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Surveying Anastomosis Groups of the Black Scurf Pathogen (*Rhizoctonia solani*) on Potatoes in the Pacific Northwest

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Rhizoctonia solani is an important pathogen of potato, causing both qualitative and quantitative losses. It has been associated with stem canker (Figs. 1 and 2), black scurf (Fig. 3), and elephant hide. *Rhizoctonia solani* isolates are assigned to one of 13 anastomosis groups (AGs), of which AG3 is most commonly associated with potato disease. Knowledge of the AG present is important as AGs can differ in aggressiveness to potato, host range, symptoms and fungicide sensitivity. As part of an IPC funded study (IPC 8717) in August 2011, isolates of *R. solani* were collected from diseased potato plants grown in Idaho. The majority of isolates were identified as AG3 by real-time PCR, but sequencing confirmed that two were AG2-IIIB and another was AG4 HG-II. Koch's postulates confirmed the pathogenicity of these three isolates on potato. In spring 2012, tubers were collected from seedlots throughout the Pacific Northwest, including Idaho, Montana, Oregon, and Washington. One hundred and ninety two *R. solani* isolates were recovered from 102 tuber samples. Direct screening of tubers showed 46% were positive for AG3. In summer 2012, stem canker samples were collected from potatoes and soil samples were collected from 7 different crops grown in rotation with potatoes throughout Idaho. Seventy-one stem canker isolates were screened for their AG using real-time PCR and 60 isolates tested positive for AG3. Further research is required to determine the AG of the remaining 11 isolates as well as their pathogenicity on potato. However, results from this study show the importance of AG screening, and could have implications on the crop rotation practices in the Pacific Northwest.



Figure 1. Stem canker on potato stems caused by *Rhizoctonia solani* AG3.



Figure 2. Stem canker lesions on a potato stem and stolons caused by *R. solani* AG2-2IIIB.



Figure 3. Black scurf on potato tubers caused by *Rhizoctonia solani* AG3.

Materials and Methods

Potato stem canker AG survey. In 2011 and 2012, diseased potato plants from Aberdeen, Burley, Kimberly, Parma and Rupert in Idaho, and Three Rivers in Michigan were collected from different potato fields. All samples displayed stem and stolon lesions typical of *Rhizoctonia* stem canker. The presence of *R. solani* was confirmed by isolation (Table 1). AG was confirmed using TaqMan® qPCR. AG was determined for non-AG3 isolates by sequencing the rDNA ITS region using primers ITS4 and ITS5. The resulting sequences from the isolates will be compared to those of other isolates present in sequence databases.

Table 1. Relative incidence of *Rhizoctonia solani* AG3 from symptomatic potato plants in 2011 and 2012 in Idaho.

Location	Number of isolates	% of AG3 isolates	% of non-AG3 isolates
<i>2011</i>			
Aberdeen, ID	6	100	0
Kimberly, ID	5	80	20
Parma, ID	3	100	0
Rupert, ID	1	0	100
Three Rivers, MI	1	0	100
<i>2012</i>			
Aberdeen, ID	18	89	11
Burley, ID	2	100	0
Kimberly, ID	18	94	6
Parma, ID	27	85	15
Rupert, ID	6	33	67

Seed lot tuber AG survey. In 2012, 102 seed tuber samples were collected from Canada, Idaho, Montana, Oregon, Utah, and Washington. The samples had symptoms of elephant hide and/or black scurf. DNA was extracted from tubers and tested for AG3 using qPCR. Additionally, isolates were obtained from tubers and screened for AG3 (Table 2). Negatives will be sequenced as previously described.

Soil survey of anastomosis groups. In 2012, soil samples were obtained from various crops with a history of potato production. Samples were collected in a “W” pattern across approximately half a hectare. Samples were screened using TaqMan® probes for AG3.

Table 2. Incidence of *Rhizoctonia solani* AG3 in seed collected throughout the Pacific Northwest in 2012.

Number of seed lot tubers positive for AG3		Number of <i>R. solani</i> isolates from seed lot tubers positive for AG3	
Canada - Alberta	2	Canada - Alberta	5
Canada – Saskatchewan	2	Canada – Saskatchewan	7
Idaho	20	Idaho	81
Montana	13	Montana	43
Oregon	5	Oregon	26
Utah	1	Utah	4
Washington	3	Washington	22
Total (out of 102)	48	Total (out of 196)	188

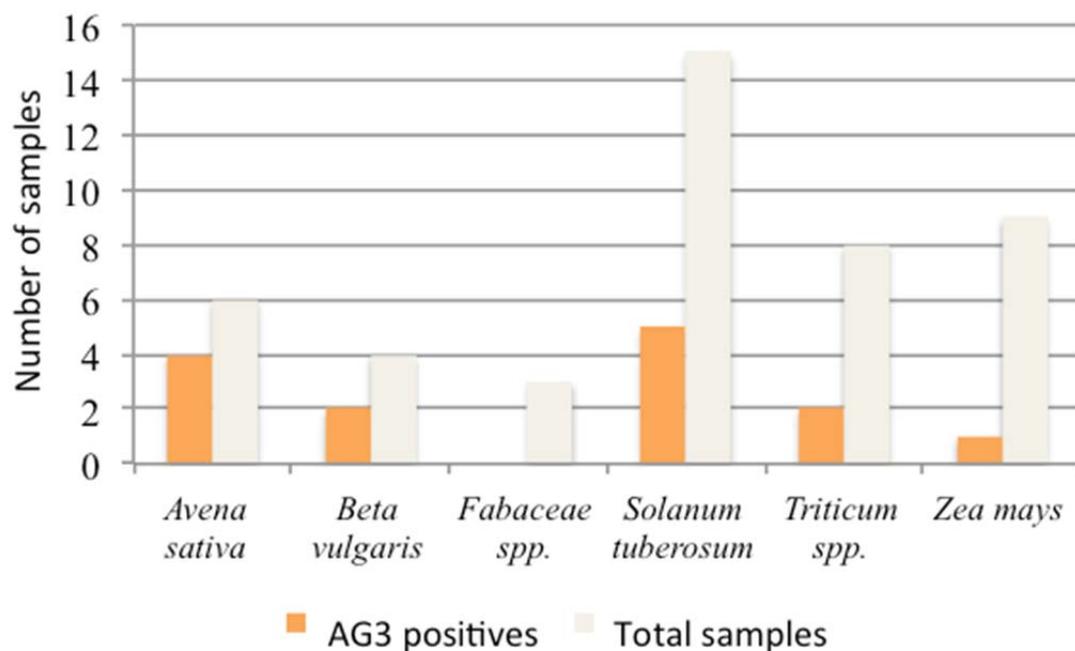


Figure 4. Detection of *Rhizoctonia solani* AG3 in soils collected from various crops in fields throughout Idaho in 2012. Orange denotes positive detection of AG3. Note for *Avena sativa* (oat) n = 6; *Beta vulgaris* (sugar beet) n = 4; *Fabaceae* spp. (alfalfa and soybean) n = 3; *Solanum tuberosum* (potato) n = 15; *Triticum* spp. (wheat) n = 8; *Zea mays* (corn) n = 9.

Results and Conclusions

- ⊛ Potato stem canker isolates were predominately AG3, further sequencing is required to determine the prevalence of other anastomosis groups among the negatives.
- ⊛ 196 *R. solani* isolates were recovered from the seed tubers and 96% were positive to AG3. Further testing of other anastomosis groups is required on negative *R. solani* isolates.
- ⊛ Among the soil samples collected from various crops in 2012, oats had the highest percentage of *R. solani* AG3. This result might have implications in potato crop rotations.
- ⊛ Future studies will investigate the pathogenicity of the new anastomosis groups on the various hosts.

Volunteer Potato Forecast for Columbia Basin in 2013

Marc Seymour & Rick Boydston, USDA-ARS, Prosser, WA

The minimum air temperature at the Paterson USDA-ARS research farm for the period December 22, 2012 thru February 14, 2013 was 16° F recorded on January 12, 2013. Temperatures at 2¾" deep fell below 28° F (the threshold to kill tubers) on several occasions between January 12th and January 24th, but it was not until January 24th that soil temperatures at 4¾" fell to a low of 27.5° F. Minimum soil temperatures at 6¾" and 8¾" did not fall below 30° F for the period January 12th through January 24th when the lowest ambient air temperatures for the winter were recorded.

Surveys in the Columbia Basin have revealed that post-harvest tuber leavings at depths greater than 4" can be as high as 25,742 tubers per acre. We estimate that approximately 75% of volunteer tubers were killed by winter temperatures this year, but that tubers below about 5" deep survived. Tuber leavings below 5" deep account for about 18,000 tubers per acre, which is greater than a standard commercial planting rate.

Plants from volunteer tubers will emerge late this spring because of the depth of viable tuber leavings and emergence will take place in a shorter time span than in years when tubers close to the surface remain viable. However, their numbers will represent a significant challenge to rotation crops that emerge slowly and compete poorly early in the season.

Control measures for volunteer potatoes in crop rotations can be found on the Prosser USDA-ARS website; http://www.ars.usda.gov/main/site_main.htm?modecode=53-54-00-00
A presentation on control of volunteer potatoes at the Pacific Northwest Vegetable Association Conference is posted at <http://www.pnva.org/files/files/2012PVNAPestManagementSess.pdf>

WSPC IPM Supplies Reminder

The WA State Potato Commission is once again offering free supplies to WA growers for trapping leafhoppers and tuberworm. **The yellow sticky cards can also be used to trap potato psyllids!** 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, or for help with insect identification or any other aspect of insect monitoring, contact Raina Spence (rspence@potatoes.com; 509-765-8845) or Andy Jensen (ajensen@potatoes.com; 208-939-9965).



2013 WA Commercial Seed Lot Pick Up & Trial Information

Info also available each year at: www.potatoes.wsu.edu

Commercial potato seed samples are requested for the 2013 Washington Seed Lot Trial. **Two hundred whole (single drop) seed is an acceptable sample size, or 50 lbs of 4 oz single drop seed.**

**Requested: 50 lbs of 2-4 oz whole seed, no seed treatments.
We want a representative sample - if applicable, include a
representative amount of ROTTEN TUBERS!**

(Seed over 6 oz is not acceptable)

A representative sample is needed. Sampling the first (or last) 300 seed from the truck is not likely to provide a representative sample of the lot. Sample tags may be obtained by calling the Potato Commission at 509-765-8845.

Your assistance with collection and drop off of seed samples is needed. Seed samples may be taken to the WSU Othello Research Unit (509-488-3191); located on Booker Road ¼ mile south from State Highway 26 and about five miles east of Othello. For sample pick up and any questions regarding the seed lot trials please call:

South Basin: Tim Waters (509-545-3511), Mark Pavek (509-335-6861), or Zach Holden (509-335-3452).

North Basin: Carrie Huffman Wohleb (509-754-2011), Mark Pavek (509-335-6861), or Zach Holden (509-335-3452).

In the North Basin, one seed “drop-off” has been established. It is located at Qualls Ag Labs (Mick Qualls, 509-787-4210 ext 16) on the corner of Dodson Road and Road 4; come to front office between 8 am and 5 pm. Please call the numbers below to arrange additional pick up sites. Samples will be picked up at 2:00 pm the day before each planting date (below) to be included. Growers planting in early March should drop their samples off at the Othello Research Center or store the samples and call the numbers below for pick up. For all alternative pick up locations or questions please call Mark Pavek at 509-335-6861 or Zach Holden at 509-335-3452.

PICK UP DATES ARE ONE DAY PRIOR TO THE PLANTING DATES BELOW

The planned seed lot planting dates for 2013 are:

1st (Early)	March 26
2 nd	April 9
3 rd	April 23
4th (Late)	May 7

2013 Potato Field Day - Thursday June 27

This year’s virus reading of the seed lots will take place on June 11 and 25.