Potato Progress

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Potato Purple Top or Psyllid Yellows: What Was the Problem in 2002, and How Might it be Controlled?

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Early last summer, Oregon and Washington potato industry members saw what appeared to be the start of a major potato leafroll virus (PLRV) epidemic. Many fields were impacted while just as many seemed to be unaffected. In early June a number of fields, primarily in the southern Columbia Basin, exhibited symptoms similar to early PLRV, such as curling leaves, stunting, and sometimes yellowing. Laboratory tests did not confirm PLRV. Low aphid numbers in the area during that period further suggested that PLRV was not the problem. Within another 10-14 days the symptoms continued to develop, becoming less like typical PLRV and more like typical "purple top" symptoms. Purple top, a disease caused by the aster yellows phytoplasma, is characterized by stunting, yellowing, leathery leaves, thickened nodes, axillary bud elongation (making the plant look bushy), and aerial tubers. Tubers from purple top-infected plants are prone to premature sprouting and browning of fried products due to high sugar concentrations. As we struggled to diagnose the problem, purple top seemed more likely due to the large numbers of the leafhopper vectors of purple top in the Columbia Basin. Because of the high incidence and severity of damage, particularly in the mid to southern areas of the Basin, laboratory analyses were attempted to confirm the presence and identity of the phytoplasma involved.

In contrast to PLRV testing with the ELISA technique, testing for phytoplasmas in plants is not simple or straightforward. This is because phytoplasmas are more similar to bacteria than they are to viruses and occur at much lower concentrations in the plant. Phytoplasma testing requires another technique called polymerase chain reaction (PCR). The advantage of PCR is its sensitivity -- PCR can pick up minute quantities of a pathogen in a plant; at much lower concentrations than ELISA will detect.

Samples were sent initially to one laboratory for analysis. Using standard "primers," or specific segments of DNA with exact nucleic acid sequences that are specific for phytoplasmas, the plants were tested to see if any contained that nucleic acid sequence. Because of the close relationship between phytoplasmas and bacteria, care must be taken not to confuse a "phytoplasma positive" with the presence of contaminating bacteria. These first laboratory tests were negative. Additional samples were taken, originating from fields throughout the Columbia Basin and representing all the important potato cultivars. This time samples were sent to three different laboratories, each asked to look for two

possible phytoplasmas, aster yellows, and beet leafhopper transmitted virescence agent (BLTVA), another type of phytoplasma that might be present. All laboratory tests were again negative. To help confirm that laboratory tests were accurate, carrots with typical symptoms of aster yellows infection were tested. These were positive. It appeared that the potatoes where being impacted by some other agent.

An insect pest that causes similar symptoms to purple top is the potato psyllid (see *Potato Progress* Vol. II #10, August 29, 2002). This insect, which winters near the Rio Grande River, moves in the winds in early to mid-spring, typically finding its way to potato fields in Nebraska, Colorado, and Wyoming. These insects do not transmit a pathogen to the potato plant. Instead, nymphal feeding activity injects a toxin that causes symptoms very similar to those described above. The literature suggests that if psyllids are killed using insecticides, symptomatic plants would recover. There is no laboratory test to confirm that plant damage is caused by this insect.

Psyllid occurrence and damage in the Columbia Basin have not been studied in any detail. However, in the late 1990s, psyllids were confirmed in the area by Pete Thomas and Jim Crosslin during their investigation of PLRV related issues. In their situation they also found PLRV-like symptoms (much like what was seen early last summer) but these plants were also negative for the virus. Further investigation found psyllids associated with these plants. No effort was made at that time, due to the lateness of the season, to determine the importance of these insects to the potato crop, or if they were even the cause of the symptoms. When psyllids are found in potato fields in Colorado, Nebraska, and Wyoming, they are considered a serious pest and insecticide treatments are recommended.

So what really was the cause of the problem in potatoes last summer and can it be controlled?

Samples of symptomatic plants were also sent to two other laboratories. At both of these laboratories, using similar but slightly different methods, some samples tested positive for phytoplasmas. Rechecking a number of the samples we originally submitted, using these different techniques, we also found a phytoplasma. At this point, most evidence as to what caused the widespread problem in potatoes last summer suggests a leafhopper-transmitted phytoplasma, probably related to BLTVA. Some questions still remain however, since not all symptomatic plants were positive for phytoplasma.

Some growers seemed to control the problem incidentally with insecticides aimed at other pests. A group of Columbia Basin potato industry members met to try and determine what factors contributed to apparent control of this disease in unaffected fields. The following information, based on field observations and chemical use records of industry representatives at the meeting, provides some indication of what was effective and what was not.

Evidence strongly suggests that:

- Leafhopper populations were high in early June.
- Foliar insecticides were effective when applied in June.
- Scheduled Vydate in June was effective.
- In order to control the disease, treatments must be made before symptoms develop.

- Imidacloprid & thiamethoxam products (Admire, Genesis, Gaucho, Platinum) on seed and

in-furrow did not control the problem.
- Symptom development was equally severe in all cultivars.

There are weaker indications that:
- Temik used in late planted fields seemed to reduce symptomology (product no longer effective in early planted fields when insect flight occurred in June?).
- Plants appeared to be infected from June through July.

Conclusions

- A combination of evidence suggests that the problem was likely a leafhopper-transmitted phytoplasma, possibly BLTVA.
- Due to the occurrence of psyllids, and the failure to confirm a phytoplasma in some symptomatic plants, some damage may have been caused by this insect.
- Foliar insecticide application in June seemed to control the problem.
- In-furrow and seed treatment insecticides other than Temik did not seem to control the problem.

The Washington State Potato Commission is considering funding a multi-pronged research project on this problem during the 2003 season.

Nutrition Data on the Web

We just recently found a wealth of nutrition information on the USDA web site. The following web site link has detailed nutrition information for almost any food, including potatoes. The tables include potatoes raw and cooked or processed in almost any fashion one can want. A recent e-mail requested nutritional content of potato flour, and 5 minutes of work put that information to hand.

http://www.nal.usda.gov/fnic/foodcomp/Data/SR15/reports/sr15page.htm

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21st Annual Western Washington Potato Workshop

Friday, February 28th, 2003
Cotton Tree Inn, Mount Vernon, WA
8:00 am to 3:30 pm

8:00 Registration and Coffee

8:30 Welcome – *Dyvon Havens*

8:35 Branding Spuds: Market Forces of the Future – *Joe Guenther*

9:05 Discovery and Development of Natural Sprout Inhibitors – *Rick Knowles*

9:35 Mustard Green Manures for Potato Production – *Andy McGuire*

10:05 Break

10:25 Phostrol for Potato Tuber Rots – *Debbie Inglis*

10:40 New Virus Issues of Importance to Spud Growers – *Phil Hamm*

11:10 Seed and Soil Treatments for Rhizoctonia – *Debbie Inglis*

11:30 Potato IPM Program is Working in British Columbia – *Debra Henderson*

12:00 Lunch

12:50 Wireworms: To Know Them is to Control Them – *Bob Vernon*

1:20 Endangered Species and Clean Water Act Lawsuits Involving Pesticides – *Jim Jesernig*

2:00 Prospects for High Anti-Oxidant Potatoes – *Chuck Brown*

2:30 Economic Impact of Missing and Irregularly Spaced Potato Plants – *Mark Pavek*

2:55 Western Washington Variety Trials Results – *Bob Thornton*

3:20 Adjourn