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Silver Scurf Caused by *Helminthosporium solani* Can Be A Polycyclic Disease on Potato Tubers, Below Ground

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INTRODUCTION

Specialty potato growers in western Washington seek effective measures for controlling silver scurf on smooth-skinned red, yellow, and white potatoes. Quality is an important issue for fresh market potato sales, and the lesions produced by *H. solani* are detrimental. In other potato production regions, potato seed treatments have been shown to be efficacious in reducing silver scurf infections on the progeny tubers (new tubers that form from the seed tubers). However, in western Washington, which has a mild marine climate, seed treatments have not been as effective. Many facets of the silver scurf disease cycle are unknown, and this experiment was designed to gain a better understanding of how the disease spreads from infected seed tubers in the field production environment.

METHODS

A small field trial was planted 28 May 2008 near Mount Vernon with a potato seed lot of cultivar Yukon Gold, having an extremely high incidence (100%) and severity (57% to 90%) of naturally-occurring silver scurf lesions caused by *H. solani*. Experimental design was a randomized complete block with 4 replications. The trial plots were maintained for 10 weeks using cultural practices typical for growing fresh market potatoes under western Washington conditions. Seed and/or progeny tubers from 3 plants per plot were destructively sampled 7 times during the growing season to document infection and sporulation by *H. solani* below ground.

After digging, all sampled tubers were placed in paper bags, immediately brought to the laboratory, directly observed (without washing) for signs of *H. solani* using a dissecting microscope at 40x, and photographed within a few hours of digging the sample. Conidiophore (hyphae that produce conidia, which are asexual fungal spores) formation and spore multiplication on seed tubers, followed by progressive movement of conidia onto developing stolons and roots and then to new progeny tubers, was documented. Tubers were sampled on 8 September 2008 prior to harvest and were shipped overnight to WSU in Pullman for scanning electron micrographs. The identity of *H. solani* was confirmed via pure culture isolations in the laboratory, and also by scanning electron microscopy.

RESULTS AND DISCUSSION

Direct observations of buried, naturally-infected tubers indicated that *H. solani* can sporulate profusely on seed tubers below ground, even after the tubers are rotted, aged, dried or shriveled (Table 1). Further, the spores can spread onto newly developing potato tissues, such as roots, stolons, and progeny tubers, leading to silver scurf infections well before harvest (Figures 1-3). Crevices and depressions near the stolon end and at eyes and near sprouts appeared to be the most common locations for *H. solani* sporulation on buried tubers. Conidia were abundant on progeny tuber surfaces at the time tubers entered storage. Of the seed and progeny tubers sampled on 8 September, 43% and 16%, respectively, were positive for *H. solani* conidiophores and/or conidia. Isolates of *H. solani* were also collected from buried tubers, and their pathogenicity on potato confirmed.

CONCLUSIONS

Buried seed tubers are a primary source of inoculum for *H. solani* in western Washington. Seed treatments are commonly used to control silver scurf on specialty potatoes, but to be effective in this region, seed treatments must have long term residual activity. We hypothesize that moisture from rain or irrigation water percolating through the soil facilitates reproduction and movement of *H. solani* conidia below ground. Since prolific infection and sporulation on progeny tubers can occur prior to storage, disease interventions during the growing season such as alternative seed treatments, fungicide drenches, irrigation management, and/or disease forecasting based on below ground environmental conditions need to be investigated in addition to storage management.

ACKNOWLEDGEMENTS

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IPM Supplies Reminder

The commission is once again offering free supplies to WA growers for trapping leafhoppers and tuberworm. We are also supplying WA growers with free beating sheets. We have both all black and two-sided white and black. The beating sheets are $25 for non-WA growers and others. These supplies are pictured below.

To receive these supplies, simply call the commission office, or send an email to ajensen@potatoes.com specifying how many fields you need to monitor and/or how many traps you need, and whether you want a beating sheet. For help with insect identification or any other aspect of insect monitoring, call (509-765-8845) or email Andy Jensen at the commission office.

Table 1.

Silver scurf on buried seed and progeny potato tubers of cv Yukon Gold[a] that were destructively sampled during the 2008 growing season at WSU-NWREC, and immediately and directly observed for signs of *H. solani*.

Sample time and (DAP)[b]	Seed tubers: Seed piece decay, %	Seed tubers: *H. solani* rating[c] 1	Seed tubers: *H. solani* rating[c] 2	Seed tubers: *H. solani* rating[c] 3	Progeny tubers: No./plant	Progeny tubers: Wt.(g)/plant	Progeny tubers: *H. solani* rating[c] 1	Progeny tubers: *H. solani* rating[c] 2	Progeny tubers: *H. solani* rating[c] 3	Microscopic observations
14 Jul (47)	0	0/1	1/1	0/1	.	.	.	.	.	*Hs* sporulating on seed tuber belowground—destructive sampling initiated
21 Jul (54)	2	12/12	4/12	0/12	6.2	53.1	.	.	.	*Hs* sporulating on seed tubers especially in crevices and protected depressions
30 Jul (63)	0	12/12	2/12	12/12	6.2	331.8	.	.	.	Conidiophores remain on seed tubers but no longer have numerous conidia; 'dehisced' conidia on eyes/sprouts/rootlets of developing tissues
12 Aug (76)	16.7	10/12	2/12	5/12	5.5	439.3	.	.	.	Some conidiophores with conidia; dehisced conidia on stolons and progeny tubers, especially in protected depressions or protected areas like eyes
21 Aug (85)	.	.	.	.	.	.	51/65	24/65	0/65	*Hs* actively sporulating on belowground tissues, including surfaces of progeny tubers
5 Sep (100)	70.8	12/12	3/12	0/12	6.6	744.7	3/79	24/79	10/79	*Hs* still actively sporulating on seed tubers--especially progeny tuber in protected depressions of tuber surface; some *Hs* spores dehisced and appear to be germinating on progeny tubers
30 Sep (125)	.	.	.	.	5.6	700.7	60/67	0/67	60/67	Conidiophores on progeny tubers mostly with dehisced conidia; these appear on tuber surfaces and on stolons

[a] The seed tubers were naturally infected with high levels of *Hs* prior to planting on 28 May.
[b] Each sample was composed of 4 replications of 3 plants. DAP = days after planting.
[c] *H. solani* sporulation on tuber: 0 = none; 1 = conidiophores but no conidia; 2 = conidiophores + conidia; 3 = dehisced conidia on tuber surface.

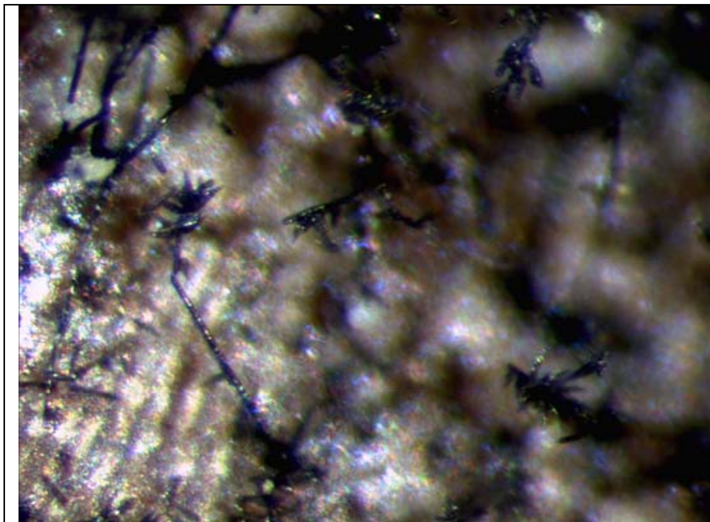

Figure 1. *H. solani* sporulating below ground, on a seed potato of cultivar. 'Yukon Gold,' 47 days AFTER planting.

Figure 2. *H. solani* spores forming below ground, on a progeny potato tuber of cultivar. 'Yukon Gold,' 103 days AFTER planting, and 14 days BEFORE harvestl.

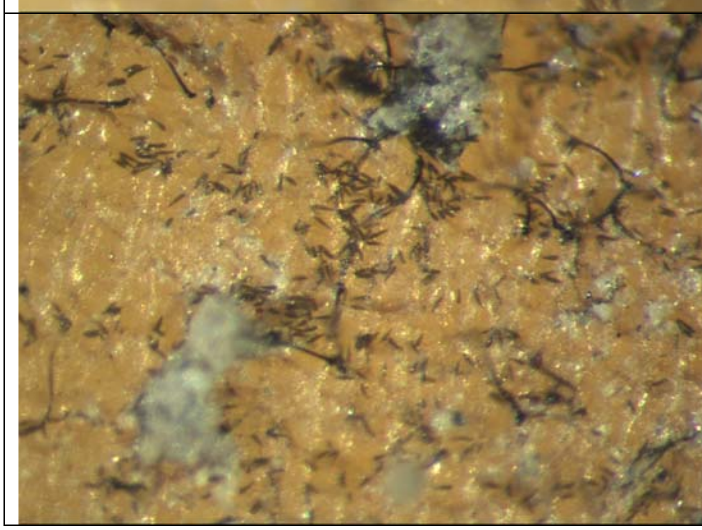

Figure 3. *H. solani* spores on thesurface of a progeny potato tuber of cultivar. 'Yukon Gold,' 8 days AFTER harvest and 1 day BEFORE storage. Note some spores have germinated on the tuber surface.