Home Pesticide Use

Risks & Benefits

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Handouts on-line
Which type of gardener are you?

1. Black thumb
2. Novice
3. Intermediate
4. Experienced
5. Greenest thumb
Have you ever heard of the Board of Pesticides Control (BPC)?

1. Yes
2. No
What is your opinion of the BPC?

1. Strongly favorable
2. Favorable
3. Neutral
4. Unfavorable
5. Strongly unfavorable
How we see ourselves using pesticides

Unfortunately, a not so uncommon result from our use of pesticides

[Columbia, S.C. — Bug spray likely killed infant, injured 2 in SC]


Bug spray that poses a fire and explosion risk is likely to be blamed for the death of a 16-month-old South Carolina boy, and his 2-year-old brother was critically injured by the fumes, authorities said Monday.
We’ve relied on pesticides in the past and still rely on them today.
Which are pesticides?

1. A.
2. B.
3. C.
4. D.

No endorsement intended or implied
Maine pesticide use more common than perceived

No endorsement intended or implied
What are pesticides?

- Bleaches, Lysol, pine oil
- Weed & Feed, Roundup
- Rat & mouse baits
- Plant disease controls

No endorsement intended or implied
What are Pesticides?

- Sevin, Pyrethroids, *Raid*
- “Organics” like pyrethrum
- Biological Controls
- Wood preservatives

No endorsement intended or implied
These are Pesticides?

- Plant incorporated protectants
  - Have the *Bt*. Crystalline protein engineered into them

No endorsement intended or implied
EPA exempt pesticides

- Some pesticides have been deregulated by EPA
  - Exempt from Federal registration
  - Must be registered by State of Maine
  - Exempt from toxicity testing
  - NOT risk free

Ingredients in some of these products:
- Rosemary oil
- Peppermint oil
- Thyme oil
- Clove oil
- Wintergreen oil
- Cinnamon oil

No endorsement intended or implied
What are the risks?

- Peppermint oil —
  - highly toxic,
  - use in infants or children is not recommended, when inhaled, due to the potential toxicity of the product
  - doses of menthol over 1 g/Kg body weight may be deadly
  - causes dermatitis,

- Cinnamon oil —
  - powerful irritant and
  - even worse sensitizer
  - cinnamon contains coumarin, the parent compound of warfarin, a medication used to keep blood from clotting


No endorsement intended or implied
Caveat emptor!

For Release: 09/10/2012

FTC Takes Action Against Companies Marketing Allegedly Unproven Natural Bed Bug and Head Lice Treatments

Cedar, Cinnamon, Lemon Grass, Peppermint, and Clove Oil? There's No Proof They Will Eradicate Bed Bugs, Agency Says

The Federal Trade Commission filed deceptive advertising charges against two marketers of remedies for bed bug infestations, who allegedly failed to back up overhyped claims that they could prevent and eliminate infestations using natural ingredients, such as cinnamon and cedar oil. One marketer also allegedly made misleading claims that its products were effective against head lice.

In one of the two cases, RMB Group, LLC and its principals have agreed to settle the charges relating to their “Rest Easy” bed bug products. In the case against Cedarcide Industries, Inc. and others, challenging their marketing of “Best Yet!” bed bug and head lice treatments, the defendants have not settled, and the FTC is beginning litigation against them.
What about home remedies

- Home chemistry is not recommended by the BPC
- Many of the materials used seem “safe” because we eat them or use them on our skin
- Exposure routes may be different
- What we eat may not be safe to breathe

Example

6. Eucalyptus oil
A great natural pesticide for flies, bees and wasps. Simply sprinkle a few drops of eucalyptus oil where the insects are found. They will all be gone before you know it
Eucalyptus oil is **POSSIBLY UNSAFE** when applied directly to the skin without first being diluted. Eucalyptus oil is **LIKELY UNSAFE** when it is taken by mouth without first being diluted. Taking 3.5 mL of undiluted oil can be fatal. Signs of eucalyptus poisoning might include stomach pain and burning, dizziness, muscle weakness, small eye pupils, feelings of suffocation, and some others. Eucalyptus oil can also cause nausea, vomiting, and diarrhea.

**Children**: Eucalyptus oil is **LIKELY UNSAFE** for children. It should not be taken by mouth or applied to the skin. Not much is known about the safety of using eucalyptus leaves in children. It’s best to avoid use in amounts larger than food amounts.

**Surgery**: Since eucalyptus might affect blood sugar levels, there is concern that it might make blood sugar control difficult during and after surgery. Stop using eucalyptus at least 2 weeks before a scheduled surgery.
What products are NOT pesticides?

- Insect parasitic nematodes
- Rodent or insect traps
- Beneficial insects or mites

No endorsement intended or implied
What does registration mean?

- Not a safety guarantee
- Reasonable certainty of no harm, but NOT risk free
- Must read and follow the label to manage the risk
Risk assessment

Prior to 1996 FQPA

After 1996 FQPA

Aggregate and Cumulative Risk Cup
What are the benefits?

- Healthy saleable plants & produce

- Aesthetics
What are the benefits?

- Bountiful harvest
- Nuisance or public heath pest control
Risk vs. Risk

- West Nile Virus & EEE
- Malaria
- Potato Late Blight Disease
- Lyme Disease
What are the human risks?

- **Acute**
  - Rash
  - Nausea
  - Eye ticks
  - Stomach cramps
  - Death

- **Chronic**
  - Cancer
  - Birth defects
  - Allergies
  - Organ damage
  - Endocrine effects
How are the risks determined?

REMEMBER THE GOOD OLD DAYS WHEN WE ONLY HAD TO SMOKE A FEW CIGARETTES AND EAT SACCHARIN?
All pesticides have risks!!!

- Organic ≠ Safe
- Synthetic ≠ Highly toxic
- Natural ≠ Safe

No endorsement intended or implied
Even natural or organic products are toxic!

TABLE 2-12  Original chart from Pests of the Garden and Small Farm by Mary Louise Flint Amended by Gary Fish September 2007

Oral LD₅₀ Values for Some Pesticides Used in Small Farms and Gardens.

<table>
<thead>
<tr>
<th>CHEMICAL</th>
<th>COMMON TRADE NAMES</th>
<th>ORAL LD₅₀³</th>
<th>EIC³</th>
<th>TYPE OF PESTICIDE</th>
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</thead>
<tbody>
<tr>
<td>Nicotine</td>
<td>Black Leaf 40</td>
<td>55</td>
<td>45¹</td>
<td>insecticide</td>
</tr>
<tr>
<td>Rotenone*</td>
<td></td>
<td>132</td>
<td>33</td>
<td>insecticide</td>
</tr>
<tr>
<td>Bordeaux*</td>
<td></td>
<td>300</td>
<td>68</td>
<td>fungicide</td>
</tr>
<tr>
<td>Diazinon</td>
<td></td>
<td>300</td>
<td>43</td>
<td>insecticide</td>
</tr>
<tr>
<td>2,4-D</td>
<td></td>
<td>375</td>
<td>17</td>
<td>herbicide</td>
</tr>
<tr>
<td>Carbaryl</td>
<td>Sevin</td>
<td>500</td>
<td>21</td>
<td>insecticide</td>
</tr>
<tr>
<td>Acephate</td>
<td>Orthene</td>
<td>866</td>
<td>23</td>
<td>insecticide</td>
</tr>
<tr>
<td>Copper hydroxide*</td>
<td>Kocide</td>
<td>1000</td>
<td>33</td>
<td>fungicide</td>
</tr>
<tr>
<td>Copper oxychloride sulfate*</td>
<td>C-O-C-S</td>
<td>1000</td>
<td>33¹</td>
<td>fungicide</td>
</tr>
<tr>
<td>Ryania*</td>
<td></td>
<td>1200</td>
<td>55</td>
<td>insecticide</td>
</tr>
<tr>
<td>Malathion</td>
<td></td>
<td>1375</td>
<td>24</td>
<td>insecticide</td>
</tr>
<tr>
<td>Pyrethrum*</td>
<td></td>
<td>1500</td>
<td>18</td>
<td>insecticide</td>
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<tr>
<td>Propargite</td>
<td>Omite</td>
<td>2200</td>
<td>43</td>
<td>acaricide</td>
</tr>
<tr>
<td>Sabadilla*</td>
<td></td>
<td>4000</td>
<td>36</td>
<td>insecticide</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>Round-up</td>
<td>4300</td>
<td>15</td>
<td>herbicide</td>
</tr>
<tr>
<td>Cryolite*</td>
<td>Kryocide</td>
<td>10,000</td>
<td>21</td>
<td>insecticide</td>
</tr>
<tr>
<td>Benomyl</td>
<td>Benlate</td>
<td>&gt;10,000</td>
<td>53</td>
<td>fungicide</td>
</tr>
<tr>
<td>Bacillus thuringiensis*</td>
<td>Dipel</td>
<td>15,000</td>
<td>8</td>
<td>insecticide</td>
</tr>
</tbody>
</table>

NOTE: Some materials on this list may not be currently registered as pesticides or their use may be restricted.

*astern indicates chemical was acceptable for organically grown produce.

¹LD₅₀ indicates the amount of pesticide that will kill half of a group of test animals. These values are for milligrams of pesticide per kilogram of body weight. These figures do not provide an indication of the chronic health risk or persistence in the environment.

²EIC or Environmental Impact Quotient is a method to calculate the environmental impact of most common fruit and vegetable pesticides (insecticides, acaricides, fungicides and herbicides) used in commercial agriculture. The values obtained from these calculations can be used to compare different pesticides and pest management programs to ultimately determine which program or pesticide is likely to have the lower environmental impact.

³Estimated EIC.
“All substances are poisons; there is none which is not a poison. The right DOSE differentiates a poison from a remedy.”

—Paracelsus (1493-1541)

Even too much water can kill – over 1.5 liters/hour
Endocrine effects

- EPA just finished the initial screening of 52 active ingredients.
  - 34 were not judged to be endocrine disruptors
  - 18 of 18 showed potential effects on the thyroid
  - 17 of 18 showed potential androgenic effects
  - 14 of 18 showed potential estrogenic effects
- EPA will now require additional tests to determine if any of the 18 truly are endocrine disruptors
- [www2.epa.gov/ingredients-used-pesticide-products/endocrine-disruptor-screening-program-tier-1-assessments](http://www2.epa.gov/ingredients-used-pesticide-products/endocrine-disruptor-screening-program-tier-1-assessments)
- Does the dose make the poison?? What about hormesis?
- [http://www.belleonline.com/index.htm](http://www.belleonline.com/index.htm)
No endorsement intended or implied
One way to quickly assess the risk?

**Signal Words**

- Danger
- Warning
- Caution

No endorsement intended or implied.
Please choose the two pesticide formulation types with the lowest exposure potential

<table>
<thead>
<tr>
<th>Formulation Type</th>
<th>Percent Active Ingredient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Granular</td>
<td>3 - 15%</td>
</tr>
<tr>
<td>2. Ready to Use Baits, Gels or Liquids</td>
<td>1 - 15%</td>
</tr>
<tr>
<td>3. Dust</td>
<td>5 - 10%</td>
</tr>
<tr>
<td>4. Aerosol</td>
<td>1 - 5%</td>
</tr>
<tr>
<td>5. Wettable Powder</td>
<td>50 - 85%</td>
</tr>
<tr>
<td>6. Liquid Concentrate</td>
<td>40 - 90%</td>
</tr>
</tbody>
</table>
Reduce exposure by using targeted materials

- Enclosed baits & gels
- Spot treatments
- Broadcast treatments

Best

Worst
Which product do you think is the better choice?

1. A
2. B
3. C
4. D

No endorsement intended or implied
How is risk reduced? - PPE
What are some “environmental” risks?

- Wildlife effects
- Residues on food
Remember “Silent Spring”

*Biomagnification of chlorinated hydrocarbons like DDT or Dieldrin was a problem in the 60’s & 70’s
Today’s wildlife concerns

- Biomagnification is not a big issue any more
  - the old extremely persistent products were cancelled

- Pollinators are now a focus area

http://www.beeccdcap.uga.edu/index.html
Recent neonicotinoid research

The answers are only beginning to emerge, but current research has revealed some results:

- Mites and viruses appear to be the main causes of hive failure along with the mite controls applied by beekeepers.
  - Fungicides may exacerbate Nosema disease.

- Sub-lethal levels of some neonicotinoids affect wild bee density, nesting and colony growth.

- Varroa mite levels have been found higher in honey bee hives exposed to sub-lethal levels of imidacloprid.

- Neonicotinoids like this one can be expressed in ornamental plant pollen and nectar at levels much higher than in agricultural uses.
  - Mostly found at levels that are sub-lethal.

No endorsement intended or implied.
### Toxicity of Common Organic-Approved Pesticides to Pollinators

Soaps and Oils, only when directly sprayed upon the pollinator.
Acute Toxicity and Sublethal Effects to Honey Bees

- Andiroba oil, Garlic extract, Eucalyptus oil, Rotenone, Neem oil and Citronella oil applied to adults and fed to larvae
- All but Andiroba oil caused significant mortality to adult bees
- Andiroba, Garlic and Neem caused significant larval mortality
  - These may work like insect growth regulators preventing ecdysis (moulting)

Pesticide residues are found on all types of food

- Samples are randomly chosen near the point of consumption, and
- Samples reflect what is typically available to the consumer throughout the year
- Samples are selected without regard to country of origin, variety, or organic labeling
2015 USDA-PDP Sampling

- USDA – PDP 2015 sampling shows that over 99% of all samples are well below the tolerances set by EPA
- 15% of samples had no detectable residues
- 394 (3.9%) of samples contained extremely low levels of pesticides for which there is no tolerance
- “The data reported by PDP corroborate that residues found in agricultural products sampled are at levels that do not pose risk to consumers’ health”

http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5110007
PDP also detects pesticide residues on organic produce

- According to the 2008 USDA Pesticide Data Program Report:
  - 43% of organic spinach samples were positive for spinosad (13 of 30 samples positive)

- According to the 2010 and 2011 USDA Pesticide Data Program Report:
  - 52% of organic baby food pear samples were positive for spinosad (16 of 31 samples) 2010
  - 49% of organic baby food pear samples were positive for spinosad (33 of 67 samples) 2011

- 2013 USDA PDP report
  - 92% of organic nectarine samples were positive for spinosad (11 of 12 samples)

- Spinosad is National Organic Program approved and is derived from a naturally occurring soil bacteria

No endorsement intended or implied
Other pesticide risks

- Drift
- Water contamination
- Storage
- Disposal
Drift

- Check for sensitive areas first!
- Watch the wind speed
- Keep the spray low
- Spray with the breeze
- Don’t apply when over 85°F
Pesticides Can Leach Into Groundwater

More than two dozen pesticides have been detected in Maine groundwater
Evidence? Maine Studies

- 1980’s: Aldicarb (Temik) contamination of 107 wells near potato fields in Aroostook Co.
- 1980-90’s: Multiple collaborative studies near potato fields
- 1994 to present: Periodic statewide groundwater and hexazinone monitoring programs
Home pesticide use - Worst case scenario

- Homeowner application of granular diazinon around well casing to control ants resulted in 10x over Maximum Contaminant Level (MCL) for drinking water.

- Detected during 1994 statewide groundwater monitoring of 129 wells for agricultural pesticides

- Of 31 samples with positive detections, 30 below health advisory levels (HAL), Maine exposure guidelines (MEG), maximum contaminate levels (MCL)
Agricultural Use Groundwater Monitoring Results

• 50 wells sampled near blueberry fields in 2015
  – 41 wells with detections
  – 7 different herbicides found
  – No detections above health advisory or maximum exposure levels
Pesticides Can Run-off Into Surface Waters
Surface Water/sediment Sampling – Home, Lawn & Garden Pesticides

– Pesticide residues detected in surface water

• Diazinon up to (2.6 ppb)**
• 2,4-D up to (36.4 ppb)
• Dicamba up to (4.1 ppb)
• MCPP up to (26 ppb)
• MCPA up to (0.45 ppb)
• Clopyralid up to (0.91 ppb)
• Propiconazole up to (0.075 ppb)
• Chlorothalonil up to (0.22 ppb)
• Found Excess Nitrogen & Phosphorous in most samples

– Pesticide residues detected in sediments

• Bifenthrin up to (37 ppb)
• Permethrin up to (47 ppb)
• Cypermethrin up to (5 ppb)

**Values in red exceed Aquatic Life Criteria
BPC Gulf of Maine Study 2015

• 20 of 20 stormwater sites, Kittery to Whiting, with detections

• 22 pesticides and fipronil degradates in water
  – Bifenthrin exceeded aquatic life criteria at 7 sites, permethrin at 1 site

• 2 pyrethroids in sediment
  – Bifenthrin at 7 of 14 sites, esfenvalerate at 1 site
USGS National Water Quality Assessment

- Sampled urban streams
  - Insecticides occurred more frequently in urban streams than they did in agricultural area streams
  - Herbicides detected in 99% of Urban stream samples
  - Phosphorous found at same levels as in agricultural streams
    - 70% of those samples exceeded the EPA desired goal for reducing nuisance plant growth (algae)
Prevent water contamination

- Locate & stay away from wells
- Stay away from ledge
- Stay away from wetlands & water
- Do not apply to slopes near water
- Do not apply before heavy rains
- Spot applications
- Vegetative buffers
Storage

- Buy only what you need
- Keep them out of reach of children & lock them up
- Keep in original containers
- Never store in basement!
Disposal

- Follow label
- Rinse containers
- Apply extra mix to labeled site
- Call BPC about obsolete pesticides
Which product is most risky to handle?

A. Vegetation Killer
B. Roundup
C. BurnOut II

No endorsement intended or implied.
Think First…. Spray Last

“The quick fix is neither”!

Make the benefits

Outweigh the risks
1997 Legislative Mandate

- It is the policy of the State to Minimize reliance on pesticides!
Look at the big picture

Make plans to avoid pest problems
Use site appropriate, non-invasive plants

- Native plants are often well adapted
  - Fewer problems, less work, more rewards, **but not all are problem free**, e.g., viburnums

- Invasive plants are easy to grow but crowd out native vegetation
  - Our local forest habitats are changing rapidly
  - Invasive plants can ruin wildlife habitat
  - Invasive plants harbor more infected deer ticks
Right plant, right place, right purpose

- Choose plants based on the site conditions not just for their color
- Select plants that thrive under existing conditions rather than trying to alter the conditions to meet the needs of a plant
- Minimize disturbance of the existing landscape
Use a diversity of plants and grasses

- Less noticeable damage from pests and disease
- Incorporate many layers of plant types
  - Trees
  - Shrubs
  - Ground covers
  - Perennials, and
  - Lawns
Create wildlife habitats

Diversity and plant layers go hand in hand with habitat creation

Add nectar and fruit producing plants

Strive for continuous blooms

Add water, walls, feeders, woody debris
Habitat enhancement for beneficials

Many beneficials require pollen and/or nectar as dietary supplements

Provide a series of plants that, collectively, provide continuous nectar/pollen supply

Many plants benefit natural enemies and pollinators
### Bloom Timing of Native Plants Attractive to Beneficial Insects

<table>
<thead>
<tr>
<th>Native plant</th>
<th>Natural enemies</th>
<th>Bees</th>
<th>Bloom Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>wild strawberry</td>
<td>**</td>
<td>*</td>
<td>May</td>
</tr>
<tr>
<td>golden Alexanders</td>
<td>****</td>
<td>**</td>
<td>Jun</td>
</tr>
<tr>
<td>Canada anemone</td>
<td>****</td>
<td>*</td>
<td>Jul</td>
</tr>
<tr>
<td>penstemon</td>
<td>**</td>
<td>**</td>
<td>Aug</td>
</tr>
<tr>
<td>angelica</td>
<td>****</td>
<td>*</td>
<td>Sep</td>
</tr>
<tr>
<td>cow parsnip</td>
<td>****</td>
<td>*</td>
<td>Oct</td>
</tr>
<tr>
<td>sand coreopsis</td>
<td>****</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>shrubby cinquefoil</td>
<td>****</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Indian hemp</td>
<td>****</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>late figwort</td>
<td>**</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>swamp milkweed</td>
<td>**</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>Culver’s root</td>
<td>**</td>
<td>****</td>
<td></td>
</tr>
<tr>
<td>yellow coneflower</td>
<td>****</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>nodding wild onion</td>
<td>*</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>meadowsweet</td>
<td>****</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>yellow giant hyssop</td>
<td>**</td>
<td>****</td>
<td></td>
</tr>
<tr>
<td>horsemint</td>
<td>****</td>
<td>**</td>
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</tr>
<tr>
<td>Missouri ironweed</td>
<td>**</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>cup plant</td>
<td>****</td>
<td>****</td>
<td></td>
</tr>
<tr>
<td>pale Indian plantain</td>
<td>**</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>boneset</td>
<td>**</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>blue lobelia</td>
<td>****</td>
<td>****</td>
<td></td>
</tr>
<tr>
<td>pale-leaved sunflower</td>
<td>****</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>Riddell’s goldenrod</td>
<td>****</td>
<td>****</td>
<td></td>
</tr>
<tr>
<td>New England aster</td>
<td>****</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>smooth aster</td>
<td>**</td>
<td>**</td>
<td></td>
</tr>
</tbody>
</table>

**KEY**
- ** good
- ** better
- **** best
Pretty ornamentals? Pests?
Birds can also be our allies

http://www.bringingnaturehome.net/
On average natives support 12x more lepidopteran species

N=69 for aliens & N=101 for natives

Woody Ornamental
Reduce lawn area

- Reduces
  - Water & air pollution
  - Water usage
  - Maintenance
  - Costs

- Gives
  - More free time

Mower exhaust = 11 cars’ exhaust

One hour of mowing = driving 400 miles

Mowers spew 87 lbs of greenhouse gases and 40 pounds of other pollutants annually
Use low input plant varieties

- No-mow fescue vs Kentucky bluegrass
- Pagoda dogwood vs flowering cherry
- River birch vs paper birch
Protect lakes & streams with buffers

- Preserve existing landscape
- Winding paths
- Don’t mow to the water’s edge
- Leave the duff
Reduce runoff

- Reduce amount of impervious (hard) surfaces
- Create rain gardens or install rain barrels
- Direct water into vegetated areas
- Irrigate properly and only when needed
Reduce reliance on pesticides, fertilizers and water

- Grow plants that are resistant to insects & diseases
- Use plants that tolerate low fertility
- Use drought resistant plants

Sweet Fern

White Fir
Use common sense pest management

- Integrated pest management
  - Know your pest
  - Cultural practices
  - Mechanical methods
  - Use pesticides as last resort
Know Your Pest

- Identify the pest
Is it a pest problem?
Is this a disease?
Welcome or Unwelcome?

1. Welcome
2. Unwelcome
Tachinid fly (the so-called “winsome fly”) laying an egg on a Japanese beetle adult

*Istocheta (=Hyperecteina) aldrichi*

Introduced into US from Japan in 1922

Adults emerge Late June/July, feed on honeydew, nectar

Lay up 100 eggs in two weeks

Eggs hatch 1 day later, dig into beetle

Kills beetle in 5-6 days

Just before death, beetle digs into ground where fly spend winter as pupa

Joshua P. Basham
T.S.U. Otis L. Floyd Nursery Research Center
McMinnville, TN 37110-1367
From Point Sebago Golf Course, Casco, Maine
We love the good “bugs!”
Welcome or Unwelcome?

1. Welcome
2. Unwelcome
Good bug in action
Welcome or Unwelcome?

1. Welcome
2. Unwelcome
Flower fly larvae eat aphids!
Science fiction monster?
Delicate beauty
Proceed with caution to protect beneficial insects

- Dragonflies
- Spiders
- Small parasitic wasps
- Predatory mites
- Syrphid flies
- Ground beetles
Know Your Pest

- Identify the pest
- Is it really a problem?
- Monitoring
  - When do you need to control it?
Cultural Controls

- Landscape design
  - replace “susceptible” or chronically pest-prone plants with resistant or non-susceptible plants
  - increased plant diversity and habitat complexity can increase natural enemies present (Shrewsbury 1996)
Cultural controls

- **Fertilizer**
  - over fertilization can cause the “aphid effect”
  - high nitrogen fertilizers may help the pest more than the plant

No endorsement intended or implied
Select slow release fertilizers

GUARANTEED ANALYSIS

- Total Nitrogen (N)..........................8.00%
  - 1.0 % Water Soluble Nitrogen
  - 7.5 % Water Insoluble Nitrogen
- Available Phosphate (P2O5)...............0.0 %
- Soluble Potash (K2O)......................1.0 %

- NON PLANT FOOD INGREDIENTS
  Bacillus subtilis, Bacillus licheniformis, Bacillus pumulis, Bacillus megaterium, Paenibacillus polymyxa, Paenibacillus durum each @ 275,000 CFU per gram of finished product

Derived from corn gluten, steamed bone meal & sulfate of potash

Look for Water Insoluble Nitrogen (WIN)
Water management is crucial

- proper irrigation
- water deeply and infrequently
- only water the root system
- water early in the morning
Colorado Potato Beetle

- **Crop Rotation**: Rotate potatoes or eggplant to a field that is at least 200 yards from the previous year's fields.

- **Early planting**: Green sprouting, prepares whole seed potatoes to emerge rapidly, gaining about 7-10 days to harvest.

- **Late planting**: CPB adults that do not find food leave the field in search of greener pastures. Plant after mid-June

- **Straw mulch**: When potato or eggplants are mulched with straw, fewer Colorado potato beetle adults will settle on the plants and fewer eggs will be laid.

- **Biological control**: There are numerous predators and parasitoids that attack CPB adults (a tachinid fly), larvae (12-spotted ladybeetle, spined soldier bug, ground beetles), and eggs. If sprays are needed, selective products will conserve beneficial.
Cultural Controls – Late Blight

- Do not keep cull piles of potatoes
- Do not save questionable potato seed
- Do not compost diseased tubers,
- Buy seed from a good source
- In the spring, scout, pull and destroy all volunteer potatoes
Look for varieties that are resistant to disease

Defender is the only U.S. commercial potato with late-blight-resistant leaves and tubers.

Photo by Peggy Bain

**Figure 5 – Potato Varieties**

<table>
<thead>
<tr>
<th>Better</th>
<th>Worse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Cloud</td>
<td>Carolina</td>
</tr>
<tr>
<td>Red Dale</td>
<td>Shepody</td>
</tr>
<tr>
<td>Butte</td>
<td>Red Cloud</td>
</tr>
<tr>
<td>Kennebec</td>
<td>Red Norland</td>
</tr>
<tr>
<td>Russet</td>
<td>Kennebec</td>
</tr>
<tr>
<td>Chieftan</td>
<td>Chieftan</td>
</tr>
<tr>
<td>Elba</td>
<td></td>
</tr>
<tr>
<td>Red Norland</td>
<td></td>
</tr>
<tr>
<td>* Island Sunshine</td>
<td></td>
</tr>
</tbody>
</table>

* – Commonly reported
Italic – reported both better and worse

http://www.mofga.org/
Japanese Beetle

- Select non-preferred shrubs and trees (avoid linden, roses, crabapples, grapes, raspberries, cherries, etc.)
- Cover susceptible plants with protective netting
- Avoid traps
- Use trap plants (Virginia creeper, zinnia, pole beans, etc.)

Kentucky wonder pole beans
Composting?...

NOT diseased material
Temperatures needed to kill plant pests:

- 212°F, 0°C: Heat-tolerant weed seeds and viruses
- 180°F, 82°C: Most weed seeds, bacteria, most plant-pathogenic viruses, most insects
- 160°F, 71°C: Most plant-pathogenic bacteria and fungi, worms, slugs, centipedes
- 120°F, 49°C: Oomycetes, nematodes, some fungi
Physical IPM Methods

• Mulching
  – Suppress weeds
  – Conserve moisture
  – Provide habitat for natural enemies
Physical Methods

- Exclusion (example: bird netting, row covers)
- Pruning Physical removal
  - hand-pick,
  - shake and capture
  - rake or remove infested tissue
Do you need a pesticide?

- Is the pest in a susceptible stage?
- Application timing is critical
- Is the pest still present?
Is the pest protected?

Birch leafminer

Birch leafminer

Birch leafminer
Don’t apply when you can’t hit a susceptible target

Colorado potato beetle

Lace bugs
Timing is everything?
Nobody home!

Eriophyid gall mite

Oak apple gall wasp
The key to proper use

- Read the label!
The old days
Great directions!

“Bug Death is a patented non-poisonous powder, and is entirely different from anything that has ever been placed on the market, and overcomes all the objections to the deadly poisons that the farmers have been obliged to use in the past. It is just as effectual as Paris Green and other dangerous insect powders. It is sure death to the potato, squash and cucumber bugs, currant and tomato worms, also other plant and vine eating pests.

The deadly effect on bugs will not always be as quick, but it is just as sure. Contrary to the arsenic preparations, it is a benefit to the plant, and the more freely used the better the plant will thrive, and for potatoes when blight is prevalent, the extra yield will more than pay all expense of Bug Death.”

Contained 5% lead oxide & 47% zinc oxide
Colorado Potato Beetle Beater is a moderately hazardous pesticide.

1. True
2. False
False – Caution = slight hazard
Colorado Potato Beetle Beater should be applied before the pest is seen.

1. True
2. False
False

WHEN TO APPLY
Apply when listed pests are present. Repeat applications may be made as indicated in the Home Gardens section. See your state extension service recommendations for treatment guidelines in your area.

HOME GARDENS
In the state of Georgia, do not apply this product to: Broccoli Raab, Chinese Cabbage (Bok Choy), Collards, Kale, Mizuna, Mustard Greens, Mustard Spinach, Rape Greens.
Colorado Potato Beetle Beater is approved for organic production so it is not harmful to the environment.

1. True
2. False
This product is toxic to aquatic invertebrates. To protect the environment, do not allow pesticide to enter or run off into storm drains, drainage ditches, gutters or surface waters. Applying this product in calm weather when rain is not predicted for the next 24 hours will help to ensure that wind or rain does not blow or wash pesticide off the treatment area. Rinsing application equipment over the treated area will help avoid run off to water bodies or drainage systems.

**Physical or Chemical Hazards**

Combustible. Do not use or store near heat or open flame.
How many tablespoons of Colorado Potato Beetle Beater should you add to a 3 gallon sprayer?

1. 2 Tbs
2. 4 Tbs
3. 6 Tbs
4. 12 Tbs
12 Tbs for 3 gallons of spray

**HOW TO MIX**

Add the required amount of this product to the recommended amount of water, mix thoroughly, and apply uniformly to both upper and lower surfaces of plant foliage. It is recommended to mix only as much spray as needed for a single treatment. In vegetable gardens it is recommended to use not more than 3 gallons of spray for 1000 sq ft of area. Do not use kitchen utensils for measuring. Keep measuring utensils with product and away from children.

<table>
<thead>
<tr>
<th>Unit of Measure*</th>
<th>Amount of this product to Use per Pint, Quart or Gallon of Spray</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per Pint (16 fl oz)</td>
</tr>
<tr>
<td>Fluid Ounces (fl oz)</td>
<td>0.25 fl oz</td>
</tr>
<tr>
<td>Milliliters (mL)</td>
<td>7.5 mL</td>
</tr>
<tr>
<td>Tablespoons (Tbs)</td>
<td>½ Tbs</td>
</tr>
<tr>
<td>Teaspoons (tsp)</td>
<td>1 ½ tsp</td>
</tr>
</tbody>
</table>

* Conversion factors: 1 fl oz = 30 mL; 2 tablespoons (Tbs) = 6 teaspoons (tsp) (1 teaspoon = 1/3 tablespoon)
Colorado Potato Beetle Beater is a good choice for treating asparagus spears for asparagus beetle damage

1. True  
2. False
False – may only treat post harvest

<table>
<thead>
<tr>
<th>Crops</th>
<th>Pests Controlled</th>
<th>Maximum Number of Applications per Season</th>
<th>Minimum Days to Wait before Reapplying</th>
<th>Minimum Days to Wait from Last Application to Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>apple and other pome fruits including crabapples, mayhaw, pears, and quince</td>
<td>codling moth, leafminers, leafrollers, Oriental fruit moth, tufted apple budmoth</td>
<td>6</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>asparagus (post-harvest to protect ferns)</td>
<td>asparagus beetles</td>
<td>4</td>
<td>7</td>
<td>60</td>
</tr>
<tr>
<td>bushberries and caneberries, including blackberry, blueberry, currant, elderberry, gooseberry, huckleberry, juneberry, lingonberry, loganberry, raspberry, and salal</td>
<td>armyworms, fireworms, fruitfly (suppression), fruitworms, leafrollers, loopers, thrips</td>
<td>6</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>
What protective equipment must be worn when mixing Colorado Potato Beetle Beater?

1. goggles
2. gloves
3. long pants & long sleeves
4. None of these
Nothing is required… But

PRECAUTIONARY STATEMENTS

Environmental Hazards
This product is toxic to bees exposed to treatment for 3 hours following treatment. Do not apply this pesticide to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period. This product is toxic to aquatic invertebrates. To protect the environment, do not allow pesticide to enter or run off into storm drains, drainage ditches, gutters or surface waters. Applying this product in calm weather when rain is not predicted for the next 24 hours will help to ensure that wind or rain does not blow or wash pesticide off the treatment area. Rinsing application equipment over the treated area will help avoid run off to water bodies or drainage systems.

Physical or Chemical Hazards

Combustible. Do not use or store near heat or open flame.
Purchase wisely

- Measure the area needing treatment

- Only purchase what you need “right now”

- Check the label for:
  - re-entry
  - site & pest
  - days to harvest
  - personal protective equipment needs
Prepare for the application

- Read the label
- Wear all PPE
- Mix carefully
- More is NOT better
- Never use more than the label directs
Apply properly & be cautious

- Only treat infested areas
- Spot treatments conserve beneficial organisms
- Avoid broadcast treatments
- Keep the plant’s condition in mind
- Check coverage & monitor control
- Only repeat application if the label allows
Why treat the whole tree?

Dogwood borer on apple
Why treat the whole tree?

Eastern tent caterpillar
Broadcast applications

- Broadcast applications of lawn herbicides can cause weird results.

- Broadcast applications of any pesticide are prohibited within 25 feet of any wetland or water body.
If you must apply a pesticide

- Wait long enough for the product to work

- Examples

No endorsement intended or implied
If you must apply a pesticide

- Keeps records of what was used and how well it worked
- Review your records before treating again next season
If you must apply a pesticide

- Clean yourself and your equipment
- Apply rinse water to the application site
- Wash contaminated clothing separately
You must wait 10 days before re-applying Colorado Potato Beetle Beater to apples.

1. True
2. False
In the state of Georgia, do not apply this product to: Broccoli Raab, Chinese Cabbage (Bok Choy), Collards, Kale, Mizuna, Mustard Greens, Mustard Spinach, Rape Greens.

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<td>4</td>
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<td>60</td>
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It is appropriate to use Colorado Potato Beetle Beater if you will be selling your produce.

1. True
2. False
Colorado Potato Beetle Beater Concentrate

- DO-IT-YOURSELF HOME GARDEN INSECT CONTROL.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Read all Directions for Use carefully before applying.

For residential use in home gardens, lawns and ornamentals. Not for use on plants being grown for sale or other commercial use, or for commercial seed production, or for research purposes.
Colorado Potato Beetle Beater is best applied to apple trees just as they reach full bloom.

1. True
2. False
PRECAUTIONARY STATEMENTS

Environmental Hazards
This product is toxic to bees exposed to treatment for 3 hours following treatment. Do not apply this pesticide to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period. This product is toxic to aquatic invertebrates. To protect the environment, do not allow pesticide to enter or run off into storm drains, drainage ditches, gutters or surface waters. Applying this product in calm weather when rain is not predicted for the next 24 hours will help to ensure that wind or rain does not blow or wash pesticide off the treatment area. Rinsing application equipment over the treated area will help avoid run off to water bodies or drainage systems.

Physical or Chemical Hazards
Combustible. Do not use or store near heat or open flame.
Who you gonna call?

PESTICIDE REGULATIONS
- Board of Pesticides Control
  207-287-2731

PEST PROBLEMS
- Cooperative Extension
  800-287-0279
- Maine Forest Service
  207-287-2431

PESTICIDE POISONING
- Northern New England Poison Center
  800-222-1222
Board of Pesticides Control

WHAT'S NEW

- DEP General Permit for the Discharge of Pesticides March 2, 2015 [PDF]
- Next Board Meeting: April 24, 2015
- 2015 Non-Agricultural Pesticide Notification Registry [PDF] or XLS spreadsheet

Useful Information on our Website

- Pollinator Protection
- Environmental Risk Advisory Committee
- Recently Adopted Rule Amendments and Amendments Under Consideration
- Presentations from the 2015 Agricultural Trades Show and MELNA/MAA Conference
- Important Warning Regarding Persistent Herbicides [PDF]: Herbicide Carryover Customer Acknowledgment Sample Form [PDF]
- Licensing and Certification (Applicators and Distributors)
- Pesticide Registration
- Water Quality Program
- Enforcement
- School IPM
- Worker Protection Standard
- Best Management Practices
- Maine YardScaping Partnership
- Bt Corn
- Container Recycling
- Chocolate Pesticide Collection

Licenses for Medical Marijuana Growers

Medical Marijuana growers that intend to control, repel or mitigate any pest (insect, mite, plant disease, weed or rodent) or use rooting hormones or other plant growth regulators must be licensed to apply any product to the crop or the growing media. Primary Caregivers or Dispensaries must have at least one owner or employee licensed who will supervise the application of any pesticide.

Learn more:
- What is a Pesticide?
- Scheduled Trainings
- Details on Pesticide Licensing
- Details on Medical Marijuana Licensing (DHHS)

Agricultural Basic License Deadline is April 1, 2016!

Growers who use only general-use (over-the-counter) EPA registered pesticides and comply with all other provisions of the Agricultural Basic License Program are encouraged to apply for the Agricultural Basic License for the 2016 growing season. Application period closes April 1, 2016.
Summary

- Risk = Toxicity x Exposure
- All pesticides have risks
- Reduce risks - wear PPE
- Make the benefits outweigh the risks
Please rate this presentation

1. Wow
2. Helpful
3. Ho Hum
4. Crap
5. Bull Crap