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Important Potato Mosaic Virus Information

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Potato viruses, particularly potato virus Y (PVY) and potato virus S (PVS), have been the story so far for the young 2008 potato season. Unfortunately there has been a great deal of speculation and misunderstanding regarding the detection of these viruses and the effect they have on yield in various varieties. No doubt some of the fears are being fueled by cases of high PVY levels in several seed lots last season. The Idaho seed industry has taken action to eliminate PVY as a problem for commercial growers by mandatory ELISA testing of all seed lots for PVY in the winter grow-out in California.

Virus Detection: What is the best way to detect a potato virus? The current industry standard for virus detection is the Enzyme-Linked-ImmunoSorbent-Assay or ELISA test. This is a serologically-based test that employs antibodies specific for the protein portion of the virus. The ELISA system has been in use for potato certification since about 1980 and has an excellent track record of accuracy. No system is fool-proof, but ELISA is such a well established and familiar technique that modern laboratories seldom have problems with it. The technique is relatively quick and can readily detect virus at concentrations in the plant well below the level that would produce plant symptoms.

Another laboratory technique that is becoming more common is the Polymerase Chain Reaction (PCR) assay. The PCR assay targets the nucleic acid portion of the virus particle. PCR is

also very capable of detecting virus at concentrations below the level that causes visual plant symptoms. However, successfully implementing this technique requires specialized equipment, extremely high purity of all reagents, advanced technical training, and meticulous attention to detail. Unless all these requirements are strictly followed, PCR may produce false-positive results. PCR has proven to be an invaluable tool for teasing out strain differences and other nuances in PVY and other viruses, when performed in research laboratories.

At the present time, ELISA is the standard technique for certification of seed potato virus levels within the United States. The PCR technique is an excellent research tool and is being investigated for a potential role in seed certification but is currently not utilized by any certification agency in the country for this purpose. PCR may eventually find a place in seed certification, but before the procedure can be used as a certification tool, it must be calibrated against the techniques that are currently being used and then validated for accuracy by employing other supporting techniques including a bioassay (an actual grow out). So far, some results on the validation of these steps have been published, but the necessity of testing under real world conditions is recommended (Chandelier, et al. 2001, Fox, et al. 2005). Journal publication of new techniques is a first step toward establishing validated peer-reviewed results from which interpretation of test results can be made.

About the viruses:

PVY. Potato virus Y, also known as “common mosaic” can be responsible for a range of symptoms from virtually none (latent), like we see in Shepody and Russet Norkotah varieties, to noticeable stunting and mosaic symptoms as seen in Russet Burbank. Varieties such as Ranger Russet may exhibit severe foliar damage and even death of the entire plant. A three-year study performed by University of Idaho scientists on how seed-borne PVY affects yield in the varieties Russet Burbank, Russet Norkotah and Shepody concluded that 1% virus would result in a yield loss of 1.5 cwt per acre (Nolte, et al, 2003). Seed lots with PVY levels of 10% or less should perform with no detectible yield loss. Additional yield studies indicated that current-season infection (virus spread from plant to plant after emergence) had no detectable negative effect on yield in either Russet Burbank or Russet Norkotah (Lent, 2007).

PVS. Potato virus S is another virus commonly found in potatoes worldwide. It is latent (symptomless) in most potato varieties, and the effect on yield is considered to be minor. Visual symptoms do not occur in the vast majority of cultivated potato varieties. Symptoms reported for this virus include a slight deepening of the leaf veins, roughened texture of the leaves and general plant stunting. This virus is so common and so easily spread that no control measures have proven effective for management and most potato seed stocks have some level of infection.

The yields of most commonly grown varieties of potato are not known to be affected by PVS infection. Because the virus is virtually impossible to control and there is no known problem regarding yield loss, PVS infection is not considered to be a problem in the North American potato industry.

The Idaho PVY Task Force was recently formed to coordinate PVY research and education efforts for the benefit of the Idaho potato industry. Members include: Phillip Nolte, Mike Thornton, Juan Alvarez,

Alex Karasev and James (Ding) Johnson, University of Idaho; Jonathan Whitworth, USDA-ARS, Allan French, Simplot and Ritchie Toevs, Seed Potato Producer in Aberdeen, Idaho.

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