

# Chapter 13 Integrated Pest Management and Pesticide Use



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# Learning Objectives



What is IPM and why it's important



What are the principal steps of an IPM program



What are pesticides



Why it's important to read and understand the label



Types of chemical control used around the home

# What is IPM?

## Integrated Pest Management

A strategy that

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

# How TDA Defines Integrated Pest Management (IPM)?



a pest management strategy that relies on multiple pest control tactics



including the judicious use of pesticides



informed by accurate identification and scientific knowledge of pests



reliable monitoring methods to assess pest presence



preventative measures to avoid pest infestations



and thresholds to determine when corrective control measures are needed.



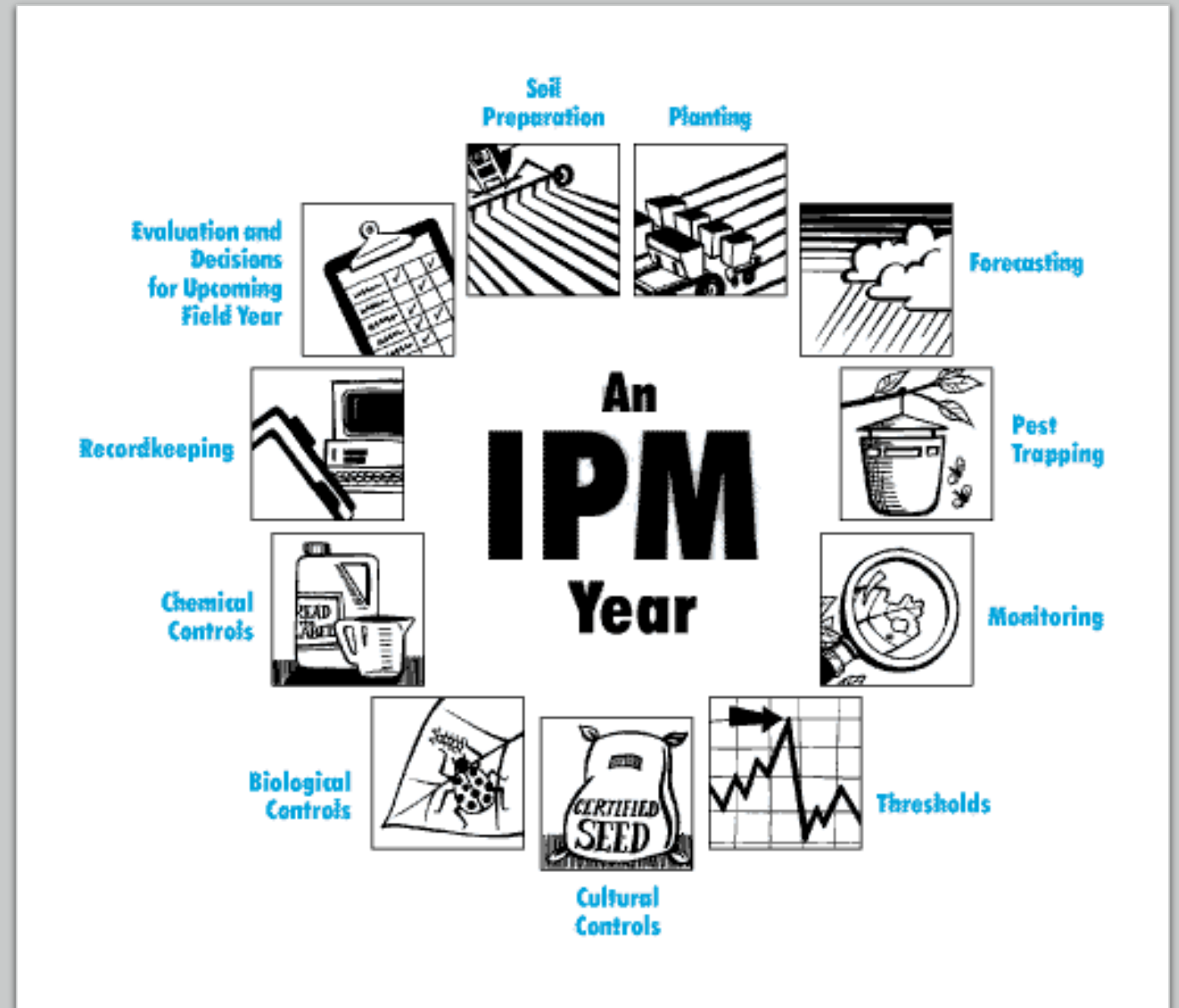
# Practicing Green Landscaping

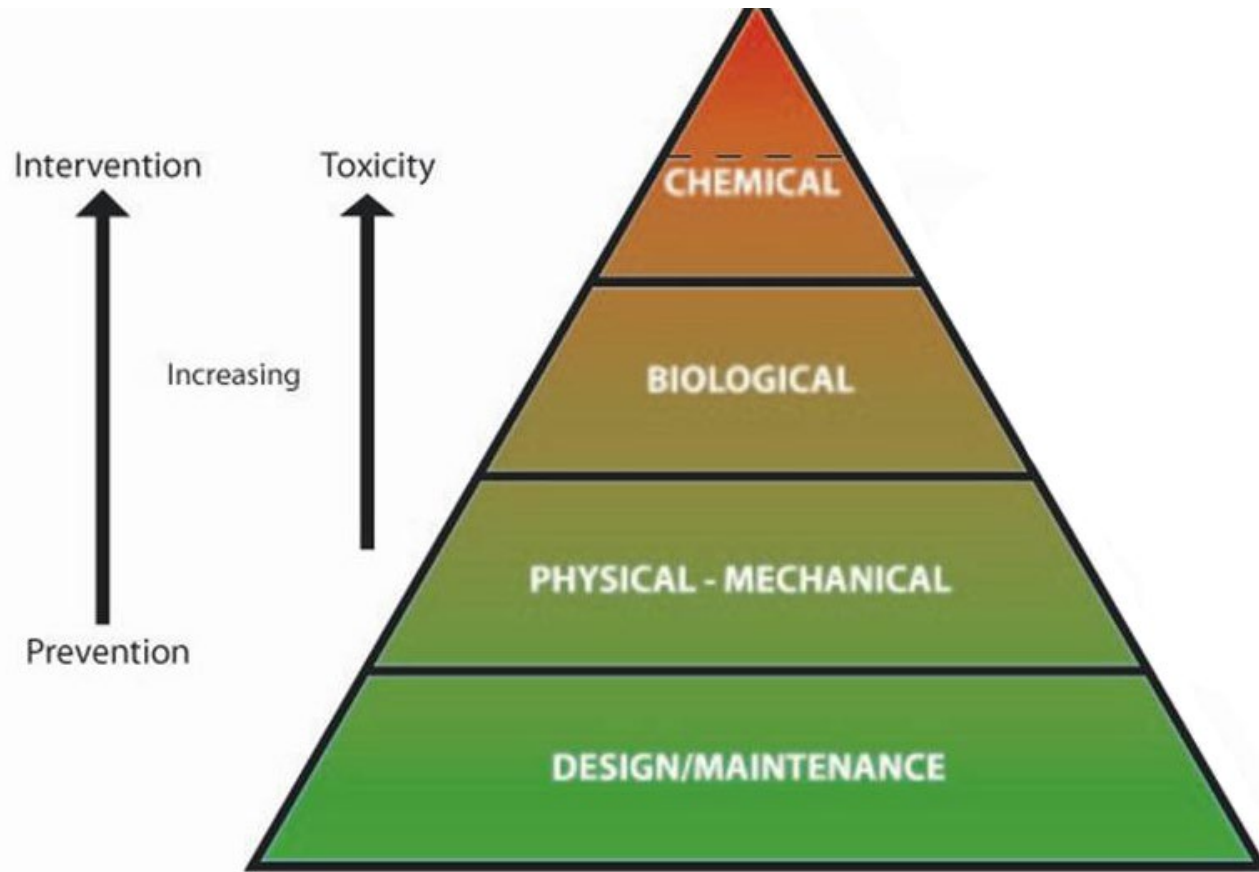
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- Efficient watering
- Planting ornamentals & shrubs wisely
- Building healthy soil
- Limited use of insecticides and herbicides

# Ingredients to an IPM Program

- Identify the problem
- Know the enemy
- Taking Action
- Evaluate your measures





The IPM  
Pyramid

# Identify the Problem

- Before you act, know what to act on
  - Plants under environmental stress
  - Is it a disease or insect
  - Is it temporary or on-going
  - Could the problem be?
    - Poor growing conditions
    - Too much moisture, not enough
    - Too much sun, not enough



# Friend or Foe

- Beneficial insects' prey on harmful insects
- Examples:
  - Lady beetles
  - Fireflies
  - Green lacewings
  - Praying mantids
  - Spiders





# OUR FRIENDS the Pollinators

A Handbook of Pollinator Diversity and  
Conservation in East Africa

Dino J Martins

## Beneficials need love too

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- Pollinate your plants
- Decompose organic matter
- Chemicals can harm beneficial insects
- If in doubt, ask
  - Collect samples take to Extension office, gardening center, look up on internet or book
  - iNaturalist <https://www.inaturalist.org/>
  - Google Lens <https://lens.google.com/>
  - <https://extensionentomology.tamu.edu/resources/insects/>

# Creating a Haven for Beneficials

- They need three things
- Food
  - Pollen and nectar
- Water
  - Keep it fresh – stagnant water attracts the wrong type
- Shelter
  - Growing the right plants



# Keeping the bad pests out Control Measures

- Removal
- Barriers
- Repellants
- Traps
- Biological controls
- Least-toxic controls



# Things to remember when you are in the garden

A good gardener always plants 3 seeds - one for the bugs, one for the weather and one for himself.

- Leo Aikman

One for blackbird, one for the crow, one for the cutworm, and one to grow.

- American saying

# Removal

- 100% effective for species specific
- Must watch plants for signs of damage
- Can pick off or mash harmful insects
- Blast of water remove aphids
- Pruning shears remove tent caterpillars
- Uproot weeds that have spreading roots
- Use mechanical weed puller



# Removal





# Barriers

- Keep pests out of areas
  - Floating row covers
    - Lightweight, keep flying insects out – grasshoppers
  - Netting
    - Birds off, especially fruiting plants
  - Copper Slug Barrier
    - Slugs can't cross copper use on pots, raised beds
  - Protective Collars
    - Good for new seedlings, young growth, remove





## Barriers

# Traps

- Attract target pests to capture
  - Sticky traps
    - Sticky surface, sometimes has smell
    - Mice, rats, roaches
  - Japanese beetle traps
    - Fermenting mush of fruit placed in trap
  - Slug and snail traps
  - Wasp and yellow jacket traps
    - Great for picnics or large gatherings







# Biological Controls

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- Using living organisms to control pests
- Ladybugs
  - Aphids, soft body insects
- Lacewings
  - Aphids, scales, spider mites, soft body insects
- Predatory mites
  - Spider mites and other pest mites
- Trichogramma Wasps
  - Moth and butterfly eggs, some research on fire ants



# Chemical Controls - Pesticides

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- Any substance or mixture of substances designed to
  - control
  - prevent
  - destroy
  - repel
  - attract
  - or otherwise mitigate pests

# Pesticide use in the U.S.

[https://www.epa.gov/sites/production/files/2017-01/documents/pesticides-industry-sales-usage-2016\\_0.pdf](https://www.epa.gov/sites/production/files/2017-01/documents/pesticides-industry-sales-usage-2016_0.pdf)

Figure 2.2  
User Expenditures on Pesticides in the U.S.  
by Pesticide Type and Market Sector, 2001 Estimates

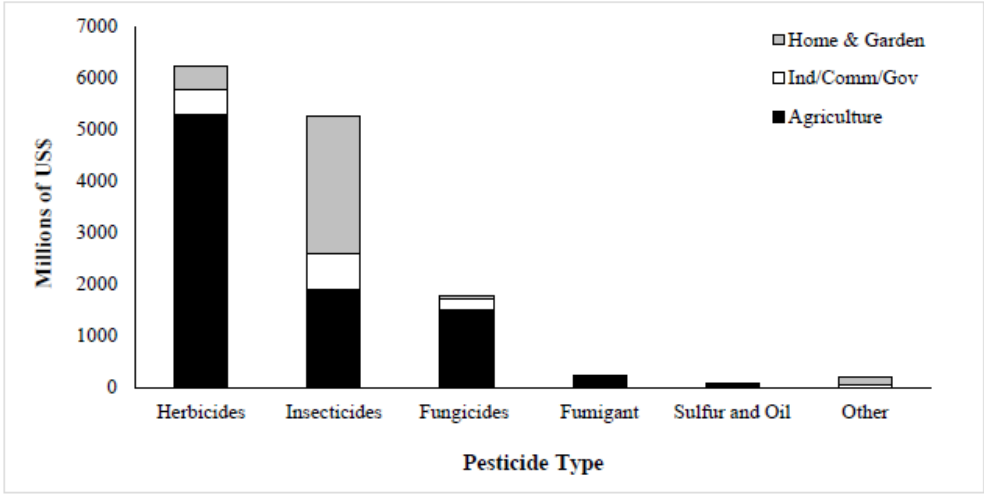
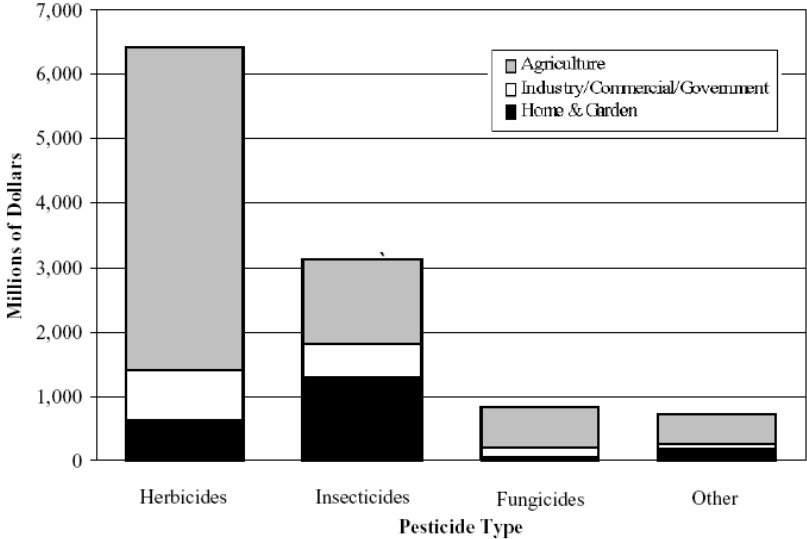


Figure 2.2. User Expenditures on Pesticides in the United States by Pesticide Type and Market Sector, 2012 Estimates

# Pesticide use in the U.S.

## 2001

- \$11 billion total sales (\$3 billion insecticides)
- 15% of insecticide sales are structural, horticultural and government use
- 15 million lbs. per year in Industry/commercial/government sector

## 2012

- \$14 billion in total sales and \$13 billion in 2009
- 33% of insecticide sales are structural, horticultural and government use
- 48 million lbs. per year per year in industry/commercial/government sector
- 59 million lbs. for home and garden



# How insecticides work: Modes of action

- Nervous system poisons
  - Acts on the nerve
- Metabolic inhibitors
  - Affect ability of target to process food
- Hormone mimics
  - Disrupt normal growth & reproduction
- Physical poisons
  - Physically damage insect
- Repellents & attractants
  - Attracts like sex pheromones used in traps to lure



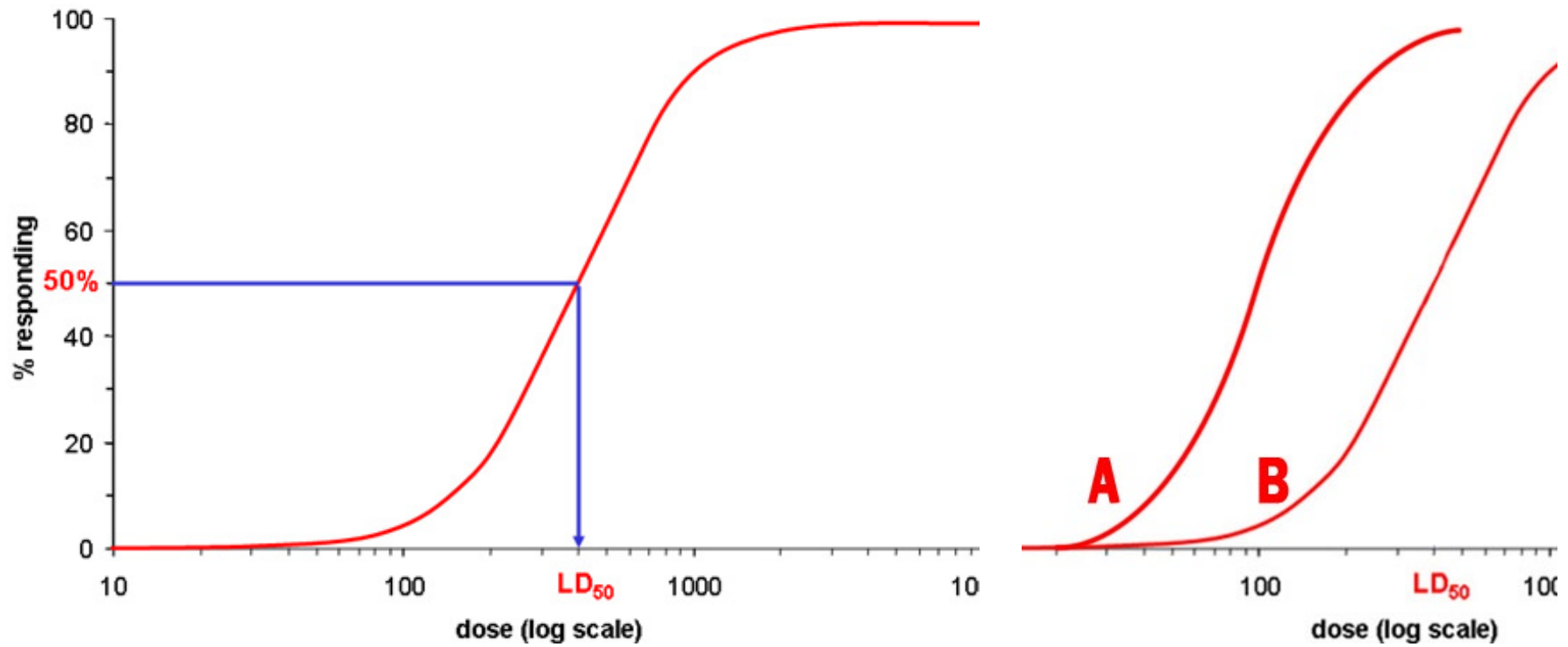
NOT ALL INSECTICIDES ARE  
EQUALLY HAZARDOUS!

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.”





# Dose-Response Curve

# Some terms

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- $LD_{50}$  (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)



# 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





**Herbicide**

\*Trademark of Dow AgroSciences LLC

For selective postemergence grass weed control in rice

Active Ingredients:

cyhalotrin 2-(4-cyano-2-fluorophenoxy) propionic acid, butyl ester, (S)	20.0%
_____	70.0%
<b>Total</b>	<b>90.0%</b>

Contains 2.36 lb of active ingredient per gallon.  
Contains petroleum distillates.

EPA Reg. No. 62719-057

**Keep Out of Reach of Children**

**WARNING AVISO**

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

**Precautionary Statements**

Hazards to Humans and Domestic Animals

application. When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240 (b) (4-6)), the handler PPE requirements may be reduced or modified as specified in the WPS.

**User Safety Recommendations**

Wear should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove clothing worn during treatment. Wash the clothing separately from other laundry.



# Pesticide Safety

## Acute toxicity

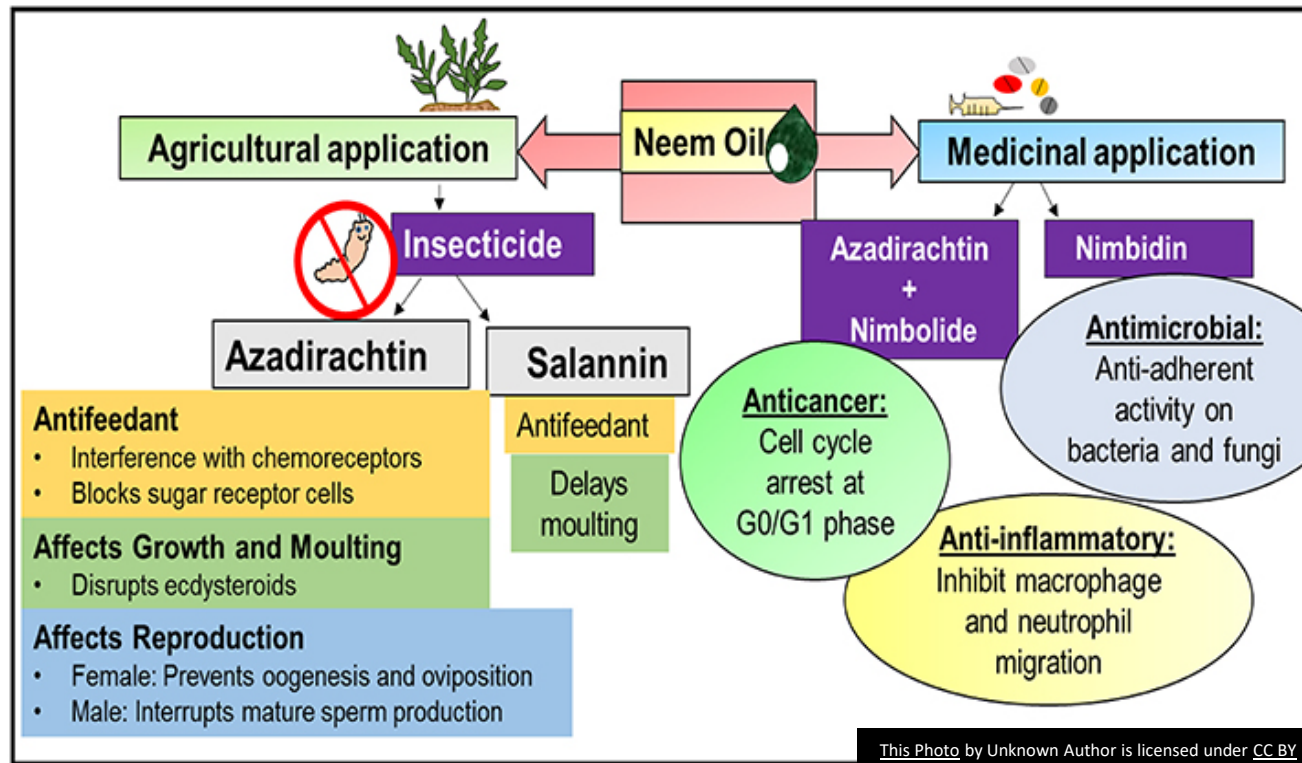
Rapidly produced toxicity, usually resulting from a single exposure

## Chronic toxicity

Toxicity due to slow-action or long-term exposure to a poison



# Possible chronic effects:



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

# Tests to register a pesticide must include chronic toxicity evaluations

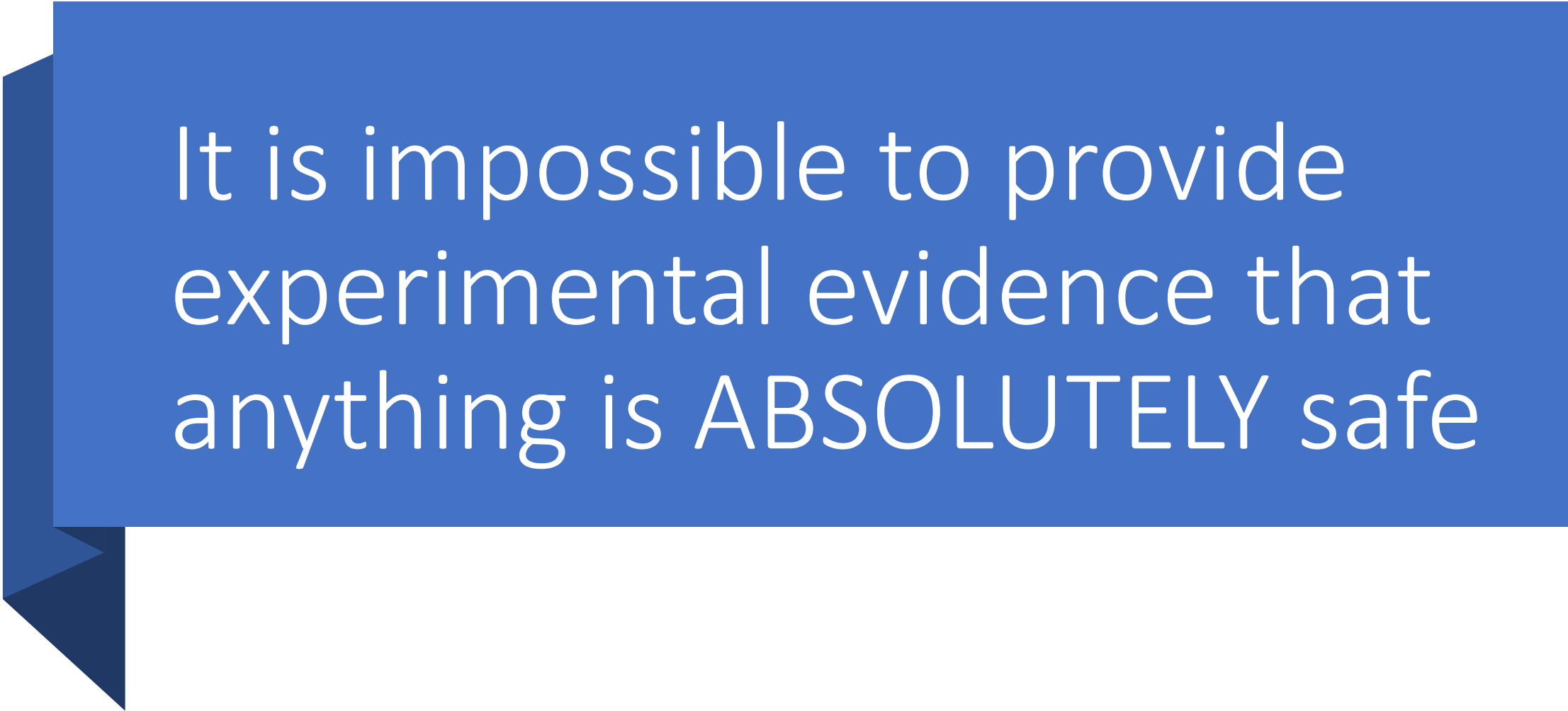
- Acute oral toxicity
- Acute dermal toxicity
- Acute inhalation
- Acute intraperitoneal
- Eye irritation
- Dermal irritation



- 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



Do you feel better now?



It is impossible to provide  
experimental evidence that  
anything is ABSOLUTELY safe



NEVER ALLOW CHILDREN  
UNDER LEGAL DRIVING AGE  
TO DISPENSE FUEL

### HEALTH WARNING

- Long-term exposure to gasoline vapor can cause cancer in laboratory animals
- Avoid prolonged breathing of vapors
- Keep face away from nozzle and tank
- Keep away from eyes and skin
- Never siphon with mouth
- Harmful or fatal if swallowed

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When using a debit card for fuel purchases at the pump, your bank may place a monetary "hold" on your account for several days. Corner Store is not responsible for holds on our customers' accounts. Please contact the bank issuing your debit card with any questions.

Thank you for your business!

Quando use su tarjeta de débito para pagar por gasolina, su banco puede hacer una "retención" de una suma de dinero en su cuenta por algunos días. Corner Store no se responsabiliza de las retenciones de las cuentas de nuestros clientes. Por favor, póngase en contacto con el banco que le otorgó su tarjeta de débito para más detalles.

# WE MANAGE RISKS DAILY

TOXICITY X EXPOSURE =  
HAZARD



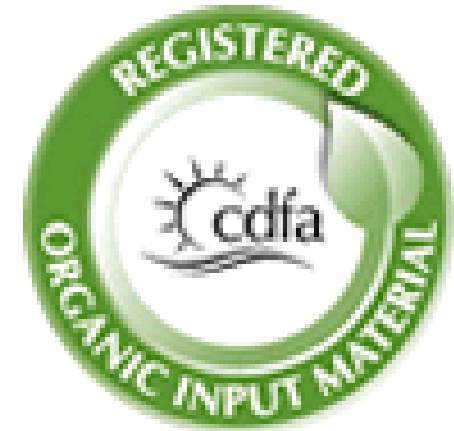
## Organic vs. synthetic

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- Organic pesticides include products derived from natural sources
- Synthetic pesticides are human-produced

# What's OMRI

- OMRI is a 501(c)(3) nonprofit organization that provides an independent review of products, such as fertilizers, pest controls, livestock health care products, and numerous other inputs that are intended for use in certified organic production and processing.
- Food and fiber products that use the term "organic" are required to be certified by an independent third-party certifier.
- Supply food and fiber producers with certified organic choices





## Some terms

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*Contact* - you get what you hit

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*Residual* - continues to kill on surfaces after dry

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*Systemic* - refers to water soluble insecticides that are taken up in plant's phloem system

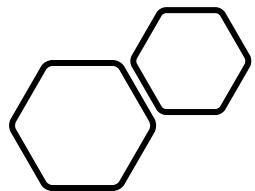
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*Translaminar* - some movement into leaf, controlling insects on inside of leaf or on leaf undersides



Pesticide  
Labeling

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# 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



# Parts of a Label

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



# 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:

*(±) 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)





**12 Month**  
**Tree & Shrub**  
**Insect Control**

CONCENTRATE

*This product provides 12-Month systemic protection against damaging insects including Leafminers, Beetles, and Borers. Having beautiful trees and shrubs has never been easier.*

**PRECAUTIONARY STATEMENTS**

**CAUTION** Hazards to Humans and Domestic Animals

- Causes moderate eye irritation.
- Avoid contact with skin, eyes or clothing.
- Wash thoroughly with soap and water after handling.

**FIRST AID +**

**IN CASE OF ACCIDENTAL...** IMMEDIATELY...

- |                          |  |
|--------------------------|--|
| <b>SWALLOWING</b>        | <ul style="list-style-type: none"><li>• Call a poison control center or doctor immediately for treatment advice.</li><li>• Have person sip a glass of water if able to swallow.</li><li>• Do not induce vomiting unless told to do so by a poison control center or doctor.</li></ul>                  |
| <b>CONTACT WITH EYES</b> | <ul style="list-style-type: none"><li>• Hold eye open and rinse slowly and gently with water for 15 to 20 minutes.</li><li>• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.</li><li>• Call a poison control center or doctor for treatment advice.</li></ul> |

**NOTE:** When calling poison control center, have this product label accessible. If seeking treatment at an emergency room or doctor's office, bring this product label to show medical personnel. You may call toll-free 877-229-3763 for medical emergency information.  
Active Ingredient: 1.47% Imidacloprid (CAS # 138261-41-3).

**ENVIRONMENTAL HAZARDS**

- This pesticide is toxic to aquatic invertebrates. Do not apply directly to lakes, streams, rivers or ponds.
- Do not dump rinse water into sewers or other bodies of water.
- Apply this product only as specified on this label.

**NOTICE:** Research and testing have determined that the "Directions For Use" are appropriate for the proper use of this product under expected conditions. The Buyer assumes responsibility for lack of performance or safety if not used according to the directions.

**Money Back Guarantee:** If you are not satisfied with this product, we will gladly refund your original purchase price.

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Bayer Advanced  
A Business Unit of Bayer CropScience LP  
P.O. Box 12014, 2 T.W. Alexander Drive  
Research Triangle Park, NC 27709

EPA Reg. No. 72155-55  
EPA Est. No. indicated by 2nd and 3rd digits of the batch number on this package.  
(01) = 3125-MO-1 (65) = 432-TX-1 (68) = 67572-GA-1  
(38) = 58996-MO-1 (49) = 072155-AL-001

Bayer Advanced, Merit, Bayer and are registered trademarks of Bayer. Made in USA

PRESS TO RESEAL

389011 E4

# Parts of a Label

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



**NO SPRAYING!** **QUICK FACTS** **PROTECTS ENTIRE TREE for up to 12 months!**

**READ THE LABEL FIRST!** **OPEN** Resealable Label for Directions & Precautions

**FOR OUTDOOR RESIDENTIAL USE ONLY**

**ACTIVE INGREDIENT:** Imidacloprid 1.47%

**OTHER INGREDIENTS:** 98.53%

**Total:** 100.00%

Imidacloprid is the chemical name for Merit®  
 EPA Reg. No. 72155-55  
 EPA Est. No. indicated by 2nd and 3rd digits of the batch number on this package.  
 (01)= 3125-MO-1 (65)= 432-TX-1 (68)= 67572-GA-1  
 (39)= 58996-MO-1 (49)= 072155-AL-001

3548911 R4 6 87073 02802 7

**DIRECTIONS FOR USE**

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. For best results, read and follow all label directions.

**BEFORE YOU USE** Read and follow these directions when using:

- Do not apply near lakes, streams, rivers, or ponds.
- Do not apply to soils which are water-logged or saturated.
- Bucket or measuring utensils should not be used for any food or drinking water purposes after use with this product.

**HOW TO USE**

Determine the amount to use by measuring the distance around the tree trunk or height of the shrub. Pour the required amount into a bucket of water and empty the bucket around the base of the tree/shrub.

**FOR USE ON**

Apple	Mayhaw	Pecan
Crabapple	Oriental Pear	Quince
Loquat	Pear	

**CONTROLS**

Adelgids	Leafhoppers
Aphids	(including Glassy-winged Sharpshooter)
Roundheaded Borers (including Asian Longhorned Beetle and Eucalyptus Longhorned Borers)	Leafminers (including Birch Leafminers)
Flatheaded Borers (including Bronze Birch, Alder Borers and Emerald Ash Borer)	Mealybugs
Japanese Beetles (adult)	Pine Tip Moth Larvae
Lacebugs	Psyllids
Leaf Beetles (including Elm Leaf Beetles and Viburnum Leaf Beetles)	Root Weevil Larvae (including Black Vine Weevil)
	Royal Palm Bugs
	Scales (including Armored Scale [suppression] and Soft Scale)
	Sawfly Larvae
	Thrips
	Whiteflies

front

page 2



## 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



# Older Chemical Classes & Synthetics

- Organo-phosphates
  - chlorpyrifos (Dursban)
  - diazinon
  - acephate (Orthene)
  - malathion
- Carbamates
  - Nerve toxins: acetylcholinesterase inhibitors
  - Variable residual life (short to moderate)
  - Broad spectrum, toxic to beneficials, fast acting
  - Examples:
    - carbaryl (Sevin®)
    - indoxacarb (Advion™)
    - Advion™ bait fastest broadcast treatment for fire ants
- Pyrethroids
- Neo-nicotinoids

**GARDEN TECH**  
**Sevin**  
**BUG KILLER**

### Harvest with Sevin®

After planting your garden, apply Sevin® Bug Killer to protect your fruits & vegetables from insect damage.

Be mindful of the maximum number of applications per year, also known as the APP, which can be found on the label for your specific fruit trees, vegetables, and small fruits.

Care for your garden and look out for pests. If needed, apply Sevin® Bug Killer.

Ready for harvest! How long do I need to wait after applying Sevin® Bug Killer?

Pre-Harvest Interval Chart

Pre-harvest interval? A pre-harvest interval is the maximum number of days you must wait after applying Sevin® Bug Killer before harvesting your fruits and vegetables.

Pre-harvest interval? The pre-harvest interval is the number of days you must wait after applying Sevin® Bug Killer before harvesting your fruits and vegetables.

### Ready To Use Products Pre-Harvest Interval Chart

Vegetable	Pre-Harvest Interval (Days)
Asparagus	14
Brassica head and stem vegetables*: Broccoli, Brussels sprouts, Cabbage, Cauliflower, Chinese cabbage, Kohlrabi	14
Brassica leafy green vegetables*: Chinese cabbage, Collards, Kale, Mustard greens, Mustard spinach, Turnip greens	14
Corn(sweet)	14
Cucurbit vegetables: Cucumber, Melons, Pumpkin, Squash	14
Dried shelled legume vegetables**: Adzuki bean, Blackeyed pea, Cowpea, Field bean, Kidney bean, Lentils, Lima bean (dry), Mung bean, Navy bean, Pinto bean, Southern pea	14
Edible-podded legume vegetables**: Dwarf pea, Edible-pod pea, Jack bean, Snap bean, Snow pea, Sugar snap pea, Wax bean, Yardlong bean	14
Fruiting vegetables: Eggplant, Groundcherry, Okra, Peppers, Tomatoes	14
Leafy vegetables: Cardoon, Celery, Celtuce, Florence fennel, Dandelion, Endive, Lettuce (head and leaf), Parsley, Rhubarb, Spinach, Swiss chard	14
Okra	14
Peanuts	14
Root and Tuber vegetables (except sugar beets and sweet potatoes): Artichoke (Chinese and Jerusalem), Carrots, Garden Beets (roots and tops), Ginger, Ginseng, Horseradish, Parsnip, Potato, Radish, Rutabaga, Salsify, Turnip (roots and tops), Yams	14
Sweet Potatoes	14

\* Application is only permitted within 30 days of crop emergence or the date of transplant.  
 \*\* Do not use on fresh/succulent peas and beans.

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# Low impact pesticides

- Contact or short-lived insecticides
  - Insect growth regulators
  - Botanicals - pyrethrums
  - Microbials – Bt, Spinosad
  - Baits – roach, cricket
  - Low toxicity inorganics – DE, boric acid
  - Soaps & oils



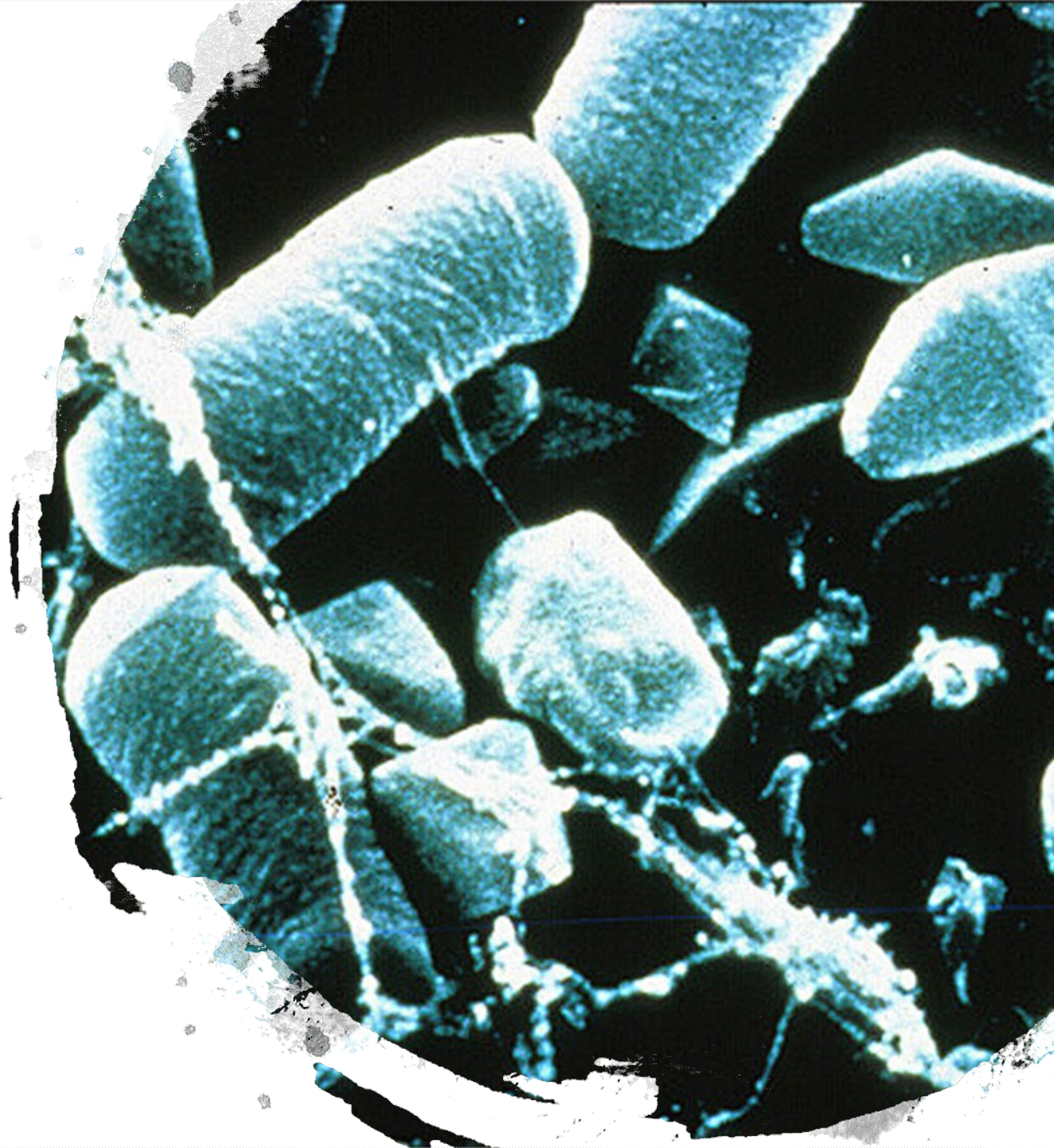
# Certain inorganic pesticides

- Examples
  - Boric acid
  - Disodium octaborate tetrahydrate (borates)
  - Silica aerogel
  - Diatomaceous earth
- Stomach poisons (borates and boric acid)
- Sorptive dusts (silica aerogel, diatomaceous earth) that absorb the waxy layer from the cuticle of pests.
- Derived from minerals or chemical compounds that occur as deposits in nature



# Microbials

- Active or killed microbes
  - *Bacillus thuringiensis*, *Beauveria bassiana*, etc.
    - Larvae of moths, butterflies, mosquitoes
- Microbial byproducts
  - Spinosad (see next slide)
  - Avermectin
    - Examples
      - avermectin (Advance, Avid, Vendetta)
      - Ivermectin (pets and head lice)
      - milbemectin (Safer Caterpillar Killer)
        - is a reduced-risk product
    - Nerve toxin, chloride channel activators
    - Microbe bases
      - avermectin derived from fermentation of *Streptomyces avermitilis*, a soil microorganism



# Spinosyns (Naturalyte class)

- Examples
  - Monterey Garden Insect Spray
  - Conserve SC Spinosad Insecticide
- Nerve toxin at site of nicotinic acetylcholine receptor
- Leaf residual 2-16 days
- Safe for many beneficials, toxic as direct spray to honey bees
- Okay to use in vegetable gardens for fire ants
- OMRI Certified





# Insect growth regulators

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



DoMyV.com




IGRs

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# Botanicals

- Derived directly from plants
  - Some more toxic than others
  - Sometimes referred to as “organic”
  - Break down faster in the environment
  - Various modes of action
  - Usually short-residual
  - Short residuals usually mean minimal impact on beneficials
- Pesticides derived from plants
    - pyrethrins
    - neem extracts
    - various plant oils
    - rotenone
    - limonene, linalool
    - Mint oils
    - citrus oils
    - clove oil
    - 2-phenethyl proprionate
    - other essential oils

A photograph of a large field of pyrethrum daisies, which are small, white, ground-hugging flowers. The field is densely packed with these plants. In the background, several people are visible, some standing and some walking, providing a sense of scale to the vast field. The overall scene is outdoors, likely in a rural or agricultural setting.

## Pyrethrum (pyrethrins = natural)

- From ground-up flowerheads 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” to keep insects from detoxifying it

# Baits



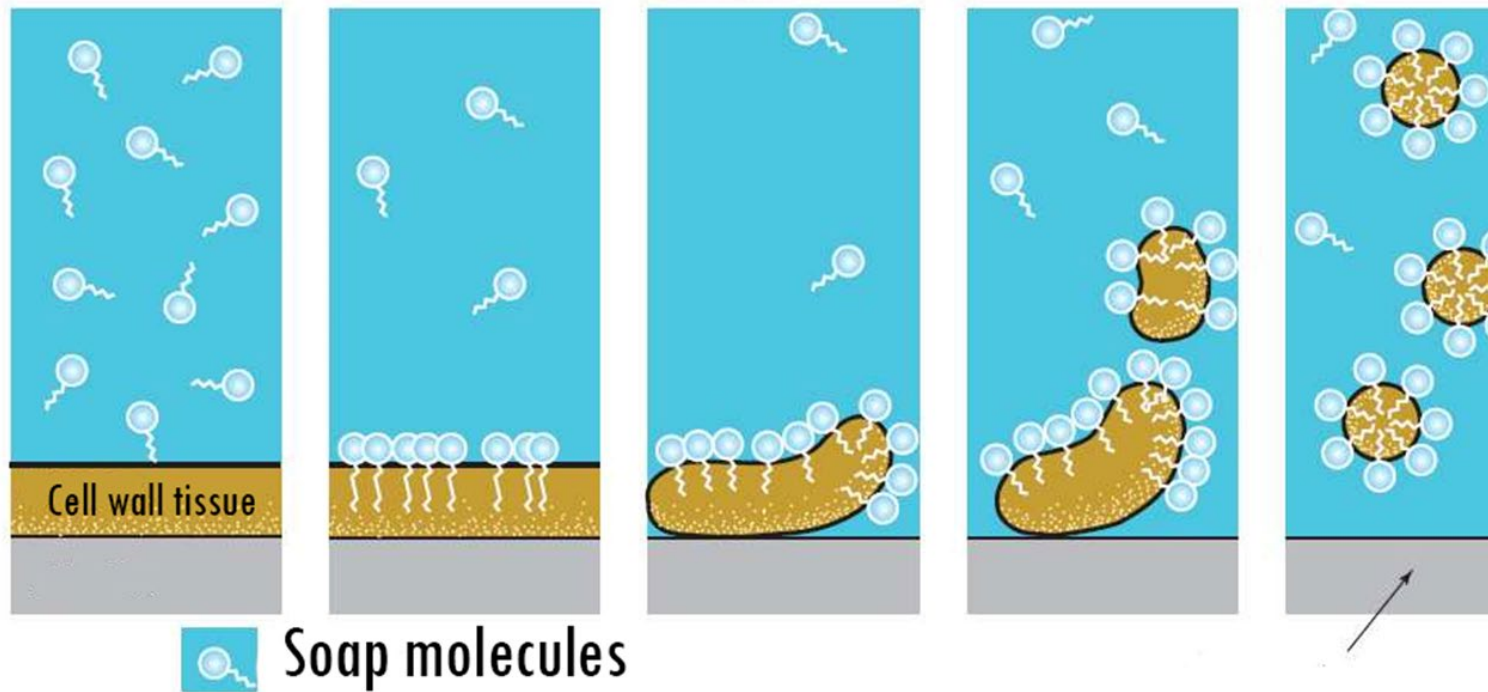
- Mixture of an insecticide with food attractive to pest. Low percentage active ingredients make these relatively safe.
- Examples: fire ant baits, containerized cockroach baits, granular ant, cockroach and cricket baits



# Soaps and Oils

- Insecticidal soaps & oils
- Kill small and soft-bodied insects and mites. Must come in direct contact with pest to kill. Short residue.
- Easy recipe: 1 ½ teaspoons of Dawn liquid detergent per one quart of water.
- Examples: Safer's soap, Sunspray Ultrafine Spray Oil, vegetable and neem oils

Soaps most likely kill insects through cell destruction via entering through spiracles, and other body openings



Mode of action

Image modified from <http://guernseydonkey.com>

# Pyrethroids – Synthetic (not natural)



- Broad spectrum replacements for Dursban®
  - permethrin
  - cyfluthrin
  - bifenthrin
  - allethrin
  - sumithrin
  - tetramethrin
  - Efenvalerate
  - Fluvalinate
- Good residual in soil, on leaves
- Affects nerves at sodium channel
- Low in toxicity to birds and mammals, but hazardous to fish
- Bind tightly to organic matter in soil, difficult to move into soil profile
- Some cause skin irritation to humans
- Wide applicability and useful residual

**FEEDS**  
FOR UP TO  
**3 MONTHS\***

For Outdoor Use Around  
the Home Only.

**Spectracide**

SYSTEMIC

Concentrado para el control sistémico de insectos  
de árboles y arbustos + fertilizante

**TREE & SHRUB**

**Insect Control + Fertilizer**  
CONCENTRATE

**SEASON LONG  
PROTECTION**



Protects from Aphids,  
Japanese Beetles, Borers  
& other listed insects



For Use On All Ornamental Trees & Shrubs

# Nicotinoids

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- Examples
  - Acetamiprid (Temprid SC Insecticide)
  - Clothianidin (Tandem Insecticide)
  - Dinotefuran (Safari & Merit)
  - Imidacloprid (Merit)
  - Nitenpyram (Guardian mostly for pets)
  - Thiacloprid (Rose Shield concentrate)
  - Thiamethoxam (Helix Xtra)
- Nerve toxins at nicotinic receptor (mimics nicotine)
- Systemic, Good residual in plants, soil.
- Moderate impact on beneficials
- Toxic to Pollinators

# Neonicotinoid controversies

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- 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, neonics 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



# The End

You made it – pat yourself on the back

Visit our Podcast

<https://bugs-by-the-yard.captivate.fm/>

