

## **Fungicides for Managing Late Blight in Potato** **Updated July 3, 2018**

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Late blight (caused by *Phytophthora infestans*) has occurred sporadically in Idaho since 1995. Late blight was widespread in many fields in southern Idaho in 2015 but was not reported in 2016 or 2017. Early season weather in 2018 was favorable for the development of disease and growers should take steps to protect their crop this season.

One effective method to manage late blight is to maintain an effective fungicide program. The purpose of this article is to provide an overview of fungicides as they relate to effective late blight management. Foliar fungicides can be highly effective if used properly. Three factors to consider when designing a foliar fungicide program include: 1) fungicide choice, 2) application method, and 3) timing and frequency of applications.

### **WHICH FUNGICIDE SHOULD I USE?**

Selecting the right product for disease control can save you money. On the other hand, using the wrong fungicide or a less effective fungicide can cost you money. Some of the more expensive products don't necessarily provide better disease control under the semi-arid conditions of southern Idaho.

Two groups of standard fungicides that have a broad spectrum of activity against potato diseases are chlorothalonil (e.g. Bravo or Echo) and ethylene bisdithiocarbamate (EBDC, e.g. Dithane or Penncozeb) based products. Both are effective against early and late blight and their efficacy against late blight is similar under the semiarid conditions of the Pacific Northwest. However, under high disease pressure these products will not be enough to provide adequate control. Research has shown that mancozeb and metiram can provide an effective soil barrier that can reduce viable spores from washing down from the vines to the tubers (Porter et al. 2006).

Curzate, Forum, Gavel, Omega, Orondis, Previcur, Ranman, Revus Top, Zampro, and Zing! are highly effective against late blight. These products can be used in place of the standard protectants when late blight pressure is high. University research has shown that foliar applications of these products can be more effective in reducing the tuber blight phase of late blight than standard protectants. Omega has the added benefit of effective white mold control. Ranman has shown some activity against pink rot, but the timing of application for pink rot control is much earlier in the season than when it would be used to manage late blight. (Foliar applications of Ranman have not shown any protection against pink rot.) Revus Top contains two active ingredients, mandipropamid and difenoconazole. Mandipropamid (the "Revus" portion) is active against late blight and difenoconazole (the "Top" portion) is active against early blight and brown leaf spot. Gavel and Zing! both contain zoxamide which is very effective against late blight. Gavel contains an EBDC component and Zing! contains chlorothalonil. Zampro is a newer

product which combines ametoctradin with dimethomorph (active ingredient in Forum) for late blight control.

Triphenyltin hydroxide-based products such as Agri Tin and Super Tin can be added with standard protectants for added late blight control. Agri Tin and Super Tin also have activity against early blight and brown leaf spot. However, these two products can also cause phytotoxicity when applied at low spray volumes or when temperatures are high. The mammalian toxicity of these products is also relatively high.

Headline and Quadris are effective against late blight at higher rates (12 fl oz/acre for both products) than what is typically used for early blight. Quadris Opti combines azoxystrobin (active ingredient in Quadris) with chlorothalonil. Tanos is a mixture of famoxate (active against early blight) and Curzate (active against late blight – see previous paragraph). The active ingredient in Reason is fenamidone. Reason is effective against both early blight (5.5 fl oz. rate) and late blight (8.2 fl oz.). These QoI fungicides should never be applied consecutively unless they are applied with a tank mix partner, such as a standard protectant (chlorothalonil or EBDC). Read the label carefully to follow manufacturer recommendations with respect to resistance management.

Orondis Opti is a new fungicide which combines oxythiapiprolin with chlorothalonil. Oxythiapiprolin is highly effective against late blight. Use of this product is limited in the Pacific Northwest due to product availability and issues related to MRLs. If you choose to use Orondis Opti, be sure to consult with your processor to see if it is allowed for use.

Endura and Luna Tranquility have been very effective for controlling early blight and white mold when used at appropriate rates (5.5 oz for Endura and 11.2 fl oz for Luna Tranquility). Both of these products are NOT effective against late blight. If these are used to manage foliar diseases, then another product is required to provide protection against late blight.

Phosphite-based fungicides such as Phiticide, Phostrol, and Resist 57 have resulted in increased tuber protection to both late blight tuber blight and pink rot. However, research shows that phosphite fungicides need to be applied multiple times early in the season. The first application should be made when the largest tubers are dime-sized with two additional applications repeated every 14 days. Phosphites are not effective in protecting the foliage from late blight. If you use a foliar phosphite fungicide program for managing pink rot, then the tubers will have additional protection against late blight.

Phosphite fungicides can be applied to tubers as they are being placed into storage. The rate of 12.8 fl oz/ton of tubers applied in 0.5 gallons of water/ton tubers has proven most reliable. Post-harvest applications will not cure infected tubers. However, they will keep healthy tubers from being infected if they are exposed to spores during the harvest and handling process. Tubers destined for storage which are coming from fields known to have late blight should be treated with a phosphite fungicide post-harvest.

Storage rots (pink rot and Pythium leak) can be suppressed by applying foliar fungicides containing mefenoxam or metalaxyl (Ridomil Gold products, Metastar, Ultra Flourish). Some of the Ridomil Gold products are pre-packed with a standard protectant such as chlorothalonil or mancozeb and these are labeled for late blight. In 2015, the US-23 strain was responsible for late blight in Idaho and this strain is generally sensitive to mefenoxam. In fact, growers who had used a mefenoxam-based product generally had less severe late blight than those who did not. Unfortunately, not all isolates of the new strains are sensitive to mefenoxam/metalaxyl. Regardless of what strain of the late blight pathogen is present, the pre-pack partner (e.g. chlorothalonil, mancozeb) will provide protection against late blight. It is essential to be sure a fungicide with another mode of action against late blight is used in combination with mefenoxam/metalaxyl to help reduce the likelihood for selecting for fungicide resistance.

University research around the country has shown that spray programs based on copper fungicides do not perform as well as programs based on standard protectants for controlling late blight.

With the use of any fungicide, be sure to follow the label and adhere to any pre-harvest intervals specified on the label.

### **WHAT APPLICATION METHOD IS THE BEST?**

Ground, air, and chemigation applications of fungicides can all be effective if time is taken to ensure proper application. Chemigation has been criticized for having low levels of fungicide residue in the potato canopy following application. Research performed in Idaho with Dithane DF Rainshield has shown that fungicide residues on stems are just as high with chemigation as stem residues from aerial application. Fungicide residues in the upper canopy are lower for chemigation than for aerial application, however. With chemigation, residues may decrease to a level which does not provide control compared to aerial application.

Research and field observations have shown that chemigation is an effective method for late blight control. It is the least expensive application method, but requires more grower management. If an airplane is used, care must be taken to ensure fungicide is applied to areas which are difficult to fly (i.e. near power lines and buildings). Aerial applications have the benefits of quick application time and less management time by the grower. Irrigation is needed to redistribute residues down in the potato canopy.

In the late blight epidemics of the 1990s, late blight incidence and severity was generally similar in fields receiving applications by airplane and by chemigation.

### **HOW OFTEN AND HOW FREQUENTLY SHOULD FUNGICIDES BE APPLIED?**

Timing and frequency of application are perhaps the most critical components of a good spray program and this is where taking shortcuts can be dangerous. It is good to think of

fungicides like sunscreen. They need to be applied before exposure, thorough coverage is needed for protection, and re-application is necessary.

The first fungicide application for late blight should be made just prior to row closure. Once a canopy has formed, conditions are often favorable for late blight. Under the semi-arid conditions of southern Idaho, applications every two weeks are generally adequate to protect against both early blight and late blight. When we experience frequent thunderstorms or rain events, weekly applications are needed to cover and protect the crop. As the interval between applications increases, the risk of late blight increases.

Fields affected by late blight should be treated every 5-7 days. If weather conditions are favorable for blight, a 5-day interval should be followed. If weather conditions are hot and dry a 7- day interval would be adequate. Fields in close proximity to infected fields should be treated on a 7-10 day interval. Whenever late blight is confirmed in an area, fungicide programs should be maintained until the vines are dead. Thundershowers can quickly spread the pathogen over long distances.

## **SUMMARY**

Recommended programs for late blight control are not straightforward. The product of choice may well depend on how and from where the disease has developed. As a general rule, using a protectant fungicide such as Chlorothalonil or EBDC on a regular schedule with the application method best suited to your needs can be done economically, and provide good protection against late blight. It is important to choose the right fungicide, apply it properly, and maintain a good program while vines are actively growing. If late blight is confirmed in or near your fields, using additional products with extra activity against late blight would be recommended.

## **REFERENCES**

Porter LD, Cummings TF, and Johnson DA. 2006. Effects of soil-applied late blight foliar fungicides on infection of potato tubers by *Phytophthora infestans*. Plant Disease 90(7):964-968.