozeb) in three gallons of water; another set of 100 tubers was dipped in a 0.2 M solution of potassium sorbate ($C_6F1,0_2K$); and a third set of 100 tubers was dipped into a 0.2 M solution of calcium propionate ($C_3H_sO_2$•Y2Ca). Maxim Potato Seed Protectant (fludioxonil) was applied to a fourth set of 100 tubers at a rate of 0.5 lb product per 100 lb potatoes. The fifth set of 100 tubers was sprayed with Mertect 340-F (thiabendazole) as they tumbled through the piler unit at a labeled rate of 0.42 fl oz of product per ton of potatoes. A sixth set of 100 tubers was left untreated. After the fungicide treatments were applied, the tubers were allowed to air dry. The untreated check tubers and the treated tubers for each treatment were placed into mesh bags of twenty tubers each. The mesh bags were placed onto the face of the pile about four feet above the floor of the storage and buried with potatoes. The samples were stored at 42°F until they were removed from storage on June 2, 1998. Tubers from each mesh bag were placed in plastic bags, moistened, and placed in a dark room at 70°F to cause the silver scurf lesions to sporulate. After a month, tubers were removed from the plastic bags. Each tuber was scored for the presence of silver scurf, and the tuber area covered by lesions was rated visually.
1998-99 Experiment. Methods were similar to the 1997-98 experiment except as follows. The tubers were selected, treated, bagged and placed into the storage pile on October 2, 1998. One hundred tubers were collected for each treatment, including the pre-storage untreated check. Samples were removed from storage on May 11, 1999.

Results and Discussion

Silver scurf lesions were observed on nearly one-half of the tubers sampled prior to placement in storage (Table 1). These tubers apparently were infected in the field or during harvest and trucking operations. After the storage period, 99 percent of the untreated tubers had silver scurf lesions and evidently were infected by spores moving with the circulating air in the storage. The percent of tubers infected with silver scurf after treatment with Mertect was not significantly reduced as compared with the untreated post-storage check. Potassium sorbate prevented the secondary infection occurring in storage as the percentage of tubers with silver scurf lesions was not significantly different from the pre-storage check treatment. More tubers treated with Maxim were observed with silver scurf lesions than potassium sorbate in 1997-98. The trend was reversed in 1998-99. Calcium propionate and Dithane ST were less effective than potassium sorbate in preventing secondary lesion development.

Mertect has been commonly applied for a number of years to control Fusarium dry rot in many commercial storages. Apparently, it controlled silver scurf as well. However, it has been noted that *H solani* has recently developed resistance to Mertect (Merida and Loria, 1990). This study suggests that local *H. solani* populations also have developed some degree of resistance to Mertect, as most of the Mertect-treated tubers developed silver scurf lesions.

All fungicide treatments, except Mertect, significantly reduced the average tuber surface area covered by silver scurf lesions as compared to the untreated post-storage control (Table 1). The average tuber surface area covered with silver scurf lesions was significantly lower with potassium sorbate treated tubers than with any of the other treatments in the 1997-98 experiment. In the 1998-99 experiment, the area covered by silver scurf lesions was similar for the potassium sorbate and Maxim treated tubers. Similar results have been observed in *in vitro* and greenhouse experiments (Olivier et. al., 1998).

Calcium propionate and potassium sorbate are fungicides commonly used in food products. Dithane ST was registered in 1997 for post-harvest treatment of seed potatoes only. Mertect is currently registered as a postharvest treatment. Maxim is not currently registered for this type of application.

Table 1. Post-harvest tuber treatments to control silver scurf, Madras, 1997-98 and 1998-99.

	% of Tubers with Silver Scurf Lesions		% of Skin Surface Covered by Silver Scurf Lesions	
Treatment	1997-98	1998-99	1997-98	1998-99
Untreated Pre-storage	48	48	6.5	6.1
Potassium Sorbate	47	51	4.8	4.0
Maxim	68	42	9.6	4.6
Calcium Propionate	79	80	13.6	9.7
Dithane ST	78	82	13.2	11.8
Mertect	93	90	16.4	25.4
Untreated Post-storage	99	99	22.8	25.4
LSD 5%	18	14	4.8	7.6

Literature Cited

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Acknowledgments

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