New tools for insect, weed and disease control in cranberries in 2010 and other misc. stuff

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Lotus management

- Long-lived (40 years) seeds with prolonged germination during summer
  - Prevent from seeding – or you’ll be fighting its control for next 40 years
- Slow canopy development in spring makes it hard to find and successfully treat with Stinger.
  - Post-harvest mapping /flagging
  - Multiple spot treatments of winter/early spring Stinger
  - High spray volumes (200 gpa) to get under canopy
  - Treat areas bigger than infested zone
- Lotus very susceptible to Callisto, but only if treated early
  - Post-harvest mapping /flagging
  - High spray volumes (200 gpa or chemigation) to get under canopy
  - Treat twice
  - Don’t let the canopy gets too big before treatment.
  - Treat areas bigger than infested zone

Prevent from seeding, early season treatment with Stinger followed by Callisto
Barnyard grass management

• Single plants can produce up to 10,000 seeds, seeds remain viable from 2 to 7 years, and germinate late when soil temperature warms up
  – Consider removing seed heads prior to their maturity
  – Spray out all off-bed infested sites
  – Don’t let new plants get infested

• Pre-emergence control
  – Devrinol provides good grass control, but unlikely to provide season long efficacy. Needs to be watered in ASAP. Ditto for Casoron, but maybe less control.

• Post-emergence control
  – Use Select (30 day PHI)
  – Callisto (control best on small plants, efficacy is compromised on large plants)

Prevent from seeding, control with grass herbicide if possible
Perennial grass management

- Post-emergence control
  - Select (30 day PHI)
    - Treat early to late spring while vigorous
    - May require two or more treatments
    - May require two years
  - Callisto (45 day PHI)
    - Only works on some grass species
    - Not very well on perennials
    - Ok if new seedlings

Prevent seeding establishment, control with Select
Buttercup management

- Deep rooted, spreads fast (one plant can cover 40ft$^2$/year, long-lived (20 to 80 years) seeds
  - Difficult to hand pull
  - Abundant seed populations in sand piles, in beds, along dikes.
  - Treat roads, dikes (non-bed areas) with selective herbicides to prevent spread.
  - Important to use herbicides (Callisto, Casoron and Devrinol) to prevent new seedlings from becoming difficult to control adults
- Callisto and Devrinol at label rates only suppress mature plants
- Curio (new herbicide) very effective
  - 3rd party 24C label in 2010 (WA only)
  - PCCRF will hold label
  - Waiver of liability signature required
  - 1 oz/ac rate

Prevent new infestations, suppress with Callisto, use Curio when available
Sheep Sorrel management

- Extensive deep horizontal roots, creeping rhizomes and long-lived (10 to 20 years) seeds make management difficult
  - Prevent from seeding
  - Consider fumigation of new plantings if there is rich seed bank
  - Difficult to hand pull and not rip up cranberries

- Casoron effective as pre-emergent and partial post-emergent herbicide
  - Requires high rates
  - Effect might wear off by mid-season.
  - Use on established beds as last resort

- Not very susceptible to label rates of Callisto, unless new seedlings
  - Carefully monitor new plantings and treat when first observed.

- Partial control/suppression with Stinger possible
  - Multiple treatments starting early post-harvest and again in early spring
  - Results have been mixed, high rates work better.

Prevent from seeding and establishment in new beds,
Try Casoron, early post-emergent Callisto & winter Stinger
Purple Aster Management

- Late emergence makes management difficult
  - Prevent from seeding
  - Consider fumigation of new planting if there is rich seed bank
  - Difficult to hand pull and not rip up cranberries
- Casoron effective for suppression only
  - Requires high rates & effect might wear off by mid-season.
  - Use on established beds as last resort
- Callisto for suppression &/or control
  - Requires >1 application, early timing, lower spray volumes.
  - Mixed report of success from growers.
  - Carefully monitor new plantings and treat when first observed.
- Partial control/suppression with Stinger possible
  - Wiping after bud set
  - Broadcast early post-harvest

Prevent from seeding and establishment in new beds, Callisto effective, but requires persistence
Yellow loosestrife management

- Spreads rapidly from seeds, rhizomes and bulblets
  - Good bed sanitation following harvest to prevent spread
- Late spring Casoron will suppress
  - Doesn’t provide permanent control, long-term use will damage, suggest alternative year usage
- Early Callisto will reduce height and prevent bulblets
  - Not really a viable option
- Wiping with Roundup
  - Difficult to do when height suppressed with Casoron or Callisto
  - Only a few growers have been successful with this treatment
- New herbicides look very promising

Prevent from spreading with good sanitation, Casoron to suppress, improve drainage
Blackberries/brambles management

• Some susceptibility to Callisto
  – Each species a little different in their susceptibility
  – Growers report varying degrees of success based on rate and frequencies (within year and across years)

• Wiping
  – Upright species reasonable easy
  – Consider using Roundup in lanolin as dormant season hand application
  – Trailing species not wipeable without special precautions such as staking.

Wiping and maybe Callisto
Silverleaf management

- Deep-rooted, swollen rhizomes with large food reserves, seeds medium-lived 3 years, with ~100 seeds per flower
  - Difficult to control on long-established beds
- Pre-emergence control
  - Casoron for suppression, high rate on peat, low split applications on sand
- Post-emergence control
  - Callisto efficacy ranges for suppression (one application) to complete control (two applications/yr for several years)
  - Timing is important: one early when weed canopy first fully developed, second when weed canopy regrowth has occurred.

Callisto usually adequate, if not suppress with Casoron
Blackhead fireworm management without diazinon

- Most new alternative chemistries are showing good efficacy with broadcast applications - chemigation is the problem.
- Ovicides
  - One new chemistry, with label pending, but we don’t know how to use it for this purpose or if it works.
- Larvicides – getting closer
  - Efficacy with broadcast
    - Success/Entrust: OK to good @ right timing
    - Confirm: OK@ right timing
    - Delegate: good@ right timing
    - Intrepid: OK to good@ right timing
  - Efficacy with chemigation
    - Success/Entrust: poor to OK@ right timing
    - Delegate: good at high rate & right timing
    - Intrepid: OK with right timing @ right timing
Blackhead fireworm management without diazinon

- Order of activity (rule of thumb)
  - Delegate > Success/Entrust = Intrepid > Confirm
- Activity on different larvae size
  - small (1\textsuperscript{st} or 2\textsuperscript{nd} instars): Confirm, Intrepid, Success, Delegate
  - medium (3\textsuperscript{rd} and 4\textsuperscript{th} instars): high rate of Delegate
  - Large (5\textsuperscript{th} instar): all are marginal
- Chemigation (rule of thumb)
  - Rinse off under 6 minutes: Confirm, Intrepid, Success, low-rate Delegate
  - Rinse off under 8 minutes: high rate of Delegate
- Retreatment
  - 6 hours drying time following application is required, retreat if rain or frost protection interfered.
  - New growth is not protected.
  - Residual effect 7-10 days, retreatment recommended
  - Asynchronous hatch, retreatment recommended
  - Previous history of infestation, retreatment required
Blackhead fireworm management without diazinon

• First generation (good control critical to reduce population base and avoid damage from 2\textsuperscript{nd} generation)
  – Sweep net in May, especially along warm edges
  – When small larvae are found on rim of net spray – Treat ASAP with Confirm, Intrepid, Success
  – Sweep again in a week to assess efficacy, and retreat
  – If large larvae found use Delegate

• Second generation
  – Pheromone trap for timing, but also consider using a sweep net
  – Timing for Intrepid or Confirm is 2 weeks after \textit{onset} of moth flight and again 10 days later (Not 10 days after \textit{peak} moth flight).
  – Intrepid or Confirm are bee safe; Spinosyn products are moderately toxic to bees.
  – If larvae reached large size (sweep net sample), Delegate is a preferred choice.
Tipworm management (big problem in BC, not in WA)

- **Ovicides**
  - One new chemistry, with label pending, but we don’t know how to use it for this purpose or if it works.

- **Larvicides**
  - Assail: poor
  - Avaunt: poor
  - Delegate: poor
  - Diazinon: good
  - Movento: good – label maybe in 2011

- **Timing**
  - 3 to 5 asynchronous generations
  - frequent applications aimed at 1st instar larvae
  - Some applications timings correspond to fireworm timing, others not
  - Need to scout
Blackvine Weevil management

- All individuals are females and very fecund: an overwintering adult lays 600-700 eggs, new adults lay 200 to 300 eggs
  - High fecundity requires >95% control for success
- Adulticides
  - Orthene – knockdown only
  - Avaunt – good tool, apply two – three times, 10 to 14 days apart, based on sweep counts. Start at first adult emergence
  - Assail – OK, but not great
  - Sodium silicofluoride-based baits: poor to fair
  - Actara – poor
  - Rimon – poor to fair
- Larvicides
  - Entomopathogenic Nematodes – several species, efficacy variable from fair to good, not always predictable, $, requires exacting application
  - Entomopathogenic Fungus – label pending, initial data from USDA/OSU looks promising
  - Several insecticides in US, variable efficacy with nothing too great
  - Admire: good on sand, poor on peat
Change in Weevil density with two 6 oz/ac Avaunt applications

- Adults/25 sweeps

Avaunt
- 7/1
- 7/17

Avaunt untreated

Adult sweep 7/10/08
Adult sweep 7/17/08
Adult sweep 7/24/08
Larvae dig 1/15/09
Adult sweep 7/1/09

Appears we get 7-10 days of good activity from Avaunt
Control of adults translates to good control of larvae

Avaunt is a great tool for BVW control, but don’t assume it will be 100% effective. Scout for damage, larvae, adults and notching yearly.
The lower the risk quotient the safer the insecticide for bees

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Bee Toxicity LD50 (µg/bee)</th>
<th>Rate used (lbs/ac)</th>
<th>Relative risk quotient (use rate/toxicity)</th>
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<tr>
<td>Admire</td>
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<td>Avaunt</td>
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<td>Intrepid</td>
<td>100</td>
<td>0.25</td>
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Vole control with anti-coagulant baits

- None registered on beds, use on dike (non producing ground) only
- PNW raspberry industry uses
  - Weatherblok XT
  - Rozol Pellets
- Works best when very cold and dry
- Bait must be available until the vole population is controlled. Therefore use for several weeks until feeding is no longer observed.
- Winter is best time to control

<table>
<thead>
<tr>
<th></th>
<th>Active ingredient</th>
<th>Toxic to mammals</th>
<th>Method of application</th>
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<tr>
<td>Rozol Pellet</td>
<td>Chlorophacinone</td>
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<td>Drop down holes</td>
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<tr>
<td>Weather Blok XT</td>
<td>Brodifacoum</td>
<td>high</td>
<td>Bait stations only</td>
</tr>
</tbody>
</table>
Deer management - How

- Chemical – no repellents have approval for food use
- Frightening tactics for small acreage
  - Need two senses (sight and sound) to be effective
  - 24-hour talk radio, flash tape, and motion type devices, propane exploder.
- Fences.
  - poly or steel wire
    - A straight ten-foot fence provides poor barrier to a deer determined
    - A 7-foot fence inclined at a 25° angle out from the vertical – better.
  - Electric fences (inclined better than straight up and down)
- Gun
New Variety trials – planted 2003
Yield bbl/ac

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<tr>
<th>Variety</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
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<td>AR2</td>
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</tr>
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<td>1.16</td>
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Yield components

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<th>Fruit set %</th>
<th>% Fruiting Ups</th>
<th>Fruit size (g)</th>
<th>Yield (bbl/ac)</th>
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Crimson Queen | Mullica Queen | Willapa Red | Pilgrim | Stevens

- **Crimson Queen**
- **Mullica Queen**
- **Willapa Red**
- **Pilgrim**
- **Stevens**
### Early color, disease resistance, & canopy characteristics

<table>
<thead>
<tr>
<th>Variety</th>
<th>Early red color</th>
<th>Incidences of foliage diseases</th>
<th>Inclination to be over-vegetative (runner/m²)</th>
<th>Ease of dry harvesting*</th>
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<tr>
<td>‘Crimson Queen’</td>
<td>excellent</td>
<td>Moderate to high</td>
<td>31</td>
<td>good</td>
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<td>good</td>
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<tr>
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<td>Moderate to high</td>
<td>7</td>
<td>fair</td>
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</table>

* Based on grower ratings, fruit size, location of fruit within canopy
Comparative Yields
Willapa Red vs. Pilgrim & Stevens

Willapa Red
Pilgrim
Stevens

Dubay WI

WSU

BBL/ac


2005 2006 2007 2008 2009
DNA Purity of original pilgrim plantings in WA 1980’s to early 1990’s

<table>
<thead>
<tr>
<th>Location</th>
<th>type of sample</th>
<th>source of vines</th>
<th>date planted</th>
<th>% Pilgrim</th>
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<tr>
<td>Long Beach</td>
<td>uprights</td>
<td>WI or BC</td>
<td>1980's</td>
<td>50%</td>
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<tr>
<td>Long Beach</td>
<td>runners</td>
<td>WI or BC</td>
<td>1980's</td>
<td>0%</td>
</tr>
<tr>
<td>Grayland</td>
<td>uprights</td>
<td>BC</td>
<td>1980</td>
<td>0%</td>
</tr>
<tr>
<td>Grayland</td>
<td>uprights</td>
<td>BC</td>
<td>1982</td>
<td>0%</td>
</tr>
<tr>
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<td>Dillion, BC</td>
<td>1991</td>
<td>66%</td>
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<tr>
<td>Long Beach</td>
<td>uprights</td>
<td>Dillion, BC</td>
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<tr>
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<td>uprights</td>
<td>Dillion, BC</td>
<td>1991</td>
<td>85%</td>
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<tr>
<td>Chinook</td>
<td>uprights</td>
<td>Scott, WI</td>
<td>2000</td>
<td>88%</td>
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</table>
Trace change in purity over time when prunings are used for new plantings

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Uprights 85% Pilgrim</td>
<td>0% Pilgrim</td>
<td>Uprights 25% Pilgrim, Runners 0% Pilgrim</td>
<td>Uprights 20% Pilgrim</td>
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<td>Sacks, 1998, Upright 40% Pilgrim</td>
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<tr>
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<td>Wood, 1998, Upright 100% Pilgrim</td>
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<thead>
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<tbody>
<tr>
<td>Uprights 85% Pilgrim</td>
<td>Uprights 100% Pilgrim, Runners 0% Pilgrim</td>
<td>Uprights and Runners 0% Pilgrim</td>
<td>Uprights 33% Pilgrim, Runners 50% Pilgrim</td>
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</table>

| Jubilee c40, 1980's | Jubilee c36, 2008 0% upright |
### Comparative purity of Pilgrim uprights and runners off the same bed

<table>
<thead>
<tr>
<th>Owner</th>
<th>Bed</th>
<th>Type and number of samples</th>
<th>Pilgrim Purity (%)</th>
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<tbody>
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<td></td>
<td></td>
<td></td>
<td>uprights</td>
</tr>
<tr>
<td>Whannell</td>
<td>a11</td>
<td>grouped uprights 4 samples; grouped runners 1 sample</td>
<td>100%</td>
</tr>
<tr>
<td>Whannell</td>
<td>a4</td>
<td>grouped uprights 4 samples; grouped runners 1 sample</td>
<td>0%</td>
</tr>
<tr>
<td>Whannell</td>
<td>a5</td>
<td>grouped uprights 3 samples; grouped runners 2 samples</td>
<td>33% 50%</td>
</tr>
<tr>
<td>McPhail</td>
<td>s1</td>
<td>grouped uprights 4 samples; grouped runners 1 sample</td>
<td>25% 0%</td>
</tr>
<tr>
<td>Gray</td>
<td>g1</td>
<td>grouped uprights 1 sample; grouped runners 1 sample</td>
<td>100% 0%</td>
</tr>
<tr>
<td>Jubilee</td>
<td>c40</td>
<td>grouped uprights 4 samples; grouped runners 4 samples</td>
<td>50% 0%</td>
</tr>
</tbody>
</table>