

A POSSIBLE NEW CULPRIT OF INSECT RESISTANCE

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Over the years growers, researchers, and chemical companies have been working in unison to develop effective pesticide control strategies. In addition to strategies, insect resistance is always of grave concern and, therefore, many articles, books, and lectures are developed to inform the industry on this critical issue in an effort to reduce its likelihood. Considering this, one would think that among these three constituents and the constant scientific advancements that are being made, insects would not have a chance of survival in the 21st century. Well, as we all know, this is not the case. Insects appear to be surviving just fine and, as long as the industry is providing them with their dietary needs, they do not appear to be going anywhere. The primary reason insects are still existing is their natural ability to develop resistance to pesticides. Their resistance can be developed through several factors. Strictly focusing on insects, their resistance is primarily due to their inherited ability to develop genetic resistance through mutation. This trait is then naturally passed on to their offspring.

One of the most significant advancements made in the industry to help reduce the likelihood of resistance was Integrated Pest Management (IPM). IPM will usually provide sufficient control, however, if practices are not properly adhered to results may be unfavorable. At times when unsatisfactory results occur a grower may become impatient and turn to the heavy artillery and use a "tank mix" or "cocktail mix" (a combination of one or more insecticides in the same tank). I have personally witnessed this "nuke the insect" mentality and, at times, have taken on this attitude myself. For some unknown reason this vengeful attitude appears to provide the grower satisfaction and contentment. Satisfaction due to the fact that the applicator's inspection of the 'killing field' results in no survivors. Contentment due to the fact the applicator's strategy works.

Unfortunately, there may exist a serious problem with this approach; the resilient survivors. Think about it for a moment, what is the likelihood of every single insect in the sprayed area being killed, it's highly unlikely. New scientific evidence from researchers in Europe is strongly suggesting that the insects subjected to a tank or cocktail mix are developing into highly resistant insects at an accelerated pace due to the combination of chemicals. Dr. James Bethke from the University California, Riverside, explains this phenomena- biochemical mechanisms associated with resistance. The mode of action of many pesticides is to inhibit Acetocholinesterase (AChE) from acting on Acetocholine (ACh) in nerve synapses, thus killing the insect. The first reaction by the insect (resistance) is for the level of AChE to increase so that more pesticide is needed to kill it. When a synergist is added, its main mode of action is to knock out any esterase activity; thereby allowing the first pesticide to act on the AChE. The second reaction is for general esterases (glutathione S-transferases, GSTs) within the insect system to increase to such levels that the pesticide and its synergist no longer work. Finally, the scientists involved in this study also noted a more pesticide tolerant AChE. Therefore, con-

stant sprays of one or even two modes of action and a synergist has good potential for resistance build up.

The intention of this article is not to discourage growers but to provide an example of a practice; cocktail mixing of pesticides, that may have a dramatic effect on the industry and its practices. Also, to encourage growers to try to stay abreast of current issues and trends that may effect their operation. Without keeping in-tune one could be making costly mistakes. In this month's edition of *Ohio Florists' Association Bulletin*, number 848, June/July issue, Drs. Cloyd and Lindquist provide an excellent article on resistance management. I would encourage everyone to read this article. In addition, Dr. Lindquist of Ohio State University/OARDC is probably one of the leading experts on this subject matter. His website offers great resources in the areas of pesticides, IPM, and much more.

This discovery can be contributed to a very intuitive and committed research team and technically advanced equipment. As technology advances further investigations into areas commonly referred to as "gray areas" are being solved. It's going to be very interesting to see how sophisticated the greenhouse and nursery industry will become and yet maintain its general principles and practices such as IPM.

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