

# INSECT MANAGEMENT AND INSECTICIDES

MVES Training 2017  
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## PROBLEMS WITH INSECTICIDES

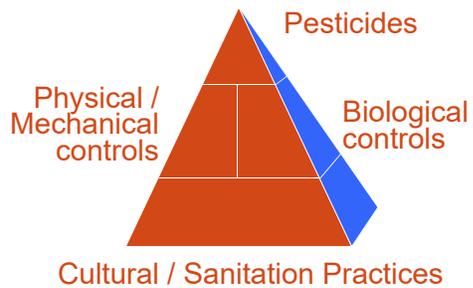
- Heavy use resulted in resistance
  - Selection for individuals possessing natural resistance traits
- Bioaccumulation in food chain
- Toxicity to wildlife, humans
- Secondary pest problems



## INTEGRATED PEST MANAGEMENT

- IPM - a strategy that
  - focuses on long-term suppression of pests
  - uses a combination of control tactics
  - minimizes pesticides' negative impact on people and the environment
  - strives to be economical

## THE IPM PYRAMID



NON-CHEMICAL  
CONTROLS FOR PESTS



## PESTICIDES

- Any substance or mixture of substances used for controlling, preventing, destroying, repelling, or mitigating pests.

## PESTICIDES INCLUDE:

- Insecticides
- Herbicides
- Fungicides
- Bactericides
- Repellents
- attractants



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AGRI LIFE  
EXTENSION



## INSECTICIDE MODES OF ACTION

- Nervous system poisons
- Metabolic inhibitors
- Hormone mimics
- Physical poisons
- Repellents
- Attractants

## NOT ALL PESTICIDES ARE EQUALLY HAZARDOUS!

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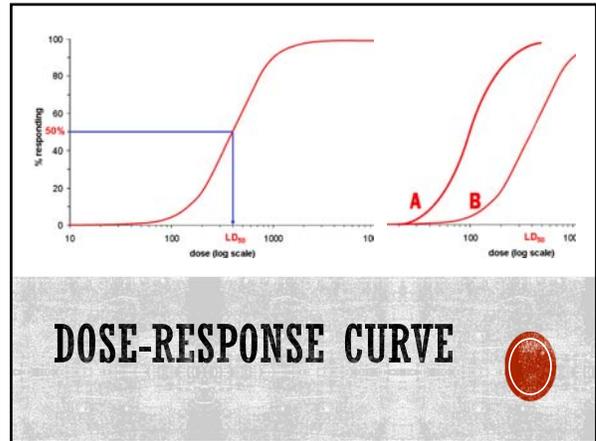
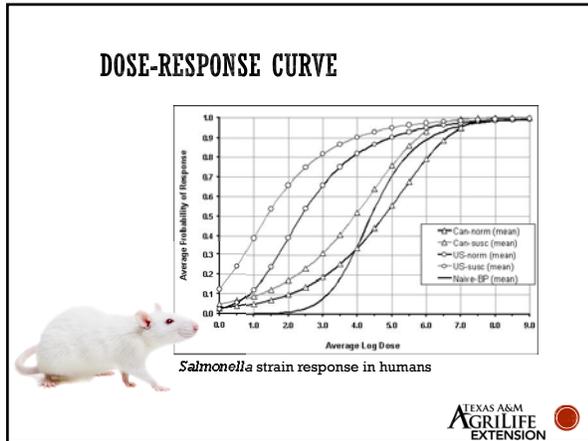


## IS THAT SAFE?

## THE DOSE MAKES THE POISON

- Paracelsus (1493-1541)
- "All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy."





### SOME TERMS

- LD<sub>50</sub> (Lethal Dose 50) - The amount of material needed to kill half of a test population
- Mg/Kg - The amount of toxin (in milligrams) per Kilogram of body weight of the test subject (equals parts per million)

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### EPA PESTICIDE TOXICITY CLASSES

	Extremely Toxic	Very Toxic	Moderately Toxic	Slightly Toxic
Toxicity Category	I	II	III	IV
Signal Word	Danger	Warning	Caution	Caution
Oral LD <sub>50</sub> (mg/Kg)	0 - 50	50 - 500	500 - 5,000	> 5,000
Equivalent Lethal Dose for 150 lb human	Less than a teaspoon	Teaspoon to an ounce	Ounce to a Pint	Pint to a quart or more

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TOXICITY

Keep Out of Reach of Children

**WARNING** DANGER PELIGRO **POISON**

Precautionary Statements

Causes Irritable Eye Damage

Causes Skin Irritation - May Be Fatal if Swallowed

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### Pesticide Safety

**Acute toxicity**  
Rapidly produced toxicity, usually resulting from a single exposure

**Chronic toxicity**  
Toxicity due to slow action or long-term exposure

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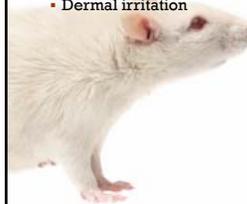
### Possible chronic effects:

- Carcinogenicity-cancer
- Mutagenicity-genetic mutation
- Teratogenicity-birth defect
- Oncogenicity-tumors
- Reproductive effects
- Delayed neurological effects



### TESTS REQUIRED TO REGISTER A PESTICIDE

- Acute oral toxicity
- Acute dermal toxicity
- Acute inhalation
- Acute intraperitoneal
- Eye irritation
- Dermal irritation
- Dermal photosensitization
- Acute delayed neurotoxicity
- 90-day rat feeding study
- 12-month dog feeding study
- 21 & 90-day dermal
- Lifetime rat feeding study
- Lifetime mouse feeding study
- Teratology (rat)
- Teratology (rabbit)
- Reproduction
- Excretion/metabolism & accumulation
- Antidote
- Mutagenicity



I FEEL BETTER NOW



IT IS IMPOSSIBLE TO PROVIDE  
EXPERIMENTAL EVIDENCE THAT ANYTHING  
IS ABSOLUTELY SAFE!



TOXICITY X EXPOSURE =  
HAZARD

WE MANAGE RISKS DAILY

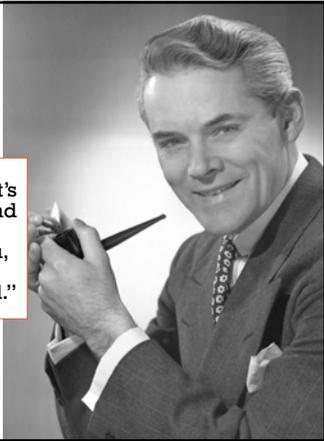


### PESTICIDE LABELING



## IS THAT SAFE?

“If you use the insecticide in the way it’s designed to be used and follow the label directions, risks to you, your children or your pets should be minimal.”



## PESTICIDE LABELING

- Most important source of information
- The label is the Law
- Read the label
  - before you buy/sell the product
  - before you use the product
  - before you dispose of the product



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## LABEL EXERCISE

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**FINDING THE LABEL**

1. Can this much rain impact the efficacy of Bayer Advanced® 12 Month Tree & Shrub Insect Control Landscape Formula II?
2. Does the size of the tree make a difference?
3. How long does Bayer Advanced 12 Month Tree & Shrub Insect Control Landscape Formula II last?
4. Can I use Bayer Advanced 12 Month Tree & Shrub Insect Control Landscape Formula II on my house?
5. Can I use Bayer Advanced 12 Month Tree & Shrub Insect Control Landscape Formula II on my lawn?

## PARTS OF A LABEL

- Names
- Formulation type
- Precautionary information
- Instructions for use
- Allowed sites



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## NAMES...

- Trade name is a proprietary name used by a company (e.g., Demon®)
- Common name is the generic name for the pesticide (e.g., cypermethrin)
- Chemical names (sometimes) on labels, for example:  
 $(\pm)$   $\alpha$ -cyano-(3-phenoxyphenyl)methyl(+)-cis, trans-3-(2,2-dichloroethenyl)2,2-dimethylcyclopropane carboxylate  
**cypermethrin**



## PARTS OF A LABEL: FORMULATION

- Make the active ingredient safer and easier to use
- Examples:
  - Granules
  - Baits
  - Dusts
  - Liquid concentrates
  - Aerosols
  - Suspensions
  - RTU (ready to use)



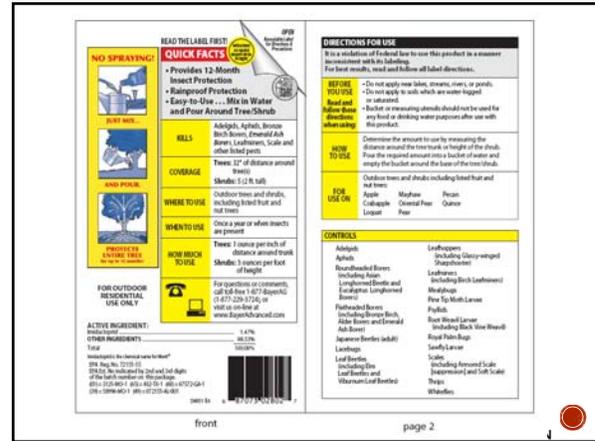
## PARTS OF A LABEL

- Precautionary statement
- First aid
- Environmental statement
- EPA Registration number
- Directions for use
- Disposal instructions



## EXAMPLES OF ALLOWED SITES

- Indoors, residential
- Indoors, commercial
- Food handling areas, kitchens
- Outdoor landscapes
- Indoor plantscapes
- Residential lawns
- Commercial lawns
- Vegetable gardens
- Fruit and nut trees
- Around building/home foundations



## LEEWAY WITH LABELS?

- Very little
- Can use on pests not listed only if the site of application is listed
- In most cases you can use **LOWER** rate than on the label



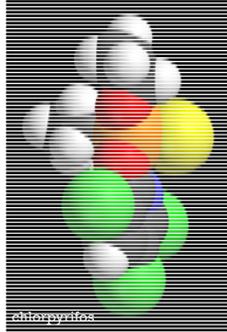
## REVIEW OF PESTICIDE SIGNAL WORDS

- Caution
  - LD<sub>50</sub> greater than 500 mg/Kg
- Warning
  - LD<sub>50</sub> 50-500 mg/Kg
- Danger - Poison
  - LD<sub>50</sub> less than 50 mg/Kg



## CLASSIFYING INSECTICIDES BY CHEMICAL CLASS

- Organophosphates
- Carbamates
- Botanicals
- Pyrethroids
- Neonicotinoids
- Others



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## ORGANOPHOSPHATES

- Many formerly common pesticides
  - chlorpyrifos (Dursban)
  - diazinon
  - acephate (Orthene)
  - malathion
- Disappearing from market



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## BOTANICALS

- Pesticides derived from plants
  - pyrethrins
  - neem extracts & oils
  - rotenone
  - Mint oils
  - citrus oils
  - clove oil
  - other essential oils



Neem seed

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*Chrysanthemum cinerariifolium*  
*C. coccineum*

## PYRETHRINS

- From ground-up flower heads of pyrethrum daisies
- A natural combination of six compounds: pyrethrins I and II, jasmolin I and II, and cinerin I and II
- More uses approved than any other insecticide
- Usually includes a "synergist"



## PYRETHROIDS

- Synthetic chemicals based on pyrethrins chemistry
- Broad spectrum replacements for Dursban®, diazinon
- Low in toxicity to birds and mammals, but hazardous to fish in some settings



## PYRETHROIDS

- Usually recognized by suffixes:
  - -ATE
    - Esfenvalerate
    - Fluvalinate
  - -THRIN
    - Permethrin
    - Bifenthrin
    - Cyfluthrin
    - Allethrin
    - Sumithrin
    - Others



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## NEONICOTINOIDS

- New class of systemic (water soluble) pesticides
  - imidacloprid (Bayer)
  - dinotefuran (Spectracide?)
- Effective against
  - Homoptera
  - Coleoptera (chewing, boring)
  - Thysanoptera
- Relatively low in mammalian, bird toxicity.
- Toxic to pollinators



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## NEONICOTINOID CONTROVERSIES

- Several studies claim to show that neonicotinoids cause colony collapse disorder (CCD)
- Bee researchers in U.S. claim that CCD is result of multiple factors, neonic a minor problem
- Conservationists pressing EPA for bans or restrictions on these pesticides
- Urban use accounts for very minor slice of overall neonicotinoid market
- New labels and labelling will address the issue



## WHAT ABOUT ORGANIC? ORGANIC VS. SYNTHETIC INSECTICIDES

- “organic” pesticides include products derived from natural sources
- Synthetic pesticides are human-produced



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## ARE ORGANIC PRODUCTS INHERENTLY SAFE?



Giant hogweed

Poison Ivy

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## EVEN PLANTS HAVE CARCINOGENS!

- Tobacco (leaf) - 7 carcinogens
- Strawberry (fruit) - 7 carcinogens
- Onion (bulb) - 6 carcinogens
- Tea (leaf) - 6 carcinogens
- Carrot (root) - 6 carcinogens
- Cauliflower (leaf) - 5 carcinogens
- Grapefruit (fruit) - 5 carcinogens



Source: Phytochemical Database, USDA - ARS - NGRL  
<http://www.ars-grin.gov/duke/activity.html>

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## LOW IMPACT INSECTICIDES

- Insecticides with minimal impact on people and on beneficial organisms, including beneficial insects

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### LOW IMPACT INSECTICIDES

- Baits
  - Mixture of an insecticide with some sort of food attractive to pest. Generally low percentage active ingredients make these relatively safe.
  - Examples: fire ant baits, containerized cockroach baits, granular ant, cockroach and cricket baits



### LOW IMPACT INSECTICIDES

- Botanicals
  - Derived from plants. Although some active ingredients are toxic, generally formulated as a low percentage a.i. and degrade quickly in the environment.
  - Examples: pyrethrum, neem extract, essential oils, others...



### LOW IMPACT INSECTICIDES

- Insect growth regulators
  - Based on insect hormones unique to arthropods
  - Disrupts reproduction, molting, other growth processes
  - Excellent safety record
  - Products for fire ants, white grubs, fleas, others



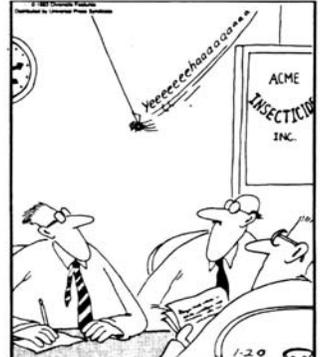
### LOW IMPACT INSECTICIDES

- Other low toxicity pesticides
  - Kill through physical or stomach poison action.
  - Generally non-toxic on skin.
  - Examples
    - silica aerogel,
    - diatomaceous earth,
    - boric acid and borate compounds
    - sulfur



### CHOOSE LOW-IMPACT INSECTICIDES WHEN YOU CAN

**THE FAR SIDE** By Gary Larson



1-20

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