

Managing Early blight and Late blight in 2010.

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With the growing season upon us it is time to start thinking about what we can do to manage foliar diseases in the potato crop this year. Two of the most important diseases to consider when formulating a foliar disease management strategy are early blight and late blight. Early blight caused by *Alternaria solani*, is a very common disease of potato in Idaho and most potato-growing regions in the US. Although it occurs annually to some degree in most production areas in Idaho, the timing of its appearance and the rate of disease progress help determine the impact on the potato crop. Foliar symptoms of early blight first appear as small, irregular to circular dark brown spots on the lower (older) leaves. As the disease progresses these lesions enlarge and several lesions may coalesce to cover the entire leaf. Severely infected leaves eventually wither and die but usually remain attached to the plant. Severe infection of foliage by the early to mid-bulking tuber period can result in smaller tubers, yield loss and lower tuber dry matter content. Traditionally early blight control has primarily depended on multiple fungicide applications typically applied at approximately 10- to 14-day intervals throughout the growing season. There are a wide variety of fungicides to choose from for the control of early blight. However, the QoI strobilurin fungicides (e.g. kresoxim-methyl, azoxystrobin, pyraclostrobin, trifloxystrobin, famoxadone, and fenamidone) are often favored because they offer broad spectrum protection against a wide range of fungal and oomycete diseases.

In the past couple of years, many Idaho growers reported the failure of the traditionally effective QoI strobilurin fungicides (azoxystrobin and pyraclostrobin) to control early blight. This may also be due to the development of fungicide resistant isolates of *A. solani*. Fungicide resistant isolates of *A. solani* have been found in Idaho, however the proportion of resistant isolates present in the populations of *A. solani* in Idaho is unknown and currently under investigation at the University of Idaho. An alternative hypothesis is that these fungicide resistance problems may be due to misdiagnosis of early blight. Brown leaf spot, caused by *A. alternata* is also found on potato in Idaho and other potato growing regions of the US. This disease is often confused with early blight as its symptoms are very similar. The pathogens causing these two diseases are also very closely related. However, unlike the early blight fungus (*A. solani*) where fungicide resistance is known to occur, the brown leaf spot pathogen (*A. alternata*) is inherently more resistant to QoI strobilurins and has never been well controlled by this class of fungicides. Due to the similarity of these two pathogens and their disease symptoms it may be possible that growers are confusing brown leaf spot for early blight and thus reporting poor disease control of early blight. Brown leaf spot can occur throughout the growing season and is usually seen before early blight. On young leaves, lesions may be confused with those of early blight, which are also small, circular lesions initially. However, brown leaf spot lesions never develop the dark, alternating concentric rings characteristic of early blight. This is an important distinguishing factor between brown leaf spot and early blight. Furthermore, as the lesions coalesce, they are not restricted by large veins as in early blight and the whole leaf may become chlorotic, with infected areas turning brown and disintegrating, causing the edges of the leaf to roll up.

The likelihood of the occurrence of late blight (caused by *Phytophthora infestans*) in 2010 is relatively high based on the appearance of the disease in Idaho in 2008 and 2009, and the recent wet weather we have had in April and May. However, whether late blight is found and

the timing of its appearance will be highly dependent on several factors including survival of the pathogen over the winter in infected volunteer potatoes, the weather and fungicide use patterns by growers. Cultural practices are the first line of defense against late blight. First, it is important to eliminate sources of inoculum. The initial sources of inoculum are likely to be infected potatoes in cull piles, infected volunteer potato plants that have survived the winter and infected seed tubers. Therefore, it is important to keep a clean operation by destroying all cull and volunteer potatoes. Rock piles that are deposited after planting contain rocks and potato seed pieces and should also be monitored carefully throughout the growing season. Emerging plants should be killed off with an effective herbicide. It is also very important to make sure that you plant only certified seed. Using seed saved from local crops may increase the risk of late blight. Second, avoid conditions that favor late blight. Weather conditions strongly influence the incidence and severity of late blight. Although weather conditions are beyond control, field selection and carefully managed irrigation practices can help reduce the extent of periods favorable for disease development. After planting and early in the season, it is important to get rid of cull potatoes and potato pieces resulting from seed cutting operations or left after loading or unloading at storage facilities as these may support the production of inoculum whether or not the pieces are sprouting. It is also beneficial to control weeds and alternative late blight hosts such as hairy nightshade, which may contribute to disease spread under some conditions. Although weed species are not late blight hosts, they can contribute to conditions that favor disease development by restricting air movement within the canopy. Heavy weed infestations also prevent adequate coverage of potato foliage with fungicides. Current research also indicates that when late blight infestations are found early in small patches, it may be beneficial to disk, burn with a propane burner or spray these patches with a desiccant to remove these local sources of inoculum. For destruction of affected areas within crops the rule is that 30 rows on each side of the newest lesions at the border of the late blight locus and 100 feet along the row (each side) should be killed. Although this sounds harsh, university trials have shown that the latent period between infection and symptom development is about 7 days, and although symptoms are not visible, plants within this area are already infected.

It is possible to control early blight, brown leaf spot and late blight using an integrated disease management approach. Selecting the right product or program for disease control can save you money. On the other hand selecting the wrong fungicide or program can cost you money. If you have found that the traditional QoI strobilurin fungicides have not been effective in controlling early blight in your potatoes in the past two growing seasons there is a high likelihood that you either have a population of early blight in your area which is fungicide resistant or brown leaf spot is more prevalent in your area. In this case you should probably consider using a different class of fungicides to manage foliar disease in your fields. Protectant fungicides that contain either chlorothalonil or ethylene bisdithiocarbamate (EBDC) have a broad spectrum of activity against potato diseases including late blight, early blight and brown leaf spot. These products are effective against early blight and brown leaf spot when applied at approximately 10 – 14 day intervals and against late blight when applied at 7 – 10 day intervals. The QoI strobilurin fungicides are very effective against late blight, so if you don't have problems with *A. solani* fungicide resistance or brown leaf spot in your area then they can provide a very effective means of protection against late blight and early blight. However, these products should always be mixed with a protectant fungicide (e.g. EBDC or chlorothalonil based products) and never applied consecutively in order to reduce the chance of the development of fungicide resistance. If the threat of late blight in your area is low then boscalid is a very

effective fungicide for controlling both early blight and brown leaf spot and at higher rates it provides good white mold protection. However, it is not effective against late blight. There are also several fungicides available which are mixtures of active ingredients which are effective against late blight and early blight/brown leaf spot. For example, Revus Top contains mandipropamid and difenoconazole. Mandipropamid is effective against late blight and difenoconazole is effective against early blight/brown leaf spot. Tanos is another example, containing cymoxanil for late blight and famoxadone both early blight/brown leaf spot and late blight.

In summary, it is important to choose the right fungicide or fungicide program for your disease management program based on the disease history of your fields and the risk of late blight in your area. Using a protectant fungicide on a regular schedule can be done economically and provide good protection against both late blight, early blight and brown leaf spot. It is important to maintain a good program while vines are actively growing as none of the fungicides available on the market today have curative action against late blight.