

“You can teach a student a lesson for a day; but if you can teach him to learn by creating curiosity, he will continue the learning process as long as he lives.”

-- Clay P. Bedford

ILLINOIS PESTICIDE APPLICATOR TRAINING

GENERAL STANDARDS

How do you apply these chapters to your everyday herbicide application?



CHAPTER 1: INTEGRATED PEST MANAGEMENT (IPM)



What is a Pest?

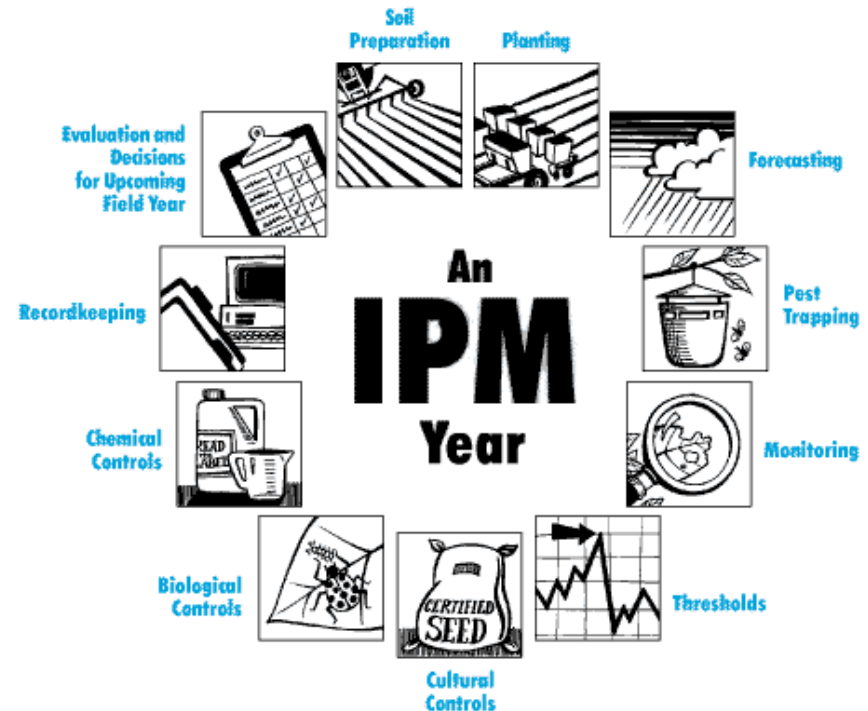


- any insect, mite, rodent, weed, etc that is injurious to the health of humans, animals, plants or the environment.



What is the goal of Integrated Pest Management (IPM)?

Not to eliminate the entire pest population but to avoid adverse effects on humans, wildlife and the environment.



Economic Injury Level



<http://www.dreamstime.com/royalty-free-stock-photo-rabbit-eating-grass-image9357955>

Is the breakeven point at which the cost of pest control equals the revenue loss caused by a pest

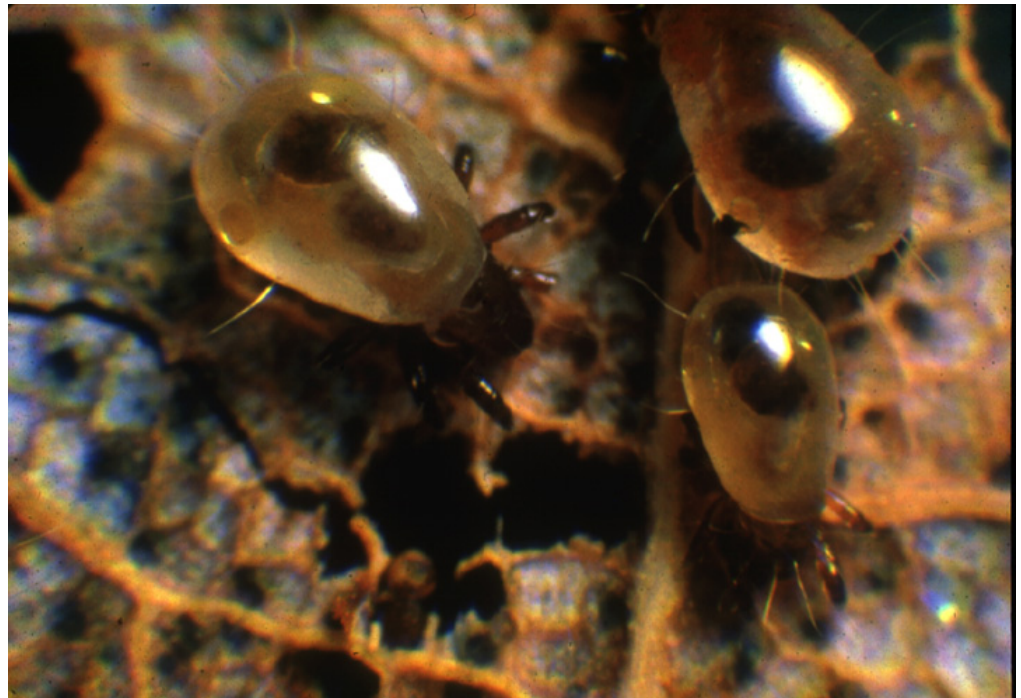
ex) Shedd Aquarium
30K

What is an Economic/Action threshold?

- the number of pests per plant or amount of damage to plant at which control measures should begin

If control is applied
the pest population
should not reach
economic injury

Level- aphid



Aesthetic injury level

- the number of pests that might cause enough damage to the appearance of a plant to warrant the cost of control

Based on Look-

Acceptable in forest

compared to at

in your yard- damage



What are the 4 types of control methods (IPM controls)?

- **Cultural**- improves crop health so it may compete better against pests
- **Mechanical**- the physical elimination of pest
- **Biological**- using living organisms to reduce pest populations
- **Chemical**- using chemical agents (at proper time using scouting techniques)

Cultural control

- improves crop health so it may compete better against pests (mulching, soil preparation)

Prescribed burning
is an example

CULTURAL CONTROL

Figure 28



Mechanical control

- the physical elimination of pest (pulling, cutting, etc.)



Biological control

- using living organisms to reduce pests (predators and diseases)



Chemical control

- using chemical agents to reduce pests
(at proper time using scouting techniques)

Before using pesticide consider:

- Other effective nonchemical controls
- Is the pest population large enough to warrant control
- Is this the correct time to apply

<http://www.teara.govt.nz/files/p16490atl.jpg>



Also there are Preventative controls

- To prevent entry and spread of pests

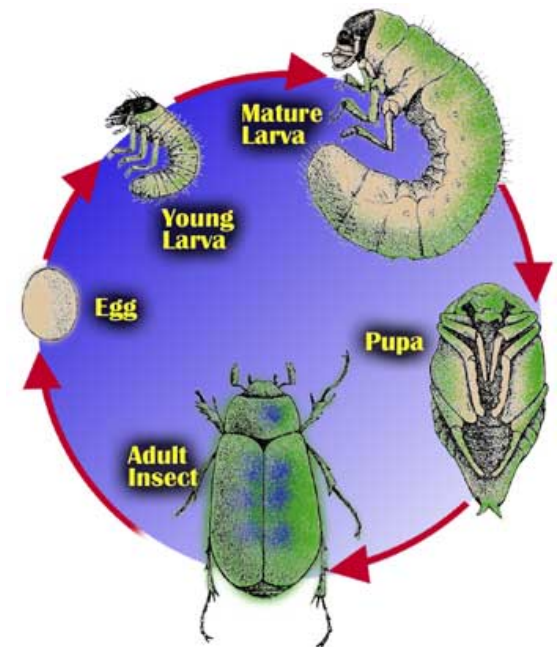


Pest Identification

- Need to properly identify pests to treat for them
- Need to diagnose disease symptoms in order treat
- Need proper identify invasive plants to treat

Why it is important to identify pests and their life cycles?

- Many people think that all insects are pests however they are beneficial part of ecology- predators or parasites of other insects
- Knowing the pest allows to you understand if it is injurious or not to the plant
- Allows you to know if the pest is susceptible or not susceptible to control



Adult insects

Have exoskeleton-

- ▣ 3 pairs of jointed legs
- ▣ 3 pairs of distinct body regions-
head, body, thorax

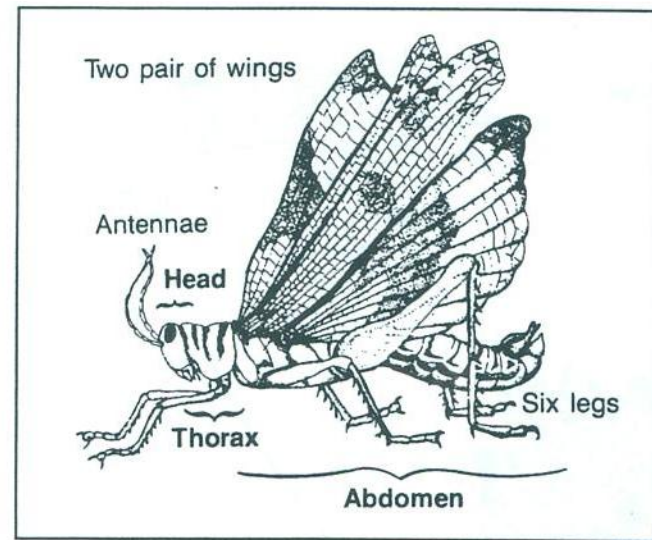


Figure 1.2 Adult insect.

Incomplete development in insects

- 3 life stages- eggs, nymph, adult

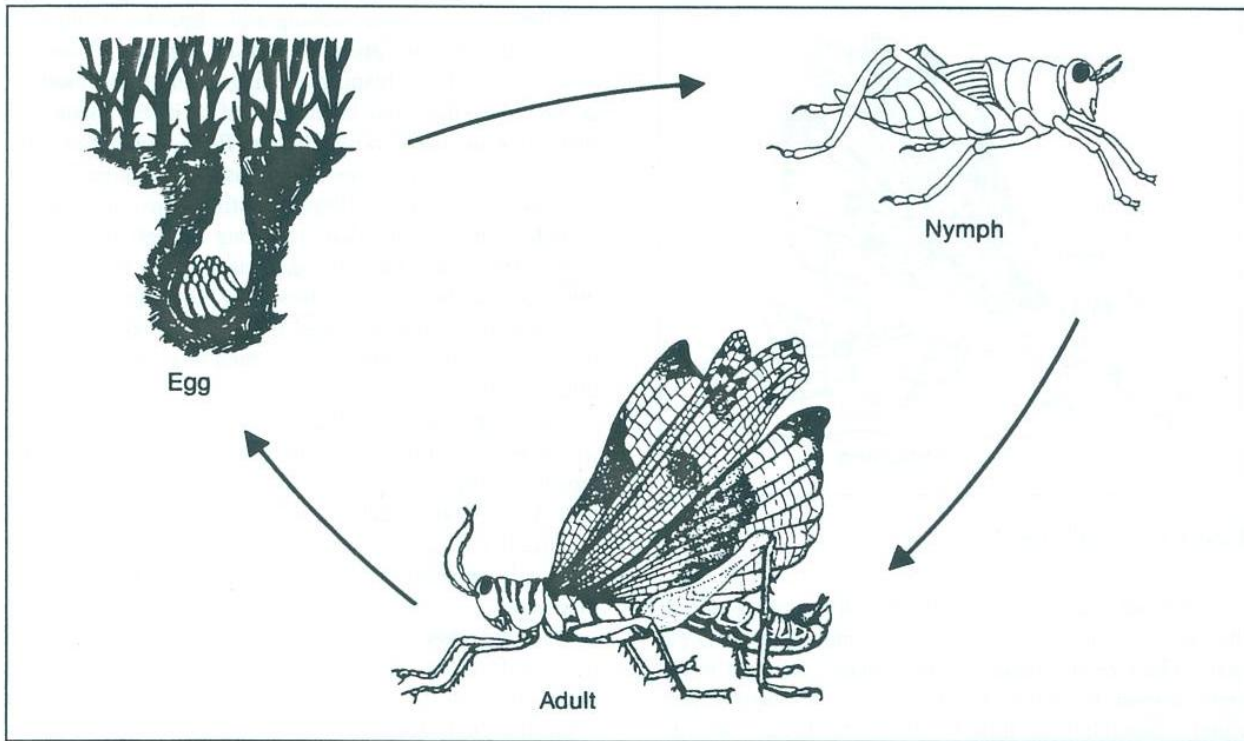


Figure 1.4 Incomplete development: three-stage life cycle.

Complete development in insects

- 4 life stages- eggs, larvae, pupae, adults

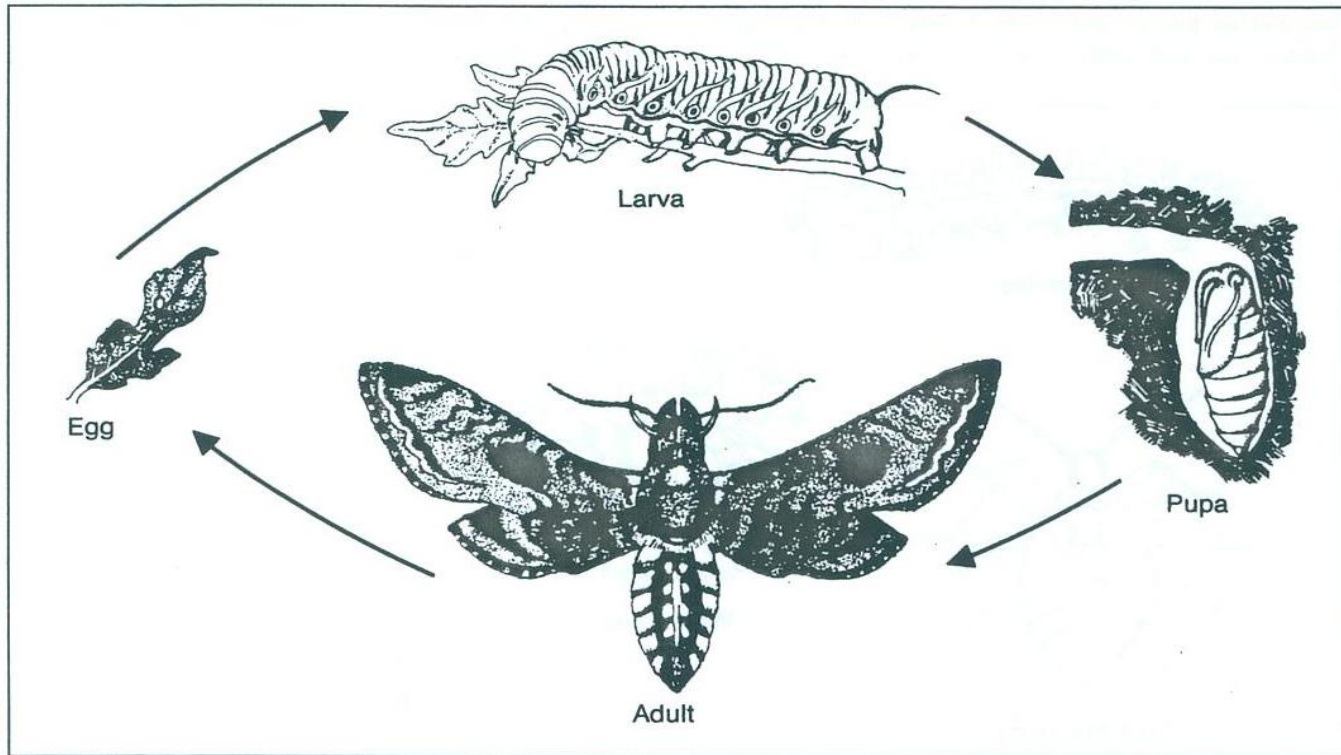
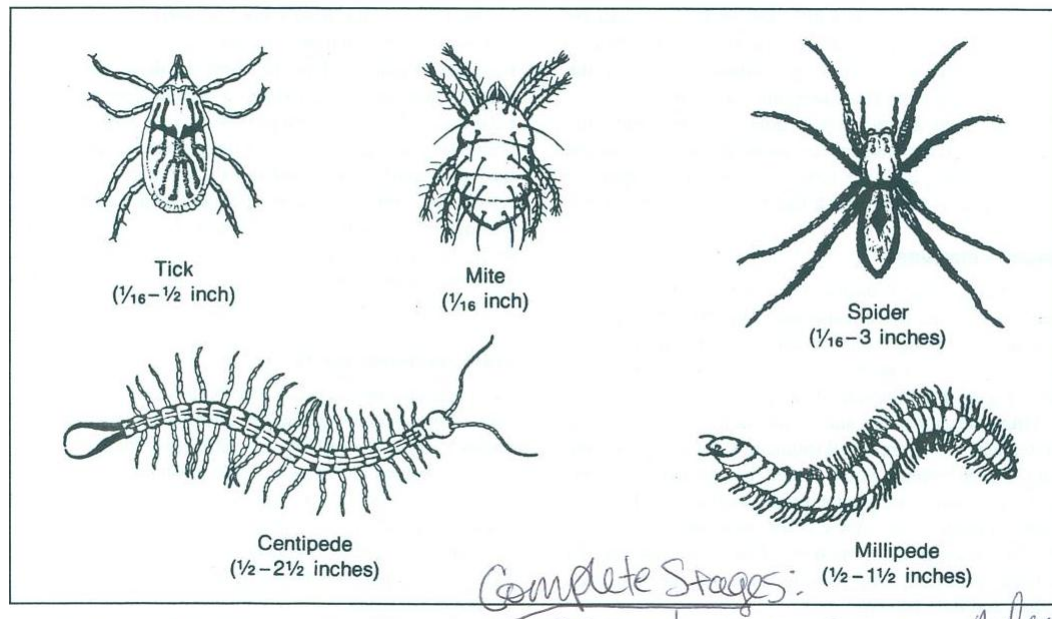


Figure 1.5 Complete development: four-stage life cycle.

Insect Relatives

- Mites- spiderlike and have 4 pairs of jointed legs
- Spiders- have 4 pairs of legs and 2 distinct body regions



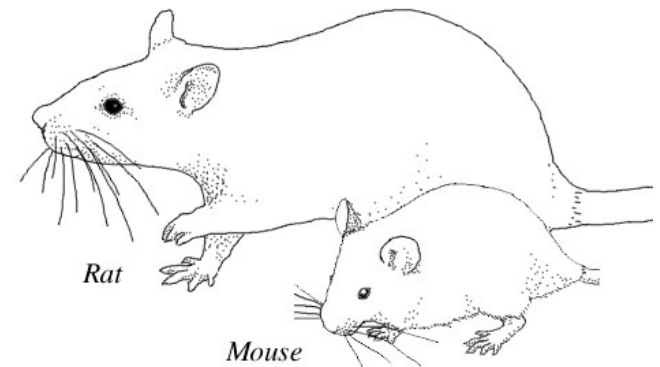
Illinois Department of Natural Resources (IDNR)-Mammals & Birds

- All birds are protected under the law except non-native birds- starlings, feral pigeons, and house sparrows



<http://www.outdooralabama.com/watchable-wildlife/images/european%20starling.jpg>

- All mammals are protected by law except for rats and mice



Plant Pathology-

- Is the study of plant diseases
- 2 types of plant diseases:
- Non-infectious and Infectious

Noninfectious diseases

- cannot be transferred from pest to pest or plant to plant
- generally result of an unfavorable growing condition



Infectious diseases

- can be transferred from plant to plant and are cause by pathogens or living organisms-

fungi, bacteria, nematodes, viruses and phytoplasmas



Fungi

- Small multicelled organisms that feed on waste materials



http://mi9.com/fancy-mushroom_24957.html

Bacteria

- Microscopic single-celled organisms



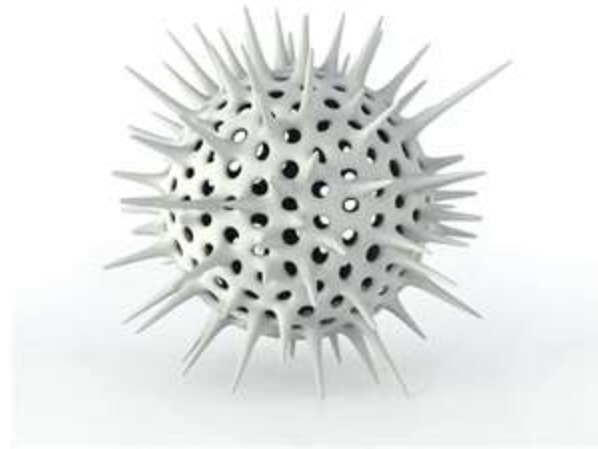
Nematodes

- microscopic roundworms that live in or on soil and feed in the roots of plants (infectious)



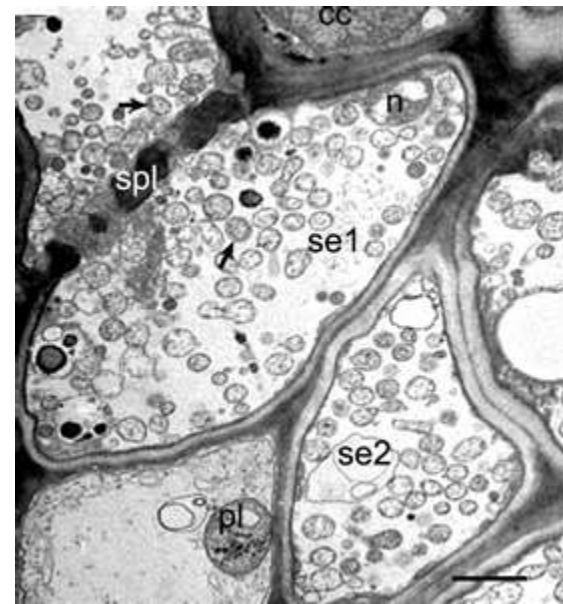
Viruses

- submicroscopic pieces of DNA or RNA



Phytoplasma

- bacteria like organisms that lack cell walls
transmitted by leafhoppers or plant propagation
- witches broom



<http://www.jic.ac.uk/staff/saskia-hogehout/plant.htm>

Plant disease (common)

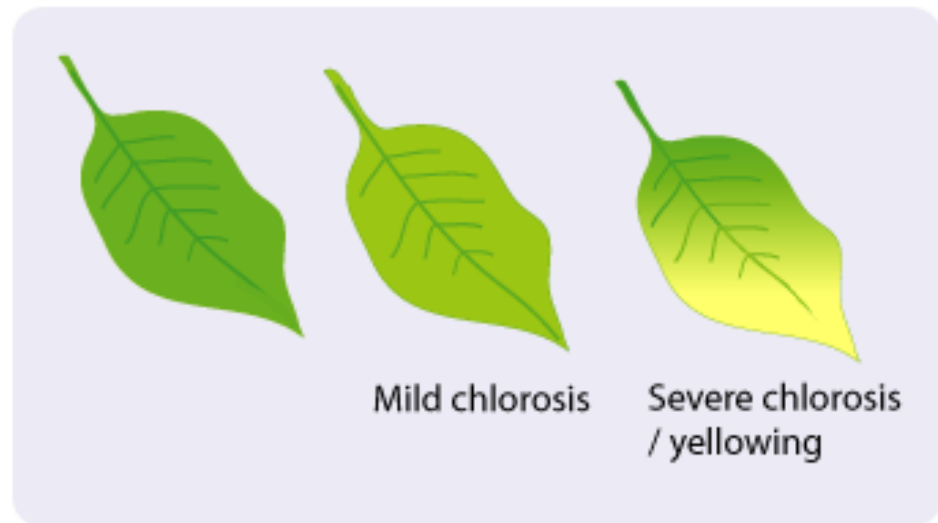
- condition when plant differs from normal healthy appearance, structure or function
- Common signs of plant pathogens- wilting, yellowing, leaf spots, dropping leaves, necrosis

3 Common Plant Disease Examples

- **Chlorosis**
- **Mosaic**
- **Gall**

Chlorosis

- is a yellowish-green coloration in normally green tissues such as leaves



Mosaic

- an intermingling patch of green and yellow color on a leaf



Gall

- An abnormal swelling in portion of a branch, leaf, root or bud- wasp



Factors for Infectious Disease

4 elements necessary for the development of an infectious plant disease

- Susceptible host**
- Plant Pathogen**
- Favorable Environment**
- Time**

Susceptible host

- for a disease to occur a plant must be able to become infected by that type of pathogen
- Example Oak wilt, gall

Favorable Environment

- Plant pathogens have certain temperature and moisture requirements for growth and entry into plants
- Such as extra moisture susceptibility or drought

Time

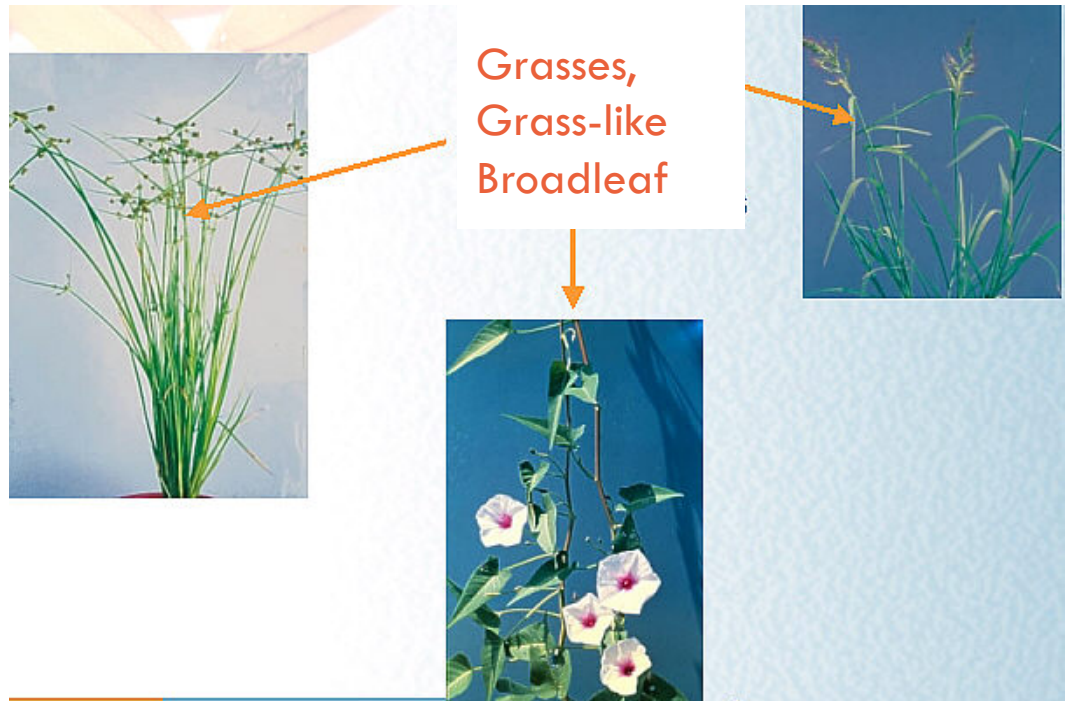
- symptoms change over course of weeks or months
- time for the disease to progress throughout the plant

Weeds

- any plant growing where it is not wanted
- First step in planning weed control is correct identification of the plant

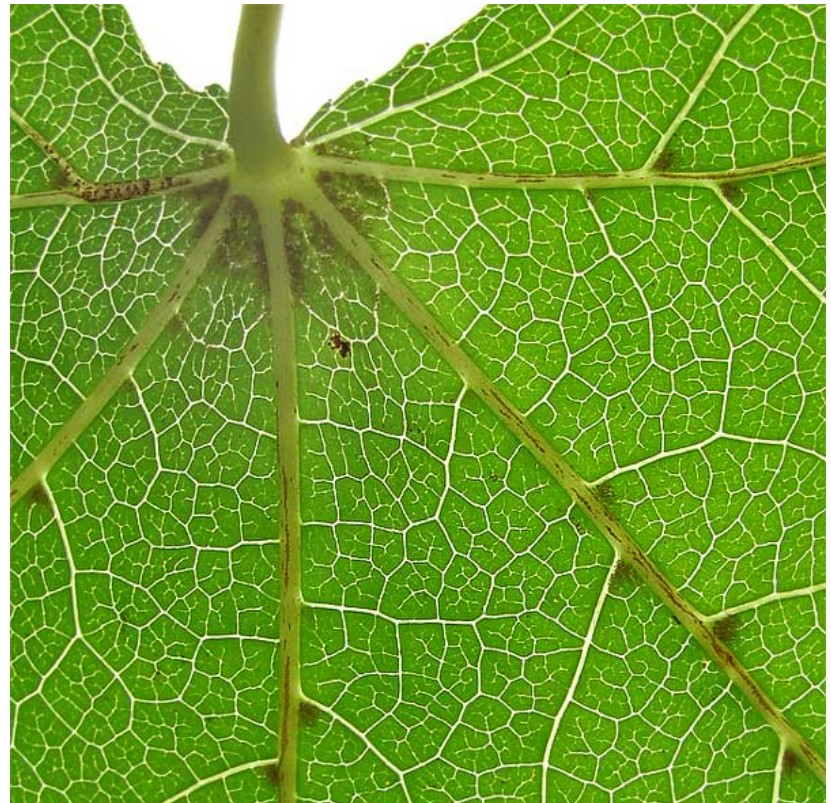
3 types of weeds

- Grasses
- Grass-like
- Broadleaf weeds



Broadleaf plants

- Broadleaf plants- have **net-veined** leaves and are usually less elongated than grasses.



Life cycles of weeds

Plants are easiest to control when they are seedlings

- Annual weeds- complete life cycle in 1 year
- Biennial- complete life cycle in 2 years-
first year is a low-growing cluster of leaves called a rosette
- Perennial- live longer than 2+ years



Life Cycles of Weeds- p. 14

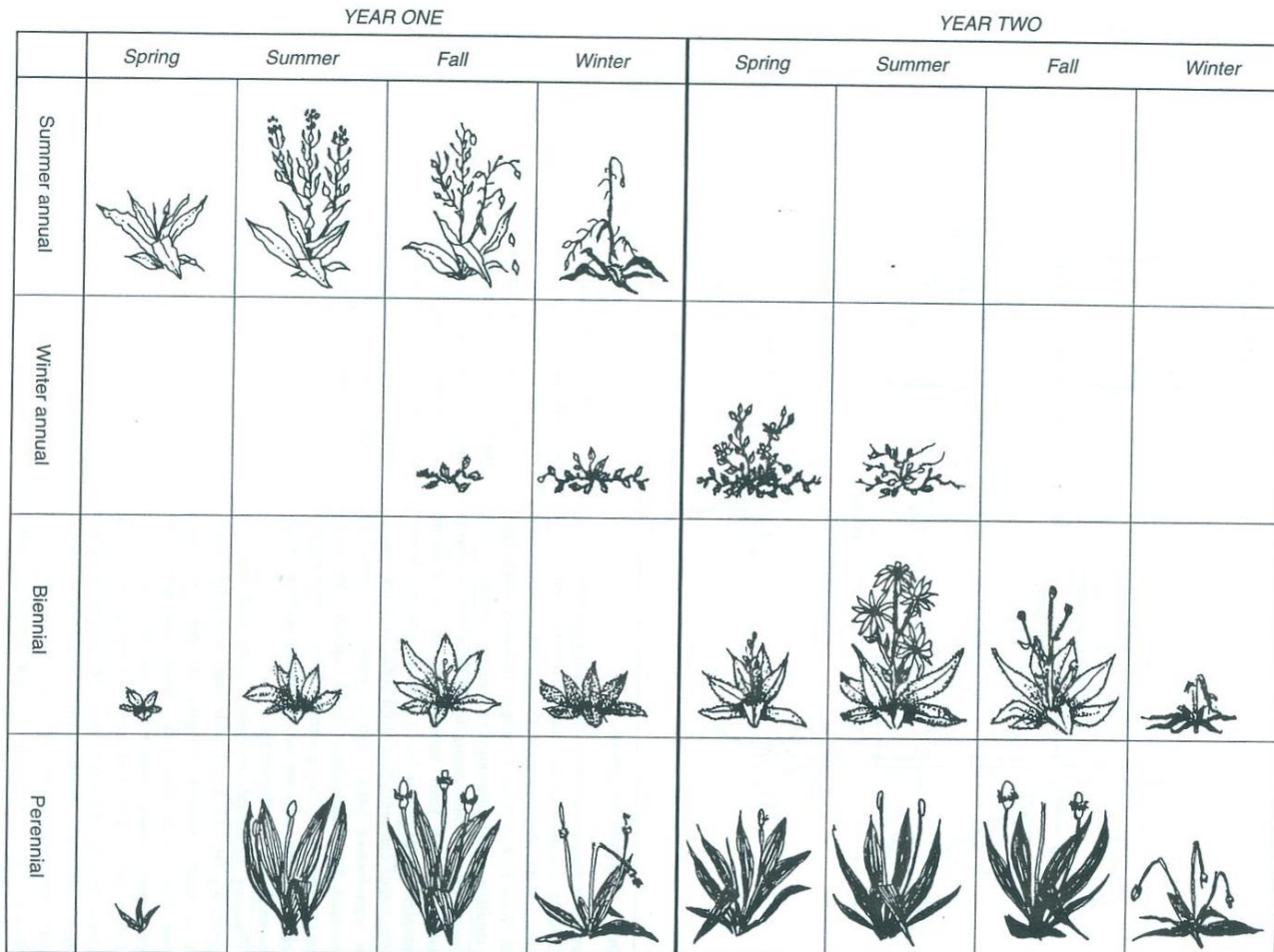


Figure 1.6. Weed life cycle.

Cycle repeats until plant dies.

Sample Question

- What type of disease is generally the result of unfavorable growing conditions, such as temperature extremes or moisture extremes, soil compaction, pesticide or fertilizer excess?

Sample Question

- What type of disease is generally the result of unfavorable growing conditions, such as temperature extremes or moisture extremes, soil compaction, pesticide or fertilizer excess?

A Noninfectious disease

Sample Question

- What type of weed germinates in the spring, develops a root system and low growing cluster of leaves called a rosette?



Sample Question

- What type of weed germinates in the spring, develops a root system and low growing cluster of leaves called a rosette?

A Biennial weed

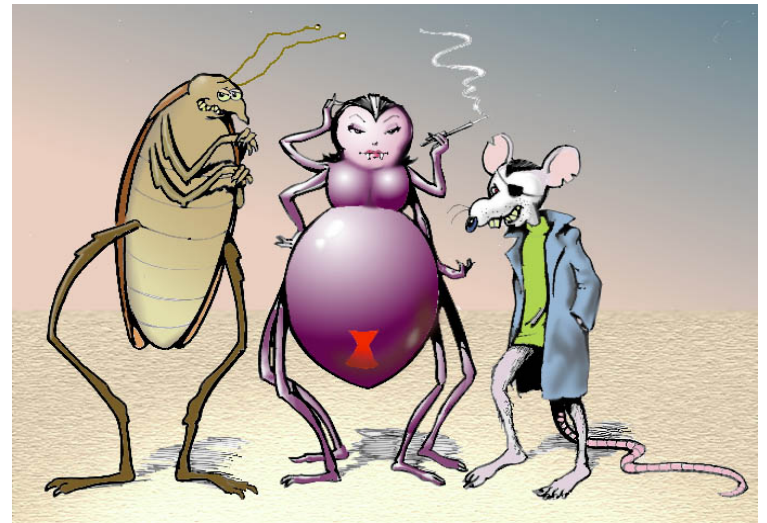


CHAPTER 2: UNDERSTANDING PESTICIDES



What is a Pesticide?

- any chemical used to destroy, prevent or control any form of life declared as a pest

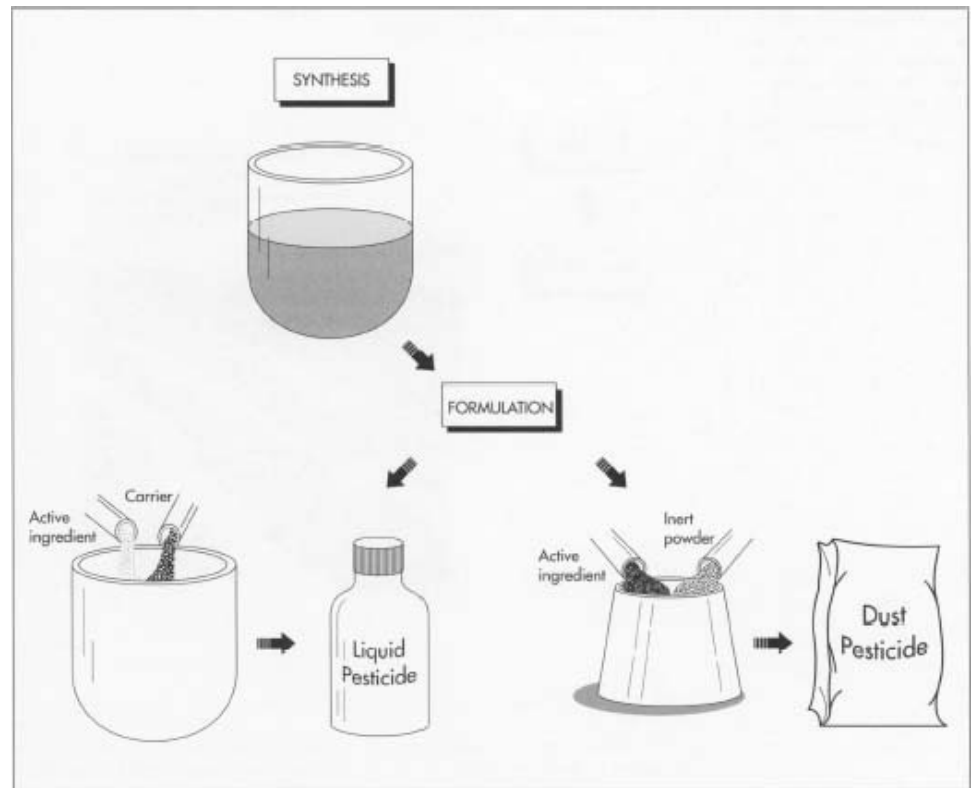


Pesticide formulation

- made up of **Active** and **Inert** ingredients

Active ingredient (AI)

- the chemical effective against the pest
- the part of the pesticide that kills the weeds



Inert ingredients

- make the Active ingredient **more effective**

RESTRICTED USE PESTICIDE
FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS
OR PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY
FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S
CERTIFICATION.

ILLI-ON 1.5 EC



FOR USE IN FIELD CORN AND SOYBEANS

ACTIVE INGREDIENT:

Illinate:Dimethyl zillate 0,0 dimethyl 2 (N-methyl ethyl propil, carbonyl).....	22.8%
INERT INGREDIENTS	77.2%
Total.....	100.0%

Contains 1.5 pounds Illinate per gallon
Net Contents 5 Gallons Liquid
EPA Reg. No. 123-4567-AA Establishment No. 12345

For Emergency Assistance Call: 1-800-xxx-xxxx
KEEP OUT OF REACH OF CHILDREN

 **DANGER/¡PELIGRO!** 
DANGER-POISON

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.)

SAMPLE PESTICIDE LABEL

Product Information

Use classification [Restricted use]
Trade or brand name [Illi-On]
Formulation [1.5 EC]
Common name [Illinate]

Ingredients

Net contents of container

EPA registration number

Establishment number

Emergency phone number

Signal words:

- Danger-Poison (high toxicity)
- Warning (moderate toxicity)
- Caution (low to very low toxicity)

Herbicide Formulations

- may be ready to use as is or may require dilution with water or another carrier (oil or liquid)

Example- for the math problems on test

Dry formulations

- 60WDG means 60% active ingredient water-dispersible granule (.6 pounds AI)

Wet formulations

- 4EC means 4 lbs of active ingredient per gallon of emulsifiable concentrate

Dry Formulations

- Soluble powder
- Wettable powder
- Dry flowables
- Granules
- Pellets
- Dusts

Soluble powders (SP)- p.16

- are mixed with water and dissolve readily and form a true solution

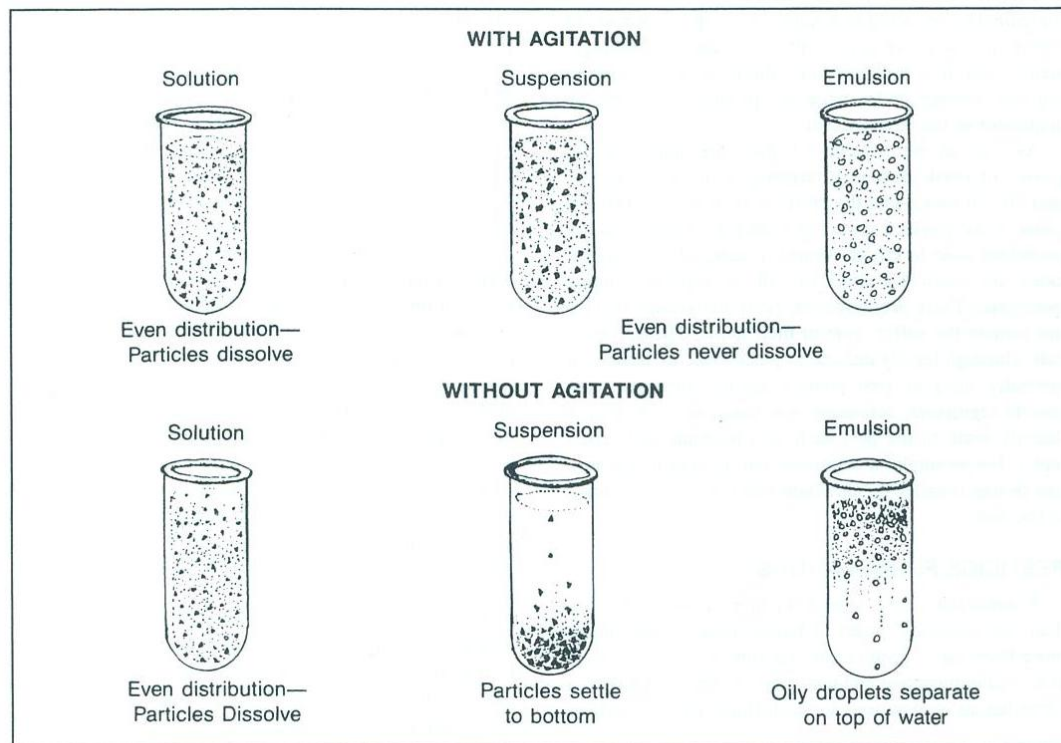


Figure 2.1 Differences among solutions, suspensions, and emulsions.

Wettable powders (WP)

- Finely ground powder mixed with water to form a **suspension** and not a true solution
- are **ABRASIVE** to pumps and nozzles
- ** *Also an inhalation hazard*
- *Require agitation when mixed with water*



Dry Flowables (DF) and Water-dispersible granules (WDG)

- Similar to wettable powders except the Active ingredient (AI) is formulated in a microgranule or granule instead of a powder



Granules (G)

- Active ingredient is coated to make coarse particles such as clay, newspaper pellets. May present less hazard to handlers applied directly

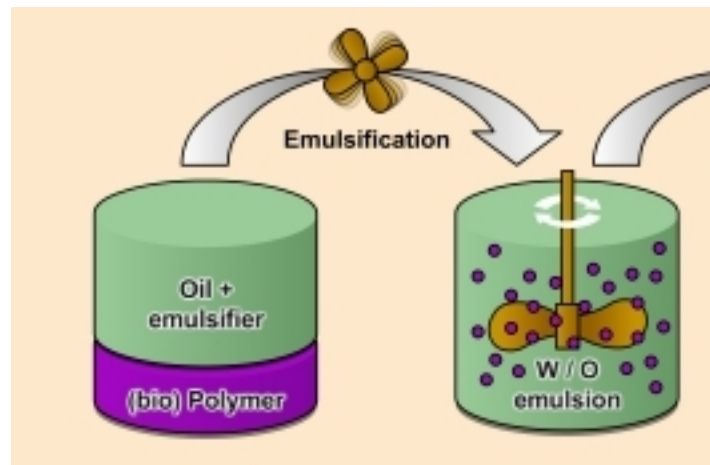


Wet formulations

- Emulsifiable concentrates
- Emulsions
- Microencapsulated
- Liquids or Flowables
- Solutions
- Ultra-low-volume concentrates (ULV)

Emulsifiable concentrate (EC)

- Active ingredient is mixed with 1 or more solvents and emulsifier that allows mixing with water
- **They are easily absorbed into the skin and create a dermal hazard**



Microencapsulated (ME)

- Active ingredient is surrounded by a capsule or coating that is suspended in a solvent or carrier- which results in time-released product.

Must be used with special caution near bee hives, since bees may carry them back to the hive and poison the entire colony

Solutions (S)

- Form true solutions when mixed according to label and will not settle out or separate

Ultra-low volume concentration (ULV)

- have high % of active ingredient in solution with a solvent- *usually oil*

Fumigants

- substances or mixtures that produce gas, vapor, fumes or smoke intended to control a pest
- Special Licensing is required to handle most fumigants, since they are highly toxic to humans and animals



Restricted Use Pesticides

- Can only be purchased by **Certified Applicators or persons under their direct supervision**
- Records of restricted pesticide applications be maintained for 2 years

Adjuvant

- Chemical that modifies pesticide physical properties or also enhances its performance

Drift reduction additives

- Thickening agents that increase droplet size and reduce the amount of spray drift

Sticker

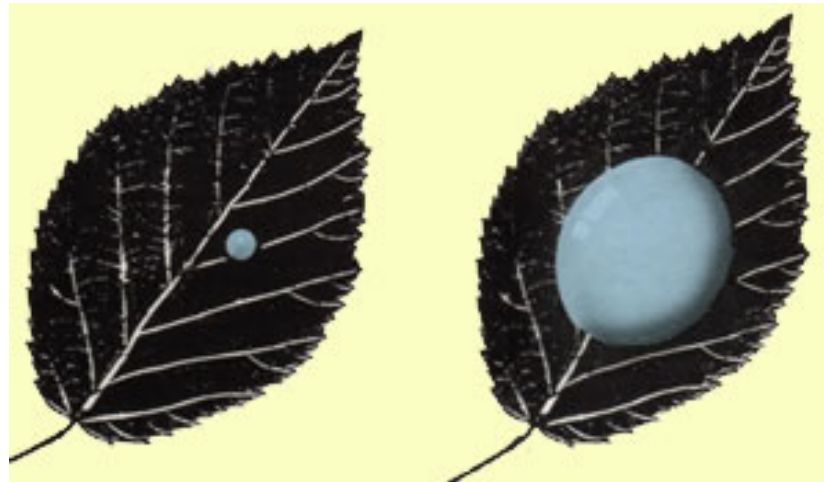
- used to increase the adherence of the chemical to the surface

Surfactant or Spreaders- p. 19

- are added to spread the spray mixture more thoroughly over the target plant or insect
- work by decreasing the surface tension of water allowing the water carrier to spread over the surface

Penetrants

- help pesticide pass through the outer surface of the plant (since waxy coating on leaves)



Defoaming agents

- eliminate foam in the spray tanks



<http://www.silicone.jp/e/products/type/defoaming/images/image1.jpg>

Mixing of pesticides

- By Law it is your responsibility to make that pesticides retain their properties if you mix them together and that they change toxicity or other physical properties
- Its *illegal* to mix pesticides with other products that are prohibited on the label

Antagonism

- Decreased activity or effectiveness

Physical Incompatibility

- Some pesticides cannot be physically mixed together. This can result from improper mixing or inadequate agitation.
- Signs of incompatibility-Upon mixing two pesticides they may curdle, gel or become sludge-like
- Perform a jar compatibility test to check prior to placing in tanks

Proper mixing order: p. 20 2nd paragraph on right

(from hardest to dissolve to easiest)

- 1) fill tank $\frac{1}{4}$ - $\frac{1}{2}$ with carrier and agitate
- 2) add compatibility agent (if needed)
- 3) add suspension products

First dry: (WP, DF, WDG)

Second liquids: (F, L, ME)

- 4) add emulsion products (EC)
- 5) add solution products (S, SP)
- 6) add surfactants and penetrants (if needed)
- 7) Finish filling tank with carrier

Sample Question

- Of activities associated with pesticide use which is the most dangerous?

Answer

- Of activities associated with pesticide use which is the most dangerous?

Mixing and loading

Sample Question

- Which of the following would you add to the tank first?

Answer

- Which of the following would you add to the tank first?

Wettable Powder (WP)



Other terms on pesticide labels

Residual pesticides

- remain active to kill pests for several days, weeks or years
- Residue may also affect non target species

Preharvest interval (PHI)

- the latest time a pesticide may be applied prior to harvest

What is “tolerance”?

- **The amount of chemical residue**
- **that may legally remain in or on**
- **food or feed crop when it is**
- **harvested.**



Selective pesticides

- control pest with little or no injury to related organisms

Garlon



Nonselective (broad-spectrum) pesticide

- control nearly all related organisms



Roundup

http://www.extension.umn.edu/projects/yardandgarden/YGLNews/images2/Jul12009/art3-3_600.jpg

*Overuse of broad-spectrum insecticides may also kill natural predators and parasites of that pest, resulting in **pest resurgence***

Systemic (or translocated) pesticide

- **moves** within the plant/animal from site of uptake to other parts- effective for underground reproductive structures- what plants do you know?

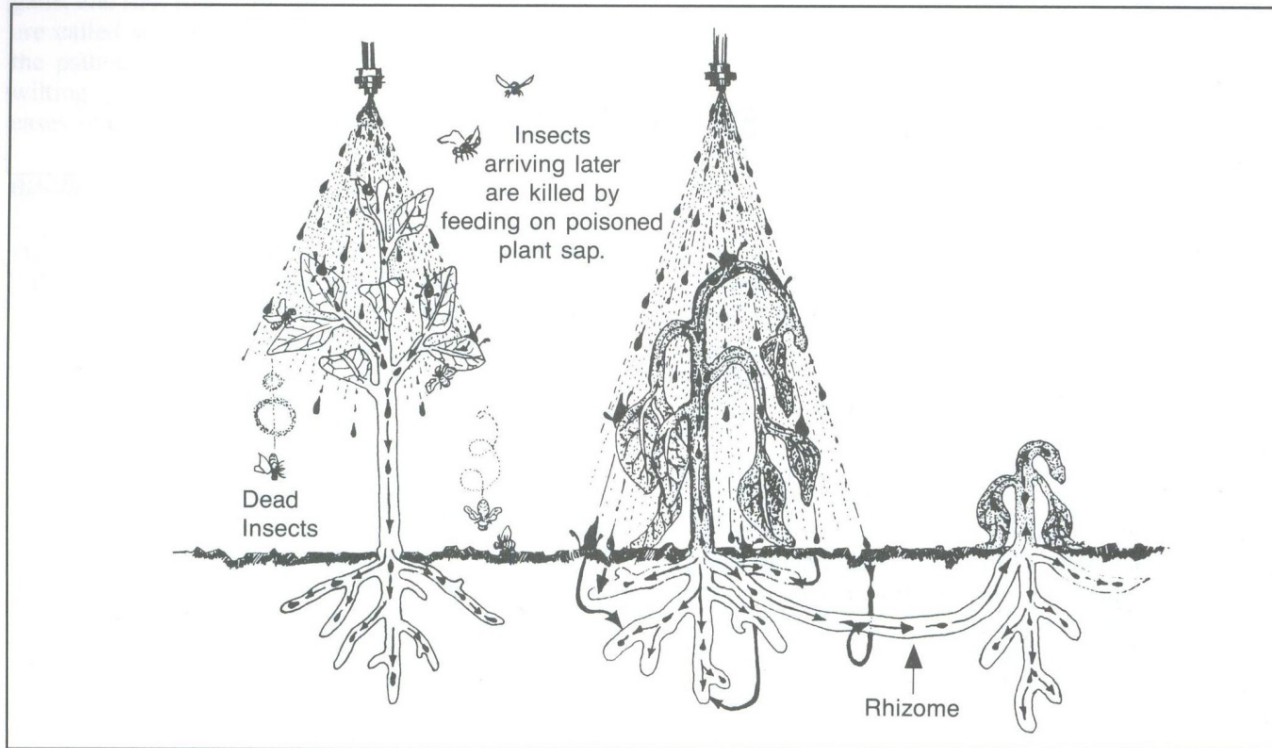


Figure 2.1. Systemic pesticides move in the circulatory system and can kill the pest at a site other than the point of pesticide contact.

Contact pesticide

- control by **direct contact** with the pest only

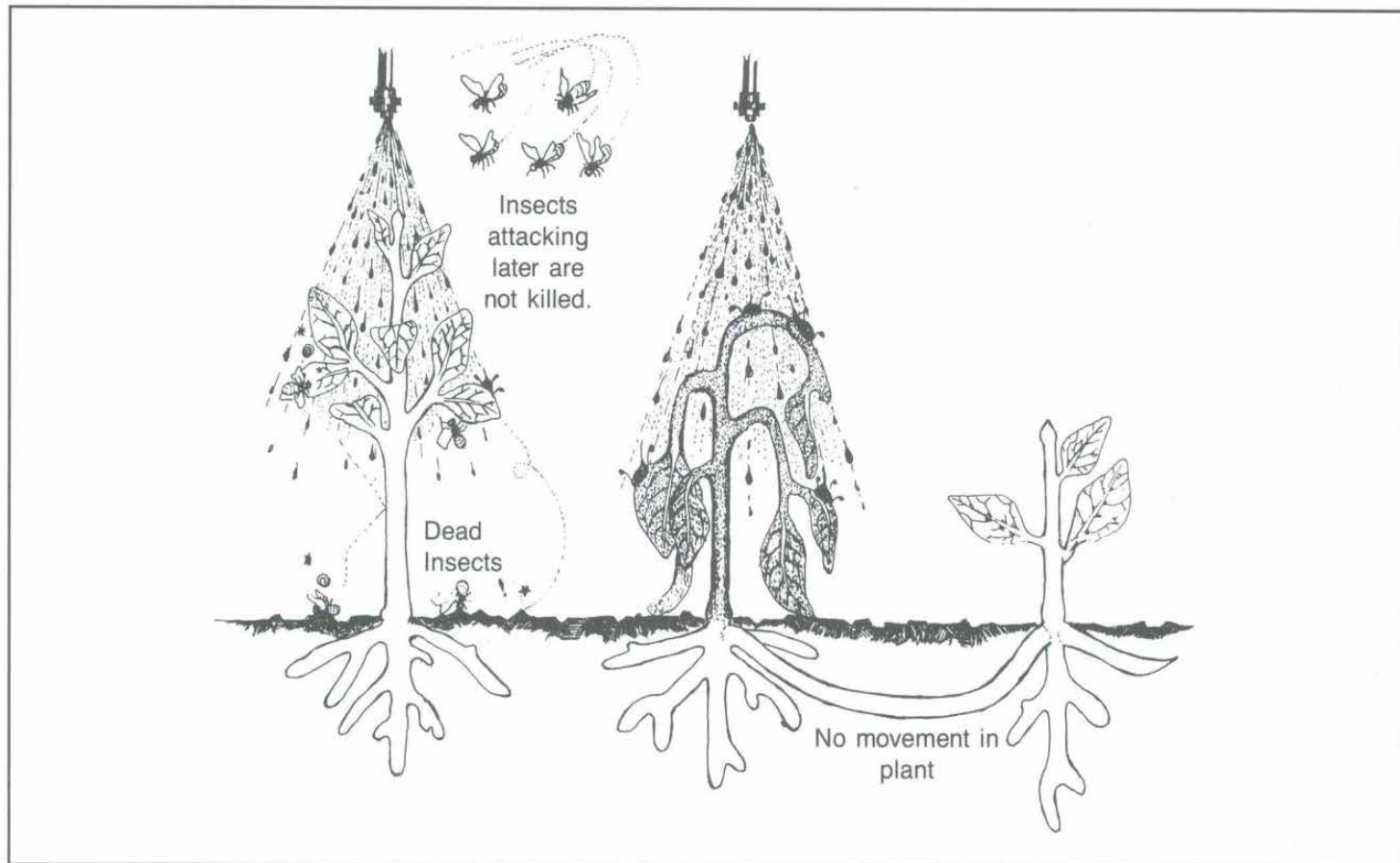


Figure 2.2. Contact pesticides kill pests only at the site of pesticide contact.

Broadcast Applications

- Treat the entire field or area- boom sprayer even application



Pest Resurgence

- Occurs from overuse of broad spectrum insecticides since they may also kill natural predators for the pest
- predator and parasite populations rebound more slowly than the target pest- making it harder to control pest

Sample Questions

- Which of the following is not a type of pesticide?
 - a) wettable powder
 - b) microencapsulated
 - c) surfactant
 - d) soluble powder

Answer

- Which of the following is not a type of pesticide?
 - a) wettable powder
 - b) microencapsulated
 - c) **surfactant**
 - d) soluble powder

Sample Question

- Pesticide failure can be caused by which of the following?
 - a) pest resistance
 - b) inappropriate rate of pesticide used
 - c) environmental factors unfavorable for pesticide activity
 - d) all of the above

Answer

- Pesticide failure can be caused by which of the following?
 - a) pest resistance
 - b) inappropriate rate of pesticide used
 - c) environmental factors unfavorable for pesticide activity
 - d) all of the above

Sample Question

- A biennial weed is?
 - a) Grows and sets seed every other year, staying dormant underground on alternate years
 - b) Flowers and set seeds twice per year
 - c) Grows vegetatively for two years and flowers and set seed on the third year
 - d) Grows vegetatively for one year and flowers and set seeds during the second year

Answer

- A biennial weed is?
 - a) Grows and sets seed every other year, staying dormant underground on alternate years
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 - d) Grows vegetatively for one year and flowers and set seeds during the second year

Sample Questions

- What is the first step to planning a successful weed control program?

Answer

- What is the first step to planning a successful weed control program?

Scouting- identify the problem is actually caused by a pest that needs to be treated

Sample Questions

- What type of treatment is most effective against perennial weeds?

Answer

- What type of treatment is most effective against perennial weeds?

A Systemic (translocated) herbicide to control vegetative reproductive parts

CHAPTER 3: LABELS AND LABELING



Read the Label

- Labels change very little typically but new formulations occur
- Recognize hazards to yourself and the world around you
- How much to use
- How often to spray
- Legal limit per acreage per year

When purchasing and applying a pesticide remember

- a) The label is a legal document
- b) Before you buy and apply a pesticide read the label
- c) A General Use pesticide is not given a classification on the label

Information on the Label- compare to Safari label

3 sections on every label

- Product Information
- Precautionary Statements
- Directions for use

Product Information Section

- What the product is and who can legally apply
- Ingredients
- EPA registration number
- Emergency Contact information
- Danger rating

SAMPLE PESTICIDE LABEL

RESTRICTED USE PESTICIDE
FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS
OR PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY
FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S
CERTIFICATION.

ILLI-ON 1.5 EC

FOR USE IN FIELD CORN AND SOYBEANS

ACTIVE INGREDIENT:
Illinate: Dimethyl zillate 0.0 dimethyl 2 (N-methyl ethyl propil, carbomyl). 22.8%
INERT INGREDIENTS 77.2%
Total..... 100.0%

Contains 1 .5 pounds Illinate per gallon
Net Contents 5 Gallons Liquid

EPA Reg. No. 123-4567-AA Establishment No. 12345

For Emergency Assistance Call: 1-800-xxx-xxxx
KEEP OUT OF REACH OF CHILDREN

DANGER/¡PELIGRO!
DANGER-POISON

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.)

Product Information

Use classification [Restricted use]
Trade or brand name [Illl-On]
Formulation [1.5 EC]
Common name [Illlinate]

Ingredients

Net contents of container
EPA registration number
Establishment number
Emergency phone number

Signal words:

- Danger—Poison (high toxicity)
- Warning (moderate toxicity)
- Caution (low to very low toxicity)

Precautionary Statements Section

- Human and animal hazards
- Personal Protective Equipment (PPE) needed
- First Aid
- Hazard Statements

PRECAUTIONARY STATEMENTS

X **HAZARDS TO HUMANS AND DOMESTIC ANIMALS**
May be fatal if swallowed, inhaled, or absorbed through skin. Do not contaminate feed or food.

X **PERSONAL PROTECTIVE EQUIPMENT (PPE) - What do you need?**
Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category F on an EPA chemical resistance category selection chart. Applicators and other handlers must wear: coveralls over long-sleeved shirt and long pants; chemical-resistant gloves, such as Barrier Laminate or Viton; chemical-resistant footwear plus socks; chemical-resistant apron when cleaning equipment, mixing, or loading; and respirator with an organic vapor-removing cartridge (MSHA/NIOSH approval number prefix TC-23C).

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions are given for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

X **USER SAFETY RECOMMENDATIONS.** Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.

X **STATEMENT OF PRACTICAL TREATMENT - Note to Physician**
Call a physician immediately. If swallowed—induce vomiting by giving a tablespoon of salt in a glass of warm water; if inhaled—remove to fresh air. If in eyes—flush with plenty of water for 15 minutes. If on skin—remove contaminated clothing immediately, wash skin with soap and water.

X **ENVIRONMENTAL HAZARDS**
Ili-On is toxic to fish, birds, and other wildlife. Birds feeding on treated areas may die. Keep out of any body of water. Do not apply where runoff is likely to occur. Do not apply when weather favors drift. Do not contaminate water by cleaning equipment or disposing of wastes.

PHYSICAL OR CHEMICAL HAZARDS
Flammable! Keep away from heat or open flame.

MFG BY HORSEHIDE CHEMICAL COMPANY
GENTRYVILLE, ILLINOIS

Precautionary Statements

Human and animal hazards
Personal protective equipment
(for handlers)

Practical treatment (first aid)

Environmental hazards

Physical or chemical hazards

Directions for Use Section

- Agricultural Use Requirements
 - ▣ Worker Protection Standard (WPS)
 - ▣ Reentry information/notification (for unprotected people)
 - ▣ PPE required for workers
- Crop or area of application
 - ▣ Pest Controlled
 - ▣ Amount to use
- Directions for application
- Storage/ disposal directions
- Use Restrictions

DIRECTIONS FOR USE

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

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its 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 48 hours.

Notify workers of the application by warning them orally and by posting warning signs at entrances to treated areas.

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 treated, such as plants, soil, or water is: coveralls, chemical-resistant gloves, and shoes plus socks.

Crop	Pest Controlled	Pounds/Acre
Corn	Armyworm	1-1/4 to 2-1/2
	Flea beetle	
	Chinch bug	
	European corn borer	
	Western bean cutworm	2-1/2
Soybeans	Bean leaf beetle	2/3
	Cucumber beetle	
	Mexican bean beetle	
	Corn earworm	2/3 to 1

SPECIFIC DIRECTIONS

Apply every 5 days or as needed by air or ground. Use sufficient water to obtain full coverage of foliage. Do not apply more than 0.8 lbs. a.i. per season. Do not apply within 1 day of harvest.

This product intended for use by commercial grower or applicator in conventional hydraulic sprayers, ground applicators, or airplane sprayers.

Ground Application: Apply III-On alone or in tank mixtures by ground equipment in a minimum of 10 gals. of spray mixture per acre unless otherwise specified.

Air Application: Apply III-On alone or in tank mixtures in a minimum total volume of 2 gals. per acre by aircraft.

STORAGE AND DISPOSAL

Storage: Store pesticide products in a secure locked area where children, unauthorized persons, and animals cannot enter. Do not store in the same area with food or feed. Do not store opened bags. Do not contaminate water, food, or feed by storage or disposal.

Disposal: Puncture, triple-rinse, and destroy empty container. Dispose of empty container by recycling, or in a sanitary landfill, or if allowed by State and local authorities, by burning. Never reuse. Open dumping is prohibited.

Consult federal, state, or local disposal authorities for approved alternative procedures such as limited open burning.

NOT FOR USE IN OR AROUND THE HOME

Directions for Use

Worker Protection Standard requirements

Reentry statement

Notification requirement

Personal protective equipment (for workers)

Crop or area of application

Pest controlled

Amount to use

Directions for application

Storage and disposal directions

Use restriction

Examination contains 20 questions on pesticide labels

1. What group or class is Safari 20 SG Insecticide? p1
2. What company makes Safari 20 SG Insecticide? p1
3. Are there any animals to which Safari 20 SG is particularly toxic to? p1
4. What is the REI of Safari 20 SG? p2
5. How many days does the purchaser have to make a claim for affected crops? p3
6. In what order should tank mixtures be added to Safari Insecticide? p4

Examination contains 20 questions on pesticide labels

1. What group or class is Safari 20 SG Insecticide? **4A p1**
2. What company makes Safari 20 SG Insecticide? **Valent p1**
3. Are there any animals to which Safari 20 SG is particularly toxic to? **Shrimp and Bees p1 Environmental Hazards**
4. What is the REI of Safari 20 SG? **12 hours pg2 Agricultural Use Req.**
5. How many days does the purchaser have to make a claim for affected crops? **21 p3 under limited liability**
6. In what order should tank mixtures be added to Safari Insecticide?
products packaged in water-soluble packaging, wettable powders, wettable granules (dry flowables), liquid flowables, liquids, emulsifiable concentrates, and surfactant/adjuvants? See top left of Pg4 general info

- 7) Who should you call with questions about calibration? p5
- 8) Can you use this product on house plants inside private residences? p7
- 9) What is the product rate when spraying vegetable transplants of melons i per 1000 sq. feet? p12
- 10) What is the A.I. of Safari Insecticide? p1
- 11) What is the hazardous category of Safari? Hint: This is listed below the item on every single herbicide label? p1
- 12) What PPE is required for early entry into treated areas? p2

- 7) Who should you call with questions about calibration? State Extension Specialists, equipment managers, or other experts. Pg.5
Application through irrigation systems
- 8) Can you use this product on house plants inside private residences?
No p7 ornamental plants
- 9) What is the product rate when spraying fruiting vegetable transplants per 1000 sq. feet? .16-.32 oz per 1000 sq feet. Pg 12
- 10) What is the A.I. of Safari Insecticide? Dinotefuran pg1
- 11) What is the hazardous category of Safari? Caution pg1
- 12) What PPE is required for early entry into treated areas?
Coveralls, Chemical-resistant gloves, shoes plus socks pg2 under Agricultural Use Requirements

- 13) True or False? Safari 20 SG is a non-systemic product. p3
- 14) When can children and pets return to the treated areas? p5
- 15) What is the intended use of Safari insecticide? p1
- 16) Where can Safari be appropriately applied? p1
- 17) True or false? You can use this product to control Cicadas on ornamental plants? p7
- 18) True or false? You can make no more than 2 sprays of a Group 4a insecticides in a 2 month period? 4a insecticides all have the same mode of action p7

- 13) True or False? Safari 20 SG is a non-systemic product. **False...pg. 3 under General Information**
- 14) When can children and pets return to the treated areas? **When the spray has dried p5**
- 15) What is the intended use of Safari insecticide? **For Foliar and Systemic Insect Control in Ornamental plants and Vegetable Transplants. p1**
- 16) Where can Safari be appropriately applied? **Greenhouse, Nursery, Interior Plantscape, and Outdoor landscapes. P1**
- 17) True or false? You can use this product to control Cicadas on ornamental plants? **False p 7 under Pest its not listed**
- 18) True or false? You can make no more than 2 sprays of a Group 4a insecticides in a 2 month period? **True p7 see box at bottom of table**

19) Can you use this product on Evergreens? p7

20) How many square feet will 100 gals. of spray mix treat?

Bonus: What form of herbicide is valient?

Solution? Granules? Wettable Powder? Soluable Granules? Emulsifiable Concentrate?

19) Can you use this product on Evergreens? Yes p 7 under Crop

20) How many square feet will 100 gals. of spray mix treat?

20,000 p 7 under Remarks

Sample Question

- What warning is on every herbicide label?

Answer

- What warning is on every herbicide label?

Keep out of the reach of children

Sample Question

- If you have herbicide that you bought in 2011 and a new label comes out in 2012. The new label says that the herbicide can be used on corn. Can you use the old herbicide on corn?

Sample Question

- If you have herbicide that you bought in 2011 and a new label comes out in 2012. The new label says that the herbicide can be used on corn. Can you use the old herbicide on corn?

No, you cannot apply the old product to sites that are not on the old label but appear on the new one.

CHAPTER 4: HUMAN PESTICIDE PROTECTION



Toxicity

- Ability of pesticide to cause injury or death



LD₅₀

- Dose that kills half of the test animals, stands for lethal dose (LD) for 50%- p32

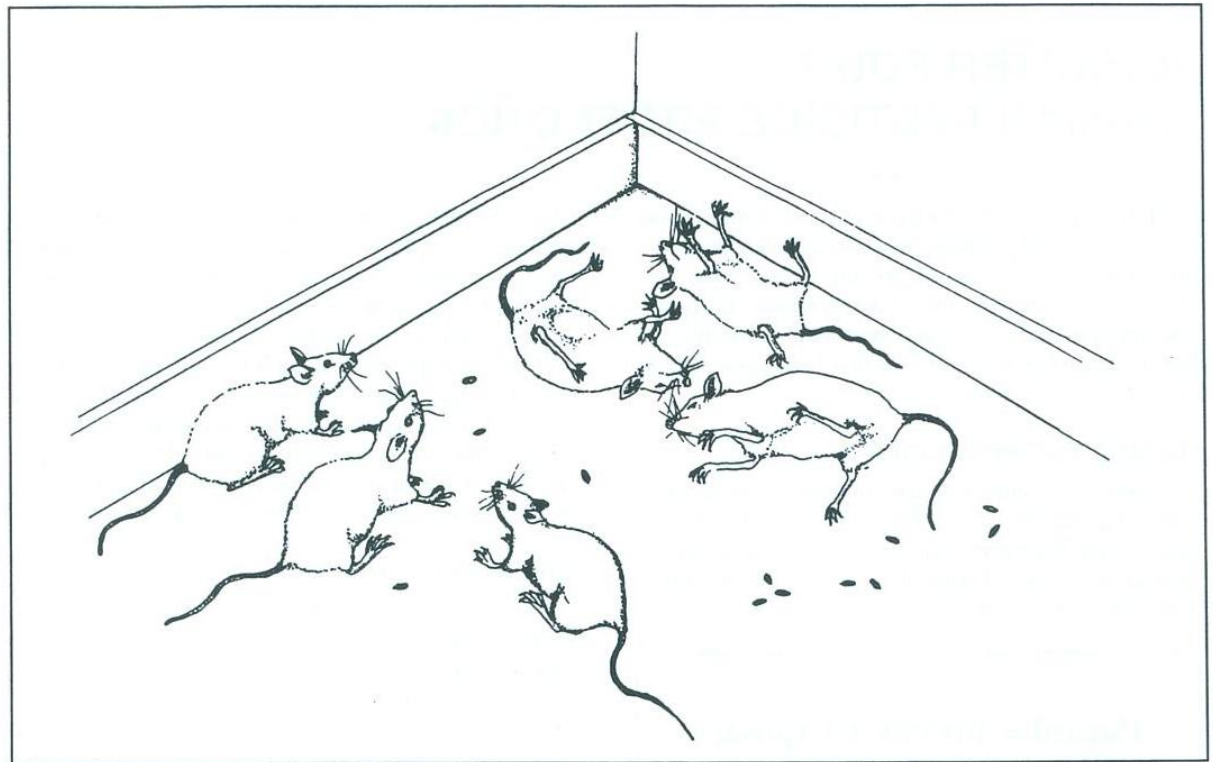


Figure 4.2 LD₅₀: The amount that kills half of the tested animals.

Acute exposure

- One- time hazardous contact with pesticide
Spilling chemical on clothes and skin.



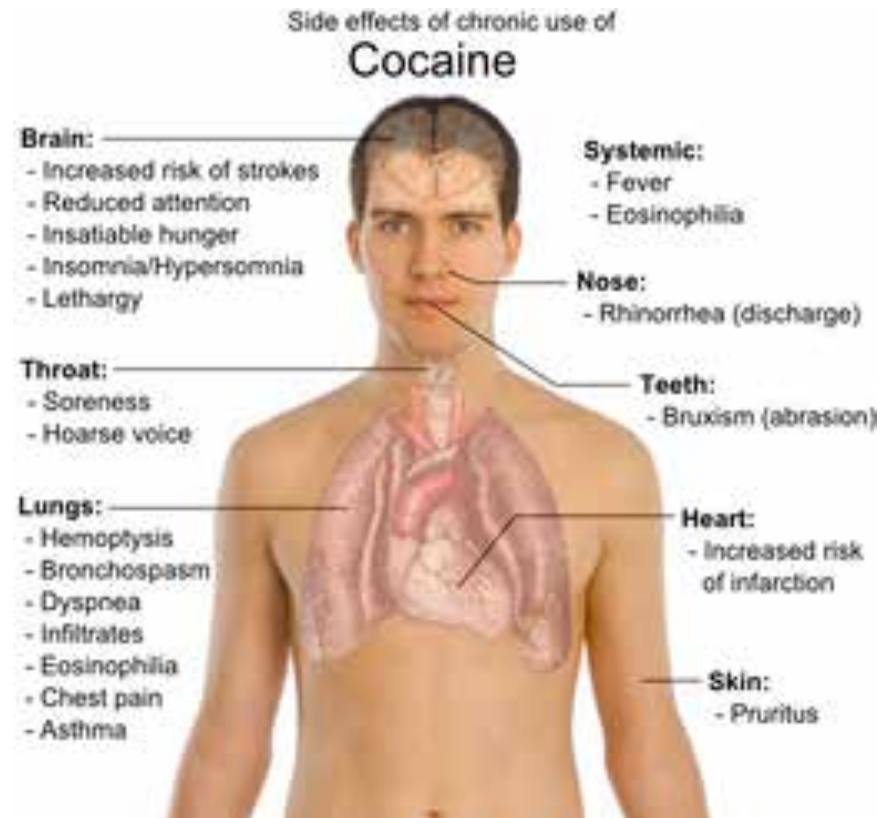
Cholinesterase test

- Used to detect organophosphate and carbamate poisoning in the blood

Chronic Effects

□ Risks associated with long term use of a pesticide

□ This is an example of chronic effects of cocaine- not a pesticide



Routes of Exposure

Why protective equipment is needed

Routes of Exposure

- Oral- by mouth
- Dermal- by skin
- Eye- by eye
- Inhalation- by lungs

Table 4.1 Oral, Dermal, and Inhalation Toxicity Ratings of Pesticides

Toxicity	Label signal words	Oral LD50 (mg/kg)	Dermal LD50 (mg/kg)	Inhalation LC50 (mg/l)	Lethal oral dose (150-lb person)
High	Danger/Poison	0–50	0–200	0–2,000	few drops to 3/4 tsp
Moderate	Warning	50–500	200–2,000	2,000–20,000	3/4 tsp to 1 oz+
Low	Caution	500–5,000	2,000–20,000	20,000+	1 oz+ to 1 pt
Very low	Caution	5,000+	20,000+	—	1 pt+

Dermal absorption rates - p 35

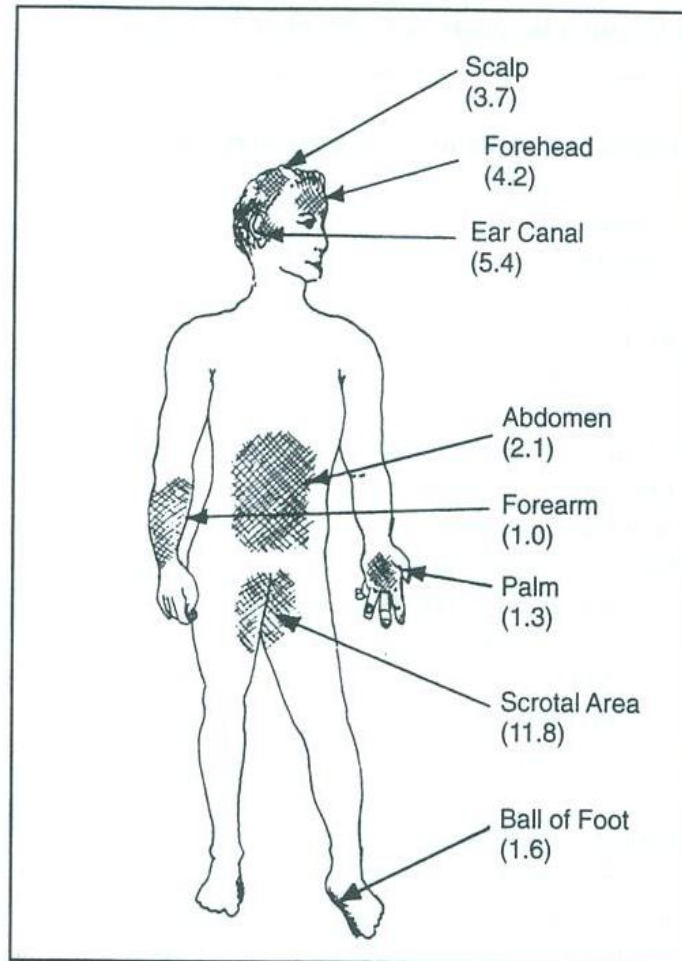


Figure 4.4 Dermal absorption rates as compared with the forearm.

Treatment for Exposure

- **Oral-** Check label or contact poison control
Do not use food containers to hold herbicide
- **Skin-** Rinse thoroughly with water, if clothing soaked removed pesticide soaked clothing and clean skin
Most serious dermal exposures is when a pesticide mixed with oil crosses the skin barrier and into the bloodstream, the results can be fatal.
- **Eye-** Rinse eye with water or eyewash bottle 15 min
- **Inhalation-** Move to better ventilated area

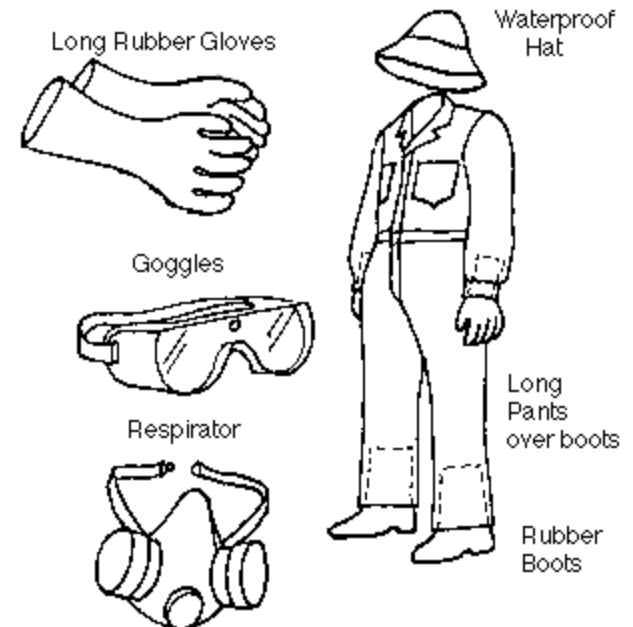
Personal Protective Equipment (PPE)

- Hat, long sleeves, trousers, socks and shoes
- During mixing boots, glove, apron, and goggles
- Wash PPE **separately** from other clothing at home

- Where on the label can you find the minimum PPE listed?

In the Precautionary Statement

- If you spill highly concentrated chemicals on your clothes do not clean them dispose of them properly



Respirators

- Label indicate if respirator is need for application
- Type of respirator is indicated and whether a prefilter is needed

- N- do not use with oil
- R- oil resistant
- P- oil proof
- HE- high efficiency

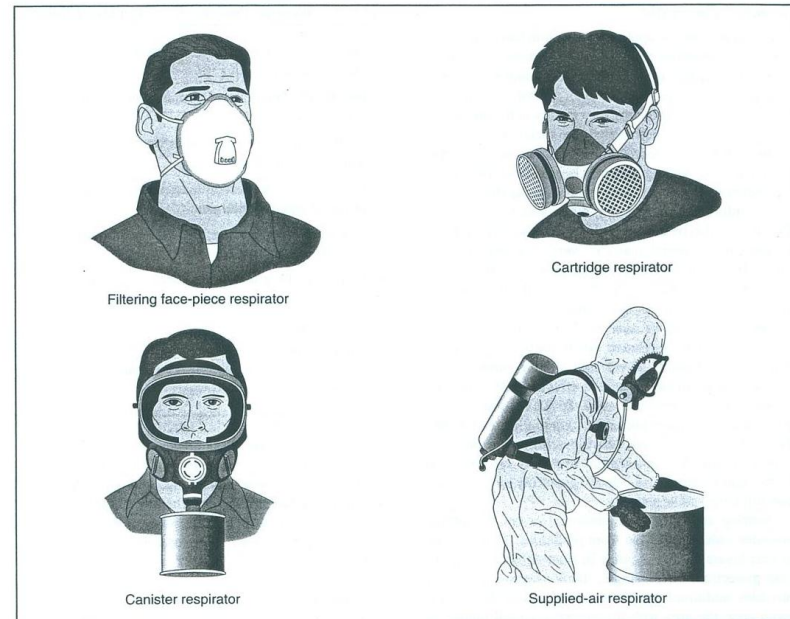


Figure 4.10 Respirators used for pesticide protection.

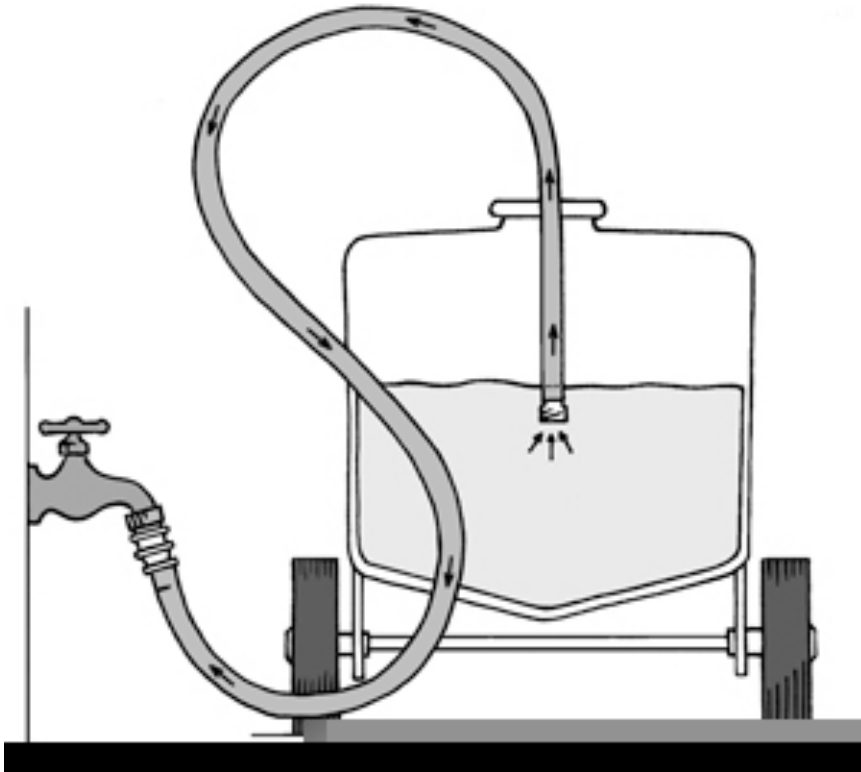


Other things to know

To protect others

Backsiphoning

- To prevent back-siphoning of pesticide back into the water supply (right) by keeping an air gap or using anti-siphoning devices on garden hoses (left).



Transporting Pesticides

- Check to make sure all containers are not leaking

- Do not transport with:

 - Food

 - Animal feed

 - Animal supplies

Tie down and secure containers

Pesticide Storage

- Store downwind and downhill from houses, play areas and ponds
- Store away from human and livestock areas to avoid contamination in case of fire
- If possible in a separate building – first floor, in cool dry area away from direct sunlight
- Signs posted with a locked door

Pesticide mixing & loading - p 47

- When filling, rinsing and draining equipment you should have a wash pad, wash rack or concrete apron with well designed sump to catch contaminated water

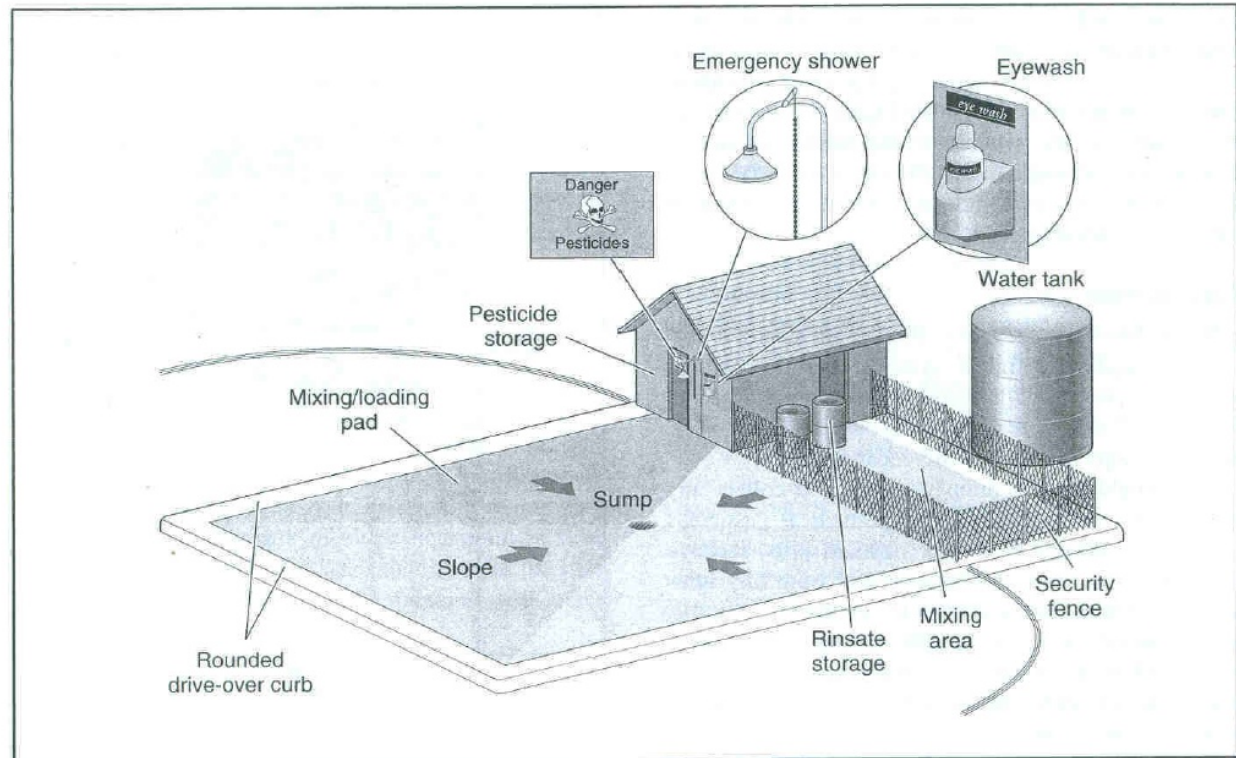


Figure 4.14 Pesticide mixing and loading area.

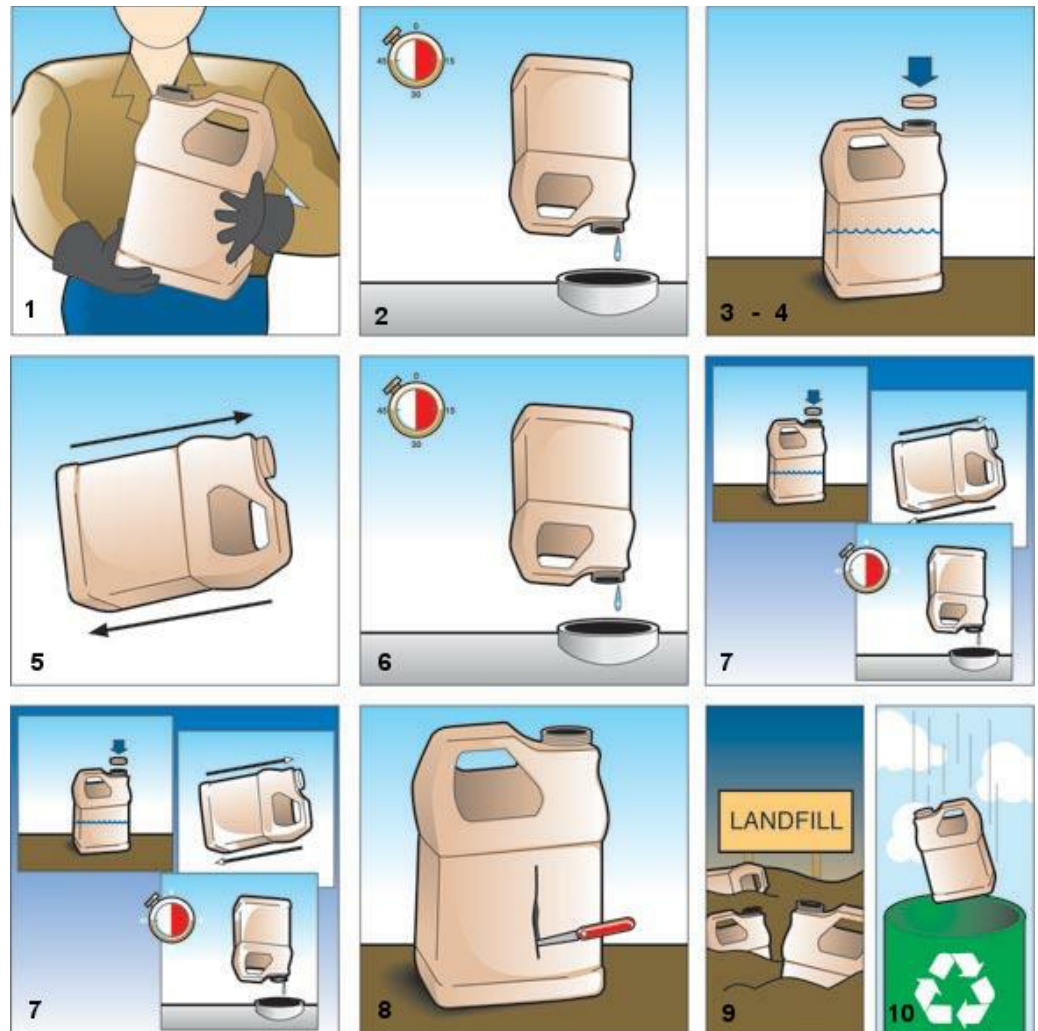
Large Quantity Containment Area

- Soap
- Pesticide absorptive material
- Fire extinguisher
- Broom & dustpan
- Trash can
- Keep Labels on containers

Pesticide Container Rinsing p 51

- At end of day
From backpack-
Spray remaining
herbicide on target
plants to empty

- Triple Rinsing
- Still have residue



Sample Questions

- What type of exposure occurs if chemical blows onto an operators chest?

Sample Questions

- What type of exposure occurs if chemical blows onto an operators chest?

Dermal exposure

Sample Questions

- If you spill **highly concentrated toxic** chemicals on your clothing how should you clean them?

Answer

- If you spill **highly concentrated toxic** chemicals on your clothing how should you clean them?

Do not clean them... dispose of them immediately and change into clean clothes

- 
- What is the most serious dermal exposure?



- What is the most serious dermal exposure?

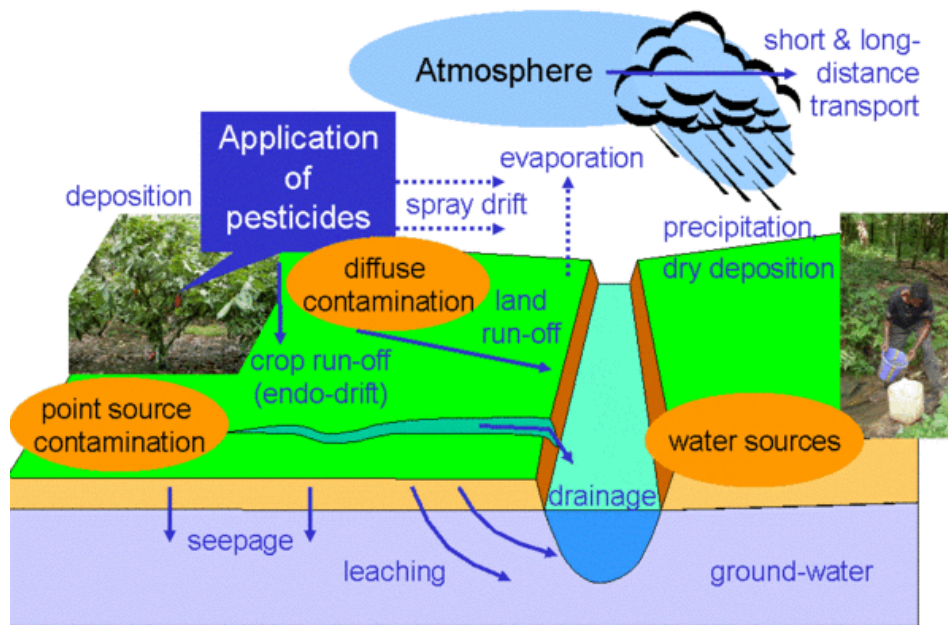
When a pesticide mixed with oil crosses the skin barrier and into the bloodstream, the results can be fatal.

CHAPTER 5: PESTICIDES IN THE ENVIRONMENT



Particle Drift

- Movement of spray particles, usually by the **wind** resulting in misapplication winds over 10mph shifting/ during periods of inversion



Leaching

Seepage

Runoff into surface water

-Nozzle pressure

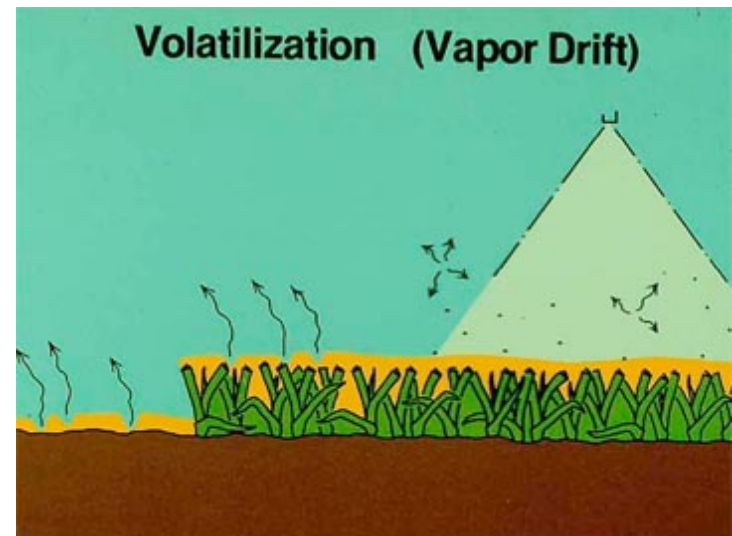
-Droplet size

-Spray height

Vapor Drift

- Vapors formed after application are carried out of target area, such as *volatilization* which can occur up to several days after application
- Typically occurs when product used in *hot* weather, not following label cautions

Both can result in off target damage to vegetation and people



Other factors

- Pesticides degradation (breakdown) is much slower in ground water because of the low oxygen and light conditions.

Soil texture and organic matter influence leaching ability

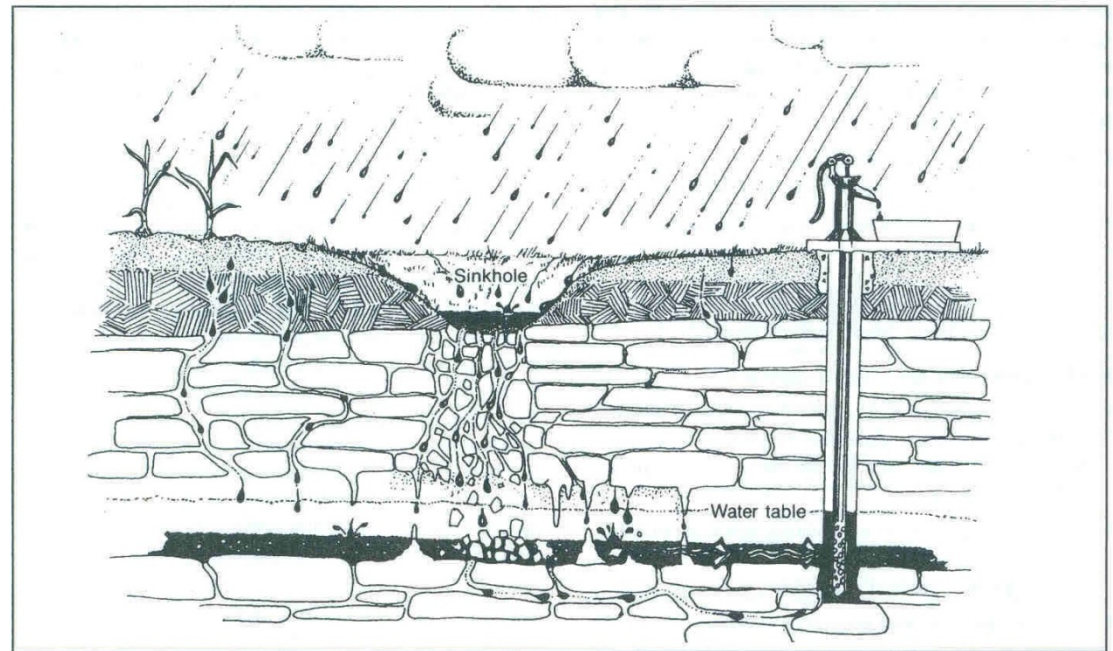


Figure 5.2 Sinkholes are very susceptible to run-in.

Pesticides and groundwater

4 factors

- Pesticide properties (adsorption and solubility)
- Soil properties (soil texture and organic matter)
- Site conditions (depth of groundwater, slope & climate)
- Management practices (mishandling, not following directions)

Example- Leaching occurs more on sandy soil or runoff on sloped areas

Statements on back of labels

- May not be mixed or loaded within 50 feet of intermittent streams...
- May not be applied aerially or by ground within 66 feet of the points...
- May not be mixed, loaded or used within 50 feet of all wells and sinkholes...

Spills p 58

- ❑ Do everything to stop the spill
- ❑ Attend to injured people, wear your protective equipment
- ❑ Confine spilled pesticides
- ❑ Contact the proper authorities for large spills- **Contact IEMA**
- ❑ Remove the spilled materials



Protecting Nontarget Species

- Use pesticides with low bee toxicity
- Spray when bees are not active
- Notify the beekeeper to remove bees- 48hr prior, within 3 miles

- Remember endangered plant and animal species are protected by the US Fish and Wildlife Service

Sample Questions

- When should you not spray to prevent drift?

Answer

- When should you not spray to prevent drift?

When winds are over 10 mph, wind is blowing towards sensitive areas, winds are shifting and during periods of calm/inversion.

Sample Question

- Which of these conditions is most likely to result in runoff?
 - a) Sloping areas
 - b) Areas with little ground cover
 - c) Intense rainfall
 - d) All of the above

Answer

- Which of these conditions is most likely to result in runoff?
 - a) Sloping areas
 - b) Areas with little ground cover
 - c) Intense rainfall
 - d) All of the above

Sample Question

- How do you determine if the pesticide you are using is prone to volatilization?

Answer

- How do you determine if the pesticide you are using is prone to volatilization?

Check the label, it often indicates.

Sample Question

- What are two ways for pesticides to move downwind to non-target areas?

Answer

- What are two ways for pesticides to move downwind to non-target areas?

By vapor drift and particle drift

Sample Question

- What is the major concern of drift?

Answer

- What is the major concern of drift?

Off target damage to vegetation and people



Sample Question

- What is the major complaint the Department of Agriculture receives about spraying?

Answer

- What is the major complaint the Department of Agriculture receives about spraying?

Spray drift from farms

Sample Question

- Who do you have to contact if you have a chemical spill?

Answer

- Who do you have to contact if you have a chemical spill?

Illinois Emergency Management Agency (IEMA) (*available 24 hours*). They will notify the appropriate agency

OR

Contact the emergency number on the label (*available 24 hours*)

Sample Questions

- What can be done to protect bees?
- When is the best time to spray if bees are in the area?

Answers

- What can be done to protect bees?

Notify beekeepers (link on IDA website):

- within 3 miles
- 48 hours prior to spraying

- When is the best time to spray if bees are in the area?

Dawn and dusk

Sample Question

- What pesticide is most harmful to honeybees since they may take it back to their colony?

Answer

- What pesticide is most harmful to honeybees since they may take it back to their colony?

Microencapsulated formulas

CHAPTER 6: EQUIPMENT AND CALIBRATION



Area Calculations



Make sure to have simple calculator ready
They do not allow cell phone calculator

The Comparative Measures, Weights, Abbreviations and Formulas page is to use for conversions and flow rates
Found in the last page of study guide.

Sample Calculations more help see p 64

□ From Page 78

16. What Gallons per Acre (**GPA**) is applied if your nozzles supply 1.4 GPM, are 60-inches apart, and you travel 15 MPH?

Which formula do we use we want GPA as answer?

How to solve

16. What GPA is applied if your nozzles supply 1.4 GPM, are 60-inches apart, and you travel 15 MPH?

Answer is in **GPA** and **question is in inches**

$$\text{Formula to use: } \mathbf{GPA} = \frac{\mathbf{GPM} \times \mathbf{5,940}}{\mathbf{MPH} \times \mathbf{W} \text{ (in inches)}}$$

16. What Gallons per Acre (GPA) is applied if your nozzles supply 1.4 GPM, are 60-inches apart, and you travel 15 MPH?

Answer is in GPA and question is in inches

$$\begin{aligned} \text{Formula to use: GPA} &= \frac{\text{GPM} \times 5,940}{\text{MPH} \times W \text{ (in inches)}} \\ &= \frac{1.4 \text{ GPM} \times 5,940}{15 \text{ MPH} \times 60 \text{ inches}} \\ &= 9.24 \end{aligned}$$

□ From Page 78

18. What Gallons per Minute (**GPM**) should your nozzles provide if you want to apply 30 GPA traveling 8 MPH with nozzles 20-inches apart?

Which formula do we use we want GPM as answer?

18. What **GPM** should your nozzles provide if you want to apply 30 GPA traveling 8 MPH with nozzles 20-inches apart?

Answer is in **GPM** and **question is in inches**

Formula to use:
$$\text{GPM} = \frac{\text{GPA} \times \text{MPH} \times \text{W inches}}{5,940}$$

18. What **GPM** should your nozzles provide if you want to apply 30 GPA traveling 8 MPH with nozzles 20-inches apart?

Answer is in **GPM** and **question is in inches**

$$\begin{aligned} \text{Formula to use: } \text{GPM} &= \frac{\text{GPA} \times \text{MPH} \times \text{W inches}}{5,940} \\ &= \frac{30 \text{ GPA} \times 8 \text{ MPH} \times 20''}{5,940} \\ &= 0.81 \end{aligned}$$



□ From Page 78

7. How much of a 20G pesticide is needed to provide 1 pound of A.I. ?

20G means 20 % per as a decimal .20 – G stands for Granular (dry form)

□ From Page 78

7. How much of a 20G pesticide is needed to provide 1 pound of A.I. ?

20G means 20 %

$$1 \text{ pound of a.i.} \times \frac{100\%}{20\% \text{ a.i. per product}} = 5 \text{ pounds}$$

□ From Page 78

8. How much of a 8 EC pesticide is needed to provide 1 pound of A.I. ?

8EC means 8 lbs of ai per gallon of product— EC stands for Emulsifiable Concentrate (liquid form)

□ From Page 78

8. How much of a 8 EC pesticide is needed to provide 1 pound of A.I. ?

8EC means 8%

$$\frac{1 \text{ pound of a.i. per } \underline{\hspace{2cm}}}{8 \text{ lb of a.i. per gallon of prod}} = .125 \text{ gallons}$$

Nozzles

- **Flat fan-** thin sheet of spray
- **Even flat fan-** thin sheet spray with uniform deposit
- **Hollow cone-** sprays in a circle, no droplets in center
- **Solid cone-** sprays in a circle droplets throughout

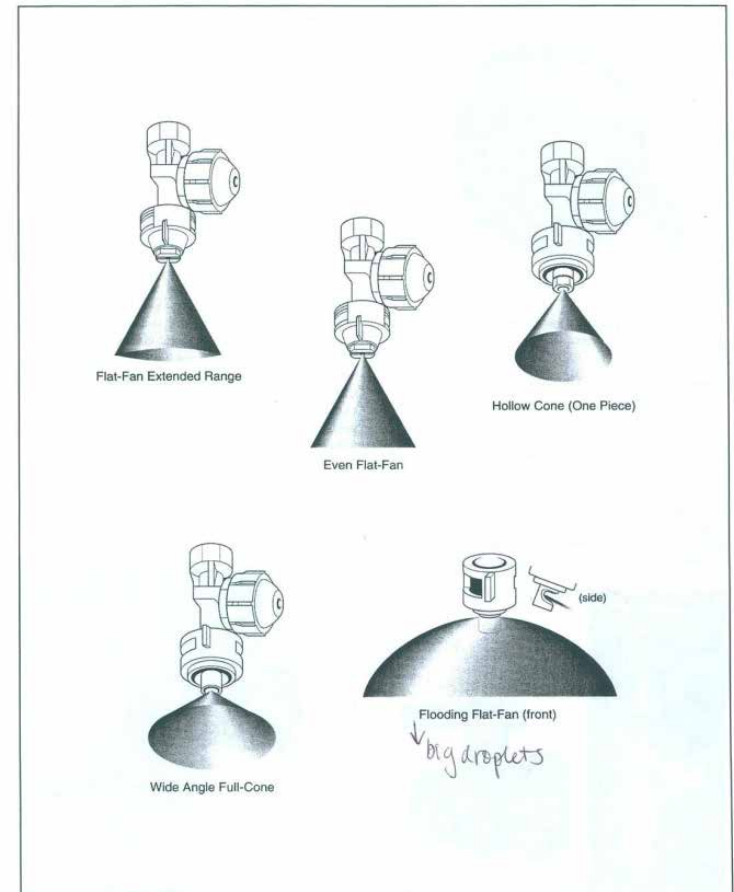


Figure 6.15 Nozzles have different spray patterns including flat-fan, even flat-fan, hollow cone, full cone, and flood.

Boom Sprayer Height

- Raising the boom sprayer does what?



<http://www.arnoldsinc.com/cih-sprayers.htm>



http://www.norac.ca/media/ca/en/image/product/preview/page_sprayhtcontrollers.jpg

Boom Sprayer Height

- Lowering the boom sprayer does what?



<http://www.arnoldsinc.com/cih-sprayers.htm>

It reduces or eliminates the overlap, but it increases the amount of drift

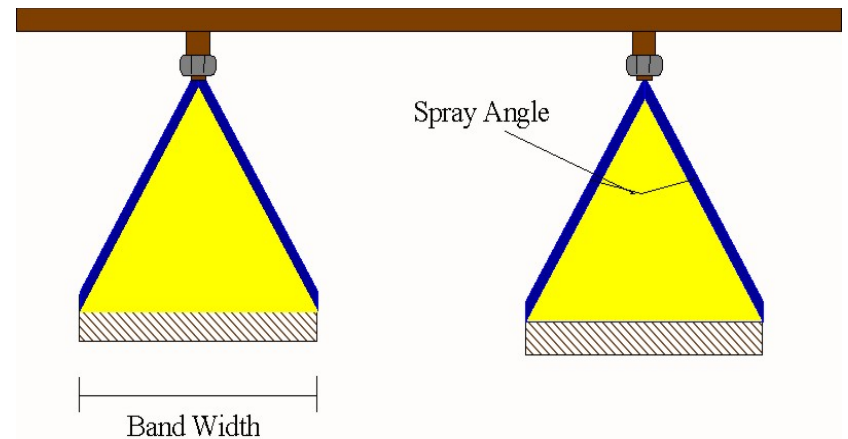


http://www.norac.ca/media/ca/en/image/product/preview/page_sprayhtcontrollers.jpg

Sample Questions

- Which nozzle type provides a thin sheet spray with uniform deposit?

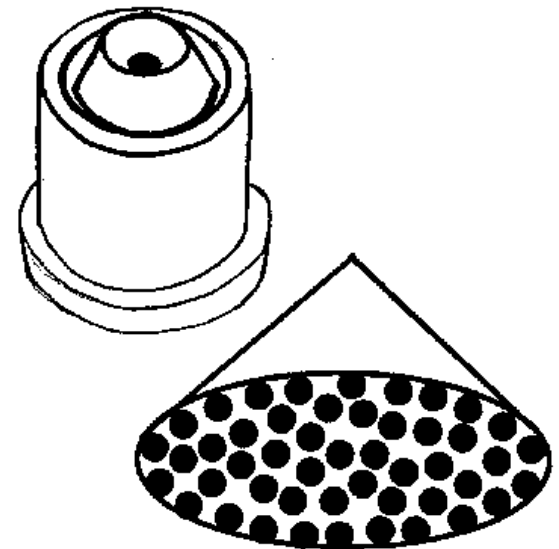
Even flat fan



- What type of nozzle sprays in a cone pattern with droplets throughout?

Solid- cone

FIGURE 2G - Full-cone



CHAPTER 7: PESTICIDES LAWS AND REGULATIONS



Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

- It regulates the use of pesticides to protect humans, wildlife and the environment
- Administered by the U.S. EPA
- Pesticide classification
- Pesticide registration
 - general use
 - restricted use- too hazardous for general public

Federal Environmental Pesticide Control Act (FEPCA)- 1972

- Covers pesticide manufacturing, shipment and use
- Requires states to have similar FIFRA

Food Quality and Protection Act (FQPA)- 1996

- Special provision for infants and children
- Minor use registrations
- Endocrine disruptor testing



Office of Safety and Health Administration (OSHA)

- “*Worker Right-to-Know*” intended to protect our nations workers through dissemination of chemical safety information on labels, MSDSs and training programs

Worker Protection Standards (WPS)

- Informs employees about the hazards of pesticides, how to reduce exposure to pesticides and to mitigate exposures that occur.
- Anyone that employs pesticide handlers or agricultural workers must comply with the Worker Protection Standards (WPS)

Illinois Environmental Protection Agency (IEPA)

- Hazardous waste laws
- Spills and illegal disposal
- Laws regulating air, land and water quality

Clean Water Act (CWA)

- Regulates water pollution in navigable waters



http://mjcdn.motherjones.com/preset_16/frontline.jpg

Illinois Department of Public Health (IDPH)

□ Administers the Illinois Structural Pest Control Act

Indoor pests, birds, wood treatment



Illinois Department of Agriculture (IDA)

- Illinois Pesticide Act regulates
 - Pesticides
 - Agricultural Pesticides
 - Certification & Licensing
 - Misuse Investigation

State lead agency for administration
of the Illinois Pesticide Act



Sample Questions

- What is the FIFRA?

Sample Question

- What is the FIFRA?

The **F**ederal **I**nsecticide, **F**ungicide and **R**odenticide **A**ct administered by the U.S. Environmental Protection Agency (USEPA) that regulates pesticide use and registration

Sample Question

- What **federal** agency regulated the registration of pesticides and the proper certification of pesticide applicators in the US?

Sample Question

- What **federal** agency regulated the registration of pesticides and the proper certification of pesticide applicators in the US?

U.S. Environmental Protection Agency (USEPA)

Sample Question

- What act regulates the registration, storage, handling and distribution of pesticides in the **state** of Illinois?

- What act regulates the registration, storage, handling and distribution of pesticides in the state of Illinois?

Illinois Pesticide Act

Sample Question


- What law is administered by the Occupational Safety and Health Administration (OSHA) that requires that employees be informed of the pesticides and other hazardous chemicals in the workplace?

- What law is administered by the Occupational Safety and Health Administration (OSHA) that requires that employees be informed of the pesticides and other hazardous chemicals in the workplace?

Worker-Right-to-Know Law

Sample Question

- What agency administers the **Structural** Pest Control Act which regulates wood treatment and other pests inside houses or other structures in Illinois?

- 
- What agency administers the **Structural** Pest Control Act which regulates wood treatment and other pests inside houses or other structures in Illinois?

Illinois Department of Public Health

Sample Question

- What agency serves as the state lead agency for administration of the Illinois Pesticide Act?

- 
- What agency serves as the state lead agency for administration of the Illinois Pesticide Act?

Illinois Department of Agriculture

Sample Question

- How many years must records of restricted pesticide applications be maintained?

- 
- How many years must records of restricted pesticide applications be maintained?

2 years

Sample Question

- Which of the following is important to consider when purchasing and applying a pesticide?
 - a) The label is a legal document
 - b) Before you buy and apply a pesticide read the label
 - c) A General Use pesticide is not given a classification on the label
 - d) All of the above

Sample Question

- Which of the following is important to consider when purchasing and applying a pesticide?
 - a) The label is a legal document
 - b) Before you buy and apply a pesticide read the label
 - c) A General Use pesticide is not given a classification on the label
 - d) All of the above