



Organic vs. Conventional (Synthetic) Pesticides: Advantages and Disadvantages

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Introduction

As part of an Integrated Pest Management (IPM) strategy, choosing a pesticide to control a pest (whether it is a weed, plant pathogen, insect, or vertebrate pest) may be the most appropriate option. When using pesticides, always choose a product that will solve your problem, yet pose the fewest risks to your health, and the health of non-target species and the environment.

In recent years, organic pesticides have become a popular alternative to conventional (aka, synthetic) pesticides. However, there is often confusion surrounding the terms “organic” and “synthetic,” and more confusion about their safety and efficacy. This factsheet attempts to clarify some of the information surrounding organic and synthetic pesticides. Knowing their similarities and differences will prepare you to choose the best management solution for your pest problem.

Know the Difference

Organic pesticides are generally considered to be pesticides derived from naturally occurring sources such as minerals, plants, or animals. These chemicals are broken down relatively quickly by weather or soil microbes. Examples of organic pesticides include diatomaceous earth (fossilized water microbes), neem oil (a tree oil extract), or pyrethrins (an extract from chrysanthemums).

A broader definition of an organic pesticide, is “a pesticide approved by the USDA for use in organic agriculture.” The USDA makes distinctions about what can be used in organic farming based largely on whether the compound is synthetic or non-synthetic. The USDA defines **synthetic** as “a substance that is formulated or manufactured by a chemical process or by a process that chemically changes a substance extracted from naturally occurring plant, animal, or

mineral sources.” Synthetic pesticides are often referred to as conventional pesticides. Some synthetically produced pesticides meet the criteria for use in organic agriculture. For example, copper sulfate and paracetic acid can be used for plant disease control.

Origin Does Not Dictate Toxicity

Regardless of whether a pesticide is organic or synthetic, it can still be dangerously toxic in certain doses. The Environmental Protection Agency uses signal words to indicate how acutely toxic a pesticide is to humans through different exposure routes (oral, dermal [skin], inhalation, and eye).

DANGER – highly toxic (sometimes labeled as **POISON** with skull and crossbones).

WARNING – moderately toxic.

CAUTION – slightly toxic or nontoxic.

While organic pesticides are typically viewed as safer alternatives to synthetic pesticides, this is not always the case. It is essential that you read the label to determine the toxicity of each pesticide you use. Follow all label directions to protect yourself and the environment.

Some organic pesticides carry the highest toxicity signal word, **DANGER**. For example, lime-sulfur solution, an effective fungicide, carries the **DANGER** signal word. This organic pesticide should be used with extreme caution.

Conversely, simply because a pesticide is synthetic does not mean it is highly toxic. For example, the

fungicide Armada 50 WDG, carries a CAUTION label on the product.

The point to remember is that organic does not mean “safe,” just as synthetic does not mean “dangerous.” Read the label to determine the hazards of each product you use. Choose the pesticide that best meets your needs.

Advantages and Disadvantages of Organic Pesticides

Growers often choose organic pesticides because they are less “persistent” than some synthetic alternatives. This means that organic pesticides typically break down in the environment, leaving no residual activity after a relatively short time. While this can be desirable, it may require that you apply the pesticide more frequently to get the desired control. This can result in a greater total volume of pesticide being applied than if you used a more persistent product.

Organic pesticides, particularly biologicals (e.g., insecticides containing *Bacillus thuringiensis*), may be chosen because they are selective in what pests they control. This is helpful because it can reduce potential harm to non-target species (e.g., pollinators and other beneficial insects). By killing only the target pest(s), you can support populations of beneficial organisms that may help keep overall pest pressure low. However, if multiple pest species are present, selective products may not provide the desired control for all pests.

Because organic pesticides are less persistent and can be more selective than synthetics, applicators often need to know more about the target pest if they want to control it successfully. Accurate pest identification and knowledge of the pest lifecycle is crucial when using organic pesticides.

Proper timing of pesticide applications can be key for effective control. For example, neem oil can be applied to stop some immature insects from feeding, but may have little effect on adult insects.

Organic pesticides may also require special handling to be effective. For example, beneficial nematodes applied as a biopesticide spray must be refrigerated upon receipt and used within two weeks to be effective.

Advantages and Disadvantages of Synthetic Pesticides

Synthetic pesticides are often less expensive than an organic solution for a pest problem. While some synthetic pesticides are relatively short-lived in the environment, many are more persistent than organics. This can lead to longer periods of protection and less frequent and lower volumes of pesticide applied, saving time and money.

Unfortunately, synthetic pesticides that do not breakdown quickly, can cause environmental concerns or have harvest restrictions. However, when label directions are followed, foods grown with synthetic pesticides do not contain harmful residues.

Synthetic pesticides are readily available and have a longer shelf life than most organics. This can relieve the grower of the necessity of relying on time-sensitive purchases and applications of pesticides.

Some synthetics (e.g., pyrethroid insecticides) as well as some organic pesticides, are broad-spectrum and may harm beneficial insects like pollinators, predators, and parasitoids. This can lead to secondary explosions of other pests, making further control measures necessary.

How to Choose

Choosing between organic and synthetic conventional pesticides is rarely straightforward. Both types of pesticides have benefits and limitations. You must weigh these pros and cons to determine which type of pesticide best suits your pest management goals. Understanding this information will also help you to use a product appropriately and with successful results.

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