

Insecticide Formulations 101

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OVERVIEW

What is a Pesticide Formulation?

Pesticides are available in various "formulations". A formulation is simply the form of a specific product that you use. Some insecticide formulations include dusts, gels, granules, liquids, aerosols, wettable powders, concentrates, and pre-mixed solutions.

A pesticide formulation typically consists of an [active ingredient](#), plus several inactive materials called adjuvants, or additives. The main purpose of additives is to increase the effectiveness of the active ingredient. Some common additives include spreaders, stickers, wetting agents, compatibility agents, and foaming agents.

How to Choose a Pesticide Formulation

Any given active ingredient can often be purchased in more than one formulation. For example, the active ingredient [Deltamethrin](#) is available as a granule ([DeltaGard G Granules](#)), a suspension concentrate ([Suspend SC](#)), a dust ([Delta Dust](#)), and an aerosol ([D-Force Insecticide](#)). Same active ingredient, four different products.

The reason for this is that different formulations of the same active ingredient behave differently. Therefore, a deltamethrin dust is perfect for application into wall voids where it coats the inner wall and controls crawling pests, while a deltamethrin aerosol is more suited towards contact control of flying pests.

Knowing the characteristics of a given formulation will help you to choose the right product for your needs and use that product more effectively. Here are some points to consider when choosing a formulation. This information can usually be found on the product label:

- Percent of active ingredient
- Ease in handling and mixing
- Personal safety risk
- Type of environment (agriculture, forest, urban, etc.)
- Effectiveness against the pest
- Habits of the target pest
- The crop to be protected
- Type of application equipment or machinery
- Danger of drift or runoff
- Possible injury to crop
- Cost

Different Types of Pesticide Formulations

Here are some of the most common kinds of pesticide formulations available, along with a description to give you a better understanding of what they are:

- **Dusts (D)** are made up of a finely ground mixture of active ingredient combined with clay, talc, or other powdered materials. Dusts are intended for dry use and should never be mixed with water. The percentage of active ingredient in a dust is generally quite low. [Insecticide dusts](#) are commonly used for interior wall void and perimeter treatments, as well as for crop-dusting.
- **Granules (G)** are hard, dry particles made up of porous materials and active ingredient. The percentage of active ingredient in a granule formulation is higher than that of a dust but lower than that of an EC. Granules are usually more safe to apply than dusts or ECs. [Granular insecticide](#) formulations are used most often for soil treatments. Granules will not cling to plant foliage, so that they may be directly applied over plants or soil.
- **Aerosols (A)** are sold in cans and contain one or more active ingredients under pressure. [Aerosol pesticides](#) are sold most often for home and garden use, not for agricultural use. The percentage of active ingredient in aerosols is usually very low. One of the main advantages of aerosols is that they are convenient and easy to use. Many aerosols are used for killing pests on contact, or for time-released control of flying pests.
- **Emulsifiable Concentrates (EC or E)** are liquid formulations where the active ingredient is dissolved in oil and an emulsifier is added so that the formulation may be mixed with water or oil for spraying. ECs are among the most widely used formulations, along with wettable powders. ECs typically contain two to six pounds of active ingredient per gallon. Unlike wettable powders, ECs require very little agitation and are easy to handle.
- **Flowable liquids (F, L or SC)** are made with active ingredients that can not be dissolved completely in water or oil, so

the active ingredient is ground up and suspended in a liquid with other suspending agents. The formulation is then ready to mix with water for application. Flowables are easy to handle, will not clog spray nozzles, and require only moderate agitation. (The abbreviation F is for flowable, L for liquids, and SC for suspended concentrates)

- **Solutions and water soluble concentrates (S or CS)** are liquids in their original state and are fully soluble in water and any other solvent. Solutions that are prepared the right way will not leave unsightly residues or clog spray nozzles.
- **Encapsulated or Microencapsulated pesticides (M or ME)** are a new kind of formulation in which the active ingredient is held in a very small capsule. These capsules are then suspended in a liquid. This formulation of suspended capsules is then mixed with water and maybe applied with a sprayer. Encapsulated pesticides are safe and easy to use, but may pose a threat to bees when they carry the capsules back to their hive.
- **Wettable Powders (WP or W)** are dry and powdery. They appear similar to a dust but contain additional wetting and dispersing agents so that water may be added for maximum effectiveness. Wettable powders are also more highly concentrated than dusts to contain more active ingredient. Wettable powder formulations do not form a true solution when water is added, so frequent agitation of the spray tank is required to keep the formulation in suspension.
- **Soluble Powders (SP or S)** are dry formulations similar to wettable powders, but the difference is that when added to water a soluble powder will dissolve completely and form a genuine solution (whereas a wettable powder does not). Some agitation may be required to dissolve the soluble powder initially, but once a solution, agitation is not needed. The percentage of active ingredient in a soluble powder is high compared to ECs and WPs, and there are not currently many SP formulations available.
- **Dry Flowables (DF) or Water-Dispersible Granules (WDG)** are very similar to granules in appearance, but behave in the same way as wettable powders. Dry flowables have several advantages over WPs because of their shape: they can be easily "poured" and measured just like liquid, and are safer to use because very little dust is released into the air when they are mixed and measured. Dry flowables contain very high percentages of active ingredient.
- **Baits (B)** are food-like substances mixed with a pesticide specifically designed to attract and be eaten by insects or other pests and eventually poison them to death. Poisonous baits are commonly used for [rodent control](#), including mice and rats. However, baits are also used to control [roaches](#), [ants](#), [flies](#), and other insects. Bait formulations can be used indoors or outdoors. When compared to ECs or other formulations, the percentage of active ingredient in a bait is low.

Combining Different Pesticide Formulations

Sometimes two different pesticide formulations are combined to create a more effective application. However, not all pesticides can be combined safely. **Before combining various formulations, always consult the label or a pest control professional to find out whether the two formulations are compatible. The mixing of two incompatible pesticide formulations may be fatal.** Incompatibility can be either chemical or physical.

These incompatibilities should be clearly indicated on the product label, however, it is still a good idea to contact a professional if you have any questions.