



Potato Progress

Research and Extension for Washington's Potato Industry
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Andrew Jensen, Editor. Submit articles and comments to: ajensen@potatoes.com
108 Interlake Rd., Moses Lake, WA 98837; Fax: 509-765-4853; Phone: 509-765-8845.

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Analysis of a Panel of Traits to Identify Potato Varieties Resistant to Powdery Scab and Black Dot

Charles R. Brown, Rich Quick, Launa Hamlin, Ricarda Castañeda, Jim Crosslin, USDA/ARS, Prosser, WA; Dallas Batchelor, Weather Or Not, Pasco, WA; Chris Olsen, Olsen Farms, Othello, WA; Dennis Johnson, WSU, Pullman, WA; Nadav Nitzan, ARO-Volcani, Bet-Dagan, Israel.

Powdery scab (*Spongospora subterranea*) is a soil and potato tuber-borne pathogen. On potato this pathogen has root infection and tuber infection stages in its life cycle, which result in two diseases: "Spongospora root galling" and potato tuber "powdery scab." Potato cultivars that are susceptible to the disease demonstrate sponge-like galls on the roots, and/or lesions on the tubers. Potatoes vary in susceptibility to these two diseases. Russet skin cultivars do not develop severe or noticeable "powdery scab" tuber lesions as happens with tubers of white or red potatoes with smooth skins. However, roots of most, if not all, commercially successful cultivars demonstrate "Spongospora root galling" to different degrees. Reports from the industry in Washington State indicated that certain processing cultivars with russet skin are no longer grown in areas of the Columbia Basin where soil populations of this pathogen are high due to the damage the pathogen causes to the roots. The observations suggested that losses of 5 to 12 metric tons/ha may occur due to root impairment.

Potato black dot is caused by the soil-borne, tuber-borne and potentially air-borne fungus *Colletotrichum coccodes*. This disease is prevalent in potato production regions and can be of economic concern by itself, or as a part of the potato early dying syndrome. Black dot has been demonstrated to decrease total yields between 16 to 30 percent, causing premature death of the plants. The disease also causes grey-brown blemishes on the surface of tubers. The blemishes usually develop prior to harvest, become more evident during storage, and reduce the quality of the tubers. To date the management of black dot could be best achieved by application of strobilurin-based fungicides to potato foliage during the growing season. However, considering the expense, a more desirable means of disease management would be the release of resistant potato cultivars.

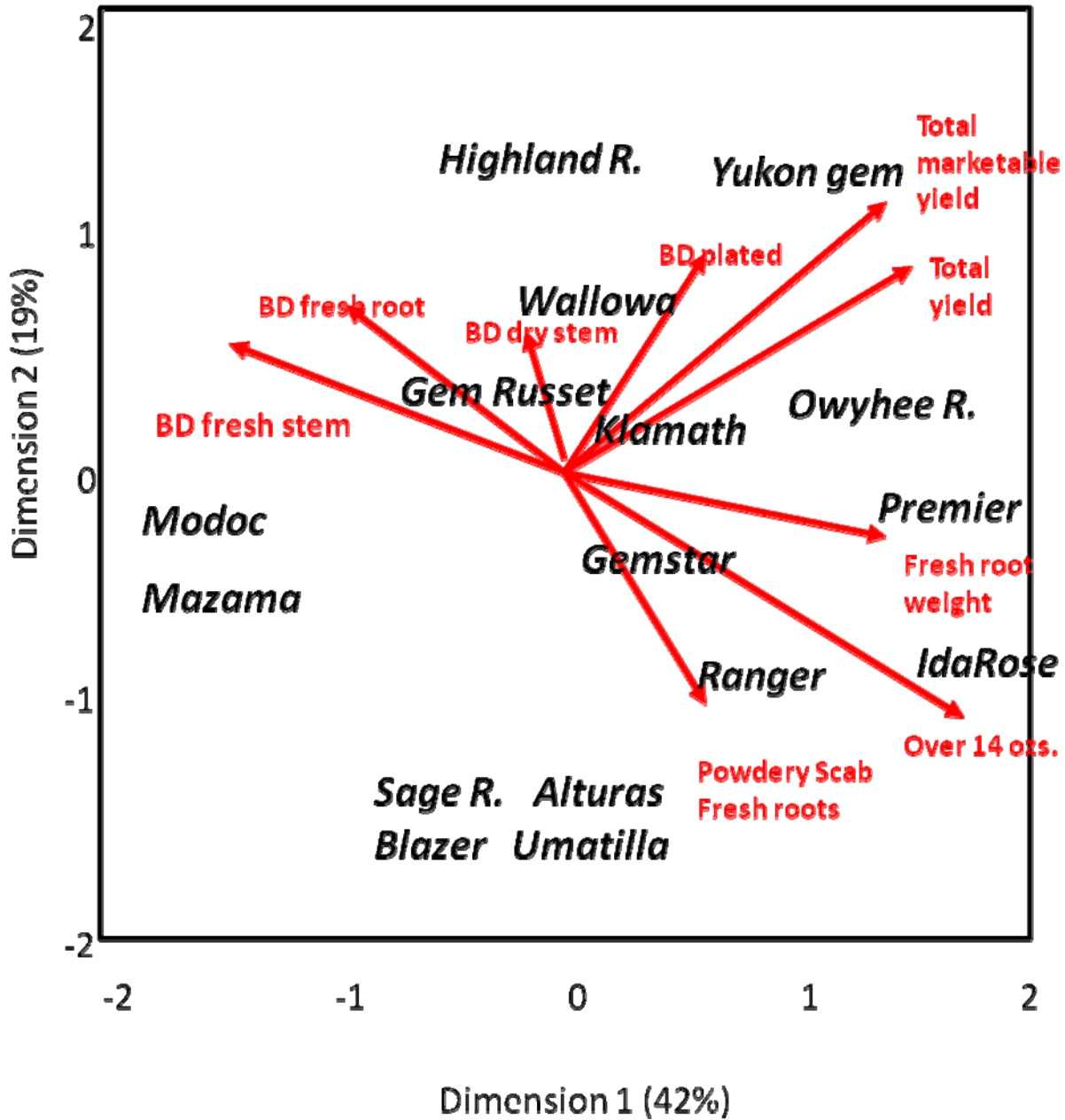
In the Columbia Basin these two diseases often occur together. Selecting for resistance among potato breeding lines is difficult because the elements of resistance are not well understood, and disease pressure varies considerably from year to year. One thing is clear, however: a resistant cultivar would have to produce a profitable yield or it would be of no use. In 2009 we undertook a study of cultivars managed by the Potato Variety Management Institute (PVMI) to try to identify those that appeared to show signs of resistance and yield characteristics that would indirectly

indicate resistance or tolerance to the two diseases. The varieties were planted in two experiments of four replications in each. The location was in a commercial field with a history of severe black dot and powdery scab damage. The following traits were measured at two harvest dates. Traits 1 through 8 were measured on plants harvested at 90 days after planting, while traits 9-18 were measured from tubers harvested at 120 days after planting.

1. Expansion of sclerotia on dry stems
2. Culturing of black dot fungus from stem disks
3. Fresh weight of root system
4. Dry weight of root system
5. Percent dry weight of root system
6. Fresh root galling index (powdery scab)
7. Fresh root sclerotia index (black dot)
8. Fresh stem sclerotia
9. Total yield
10. Marketable yield
11. Cull weight
12. Yield of under 4 oz.
13. Yield of size 4 to 6 oz.
14. Yield of size 6 to 9 oz.
15. Yield of size 8 to 10 oz.
16. Yield of size 10 to 12 oz.
17. Yield of size 12 to 14 oz.
18. Yield of size over 14 oz.

The data were analyzed in the form of a "Bi-Plot." This is a procedure for taking large sets of data and determining trends on two dimensions. Plant breeders and agronomists are often faced with taking masses of data obtained from different locations and different years and determining what is the best treatment or genotype. The Bi-Plot is a way of observing trends, but does not completely remove the complexity of deciding which is best in a real world situation. On the Bi-Plot below the red arrows indicate the direction of expression of certain traits. The length of the arrows indicates relative importance. The direction is important from the standpoint of how the traits are correlated. Arrows that are nearly parallel are highly correlated while those at right angles to each other vary independently. Those that point in opposite directions are negatively correlated. One of the important relationships observed on this Bi-Plot that lends confidence to this method of presenting these results is that yields of the very largest tuber sizes (i.e., over 14 ounces) were negatively correlated with indicators of black dot disease severity (e.g., BD fresh root, BD fresh stem, and BD dry stem). In addition, the fresh weight of roots was highly correlated with this trait. From this biplot, it would be possible to pick out Premier Russet, IdaRose, Sage Russet, Owyhee Russet, Yukon Gem, and Alturas as resistant cultivars. The new information for the processing industry is the possible utility of three new cultivars: Premier, Owyhee, and Sage in black dot/powdery scab zones of the Columbia Basin. This type of work was carried out in 2010 again. In particular we are interested to see if Sage, Premier, and Owyhee appear to be resistant again. In addition, we may discover intriguing signs of resistance in other breeding lines that are potential new cultivars.

Potato Variety Management Institute List



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CONFERENCE 2011

www.potatoconference.com

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Convention Center,
Kennewick, WA

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MONDAY, JANUARY 24

6 - 9 p.m.

Early Bird Reception,
Red Lion Columbia Center

TUESDAY, JANUARY 25

9:00 a.m. - 3:30 p.m.

Spanish Language Session

12 noon - 5 p.m.

Trade Show

2 - 4:30 p.m.

Cultivar Performance
Workshop

5 - 8 p.m.

Trade Show Reception
& Potato PAC Auction

WEDNESDAY, JANUARY 26

7:30 a.m.

Continental Breakfast

8 - 11 a.m.

General Sessions

8 a.m. - 5 p.m.

Trade Show

9:30 a.m.

Ladies Program

11 a.m. - 12 noon

Keynote Address

12 noon - 1:30 p.m.

Potato Bar

1:00 - 4 p.m.

General Sessions

6 - 9 p.m.

Potato Industry
Leadership Banquet,

Red Lion Columbia Center

THURSDAY, JANUARY 27

7:30 a.m.

Continental Breakfast

8 a.m. - 12 noon

General Sessions

8 a.m. - 1 p.m.

Trade Show

12 noon - 1 p.m.

Lunch

1 p.m. - 4 p.m.

General Sessions

Jan. 25-27, 2011

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