Commercial Applications of Insecticides and Miticides in the Green Industry

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Any pesticide, as it is marketed, contains a primary toxicant (active ingredient) and other inert materials or carriers that are intended to improve the performance of the pesticide. Insecticides are almost never applied at 100% of the active ingredient, in part because the technical grade active ingredient needs to be modified into a sprayable or dispersible form. Thus, there are several different kinds of formulations. 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 are sold in over 50 different products as various formulations, labeled at different rates and/or uses for different sites.

Adjuvants are substances added to a pesticide formulation by the manufacturer or tank mix by the applicator to improve the pesticide's performance, ease of application, or reduce its toxicity to non-targets (e.g., people, animals). 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. This is especially useful when spraying plants with waxy leaves. 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 and miticides, 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, or try mixing a small amount of the products in a jar to see if they separate out or form a precipitate (might look like sludge). 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. In addition, pesticides are less likely to damage plants if treatments are done in the early morning. Foliage should be dry before temperatures get too hot and sunlight magnifies through spray droplets. Regardless of the pesticide or mixture of pesticides used, it is strongly recommended that the effects be evaluated on a few plants, under your particular conditions, before treating all plants.

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**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. This use is not generally allowed in urban landscapes, but may be used in greenhouse or nursery settings.

**Trunk injections** directly apply concentrated 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 or capsules are inserted into the holes and the insecticide is injected under pressure into the trees. Sometimes the drilled holes are filled in with a plug, but sometimes they are left open. 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 to control 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 broadcast 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 or in urban landscapes. 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, even if you have used the product before. Labels can be changed without notice. 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 any water source. Store pesticides in their original labeled containers, in a locked room with metal shelves. Rinse empty containers several times with water and pour the rinsate into the 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 exposure or poisoning. Also, keep the labels and Safety and Data Sheets 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. This information can be found on manufacturer websites or through online databases (e.g., CDMS, Greenbook).

Because cultural conditions vary widely in the Green Industry, no single pest control program can be suggested. Chemical management of insects is likely to be successful 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. However, we strongly suggest that a scouting program be conducted and insecticides be applied only when truly needed. Following an integrated pest management program is the best option, but advanced planning is needed.

**Additional Information**

For more information, see the following Extension publications:

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