CSU Entomology Update – ProGreen 2018

Whitney Cranshaw
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Japanese Beetle

*Popillia japonica*
Overlap of adult feeding on flowers – and use of those flowers by pollinators

Issue of unusual concern with Japanese beetle
Chemical Controls Most Effective for Control of Japanese Beetle Adults

- Most pyrethroids (e.g., cyfluthrin, permethrin, bifenthrin)
- Carbaryl
- Acetamiprid
- Imidaclorpid
- Chlorantraniliprole

Do not treat plants with flowers in bloom!
New biological control for Japanese beetle - and other grubs?

Bacillus thuringiensis var. galleriae

Sold as **beetleGONE!** in commercial/ag markets

Sold as **beetleJUS** in gardener market
**Bacillus thuringiensis**

- Derived from a widely distributed soil bacterium
- Active ingredient a toxic protein crystal that destroys cells of the midgut
- Used as a stomach poison
- Several different strains – each effective against different insects
Several strains are present, each with specific activity:

- *kurstaki*, *aizawi* strains (leaf feeding Lepidoptera larvae)
- *tenebrionis* strain (leaf beetles)
- *israelensis* strain (mosquito, gnat, black fly larvae)
Treated Foliage Consumed
Feeding Inhibition (1 Hour)

- Toxin Crystals Dissolve in Gut.
- Larvae Stop Feeding.
- Growth Stops.
Death (2-5 Days)

- Starvation
- Gut Disruption
New biological control for Japanese beetle - and other grubs?

*Bacillus thuringiensis var. galleriae*

Sold as *beetleGONE!* in commercial/ag markets

Sold as *beetleJUS* in gardener market
beetleJUS treated

Water check
beetleJUS for adult Japanese beetle?

Provides **good reduction in feeding** injury by Japanese beetle

Provides **fair mortality** of Japanese beetles and mortality is slow

Persistence of effects probably a few days
Bee hazard warnings and use restrictions?

None. You can apply this product to plants in bloom when bees are visiting.
After application

Are they dead? (probably not)

Are they still feeding? (probably not)
Should we now consider trying to introduce natural enemies of Japanese beetle into Colorado?
Natural Enemies of Japanese Beetle Exist Elsewhere in the US

- *Paenibacillus popilliae* (Milky spore)
  - Bacterium
- *Istocheta aldrichi*
  - Tachinid fly
- *Tipha* species
  - Parasitic wasps
- *Ovavesicula popilliae*
  - Microsporidium
Natural Enemies of Japanese Beetle for Potential Introduction into Colorado?

*Ovavesicula popilliae* – a microsporidian disease of Japanese beetle larvae

Main observed effects from infection – reduced fecundity, reduced winter survival
Japanese beetles collected from Michigan that were infected with *Ovavesicula popilliae* were shipped to us in late July 2015. The beetles were frozen, so no live beetles were introduced, but the pathogen should still be viable.
The infected (but dead and frozen) beetles were applied in several ways:

- Inserted whole into soil
- Broadcast whole on surface
- Blended and applied as slurry
2015 releases of *Ovavesicula popilliae* – It took!

Positive infections confirmed from both Flatirons Golf Course (Boulder) and Pueblo Zoo release sites!!!!
Should we now consider trying to introduce natural enemies of Japanese beetle into Colorado?

Yes!
Heavy *O. popilliae* infection of Malpighian tubules of Japanese beetle.

Source: David Smitley, Michigan State University
Infected malpighian tubule packed with *O. popilliae* sporophorous vesicles
Microsporidia

Fungus

The Microsporidia constitute a group of spore-forming unicellular parasites. They were once considered protozoans or protists, but are now known to be a unique group of fungi.
Year 6: Impact of *Ovavesicula* Infection on Winter Grub Mortality (Oct.'05 to April '06)

\[ y = 1.34x + 0.27 \]

\[ R^2 = 0.45 \]

Source: David Smitley, Michigan State University
Ovavesicula popilliae: % infection of adult Japanese beetles at ten golf courses in Michigan from 2000 to 2016.

\[ y = 0.16x^2 - 0.90x + 1.3 \]

\[ R^2 = 0.61 \]

Source: David Smitley, Michigan State University
Japanese beetle trap catches at ten golf courses in southern Michigan from 1999 to 2016.

Data are mean beetles/trap/week.

Source: David Smitley, Michigan State University
Natural Enemies of Japanese Beetle for Potential Introduction into Colorado?

*Tiphia* wasps – parasitic wasps (2 species) of Japanese beetle larvae
Natural Enemies of Japanese Beetle for Potential Introduction into Colorado?

*Istocheta aldrichi* – tachinid fly parasitoid of Japanese beetle adults
Should we now consider trying to introduce natural enemies of Japanese beetle into Colorado?

Yes!
I am looking for release sites for Japanese beetle natural enemies in 2018

- **Ovavesicula popilliae** (the pathogen)
  - Site must have *alot* of Japanese beetle grubs

- **Istocheta aldrichii** (the parasitic fly)
  - Site must have *alot* of flowering plants in bloom during late June-early August

If interested, let’s talk here or email me at:
Whitney.Cranshaw@colostate.edu
Uber-host Plants Favored by Japanese Beetle Adults in CO

- Roses**
- Linden*
- Virginia Creeper*
- Silver lace**
Other Plants Commonly Grown in CO that are Highly Favored by Japanese Beetle

**Ornamentals**
- Hollyhock*
- Gaura**
- Rose-of-Sharon**
- Crabapple
- Japanese maple
- Peking cotoneaster

**Food Crops**
- Beans (green, edamame)
- Basil
- Raspberry*
- Grape

* JB populations overlap with flowering
** JB populations overlap >alot< with flowering
Evaluations of roses at the War Memorial Garden in Littleton, 2016-2017
Japanese Beetle Damage Evaluations on Roses – War Memorial Rose Garden

- Seven observations were made during season
- Damage by Japanese beetle ranked on a 0 to 3 scale (no damage to heavy damage)
Japanese Beetle Damage Evaluations on Roses – War Memorial Rose Garden

- Seven observations were made during season
- Damage by Japanese beetle ranked on a 0 to 3 scale (no damage to heavy damage)
- Observed flower visitation by bees ranked on a 0 to 3 scale (no visitation to high visitation)
Roses that *Were Not* Observed Damaged by Japanese Beetle

- Child’s Play
- Cupcake
- Gemini
- Old Glory
- Rainbow Sorbet
- Angel Face
- Class Act
- Electron
- Jean Kenneally

- Perfecta
- Shining Hour
- Carrot Top
- Colossus
- French Lace
- Joseph’s Coat
- Picotee
- Sun Sprinkles
- Merlot
<table>
<thead>
<tr>
<th>Cultivars on which no bees were noted</th>
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<tbody>
<tr>
<td>Child's Play (M)</td>
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<tr>
<td>Midas Touch (M)</td>
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<tr>
<td>Baby Boomer (M)</td>
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<tr>
<td>Graham Thomas (DAS)</td>
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<tr>
<td>Tuscan Sun (HT)</td>
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<table>
<thead>
<tr>
<th>Cultivars on which very few bees were noted (0 - 0.5 rating)</th>
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<tr>
<td>Winsome (HT)</td>
</tr>
<tr>
<td>Salmon Sunblaze (HT)</td>
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<tr>
<td>Eutin (F)</td>
</tr>
<tr>
<td>Shining Hour (HT)</td>
</tr>
<tr>
<td>Garden Party (HT)</td>
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<tr>
<td>Sun Flare (HT)</td>
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Cultivars that will be difficult to maintain in a post-JB world

Cultivars bees do not visit – insecticide options are much greater

Cultivars that JB doesn’t damage in the first place
Roses that are Heavily Damaged by JB and Visited a lot by Pollinators

- Prima Donna
- Carefree Delight
- Carefree Spirit
- Climbing New Dawn
- Day Dream
- Easy Does It
- Elle
- Eureka
- First Edition
- Fourth of July

- Glowing Peace
- Honey Perfume
- Hot Coco
- Lady Elsie May
- Moon Dance
- Morden Sunrise
- Pescali
- Rainbow Knock Out
- Starry Night
- Touch of Class
Japanese Beetle Extension Materials for 2018

• Updated Japanese Beetle Fact Sheet

• New Questions and Answers about Japanese Beetle

These will be placed on a new section on the Insect Information Website.
This presentation – and a new JB section - will be posted at the Colorado State University Insect Information Website.

Insect Information

All materials needed in another accessible format can be made available upon request.

- Insect Information
  All materials needed in another accessible format can be made available upon request.
  + Colorado Bug Mugs
  + Arthropods of Colorado
  + Extension Related Insect Information
  + Emerald Ash Borer
  + Hemp Insect Website
Insect Management Considerations in Hemp Production

The Hemp Insect Website is designed to provide hemp producers a way to recognize and to better understand the insects, mites, and other “bugs” that are present when this crop is grown in North America.

The goals of the Hemp Insect Website are to: (1) Provide description of all insects and mites observed in production of hemp; (2) Provide information on the habits of all insects that are associated with hemp production.

In this start-up form (2017), the Hemp Insect Website is giving particular attention to insects and mites that are...
New(ish) online course

Horticultural Entomology (BSPM356)

• Made of three, 1-credit sections
  – Introduction to Horticultural Entomology (required or equivalent)
  – Horticultural Entomology: Food Crops
  – Horticultural Entomology: Landscape Plants

• Taught in Spring and (I expect) Fall Semesters
Hot off the presses!
Garden Insects of North America, 2nd Edition

- Complete revision of original
- Co-authored (with David Shetlar, Ohio State University)
- Contains over 3100 photos, most all new
- Retail price $35
This presentation will be posted at the Insect Information web site

- **Housed at** Department of Bioagicultural Sciences and Pest Management
  - **Search** “BSPM CSU”
- **Within** “Extension and Outreach”
- “Insect Information”
  - **Extension presentations are posted at bottom of page**
Thank you!

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