

Vineyard Views

by Cliff Ohmart

By the time this column is printed we will be well into the growing season, which means that growers and pest control advisors will be grappling with decisions about whether or not to spray for leafhoppers or mites or for both. This gives me an excellent opportunity to get on my soapbox about the importance of using the concept of economic thresholds in pest management decision-making, particularly when it pertains to leafhoppers and mites.

An economic threshold is the level of a pest population above which the crop damage caused by the pest exceeds the cost of controlling the pest. In other words, it is the break-even point. If pest numbers are below the economic threshold and you treat for it, you are actually losing money because the damage caused by the pest, if you did nothing to control it, is less than the cost of the control measure. Using economic thresholds in pest management decision-making works well for pests for which you can monitor and then act on if the number reaches or exceeds the threshold. Unfortunately, economic thresholds cannot be used in managing pests like plant pathogens because once the pathogen infects a plant or its fruit it cannot be eradicated from the plant. Therefore, treatment for diseases must be prophylactic, in other words made before the pathogen becomes established on the crop, usually when weather conditions are conducive to disease development.

An economic threshold is a very simple concept, and it is the foundation of Integrated Pest Management, but it can be difficult to apply in the vineyard. It is difficult for many reasons, a few of which are listed here. First, an economic threshold can be affected by the overall vigor of the vineyard. If vine vigor is low then it will take less pest damage to have a significant effect and therefore the economic threshold is lower than in a more vigorous vineyard. Second, it can be affected by the time of year the pest damage occurs. Significant pest damage just before harvest is usually less important than if it occurs at the beginning or the middle of the season, so an economic threshold tends to get higher the closer you are to harvest. Third, it is dependent on the amount of pest damage that is already present. For example, a particular amount of leafhopper damage will be more significant if there is leafhopper damage present from earlier in the season. Trellis type can affect economic thresholds for leaf-damaging pests. On vines trained on a vertical shoot-positioned trellis there are fewer leaves shading the grape bunches when compared to vines on trellis types such as a 'T' trellis or Geneva double curtain, so one cannot afford to have too much damage occur on these leaves for fear of losing them and exposing the fruit to too much direct sunlight. And finally, cost of the control measure affects an economic threshold. The higher the cost of the control measure the higher the economic threshold becomes.

Another major hurdle one confronts when attempting to use economic thresholds is that they have been scientifically determined for only a few pests. Why? For one thing economic thresholds are affected by many different variables, as discussed above, and it is very difficult, and expensive, to set up experiments that take them all into account

when developing economic thresholds. Secondly, it very difficult to correlate pest damage with crop loss, particularly for winegrapes. Thirdly, particularly in more recent years, few research institutions are willing to carry out research on applied topics like developing economic thresholds. The only ones determined for grape pests of which I am familiar are for grape leafhopper and Willamette mite; both are discussed in the University of California's *Grape Pest Management*¹. These thresholds were developed for Thompson seedless grapes and most people agree they are not very suitable for winegrapes. My experience as a Pest Control Advisor (PCA) working in winegrapes, as well as in many orchard crops, is that most PCAs and growers have set their own thresholds for each pest based on experience. Interestingly, these thresholds can vary considerably from PCA to PCA and grower to grower.

So what can a grower or PCA do if there are no scientifically determined economic thresholds established for the pests they are managing and if research institutions are not going to work on them in the future? The answer is they need to determine them for their own vineyard operations. And herein lies the next major hurdle; many growers and PCAs don't make quantitative estimates of pest numbers in a systematic manner on a regular basis and then record these data for later use, all of which are essential for developing an accurate economic threshold. I would like to present an example illustrating why this is so important. I have worked with grape growers who spray when leafhoppers are at a level of less than two nymphs per leaf and with other growers who don't spray when they have more than 10 nymphs per leaf. In both situations each grower feels they have an economic problem and are happy with the results of their action (or inaction). I have had similar experiences working with growers dealing with Willamette mites. Some feel they have a problem when less than 30% of the leaves are infested so they treat, while other growers do not spray when they had more than 60% of the leaves infested with mites. Again, in both situations growers are happy with their results. Without quantitative estimates of leafhopper or mite levels the differences in economic thresholds used by these growers would not be apparent because in both cases there was a perception that a problem existed. Furthermore, I have spoken to many growers who recall not spraying for leafhoppers or mites and wishing they had because they suffered apparent crop loss, whether due to yield or negative impacts on quality. However, since they did not record a quantitative measure of the pest and its damage they had nothing to go on for the future except that they remember the pests were bad. 'Bad' is not a useful measure when developing an economic threshold. There are a couple of important take home messages here. One is that we have a lot of work to do on refining our economic thresholds for leafhoppers and mites since they can vary significantly from grower to grower and PCA to PCA and yet achieve acceptable results in each case. The other is that without quantitative estimates of leafhopper and mite numbers over time it will not be possible to make progress on refining these thresholds.

It is remarkable how many pest management decisions made in winegrapes, and most other crops, are based on perceptions rather than quantitative estimates of pest numbers vs. losses. It is understandable to some degree why this is the case. Growers and PCAs

¹ Flaherty, D. L. et. al. 1992. *Grape Pest Management. Univ. Calif. Div. Agric. Nat. Res. Publ. 3343. 400pp.*

are very busy people and it takes time to make quantitative estimates. However, pesticides are expensive, as is the cost of their application, not to mention the ‘costs’ associated with their environmental impacts, and every effort should be made to use cost/benefit analyses (i.e. economic thresholds) when making a decision whether or not to use them. I find it particularly interesting that cost/benefit analyses seem to be used even less often for environmentally friendly alternative strategies to synthetic pesticides. Just because something is ‘good’ for the environment does not make it exempt from using the economic threshold concept. If the benefit of doing something does not exceed the cost to implement it then don’t do it. If you are unsure of the cost/benefit ratio then start trying to measure the costs and benefits so a sound decision can be made about its use in the future.

Growers are constantly talking about the ‘bottom line’ yet cost accounting is not really driving pest management decision-making because we have no good economic thresholds. People are making these decisions based on their best guess. Applying the economic threshold concept is essential for successfully implementing truly sustainable vineyard operations.