Wild Blueberry Best Management Practices for Insects
Insects associated with wild blueberry by Dr. Frank Drummond University of Maine

outline

• natural enemies: predators and parasites
• pollinators
• pest insects and their management
• insecticide tutorial
Natural enemies

What is this insect?

1) Who are they?
2) Their role (what they feed upon) and their biology
3) How can they be conserved in fields?

ground spiders

• most abundant (130 species) - ground or wolf SPIDERS
• night hunters, ambush and paralyze prey with venom
• feed upon spanworm larvae, flea beetle larvae and adults, grasshoppers, blueberry flies, and each other (spiders)
• abundant near field edges, peak in late June, early July
ants

- ANTS are abundant in some fields, live in social colonies
- prey upon insects during the day, climb plants to hunt
- feed upon spanworm larvae, flea beetle larvae, grasshoppers, and other natural enemies. Blueberry flea beetle pupae and blueberry leaf beetle adults are attacked, but at a low level.
- sensitive to many common insecticides, such as Imidan®
- common in fields that are weedy

[Image of an ant]

ground beetles

- GROUND BEETLES are common in all fields, ca. 30 spp.
- prey upon insects mostly during the night, search ground
- feed upon spanworm, flea beetle, red-striped fireworm larvae, maggots, and other ground dwelling insects
- also, some feed on weed seeds

[Image of a ground beetle]
**harvestmen**

- HARVESTMEN or daddy longlegs are abundant some years and scarce other years, only 7 species in Maine
- prey upon very small insect eggs and larvae mostly during the night, search ground and will climb plants for prey
- feed upon very small spanworm and flea beetle larvae as well as thrips prior to leaf curl

**parasitic wasps**

- parasitic wasps, 2-3 species in Maine
- parasitize spanworm caterpillars and blueberry maggots
parasitic wasps (continued)

- wasps need flowers to obtain nectar energy to hunt pests
- wasps are sensitive to insecticides

summary

- many beneficial enemies
- can enhance populations
- economic value – not known, but there is potential to reduce pest populations
pollination and pollinators

1) pollination of wild blueberry
2) commercial bees: honey bees, bumble bees, and alfalfa leafcutting bees
3) native bees or wild bees

pollination

- pollination is the means to plant reproduction
- wild blueberry is a clonal system
- male/female flowers - self-incompatible
fertilization or pollination

flower dynamics

- flower phenology
- flower receptivity
result of pollination

- fertilized eggs – seeds
- many ovules or eggs per flower
- fruit set – a fruit for each set flower
- seeds and fruit size

commercial pollinators – honey bee

- honey bees – not a native bee
- live in social families units – 50,000 worker bees and a single queen
- 4 hives / acre
- ? bees / sq. yd
- Not efficient on a per bee basis...BUT
commercial pollinators – bumble bee

• *Bombus impatiens* – the commercial bumble bee of the east
• purchase bumble bees
• 4 hives / acre
• highly efficient pollinator

commercial pollinators – alfalfa leafcutting bees

• ordered from western U.S. or Canada
• arrive in the pupa stage in a leaf roll
• need to incubate prior to bloom
• sensitive to cold springs
native bees, flies, hornets

• more than 100 species of native bees
• these bees have evolved with wild blueberry
• some fields have an abundance of natives
• unpredictable in abundance year to year

native bee enhancement

• economic value? 2.3 X that of honey bees
• decrease - proportional to insecticide applications
• increase - nesting habitat and flowering species
pollination management

- If using honey bees invest in strong colonies
- consider buying bumble bees for smaller isolated fields
- reduce competing flowering weeds that bloom at the same time as wild blueberry
- minimize pesticide exposure to bees
  - insecticides AND fungicides
  - never spray during bloom
- provide requisites for native bees
  - flowering plants before and after blueberry bloom
  - bare ground habitat for soil nesting bees
  - nesting substrates for leafcutting bees

summary

- pollination is the fundamental requisite for a good wild blueberry crop
- if you have to cut back expenses for management, pollination should be a priority
- an integrated pollination strategy involves the use of commercial bees such as honey bees or bumble bees, but in addition, enhancement of native bee populations
## Recommended insecticides for wild blueberry in Maine

- Imidan 2.5 EC, 70 WP (phosmet) - nerve toxin
- Malathion SE, 8F (malathion) - nerve toxin
- Diazinon (diazinon) - nerve toxin
- Sevin 4XLR (carbaryl) - nerve toxin
- Assail 70 WP (acetamiprid) - nerve toxin
- Admire, Provado 1.6 F, Montana 2F (imidacloprid) - nerve toxin
- GF-120 NF Naturalyte (spinosad) - nerve toxin
- Entrust 80 W (spinosad) - nerve toxin
- Delegate WG (spinetoram) - nerve toxin
- Asana XL (esfenvalerate) - nerve toxin
- Danitol 2.4 EC (fenpropathrin) - nerve toxin
- Confirm 2F (tebufenozide) - prevents insect molt & development
- Intrepid 2F (methoxyfenozide) - prevents insect molt & development
- Dipel, Biobit, Javelin, Lepinox (Bacillus thuringiensis) - paralyzes insect gut
- Botanigard ES (Beauveria bassiana) - fungus that consumes insect
Classification for recommended insecticides

<table>
<thead>
<tr>
<th>Category</th>
<th>Brand Name</th>
<th>Human</th>
<th>Aquatic</th>
<th>Bird</th>
<th>Bee</th>
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</thead>
<tbody>
<tr>
<td><strong>Organophosphate</strong></td>
<td>Imidan 2.5 EC, 70 WP (phosmet)</td>
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<td>Malathion SE, 8F (malathion)</td>
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<td>Diazinon (diazinon)</td>
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<td><strong>Carbamate</strong></td>
<td>Sevin 4XLR (carbaryl)</td>
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<td><strong>Pyrethroid</strong></td>
<td>Asana XL (esfenvalerate)</td>
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<td></td>
<td>Danitol 2.4 EC (fenpropathrin)</td>
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<td><strong>Neonicotinoid</strong></td>
<td>Admire, Provado 1.6 F, Montana (imidacloprid)</td>
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<td><strong>Spinosyn (natural and synthesized)</strong></td>
<td>GF-120 NF Naturalyte (spinosad)</td>
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<td></td>
<td>Entrust 80 W (spinosad)</td>
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<td></td>
<td>Delegate WG (spinetoram)</td>
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<td><strong>Motting hormone analogue</strong></td>
<td>Confirm 2F (tebufoenozide)</td>
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<td>Intrepid 2F (methoxyfenozide)</td>
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<td><strong>Bacterial toxin</strong></td>
<td>Dipel, Biobit, Javelin, Lepinox (Bacillus thuringiensis)</td>
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<tr>
<td><strong>Living Fungus</strong></td>
<td>Botanigard ES (Beauveria bassiana)</td>
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**REI and PHI?**

- **REI**: re-entry period
  - Delegate is 4 hrs REI
  - Malathion is 12 hrs REI
  - Imidan is 3 days REI

- **PHI**: post-harvest interval
  - Botanigard and Assail are 1 day PHI
  - Imidan is 7 days PHI
  - Asana is 14 days PHI
considerations

- make sure target insect and insecticide match
- know the residual activity

considerations

- human toxicity and REI
- drift and off-target toxicity / sensitive areas
- cost: reduced rates, thresholds, perimeter sprays
the MRL

• MRL stands for maximum residue level
• it is an issue for international trade
• a country’s MRL for a particular insecticide does not necessarily match the MRL for the US
• current MRL examples:
  – Phosmet (Imidan) = 10 ppm (US, Japan, New Zealand, EU), 5 (Canada)
  – Imidacloprid (Provado) = 5 ppm (EU, New Zealand), 3.5 (US, Japan), 1 (Canada)
  – Carbaryl (Sevin) = 7 ppm (Canada, Japan), 5 (New Zealand), 3 (US), 0.05 (EU)

summary

• insecticides can be an important tool for insect pest management in wild blueberry

• know your insecticides - make informed decisions!
insect pest biology & management

1) common insect pests of wild blueberry
2) blueberry landscapes and consequences for management
3) focus: four pests, their biology and management
4) potential developments for the future

common insect pests
the blueberry landscape

- forest edges – BMF, BLB
- weedy fields – GH, BMF
- low, wet areas – SRW, BSW
- coast – thrips
- isolation - BMF

common blueberry insect pests

1. spanworm
2. flea beetle
3. thrips
4. blueberry maggot
blueberry spanworm life cycle

time-table of blueberry spanworm occurrence

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<thead>
<tr>
<th>Apr</th>
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Bud Swell  Bloom  Fruit Set  Ripening  Harvest
Blueberry Plant Development
monitoring and action thresholds

1. twelve inch diameter muslin sweepnet
2. take sets of 10, 180° sweeps (at least 10 sets)
3. count spanworm in each set
4. average # spanworm / set

Crop field: 10 spanworm / set
Prune field: 5 spanworm / set

2012 insect control recommendations

Cultural Control – prune burning

STANDARD insecticides for Blueberry Spanworm
– Imidan 70 WP or 2.5 EC
– Sevin 4XLR
– Asana XL
– Confirm 2F
– Intrepid 2F
– Delegate WG*
– Assail

ORGANIC insecticides for Blueberry Spanworm
– Bt (Bacillus thuringiensis toxin)
– Entrust 80 WP*
blueberry flea beetle life cycle

Blueberry Plant Development

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Blueberry Plant Development
monitoring and action thresholds

1. twelve inch diameter muslin sweepnet
2. take sets of 10, 180º sweeps (at least 10 sets)
3. count flea beetle in each set
4. average # flea beetle / set

Crop field: 50 larvae or adults / set
Prune field: 50 larvae or adults / set

2012 Insect Control Recommendations

Cultural Control – prune burning

STANDARD insecticides for Blueberry flea beetle
  – Imidan 70 WP or 2.5 EC
  – Sevin 4XLR
  – Delegate WG*
  – Assail

ORGANIC insecticides for Blueberry flea beetle
  – Bt (Bacillus thuringiensis toxin)
  – Botanigard ES (fungus Beauveria bassiana)
  – Entrust 80 WP*
blueberry thrips description

- Lemon yellow cigar shaped insects 1/16 to 1/8 inch long
- Immatures resemble adults except they don’t have wings and are smaller
- Usually leaf galls are the only evidence of thrips... red curled leaves.

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time-table of blueberry thrips occurrence

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Bud Swell  Bloom  Fruit Set  Ripening  Harvest

*Blueberry Plant Development*
plant monitoring

• watch for patches of tight, red leaf-curls in prune and crop-year fields.
• stake out infested areas.
• insecticide treatment should be done during the next pruning cycle as blueberry plants begin emerging.

blueberry thrips’ monitoring

• Blue or Yellow sticky cards may be used to monitor for blueberry thrips
• Place 2 or 3 sticky cards in staked out areas in mid-May
• Place cards on wooded stake 3 to 4 inches above the soil surface.
• Use a magnifying glass to check cards for small, lemon yellow thrips every 3 days.
blueberry thrips’ control

• Time application based on blueberry plant growth.
  – 1st - 1/4 to 1/2 inch tall
  – 2nd - 1/2 to 1 inch tall

• Time based on sticky cards.
  – 1st application at first presence of thrips on cards or first noticeable leaf curls.

2012 Insect Control Recommendations

• STANDARD Blueberry Thrips
  – Diazinon 50 WP
  – Malathion
  – Assail
  – Provado 1.6F
  – Admire

• ORGANIC Blueberry Thrips
  – delayed pruning by burning
blueberry maggot life cycle

blueberry maggot occurrence time-table

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Blueberry Plant Development

Bud Swell Bloom Fruit Set Ripening Harvest
**blueberry fly monitoring technique**

**trap placement for blueberry flies**

- Place trap 4 to 6 inches above the foliage canopy in a “V” with sticky surface down.
- 25 ft in from the perimeter.
- Near bushes or weedy patches, if possible.
- 1 trap/acre for fields under 10 acres.
- 1 trap every 100 to 200 ft for larger fields.
- Replace after 2 weeks.
blueberry maggot fly identification

• The adult fly is distinguished from other species by its characteristic wing pattern.
• The blueberry maggot fly has a continuous dark pattern of two V’s...one upright, the other inverted.

blueberry fly action threshold

• Average of six or more flies found on all traps in a field in a single visit (2 times / week).

OR

• An average of the cumulative total of ten flies or more captured on all the traps in more than one visit.
2012 Insect Control Recommendations

• **STANDARD Blueberry maggot**
  - Imidan 70 WP or 2.5EC
  - Sevin 4XLR
  - Malathion
  - Asana XL
  - Danitol 2.4 EC
  - Assail
  - Provado 1.6F, Montana
  - Delegate WG

• **ORGANIC Blueberry maggot**
  - GF-120 NF Naturalyte
  - isolated field on a single crop cycle
  - Hopper Barrier perimeter sticky tape

potential developments

• **might invade Maine soon?**
  - spotted winged drosophila
  - brown marmorated stinkbug

• **old associate but new pest?**
  - blueberry tip midge
Summary and THANK YOU

• know the pest biology
• know the many factors that affect pests
• adopt a strategy of monitoring & using thresholds
• know your insecticide options