

Pesticide application methods

By Juanita Popenoe

Editor's note: This article grants one continuing education unit (CEU) in the Core category toward the renewal of a Florida Department of Agriculture and Consumer Services restricted-use pesticide license when the accompanying test is submitted and approved.

ave you recently thought about safely applying pesticides in your citrus operation? Have you wondered if there was a better way to do the job? Being aware of all the different types of application methods may help you to rethink how you are doing things and allow you to increase efficiency while reducing costs. The choice of method depends on many things: target pest type and life stage, site characteristics, type of application equipment, pesticide properties and label requirements, and cost and efficiency of alternative methods. As the citrus industry strategizes on how best to live with HLB, perhaps it should consider different approaches to pesticide application.

Reviewing the different types of application methods may provide insight on how to use them differently in the grove. But as a cautionary statement, as new and alternative pest control methods and techniques are tried, it is important to be sure that the label allows their use and that all label directions are followed.

BAND

Applying pesticide in parallel strips rather than uniformly over the entire field is called a band application. Band applications are used to apply pesticides, including but not limited to herbicides, in the rows or aisles. Potential herbicide drift, overspray and vaporization should be taken into consideration when using this technique, and the application should be done with guards or shields to minimize contact of the herbicide to the crop plant. The growth of some citrus trees has been set back by drift from herbicides applied beneath the tree, especially with stressed trees. Special care should be taken when using herbicides around young trees to avoid contact with the tree trunk, as injury could occur.



Figure 1. Basal application

BASAL

A basal application is a lowpressure spray directed to the lower portions of the tree trunk (from the ground up to 20 inches). This type of application is used in forestry operations with herbicides to kill undesirable trees with thin bark, and with insecticides to control borers in some fruit trees. It can be a time-consuming application because each plant is treated separately and completely around the trunk, but it is very selective with nothing applied where it is not needed.

BROADCAST

When a pesticide is applied uniformly to an entire area or field, it is termed a broadcast application. An application of ant bait to an entire field would be considered broadcast because it is applied to the whole area. Broadcast applications require more pesticide than other types of applications because the entire area is covered, rather than targeted plants or areas.

CRACK AND CREVICE

Crack and crevice application is used in pest control in buildings. In this technique, small amounts of pesticide are placed directly into cracks and crevices of buildings, cabinets and areas where some pests commonly hide. Although not likely to be used in citrus groves, this method may be commonly used in your home, barn, packing shed or other structure. The importance of having a clean, pest-free packing environment is critical to produce safety, and this technique should not be overlooked for these applications.

DIRECTED SPRAY

To minimize pesticide contact with non-target plants and animals, a directed-spray application may be used. This is a type of spot treatment with pesticides applied directly to the pests, like a wasp nest on a building. In the future, new artificial intelligence robotic scouts may be used to identify pests and be equipped to apply a directed-spray at the pests when found.

FOLIAR

Foliar applications are by far the most common type of application method used in a grove. This technique directs the pesticide to the foliage of the tree and is very susceptible to drift. Foliar applications should not be used under windy conditions, although a breeze of three miles per hour can help the spray become more dispersed in the tree canopy. Drift should be minimized by not spraying into the wind, using low spray pressure and choosing nozzle tips with a larger orifice. Adjuvants may also help to reduce drift.

ROPE WICK OR WIPER

A very targeted, low-volume application is the rope-wick or wiper treatment. In this application method, the pesticide is released onto a wick that is wiped onto the target plant. Typically it is used with herbicides to target tall weed plants emerging above the crop canopy or to selectively apply to weeds in a mixed plant community. However, this method could also be used to apply small amounts of insect pheromones or other pesticides throughout an orchard. Drift is completely eliminated, but care should be taken with excessive herbicide dripping from the wick that may come into contact with non-target plants.

SOIL

Applications of pesticides directly on or in the soil are soil applications. There are several types of soil applications. Pesticides applied with this technique may be soil-active herbicides, systemic insecticides taken up by the roots, or pesticides targeting soil organisms. Care should be taken in this type of application to minimize leaching or runoff where excessive irrigation or rainfall could move the pesticide off target.

Relatively few pesticides are truly systemic, and it is tempting to use these exclusively because they are so easy to apply without attention to coverage. Because of this scarcity and the few modes of action represented, care should be taken not to overuse these chemistries and cause pest resistance to develop. Systemic soil-applied pesticides to control Asian citrus psyllid on young nonbearing citrus trees include only two modes of action - three neonicotinoids (all group 4A mode of action) and one group 28 insecticide. Research has indicated that repeated application of the same mode of action can lead to pesticide-resistant pest populations.

SOIL INCORPORATION

Soil incorporation is a slightly different type of soil application because tillage, rainfall or irrigation is used to move the pesticide into the soil. The properties of the pesticide will determine which of these soil application methods is required and how much water needs to be applied to activate the pesticide but not leach it from the field or too deeply into the soil profile. Tillage down rows of established trees causes unacceptable levels of root damage and should be avoided with HLB-stressed trees.

SOIL INJECTION

Soil injection is the application of a pesticide under pressure beneath the soil surface. It may be done with or without a plastic covering, depending on the pesticide properties. This technique is a way to get pesticides directly to the root zone with less chance of off-target movement, but can be more time consuming than other soil applications and expensive because of specialized equipment. This technique may be used to treat soil before planting row crops. Injection is the term often used for the method of applying a pesticide injected into the irrigation system, but application through the irrigation system is technically soil incorporation, not soil injection.

SPACE TREATMENT

Space treatment is the application of a pesticide in an enclosed area. This type of application is used on bins of fruit to control pests that might move with the fruit. California recently successfully tested a control for HLB movement between orchards





Figure 2. A drone may be used to deliver spot treatments.

in which harvested fruit on the truck is fogged with a carrier and a pesticide that destroys the disease-bearing insects before the truck leaves the orchard. The truck is driven into a specially built tarp chamber where the fogging space treatment is applied. A space treatment might also be used on containerized trees in a citrus under protective screen system that requires individual treatment because the whole tree can be treated in an enclosed space. Thermotherapy has been effective with containerized trees because the whole tree, including the root system, can be treated.

SPOT TREATMENT

Spot treatment is another name for the application of a pesticide to a small, distinct area. If scouting is done frequently enough, many pests can be controlled with a spot treatment that limits the amount of pesticide required. However, the success of spot treatments will depend on the nature of the pest to be controlled. Some pests will require a preventive spray, rather than a limited spot treatment, to the whole field to keep them from affecting the rest of the crop.

TREE INJECTION

Getting the pesticide under the bark of trees and into the vascular system of the plant is termed tree injection. This can be accomplished in several ways, depending on whether you are using a herbicide or another pesticide. "Hack and squirt" and "frill and girdle" are the same technique in which downward angled cuts through the bark and into the cambium are then filled with herbicide that is



gradually taken into the tree's vascular system. "Cut stump," in which herbicide is applied directly to a freshly cut stump's cambium layer, is also considered a tree injection.

In the quest for a cure for HLB, a form of tree injection is proposed to apply modified citrus tristeza virus that will produce an antibiotic protein to kill HLB in the plant, or as a way to apply antibiotics more effectively. In this type of "injection," the pesticide is pressurized and applied to the trunk either through a gun-type applicator or through an infusion into a hole drilled in the trunk.

There are many types of pesticide application methods, although few are



Figure 3. An injection port for infusion of fungicides to combat laurel wilt in avocado

usually used. Consider all the alternative methods, including cost and efficiency. Also, take into consideration how best to achieve the desired results with your site conditions, your application equipment, and the pesticide properties and label requirements.

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'Pesticide application methods' test

To receive one Core continuing education unit (CEU), read "Pesticide application methods" in this issue of Citrus Industry magazine. Answer the 20 questions on the magazine's website (www.CitrusIndustry.net) or mail the answers and application information to the address at the end of the article. The article and test set are valid for up to one year from the publication date. After one year, this test will no longer grant a CEU. You must answer 70 percent of the questions correctly to receive one Core CEU.

1. When making a decision about which method to us	se, consider (choose a	ll that apply):	cide properti	es	
2 A band application involves using a pheromone-im	pregnated rubber ba	d around the tree	trunk T F	65	
2. A band application involves using a pretomone-inf	the roots of the plan				
5. In a basar application, a pesticide drench is made to		· · · · ·	1	I	
4. Common pest control application methods used in applications.	buildings like a pack	ing shed are the	and	l	
 In the future, a scout drone with artificial intelligence a. soil injection b. basal treatment 	e to identify pests may c. directed spray	be equipped to ap d. space	ply which type e treatment	e of treatment?	
6 applications are by far the most comm	on type of applicatio	n method used in	a grove.		
7. A wiper treatment involves:					
a. using a rope to wick pesticide out of a tank and ir b. using pesticide-wet rope to wipe over the target p	to the irrigation system c. ant d.		:. wiping insect pests off leaves l. risky drift issues		
8. Soil incorporation involves using tillage or irrigation	n to get the pesticide	into the root zone	TF.		
9. Soil injection is commonly used pre-plant to inject	pesticides into the so	il under plastic mu	llch to grow r	ow crops. T F	
10. Space treatment is:a. applying pesticides on the space stationb. applying pesticides into an open space between the	ne target plants	c. applying pesti d. applying pest	. applying pesticides into an enclosed area l. applying pesticides to fruit before picking		
11. "Hack and squirt" and "frill and girdle" are both typ	pes of tree-injection a	pplication method	ls.TF		
12. The "cut stump" treatment involves applying a pesti	icide to a cut stump a	t least one day afte	r the cutting.	T F	
13. Using a special pesticide "gun" to shoot pesticide int	to a tree is a form of a	space application.	ΓF		
14. Fire ant bait application may utilize a broadcast app	olication method.				
15. Drift can be a problem in which application method a. tree injection b. soil injection	d? c. foliar applicatio	n d. crack	and crevice	application	
16. Soil incorporation with tillage is a good way to get p	pesticide into the roo	t zone of an HLB-s	stressed tree.	ΓF	
17. Drift can be minimized by not spraying into the wir larger orifice. T F	nd and using low spra	ay pressure and no	zzle tips with	a	
18. A wasp nest would best be treated with which type ofa. broadcast applicationb. injection applicationd. band application	of application metho ray application cation	d?			
19. Applications of pesticides directly on or in the plant	t are soil applications	.TF			
20. A basal application would be used to apply pesticide	es for trunk borers in	a fruit tree. T F			
Please circle the numbe	er below to rate this ar	ticle and test:			
Not very useful 1 2 3 4	5 6 7	8 9	10	Very useful	
Pesticide	Applicator CEU Form				
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E-mail:	Phone:				
Pesticide License Number:					
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