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Managing Late Blight After Row Closure To Reduce Tuber Rot

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Potato tubers become infected when spores of the late blight pathogen, *Phytophthora infestans*, come in contact with tubers in the field. Tubers infected during the growing season may partially rot before harvest. Tubers infected late in the growing season may not show obvious symptoms at harvest. Rot becomes evident in storage within days to a few weeks. Infected tubers rot and are quickly invaded by the soft rot bacterium, *Pectobacterium carotovora* (*Erwinia*).

Soil cracking and hill erosion expose tubers in the field and make them especially vulnerable to infection from spores that are washed from infected foliage by irrigation water or rain. Infection of mature tubers occurs through tuber buds (eyes) and wounds. Frequency of infected tubers usually increases in infected fields within 80 ft of the pivot center and in low areas of the field. Tuber infections are increased during the following conditions:

1. Soil is water-saturated for extended time periods.
2. Tubers are on or near the soil surface.
3. Soil cracking occurs.
4. Foliage is severely infected.
5. Harvest is done during wet weather.

Irrigation management and timely fungicide applications are crucial in managing late blight after row closure. Irrigation management includes eliminating water application overlaps, eliminating low areas in the fields where water puddles, and not growing potatoes within 80 ft of the pivot center. Irrigation water should be scheduled from plant evapo-translocation or soil moisture measurements. Frequently wetted foliage and long wet periods increase late blight severity so, as much as possible, fill the soil profile with water during an application and reduce the number of water applications. Water needs of the potato crop usually decrease in August and as harvest approaches; fields should be watered accordingly. Harvest should only be done in dry weather because air-borne spores can be washed from the atmosphere onto tubers.

Timely fungicide applications are required to manage late blight. Short fungicide application intervals of 5 days are effective in slowing late blight on potato foliage. Generally two

weeks are needed to observe a reduction in disease spread in the field because recent infections are not affected by fungicide and new infections do not show symptoms for four to seven days. Application intervals of 7 days generally provide protection when the field is not over-watered and disease pressure is low to moderate. It is essential to continue fungicide applications until harvest. Chlorothalonil (Bravo) can be applied 7 days before harvest.

Mancozeb, metiram (Polyram), chlorothalonil (Bravo) are relatively inexpensive materials and are effective in protecting foliage against infection. Gavel, Curzate, and Acrobat have reduced spore production in research tests. However, timing of application in relation to lesion age and other factors influences effectiveness and spore production is not totally inhibited by these materials. Curzate, Acrobat, and Previcur need to be mixed with mancozeb, metiram, or chlorothalonil. Tin (triphenyltin hydroxide) and copper fungicides are not effective alone in commercial fields. Three way mixtures are not recommended unless an EBDC such as mancozeb or Polyram is mixed with tin and are counted as two components of the mix.

Mancozeb and Polyram effectively reduced tuber infections when deposited on soil in field-simulated conditions in greenhouse tests. These materials will likely help reduce tuber infection when incorporated into the fungicide program. Pre-harvest interval for Polyram and mancozeb is 14 days.

Phostrol was recently shown in field tests at Othello to protect tubers from infection (three applications of 10 pt/acre/application at two week intervals beginning at tuber bulking). This is a systemic material that moves from plant foliage to tubers where it protects tubers against infection. The material does not protect foliage, so fungicides are required to protect the canopy against foliar late blight. Over-watering will negate the effectiveness of this material.

An effective and cost saving program for applying late blight fungicides begins by applying the first fungicide application by air and then rotating with chemigation. This method has the greatest advantage when disease incidence and pressure require a 7-day application frequency, such as the current season. See, "Fungicide Application For Management of Potato Late Blight" WSU Extension Bulletin 1923 (copies available at the Commission office) for additional information on late blight fungicides and advantages of various application methods. Another source of information on late blight is: http://www.wsu.edu:8080/~djohnsn/.

Field Day Dates

The following field days are still upcoming this season. Please contact the commission office for further information, driving directions, etc.

Mount Vernon - Mount Vernon Field Day, WSU Research Unit, **August 20**, 4:00 PM.

Paterson - Specialty Potato Field Day, USDA-ARS Research Site, **Sept. 12**, 9:00 AM.

Potato Tolerance to Insect Damage

Andrew Jensen, Washington State Potato Commission

Growers of almost all crops make several decisions each year regarding whether to treat pest infestations in their fields. Decisions on some pests are easy if their damage or physical presence severely impact marketability. Such pests (e.g. green peach aphid) can and should be treated aggressively to save the bottom line. Other pests are a concern only because of risk of yield loss (e.g. chewing insects such as Colorado potato beetle (CPB), loopers, and armyworms). Defoliation by chewing pests such as loopers and armyworms (a.k.a "worms") can range from mild to severe. Not all infestations of worms should be treated with insecticides. Many times the worms all disappear before reaching the size and/or population levels to cause economically important damage. It is hard to know when things are serious enough to warrant an insecticide application, but some of the following information from published research reports might help.

A study using Red LaSoda in Texas (1) looked at the impact of 100% defoliation at various times during potato plant growth. They found that the greatest yield decrease happened when plants were stripped of their leaves at 3, 4, and 5 weeks after emergence. While the 100% defoliation treatment is unrealistic, the important point is that potatoes are more sensitive to defoliation during early tuber development. This same study also reported data on the effect of weekly defoliation at three levels: 29%, 58%, and 100%. Red LaSoda plants were able to withstand weekly loss of 29% of their leaf area without a statistically significant loss in marketable yield.

Readers may wonder about the relevance to the PNW of a study using Red LaSoda. Fortunately, two studies have used Russet Burbank, a variety more relevant to most of the PNW. A study in Wisconsin (2) examined the impact of several defoliation scenarios. Similar to the Texas study, the authors found that Burbank yield was reduced the most by defoliation during "full bloom." During this growth stage, marketable yield was reduced at 10%, 25%, 50%, and 75% defoliation, although reductions at 10% and 25% were not statistically different from the non-defoliated controls. Defoliation of 10% and 25% during the periods before and after full bloom resulted in negligible decreases or ***increases*** in total and marketable yield.

A study conducted in Minnesota also used Russet Burbank (3). They studied mid-season defoliation, the time when potatoes are most sensitive to leaf area loss. The earliest defoliation treatments of 10%, 33%, and 67% occurred 5 weeks after planting, and had no effect on total yield. Later defoliations caused numerical, but not statistically significant, yield decreases. The authors also reported on impact of 100% defoliation of the top, middle, and bottom 33% of Burbank plants at 4 different dates. They found that complete defoliation of the middle **a** of the plant at all four dates ***increased*** yield slightly (but not statistically significantly) over the untreated control. Defoliation of the top and bottom **a** of the plants had more variable results, but none were statistically significant yield losses.

The point is that potatoes can tolerate some defoliation without loss in marketable yield. The period of full bloom is clearly the most sensitive plant growth stage, but even then defoliation on the order of 10% appears to cause little if any yield loss. For pests like loopers and armyworms

that usually do not develop huge populations over the course of the season (as CPB will do), it may sometimes be best to allow a little defoliation and save the insecticide application. This will not only save money, but may also preserve beneficial insects that love to eat hapless worms.

1. Wellik, M.J., J.E. Slosser, and R.D. Kirby. 1981. Effects of simulated insect defoliation on potatoes. American Potato Journal 58: 627-632.
2. Shields, E.J. and J.A. Wyman. 1984. Effect of defoliation at specific growth stages on potato yields. Journal of Economic Entomology 77: 1194-1199.
3. Cranshaw, W.S. and E.B. Radcliffe. 1980. Effect of defoliation on yield of potatoes. Journal of Economic Entomology 73: 131-134.

Bruise Reduction

Considerable work has been done on how best to adjust a potato harvester, much of it funded by the Potato Commission over the course of several years in the 1980s and again in the 1990s. Available in the commission are copies of videos describing optimal potato harvest and handling, as well as copies of written documents covering the same information. Summaries of the videos are given below. All these videos are available on loan from the Commission office.

1. Potato Bruise Prevention: The Harvester
   This video describes optimal conditions and harvester modifications to use for reduced bruising: pulp temperature, digger blades, shakers, drops, flights/hugger belts, chain/belt types, deflectors, etc.

2. Potato Bruise Prevention: Harvester Chain Adjustment
   This video describes the timing of chains, ground speed, and tractor engine speed, and how best to synchronize them all.

3. Potato Bruise Prevention: Handling
   Best practices for moving potatoes into and out of storage, transloading, and seed handling are described in this video.

4. Reducing Bruise in Freshpack Warehouses
   This video is targeted toward operators and employees of freshpack sheds, describing how to operate and modify equipment for optimal bruise reduction.