ENY-337

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Commercial Applications of Insecticides and Miticides in the Green Industry[1]

Eileen A. Buss[2]

An insecticide, as it is marketed, contains a primary toxicant (**active ingredient**) and other inert materials or carriers which may be non-toxic. Insecticides are rarely applied at 100% of the active ingredient and may be formulated in several different ways. The most common formulations used in the Green Industry are granules (G), wettable powders (WP), emulsifiable concentrates (EC), flowables (F), sprays (S), soluble powders (SP), and aerosols. Some active ingredients occur in over 50 different products, labeled at different rates and/or uses.

Adjuvants are substances added to a pesticide formulation by the manufacturer or tank mix by the applicator to improve its performance, ease of application, or safety. Some of the most common adjuvants are **surfactants**, which change the dispersing, spreading, and wetting properties of spray droplets. **Spreaders** are adjuvants that allow the pesticide to form an even coating over treated surfaces, while **stickers** help the pesticide to stay on or adhere to the foliage. Other adjuvants may reduce the foaming of mixtures that need agitation or reduce drift during application. **Buffers** allow pesticides to be mixed with water or other pesticides of different acidity or alkalinity. For example, a buffer should be added to a spray tank if the water pH is greater than 7, to maintain the pH near 6.5. **Compatibility agents** aid in combining and mixing different pesticides effectively.

Insecticides, although used to maintain healthy plants and reduce pest populations, have the potential to damage sensitive plants. **Phytotoxicity** often appears as a marginal burn, chlorosis, spotting, distortion, or abnormal growth of leaves. Although any part of the plant may be affected, the new growth is most likely to show damage. For example, an improper tank mixture of incompatible products may cause phytotoxicity. Consult a compatibility chart and manufacturer labels before mixing materials. In addition, pesticides are less likely to damage plants if treatments are done in the early morning. Foliage will be dry before temperatures get too hot and sunlight magnifies through spray droplets. In general, powders can be mixed together, and a powder or soluble can be added to an emulsifiable concentrate. Mixes should be of compounds either of the same class or the same brand, if possible. Regardless of the pesticide or mixture of pesticides used, it is strongly

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2. Eileen A. Buss, assistant professor/extension entomologist, Entomology and Nematology Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

recommended that the effects be evaluated on a few plants, under your particular conditions, before treating all plants.

A **systemic insecticide** is a chemical compound that is absorbed by the host plant, translocated throughout its tissues and makes the host toxic to certain insect and mite pests. Several systemic insecticides are taken up from the soil by the roots of plants and translocated throughout the plant tissues; others can be absorbed by foliage or stem sprays. Systemic insecticides have been effective primarily in controlling small sucking pests, including aphids, whiteflies, scales, mealybugs, lace bugs and spider mites. Historically, they have not given satisfactory control of chewing insects.

Dry, **granular applications** may be used to control soil-dwelling insects. These insecticides are often applied with a walk-behind rotary spreader. To ensure even distribution over the soil surface, applicators often walk back and forth in one direction (e.g., north-south) until the area is covered, then criss-cross in the other direction (e.g., east-west). Granular products often need to be watered into the soil to prevent binding with plant material and to move the insecticide into the thatch or soil. Granules may cause phytotoxicity if applied to wet foliage, especially on ornamentals. Carefully calibrate spreaders so they do not grind the granules or create dust because of the increased potential for applicator exposure or inhalation of the product.

Spray applications are often done using flowable, emulsifiable concentrates, and other insecticide formulations. Spray equipment varies from hand-held pumps and backpack sprayers to high-pressure hydraulic sprayers. Thorough coverage is important to gain adequate control of insect pests. Some labels suggest applying sprays until foliage is misted or until runoff is achieved. Sufficient pressure is necessary to turn leaves and reach insects feeding on the underside of leaves. For best results, many insecticides need to be mechanically agitated in the spray tank to remain in solution.

Drench applications may be useful against root-feeders, wood- or phloem-borers, or sap-feeders. The insecticide (e.g., various neonicotinoids) is sprayed or poured within the plant's drip-line, and the plant's root system takes it up. The insecticide is then translocated systemically throughout the plant and kills the pests as they feed. Soil drenches are best applied a short time before pests are expected to be active.

Chemigation is the application of systemic products through an irrigation system. For best results, apply the products toward the end of the irrigation period. Do not apply insecticides using chemigation to plants under water stress, or follow application with excessive amounts of water. Some insecticides are not labeled for use through chemigation.

Trunk injections directly apply insecticides (e.g., imidacloprid, abamectin, emamectin benzoate, bidrin) into a tree for faster translocation. Several systems for macro- or microinfusion exist, including Mauget, Arborjet, and Wedgle. Small, shallow holes are drilled near the base of the tree trunk. Tubes are inserted into the holes and the insecticide is injected under pressure into the trees. Trunk injections reduce drift and exposure, but may be more expensive and labor-intensive, and wounds are created in the tree that may take time to heal and allow entry by pathogens.

Subsurface application of insecticides is used for control of soil-dwelling pests such as mole crickets in turfgrass. This includes high-pressure liquid injection or slit-injection of granular or liquid products. The goal is to place the insecticide in the soil where the pest lives. This technique has several advantages. Because the insecticide is delivered to the target zone, less is bound in the thatch layer. Losses from volatilization or degradation in sunlight are reduced. Less residue occurs on the surface, which reduces the hazard to workers, turfgrass users, or wildlife. Spray drift and odor are also reduced. Potentially lower insecticide rates may be needed, compared to surface treatments. Turfgrass looks torn up after treatments are applied, but thatch is reduced and the grass recovers. Disadvantages include needing to buy expensive application equipment or contract out for applications.

Smokes, aerosols, and thermal fogs may be used in greenhouses if temperatures are cool. However, these formulations are not recommended

for use during hot periods. Little research has been conducted with these products on tropical foliage plants.

Important

Federal and Florida Laws state that all pesticides must be handled and applied in strict accordance with the label and worker protection standards (re-entry times, protective clothing, etc.). According to the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the plant must be listed on the label. FIFRA does allow growers to apply pesticides against pests not specifically listed on the label. However, if a pesticide is used in a greenhouse or interiorscape, it must be labeled for such use. To the best of our knowledge, the suggested pesticides listed in this management guide are labeled on the crops and sites discussed. However, pesticide labels differ widely in plant and pest listings. Some are broad ornamental labels and others specifically list certain plants for which the pesticide is labeled.

Read the entire label carefully, including the small print, before opening the container. Avoid drift of pesticides to nearby areas or to plants that may be eaten by people or animals. Do not allow pesticides to contaminate wells, ponds, or streams. Store pesticides in their original labeled containers, in a locked room with metal shelves. Rinse empty containers several times with water and pour rinsing in spray tank. Puncture and dispose of empty containers promptly and safely.

Keep the telephone number and address of the nearest Poison Control Center listed in a convenient location in case of an accidental pesticide poisoning. Also, keep the labels and Material Safety and Data Sheets (MSDS) of all pesticides that are on the premises. If a poisoning occurs, show the pesticide label to the physician. If a product is labeled for use specifically in Florida (special local need), obtain a copy of the supplemental label from the supplier when the product is purchased.

Because cultural conditions vary widely in the Green Industry, no single pest control program can be suggested. Chemical control of insects is likely only when the correct material is applied in the correct manner to a susceptible stage of the pest. Maintenance or so-called preventive sprays may be applied every 1 to 3 weeks, depending upon the pest, time of year, and residual length of a pesticide. We strongly suggest that a scouting program be conducted and insecticides be applied only when truly needed.

Additional Information

For more information, see the following Extension publications:

- Application Equipment and Techniques (SS-AGR-101) (http://edis.ifas.ufl.edu/WG012)
- Natural Products for Insect Pest Management (ENY-350)
- Pesticide Safety (FS11) (http://edis.ifas.ufl.edu/CV108)
- Regulation of Pesticide Use (SL-53) (http://edis.ifas.ufl.edu/SS172)
- Toxicity of Pesticides (PI-13) (http://edis.ifas.ufl.edu/PI008)