# Pesticide Resistance

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Pesticide resistance has been recognized to be a problem from the early days of large-scale production of manmade pesticides nearly 60 years ago. If you are involved in a typical commercial greenhouse operation your pest control practices have certainly been affected by this phenomenon.

Resistance is by no means limited to insecticides. Many fungal and bacterial diseases, as well as some weeds have all shown resistance to one or more chemicals. Have you ever wondered why your doctor switches you from one anti-biotic to another? You guessed it; he or she is working to minimize resistance to our valuable contingent of disease fighting medicines.

There are several ways we know that populations of organisms develop resistance to pesticides, and probably more ways yet to be uncovered. Some contain proteins that bind up pesticides; others use enzymes to detoxify them. Genetic variation within a population makes it possible that a few individuals in any given population may contain the needed attributes to start the process towards resistance. Whenever we treat a pest population with a pesticide there is a chance that a few of the pests contain some ability to deal with the given treatment. If they survive with a few others that have a similar ability to cope, we have the beginnings of a breeding group that may lead to resistance over time.

Growers love systemic pesticides with long residual control, and why not? The longer the period of control the less we need to spray after all. While this is true, as the amount of chemical slowly reduces in the plant tissue it eventually falls to a level that is sub-lethal to the target pest. The end result is an extended period of time when pests are subject to less than a full dose of the pesticide. Pests with some degree of "built in" genetic resistance may survive contact with the reduced level of pesticide and breed with others that have the same. This is another reason you should never use a rate <u>lower</u> than the label calls for, regardless of whether or not you are applying a long residual product. Doing so subjects more pests to sub-lethal doses thereby adding to resistance potential.

What can a grower do to minimize the risk of contributing to pesticide resistance? It has long been agreed that we need to rotate pesticides, but the way we go about this is important. While there is some difference of opinion on the following points, there is good agreement on the major issues:

- Understand what chemical classes are represented by the products available to control a certain pest. Often you will find that potential rotational products are actually in the same class of chemistry, making them poor choices. Cross-resistance to a certain chemical mode of action is common. Two different classes of chemistry can even share a similar mode of action, as is the case with organo-phosphates (Orthene, Duraguard,etc) and carbamates (Mesurol, Closure, etc). All of this makes proper pesticide selection a complicated process. Enlist the help of your Griffin salesperson or our Technical Support Department to help you through this maze. **Lists of common insecticides, miticides, and fungicides with their chemical classes are available from Griffin upon request.**
- Rotation intervals for insects and mites should be based on the life cycle of the pest. The goal is to treat one generation with only one chemical or tank mix

before rotating so we are not encouraging resistance to multiple products. For example, much of the year the life cycle of thrips is around 21 days, so we do not want to rotate to another class of chemicals until after 21 days of treatment. Growers who rotate modes of action with each pesticide application run the risk of passing on increased resistance to several classes of product with each generation. Note: many products now contain resistance management language on their labels, which must be heeded. Remember, the label is the Law!

- Tank mixing, good or bad for resistance management? Tank mixes can improve the effectiveness of a spray program but there is concern about whether or not this hastens resistance. For maximum benefit with the least resistance potential, consider never tank mixing more than two products at a time, and rotate to another product or tank mix that is a different chemical class than either of the products in the original tank mix. Observing the rotation by generation concept will also help to avoid resistance buildup.

Utilize Integrated Pest Management practices to make sure that you use no more chemicals than necessary to control pests. Understanding the life cycle of the pest and life stage(s) the selected pesticide is effective against can avoid wasted applications. Scouting provides valuable information when making the decision whether or not to apply pesticides. Spraying when pest levels are below reasonable thresholds creates unnecessary resistance pressure.

According to Gary Thompson of Dow AgroSciences, it takes 7 to 10+ years and 40 to 100 million dollars to bring a new plant protection product to market. In Gary's estimation it takes about ten years for a successful product to pay off the accumulated debt needed to launch it. No wonder most new pesticides contain resistance management language such as; "Make no more than 3 applications of this product before rotating to another class of chemistry". It makes good sense from a resistance management standpoint, and a long effective life for the chemical is crucial to insure chemical companies have time to make a reasonable return on their investments. If plant protection products for our industry are not profitable the incentive to produce new and safer products will dry up.