Matador and Delegate effects on seed production in lodgepole pine orchards: 2014 and 2015 results

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Photo: Vicky Berger
Seed set has long been a problem in Pli orchards

Data from 9 SelectSeed orchards
Prince George data from Webber, 2014
2014 data from non-sprayed control blocks for orchards included in Matador trial
Trials to identify why low seedset exists

- Water relations
- Pollination / pollen droplets
- Fertilization
- High Okanaganan temperatures
- Out-of-provenance seed orchards
- Timing of Harvest
- Lepto removal studies (bagging, pesticides)

- Small-plot pesticide trials
  - Selected Matador to pursue further
Single-tree pesticide trials have limited value because Lepto move
Large-plot trials will kill Lepto over larger areas and slow re-colonization.
Trial objectives

2014
• Evaluate operational scale seed production with Matador
• Compare seed production in insect exclusion bags vs. Matador

2015
• Evaluate operational scale seed production with Matador and Delegate
• Investigate FSPC loss from early July to late August (Time-of-Harvest)
Trial components and purpose

• Operational collections (2014 and 2015)
  – Treatment (spray)
  – Control (no spray)

• Small-lot collections (2014)
  – Selected 20 clones in each orchard
  – Compared bagged cones and not-bagged cones in spray and control blocks

• Time-of-harvest collections (2015)
  – Quantify FSPC decline in spray and control blocks (early July to late August)
# The orchards

<table>
<thead>
<tr>
<th>2014 (all Matador)</th>
<th>2015</th>
<th>Delegate</th>
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</thead>
<tbody>
<tr>
<td>Kettle River CP</td>
<td>Matador</td>
<td>Delegate</td>
</tr>
<tr>
<td>Sorrento BV</td>
<td>• Kettle River CP</td>
<td>• Kettle River PG</td>
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<tr>
<td>PRT TO low</td>
<td>• Sorrento BV</td>
<td>• Sorrento CP</td>
</tr>
<tr>
<td>Eaglerock TO high</td>
<td>• PRT TO low</td>
<td>• PRT NE low</td>
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<td></td>
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Orchards divided into treatment and control blocks

Sorrento – Bulkley Valley – Orchard 240
Treatments

• Two or three air-blast spray applications
  – Mid May to early June
  – Late June to mid July

• 104 mls Matador per ha
  – $25 / ha / treatment (chemical only)

• 420 grams Delegate per ha
  – $63 / ha / treatment (chemical only)
2014 Seed production doubled in operational collections (lots of Lepto in 2014)

No differences found for:
- Seed germination
- Seed weight

Grams seed per hectoliter of cones

No differences found for:
- Seed germination
- Seed weight
2014 Matador was nearly as effective as bagging.
2015 Matador and Delegate seed production relative to controls

2015 – fewer Leptothrips and less gain in seed yield than in 2014
2015 harvest timing
Less FSPC decline; extended harvest window

![Graph showing the percentage of filled seeds per cone from 13-Jul-15 to 31-Aug-15 for Delegate, Matador, Delegate control, and Matador control. The graph indicates a decline in the percentage of filled seeds over time, with Delegate showing a decline starting earlier than Matador. The Delegate control shows the lowest percentage of filled seeds among the four categories.]
Early- and late-season predation by Lepto

May
- Lepto feeding starts
- Ovule predation; TSPC reduced

June
- Fertilization

July
- Nymphs hatch
- Seed predation
- Loss of potentially filled seeds

August
- Nymphs mature
- Seed predation
- Harvest cones

- Early season predation reduces TSPC
- Late-season predation reduces the FSPC and the % filled to total
Lepto have two primary feeding periods.

The graph shows the feeding time per camera-day by week. The graph has two lines:
- Blue line represents adults
- Red line represents nymphs

Key events:
- Overwintered adults feed
- Overwintered adults die
- Second-generation adults emerge & feed
- Nymphs hatch and develop
- Nymphs emerge into adults
Total formed seeds per cone increased

2014

- TSPC increases
  - 41% in spray blocks
  - 47% with bagging
Total formed seeds per cone increased

2014
• TSPC increases
  – 41% in spray blocks
  – 47% with bagging

2015
• TSPC higher in treated blocks
Seed loss to early and late predation are about equal (2014 result)

Supported by 2015 TSPC and FSPC data, but not investigated again in 2015
Seed loss to early and late predation are about equal (2014 result)

Supported by 2015 TSPC and FSPC data, but not investigated again in 2015

This means that early-season Lepto control is just as important as control later in the summer
2015: $ value or spraying
(low lepto year)

- Increased seed production value
  - Matador - $435 per hl cones
  - Delegate - $370 per hl cones
- Average cost per incremental Kg seed produced $574
- Benefit / cost ratio about 15 (in a low Lepto year)
Recommendations

- Matador at about 100 ml / ha increases seed set
- First treatment mid May or when Lepto observed (mid April this year for Okanagan sites)
- Second treatment mid to late June
- Possible third treatment prior to harvest or during harvest if numbers build (24 hour re-entry)
- Conduct regular Lepto surveys
  - 20 minute walk-through (not that effective)
  - Try branch-tugging with a hook on a pole and count Lepto that fly away
    - 100 large lateral branches on the sunny side
    - Warm- day; mid-day when Lepto are active