Potato Progress

Research and Extension for Washington's Potato Industry
Published by Washington State Potato Commission www.potatoes.com
Andrew Jensen, Editor. Submit articles and comments to: ajensen@potatoes.com
108 Interlake Rd., Moses Lake, WA 98837; Fax: 509-765-4853; Phone: 509-765-8845.

Volume X, Number 7 *July 13, 2010*

Fungicide Application for Management of Potato Late Blight

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POTATO LATE BLIGHT MANAGEMENT

Management of potato late blight in the Columbia Basin of Washington and Oregon requires a combination of several strategies: strict sanitation practices, proper irrigation management, good cultural practices, and proper application of fungicides. Sanitation practices (such as not planting infected seed and using a seed treatment containing mancozeb or cymoxanil), and proper cultural practices (such as not planting within 80 – 100 ft. of the pivot center) will reduce disease pressure and increase the effectiveness of foliar fungicides.

- ***Fungicides are most effective when*** they are applied to foliage 1) before infection occurs or 2) when the disease is in very early stages of development and cannot be detected yet by the human eye. Later applications are helpful in reducing the rate in which the disease spreads but are not nearly as effective as early applications. Late blight is very difficult to manage once infections become established in sprinkler-irrigated fields because the microclimate within the canopy usually favors further disease spread whenever the field is irrigated.

- ***Total crop and canopy coverage with fungicides is essential*** for late blight management. The late blight organism, *Phytophthora infestans*, will most likely find and infect any plants or plant surfaces skipped during application.

Potato late blight fungicides

Many fungicides are labeled for use against potato late blight. Each product has specific conditions for use and is labeled with details regarding rates and application method. Fungicides work against late blight by inhibiting one or more of the following: germination of spores (and as a result, reduced infection of plants), growth within the plant, production of spores (sporulation), and formation or development of lesions.

Spore suppression. Some combinations of fungicides, such as Acrobat (dimethomorph) plus an EBDC, and Curzate (cymoxanil) plus an EBDC have post-infection activity that inhibits sporulation and/or restricts lesion expansion. These products may help reduce tuber infection when applied during and after tuber bulking. Their use at times can be very beneficial, but they should never be used as a predetermined management tool to be used only as a "rescue" if plants in a field become infected. Proper use of protectant fungicides will ensure good and economical protection.

Examples of late blight fungicides:

1. EBDC (ethylene bis-dithiocarbamate) fungicides. Examples: Metiram (Polyram), Mancozeb (Dithane M-45, Manzate 200, and Penncozeb), and Maneb (Manex).
2. Chlorothalonil (Bravo, Echo)
3. Cymoxanil (Curzate) plus an EBDC or chlorothalonil
4. Dimethomorph (Acrobat) plus an EBDC or chlorothalonil
5. Propamocarb hydrochloride (Previcur, formerly Tattoo C), plus EBDC or chlorothalonil
6. Phosphorus Acid

Fungicide recommendations.

- Mefenoxam (Ridomil Gold, Ultraflourish) prepacks are not recommended for management of late blight; however, Mefenoxam can be effective for management of pink rot and Pythium leak.
- Super Tin by itself will not adequately control severe late blight, but it is effective when mixed with Polyram or another EBDC fungicide.
- Copper fungicides should not be used alone for control of foliar late blight in the Columbia Basin.

Methods of fungicide application

The choice of application method is important in managing late blight. The general methods of fungicide application, with strengths (+) and weaknesses (-) given for each are listed below:

1. **Air** (plane or helicopter)

a) +/- applies medium amount of fungicide to the canopy; primarily applies material to the upper canopy, and at least two applications on a weekly bases are required to ensure product has protected new foliage and redistributed to the lower canopy to provide adequate protection
b) + quickest method
c) + uses little water (5 to 10 gallons/acre)
d) - ineffective in moderate or higher winds
e) - must be scheduled with a commercial applicator
f) - ineffective near obstacles (trees, power lines, houses)
g) - gaps of non-treated foliage may result from poor fungicide application
h) +/- moderately expensive

2. **Ground** (spray booms attached to self-contained or tractor-pulled equipment)

a) + applies greatest amount of fungicide to and throughout canopy
b) +/- faster than chemigation, but slower than air
c) + uses little water (20 to 100 gal/acre)
d) + most effective method in high velocity winds
e) - requires either purchase of expensive equipment or contracting with a commercial applicator
f) - soil compaction from wheel tracks may reduce tuber yield and quality
g) - standing water in wheel tracks may increase late blight incidence
h) - most expensive method because of equipment cost
i) + can be used almost anywhere
h) + can be used as needed

3. **Chemigation** (fungicides injected into irrigation system, most often a self-propelled center pivot sprinkler irrigation system).
   a) - applies least amount of fungicide to the canopy but fungicide is nearly evenly distributed throughout canopy due to high water volume used
   b) - slowest method
   c) - tremendous water volumes required (5100 to 6250 gallon/acre)
   d) + can be applied in winds equal to or faster than those in air application, but works best when there is little or no wind
   e) + can be scheduled and performed by trained personnel employed by grower
   f) + can be applied using equipment already at the site
   g) + least expensive application method
   h) - may require a more frequent application schedule due to low fungicide levels applied to canopy

4. **Attached Boom** A method in which a spray boom is attached to the center-pivot sprinkler irrigation system (applies fungicides evenly along the length of the pivot using water independent of the irrigation water).
   a) + more efficient in applying fungicides than chemigation (equal to ground application)
   b) + little water required
   c) - equipment costly but may be able to be used to apply other pesticides
   d) +/- has many of the characteristics identified in "ground" application listed above.

5. Air/chemigation A cost saving method that provides good protection when used on a 7 day schedule is the alternating use of air application of fungicides with chemigation. The most effective way to use this method is beginning with an air application. This method provides some of the good aspects of both methods**.**
   a) +/- air applies medium amount of fungicide to the canopy, mostly the upper canopy; chemigation applies the least but uniform coverage.
   b) +/- quickest (air) and slow (chemigation) depending of method used that week
   c) +/- uses little water (air) or high levels (chemigation)
   d) +/- ineffective in moderate or higher winds (air), chemigation okay
   e) +/- must be scheduled with a commercial applicator (air), not so with chemigation
   f) +/- ineffective near obstacles (trees, power lines, houses) (air), not so with chemigation
   g) +/- gaps of non-treated foliage may result from poor fungicide application (air) not so with chemigation
   h) +/- moderately expensive (air), chemigation cheapest

Additional Considerations

- In the Columbia Basin in 1995, aircraft application was the most commonly used method (75%), followed by chemigation (25%), and ground (very little application). The use of chemigation has increased in recent years because it is less expensive than air application. Equipment availability and other financial considerations may determine the method more than delivery efficiency of the fungicide.
- Application methods vary in terms of how much fungicide is deposited on and within the canopy and how redistribution occurs over time within the canopy due to movement of irrigation water or rainwater. (For example, one study showed that chemigation deposited low amounts of

chlorothalonil on and in the canopy and redistribution over time by water caused chlorothalonil levels to drop even more. In such a situation, fungicide levels could fall below those required for sufficient control of late blight, particularly near the end of a standard 7 day application interval.)

- Application methods also vary in terms of how far into the canopy (upper vs. lower leaves) the fungicides penetrate initially. If protection is needed immediately in the lower canopy, then air may not be the best application choice.
- Alternating air application with chemigation on a 7-day interval can increase fungicide residue levels in the crop canopy at a reduced cost. This methodology provides several of the benefits of both methods without the adverse effects of using one application method on a repetitive basis.

Fungicide application tips

The important components of late blight management are: Proper timing of the first application, proper fungicide selection, proper frequency of fungicide use, proper rate of fungicide, and proper application method. Keep in mind the following suggestions when applying fungicides:

1. ***Consult the toll-free late blight hotline*** for timing of initial fungicide application and intervals between applications. The Columbia Basin Late Blight Forecasting Model, current disease conditions, and weather forecasts are used to determine fungicide timing. The model is based on the number of rainy days in April and May. Both hotlines in Washington and Oregon information lines provide information on the probability of late blight occurrence in the Columbia Basin before the end of May.
2. ***Begin applications at least 7 days prior to late blight exposure.*** Usually this requires making the first application just prior to row closure and continuing on a 7-day interval for three weeks or more. These early applications are extremely important because of the susceptibility of the foliage and the higher chance for favorable weather condition for late blight development.
3. ***Continue applications UNTIL HARVEST*** at recommended intervals to protect both new and old foliage. Consult the toll-free information lines for suggested intervals. Applications in late season may be as important as early season applications, even if late blight up to that point has been a minor problem in the Basin. In late August or September, plant water use decreases while watering levels sometimes stay constant, dews begin to form, and overall temperatures are reduced, all of which can contribute to extensive late blight infection. In addition, symptom expression in these older plants can be sometimes difficult to recognize due to natural senescing of leaves, which left untreated could further fuel a late season epidemic.
4. ***Do not skip any plants.*** Total crop coverage is essential.
5. ***Maintain adequate residue levels*** of fungicides on the foliage. Use a consistent and appropriate application interval.
6. ***Let fungicides dry*** on the foliage before beginning normal irrigation.
7. ***When disease pressure is high, use short application intervals*** (5- 7 days).
8. ***Ridomil Gold, copper, and tin fungicides are not effective against late blight by themselves.*** Super Tin is effective when mixed with metiram (Polyram) or mancozeb. Tin mixtures are most efficient from mid-season until harvest.
9. ***Apply the first fungicide application by air and then rotate with chemigation.*** This is an effective and cost-saving program for late blight fungicide application, especially when disease incidence and pressure require a 7-day application frequency.
10. ***All fields need protection from late blight.*** This includes fields scheduled for early harvest.
11. Use of phosphorus acid pre-harvest can reduce tuber infection.

New Vitamin B_6 Research at WSU

Hanjo Hellmann, WSU Pullman

Originally from Germany, I joined Washington State University in Fall 2007. My research interests include learning more about the mechanisms that plants use to cope with factors like oxidative stress, drought, and UV-light. The critical roles that vitamin B6 has in both plant growth and response and in human health are rapidly expanding fields of study. My area of research is important because it can help to develop plants with increased stress tolerance and improved phytonutrient content. My research on potato will focus on characterizing vitamin B6 amounts in tubers of different developmental stages and from a broad range of potato germplasm. The long-term goal is to utilize these studies for breeding programs to generate potato varieties with increased phytonutrient content and potentially improved resistance to environmental stress here in Washington State. I am always interested in hearing the perspectives of people in the potato growing and processing industry. Contact me anytime at hellmann@wsu.edu, phone: 509-335-2762.

Herbicide Resistant Weed Survey in Potatoes

Metribuzin (Sencor) and rimsulfuron (Matrix) are the primary herbicides registered for postemergence broadleaf weed control in potatoes, and represent the two classes of herbicides, triazines and ALS inhibitors, with the most reported cases of resistant weeds worldwide. The Washington State Potato Commission has funded us to survey the potato industry for suspected herbicide resistant weeds, collect weed seed from suspected fields, and conduct dose response studies on the herbicides in question to determine if they are herbicide resistant. If you have knowledge of possible herbicide resistant weed populations or escape weeds in potato fields in the Columbia Basin we'd like you to contact us so we can collect weeds or weed seed from fields that may have resistant weed biotypes. **Please contact Rick Boydston, USDA-ARS, Prosser, WA. Ph. (509) 786-9267 Email: rick.boydston@ars.usda.gov**

New Insect and Mite Management Guidelines

The 2010 edition of the PNW Insect and Mite Management Guidelines was recently uploaded to the www.potatoes.com website. Available for several years now, this document is led by Alan Schreiber, with contributions from many other entomologists in the Pacific Northwest. To download the Guidelines, go to www.potatoes.com/research.cfm and click on the "Insect & Mite Management Guidelines, Pesticide Resistance Management" link. Below is the document's table of contents.

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