Strategies for Insect Control in a Weak Market

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There are many advantages to growing a crop that has strong market potential. In the area of pest control, it allows a bit of flexibility in making management decisions. The grower can use practices that may be a bit more expensive, but that have other beneficial attributes, such as ease of use, worker safety, good environmental compatibility, and safety to beneficial organisms such as pollinators and biological control organisms (such as predators). It has been gratifying working with the cranberry industry because many growers have been making these sorts of decisions, and therefore Integrated Pest Management has become broadly adopted by the industry. However, in a weak market, growers must find ways of cutting production costs. If possible, this should be done without substantially upsetting a production system that has been operating successfully for many years. Here I address the subject of insect pest management as it relates to the declining market. Each grower has their own ideas in this area and so I am going to offer little in the way of specific recommendations. My objective is to provide sufficient background information to allow you to consider the various issues involved.

Pest Management Costs.

First, let's briefly review the actual costs associated with pest management. Foremost is the cost of the damage itself, if left untreated. Insects are significant pests of cranberry; if left unchecked they can result in significant economic damage -- damage that far exceeds the costs of even the most rigorous pest management programs. But this varies from location to location within the state; insect pressures are certainly greater in central Wisconsin than in the northern counties. One benefit of pest monitoring (IPM scouting) is that it allows us to reduce our pest management inputs when pest populations are low, but to respond to increasing populations accordingly. A second set of costs is associated with pest scouting. Whether contracted or done with farm personnel, there are labor and equipment (traps, nets, etc.) costs associated with pest scouting. However, because this is such an important aspect of pest management decision making, it is not a practice that can easily be set aside. Finally are the costs of actually killing the pests themselves. These costs include materials (chemicals or biological controls), personnel, and equipment, and, for some farms, the costs associated with custom application (such as aerial sprays) where there is an associated profit margin for the applicator. All of the above costs must be considered when developing or implementing a pest management program.

Action Levels.

Pest management must be economical; that is, there have to be greater economic benefits to doing pest management than there are associated with doing nothing. Somewhere along the continuum is a "break even point" where the costs of controls exactly equal the amount lost if no controls were implemented. This break even point is usually measured by the numbers of pests present, because the more pests, the more the economic damage. If we know what population level causes economic damage, we can use that population level to decide when to take action. Therefore, in insect management, we talk about "action levels." Generally, there are two action levels that we consider. The Economic Injury Level (EIL) is the pest population level at which the amount of damage done by the pest population exactly equals the costs associated with controlling that insect; in essence, this is the break even point. However, because there may be time lags associated with controlling a pest population, we actually base our actions on a more conservative population level, known as the Economic Threshold (ET), which is a bit below the EIL. Figure 1 is a hypothetical example of a population of cranberry fruitworm through time (the fluctuating line) and both the Economic Injury Level and the Economic Threshold. Note that in some years the insect population is naturally so low that the application of any controls would cost more than would be recouped from increased yield or quality.

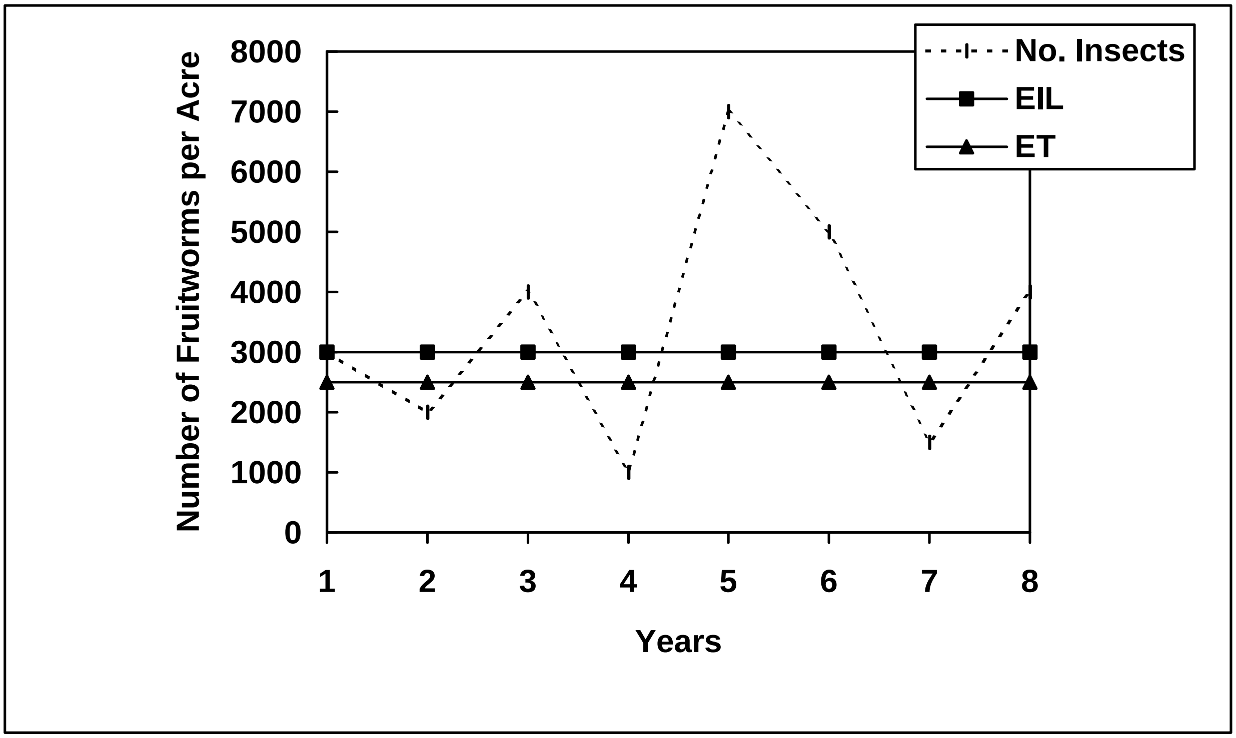

Figure 1. A hypothetical example of a fluctuating insect population through time (years) and the action levels known as Economic Injury Level (EIL) and Economic Threshold (ET).

There are several things that are taken into consideration when calculating action levels. Important factors include (1) the amount of injury caused by a single insect, (2) the total number of insects, (3) the cost of control, and (4) the value of the crop. Generally, action levels are graphically depicted as flat lines as in Figure 1 above. However, if any of the above four factors change significantly, then the action levels must also be changed. For example, if a new cranberry variety were developed that was 90% resistant to cranberry fruitworms, the population numbers would have to be significantly higher to cause the same amount of injury; therefore, the action levels would be much higher. Similarly, if the cost of controls were substantially reduced, the action levels could also be reduced and still be economical.

To give a sense of the development, usage, and change of action levels, let's continue our example with cranberry fruitworm.

First, we need to know how much damage can be done by a single fruitworm. From our knowledge of the biology of the insect, we know that a single fruitworm during the course of its life can destroy 5-7 berries (let's take an average of 6).

My good friend and colleague, Dr. Teryl Roper, who has weighed thousands of cranberries, has told me that an individual berry weighs about 1.5 grams (on average). There are 454 grams per pound, so there are about 300 berries in a pound.

At 300 berries per pound, it takes 50 fruitworms, each eating six berries, to eat a pound of cranberries, or 5000 fruitworms to eat a barrel (100 lbs.).

Now let's consider control costs. First, we will choose Orthene as an insecticide (others are effective as well, but we need to choose one). Orthene costs about $10 per pound. The rate of Orthene is 1.33 lbs/acre. So, enough Orthene to treat one acre costs about $13. Let's say that application costs (labor, fuel, equipment) are $12 per acre (this might be a bit high, but it makes for easy arithmetic!). Therefore, our calculated cost to control fruitworm is about $25 per acre, *irrespective of the number of fruitworms present*.

The next factor to consider is the value of the crop. First, let's consider a market that returns $60 per barrel to the grower. At a $25 treatment cost, it requires 0.42 barrels (42 pounds) (calculated as $25 treatment cost ÷ $60/barrel = 0.42 barrel) to cover the cost of treatment. If 50 fruitworms eat 1 pound of berries (see above), the Economic Injury level can be calculated to be 2100 fruitworms per acre (50 fruitworms/pound of berries x 42 pounds of berries = 2100 fruitworms).

If instead we consider $40 berries, the calculations for the EIL are as follows:

$25 treatment cost ÷ $40/barrel = 0.62 barrel = 62 pounds of fruit, and
50 fruitworms/pound of berries x 62 pounds of berries = 3100 fruitworms/acre.

Finally, if we consider $20 berries:

$25 treatment cost ÷ $20/barrel = 1.25 barrels = 125 pounds of fruit, and
50 fruitworms/pound of berries x 125 pounds of berries = 6250 fruitworms/acre.

These values are represented graphically in Figure 2. But note that the EIL increases substantially between $40 berries and $20 berries. Also note with this hypothetical example, for $60 berries treatment would be economical six of the eight years, whereas for $20 berries, treatment would be economical in only one of the eight years of the example.

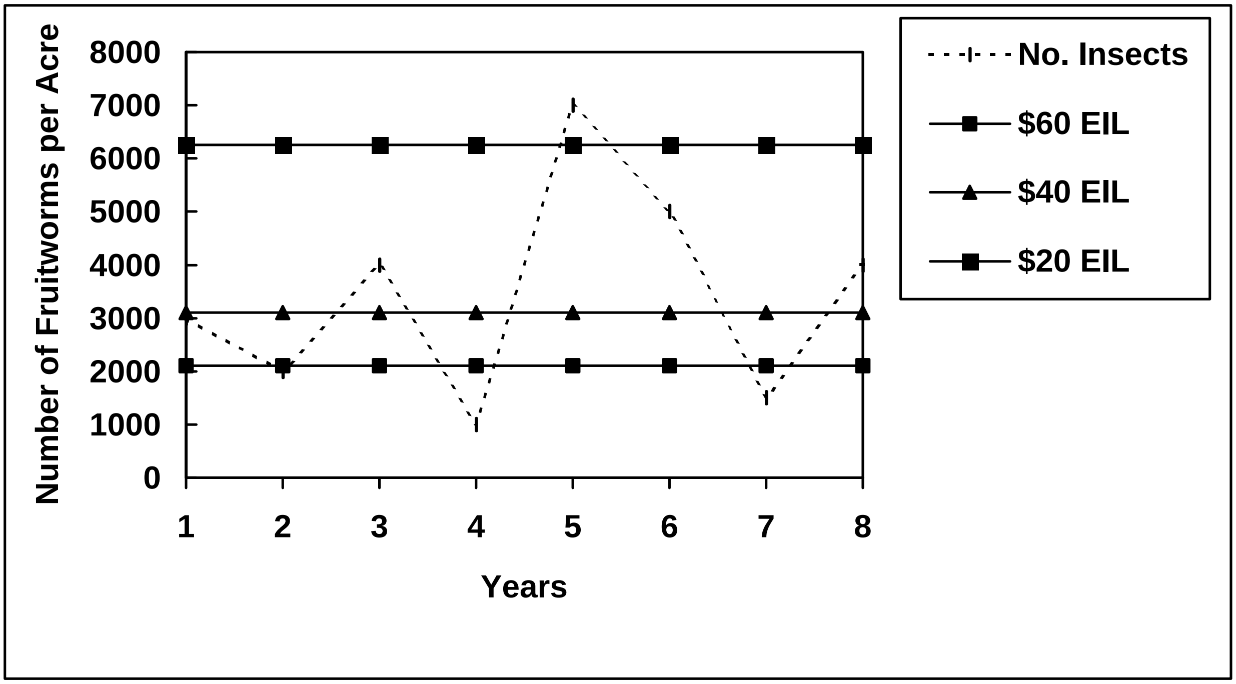

Figure 2. Hypothetical Economic Injury Levels calculated for cranberry fruitworm, based on crop values of $60, $40, and $20 per barrel.

There are always "intangibles" to be considered when dealing with action levels. The example given assumes just a single application for control. If two applications are necessary, the action levels must be adjusted accordingly. The example does not factor in how much damaged fruit a handler will tolerate, or penalties based upon the amount of bad berries. Further, the presence of multiple types of insect pests adds to the complexity. But none of these factors should obscure the important point, which is simply that, as prices fall, you must consider adjusting the amount that can economically be justified for pest management.

Scouting.

Pest monitoring, or "scouting", has been one of the most important advances in cranberry pest management in the past 20 years. Only through scouting can you determine what pests are active, and at what levels. This information is vital to making pest management decisions. However, in this period of depressed prices, scouting must be done in a cost-effective manner. Further, don't expect scouting to answer all questions. To illustrate this, let's once again take up the example of cranberry fruitworm. Although we can establish economic thresholds for cranberry fruitworm, it's not economically feasible to scout to determine if fruitworms are at threshold. In order to be effective, we need to scout the egg stage and eggs are laid singly under the calyx lobes at the bottom of the fruit. Another key factor in making this analysis is the size of the crop, and for this example we will assume an average yield of 300 barrels/acre. Let's again consider the situation for $60/barrel berries. The treshold that we calculated earlier is 2100 larvae per acre which averages about 1 per 20 sq. ft., or about one per 4000 berries. So, we wouldn't be able to tell if we were at threshold unless we inspected 4000 berries for eggs. And usually we recommend taking at least four sets of samples! Even at $20 berries, we would need to examine about 570 berries per sample in order to determine if the population was at threshold. Obviously, the economics aren't there to justify sampling berries to see if we are at threshold for cranberry fruitworm. What scouting for cranberry fruitworm can do is to determine the best timing for spray applications, and to track population levels (in qualitative terms) from year to year. And of course there are pests that are easier to sample, such as with sweep nets, where sampling to determine thresholds is a valid and economical practice.

Pesticide Costs.

Insecticides do vary in cost. Variation can depend on the specific product (active ingredient), the manufacturer, the distributor, and the quantity purchased. It's also important to consider the pest complex that needs controlling, as well as your specific pest management philosophy. For example, one insecticide may be more expensive on a per-pound basis, but it may require fewer applications for your particular complex of pests. If you are particularly interested in conserving beneficial organisms that will aid in the control of pests, you may choose to use a more selective material rather than a broad spectrum product. These are things to discuss with your pest management consultant.

Some Concluding Thoughts.

⇒ Consider all of your pest management options. Don't rely just on pesticides. Flooding, sanding, and biological controls may all play a role. If using pesticides, learn about the products that might be best for your conditions.

⇒ Know your pests and the most effective times to apply controls. I still see growers putting tipworm treatments on in August, long after the insects are mostly gone.

⇒ Carefully consider whether "second applications" are necessary. While there are certainly instances where pest populations are sufficiently big and spread out to warrant followup treatments, in many cases, a properly timed application will provide adequate control. Depending on the value of the crop, a second application may not be justified on the basis of economics.

⇒ In deciding how to cut production costs, it's likely you will think about reducing or eliminating pest scouting. Weigh this option very carefully. You may find that pest scouting pays for itself in reduced pesticide costs, more accurate (and efficient) timing of applications, and reduction in crop losses.

⇒ Finally, "doing nothing" relative to pest problems is not an option. Insects can rapidly build up if left unchecked and have a devastating impact on the yield as well as the health of the vines. Even if you decide that you won't harvest some low-producing beds, consider at least a minimal insect management program on those beds to keep large pest populations from developing and overwhelming adjacent beds.