

Over-the-Counter Pesticides and Alternatives

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Pesticides are useful to society because of their ability to kill potential disease-causing organisms and control insects, weeds, and other pests. Conversely, most pesticides also create some risk of harm to humans, animals, or the environment because they are designed to kill or otherwise adversely affect living organisms. Just because a pesticide is considered organic or "natural", does not mean that it is safe. All pesticides should be treated with care and used judiciously.



Pesticides Defined

A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. Pests can be insects, mice and other animals, weeds, fungi, or microorganisms like bacteria and viruses. Under United States law, a pesticide is also any substance or mixture of substances intended for use as a plant growth regulator, defoliant, or desiccant.

Integrated Pest Management (IPM)

IPM is a multidisciplinary approach to coping with pest problems. IPM uses chemical, cultural, biological, and mechanical methods to manage pests below economic or other predefined thresholds. A sound understanding of host biology, environmental effects on hosts and pests, and benefits and costs of control alternatives are important components of IPM. In the home garden or landscape, it also implies tolerance of some pest damage and success IPM relies on using multiple pest control strategies.

The steps followed in an IPM approach are: (1) identification the pest species; (2) understanding the biology of the pest (life cycle, feeding habits, natural enemies, etc.); (3) monitor and determine damage thresholds; (4) select and apply the right combination of control strategies to effectively reduce the pest population while causing the least harm to yourself, others, non-target organisms, and the environment; (5) monitor and evaluate to determine pest control effectiveness.

Pesticide Labels

The pesticide label provides valuable information about the proper handling, use (to include rates), potential risks a pesticide may pose, and instructions on how to minimize or avoid those risks. By reading the label you can also learn how to possibly achieve better control using less pesticide thereby reducing costs. Every pesticide applicator has the responsibility to read and follow the label information so no harm will result from misuse or mishandling of the pesticide.

Before you purchase any pesticide, you should consider the following:

- What are the target pests and will the pesticide give adequate control?
- Are there alternative methods of pest control available?
- Can the pesticide be applied safely and legally under the conditions that you will apply the product?
- What are the necessary application and safety equipment?
- How much pesticide is needed for the application? You should buy only what you need.
- Could pesticides pose problems for children, pets, non-target plants, insect and animals in the area?
- What is the active ingredient in the pesticide?

You should always compare different pesticide labels, because several different products may control the same pest. A comparison of the labels and product prices will help you select the product that controls the pest and is less toxic and/or less expensive.

Material Safety Data Sheets (MSDSs)

Specific information about pesticide toxicity to humans and other non-target organisms can be found on the product's MSDS. Specifically, the MSDS contains first aid measures, how to clean up a spill, storage, personal protection, physical and chemical properties, reactivity with other compounds, toxicological information (including LD₅₀), ecological information, disposal considerations, and other information.

Manufacturers must create an MSDS for each pesticide they sell. MSDSs are usually available online and should also be available at the place of purchase. I recommend reading the MSDS for any product you use.

Pesticide Toxicity

LD₅₀ (Lethal Dose₅₀) is the amount of a substance that, when administered by a defined route of entry (e.g. oral or dermal) over a specified period of time, is expected to cause the death of 50 per cent of a defined animal population. The units of LD₅₀ are parts per million (ppm) or milligrams/kilogram. A quicker and less technical way to indicate pesticide toxicity is through the *signal word*. The words CAUTION, WARNING, and DANGER, POISON are used to quickly define a pesticide's relative toxicity (see Table 1).

Table 1. Relative comparison of pesticide toxicity using signal words, oral LD₅₀, and probable adult human dose.

Toxicity Category	Signal Words	Oral LD₅₀	Probable Lethal Adult Human Dose
Highly Toxic	DANGER, POISON with skull and crossbones	0 to 50	a few drops to 1 teaspoon
Moderately Toxic	WARNING	50 to 500	1 to 2 teaspoons
Slightly Toxic	CAUTION	500 to 5,000	1 ounce to 1 pint (or pound)
Almost Non - Toxic	CAUTION	5,000 to 35,000	1 ounce to 1 pint (or pound)

Food Quality Protection Act

In July 1996, Congress passed the Food Quality Protection Act (FQPA) of 1996 (Public Law 104-170) and the President signed the legislation on August 3. This Act amends the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food, Drug, and Cosmetic Act (FFDCA) in ways that change the regulation of pesticides in this country.

To date, the FQPA has affected gardeners by eliminating the pesticides chlorpyrifos (Dursban and Lorsban) and diazinon from home and garden use. Other pesticides commonly used by home gardeners are likely to be eliminated in the future. These may include malathion, acephate (Orthene), dimethoate, carbaryl (Sevin), chlorothalonil, and many others. This will create a need for new products and pest control alternatives.

Before Using Pesticides

Always read the label: before mixing, before applying, before cleanup, and before disposal. Correct pest identification is critical because label instructions may vary for control of different pest species with the same product. Some plant species can be adversely affected by certain pesticides. Other pesticides are temperature sensitive and can volatilize: moving with the breeze and affecting areas a great distance from where they were applied. These are all good reasons to read the label completely.

Garden insecticides have different effect on a given insect family or species. This is largely dependent on feeding behaviors, reproductive potential, host plant biology, and many other factors. Chewing insects are most susceptible to insecticides that act as stomach poisons. Piercing and sucking insects are often controlled with contact and/or systemic insecticides. You should try to choose an insecticide that has the greatest effect on the target pest and little or no effect on beneficial and benign insects.

Herbicides can be selective or non-selective: affecting broadleaf and not grasses or visa versa. In addition, herbicides can kill plants through direct contact or be translocated within the plant to kill them systemically. Herbicides may also have pre-emergent (before seed germination) or post-emergent activity. Finally, some herbicides are soil sterilants that prevent plant growth altogether. These are not recommended for residential use.

Fungicides can be very expensive, especially the new formulations. Very few of the newer products are broad spectrum. Again, correct identification is critical.

Rodenticides and molluskicides are often poison-laced baits. These products should be used carefully to avoid harm or death to non-target organisms. Correct bait placement or the use of bait stations is critical.

Pesticides Available

Garden centers often have a wide range of pesticide products available. Some hardware stores and grocery stores also sell garden as well as household pesticides. Consumers are also asking for natural or organic alternatives to synthetic pesticides. As stated above, I encourage all consumers to compare products by looking at active ingredients. Tables 2 through 5 contain some pesticides that I found on the shelves in September 2003. Table 6 contains pesticide resources on the web.

Table 2. Conventional insecticides/miticides available in September 2003.

Active Ingredient(s)	Common Name(s)	Signal Word	Uses
acephate	Orthene	Caution	Systemic insecticide for ornamentals
carbaryl	Sevin	Caution	Stomach poison for chewing insects
captan, malathion	Fruit Tree Spray	Danger	Fungicide/contact insecticide mix
cyfluthrin	Lawn and Garden Multi-Insect Killer	Caution	Wide range insecticide with contact and stomach poison properties
deltamethrin	Many Purpose Dust, Delta Dust	Caution	Synthetic pyrethroid for many insects
diazinon	Bug Blaster (many others)	Caution	Once it is sold out, you will no longer be able to buy it
dicotol	Kelthane	Caution	Miticide
esfenvalerate	Bug-B-Gon, Conquer	Warning	Synthetic pyrethroid for many insects
halofenozide	Kill-a-grub	Caution	Replacement for diazinon in turf
imidicloprid	Advanced Lawn Grub Control, Tree and Shrub Insect Control, Merit	Caution	Replacement for diazinon in turf, systemic insecticide for non-edible plants
malathion	Malacide	Caution	Traditional contact insecticide
spinosad	Borer, Bagworm, and Tent Caterpillar Spray	Caution	"New" chemistry to replace malathion, less toxic to non-targets

Table 3. Least toxic insecticides available in September 2003.

Active Ingredient(s)	Common Name(s)	Signal Word	Uses
azadirachtin	Neem Oil, Fruit, Nut, and Vegetable Spray	Caution	Insecticide (contact and growth regulator), miticide, and fungicide
Bacillus thuringiensis (Bt)	Thuricide, Dipel	Caution	Stomach poison to larval stages of many insect depending on variety
Bacillus popilliae	Milky Spore Kills, Doom	Caution	Japanese beetle grub control for lawns
Nosema locustae	Nolo Bait	Caution	Grasshopper bait that contains a protozoan parasite
petroleum oil	Scalecide, Oil Spray, Supreme Oil, Horticultural Oil	Caution	Scales, over wintering mite eggs, aphids
potassium salt of fatty acids	Insect Killing Soap	Warning	Controls a wide range of insects by contact
pyrethrin	Yard and Garden Insect Killer	Caution	Controls a wide range of insects
rotenone	Garden Dust, Fruit Tree Spray	Caution	Controls a wide range of insects, harmful to fish
diatomaceous earth	Permaguard	Caution	Makes a barrier and desiccates insect that contact it

Table 4. Fungicides available in September 2003.

Active Ingredient(s)	Common Name(s)	Signal Word	Uses
chlorothalonil	Liquid Fungicide, Daconil	Danger	Broadspectrum fungicide
copper hydroxide	Black Spot	Caution	Leaf spots, powdery mildew, downy mildew
calcium polysulfide	Lime Sulfur	Danger	Broadspectrum fungicide
pentachloronitrobenzene	Brown Patch Fungicide	Caution	Fusarium and Rhizoctonia in turf
sulfur	Garden Fungicide	Caution	Broadspectrum fungicide

Table 5. Herbicides available in September 2003.

Active Ingredient(s)	Common Name(s)	Signal Word	Uses
2,4-D, Dicamba	Weed Out	Danger	Selective broadleaf killer
acetic acid	Burn Out	Warning	Contact herbicide
fluazifop	Over-the-Top Grass Killer	Caution	Selective grass killer
glufosinate	Finale	Caution	Selective grass killer
glyphosate	Roundup, Killzall, others	Caution	Systemic (translocated) herbicide
MSMA	Crabgrass, Nutgrass, and Dallisgrass Killer	Caution	Selective grass/sedge killer
oryzalin	Surflan, Weed Stopper	Caution	Pre-emergent herbicide
pelargonic acid	Scythe	Warning	Contact herbicide
sethoxydim	Poast, Grass Getter	Warning	Selective grass killer
trichlopyr	Brush Killer/Stump Killer	Caution	Kills stumps
trifluralin	Treflan, Weed and Grass Stopper	Caution	Pre-emergent herbicide

Table 6. Web resources for pesticide information.

<p><u>Pesticide Label Information on the Web</u> Crop Protection Reference (agricultural labels and MSDSs) http://www.greenbook.net/ Blue Book (turf and ornamental labels and MSDSs) http://www.bluebooktor.com/ Pesticide Labels and MSDS – Crop Data Management Systems Inc. http://www.cdms.net/</p>	<p><u>University-based Pesticide Information on the Web</u> Oregon State University http://ace.orst.edu/info/nptn/gen.htm University of Nebraska-Lincoln http://pested.unl.edu/ <u>Alternatives to Pesticides</u> Northwest Coalition for Alternatives to Pesticides http://www.pesticide.org</p>
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Pesticide Alternatives

Whether or not you use pesticides, practitioners of IPM must use other alternatives. For insect pests, alternatives may include using: predators and/or parasites, exclusion, deterrents, traps, tanglefoot, repellents, mechanical control, barriers, compost tea, heat treatment, or microwave treatment. For diseases, alternatives include: resistant plants, antitranspirants, baking soda, soil solarization, and introduction of competing organisms. For weed control, alternatives include: mowing, soil solarization, black plastic, mulch, planting competing vegetation, grazing, predators and/or parasites, and corn gluten meal. Organic gardening suppliers can provide you with many products and ideas.

Conclusion

As old pesticides are phased out, newer formulations will take their place. These will likely be safer for the environment and targeted at specific pests, but they can also be more expensive. Local suppliers will also begin to stock a wider assortment of least toxic pesticides. Keeping plants healthy and vigorous can also lead to better pest resistance. Minimize the transport of new pests into your garden by using native soil and composting materials on site. Use compost tea to encourage beneficial microbial populations. Finally, learn to tolerate some pests and small amounts of plant damage.