

IPM Revisited **by Cliff Ohmart**

Sometime around 1998, unknown to the California wine industry, the Vine Mealybug, a pest accidentally introduced into southern California in the early 1990's, began moving into new areas around the state on contaminated potted grape vines. As a result, it was inadvertently introduced into some winegrape vineyards in the Central Coast, North Coast, and Northern Interior regions. Once people became aware of what was happening grower meetings and mailings to growers and consultants were organized to inform them of the problem, encourage them to check their vineyards for infestations, and provide suggestions of what to do if an infestation was found. During this process I heard some growers and some University of California personnel warn people that 'you do not want to get this pest' because it will 'ruin your IPM program' (IPM being integrated pest management). While I agree with the fact that the last thing any winegrape grower should want is to get this pest in their vineyards, the more I thought about the second part of the statement the more I felt that the people making it have a different understanding of IPM than I do. The concept was first introduced in 1959¹ and fortunately is finally considered main-stream by most people rather than some left-wing conspiracy. Along the way, however, its definition seems to have changed and by doing so has lost some of its robustness as proposed by its originators. It is important to remind ourselves where the concept came from and what its original intent was. During my graduate studies at University of California Berkeley I had the privilege of studying under several of the entomologists that helped develop the concept so I feel I have the historical perspective to discuss this very important topic. Using Vine Mealybug as a case study, I would like to revisit the concept of IPM.

The IPM concept was developed to meet a crisis in agricultural pest management that developed in the 1950's. Through the overuse of pesticides many important pests had become resistant to these chemicals to the point where they could no longer be controlled. The situation was particularly dire in alfalfa and cotton. Several forward-thinking researchers at the University of California Berkeley and Riverside developed a new pest management paradigm which was to become known as integrated pest management.

IPM has been defined in several ways since its development in the 1950's and the one I like the most is: IPM is a long-term (sustainable) approach to managing pests by combining biological, cultural and chemical tools in a way that minimizes economic, environmental and health risks. It is a simple definition but hits all the important points; it is a long-term/sustainable approach and it integrates the different types of pest management tools to minimize the important risks that impinge on farming which are economics, environment and health².

¹ Stern, V. M., van den Bosch, R. and Hagen, K. S. 1959. The integrated control concept. *Hilgardia* 29:81-101.

² For a more lengthy discussion about What is IPM visit www.lodiwine.com/whatisipm1.shtml

Definitions are great but they have limitations. For example, one cannot take the definition of IPM stated above and develop an IPM program for a pest. One needs to be aware of the essential components that make up an IPM program to further understand the IPM approach as originally proposed. There are five essential components to an IPM program: 1) Understanding the ecology and dynamics of the crop, 2) Understanding the ecology and dynamics of the pest(s) and their natural enemies, 3) Instituting a monitoring program to assess levels of pests and their natural enemies for management decision-making, 4) Establishing an economic threshold for each pest that triggers a management action (an economic threshold being the level of the pest population above which the damage it causes is more than the cost to control the pest), 5) Based on doing 1 through 4 then consider the available control strategies and determine the most appropriate one(s) to use based on economic, environmental and health risks.

A wide range of control techniques is available for crop pests. They can be divided into 5 broad categories: chemical controls such as pesticides; cultural controls such as mowing, tilling or the use of resistant rootstocks; natural (biological) controls resulting from the action of natural enemies, behavioral control such as the use of insect pheromones; and genetic control such as the use of sterile male releases. For any given pest it is desirable to have several types of control options available to manage it. If one fails then there are alternatives. Furthermore, one can 'integrate' multiple control options in the different categories above to minimize the three risk drivers. Because there are 3 risk drivers involved in deciding what control option(s) are used one is often in the situation of having to weigh economic risks against environmental risks and/or health risks. Suddenly one realizes that a situation that seemed like it should be simple, i.e. when and how to treat a pest, is actually very complex. The IPM concept was developed to recognize and deal with these complexities.

As growers and pest managers have become more environmentally aware the definition of IPM in many circles has evolved to mean achieving pest management primarily through non-chemical methods. Terms like Bio-IPM and Bio-intensive IPM have been coined for this 'new' IPM. It is from this perspective that people have concluded that getting VMB will ruin one's vineyard IPM program. That is because at this point in time the only efficacious way to reduce VMB to numbers low enough to prevent economic loss and spread through the vineyard and into other vineyards is through the use of Lorsban (chlorpyrifos) and usually one other pesticide. Lorsban is an organophosphate, a family of pesticides that has significant negative environmental impacts and their overuse in the 1950's was one of the main reasons that the development of IPM was necessary. Until VMB came along, their use in California vineyards had pretty much stopped. While Bio-intensive IPM may be the holy grail of pest management, in my opinion defining IPM in this way is not true to the original concept. Moreover, it puts growers in the position of feeling like they are doing something wrong when they need to use conventional pesticides. I will show how the current management recommended for VMB fits the original IPM paradigm.

VMB is an unusual insect in that the females have no wings. Therefore it builds up slowly when it becomes established in a vineyard and monitoring for it is very difficult

because it feeds in cryptic locations. It usually is present for a couple of years before one discovers it. Moreover, as the population grows some VMB migrate to the roots of infested vines and are not reachable by natural enemies or pesticides. Because of this behavior once a population becomes well established in a vineyard it is impossible to eliminate it. A parasitic wasp is present in California that has the potential to effectively control VMB but ants in the vineyard interfere with parasitism, rendering them ineffective. The history with VMB in California vineyards has been that without aggressive chemical controls to keep the population at very low levels it builds up over several seasons to the point where it causes major crop loss and starts hitching rides to nearby vineyards on equipment, people and possibly other animals. For example, after becoming established in one raisin vineyard in Fresno County around 1998 and not aggressively treated, VMB has been found in vineyards over a 20 mile radius after 6 years.

VMB's spend the winter sheltered under bark where pesticides and natural enemies cannot reach them. As the weather warms in late winter/early spring the immatures emerge to go to new feeding locations on the vine. They are the most susceptible to chemical control at this stage. This emergence occurs over an extended period and Lorsban, when sprayed just before bud-break, is the only pesticide registered on grapes that has long enough residual activity to kill enough of the emerging mealybugs to keep the population below the economic threshold. Moreover, to keep them at very low levels to minimize spread within and between vineyards by contaminating equipment and people it is also recommended that an in-season spray of another pesticide be applied to kill VMB's feeding out on the vine. When dealing with VMB one must weigh the economic risks of crop damage and spread to additional vineyards against the environmental and health risks associated with the use of Lorsban. I suggest that the use of careful monitoring for VMB and, if found, aggressive pesticide treatments applied to stop it from spreading to new vineyards minimizes economic risks because it limits the cost of control to the infested vineyard and it also minimizes environmental risk because treatment is confined to one or a few vineyards. If VMB is allowed to spread to other vineyards significantly more pesticides will be used in the long run, increasing environmental impact and also increase management costs. Furthermore, there is research underway to better understand VMB and hopefully develop more ecologically-based management techniques for the future.

I like the original IPM concept the best because it is robust and realistic. It is best viewed as a continuum of control strategies from mainly pesticide-based on the one hand to mainly cultural and biologically-based on the other hand. The location of one's IPM program on that continuum is determined by choosing control strategies that minimize economic, environmental and health risks presented by the pest. Ideally one's IPM program should move along the continuum toward more biologically-based control strategies. In reality one's program may be more pesticide based one year and more biologically based another since the 3 risk factors may change in importance from one year to the next. The IPM approach is important because it allows a grower to evaluate their pest management program in relation to this very dynamic process and continually

improve it as we learn more about the crop, the pest, monitoring, economic thresholds and control techniques.