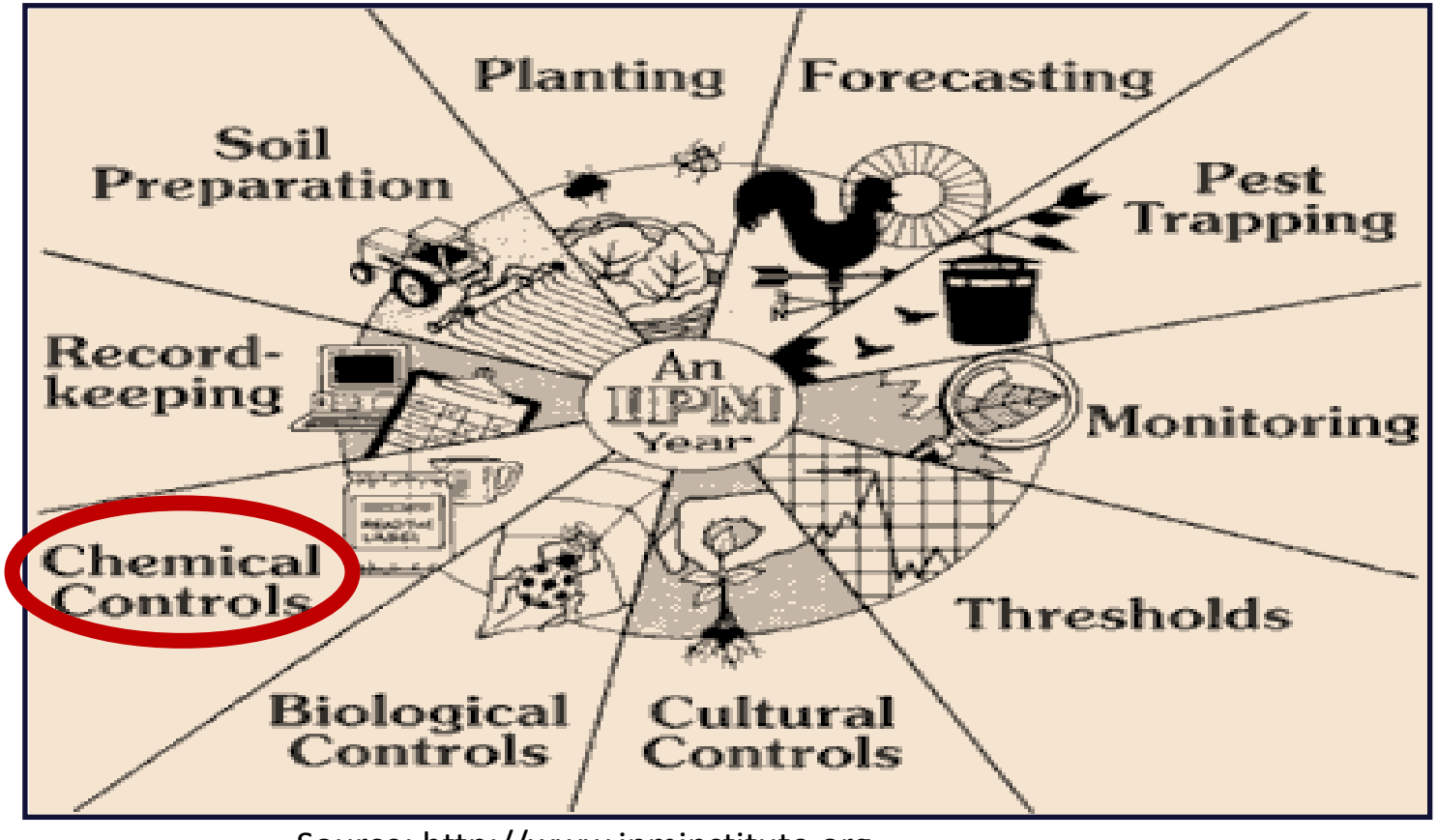
IPM also means responding to pest problems with the most effective, least-risk option



Source: http://www.ipminstitute.org

If chemical control is needed…

USE THE LEAST-TOXIC OPTION

What are Pesticides?

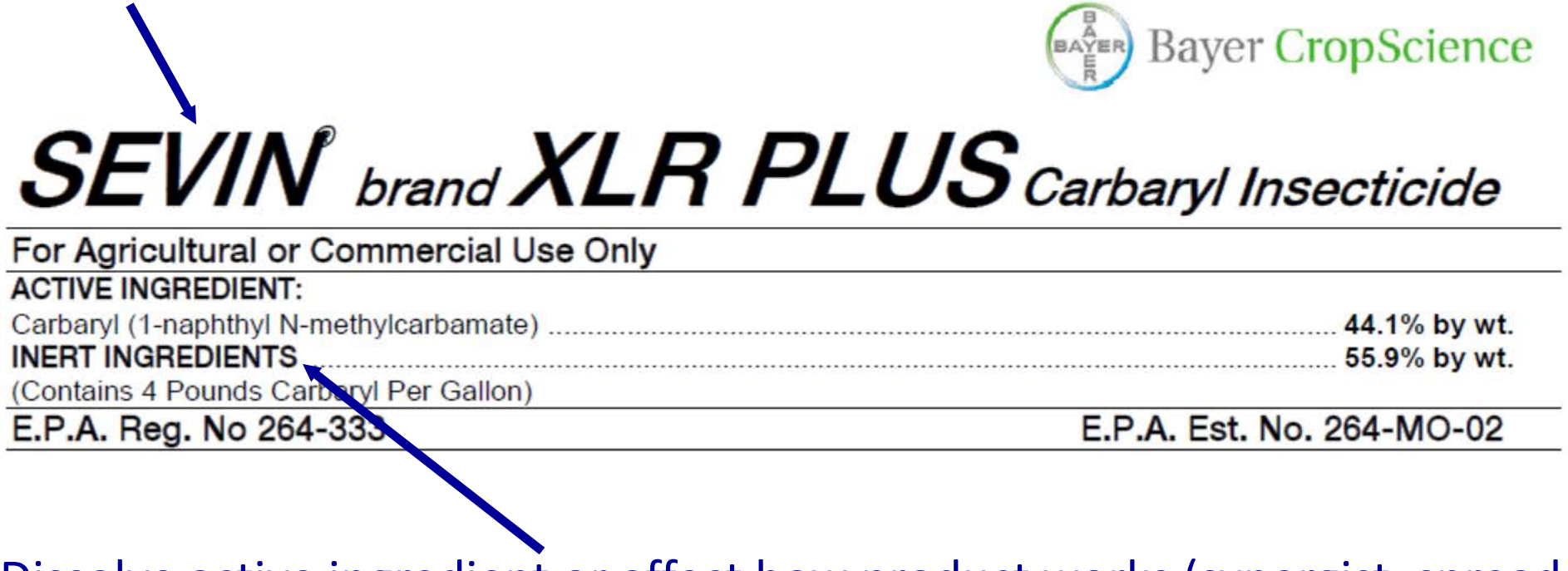
Pesticides are chemicals used to destroy, prevent or control pests. Pests include weeds, diseases, and insects.

“Pesticide” can mean a fungicide, herbicide, insecticide, rodenticide, etc.

Label Information

- Describes risks and benefits of the product
- Primary source of information to user
- Information tells how to use product safely and correctly

Trade Name



Dissolve active ingredient or affect how product works (synergist, spreader)

Read the label carefully and often. It is a violation of Federal Law to misuse a pesticide

The Label Is the Law

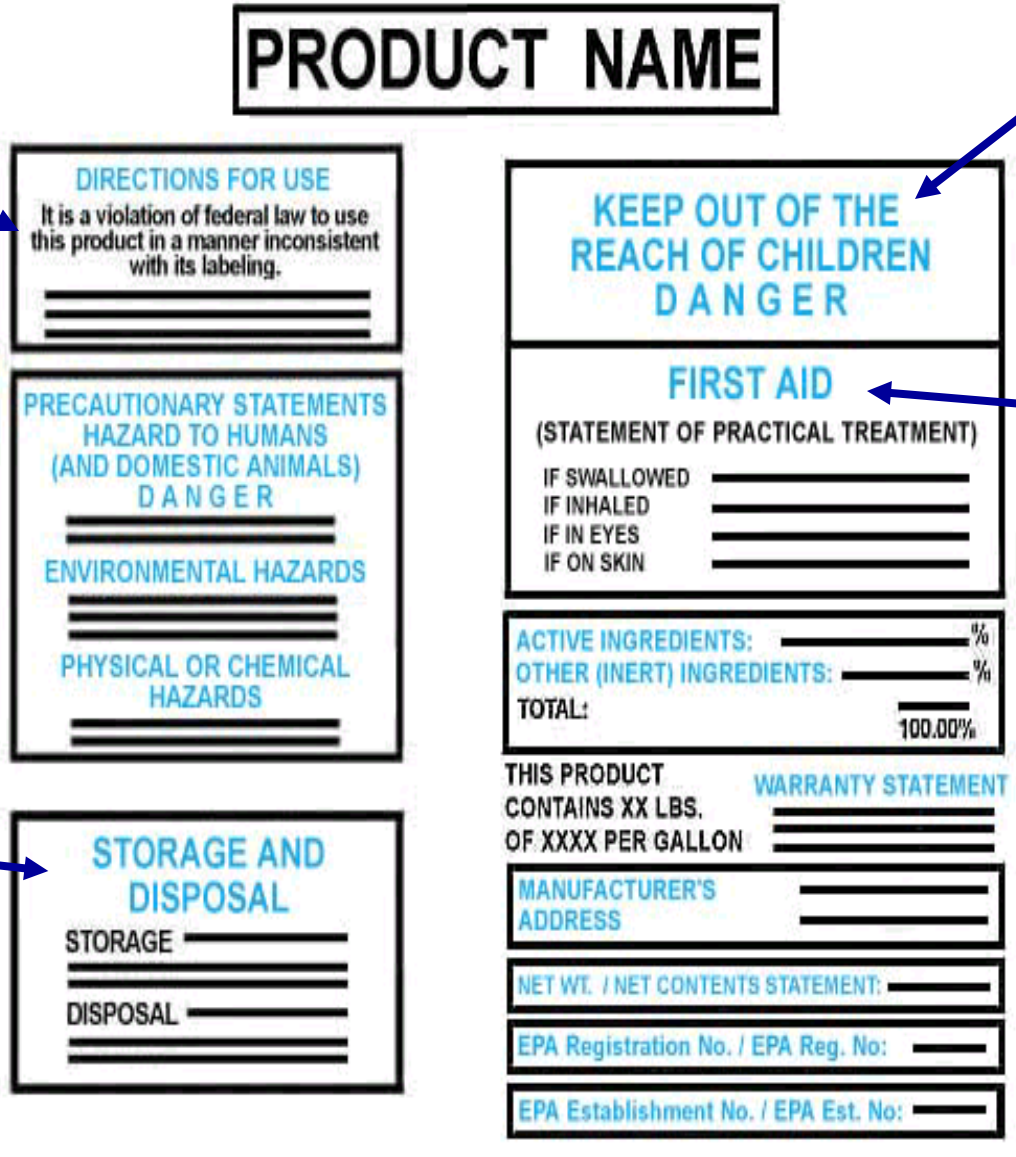
- Read the Label!
- Read the Label!
- Read the Label!
- Read the Label!
- Read the Label!
- Read the Label!
- Read the Label!
- Read the Label!

- Read the Label!
- Read the Label!
- Read the Label!
- Read the Label!
- Read the Label!
- Read the Label!
- Read the Label!
- Read the Label!

Understanding the Label

Read before you buy to be sure you are buying the right product for the job.

Buy the proper amount so you can avoid storage, and dispose of container and left-over product properly.



Very important!

Understand the potential dangers and keep out of the reach of children.

It is important to keep products in the original container in case of accidental poisoning so you can follow the first aid instructions and have the list of ingredients available to give to poison control.

Re-Entry and Pre-Harvest Intervals

- **Re-Entry Interval (REI):** Tells how much time must pass before a treated area is safe to enter by a person without protective clothing

- **Pre-Harvest Interval (PHI):** This exposure can be reduced by 99% simply by wearing chemical resistant gloves and a long-sleeve shirt

Signal Words on Labels

Category	Signal word required on label	Approximate amount needed to kill an average person
Highly Toxic	DANGER POISON	A few drops to one teaspoon
Moderately toxic	WARNING	One teaspoon to one ounce
Slightly toxic	CAUTION	Over one ounce
Not toxic	not required	

Storage and Mixing Areas

Post signs on the building and storage room door

Limit access to your pesticide storage

Always lock storage facilities

Storage and Mixing Areas

Detached structure

Nonflammable materials

Select a site with minimal runoff

At least 100’ down slope from surface water and wells

Storage and Mixing Areas

Use sealed floors

Equip floor with a continuous curb to contain spills

Storage and Mixing Areas

Best shelving – metal with a lip

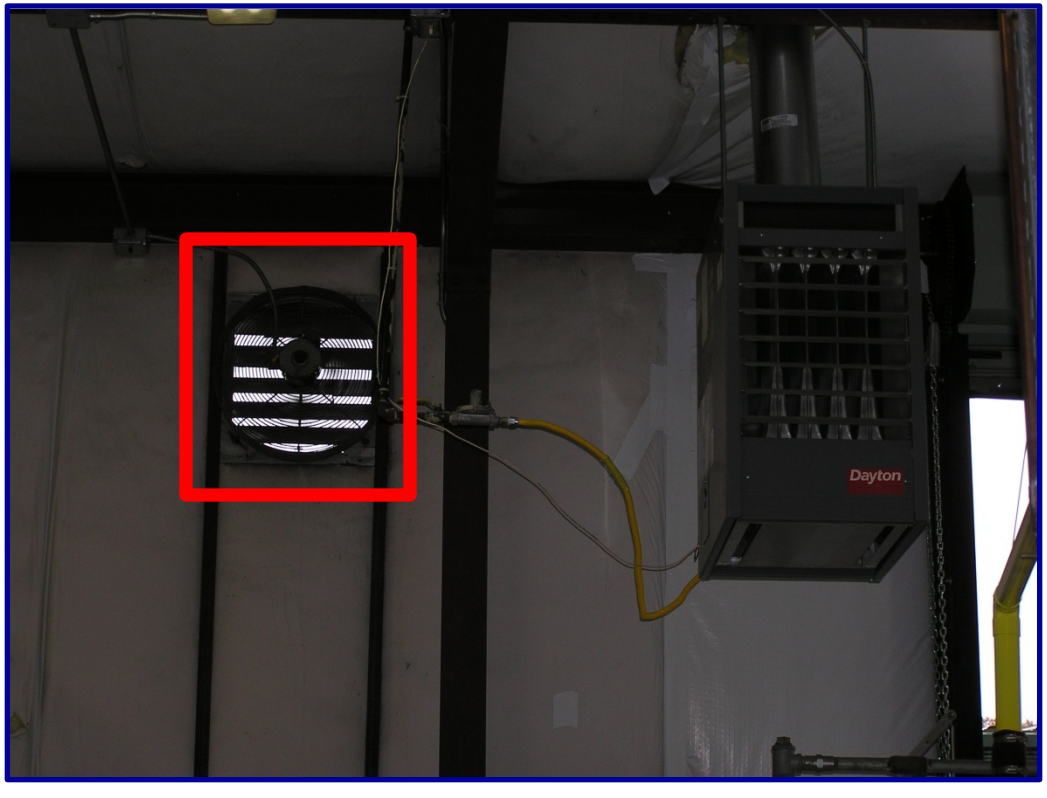
Keep shelving painted to avoid corrosion

Storage and Mixing Areas

Store all pesticides separately (you must if the label says so)

Keep separate from fertilizers, gasoline, flammables & volatiles

Storage and Mixing Areas



Keep the unit well ventilated

Use mechanical ventilation if possible

Keep pesticides from freezing and extreme high temperatures

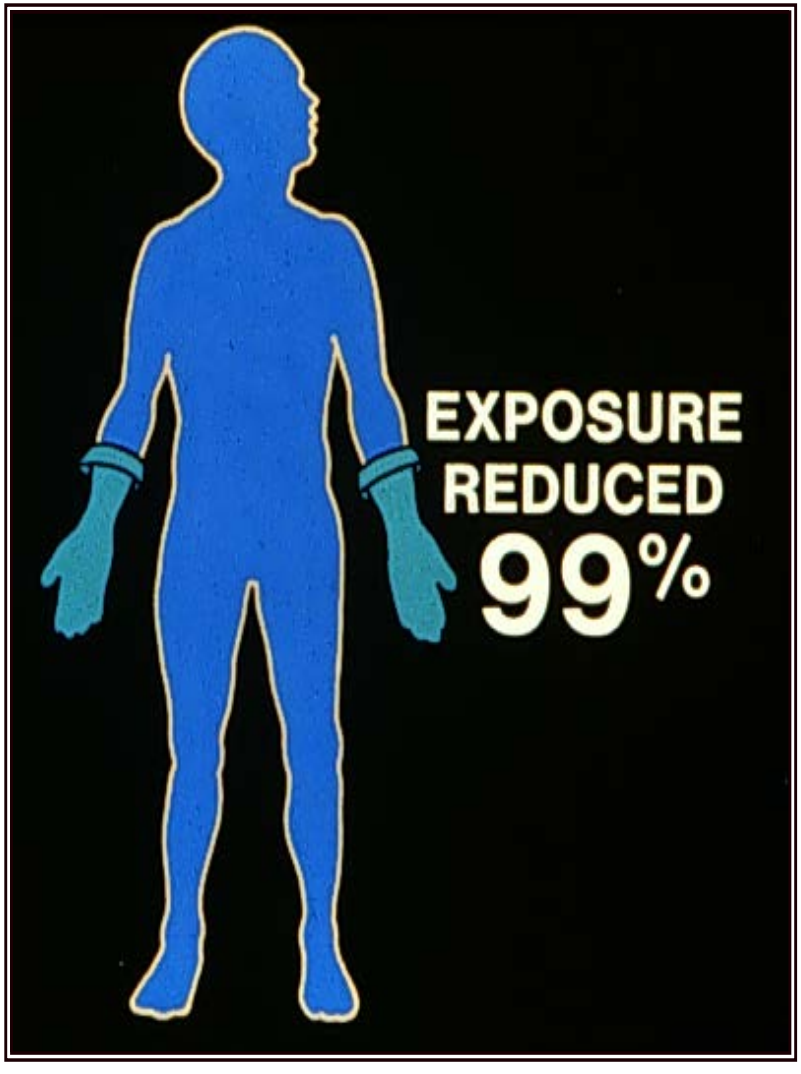
Most should be stored between 40 and 90 degrees F

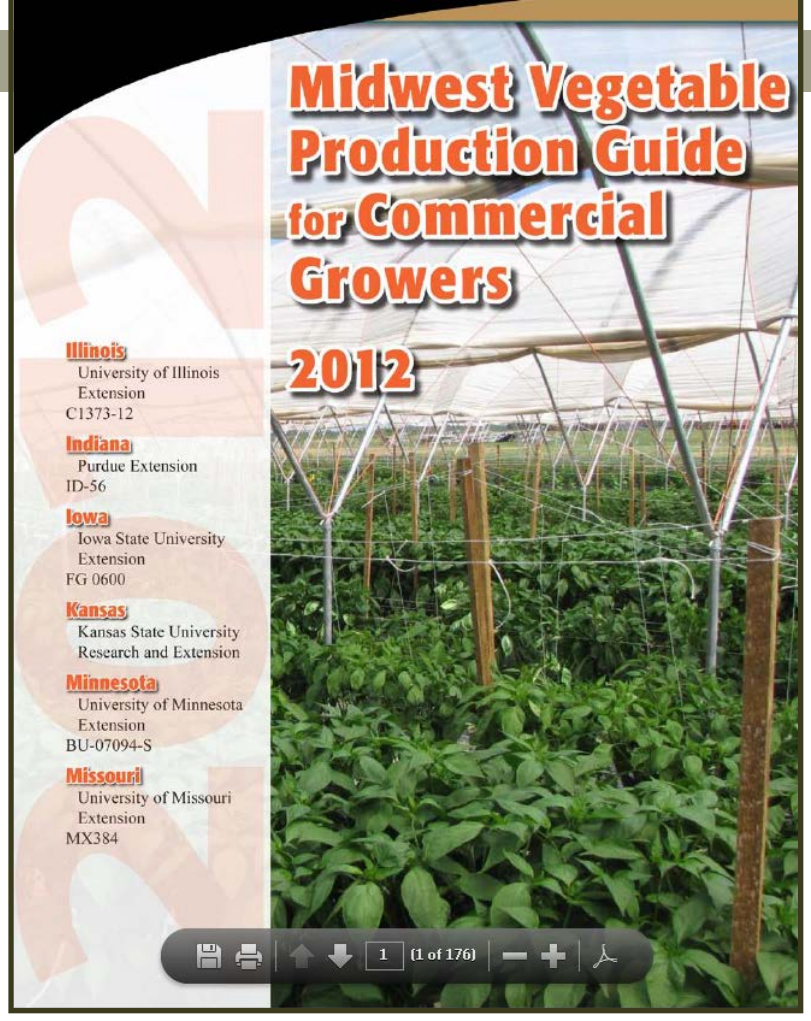
Storage and Mixing Areas

Triple rinse and dispose of used pesticide containers properly

Reduce Exposure

- Absorption through the skin is the most common route of poisoning of agricultural workers
- This exposure can be reduced by 99% simply by wearing chemical resistant gloves and a long-sleeve shirt





PDF of the Production Guide is included in flash drive

FREE at http://btny.purdue.edu/Pubs/ID/ID-56/ID-56.pdf

- Fertilizing, liming, & soil sampling
- Insect management strategies
- Weed management strategies
- Disease management strategies
- Crop recommendations

Suppression III

Reading Labels

- Sevin XLR label
- Admire pro

CAUTION means the pesticide product is slightly toxic if eaten, absorbed through the skin, inhaled, or it causes slight eye or skin irritation

Organic Insect Pest Control

- Comparatively higher costs
- Limited amount of efficacy data from replicated trials with organic products
- Kill a smaller percentage of the insect population
- Have a shorter residual effect

OMRI-listed INSECTICIDES

Insect	Product
Aphids (green peach aphid and potato aphid)	Pyrethrum (e.g., PyGanic EC 5.0 II), neem (e.g., Neemix), *Beauveria bassiana* (Mycotrol)
Flea beetles	Pyrethrum (e.g., PyGanic EC 5.0 II), neem (e.g., Neemix)
Hornworms	Pyrethrum, *Bacillus thuringiensis kurstaki* (e.g., Dipel 150 dust)
Thrips	Spinosad (e.g., Entrust)
Fruitworms	*Bacillus thuringiensis kurstaki,* Spinosad
Stinkbugs	Pyrethrum, neem
Cucumber beetles and squash bugs	Pyrethrum (some control)

Source: 2011 Midwest Veg. Prod. Guide, ATTRA, Cornell Univ., Oklahoma State Univ., eXtension, Michigan State Univ.

Effects of *Beauveria bassiana*

Before use on an organic operation, make sure that the substance, including its brand name and formulation, is listed in your organic system plan, reviewed, and approved by your USDA-accredited certification agency

Neem and azadirachtin

- **Azadirachtin**: chemical compound present in seeds of neem trees (India)
- It deters feeding and/or disrupts the growth of many insects
- Biodegradable (it degrades within 100 hours when exposed to light and water) and very low toxicity to mammals
- Neem extracts and derivatives: 62 OMRI-listed products
- Good control of **caterpillars** and **aphids**, fair control of **stink bugs**, promising against **squash bug** and **Col. potato beetle**
- Most effective OMRI-listed: Neemix (Certis), AZA-Direct (Gowan Co.)

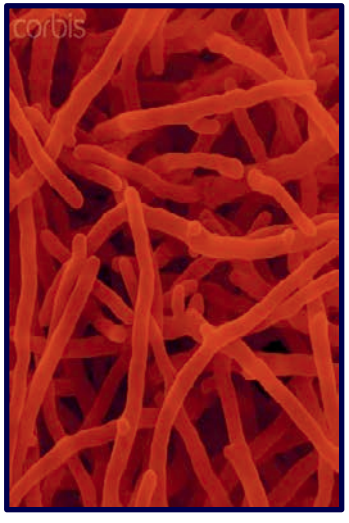
Pyrethrum and pyrethrins

- **Pyrethrum:** botanical insecticide produced by grinding the flower heads of certain species of chrysanthemums (*Chrysanthemum cinerariaefolium).* One of the first insecticides
- **Pyrethrins:** Pyrethrins are the actual insecticidal compounds (there are 6 active ingredients) found in pyrethrum
- Pyrethrins break down quickly in sunlight, so they have little residual activity. They are particularly toxic to soft-bodied insects because they are absorbed through the skin. They are not effective against spider mites
- 24 OMRI-listed products

Pyrethroids: 'Pyrethrin-like' compounds that have been chemically synthesized based on the structure of pyrethrin molecules

Spinosad

- **Material type:** Microbial (**spinosyns A** and **D** are substances produced by fermentation of the actinomycete bacterium *Saccharopolysora spinosa*)
- Actinomycetes are filamentous bacteria found in the soil that give it a sweet 'healthy' smell
- Spinosad is a fast-acting, somewhat broad-spectrum material that acts on the insect primarily through **ingestion**, or by **direct contact** with a spray droplet or a newly treated surface
- It attacks the nervous system of the insect, causing loss of muscle control; insects die of exhaustion within 1-2 days



Foliar applications of spinosad are not highly systemic. The addition of a penetrating surfactant increases absorption by tissues and activity on pests that mine leaves

Spinosad residues on the leaf surface are be broken down by **sunlight**. Half-lives for spinosyn A are 1.6 to 16 days depending on the amount of sunlight received

Spinosad

- Spinosad is principally toxic to plant-eating insects in the orders Lepidoptera (caterpillars), Coleoptera (beetles), Thysanoptera (thrips), and Diptera (flies)
- Spinosad is not effective at controlling mites at normal use rates although at high rates or in combination with some adjuvants it has miticidal activity

1 lb Entrust Naturalyte:
$ 674* (80% spinosad)

= $ 1.86 / g of spinosad

*Arbico Organics

Monterey Garden Insect Spray:
$ 17.00 (32 oz)

= $ 6.7 / g of spinosad

3.6 X more expensive!

Bacillus thuringiensis (Bt)

- Large group of spore-forming bacteria that occur naturally in the soil
- Bacteria are toxic to certain species of insects and can be used as insecticides. **Spores must be eaten by the insect**

- Once ingested by larvae, Bt bacteria release a toxic protein into the insect digestive system, causing death by rupture of the gut
- Different strains of Bt are toxic to specific groups of insects
- Young larvae are generally more susceptible than older larvae
- Spray deposit may only last a few days
- Some insect species are already developing resistance

Before use on an organic operation, make sure that the substance, including its brand name and formulation, is listed in your organic system plan, reviewed, and approved by your USDA-accredited certification agency

21 OMRI-approved products

Bt sub-species	Trade Names (and Company)	Target
Var. *aizawai* strain NB200	**Agree** (Certis), **Xentari** (Valent BioSciences)	E.g., Loopers, codling moth, Imported cabbageworm, fruitworm, Diamondback moth, European corn borer
Var. *kurstaki*	**Biobit**, **Dipel** (Valent) **Javelin** (Certis)	Lepidopteran larvae
Var. *tenebrionis* (= san diego)	**Novodor** (Valent BioSciences)* **only in the European Union**	Beetle larvae (e.g., Colorado potato beetle)
Var. *israelensis*	**VectoBac** (Valent)	Fly larvae (including fungus gnats, blackflies, and mosquitoes)

Before use on an organic operation, make sure that the substance, including its brand name and formulation, is listed in your organic system plan, reviewed, and approved by your USDA-accredited certification agency

Insecticidal Soaps and Oils

Soaps: Selected fatty acid salts that penetrate the body of pests and results in rapid death. **Oils:** act mainly by suffocation

Product (Company)	A.I.	Pest
DES-X (soap) (Certis)	Potassium salts of fatty acids	aphids, lacebugs, mealybugs, mites, leafhoppers, scale insects, plant bugs, psyllids, spider mites, whiteflies
M-Pede (Mycogen Co.)	Potassium salts of fatty acids (49%)	Aphids, mealybugs, mites, leafhoppers, scale insects, plant bugs, psyllids, spider mites, mites, powdery mildew
PureSpray™ Green (oil) (BASF)	Petroleum oil (98%)	Aphids, mites, fungus gnats, leaf miners, mealybugs, scales, thrips, whiteflies, powdery mildew
Phyta-Guard (Phyta-Oil Garlic & Citronella) (California Organic Fertilizers, Inc.)	Soybean oil (81.5%) citronella oil (3%), garlic oil (0.5%)	Aphids and other soft-bodied insects

Before use on an organic operation, make sure that the substance, including its brand name and formulation, is listed in your organic system plan, reviewed, and approved by your USDA-accredited certification agency

Protect pollinators

- CUCURBIT flowers are almost exclusively pollinated by insects
- Each female flower is open and receptive to pollination for only one day
- If many bees visit the flower, there will be more and larger fruits
- Cool, rainy, or windy weather limits bee activity and pollination. Low temperatures can prevent the development and release of pollen
- Avoid the use of **SEVIN** (carbaryl) after flowering due to its extreme toxicity to bees. Apply insecticides at dusk after the bees have bedded for the night


Picture: Univ. Missouri Extension

Active ingredient	Chemical class	Trade names	Ecological Impact Value	Notes
Cryolite	***Not determined***	***Prokil, Kryocide***	***650.8***	
Endosulfan	***Organochlorine***	***Endosulfan***	***79.5***	***Not to be used after 07.31***
Malathion	***Organophosphate***	***Malathion***	***65.0***	
Difocol	***Organochlorine***	***Kelthane***	***46.7***	
Carbaryl	***Carbamate***	***Sevin***	***44.5***	
Methomyl	***Carbamate***	***Lannate***	***44.1***	Restricted-Use Pesticide
Bifenazate	***Carbazate***	***Acramite***	***37.5***	Reduced-Risk
Dimethoate	***Organophosphate***	***Dimethoate***	***34.2***	
Imidacloprid	***Neonicotinoid***	***Admire***	***26.1***	
Fenpropathrin	***Pyrethroid***	***Danitol***	***21.0***	Restricted-Use Pesticide
Permethrin	Pyrethroid	Ambush, Pounce	14.2	Restricted-Use Pesticides
Thiamethoxam	Neonicotinoid	Actara, Platinum	11.5	Both are Reduced-Risk
Bifenthrin	Pyrethroid	Brigade, Capture	11.2	Restricted-Use Pesticides
Spiromesifen	Tetronic acid derivative	Oberon	9.1	Reduced-Risk
Acetamiprid	Neonicotinoid	Assail	7.2	Reduced-Risk
Esfenvalerate	Pyrethroid	Asana XL	5.5	Restricted-Use Pesticide
Spinetoram	Unclassified	Radiant	5.4	Reduced-Risk
Spinosad	Spinosyns	Entrust	4.4	Organic
Spinosad	Spinosyns	SpinTor	4	Reduced-Risk
Cyhalothrin	Pyrethroid	Warrior	2.6	Restricted-Use Pesticide
Pymetrozine	Triazine	Fulfill	2.4	Reduced-Risk
Cyfluthrin	Pyrethroid	Baythroid	2.4	Restricted-Use Pesticide
Cypermethrin	Pyrethroid	Mustang MAX	2.1	
Abamectin	Avermectins	Agri-Mek	1.7	

Be cautious when using pesticides

- **Pesticides are poison!** That is why they are listed last on your IPM plan. Only use them if nothing else has worked
- **READ THE LABEL BEFORE OPENING A PESTICIDE CONTAINER**
- Follow all the label directions carefully. Wear protective clothing
- Apply pesticides only on the crops listed on the label, and only for the problems listed there