Critical Periods for Fungicide Applications on Grapes

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There are four major grape diseases that need to be dealt with on an annual basis in the upper Midwest and eastern United States. All of them have the capability of causing serious damage to the crop and even destroying it under the right environmental condition. They are **Phomopsis Cane and Leaf Spot, Black Rot, Downy Mildew and Powdery Mildew**. These diseases need to be controlled simultaneously in the vineyard and will probably require some level of fungicide use annually in order to provide sufficient control. Another important fungal disease on tight clustered varieties is Botrytis Bunch Rot. Fungicides are a major component of the integrated disease management program. I wish it were not so, but I strongly believe that most vineyards in the Midwest and upper Midwest will not be successful unless they have an effective fungicide program and use good cultural practices for disease control. There are many things to consider in developing an effective fungicide program. Most currently used fungicides do not have a spectrum of activity that will control all of the diseases simultaneously. Therefore tank mixes using more than one fungicide are often required. Growers need to know what diseases a fungicide will control in order to select the appropriate materials. You also need to learn when to apply the fungicide in order to get effective control. This is called fungicide timing. In this presentation I will try emphasize the importance of early season fungicide applications for effective disease control.

It is important to realize that all four major diseases (Phomopsis Cane and Leaf Spot, Black Rot, Downy Mildew and Powdery Mildew) can get established in the vineyard very early in the growing season. Therefore, early season disease control is **absolutely critical**. At times, less experienced growers may not see powdery mildew, downy mildew or black rot until later in the growing season (post bloom). There is tendency to think that these are summer diseases that develop later in the growing season; however, infections by all of the pathogens can become established in the vineyard very early (pre bloom). Often when you see the disease post bloom, it may be too late to get it under control. I will discuss the environmental conditions required for infection in my presentation. Research in New York has shown that primary infections by the powdery mildew fungus can occur with .01 inch of rain at 50 Fahrenheit and downy mildew infections can occur after 4 inches of new cane growth with 0.4 inches of rain and 50 Fahrenheit. Obviously, these conditions can occur very early in the growing season. This allows the diseases to get established. You may not see them because they are there at low levels. Under the proper environmental conditions later in the growing season, these low levels of disease can blow up into full scale epidemics before you can react to them. For this reason, it is important to maintain and effective fungicide program throughout the entire season with emphasis on early season disease control. The most destructive phase for all of these diseases is fruit infection. Research in New York has shown that the most critical period for fruit (cluster) infection by powdery mildew, downy mildew and black rot is the period from **immediate pre bloom through 4 -5 weeks after bloom**. At 4 to 5 weeks after bloom (probably earlier on some varieties) the fruit develops resistance (ontogenic resistance) to infection by all of these diseases.

Thus, fungicide protection for the fruits and rachises (the cluster) is absolutely critical during this period. If you go out into the vineyard post bloom and see that your clusters are covered with downy or powdery mildew, there is little or nothing you can do at that point. Under the proper environmental conditions you may have lost the entire crop. If you do a good job of controlling the diseases through the **critical period**, the crop is set and the fruit is now resistant to infection. It is important to remember that the rachises (cluster stems) remain susceptible to infection through out the growing season. In addition, leaves and young cane tissues remain susceptible. Therefore, it is important to maintain a good fungicide program through out the season. The amount or fungicide protection required throughout the remainder of the season (past the critical period) will depend largely upon environmental conditions. If it is dry, less fungicide will be required and you can focus on powdery mildew control. Powdery mildew is a dry weather disease that requires high relative humidity to infect and does not require free water. If it is wet, the threat of late season downy mildew infection (which can defoliate the vine) will probably require a more intensive fungicide program through harvest. One of the main points I want to make is that if you do not control fruit (cluster) infections during the critical period (early in the season), the late season fungicide application are not going to save you. A sad fact is that if you do loose your crop to early season cluster infections, you will probably still have to spray the vines later in the season to control the build up of powdery and downy mildew in the vineyard. In wetter growing seasons, late season downy mildew epidemics can rapidly become very severe resulting in premature defoliation of the vines. If vines are prematurely defoliated, they will not harden off (become winter hardy) as they normally would and serious winter injury can occur leading to long term damage to the vine. This probably applies to the more winter hardy varieties as well.

My presentation will focus on the development of a fungicide program that controls the four major diseases during three main periods of the growing season: **the pre bloom period** (1to 3 inch shoot growth through immediate pre bloom), **immediate pre bloom through 4 to 5 weeks after bloom** (the most critical period for fruit infection) and **the late season period** (4to5 weeks after bloom through harvest).

As mentioned previously, selection of the proper fungicides for use during these periods is extremely important. Most currently used fungicides do not have a spectrum of activity that will control all of the diseases simultaneously. Therefore, tank mixes using more than one fungicide are often needed. It is important to know what diseases a fungicide will control in order to select the appropriate materials. Recently, I was in a 7-acre ‘Chardonnay’ vineyard that had 100% cluster infection from powdery mildew. The fruit were a total loss. In reviewing the growers spray program, applications were made at appropriate times, yet disease destroyed the fruit. The reason for the control failure was that the grower was using only Mancozeb fungicide in the tank through all of the early season sprays. Mancozeb provides excellent control of Phomopsis, downy mildew and black rot, but provides no control of powdery mildew. Thus powdery mildew came in and wiped out the crop. Had the grower tank mixed Mancozeb with a fungicide that would control powdery mildew (such as sulfur or several other materials) the crop would probably have been saved. I will discuss currently available fungicides for grape disease control in my presentation.

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