Try These Tips on Pesticide Efficacy, Formulations, Equipment

By Eileen Buss and Grady Miller

Each year, some turfgrass managers call university specialists and/or regulators to discuss failures of certain insecticides against key pests. Build-up of insecticide resistance by the pests is often blamed, but poor control may be caused by any number of other factors. Understanding which factors can reduce pesticide effectiveness may help you avoid retreats, unnecessary exposure and lost revenues.

Pest identification. Proper identification of a pest is critical to knowing its life cycle, which then indicates when it is most vulnerable to control. Misidentifications often lead to poorly timed pesticide applications. For assistance, samples may be sent to your local cooperative extension office for identification.

Selection of pesticide and formulation. All insecticides are different, even within chemical classes. Products vary in formulation, length of residual, which and how many pests they target, their mode of action, ability to bind to organic matter and so on. Choice of formulation also matters, depending on which pest is targeted and where it lives and feeds. The primary formulations are liquids (e.g., flowables, emulsifiable concentrates or soluble or wettable powders) and dry formulations (e.g., granulars, dusts or baits).

Liquid applications usually leave a residue on grass blades, which insects may feed on and/or physically contact, and often provide faster knockdown of surface and thatch-feeding insects than dry formulations.

Granulars may be more useful if post-treatment irrigation must be delayed and may be safer to handle than sprayable formulations. Granulars are also less likely to drift on windy days than sprayable formulations, which is a major concern for turfgrass managers. Avoid spraying if wind velocity exceeds 5 mph. Superintendents in Florida identified in a recent survey that the most common formulations they used were flowables, wettable powders and granulars (Table 1).

Granulars may be more useful if posttreatment irrigation must be delayed and may be safer to handle than sprayable formulations.

TABLE 1

Percentage of superintendents who used these pesticide formulations on golf courses.

Pesticide Formulations	
Flowable	85.0
Granule	77.2
Wettable powder	77.2
Soluble powder	64.6
Emulsifiable concentrate	61.4
Bait	56.7
Fumigant	8.7
Dust	3.2

Research suggests that the efficacy of granular and sprayable formulations for turfgrass insect pests is actually similar. Baits tend to be more environmentally friendly because they are target specific and contain less active ingredient than other formulations.

Application equipment. Selecting the appropriate application equipment and calibrating the amount of pesticide delivered are key components of proper pesticide use.

Although which sprayer or spreader used may not directly affect pesticide efficacy, the choice may affect coverage and indicate adherence to an integrated pest management program. Properly calibrated equipment is essential for even coverage. If too little product is applied, only partial control may be achieved, or none at all. Similarly, if the distribution of product is not uniform, gaps in control may occur.

Application equipment comes in all shapes and sizes. Often, smaller pieces of equipment allow for more precise applications where pests are actually located, which is useful for spot treatments. Tractors or trucks are used for large-scale applications, but the pests may not be uniformly present throughout that area. It is useful when these larger sprayers are also equipped with a hose and handgun nozzle for applications in small or hard-to-reach areas.

Florida superintendents indicated in a recent survey that they used spray rigs/tractors or hand-held spray tanks either most of the time or always in their pest management (Table 2).

Broadcast spreaders were more popular than drop spreaders or hand-held granular spreaders ("belly grinders"). The main goal is to use equipment that can apply the pesticide close to where the insects are living and feeding while minimizing drift and non-target (e.g., people, animals, beneficial insects) exposure.

In addition, spray nozzles are an integral component of

Continued on page 62

TABLE 2

Percentage of superintendents who used this equipment for pesticide applications.

Equipment	Never	Occasionally	Most of the time	Always	No response
Hand-held granular spreader	55.2	35.4	6.3	0.8	2.4
Broadcast spreader	3.9	58.3	34.6	2.4	0.8
Drop spreader	35.4	59.1	2.4	0	3.2
Backpack sprayer	42.5	40.9	12.6	12.6	3.2
Hand-held spray tank (1-3 gallons)	2.4	51.2	37.0	9.5	0
Hydraulic sprayer	62.2	12.6	16.5	3.9	4.7
Spray rig/tractor	10.2	23.6	54.3	10.2	1.6

Surveys were mailed to 773 Florida golf course superintendents in spring 2003, and 127 (16.4 percent) surveys were returned.

chinch bugs in Florida and greenbugs in the Midwest, both of which have multiple generations each year. Resistance is less likely to develop in insects with one generation a year.

Eileen Buss is an assistant professor of turfgrass entomology at the University of Florida in Gainesville. Her program focuses on the biology and management of white grubs, southern chinch bugs and mole crickets. She trains turfgrass managers on IPM. Grady Miller is an associate professor of turfgrass science at the University of Florida. He teaches turfgrass culture, golf and sports turf management and research methodology.

Continued from page 60

liquid application equipment. Nozzles are classified by spray delivery pattern, spray angle, discharge rate and construction material. Nozzles used outside their specified rates and pressure will not work accurately. Nozzles are also prone to wear, so always calibrate, check and replace worn nozzles.

Water and/or soil pH. The alkalinity or acidity of the water in a spray tank or the soil may break down or deactivate pesticides. However, many insecticides that are pH-sensitive contain buffering agents to maintain a more neutral pH. Tank mixing, agitation and temperature increases in a spray tank can also change the pH value, so periodically check it if an immediate application isn't done. Know the pH of your water source and keep buffering agents on hand if needed.

Pest resistance. Pests may become resistant to pesticides if a population is repeatedly treated over time, such that all of the susceptible individuals die and only resistant ones remain to breed. Applicators then need to treat more often at higher rates to achieve acceptable control. The mechanism of resistance is usually genetic. The speed that resistance develops depends on how much of the pest population is exposed, how often the pesticide is applied, the persistence of the insecticide and the pest's reproductive rate. For example, resistance to organophosphate insecticides has been documented with southern