Pesticide Safety

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Pesticide Recommendations - OSU policy

"Oregon State University Extension Service encourages **Sustainable Gardening** practices.

1. Always identify and monitor problems before acting
2. Then consider **cultural** controls
3. Then **physical** controls
4. Then **biological** controls
5. And finally **chemical** controls (always consider the least toxic approach first)

How would you describe this approach to pest management? Integrated

What is one of the most effective ways to avoid the use of pesticides?

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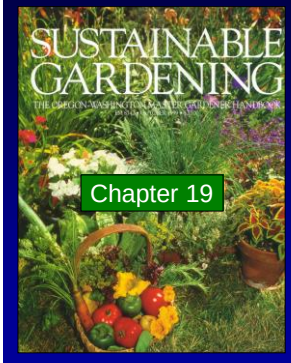

- Types of pesticides
- Pesticide formulations
- Surfactants
- Pesticide labels
- Application equipment
- Calibration
- Applying pesticides
- Storage & disposal
- Pesticide toxicity
- Environmental hazards
- Home vs commercial
- IPM
- Laws & regulations

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Types of pesticides

- Insecticides
- Fungicides
- Herbicides
- Acaricides/Miticides
- Nematicides
- Bactericides
- Rodenticides
- Molluscicides
- Plant Growth Regulators (PGRs)
- Others?

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What is <u>not</u> a pesticide?

- Drugs used to control diseases of humans or animals
  - (U.S. Food and Drug Administration)
- Fertilizers, nutrients, and other substances used to promote plant survival and health
- Biological control agents (except some microorganisms)
  - includes beneficial insects that eat insect pests.)
- Products which do not have to be registered as pesticides, as they contain certain low-risk ingredients:(for a complete list see FIFRA Sec. 152.25 (g))
  - citronella
  - citric acid
  - corn gluten meal
  - garlic and garlic oil
  - mint and mint oil
  - rosemary and rosemary oil
  - thyme and thyme oil
  - zinc metal strips

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Pesticide Formulations

The formulation describes the physical state of a pesticide product. It is comprised of:

- **active ingredients**(s) (ai)
- solvent
- dry carrier
- adjuvant

} "Inert" ingredients

The formulation of a pesticide can have <u>significant implications for safety and effective use</u>

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Pesticide Formulations

Liquids

- ✓Emulsifiable concentrate (EC)
- ✓Solution (S)
- ✓Flowable (F)
- ✓Aerosols

Solids

- ✓Dust (D)
- ✓Pelletized bait
- ✓Flowable (F)
- ✓Granule (G)
- ✓Wettable powder (WP)
- ✓Soluble powder (SP)

Others?
Ready to Use (RTU)

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Match the Formulations

Pesticide Formulations

- **Ec**
- **Solution**
- **Liquid flowable**
- **Aerosol**
- **Dust**
- **Pelletized**
- **Dry flowable**
- **Granule**
- **Wettable powder**

Household products

- **Salt**
- **Cocoa powder & water**
- **Grape nuts**
- **Flour**
- **Talc**
- **Air freshener**
- **Pepto bismol**
- **Corn syrup**
- **Whole milk**

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Pesticide Formulations

Most hazardous → least hazardous

EC → oil solution → water emulsion → water solution → WP/flowable/dry flowable → dust → granular

- All pesticides are hazardous if misused!

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Mode of Action

- **Contact**
  - pesticide must be sprayed directly on the target (weed, disease, insect, etc.).
- **Systemic**
  - pesticide can be translocated throughout the target plant to either protect it (fungicides, insecticides) or kill it (herbicides).
- **Residual**
  - pesticide will persist after application, offering control for a period of time (Casoron, *B. t*).

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Mode of Action

- **Preplant**
  - Prior to planting.
- **Preemergent**
  - Prior to emergence.
- **Postemergent**
  - After emergence (weeds or plants).

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Mode of Action

- **Curatives**
  - Also known as *eradicants*, this type of pesticide can kill target pests if present.
- **Protectants**
  - This type of pesticide protects healthy plant parts from attack by pest organisms.

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Mode of Action

- **Non-selective**
  - provides broad-spectrum control of pest organisms (i.e. Roundup)
- **Selective**
  - targets specific organisms while doing no harm to many other organisms that may be present (i.e. *Bacillus thuringiensis*).

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Pesticide Hazards

Some pesticides are very toxic.

What is the *risk* involved in using them?

Risk = toxicity x exposure

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Pesticide Hazards

Zero exposure = zero risk

High toxicity x good management
= Low risk

Low toxicity x poor management
= High risk hazard

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How is toxicity determined?

- Acute toxicity is usually determined by animal testing.
- **LD_{50} stands for "lethal dose fifty."**
  - This is the dose that killed half of the animals in a dose-response study.
  - The smaller this number, the more poisonous the pesticide.

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Examples of LD_{50}

• table salt	3750 mg/kg
• aspirin	1750 mg/kg
• Diazinon	1250 mg/kg
• caffeine	200 mg/kg
• Rotenone	130 mg/Kg
• Nicotine	55 mg/kg

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How Much is that for a 175 lb. person

- table salt 3750 mg/kg = 1.5 to 2 cups
- aspirin 1750 mg/kg = 350 aspirin
- Diazinon 1250 mg/kg
- caffeine 200 mg/kg = 160 cups
- Rotenone 130 mg/kg
- nicotine 55 mg/kg = 25-55 cigarettes



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Pesticide Hazards

Toxicity can be:

Acute – damage resulting from a single exposure

Chronic - damage resulting from long-term (repeated) exposure

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Routes of Entry

- There are 4 main routes:
  - **Dermal**
  - **Ocular**
  - **Inhalation**
  - **Oral**
- **Dermal & inhalation** are the most common routes of pesticide exposure.

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Common Symptoms of Pesticide Poisoning

Mild or early symptoms:
- Fatigue
- Headache
- Dizziness
- Blurred vision
- Excessive sweating
- Excessive salivation
- Nausea & vomiting
- Stomach cramps
- Diarrhea

Moderate symptoms:
- Inability to walk
- Weakness
- Chest discomfort
- Muscle twitches
- Pupil constriction

Severe:
- Unconsciousness
- Convulsions
- Difficulty breathing
- Death

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- Plainly and simply, beware of <u>ANY</u> unusual symptoms!
- Call 911 for immediate medical attention
  Statement of practical treatment
  EPA Registration number
- http://npic.orst.edu/index.html
- Poison Control Center:
  1-800-222-1222

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The Pesticide Label

Contains information essential for effective, safe, and legal use of product.

"The label is the law."

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The elements of a pesticide label:

Handbook pages 424-426

- Brand name
- Common name
- Chemical name
- Ingredient statement
- Type of formulation
- Net contents
- Name & address of manufacturer
- Registration number
- Establishment number
- Precautionary statements
- Environmental hazards
- Physical & chemical hazards
- Signal words & symbols
- Statement of practical treatment
- Directions for use
- Pre-harvest interval
- Restricted entry interval
- Storage & disposal directions
- Misuse statement

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A legal document which describes:

- **Ingredient**(s) of the product.
- Indicates level of **toxicity**.
- **Approved uses** of the product.
- **Application rates**
- **Environmental hazards** of its use

The format of pesticide labels is not standard.

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Brand, Common and Chemical Names

- Different manufacturers may market the same active ingredient under different brand names.
- Do not choose products by brand name alone. Read the **active ingredients** on the label.

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Signal Words

Toxicity category	Signal word
Category 1: 0-50 mg/kg	Danger-Poison
Category 2: 50-500 mg/kg	Warning
Category 3: 500-5000 mg/kg	Caution
Category 4: 5000 mg/kg +	None required

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Common Label Violations

- If one glug is good, two is better.
- If the label says it works great in the driveway it should be dynamite in the garden!
- If it says to use it every 2 weeks, it should work even better every week!
- There's just a bit left over, I'll pour it down the drain.
- Gloves are for sissies.

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What you can do…

- apply at a dose, concentration or frequency less than that listed on the label, but never more!
- apply a pesticide for a pest not listed on the label if the plant or other target is listed.
- use any appropriate equipment not specifically prohibited by the label.
- mix with pesticide(s) &/or fertilizer(s) not specifically prohibited.

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The pesticide label

When should you read the pesticide label?

- Before **purchasing** the product.
- Before **using** the product.
- Before **storing** the product.
- Before **disposing** of the product or empty container.

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Personal Protective Equipment (PPE)

- pants
- long-sleeves
- gloves
- shoes or boots
- goggles
- face mask
- hat
- protective outerwear

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Pesticide Sensitivity

Factors Affecting Response

Absorption of parathion by various body parts

Body Part	Relative rate
Forearm	1.0
Abdomen	2.1
Scalp	3.7
Forehead	7.0
Genital area	11.8

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Head & Neck

- A chemical-resistant hood or wide-brimmed hat will help keep pesticides off your head, neck, eyes, mouth & face.
- Plastic "safari" hats with plastic headbands work well and are relatively cool.

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Personal Protective Equipment (PPE)

Several types of coats made of different fabrics, with and without hoods

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Several types of masks

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Eyes

- PPE for eyes include goggles, face shields and safety glasses with shields over brow & on sides.
- Goggles or glasses work well with half-face respirators.

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Protective Eyewear

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Hands & Feet

- Wear waterproof gloves any time you may get pesticides on your hands.
- Chemical-resistant hand and footwear may be required.
- Keep at least one extra pair of gloves and footwear available in case of contamination.
- If you must remove your gloves during a handling activity, wash your gloves before removing them.

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Several types of glove made of different materials

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Gloves and Liners OK

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Gloves Over Sleeve or Under?

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Use Water Resistant Boots

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Shoe or boot coverings

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Application Equipment

There are several types of application equipment.

You should choose equipment that allows you to make safe and effective pesticide applications.

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Some pesticides are pre-mixed or formulated in containers that double as applicators.

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Application Equipment - Sprayers

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Hose-end Sprayers

- Hose-end sprayers are proportioners that mix a concentrated pesticide with water and emit a spray of diluted pesticide.
- These may be very useful when making applications to the ground with high volumes of water.
- This type of sprayer may be the only non-mechanical way of spraying trees and large shrubs.
- Don't buy a cheap one (see Handbook pages 426 & 427 for reasons why).

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When using a hose-end sprayer:

Place anti-siphon device between sprayer and water source to prevent back siphoning of pesticides into your water system.

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Compression Sprayers

- Pressurized with a hand-operated pump.
- Require agitation and uniform tank pressure for effective spray application.
- With tank capacities of more than ~ 1.5 gallons, you should consider a backpack sprayer.
- May not be suitable for spraying large shrubs and trees.

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Backpack Sprayers most Comfortable

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Calibration & Calculating Amounts

Two common types of applications:

- Apply to wet the plant or foliage.
- Apply to cover a surface of known area.

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Calibration & Calculating Amounts

To apply the correct amount of pesticide, you need to know:

- How much of the pesticide to apply per unit of area.
- How large the area is.
- How much liquid your sprayer puts out per unit of area.

You can also calibrate the quantity you will need by mixing the proper concentration of the pesticide in a small batch.

Make the application to the target area, and calculate how much more area needs to be covered.

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Re-entry Interval

- **Period of time that must pass between treatment and reentry**
- Check label for REI (often 12, 24 or 48 hours, though many say, "until dry").

Preharvest Interval

- **number of days allowed between the last pesticide application and the day of harvest.**

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Applying Pesticides

Cleanup & Disposal

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Washing PPE

- Wash pesticide-contaminated items separately from uncontaminated clothing & laundry.
- Avoid direct contact with contaminated items, and work in a well-ventilated area.
- If in doubt about ability to clean an item, discard it!

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Eyewear/Respirators

- Wash goggles, face shields, safety glasses & respirator bodies and face pieces with detergent & hot water after each day of use.
- Sanitize by soaking them for at least 2 minutes in a mixture of 2 tablespoons bleach in a gallon of water. Rinse thoroughly!

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Storage

- Original container only
- Out of reach of children & pets
- Avoid temperature extremes
- Avoid contamination of wells & surface water
- Leak proof containers

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Plastic Closeable Containers Safest

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Disposal of Pesticide Containers

Empty Containers: (not banned)

- Cardboard containers in trash (not burned)
- Triple rinse glass/plastic, apply rinse water
- Dispose of empty container in trash, or recycle/return to dealer if possible

Leftover pesticide or banned products:

- Check DEQ Home Hazardous Waste collection schedule-do not dispose!

http://www.deq.state.or.us/wmc/solwaste/hhw.html
1-800-452-4011

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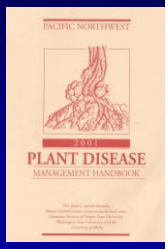
Pesticide Recommendations for Homeowners

The only source of recommendations are:

Plant Disease Control:
PNW Disease Management Handbook
http://plant-disease.orst.edu



Insect Pest Control:
PNW Insect Management Handbook
http://insects.ippc.orst.edu/pnw/insects

Weed Control:
PNW Weed Handbook
http://weeds.ippc.orst.edu/pnw/weeds

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Pesticide Label Websites

- www.cdms.net
- www.greenbook.net

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