Potato Progress

Research and Extension for Washington's Potato Industry
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Cull Pile and Waste Potato Management Important for Tuberworm Control

As winter comes bearing down on us, we need to be thinking about minimizing the success tuberworm moths can have in building large fall populations and overwintering. Any potatoes exposed to moths can be food sources for larvae, and contribute to building tuberworm populations. One of the most likely places moths will build up is the grounds surrounding storage buildings and other places where potatoes might be piled intentionally or spilled accidentally. Cull piles and piles of dirt mixed with potatoes are likely a major means of overwintering of tuberworm, just as they can overwinter late blight. Another major source of tuber moth populations and a means of overwintering are tubers left in/on the ground after harvest.

Cull/Dirt Piles

Our tuberworm trapping network identified a population build-up this summer near a complex of storage buildings north of Othello. This build-up was recently found to be due to cull potatoes and spilled potatoes lying about in large numbers. Tuberworm moths had colonized the area and, because there are usually no insecticides applied to this kind of situation, had built up to huge numbers. It is important to note that the amount of waste potatoes in the area was not unusually large – no large heaps of culls or pits full of potatoes. There were piles of mostly dirt with a few potatoes, and quite a few potatoes lying about which had been spilled from trucks. Tuberworm larvae are not afraid to share their food, and 25-50 (or more) larvae can develop in one tuber. Therefore, what seems like a small number of tubers in comparison to the thousands of tons you handle each day could be enough to build large numbers of moths. Such moths can then colonize neighboring fields or overwinter and start the race anew in the spring. **Cull potatoes should be destroyed, processed, or buried under at least 24 inches of soil as soon as possible.**

Harvester Leavings

As we all know, a very large number of potatoes are left in each field after harvest, many of them on or near the soil surface. These potatoes are ideal hosts for tuberworm during the fall and winter months. This was very clear from some of the pheromone trapping work done at the Hermiston Agricultural Research and Extension Center last winter. **Every effort should be made to limit the number of tubers left in or on the soil after potato harvest.**

Potato Commission Research Proposals

The potato commission's annual research proposal and review season is fast approaching. The new Request for Proposals is posted on our web site:

http://www.potatoes.com/research.cfm

Following is the research proposal and review schedule:

1. All proposals due: November 15, 2005.
2. Preliminary Research Review (Moses Lake): December 19, 2005.
3. Revised "new" proposals and progress reports due: January 15, 2006.
4. Final Research Review (Pullman): February 16-17, 2006.

Please contact Andrew Jensen at the commission office with questions or comments.

PVY: What, Where, and Why

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Potato virus Y (PVY) is found worldwide wherever potatoes are grown. The virus is transmitted by many species of aphids but the green peach aphid (*Myzus persicae*) is considered to be the most important in the Pacific Northwest. Potatoes are by far the most economically important host of the virus although some other crop plants can be infected, including tomatoes, peppers, and petunias. Many other species of plants have been infected experimentally. Some weeds common in potato fields, particularly nightshades, can be infected by PVY but are considered of minor importance in the spread of the virus. As with most important potato viruses, PVY is tuber-perpetuated but is not transmitted through true potato seed.

PVY was first described in the 1930's. Since that time different strains, or biological types, of the virus have been described. The so-called ordinary, or common strain, (PVY^O) has been found in potatoes around the world. This strain usually causes a mottling or mosaic discoloration of the foliage in infected potatoes. Some cultivars, including Ranger Russet, may show a severe leaf drop when infected with PVY^O. PVY^O is not known to cause internal tuber symptoms in economically important cultivars of potatoes. In tobacco, PVY^O causes a distinct systemic mottle. The tobacco necrotic strain (PVY^N), in contrast, causes a severe necrotic reaction in tobacco in which the veins, and eventually the rest of the leaf, become brown and die. In most cultivars of potatoes PVY^N produces relatively mild mottling or mosaic symptoms that may be difficult to diagnose visually. PVY^N has been found in Europe, North and South America, and sporadically elsewhere. It was first found in North America about 1990 in eastern Canada. A subgroup of the PVY^N strain, called the tuber necrotic strain (PVY^{NTN}), was originally described in Europe in the 1970s. This strain causes various internal and external rings, arcs, and discolorations in tubers of some cultivars. Sometimes PVY^{NTN} can cause severe foliar symptoms as well. Recently the PVY^N and PVY^{NTN} strains have been identified in potato-growing regions of the western United States and Canada. Another strain called stipple-streak (PVY^C) has been reported on potatoes but

does not appear to be widespread.

Now for the really confusing part! In the 1990s in Europe, strains of PVY were found that caused necrosis in tobacco, as does PVY^N, but had other characteristics associated with PVY^O such as the lack of tuber symptoms. At about this same time very specific monoclonal antibodies (Mabs) became available. These Mabs were capable of differentiating PVY^O from PVY^N, yet they identified these new necrotic-type of viruses as PVY^O. These came to be called PVY^N-Wilga, after the cultivar in which they were first identified. By the end of the 1990s the Wilga strain was the predominant type of PVY found in many potato-producing areas of central and eastern Europe. This virus has been called a recombinant, or "hybrid", because it has characteristics of both PVY^O and PVY^N.

In 2001-2002 researchers in Washington, Oregon, and Idaho observed symptoms on potatoes that suggested an unusual strain of PVY might be present. Transmission of these viruses to tobacco resulted in systemic necrosis confirming for the first time that PVY^N strains were present in major potato-growing regions of the western United States. Many of these necrotic PVY isolates are being maintained and further characterized by various research laboratories. A few have had their entire genetic sequence determined. The results indicate that in the western U.S. we have viruses that would fit the descriptions of PVY^O, PVY^N, PVY^{NTN}, and recombinants. Some of the recombinant viruses from Canada and the U.S. have been designated $PVY^{N:O}$ to indicate that they possess characteristics of both PVY^O and PVY^N. Some $PVY^{N:O}$ isolates are known to produce symptoms in tubers, especially small brown rings. In early reports of these $PVY^{N:O}$ recombinant viruses they were referred to as the "Alturas" strain because that is the cultivar from which they were first isolated. The PVY^N and PVY^{NTN} isolates are nearly identical to viruses described and characterized in Europe. Similarly, the recombinant $PVY^{N:O}$ isolates from the U.S. appear similar to those previously described from Europe.

What has happened since these viruses appeared? Researchers have investigated the occurrence of the various PVY^N types in seed lots from across the country and in production fields. It has become clear that PVY^N-type viruses are currently found coast-to-coast in the U.S. and Canada. The $PVY^{N:O}$ strain in particular has increased in occurrence. The reason for this was postulated in a research paper from Canada in 2003 and recent evidence supports this. Seed certification agencies have relied upon serological tests (ELISA) using PVY^N-specific Mabs for detection of the necrotic strains. Unfortunately, the $PVY^{N:O}$ strain reacts in ELISA tests as a PVY^O, and so could pass through since a certain amount of PVY^O is allowed in seed lots. Of course the $PVY^{N:O}$ strain could be detected by inoculation to tobacco, but this is impractical on a large scale and the necrotic symptoms require 2-3 weeks to become visible. Research currently focuses on various molecular methods for detection of all of the PVY^N viruses. Specifically, various types of the reverse transcription polymerase chain reaction (RT-PCR) are being developed for rapid detection and differentiation of the various PVY strains.

What can we do about it? Much research has shown that the initial source of PVY in a field is the seed. Aphids then rapidly spread the virus within the crop. Applications of insecticides have little effect on the transmission of PVY because the virus can be acquired and subsequently transmitted within minutes, before the chemical can kill the aphid. Preventing very large buildups in aphid numbers may have some benefit, however. Crop oils can also reduce the spread of PVY but must be applied frequently and may be impractical in large scale production systems. Therefore, starting with clean seed is essential for the production of a healthy crop. Unfortunately it is becoming more difficult to eliminate PVY in seed stocks. Many popular cultivars may show few foliar symptoms, but still suffer yield and/or quality losses from PVY. Indistinct symptoms of PVY infections make roguing difficult in seed fields. Russet Norkotah, Shepody, Alturas, and Gem Russet in particular seem to "attract" PVY but are widely grown. Currently the best recommendation is to plant early generation, virus tested seed. Serological testing can confirm the presence of PVY and identify the strains that react with the PVY^N-specific Mabs but will not specifically identify the $PVY^{N:O}$ strain.

What are the prospects and problems? We currently have molecular tests such as RT-PCR that can identify all PVY^N-types of PVY. Unfortunately these tests require specialized equipment and highly trained personnel familiar with the procedures. There will undoubtedly be technological improvements in detection methods in the future but these will also require expensive equipment and highly trained people. Indeed, as technical problems increase, the solutions also frequently increase in complexity. One obvious solution is to eliminate all PVY in seed stocks, regardless of the biological strain. Serological tests are accurate, relatively inexpensive, require less technical equipment, and can be used on a large number of samples. Commercially available antisera and monoclonal antibodies are capable of detecting, but not differentiating, all PVYs. Even so, not every plant in a seed field can be tested. Not even one plant in a hundred can be tested. How much would it cost to test one plant per 500 in a seed field? One in a thousand? Is that good enough? How many samples can be bulked per test? Who would bear the burden of the costs of extensive testing? Where would the tests be conducted? How and to whom would test results be made available? Would the cost of testing make "clean" seed too expensive to plant?

Producing seed with a very low incidence of virus is possible, but can we actually do it?

Cooperation with WASS Statistical Surveys Encouraged

The Washington Agricultural Statistics Service (WASS) will soon conduct its survey of agricultural chemical use for the 2005 season and its objective yield survey. The Washington State Potato Commission encourages all producers to cooperate with these efforts and all WASS surveys.

The WASS survey of chemical use is our primary means of providing use data to EPA and other regulatory agencies as a part of our work to protect continued access to important chemicals. Accurate and complete use data are essential in the chemical re-registration process. The commission uses these data regularly to defend existing pesticide registrations, to obtain Section 18 registrations, and to educate EPA staff and other regulators. A complete statistical profile enables us to portray the true picture of the potato industry, and avoid regulators' use of default or overestimated assumptions. The annual surveys of acreage, yield, production information, and acres planted by variety will also be conducted this fall. The latter data are used by commission staff when talking to potential potato buyers from around the world as we work to open new markets for Washington potatoes.

The survey data growers provide are kept confidential. Farm names, addresses, and information about individual farms are considered private information and are exempt from disclosure under the Freedom of Information Act. Data on individual farms cannot be released to the public under any circumstances.

Your response to the survey is, of course, voluntary and not required by law but your cooperation in this important survey is needed in developing accurate state and national estimates. If you have any questions or concerns about the survey, please contact Andy Jensen at the Potato Commission office.