Some Possible Explanations for Insecticide and Fungicide Ineffectiveness in Greenhouses

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Greenhouse growers have a wide range of pesticides that can be used to alleviate their pest problems. However, it would be highly desirable to have pest control programs as stable as possible, for each change to a new material requires evaluation by the grower and always raises the risk of plant injury on ornamentals. It certainly is desirable to minimize the shifts from one pesticide to another. What are the causes of pesticide ineffectiveness and what can be done to remedy the situations?

Lack of control can be caused by resistance, poor coverage, breakdown of pesticides in the tank or adverse environmental conditions. Resistance certainly has been a real and serious problem with insects, mites, and diseases on ornamental crops. This is because high selection pressure is usually put on a pest and there is little mixing of nonresistant genes from outside populations. Alternation of pesticides may help to slow resistance, but because there is extensive positive cross resistance, the use of several insecticides will seldom prevent the increase of resistance. Once resistance gets started, it usually increases many fold so that increasing dosages will have little effect, and growers soon must find an alternative control.

Poor coverage certainly can result in inadequate control with an effective pesticide. Growers should always keep in mind the target pest they are trying to deal with, and what type of coverage is necessary. Mites under the leaves certainly will require a different type of coverage than thrips in the blossoms. This is one of the reasons that combination sprays may be wasteful of pesticides and not give desired control. Wetting agents can be used to increase wetting and spreading over the foliage, but it should always be kept in mind that excessive wetting can cause pesticides to run off onto the ground and also increase the probability of plant injury.

Some pesticides are more stable in the spray tank than others, but in all instances growers should not mix more spray than will be used in a continuous spray operation. Settling of wettable powders, breaking of emulsions and breakdown of the active ingredient often result when pesticides are held in water for a prolonged period of time.

Many pesticides are adversely affected by acid (low pH) and particularly alkaline (high pH) conditions. As the pH shifts away from neutral (pH 7), the half-life of many pesticides can shift from days to hours and even minutes. This is true for many organophosphate and carbamate insecticides. The San Francisco Bay Area does not in general have serious water pH problems, but water pH should be measured periodically to assure that it is in the 6 to 7.5 range. If water pH exceeds 7.5, it may seriously reduce the effectiveness of your pesticides. In such cases poor control may result from the high pH of the water. Therefore, it will be very cost effective to use an agricultural buffering agent with your sprays.

With most pesticides, activity increases with high temperatures. This is why it is often said that conditions may have been too cold to get maximum activity. However, DDT and many of the chlorinated hydrocarbon insecticides have negative temperature coefficients, and this is true for the new pyrethroids such as permethrin and resmethrin. With these materials, activity decreases as temperatures go up. If you find that the pyrethroid you are using gives good control in the winter and spring and then falls down in the summer, it may very well be due to the high temperatures and the negative temperature coefficient of the pyrethroid. There is little we can do about the weather, but we should be aware that lack of control may not be caused by permanent resistance, but merely result from high temperatures.

Once high resistance to pesticides develops, there is little that we can do other than shift to another control. However, good coverage, proper water pH, and use of the right material under existing weather conditions may help to slow the development of resistance. The most certain way to promote resistance is to use pesticides improperly so that applications must be repeated often. Avoid resistance by having periodic crop-free periods that would eradicate greenhouse populations that are in the process of developing resistance. Crop-free periods are not always practical, but they are the most effective technique for resistance management in greenhouses.

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