All in the Family

A plant pathologist takes us back to the classroom because knowing what family a particular insecticide belongs to helps growers and landscapers use each material more effectively.

by LAURA POTTORFF

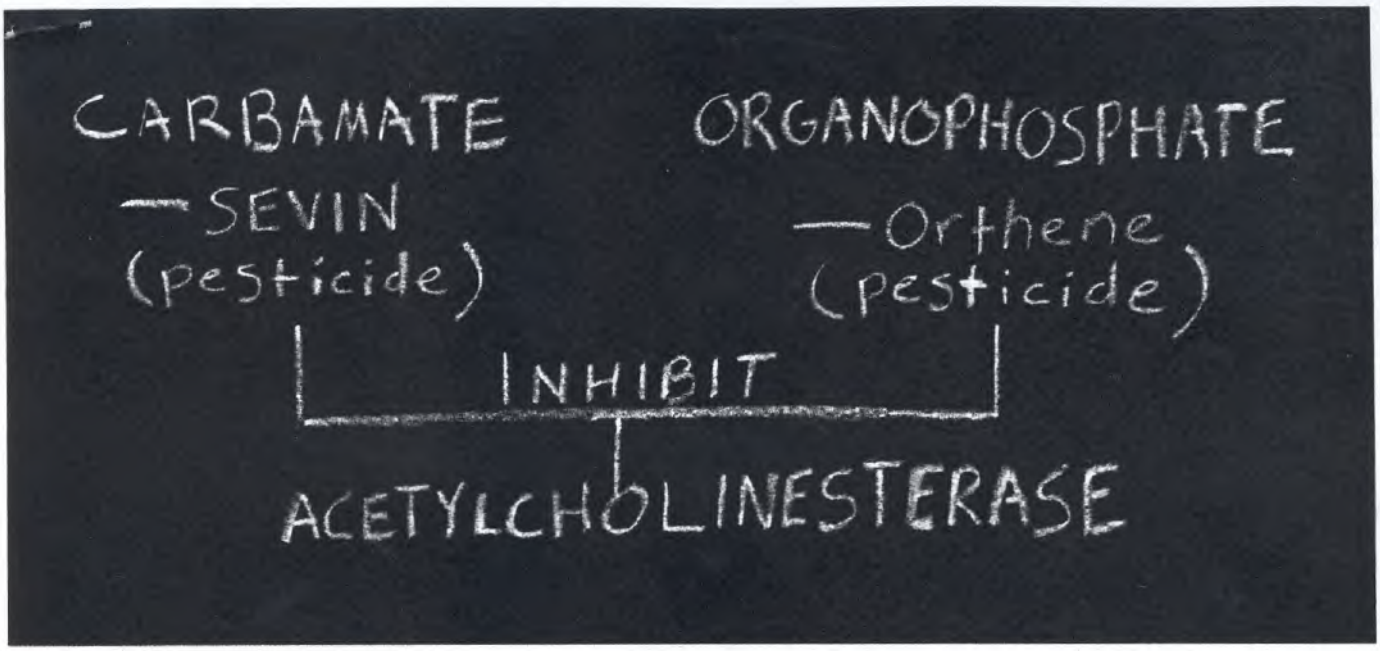
Okay, I'll cut to the chase. Yes, this article really is about the topic of pesticides and their families. For me, it is a most revered topic that conjures up memories of classrooms and having to sit through a lecture to receive continuing education units for pesticide licensure.

Knowing what family a particular pesticide belongs to allows you to use these products more effectively. Most professionals would agree with this last statement; but, in practice, some may think, "How can a person decipher all the information without having a degree in chemistry?" Certainly, a background in chemistry is helpful, but not necessary. Let's see if we can put this all together in a palatable and useful way.

Mode of action. It's human nature to group objects into categories. It's easier for us to better understand plants and animals when we can compare what's like and not like. So, we classify plants and animals. We also classify pesticides.

We group or classify pesticides in several ways. For example, all pesticides are grouped by family based on their similar chemical structures. This information is located on the material safety data sheets, but it is not always found on the label. But scientists also classify pesticides based on their mode of action, or how they work on the pest. For example, the mode of action of pesticides in the carbamate family is the inhibition of an enzyme necessary to the function of the insect's nervous system called acetylcholinesterase. Pesticides in the same family have the same mode of action.

But the mode of action of one pesticide family can be the same as another pesticide family. For example, pesticides in the carbamate family have the same mode of action as pesticides in the organophosphate family.



What this all boils down to is the ability of pests, weeds and diseases to develop resistance to a pesticide and the economics associated with this widely known fact. In order to delay (yes, the operative word here is *delay)* pesticide resistance, a grower or landscape manager must pay attention to not only the chemical family a pesticide belongs to, but also the material's mode of action.

Resistance issues. The issue of resistance is just one of many factors that are critical to a particular product's performance. The definition of a resistant pest is: "a pest that at one time was controlled by a particular product, but because of repeated use or overuse of that material, it no longer can be controlled by that pesticide."

Delaying the development of resistance is fairly straightforward and should include:

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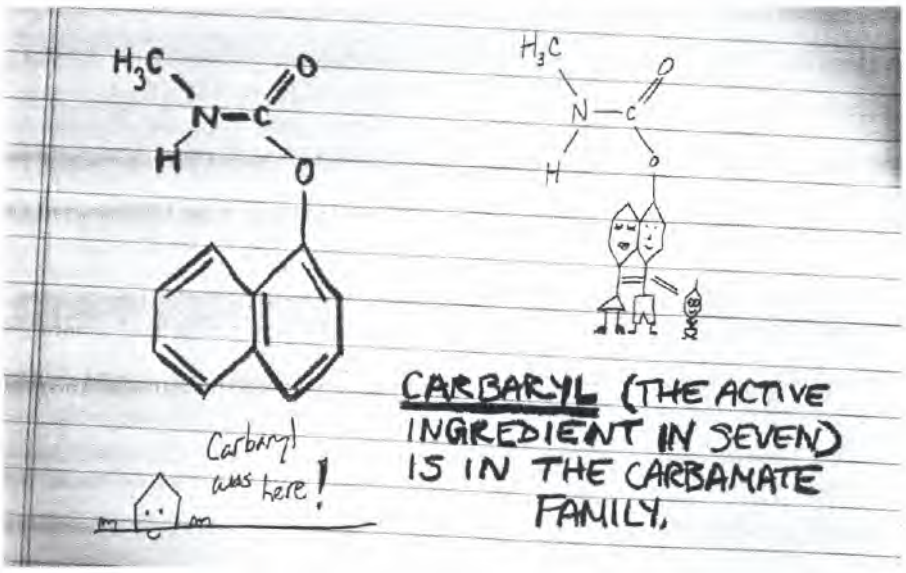
- Using alternative IPM strategies, such as physical removal of the pest/disease/weed, cultural management (water management, care and siting of the plant), exclusion techniques and biological controls (sidebar, page 24);
- Minimizing the amount and frequency of the pesticide application;
- Avoiding the use of unnecessary tank mixes; and
- Rotating pesticides.

Rotating pesticides means using different products, right? Well, it's more complicated than just switching products. The carbamate and organophosphate insecticide families illustrate this concept well. The widely known insecticides SEVIN (a member of the carbamate family) and Orthene (a member of the organophosphate family) are different products and members of different insecticide families, but are labeled to control many of the same insect pests. There also are documented cases of pesticide resistance to both materials. Can we delay the development of pesticide resistance by switching between these two materials? The answer is no. Why? The mode of action of both families and both materials are the same — the inhibition of an enzyme utilized in an insect's nervous system (acetylcholinesterase).

The "rules" for insecticide rotation are as follows:

1. Use the same insecticide for at least one and possibly two or three genera-



How can pesticide use be incorporated wisely into an IPM program? We know pesticides work better and pests will be slower to develop resistance to the materials if a "team approach" is used. Here are some examples:

Use cultural control strategies along with or instead of the pesticide. This is where knowledge of the host comes into play. Under what conditions does a particular plant grow best? A plant receiving appropriate amounts of water, light and nutrition will be less susceptible to insects and diseases and will outcompete weeds. For example, roses prefer to grow in full sun. Those roses that are not placed in a location that receives full sun typically are more susceptible to powdery mildew. If the cultural issues of the plant could be addressed, then disease control via pesticide use could be decreased.

Use physical control strategies along with or instead of the pesticide. This is a strategy that involves the physical removal of a pest, diseased plant/plant tissue or weed. Physical control also could involve the use of a barrier to prevent the invasion of a pest, such as a screen or row cover. Resistant plant varieties fit into this category. Plant a crop that isn't susceptible to a commonly occurring disease.

Encourage biological controls. If you can release biological controls, wonderful, but that tactic works best in greenhouses. Our best bet outdoors is to encourage natural predators, such as ladybird beetles, green lacewings and syrphid flies. To do this, switching to "softer" pesticides may be wise. These materials include horticultural oils and insect growth regulators.

Use monitoring and scouting techniques to watch for pest and disease buildup. If a pest infestation or disease is caught before it is at epidemic levels, then pesticides will work better. Also, a pest or disease level may never reach the "threshold" necessary to trigger its use.

It may take a little bit of thought to use pesticides more wisely, but that type of "cost" is well worth it.

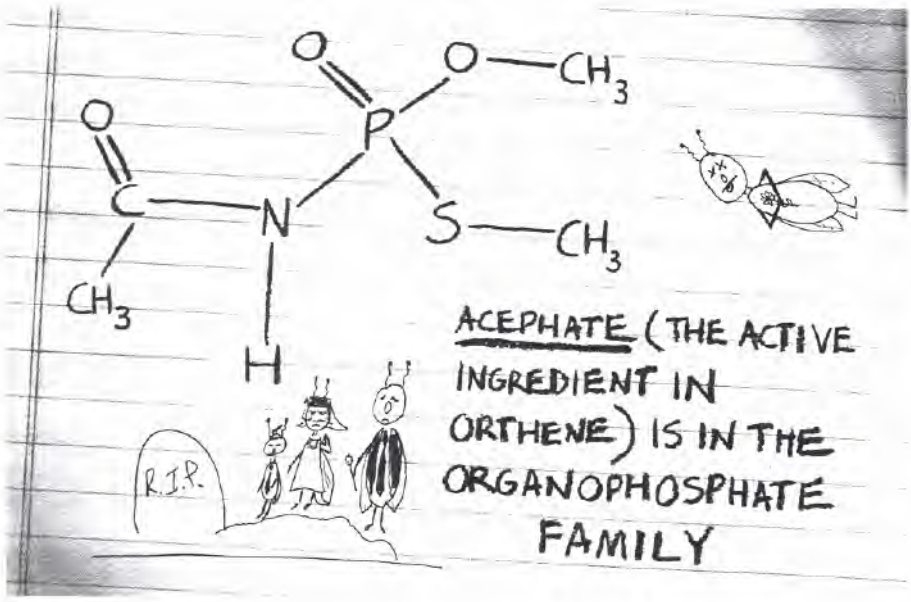
tions. A generation typically is one life cycle from egg to adult. Pesticide labels usually specify how many applications can be made in a crop cycle. For example, the label on the insecticide Conserve SC states "for greenhouse and nursery use." It also states, "Regardless of the crop or pest being treated, do not apply Conserve SC more than 10 times in a 12-month period inside a greenhouse or a structure which can be altered to be closed or open. For areas of commercial production or herbaceous (nonwoody) ornamentals in nurseries, do not apply Conserve SC more than 10 times in a 12-month period per crop regardless of the pest being treated. Because generations of a specific pest may overlap, rotate control products, and never apply more than three consecutive applications of Conserve SC, or products containing the same active ingredient, or products with the same mode of action."

Pesticides in the same family have the same mode of action. But the mode of action in one pesticide family can be the same as another pesticide family.

2. Then switch to an insecticide with a different mode of action.

Rules for fungicide and herbicide rotation are similar — materials need to be rotated based on mode of action, not product.

This really does affect you. There are many documented cases of pesticide resistance among arthropods, pathogens and weeds, and the numbers may he eye-opening. According to the Michigan State University Resistant Pest Database (www.pesticideresistance.org/DB/species.php), there are 544 arthropod species that have shown resistance to pesticides. Also, according to the Fungicide Resistance Action Committee (www.frac.info/frac/publication/anhang/monographl_fracl.pdf), there are 150 pathogens that have shown resistance to pesticides, and, according to www.weedscience.org, there are 113 weeds that are pesticide-resistant.



Show me the money. How can this information save you money? Simple. By knowing which pesticides are related and how they work, you can avoid wasting money. Careful planning of application and judicious use of materials certainly works toward saving money for an individual operation. On a wider scale, the longer a product remains effective against its target, the longer it will last on the market. In a perfect world, this should correspond to lower prices.

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