Pesticides, Formulations & Labels

Chapters 3, 4, 28

Types of Pesticides
Chapter 3

Learning Objectives

- Define “pesticide.”
- Sources of pesticides
- Relate pesticide type to pest group we use it against.
- Give examples of how pesticides of the same type can differ.

Pesticide: Defined

A *pesticide* is any substance or mixture of substances used to directly control pests or to prevent or reduce the damage they cause.

Pesticide Sources

Physical environment

Minerals

- Copper
- Sulfur
- Arsenic
- Borate
- Diatomaceous earth

Living organisms

Plants

- Pyrethrum
- Cyanide
- Nicotine
- Caffeine

Insects

- Hormones
- Pheromones

Microorganisms

- Harm pests
- Outcompete

Man-made (synthesized)

- Most common
- Easier to produce in bulk
- Easier to handle
- "Tailor made" for situation

- Risks vary greatly
- Can be expensive to develop

Pesticides are defined by what they do:

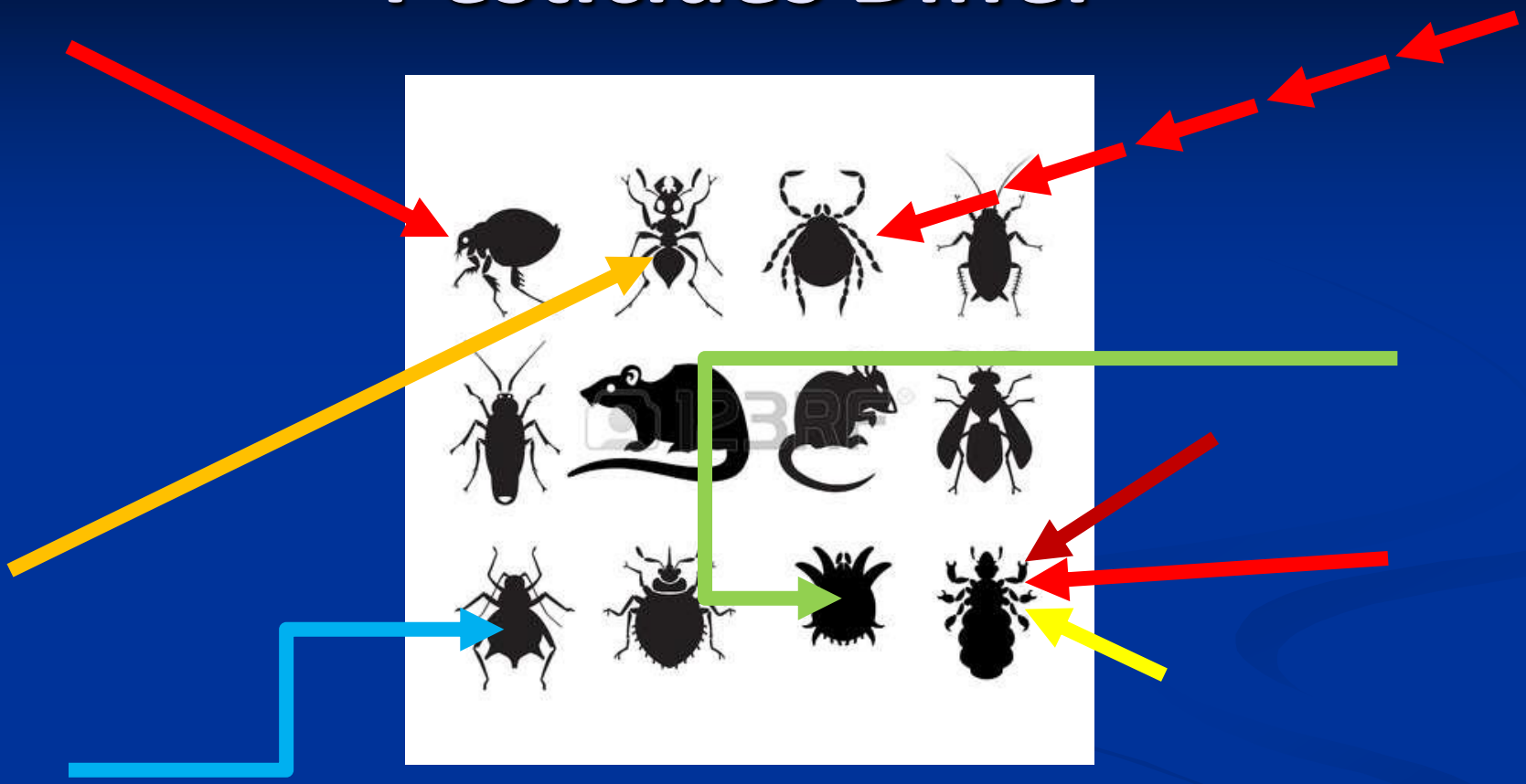
- Kill a pest
- Attract it to a trap – baits
- Repel a pest – repellent
- Interfere with a pest's life functions – hormones and pheromones

Types of Pesticides

Review List on page 23

Pesticide	Target Pests
Insecticide	Insects
Fungicide	Fungi
Herbicides	Weeds
Antimicrobials	Bacteria
Acaricides	Mites & spiders
Rotenticides	Mice & other rodents
Nematicides	Nematodes
Repellants	Insects, birds, mammals
Plant Growth Regulators	Insects & plants
Wood Preservatives	Fungi, bacteria, & insects

Pesticides Differ



pesticides will control pests in different ways

Mode of action:
the way a pesticide acts on a pest

Pesticides Differ: Insecticides

Mode of Action

- Disrupt nervous system
- Disrupt molting and development
- Inhibit feeding
- Disrupt mating behavior

Uptake by insect

- Contact
- Stomach poison
  - Systemic insecticide

Duration

- Residual: long-term effectiveness
- Nonresidual: short-term effectiveness

Pesticides Differ: Herbicides

- Uptake

  Contact

  - Kills plant tissue herbicide lands on
  - Seedlings and annual weeds - paraquat

  Systemic

  - Absorbed and travels in plant to kill underground structures
  - Perennials - glyphosate

Pesticides Differ: Herbicides

Selectivity

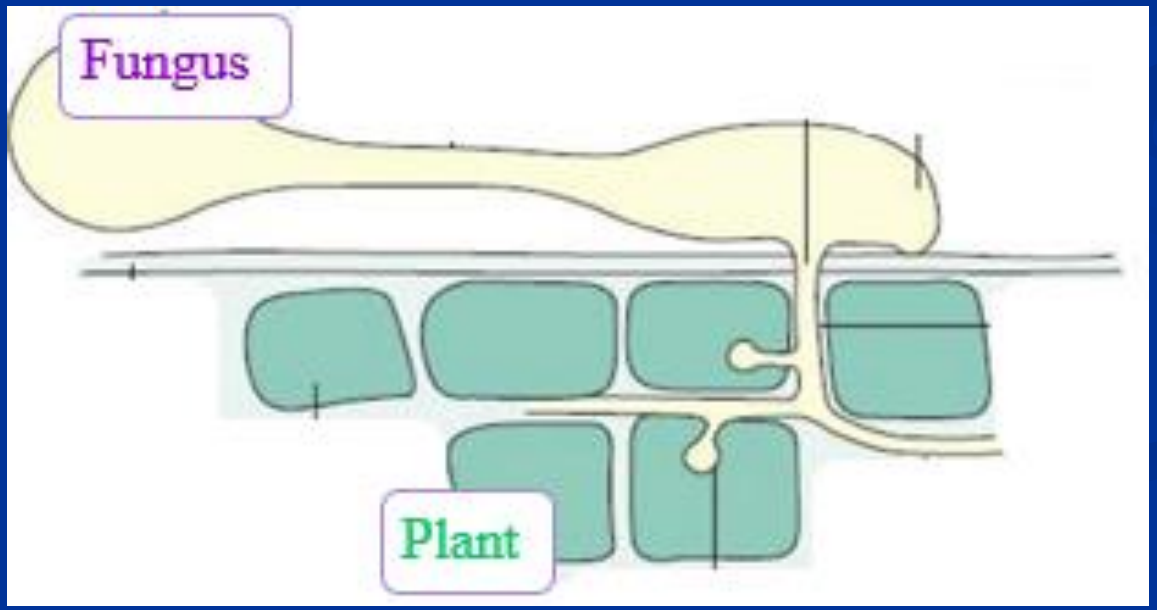
- Nonselective = broad spectrum
  (glyphosate and paraquat)
- Selective = narrow spectrum
  Stinger (clopyralid), Aim (broadleaf weeds)

Timing of application is important:

- Preplant
- Pre-emergence – before weeds germinate
- Post-emergence – after weeds germinate

Pesticides differ: Fungicides

- Protectants
  - Prevents infection
  - Applied before
- Systemics (Eradicants)
  - Absorbed by plant
  - Applied after infection



Pesticides Differ: Rodenticides

- Acute: Kills after single feeding
  - Quicker kill
- Multidose: Kills after several feedings
  - Less toxic
  - Less bait avoidance

Pesticides Impregnated Materials

- Pesticides are incorporated into/onto other products.
  - Treated seeds – insecticides and fungicides
  - Weed “n” feed Lawn care – herbicide + fertilizer
  - Ear Tags and flea collars – insecticides
  - Treated lumber – wood preservative with fungicides and insecticides

Questions ?

Pesticide Formulations – Chapter 4

- List general characteristics of a pesticide that make it usable
- Define: Active Ingredient, Inert Ingredient, Formulation
- Know the difference between: trade name, common name, vs chemical name, an where to find them on the label
- How/Why products with the same a.i. or similar trade names may differ
- Distinguish between solution, suspension, emulsion
- Describe the types of formulations, their uses and +/-
- What should you consider when choosing a formulation
- Where would you find formulation on label
- Explain meaning of designations such as 10WP and 6EC
- Adjuvants: what they are and why used
- For each Adjuvant described
  - What it does
  - What you must do or consider to be effective
- Where on label to find what/if adjuvants to use

Pesticide Products must be:

- Easy to use
- Safe to handle
- A form that can be applied to reach the pest
- Chemically stable in storage or after application

Pesticide Formulations

active ingredient (a.i.) + inert ingredients

= Pesticide formulation

Pesticide products have 3 names:

- Trade, brand, product name - *Altacor*
- Chemical name

  3-Bromo-N-[4-chloro-2-methyl-6-[(methylamino)carbonyl]phenyl]-1-(3-chloro-2-pyridinyl)-1H-pyrazole-5-carboxamide
- Common name - *Chlorantraniliprole*

  shorter unique chemical name

  accepted by EPA

Types of formulations Terminology

- Carrier = gas, liquid, or solid material a pesticide is mixed with to apply uniformly
- Solution = substance dissolved in liquid, no agitation needed
- Suspension = solid particles dispersed in liquid, but agitation needed
- Emulsion – liquid dispersed in another liquid, agitation is required

- ***Know advantages and disadvantages of all***

Types of formulations (liquid or dry)

- WP = wettable powder
- WSP = water soluble packet
- WDG = water dispersible granule
- DF = dry flowable
- SP = soluble powder
- G = granules
- D = dust
- P = pellets
- Baits

- EC = emulsifiable concentrate solution
- S = solution
- F = flowable suspension
- SC = suspension concentrate
- ULV = ultra low volume
- Aerosols
- Ready to use – low concentration

- ***Table on page 39***

Choosing the right formulation

- Labeled for target pest?
- Duration of pest control effect
- Risks to applicator, environment, site
- Application equipment – need agitation?
- Ease of handling, measuring
- Package size
- Potential phytotoxicity, or damage to protected surface

- What does the 60 in 60 WP mean?
  - Pesticide is 60% a.i.
    or 60 lb ai per 100 lbs

- What does the 4 in 4EC mean?
  - There are 4 lb of a.i.
    per gallon of pesticide

Advantages vs. Disadvantages

- Which formulations more commonly cause phytotoxicity to tender foliage?
- Which formulations is most likely to drift?
- Which dry formulation are you least likely to inhale?
- Which liquid formulation is most easily absorbed through skin?
- Which formulation shows little visible residue?

Adjuvants?

- Chemicals premixed in formulation or added during mixing
  - Improve mixing
  - Improve spray coverage
  - Reduce drift
  - Improve pesticide performance
- ***No pesticidal properties***
  No EPA registration
  No standards for composition or quality

Adjuvants?

- Surfactants = wetting agents, spreaders
- Stickers = increases adhesion
- Extenders = stickers, UV protection
- Penetrants = enhances penetration into plants
- Compatibility agents = when mixing with liquid fertilizers
- Buffers/Acidifiers = add prior to adding pesticides to set desired pH
- Defoamer = prevent foaming in tank when mixing
- Drift Control = increases droplet size

Choosing Adjuvants?

- Use only as listed for pesticides, not industrial and household detergents
- Use only when recommended on label – look in “Directions for Use” and “Mixing instructions”
- Look for when to add to tank.
- Look for research showing improved effect
- Adding adjuvant when ot recommended on label can reduce pesticide effectiveness

Questions ?

Reading the Pesticide Label Chapter 28

Cornell University

Pesticide Management Education Program

Who Reads This Stuff?

- Pesticide labels are important to many.
- How to safely and correctly use pesticide
- Label has different meanings for each.
  - Manufacturer = permission to sell
  - Regulators = control of use sale, distribution and disposal.
  - Doctor = directions of poison treatment.
  - Applicator = source of use directions

Learning Objectives

1. Identify and locate 4 main categories of information on a label.
2. Given a label, find and interpret specific information
3. Understand the “Ingredient” statements
4. What is the difference between EPA Reg No. and EPA Est. No. ?
5. Explain the meaning of the phrase "Use Inconsistent With Labeling."
6. What to do if state laws are more strict than label directions.
7. List the 4 times you should read the pertinent parts of a label.

What is on the Label?

1. What the product is.
2. All safety and health precautions.
3. Environmental concerns.
4. How to use the product.

1. Product Information

- Brand name
- Common name
- Chemical name
- Ingredient statement.
  - Active ingredient(s)
  - Inert ingredient(s)

Percentage is calculated on a weight-to-weight basis

OR

Pounds of ai per gallon

Active Ingredient	***By Weight***
Chlorsulfuron 2-Chloro-N-[(4-methoxy-6-methyl 1,3,5-triazon-2-y1)aminocarbonyl] benzenesulfonamide	75%
Inert Ingredients	25%
Total	100%

1. Product Information

- Use Classification
  - General use or
  - Restricted use

    Certified applicator - needed to purchase, apply or supervise application.

Classified as "RESTRICTED-USE" in New York State under 6NYCRR Part 326.

The words "General Use" may not appear on the label

1. Product Information

- The formulation (WP, EC, G, etc)
  - Front panel of most labels.
- Manufacturer, address and phone
- EPA Registration

  Unique to each product, indicates registered by EPA

EPA Reg No. 352 515

Manufacturer code

Product Number

- EPA Establishment Number

  Identifies the facility that produced the product

2. Safety Information

- Signal Words
  - Quick reference word for the relative toxicity.

Signal word	Category
DANGER, POISON 	**I Highly Toxic**
WARNING	**II Moderately toxic**
CAUTION	**III Slightly toxic**
CAUTION	**IV Relatively non-toxic**

2. Safety Information

Precautionary Statements

- Physical/Chemical Hazards
  'Flammable' 'Corrosive'
- Routes of Entry
- PPE – Personal Protective Equipment
  Lists Minimum – you can always choose more!

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER! CAUSES EYE DAMAGE.

Corrosive, causes irreversible eye damage. Harmful if swallowed. Do not get in eyes or on clothing. Wash thoroughly with soap and water after handling.

Other 'commonsense statements' on many labels

Do not contaminate food or feed

Remove and wash contaminated clothing

Wash thoroughly after handling and before eating or smoking

Wear clean clothes daily

Do not allow children or domestic animals into the treated area

2. Safety Information

- First Aid
  - Statement of practical treatment
  - All highly toxic pesticides must have information for treatment.
- Emergency Contact

KEEP OUT OF REACH OF CHILDREN

DANGER PELIGRO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand this label, find someone to explain it to you in detail.)

FIRST AID

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-441-3637 for medical emergencies involving this product.

2. Safety Information

- Agricultural Use Box
  - Only for agricultural applications.
  - Provide reference for WPS, REI and early entry PPE

AGRICULTURAL USE REQUIREMENTS
Use this product only in accordance with it labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry-interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 12 hours. Exception: If the product is soil-injected or soil-incorporated, the Worker Protection Standard, under certain circumstances, allows workers to enter the treated area if there will be no contact with anything that has been treated.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been tread, such as plants, soil or water is:

- Coveralls
- Chemical-resistant gloves made of any waterproof material
- Shoes plus socks

3. Environmental Information

- Special Toxicity Statements – specific to material
  - Highly toxic to honeybees.
  - Extremely toxic to fish and aquatic invertebrates.
- General Environmental Statements
  - Do not apply when runoff is likely to occur
  - Do not apply when weather conditions favor drift

ENVIRONMENTAL HAZARDS

This product is highly toxic to bees exposed direct treatment on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds while bees are actively visiting the treatment area.

4. Use Information

- Directions for use.

DIRECTIONS
ADULT MOSQUITO CONTROL in Residential areas, Municipalities, Tidal Marshes, Swamps, Woodlands, Agricultural Areas (when applied in wide-area public pest control programs sponsored by governmental entities), Livestock Pastures, Feedlots and Pastures including Dairy Cattle.

4. Use Information

- **The target PEST must be on the label when you apply a pesticide in New York.**
  - 2(ee) statement
- How much to use
  - Per acre basis typically
- How it is to be applied
- Type of equipment
- Timing of application
  - Frequency
  - Pre Harvest Interval
- Limitations placed on the use of the product.

Crop	Pest Controlled
Pome Fruit and Stone Fruit	Plum Curculio, Oriental fruit moth, stink bugs, aphids

4. Use Information

- Product storage, disposal and container disposal are described on the label.

STORAGE
Keep pesticides in original container. Do not put concentrate or dilute into food or drink containers.
For Help with any spill, leak, fire o exposure involving this material, call day or night 1-800-123-4567.

Pesticide Disposal

This product is acutely hazardous. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of Federal Law.

Container Disposal

Triple rinse (or Equivalent). Do not reuse container. Offer for recycling or puncture and dispose in a sanitary landfill.

Inconsistent Use

- The label states*:*

> *"It is a violation of federal law to use a pesticide inconsistent with its labeling."*

- Federal Insecticide Fungicide and Rodenticide Act (FIFRA) governs pesticides.

In short, users are forbidden to deviate from labeling directions.

Time to Read: Read the Label First!

- Before you buy
- Before you mix and apply
- Before you store
- Before you dispose of unused pesticide and empty containers

'The Label is the Law'