Insects in general are often thought of as pests. Although some organisms of the class Insecta can become harmful to important agricultural crops, not all insects should inherently be considered pests. A pest can be any organism that competes, injures, or spreads diseases to humans, domestic animals and desired plants. Historically, humans have utilized chemical mixtures to minimize the effects of pests on economically important agricultural crops. Throughout the years, many plant-based chemicals have been discovered that have served this purpose.

According to the U.S. Environmental Protection Agency (EPA), in the 1940s DDT was the first modern synthetic insecticide to be developed and used, not only to control agricultural pests, but also to combat insect-borne diseases like malaria that could affect humans. The success of DDT was short-lived. It was banned by the EPA in 1972 due to its hazardous effects on the environment and to public health. Many of the pest species treated with DDT became resistant to the chemical.

Pesticide resistance is when an insect, fungus, weed, rodent or other pest develops the ability to tolerate the effects of a pesticide that once controlled it. DDT was not the first time in the history of pest control that insect resistance has been recorded. The resistance of San Jose scale to lime sulfur in 1908 was the first documented case. Since then, hundreds of cases have been documented. More than 600 species are known to have developed resistance to some type of chemistry. Additionally, more than 400 weed biotypes and plant pathogens are known to have developed chemical resistance.

**WHY PESTICIDE RESISTANCE DEVELOPS**

To ensure continued survival of the species, all living organisms possess a great ability to respond to diverse factors that may cause them stress. The presence of toxic chemicals in their surroundings creates a big stressor. Therefore, pests sometimes learn to evolve unique traits that help them survive and reproduce. This means that with each generation, they can become more and more tolerant to their stressor.

**RESPONDING TO RESISTANT PEST POPULATIONS**

The modes of action refer to the way in which the chemicals of a product work. On the label of each product, the group number identifies the mode of action. For example, if applying a pesticide of group number 22, which works by impairing
nervous function in the organism, applicators must make sure to rotate to a pesticide of a different mode of action group. This prevents the target pest from getting used to the chemistries. Keep in mind that just switching to another product with a different brand name does not ensure that you have changed the mode of action. Some products may have different brand names but still have the same active ingredients or modes of action. Always look at the group number on the label to make sure.

**TAKE-AWAY MESSAGE**

Although pesticides are a valuable asset to integrated pest management (IPM) programs, they must be applied correctly and at the right time in order to continue their use. Pesticide resistance is unfortunately a big concern since it impairs management programs and limits the options available to growers when it comes to chemical control. One way to prevent this from happening is rotating the mode of action of the chemicals used. Make sure to read the label and pay special attention to the pesticide group number. Identifying different chemistries that work for your IPM program and creating a rotating schedule can help growers stay ahead of pesticide-resistant pest populations.

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