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Pesticides are substances that kill or physiologically inhibit pests, be they insects, weeds, vertebrates such as rats, mice and certain birds, disease-causing organisms, molds or other living "pests". Consequently, pesticides include a large array of chemical types that exhibit many different biological effects (modes of action). By their nature, pesticides are designed to negatively impact various life processes. How toxic a pesticide is to humans is a complicated determination that must include several immediate "acute effects" and multiple long-term "chronic effects". Due to the difficulty of actually identifying and quantifying these effects, it is a good idea to limit exposure to pesticides of all kinds. There are 3 main ways to limit exposure:

1. Use alternatives to pesticides
2. If you use pesticides, choose less toxic products
3. Always read the entire label and follow all instructions exactly (see the Pesticide Education Program)

Less toxic strategies include:

- Preventing pests and making the home harder to invade and less desirable for indoor pests by caulking cracks & holes, removing water sources (leaky faucets, etc), and keeping surfaces clean
- Selecting the best plant for the best location and maintaining plant health
- Tolerating low levels of pest infestation instead of treating every small nuisance
- Using the least toxic product that will only kill the targeted pest

How to choose a least toxic product:

1. Packaging and formulation:

- Choose products that are packaged in a child-friendly way. Ant baits are a good example because the poison is enclosed. Be sure products don't look like food or drink and never repackage a pesticide--kids can't tell the difference if it's in an unmarked bottle.
- Limit your exposure by avoiding products in liquid, concentrate and aerosol form. These linger on surfaces and air and might easily be absorbed through the skin or lungs.

2. Active ingredient: Available pesticides come with many different active ingredients (poison component). Read the label and look at active ingredients listed before you buy a product! You can look up pesticide active ingredients on the web to learn their toxicity.

Quick Links:

- ▶ Pesticide-Free Solutions (NCAP)
- ▶ Central San Less Toxic Home & Garden
- ▶ Less Harmful Pesticides
- ▶ How to Treat Common Garden Pests
- ▶ Beneficial Insects - the "Good" Bugs
- ▶ Insecticidal Soaps
- ▶ Horticultural Oils
- ▶ PAN Pesticide Product Database

Least Toxic Pest Control

(adapted from Chesapeake Bay Foundation)

This is a list of some of the product types that are considered less toxic for home and garden

pests, however, this is not a complete list and specific brand name product endorsement is not intended. Some of these may not be available in your store. Ask your retailer about adding additional less toxic products to their pest control product selection. With increased consumer interest, new pest control products that trap or repel pests or use environmentally benign active ingredients are becoming available. Saferbrand.com is a supplier of many different least toxic products

Traps, Barriers, and Other Physical Controls

Pest	Control
Ants	Sticky barriers
Cockroaches	Sticky trap, or sticky trap with pheromone attractant
Fleas	Flea comb for use on pets, place fleas in soapy water Flea traps Steam clean carpets Strong vacuum (seal vacuum bags and put in freezer before disposing)
Flying pests	Yellow sticky trap
General garden pest control	Floating row cover
Kitchen & pantry pests	Pantry light trap
Slugs & snails	Copper barrier, copper flashing Beer/yeast trap - Place a low container on the ground and fill with beer or yeast/water solution. Slugs go in to drink and then drown. Must be emptied each morning. Board - place a board on the ground in the garden, flip over every morning and remove the slugs that have collected there overnight
Weeds	Asphalt crack filler
Yellow jackets	Yellow jacket trap

Less Toxic Products

Target Pest	Product Type	Active Ingredient(s)	Brand name examples
Aphids, scales, mites, leafhoppers, hemlock woolly adelgid, mealybugs and powdery mildew	Horticultural oil (dormant oil for winter season, summer oils for growing season)	Highly refined paraffinic oil or petroleum oil	SunSpray
Aphids, ants, scales, mites, mealybugs, small caterpillars, and other soft-bodied insects, weeds	Insecticidal soap	Potassium salts of fatty acids	Safer's Soap, Garden Safe
Aphids, whiteflies, mites, extract of black spot, powdery mildew, rust, anthracnose, grubs and more	Neem oil	Clarified hydrophobic neem oil	Safer BioNeem, Azatin, Greenlight brand
Aphids, spider mites,	Hot pepper insect	Capsaicin	Hot Pepper Wax

thrips, whiteflies and others	repellent		Insect Repellent
Ants	1.Arsenic ant baits 2.Sulfluramid ant baits	1.Arsenic trioxide 2.N-ethyl perflourooctanesulfonamide	1.Grants Kills Ants 2.Hot Shot Maxattrax Ant Bait
Ants & Cockroaches	1.Abamectin ant & roach baits 2.Borax 3.Fipronil ant and roach baits 4.Hydramethylnon baits	1.Abamectin 2.Sodium tetrahydrate decahydrate 3.Fipronil 4.Hydramethylnon	1.Advance Bait Station, Avert brand, Raid Max House & Yard Roach Bait 3. Combat Quick Kill Formula 4. Combat
Ants, Cockroaches & Fleas	1.Citrus oil spray 2.Diatomaceous earth, Desiccating dust, Insecticidal dust	1.d-Limonene 2.Silicon dioxide	1.Orange Guard, Concern Citrus Home Pest Control 2.Diatomaceous earth
Ants, cockroaches, fleas, silverfish, termites	Boric acid/ borate products	Orthoboric acid	Boric acid Borax laundry detergent
Fleas & ticks (on pets)	1.Fipronil topical or spray 2.Insect growth regulator topical 3.Lufenuron pills	1.Fipronil 2.Methoprene 3.Lefenuron	1.Frontline 2.Frontline Plus (contains both fipronil & methoprene) 3.Program
Fleas (indoors)	1.Insect growth regulator carpet spray (breaks life cycle, larva can't mature) 2.Boric acid-based carpet treatments (best used with steam cleaner)	1.Methoprene 2.Borate	1.Precor 2.Fleanix
Mosquitos, aphids, ants, leafhoppers, thrips, whiteflies	Garlic (Concentrated garlic 'clips' to attach to plants OR Garlic oil sprays)	Garlic	Victor Mosquito Barrier Garlic Barrier Insect Repellent
Mosquitos (kills larvae in standing water for use in ponds, large puddles)	Bt mosquito dunks (Small, doughnut-shaped, floating disks)	Bacillus thuringiensis	Mosquito Dunks (found at home improvement stores)
Powdery mildew, black spot, rust, scab, damping-off virus	Sulfur fungicide	Sulfur	Safer Garden Fungicide, Orthoganics Garden Sulfur

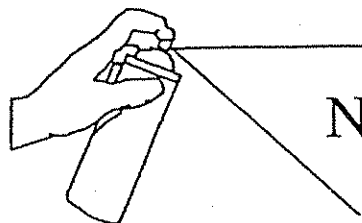
Snails & slugs	1. Snail & slug bait 2. Snail & slug barrier 3. Diatomaceous earth	1. Iron phosphate 2. Coconut oil soap 3. Silicon dioxide	1. Monterey Sluggo, Escar-go
Weeds	1. Herbicidal (insecticidal) soap 2. Corn gluten meal 3. Vinegar spray 4. Pelargonic acid herbicide	1. Potassium salts of fatty acids 2. Corn gluten 3. 20% Vinegar, put in spray bottle 4. Pelargonic acid	1. Safer Superfast Weed & Grass Killer 2. Concern Weed Prevention Plus, Supressa 3. N/A 4. Quick Weed Killer
White grubs	Imidacloprid Also see Neem above	Imidacloprid	
Yellow jackets and other flying insects	Mint oil	Mint oil, sodium lauryl sulfate	Victor Poison-Free Wasp & Hornet Killer Spray

What is IPM? | Agricultural IPM | Home & Garden IPM | Parks & Forest IPM | School IPM | Green Industry | Community IPM | Public Health IPM | Pesticides & Alternatives

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Homeowner Pesticides: How to choose?



Not all pesticides are created equal!
Did you know?

- **Homeowners use more pesticides, on a pound per acre basis, than farmers do.**
Ask yourself - is it really necessary to use a pesticide, or is there another way to control the pest?
- **Every pesticide has one word on the label that tells you about how toxic it is.**
Look on the package front for the "Signal Words":
Caution (least toxic), Warning or Danger (most toxic).
- **Risk of pesticides = Exposure x Toxicity.**
Reduce risks of pesticides to yourself and others by choosing products least likely to get on/in you, wear protective gear and choose least toxic products.
- **If some is good, more is not better!**
Use pesticides at recommended rates, not double or triple. This only increases your chances of exposure, increases contamination of the environment and helps pests become resistant to pesticides.

(over please)

- **Be a discriminating consumer when buying pesticide products. Examples:**

How a chemical is "packaged" can make a difference in toxicity.

The **same chemical** in liquid concentrate, dust, ready-mixed or covered baits will have differing toxicities. This is because the Active Ingredient (poison) is in different concentrations and the type of formulation determines the likelihood of pesticides being breathed or contacting the skin.

Understanding pest biology can tell you about which product may be the most effective.

Spraying worker ants in your kitchen contaminates the kitchen **and** is not effective because the source of the ants has not been eliminated. A product in covered bait formulation that will be carried back to the ant nest and kill the queen is both safer and more effective.

Read labels carefully and decide if you want to use the product in question. Note:

- specific pests controlled (is that what you have?)
- special precautions about toxicity to animals, bees?
- will you **realistically** be able to use the product and not breathe it or get it on you?

For more information about pesticides and IPM, contact <http://ace.ace.orst.edu/info/extoxnet>;
PSU Pesticide Education at www.pested.psu.edu; and the PA IPM Program at
<http://paipm.cas.psu.edu/> or (814) 865-1896

Table 1. Toxicity Categories for Labeling Pesticides

Category	Signal Word Label	LD50 for 150-lb. human Oral LD50 (mg/kg)	Dermal LD50 (mg/kg)	Oral LD50 in Common Measuring Units
I	Danger <i>Danger - Poison</i>	0-50	0-200	Taste-teaspoon
II	Warning	50-500	200-2000	Tsp-tablespoon
III	Caution	500-5000	2000-20,000	1 oz.-pint
IV	None	Over 5,000	Over 20,000	Over a pint

* LD50 is the amount of pesticide, measured in milligrams per kilogram of body weight, that will kill one half of the exposed population.

LD = Lethal Dose

Common name	Trade name	Chemical Class	Oral LD50* mg/kg Rat	Dermal LD50* mg/kg Rabbit	Manufacturer
Insecticides (to control insects)					
acephate†	Orthene	OP	700-980	>10,250	Valent
Bacillus popilliae	Doom, Japademic	M	L	L	Fairfax Biological
Bacillus thuringiensis var. kurstaki	Bt, Dipel, Thuricide, Bactur, Sok-Bt, MVP, Caterpillar Attack	M	L	L	numerous, including Novo- Nordisk, Abbott, Insects Limited, Bozeman, Ciba-Geigy
Bacillus thuringiensis var. israelensis	Bti, Biological Mosquito Control, Mosquito Attack, Bactimos, Vectobac	M	L	L	Summit, Novo-Nordisk, Sandoz, Bozeman
Bacillus thuringiensis var. san diego	M-One, M-Trak, Novodor	M	L	L	Sandoz, Mycogen, Ringer
Bacillus thuringiensis H-14	Gnatrol	M	L	L	Abbott
Baygon—see propoxur					
Boric acid	Boric acid, Borid, Blue Diamond Paste, Drax, Perma-Dust	boron cmpd	3,500	10,000	numerous: Organic Control, Enforcer, Waterbury, Whitmore, Copper Brite, Perma Proof, Peaceful Valley
carbaryl	Sevin, Apicide	CAR	246-283	>2,000	Rhone-Poulenc, Drexel, Mystic
chlorpyrifos	Dursban	OP	96-270	2,000	Whitmore, DowElanco
diazinon	Diazinon, Knox out‡	OP	300-400	3,600	Ciba-Geigy, Whitmire, Drexel
dimethoate	Cygon	OP	235	400 (rat)	Drexel
disulfoton	Di-Syston	OP	2	10 (rat)	Bayer, Miles
hydromethylon	Combat, Maxforce	amidino- hydrazone	>5,000	>2,000	American Cyanamid
hydroprene	Gentrol	IGR	>34,000	>2,000	Zoecon
insecticidal soap	insecticidal soap, Aphid-Mite Attack, Safer Insecticidal Soap	MISC	16,500		Mycogen, Ringer
isophenphos	Oftanol	OP	28-38	162-315	Bayer, Miles
malathion	Malathion	OP	5,500	>2,000	American Cyanamid
methoprene	Precor, Altosid, Pharorid	IGR	34,600	3,000	Sandoz, Zoecon
methoxychlor	Methoxychlor, Mariate	CH	5,000	>6,000	Drexel, Kincaid
oils, petroleum	Horticultural spray oil, Volck, Dormant oil	Refined petroleum distillate	15,000	>5,000	
permethrin	Permethrin, Dagnet, Permanone, Flee	SYP	430-4,000	>2,000	FMC, Roussel Uclaf, Zeneca
propoxur	Baygon	CAR	50	>500	Miles
pyrethrum	Exciter, Pyrenone, Pyrethrins, Safer	BOT	1,500	>1,800 (rat)	Prentiss, Roussel Uclaf, Whitmire, Fairfield American Safer
resmethrin	Resmethrin	SYP	2,500	3,000	Velsicol
rotenone	Rotenone, Derris	BOT	132-1,500	>940	Prentiss, Roussel Uclaf
silica gel	Silica Aerogel, Dri-Die	INOR	31,600	2,000	Roussel Uclaf
			<5,000	>5,000 (rat)	numerous

ORTHO

FRESHLY SCENTED
NON-STAINING

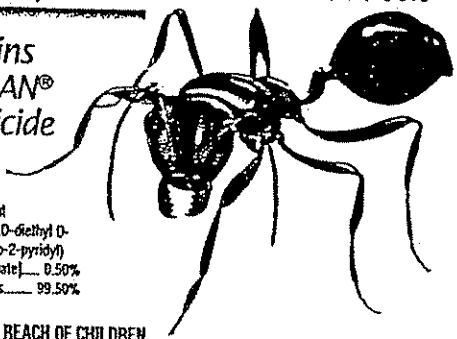
Ant-Stop™ Ant Killer



READY TO USE

Kills Ants, Roaches & Other Listed Pests

Contains
DURSBAN®
Insecticide



Active Ingredient
Chlorpyrifos (0,0-Diethyl O-
(3,5,6-trichloro-2-pyridyl)
phosphorothioate)..... 0.50%
Inert Ingredients..... 99.50%

KEEP OUT OF REACH OF CHILDREN

CAUTION See back panel booklet for additional
precautionary statements.

NET CONTENTS 24 FL OZ (1 PT 8 FL OZ) 709 mL

PULL HERE
TO OPEN
LABEL

ORTHO

Ant-Stop™ Ant Killer

Kills insects on contact.
Non-staining to carpets, rugs,
floors, and baseboards.
For use in homes.
Kills Ants, Roaches & other
listed pests

PRESS TO RESEAL

Peel open for use directions and further information

★ **CAUTION:** Avoid contact with eyes, skin and
clothing. Avoid breathing vapors or spray mist. SEE
ADDITIONAL PRECAUTIONARY STATEMENTS AND
DIRECTIONS INSIDE BOOKLET.

Medical Information call 1-800-454-2333
Product Information call 1-800-225-2883

Manufactured for The SOLARIS Group of Monsanto Company
P.O. Box 5008 San Ramon CA 94583-0808

Form S670-A
Product 5466
EPA Reg. No. 239-2490
EPA Est. 239-IA-3,
S8996-MO-1*
Superscript is first letter
of lot number
Made in USA



DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ ENTIRE LABEL. USE STRICTLY IN ACCORDANCE WITH LABEL PRECAUTIONARY STATEMENTS AND DIRECTIONS.

HOW TO USE

Shake before using. Adjust spray nozzle to give a fine spray or a stream for crack and crevice treatment. Hold container about 12 inches from surface being sprayed. Spray until slightly wet. Do not spray on plants. Wash dishes and food handling utensils with soap and water if accidentally sprayed.

Do not allow children or pets to contact treated surfaces until spray has dried. Remove pets and cover fish aquaria before spraying.

SUGGESTION

To improve control of Roaches, Spiders, Silverfish, Ants and Crickets, use **HI-POWER®** Indoor Insect Fogger after treating with this product. The total release program will flush insects out of hiding. Follow all precautions and directions on both product labels.

INSECTS	HOW TO USE
ANTS	Apply directly to ants and trails.
ROACHES CLOVER MITES CRICKETS FIREBRATS SILVERFISH SPIDERS (including Black Widow Spiders) SCORPIONS	Apply under and behind sinks, stoves, refrigerators, cabinets, around plumbing, along baseboards, and other areas where insects hide. Repeat treatment as needed.

STORAGE

Rotate nozzle to closed position. Keep pesticide in original container. Do not put concentrate or dilute into food or drink containers. Avoid contamination of feed and foodstuffs. Store in a cool, dry place, preferably in a locked storage area.

DISPOSAL

Do not reuse empty container. Wrap and put in trash.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS & DOMESTIC ANIMALS

CAUTION
Avoid contact with eyes, skin and clothing. Avoid breathing vapors or spray mist. Keep away from food, feedstuffs and domestic water supplies. Wash thoroughly after handling. Get to Physician: Emergency Information call 1-800-454-2333. Chlorpyrifos is a cholinesterase inhibitor. Acetaminophen is included. It may be also substituted and may be used in conjunction with streptomycin but should not be used alone.

PHYSICAL OR CHEMICAL HAZARDS

Do not store near heat or open flame. Do not store below 32° F. Do not apply sprays of this product in conduits, motor housing, junction and switch boxes or other electrical equipment because of possible shock hazard.

NOTICE

Buyer assumes all responsibility for safety and use not in accordance with directions.

Medical Information call 1-800-454-2333
Product Information call 1-800-225-2883

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Manufactured for The SOLARIS Group of Monsanto Company
P.O. Box 5008 San Ramon CA 94583-0808
Form S670-A / Product 5466 / EPA Reg. No. 239-2490
Epa Est. 239-IA-3, S8996-MO-1*
Superscript is first letter of lot number
Made in USA

Safety Source for Pest Management

BEYOND PESTICIDES/NCAMP FACT SHEET TOXIC SERVICES MATERIALS

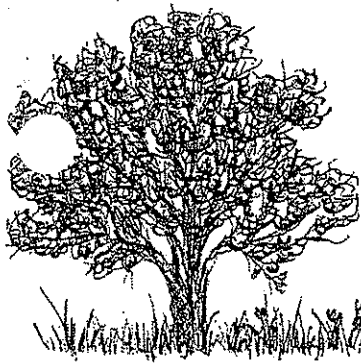
WHAT INTEGRATED PEST MANAGEMENT?	FIND A SERVICE PROVIDER	TALKING TO SERVICE PROVIDERS	BEYOND PESTICIDES HOME PAGE	WELCOME TO THE SAFETY SOURCE
PESTICIDE TICKETS	TOXICITY OF COMMONLY USED PESTICIDES	NON-TOXIC PEST MANAGEMENT	LEAST TOXIC PESTICIDES	TOXIC PESTICIDES

Toxicity of Commonly Used Pesticides

Health Effects of Toxic Pesticides

A Beyond Pesticides/NCAMP Fact Sheet on the Health Effects of Toxic Pesticides Commonly Used in Lawn Care and Structural Pest Control

Pesticide	Cancer	Reproductive Effects	Neurotoxicity	Kidney / Liver Damage	Sensitizer / Irritant	Birth Defects
Insecticide						
Acephate	C	X	X		X	
Allethrin			X	X	X	
Avermectin		X	X		X	X
Bendiocarb			X		X	
Bifenthrin	C		X	X	X	
Bromacil	C			X	X	X
Carbaryl	C	X	X	X	X	X
Chlorpyrifos		X	X	X	X	
Cyfluthrin		X	X	X	X	
Cypermethrin	C		X		X	
Deltamethrin			X		X	
Diazinon		X	X	X	X	
Dichlorvos	C, 2B		X	X	X	
Diflubenzuron		X			X	
Fenoxycarb	B2			X	X	
Fenvalerate			X		X	
Fipronil	C	X	X	X	X	
Hexaflumuron				X	X	X
Hydramethylnon	C	X			X	
Hydroprone	D					X
Imidacloprid		X				
Isophenfos			X		X	
Lamda	D		X			
Cyhalothrin				X		
Methoprene					X	
Petroleum Oils						
Phenothrin						
Piperonyl butoxide (PBO, a synergist)	C	X	X	X	X	
Propetamphos			X			
Propoxur	B2	X	X	X		X
Pyrethrin		X	X	X	X	



LAWN PESTICIDES

An Unacceptable Risk



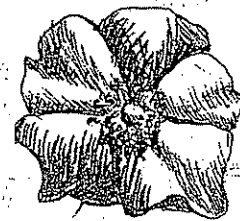
Each year, American homeowners use approximately 70 million pounds of pesticides to maintain their lawns, mostly for aesthetic purposes. Yet as the use of these chemicals continues to grow, researchers continue to uncover the links between pesticide exposures and serious human health problems, including several types of cancer, neurological and reproductive disorders and birth defects.

Regulations concerning the marketing and use of these potentially harmful products do little to protect consumers. Every pesticide on the market carries an EPA registration number, but this only means that the active ingredients are listed and instructions for its use are given, including warnings of acute health effects. Warnings about potential long-term or chronic health effects from the active ingredients are not required.

“Pesticides pose health risks, even when used and applied in full compliance with manufacturers’ recommendations and legal requirements.”



Eliot Spitzer
New York State Attorney General



Some Common Lawn Pest Problems and Solutions

Problem	Chemical Solutions	Safe, Alternative Solutions
White grubs, sod webworms, chinch bugs, etc.	insecticide application (ex: Merit, Dylox, Talstar, Acephate)	apply beneficial nematodes, watering lawn before and after application
Japanese beetle grubs	insecticide application (ex: Merit, Orthene, Dylox)	apply Milky Spore powder-can provide years of protection
Weeds	herbicide application (ex: Trimec, Trimec Super, Balan, Tupetsan, 2,4-D products)	using a spreader, apply a corn gluten product each spring to control crab grass and dandelions pull weeds by hand for large patches in lawn and fill bare spots with compost and grass seed
Fungal turf diseases	fungicide application (Ex: Daconil, Bayleton, Banner, Compass)	Spread compost or “compost tea” on affected areas

Pesticides and Children

Children are especially vulnerable to environmental toxins, including pesticides. Their normal activities include playing on floors and on grass where pesticides accumulate, and they routinely put unwashed hands or other objects in their mouths. In addition, their nervous, respiratory, reproductive and immune systems are not yet fully developed, and as they take in more toxins pound for pound than do adults, these crucial developmental processes may be adversely affected.

Dr. Philip Landrigan, pediatrician and Director of the Center for Children’s Health and the Environment, Mount Sinai School of Medicine says *“Every day of every week we are continuing in this country to expose children to chemicals whose toxicity is simply not known. As a pediatrician, I urge parents to think carefully about the choices they make, especially about pesticides.”*

Chemical Close Up

2,4-D is a toxic pesticide found in many consumer “weed and feed” products. Many people don’t realize that 2,4-D was one of two chemicals which made up the widely used defoliant Agent Orange. In addition to the growing evidence of 2,4-D’s potential harm to humans, the National Cancer Institute released a study showing that dogs whose owners treated their lawns with 2,4-D four or more times per year were twice as likely to contract canine lymphoma (cancer).*

2,4-D

For homeowners who want to control crab grass and other weeds, corn gluten is an effective and safe substitute for 2,4-D. Corn gluten is a by-product of corn syrup production and is safe for use around children and animals and has no known adverse health effects.

*Case-Controlled Study of Canine Malignant Lymphoma: Positive Association with Dog Owners Use of 2,4-Dichlorophenoxyacetic Acid Herbicides. Journal of the National Cancer Institute, Vol 83, No. 17 September, 1991

"Each year, we dump tens of millions of pounds of fertilizers and pesticides on our own backyards, thus poisoning birds and wildlife while creating one of the largest sources of pollution runoff in our lakes and streams."

John Flicker, President
National Audubon Society

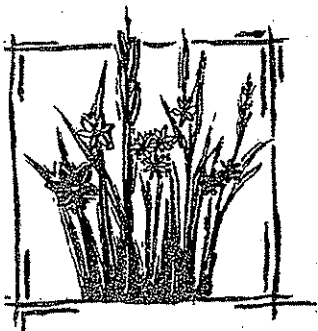


Pesticides and Wildlife

The use of lawn pesticides by homeowners accounts for the majority of wildlife poisonings reported to the EPA each year. Birds are particularly vulnerable, as they feed on the ground and often mistake pesticide granules for food. It is estimated that approximately 7 million wild birds are killed each year due to the aesthetic use of pesticides by homeowners.

Pesticides are also routinely used to control weeds and vegetation along roadsides and borders which are used by wildlife as habitats for nesting and raising their young. When a bird or small mammal is sickened by pesticides, they neglect their young, abandon their nests and become more susceptible to disease and predators.

Wildlife specialists are becoming increasingly alarmed by the presence of pesticides in lakes, rivers and streams which are essential food and water sources for so many species. A recent study by the U.S. Geological Survey (USGS) found at least two pesticides in every stream sample and one or more pesticides in every fish sample. Even minute amounts of the chemicals that make up these pesticides have been shown to have a profound effect on the reproductive viability of aquatic life. The most common pesticides found were those typically used for lawn treatments.



Websites to Visit for Pesticide Info

NCAP

www.pesticide.org

Click on "Publications and Information" and go to desired link

NCAMP/Beyond Pesticides

www.beyondpesticides.org

Click on "Info Services" and select choice from pull-down menu

PANNA

www.pesticideinfo.org

Click on "Open Database" button and enter pesticide name in "Search" box under #2

Audubon at Home

www.audubon.org/bird/at_home/

SUGGESTED READING

The Chemical Free Lawn by Warren Schultz. Rodale Press.

Redesigning the American Lawn - A Search for Environmental Harmony by Borman, Blamori & Geballe. Yale University Press.

Gardener's Guide to Common Sense Pest Control by William Olkowski, Sheila Daar, Helga Olkowski. Taunton Press.

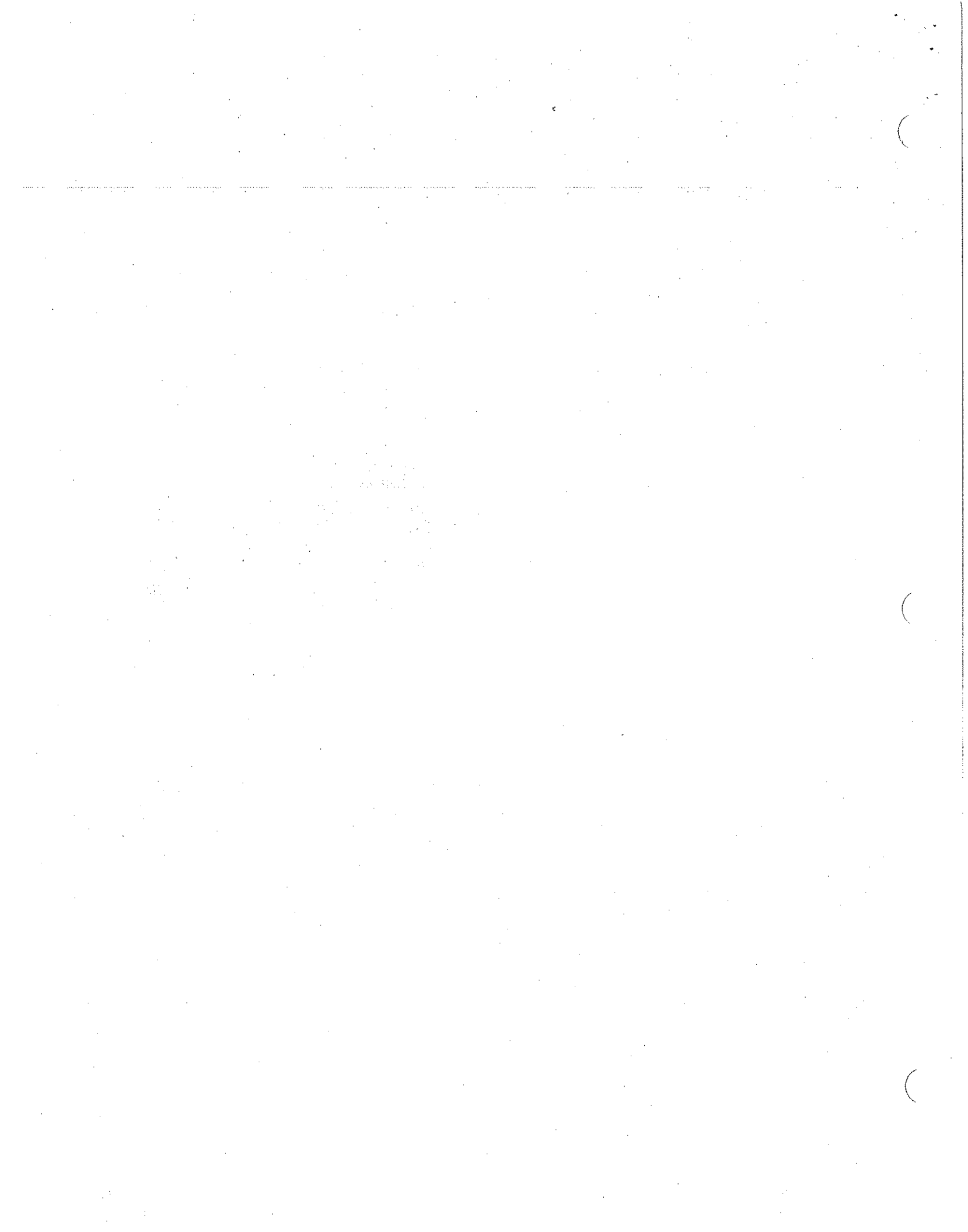
Edaphos: Dynamics of a Natural Soil System and Handbook of Successful Ecological Lawn Care by Paul Sachs. Edaphic Press.

Building a Healthy Lawn: A Safe and Natural Approach by Stuart Franklin. Storey Communications.

Tiny Game Hunting: Environmentally Healthy Ways to Trap and Kill the Pests in Your House and Garden by Hillary Dole Klein, Adrian M. Wenner & Courtlandt Johnson. University of California Press.

For information on safe lawn care and non-toxic alternatives go to
www.grassrootsinfo.org

Supporting organizations include: Audubon • www.audubon.org
CCE (Citizens Campaign for the Environment) • www.citizenscampaign.org • 516-390-7150
CHEC (Children's Health Environmental Coalition) • www.checnet.org • 609-252-1915
NCAMP/Beyond Pesticides • www.beyondpesticides.org • 202-543-5450



Talking It Over



Insect Facts

Hideable Insects The brown-banded cockroach is also called the TV roach because of its habit of hiding in electronic devices.

Share what happened

- What makes an insect a pest?
- How many different kinds of insecticide did you find?

Process what's important

- What are the advantages and disadvantages of using chemical insecticides?
- What safety precautions must be taken when applying insecticides?

Q. Why is it important to follow directions when applying insecticides?

A. _____

Generalize to your life

- How can the consumer best decide which type of insecticide to buy?

Q. How can you decide when an insecticide is the best choice?

A. _____

Apply what you learned

Q. How can you and your community make sure chemical insecticides are safely used in your area?

A. _____

Insecticide Label Information

By law each insecticide label must have the following information.

- Brand name
- Common name
- Chemical name
- Ingredients
- Uses of the pesticide
- Directions for use
- Safety information
- Signal words
- Precautions
- Net contents
- Environmental Protection Agency number
- Establishment number of the company
- Name and address of manufacturer or registrant

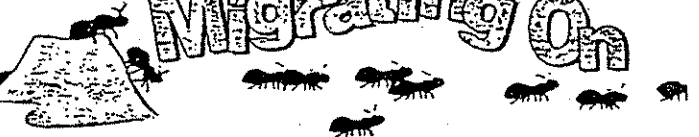
Insecticides Derived from Plants

- Nicotinefrom tobacco plants
- Azadiractin.....from the neem tree
- Pyrethrinfrom chrysanthemum
- Rotenonefrom derris plant
- Sabadillafrom lily plant

Some insects are used to control other insects.



Migrating On



1. Go to your local library and find a reference book about insect-transmitted diseases of humans and of animals. Make a list of the insects and the diseases they transmit.
2. Visit a local pest control firm. Discuss how the company controls pests and how pesticides should be safely used.

LD₅₀ of NaCl to *Gammarus* spp.

By Eric Mitcheltree, Muncy High School, Bloomsburg, PA

Standard Statements: 4.5.10.B- Analyze health benefits and risks associated with integrated pest management.

4.3.10.A- Describe environmental health issues.

Suggested Level: 9-12

Content Objectives: Students will be able to:

1. Describe the meaning of LD₅₀.
2. Graph and calculate the LD₅₀ of salt on a fresh water amphipod.
3. Compare the salt to pesticides and pollutants.

Assessment Strategies:

1. Correct production of graphs and labels
2. Post lab discussion ideas

Background:

We live in a chemical society in which our students expose themselves and others to chemicals on a daily basis. It is important for our students to understand the concept of LD₅₀ when describing toxicity levels of chemicals like pesticides and pollutants. There are several terms the student should understand the meaning of in this activity. First is the term pollutant. A pollutant is any material in an amount which is harmful to the environment or human health. Anything can be considered a pollutant if in high enough concentration. The second term is toxicity. This is the ability of a chemical to cause injury or death to a biological organism. The last is LD₅₀. It stands for lethal dose 50% and is the amount of chemical required to kill 50% of an experimental population. The Environmental Protection Agency uses LD₅₀'s when requiring labels on pesticides. The LD₅₀'s are reflected on the labels by the signal words caution, warning and danger which represent increasing levels of toxicity.

When performing this activity, the teacher may either allow students to pick their own concentrations when making serial dilutions or the teacher may wish to assign concentrations to ensure a wide spectrum of concentrations in the class.

Learning Objectives:

- 1) Learn how graph and calculate and LD₅₀
- 2) Learn that any material can have an LD₅₀ in the correct environment

Materials Needed:

1. Gammarus sp. or similar fresh water organism
2. Saturated solution of salt water
3. Graph paper
4. Deionized water
5. Petri plates
6. Hand lenses or dissection microscopes
7. Graduated cylinders
8. Pipets

Timeline: 90 minutes (two class periods)

Procedure:

Day One

1. Obtain four petri plates and label them as follows: Saturated, Control, A% and B%
2. Fill the petri plate labeled saturated with the saturated salt water solution provided by you teacher.
3. Fill the petri plate labeled control with the deionized water provided by you teacher.
4. Make a serial dilution of the saturated salt water in a graduated cylinder to any percentage you and your partner would like and fill the petri plate labeled A% with it and record the percent concentration below.

A% = _____

5. Repeat step 4 using a different concentration and place the liquid in the petri plate labeled B%.

B% = _____

6. In each petri plate, place 10 *Gammarus* sp. Observe the organisms in each plate and record below and on the board the number of *Gammarus* sp. alive after 20 minutes.

Saturated	%	%	Control

Day Two

1. Obtain class mortality data from the board and graph the data with concentration on the X-axis and number alive on the Y-axis of the graph.
2. From the graph determine the concentration in which 5 *Gammarus* sp. survived the 20-minute exposure. This is the LD₅₀ for salt on this organism.

Post-Lab Analysis Questions

1. List some chemicals in your home which would have an LD₅₀.
2. What are the three signal words on pesticide containers which indicate the pesticides LD₅₀.
3. A pollutant is anything in a concentration high enough to be harmful to the environment or human health. In this example, salt water would be considered a pollutant. In what environment(s) would fresh water be a pollutant?

Related Web Sites:

<http://paipm.cas.psu.edu>

<http://www.epa.gov>

<http://ash.xanthia.com/ld50.html>

