

## REVISED PETITION

**NUMBER:** WCC-89

**TITLE:** POTATO VIRUS DISEASE CONTROL

**DURATION:** October 1, 2001 - September 30, 2006

**DESCRIPTION:** Potato viruses represent a large portion of the disease problems that routinely face the potato industry. Control of these virus diseases is expensive, but has been accomplished using seed certification programs. In recent years, however, potato breeding programs have introduced a number of cultivars that have good agronomic characteristics, but often lack adequate virus disease expression. Efforts to control diseases in these potatoes (virus susceptible, but with an almost latent disease expression) have been of major concern to certification programs. Through good communication between the breeding and certification programs, the newest cultivars being released appear to have both agronomic characteristics and some level of virus resistance. Additionally, screening programs are weeding out those cultivars with latent expression to major viruses. Other recent efforts by commercial companies and universities have incorporated virus resistance into existing cultivars through biotechnology. Further development of this science has been slowed by lack of consumer acceptance. Finally, import of new cultivars from outside of the typical U.S. system are also straining the system regarding cultivar/virus interactions and symptomology.

The main cultivars in the western region of the country are Russet Burbank, Shepody and Russet Norkotah. Each is affected by leafroll and mosaic viruses. In the case of Russet Burbank, which represents 70-80% of the acreage in the Pacific Northwest, leafroll virus can cause substantially reduced yields and net necrosis symptoms in the tuber. When affected potatoes are graded, a small percentage of net necrosis in the internal defect column will result in rejecting the lot from market use, either fresh or processing. All three cultivars are susceptible to yield limiting mosaic viruses. In particular, Shepody and Russet Norkotah are almost latent carriers of PVY-mosaic. Recent studies on Russet Burbank show that expression of PVA-mosaic is more limited than PVY-mosaic expression, making it more difficult for seed growers to remove diseased plants from seed lots. This may help explain recent difficulties in controlling PVA in Russet Burbank.

Emerging viruses pose a constant threat to seed and commercial potato production. In the last five years, PVA and PVM were not known in the West. PVM seems to have been contained by the efforts of certification programs, while PVA appears to have become endemic in certain regions. Effects on yields from these viruses and new strains of older viruses are not well known and are confounding an already difficult situation. Tomato Spotted Wilt Virus (TSWV) has shown up from time to time in the western region and while not currently a problem, this and other viruses are significant problems in areas where they have become endemic. Also, when a new virus or virus strain is detected, there is rarely specific antiserum available to allow for widespread surveys of seed programs. Emerging viruses pose a wider threat to the potato industry as a whole simply because the industry moves more seed each year from more diverse areas to answer production needs.

Potato viruses influence not only the processing and fresh pack industries, but commercial growers, seed growers and the general public. Control of virus diseases requires the use of chemical pesticides, thus there is intense scrutiny by the public and EPA about environmental contamination

and food safety. Efforts made by researchers, regulators, and producers to limit virus spread helps reduce pesticide use and limits pest resistance problems. These practices ultimately produce lower costs and result in a healthier potato industry.

This is the only coordinating committee in the U.S. devoted to potato virus disease control. It is imperative that a coordinating committee work to share information on potato viruses, and work to identify and develop appropriate research programs which ultimately lead to strategies for control of viruses.

**OBJECTIVES:** The goal of the WCC-89 is to coordinate the diverse activities of numerous programs and agencies dealing with various aspects of potato virus diseases in order to achieve effective, reliable disease control while trying to reduce risks associated with chemical pesticides. The specific objectives are:

1. To provide a regional forum for the exchange of ideas through cooperation and collaboration among those involved in potato virus disease research for the long term goal of improving plant health and crop sustainability. Inherent in this is the pursuit of shared grant and funding opportunities, where appropriate, by WCC-89 participants.
2. To assist participants in the identification, transfer and utilization of knowledge, methods and resources. Additionally, resources will be directed toward dissemination of information to concerned parties for implementation of potato virus disease control strategies.
3. To act in an advisory capacity with regional and national organizations for the purpose of evaluating concerns, recommending policies and reviewing quarantine and seed certification issues, and other pertinent matters as they relate to potato viruses and their control.

**EXPECTED OUTCOMES:** WCC-089 expects to coordinate regional activities to include, but not be limited to:

1. Identification of priority research issues and development of cooperative strategies to obtain funding, conduct the research and publish the results.
2. Identification and characterization of new virus problems, new virus strains and virus-like organisms (phytoplasmas) with dissemination of this information to WCC-89 members and the potato industry.
3. Maintaining strong relationships with state certification programs and encouraging the standardization of testing methods for potato viruses and phytoplasmas.
4. Cooperation with WCC-027 to identify reactions of new clonal selections to specific virus diseases affecting the potato crop in the west.
5. Exchanging ideas and information through the use of annual meetings and brief publications specifically directed at interested clientele, and routine communication (i.e. e-mail, FAX,

Internet resources, etc.).

6. Acting as a resource group which would provide advice and recommendations to impact policy relating to: a) germplasm importation, b) development of new transgenic potato cultivars, c) utilization of transgenic resistance and germplasm, d) seed certification issues dealing with potato virus diseases and e) other pertinent potato virus or phytoplasma related issues.

**EDUCATIONAL PLAN:** A brief annual report, including identified research priorities for the region, plus individual summaries from each participant at the annual meeting will be generated. Minutes of the meeting plus the annual report/summaries will be sent to each committee member. In addition, the annual report will be sent to appropriate Deans and Ag. Experiment Station Directors, key legislators and identified clientele (i.e., potato grower groups within the region). A one page review of committee activities and its role will be submitted to the major western potato industry magazines for grower information. Finally, an e-mail network of potato virus workers will be established and pertinent information will be made accessible through the Internet to the potato industry.

**OPERATIONAL STRUCTURE:** The committee will utilize a three-officer system containing a Chair, Vice Chair, Secretary and general membership. Each year a new Secretary shall be elected at the annual meeting. At the end of the annual meeting, the previous year's Secretary will move into the Vice Chair position and the Vice Chair will move into the Chair position. There will be an effort made to spread the officer duties around the western region so that no one state or area will have all of the officer functions at any given time. In addition, a subcommittee will be established each year for the purpose of handling the annual meeting details. Annual meetings will be rotated around the Western Region.

**PARTICIPANTS:** The following is a list of scientists who have been active in the committee since its inception, or are interested in participating in this coordinating effort.

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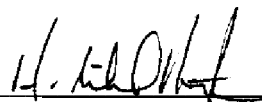
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SIGNATURES:  \_\_\_\_\_ July 18, 2001  
Administrative Advisor Date

 \_\_\_\_\_ July 18, 2001  
Executive Director, WAAESD Date

**WCC-89 ACCOMPLISHMENTS:** Since revising the petition for the last three-year cycle the WCC-89 has:

1. **Held three annual meetings in various areas of the west** where research and extension personnel had significant interaction on many aspect of potato virus disease control. Participants have been educated on the interactions of viruses and vectors, especially concerning potato leafroll virus, PVY, PVA, and PVX.
2. **Researched the effect of viruses on potato yields: collaborations include;**

Coordination of a three year study on PVA-mosaic effect on yield. The first year of this study has been completed with locations in Idaho and Oregon (Nolte and Hamm). The structure of this experiment was based on earlier work with PVY-mosaic vs. yield which was coordinated and completed through the efforts of this group.

Hane, DC and PB Hamm, 1999. "The effects of seedborne PVY infection in two potato cultivars expressing mild disease symptoms". *Plant Dis*:83:43-45.

Hamm, PB and DC Hane, 1999. "Effects of seedborne potato leafroll virus on Russet Norkotah potato". *Plant Disease* 83:1122-1124.

Nolte, P.M., Larkin, D., Love, S.L., Berger, P.H., Whitworth, J.L., and Thornton M.K. 1998. The effect of different percentages of seed borne PVY yield in three potato varieties. *Potato Assoc. of America Ann. Meeting*.

Rykbost, KA, DC Hane, PB Hamm, R Voss, and D Kirby, 1999. "Effects of seedborne potato virus Y on Russet Norkotah performance". *Amer. J. of Potato Research* 75:91-96.

Voss, R, K Rykbost, D Hane, P Hamm, and D Kirby. 1999. Potato virus Y spread and effect on production in Northwest United States. *European Potato Research* (in press)

  - **Researched nematode vectored virus problems: collaborations include;**

Brown, CR, H Mojtahedi, GS Santo, P Hamm, JJ Pavsek, D Corsini, S Love, JM Crosslin, and PE Thomas, 2000. "Potato Germplasm resistant to Corky Ringspot Disease". *Amer. J. of Potato Research* 77:23-27.

Ingham, RE, PB Hamm, and KA Rykbost, 2001. Control of Corky Ringspot in Oregon. *Amer. J. of Potato Research*. 78:(in press)

Brown, CR, H Mojtahedi, GS Santo, PB Hamm, R Novy, D Corsini, S Love, and S James, 2001. Defending the profitability of growing potato in the Columbia Basin: Development of Corky Ringspot and Columbia Root-Knot Nematode Resistant Germplasm. *Amer. J. of Potato Research*. 78(in press)
  - **Identified IFAFS grant proposal monies to fund coordinated potato virus research** (Berger). Proposed title for grant is, "Emerging virus threats: Coordinated strategies for effecting sustainable potato health." The work would include many different resources and personnel (e.g. extension/outreach, new diagnostic methods, and certification). Received a



grant for \$69,376. Real-time PCR for detection of potato viruses. USDA/ARS - Natl. Pot. Council. (3/01-2/02).

- **Joint presentations given at National Potato Council Seed Potato Seminar** by WCC-89 participants. *Entomopathic fungi's role with Green Peach Aphid and Late Blight: An Idaho Perspective, A Minnesota Perspective* (Mowry and Ragsdale). Talk focused on the increased fungicide spraying effect on GPA populations. *Impact of Latent Mosaic Viruses on Certification Programs* (Davidson). Talk focused on the impact and methods to handle latent viruses in seed certification programs.
- **Researched virus resistance of newly released varieties.**  
Release of two new potato varieties (Bannock, Umatilla) that are less susceptible to PVY-mosaic when compared against Russet Burbank. When exposed to heavy inoculum pressure, Russet Burbank had 47% PVY infection, Bannock Russet - 3%, and Umatilla Russet - 23% (Corsini). Both varieties released through the Tri-State Variety Development Program.
- **Studies for evaluation of testing methods and new disease diagnostic methods:**  
Grant funded, USDA/ARS. Real-time PCR for detection of potato viruses (Berger). PVY seed cutting/transmission studies (Franc).  
James, S. 1999. A comparison of two winter testing schemes for certifying seed potato lots. Oregon State Univ. Special Report 1003, 6/99, pgs. 24-27.
- **Virus vector studies:**  
Research efforts submitted for publication include action thresholds, acquisition studies, and pesticide work all in relation to green peach aphid and leafroll virus (Mowry). In addition, an antiserum to a Pacific Northwest isolate of PVA was produced (Berger).  
Castle, SJ, TM Mowry, and PH Berger. 1998. Differential settling by *Myzus persicae* (Homoptera: Aphididae) on various virus infected host plants. *Ann. Entomol. Soc. Am.* 91:661-667.  
Ding, H, P Shiel, P Berger, and S Eigenbrode. 2000. Volatiles from PLRV-infected potatoes are arrestants for *Myzus persicae*. *Entomol. Soc. Am.* (abstract at annual mtg.).  
Brunt, A., Berger, P.H., Lawson, R., and Loebenstein, G. (eds.) 2001. *Identification and Control of Potato Viruses*. Kluwer Academic Publ., Berlin (in press)  
  
Berger, P.H., and German, T.L. 2001. Biotechnology and resistance to potato viruses. Chapt. 13 in: *Identification and Control of Potato Viruses*. Brunt, A., Berger, P.H., Lawson, R., and Loebenstein, G. (eds.). Kluwer Academic Publ., Berlin (in press)  
  
Castle, S.J., Mowry, T.M., and Berger, P.H. 1998. Differential settling by *Myzus persicae* (Homoptera: Aphididae) on various virus infected host plants. *Ann. Ent. Soc. Am.*

91:661-667.

Sudarshana, M.R., and Berger, P.H. 1998. Nucleotide sequence of both genomic RNAs of a North American tobacco rattle virus isolate. *Arch. Virol.* 143:1-10.

Cavileer, T.D., Clarke, R.C., Corsini, D.L., and Berger, P.H. 1998. A new strain of potato M carlavirus. *Plant Dis.* 82:98-102.

- **Regional grower meetings:**

Held a series of three meetings in Colorado to discuss and develop strategies for control of PVY infections in the certified seed crop. Information from a variety of WCC-89 sources and participants was utilized. Several growers implemented significant production changes in their programs to address these issues and the relative success of these efforts is being evaluated over a three-year period.

The major benefit derived from this committee has been the coordination of efforts from a very diverse group of programs and researchers. The research, extension and government agency programs already in place have used this committee to work toward development of a unified, reasonable approach to virus disease control in the western potato industry and have been active in trying to promote virus disease control at a national level. Continuation of this committee is critical in maintaining the close relationships developed over the past few years. The levels of control necessary for potato virus diseases are not currently adequate. It is essential that continued research and extension efforts focus on these problems and recognize new, emerging concerns in order to maintain a healthy, viable potato industry in the west, and indeed, across the U.S.