

**FINAL REPORT**

**YEAR 3/3**

**WTFRC Project # PR-04-435**

**WSU Project # 13C-3661-8367**

**Project title:** Phacidiopycnis Rot of Pears

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**Objectives in 2002:**

1. Conduct packinghouse surveys to determine the occurrence of Phacidiopycnis rot and rots caused by other pathogens in storage.
2. Test *in vitro* sensitivity of the fungus, *Phacidiopycnis piri*, to various fungicides in order to develop a fungicide program for control of this disease.
3. Evaluate the effectiveness and timing of postharvest treatments with fungicides (thiabendazole, TBZ and fludioxonil, Scholar) and biocontrol agents for control of Phacidiopycnis fruit rot.

**Objectives in 2003:**

1. Determine when *Phacidiopycnis piri* inoculum is available for fruit infection in the orchard.
2. Determine when fruits are infected in the orchard by the fungus *P. piri*.
3. Evaluate effects of selected fungicides on the fungus *P. piri*.
4. Evaluate effectiveness of fungicides and biocontrol agents to control Phacidiopycnis rot.

**Objectives in 2004:**

1. Determine when *Phacidiopycnis piri* inoculum is available for fruit infection in the orchard.
2. Determine seasonal susceptibility of pear fruit to infection by *P. piri* in the orchard.
3. Determine non-target effects of preharvest fungicides on *P. piri* in the orchard.
4. Evaluate effectiveness of pre- and postharvest treatments with fungicides in controlling Phacidiopycnis rot.

**Significant findings during the past three years:**

- A 2-year survey indicated that gray mold, Phacidiopycnis rot and blue mold are the three major postharvest diseases in d'Anjou pears grown in central Washington. In addition to gray mold and blue mold, Phacidiopycnis rot should be included as one of the targets for control of postharvest diseases in d'Anjou pears in the region.
- In addition to d'Anjou pears, Phacidiopycnis rot has also been found on Bosc and Comice pears.
- Phacidiopycnis rot causes three types of symptoms on pears: stem-end rot, calyx-end rot and wound-associated rot originating from infection of stem, calyx and skin wound of the fruit, respectively. Latent infection of stem and calyx of the fruit by the Phacidiopycnis fungus occurs in the orchard and symptoms develop during storage.
- *P. piri* was found to be associated with a canker and twig dieback disease of pear trees and widespread in pear-producing areas in the Pacific Northwest.
- The fruiting bodies (pycnidia) of *P. piri* containing viable conidia were available throughout the pear growing season, indicating that inoculum is likely not a limiting factor for fruit infection and rainfall or irrigation is more important to fruit infection since conidia of the fungus are water dispersed.

- None of the six fungicides (Flint, Ziram, Vangard, Procure and Dithane) were able to eliminate *P. piri* in twigs that were inoculated with the fungus two weeks before applications of fungicides, and pycnidia containing viable conidia were produced on majority of fungicide-treated twigs, indicating that once twigs infected by *P. piri*, fungicides are generally not effective to control the fungus in diseased twigs.
- It appeared that d'Anjou pear fruit near harvest were more susceptible to infection by *P. piri*, but infection can also occur during early growing season when environmental conditions were met.
- Sensitivity of *P. piri* to various classes of fungicides was tested in vitro. Captan, Dithane, Procure and Ziram at the label and 1/10<sup>th</sup> label rates, and TBZ and Scholar at the label, 1/10<sup>th</sup> and 1/100<sup>th</sup> label rates were effective in inhibiting mycelial growth of *P. piri*. Flint was not effective in inhibiting mycelial growth. Captan, Dithane, Flint, Scholar, TBZ, Vangard and Ziram at the label and 1/10<sup>th</sup> label rates were effective in inhibiting conidial germination of *P. piri*. Procure was effective at the label rate but less effective at lower than 1/10<sup>th</sup> the label rate. Information on sensitivity to various pre- and postharvest fungicides helps us develop fungicide programs for control of Phacidiopycnis rot.
- Ziram applied at 2 weeks before harvest significantly reduced both incidence and severity (size of the decay) of Phacidiopycnis rot that originated from infection of wounds on the fruit surface, but did not provide a satisfactory control.
- TBZ, Scholar and BioSave were very effective to control Phacidiopycnis rot originating from infection of wounds by *P. piri*. *Cryptococcus laurentii* strain 87-108 reduced Phacidiopycnis rot by 40-50% compared with the non-treated control. Aspire was not effective in controlling Phacidiopycnis rot in this experiment.
- Fruit dipped in TBZ one day after inoculation had either no or a very low percentage of Phacidiopycnis stem-end and calyx-end rot after six months of storage, indicating that TBZ drench after harvest may be effective in reducing the infection in stem and calyx that established near harvest.
- Inoculated fruit developed more Phacidiopycnis stem-end and calyx-end rot as the time of TBZ application was delayed. This indicates that TBZ applied on the packing line is likely not effective to eliminate established infection in pear stem and calyx of non-drenched fruit (fruit not treated with TBZ shortly after harvest) that had been stored for a period of time before packing.

#### Methods:

In 2001 and 2002, decayed fruit were collected during repacking and repackaging operations during March to May. Approximately 60 decayed fruit from each grower lot were randomly sampled. Decayed fruit were categorized by casual agents through visually examining symptoms, presence of sporulation of the pathogen or isolating from the diseased tissue.

Inoculum availability of *P. piri* was monitored in two commercial orchards from early spring to harvest during the pear growing seasons in 2002 and 2003 and in one orchard in 2004. Samples of dying or dead bark and dead fruit spurs were sampled and examined for the presence of fruiting bodies (pycnidia or apothecia) of the fungus.

To determine susceptibility of pear fruit to infection by *P. piri* during the pear growing season, pear flowers during bloom and fruit at different growth stages were inoculated with the fungus in 2003 and 2004. Fruit were harvested and stored in air for decay evaluation.

To evaluate the efficacy of postharvest treatments with fungicides and biocontrol agents for control of Phacidiopycnis rot, surface-disinfested pear fruit were wounded and inoculated. Three biocontrol agents, the *Cryptococcus laurentii* strain 87-108, BioSave, and Aspire, and two fungicides, thiabendazole (Mertect) and fludioxonil (Scholar), were tested. After inoculation, fruit were tray-packed and stored at 32°F in air.