



# **Pesticides in Seed Production:**

## **Recent successes and future prospects**

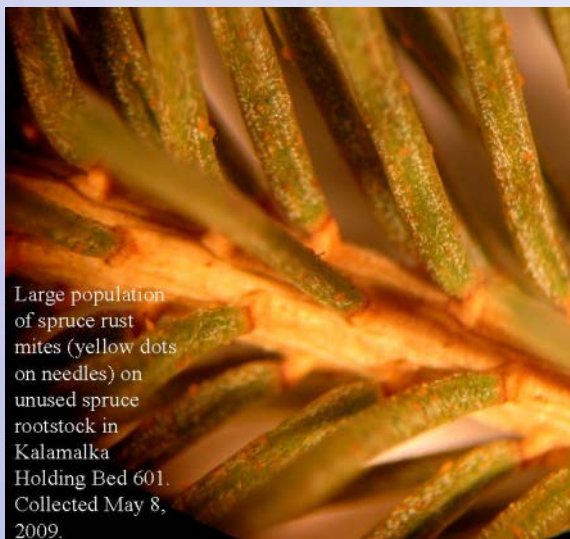
**Geoff Bradley**

**TSC 60<sup>th</sup> Anniversary**

**October 16, 2018**



# Ministry of Forests, Lands, Natural Resource Operations and Rural Development



Large population  
of spruce rust  
mites (yellow dots  
on needles) on  
unused spruce  
rootstock in  
Kalamalka  
Holding Bed 601.  
Collected May 8,  
2009.







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Developing new pesticide tools is important for many reasons:

- Additional tools in the toolkit
- New controls for existing pests
- Control of new pests that are not on-label currently
- Safer products
  - Worker safety
  - Environmental impact
  - Reduced impact on non-target organisms (beneficials)
  - Neighbours





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### Lagon (Dimethoate) Label Excerpt:

Douglas Fir (seed tree) Cone insects (cone or gall midges, cone moths, seed chalcids, scale midges). 2 L per 100 litres of water. Maximum rate 20 L of product (= 9.6 kg a.i.) per hectare. Application should be made when cones are at or near the pendant stage. Complete coverage of the cones and foliage in the conebearing area of the tree is important for satisfactory results. Maximum of two applications per year. Minimum application interval: 10 days **Seed cone harvesting: 48 days REI**. Scouting: 5 days REI. Grading, animal control, baiting: 1 day REI.



# URMULE

User Requested Minor Use Label Expansion

- Intended for small crops
- Must already have an approved label in Canada







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## Mario PMTAC

- Pesticide trials 1998 systemics
- Pesticide trials 2001 Lepto
- Pesticide trials 2005 data
- Pesticide trials 2005 Treated Trees
- Pesticide trials 2006 half-cut results
- Pesticide trials 2006 Julie\_s printouts
- Pesticide trials 2006 Timberwest May 30
- Pesticide Trials 2006 Timberwest trial
- Pesticide Trials 2006
- Pesticide Trials 2007 coastal Cwr form
- Pesticide Trials 2007 coastal data
- Pesticide Trials 2007 coastal Fdc form
- Pesticide Trials 2007 coastal randomizations
- Pesticide Trials 2007 Germination Tests
- Pesticide Trials 2007 Interior Fdi form
- Pesticide Trials 2007 Interior Sx form
- Pesticide Trials 2007 June cone assessments data
- Pesticide Trials 2007 KRS data
- Pesticide Trials 2007 KRS maps
- Pesticide trials 2008 Interior data
- Pesticide trials 2008 Interior Fdi form
- Pesticide trials 2008 Interior Sx form
- Pesticide Trials 2008 July cone assessments
- Pesticide Trials 2008 maps KRS
- Pesticide Trials 2009 Data Fdi
- Pesticide trials 2009 data for SAS
- Pesticide Trials 2009 Data Sx
- Pesticide trials 2009 June assessment analysis
- Pesticide trials 2009 setup
- Pesticide trials 2009-10 summary
- Pesticide trials 2010 data for SAS
- Pesticide trials 2010 July dissection data
- Pesticide trials 2010 PhytoRating Fdi
- Pesticide trials 2010 PhytoRating Sx
- Pesticide Trials 2010 URMULE priority list
- Pesticide trials 2010
- Pesticide trials 2011 Contarinia Julie\_s half-cut data
- Pesticide trials 2011 Dioryctria Julie\_s half-cut data
- Pesticide Trials 2011 Dioryctria Julie\_s half-cut SAS
- Pesticide trials 2011 Lepto AAFC Mario\_s lepto counts
- Pesticide trials 2011 Lepto AAFC Mario\_s seed data
- Pesticide trials 2011 Lepto AAFC Patti\_s lepto counts
- Pesticide trials 2011 Lepto AAFC Patti\_s seed data
- Pesticide trials 2011 Lepto AAFC
- Pesticide trials 2011 results summary
- Pesticide trials 2011
- Pesticide Trials 2012 Contarinia phyto data
- Pesticide Trials 2012 Contarinia
- Pesticide Trials 2012 Dioryctria
- Pesticide Trials 2012 Julie\_s half-cut data Contarinia Kal
- Pesticide Trials 2012 Julie\_s half-cut data Contarinia Sechelt
- Pesticide Trials 2012 Julie\_s half-cut data Dioryctria Kal
- Pesticide Trials 2012 Julie\_s half-cut data for analysis
- Pesticide Trials 2012 Julie\_s half-cut data ICMS Dioryctria
- Pesticide Trials 2012 Leptoglossus
- Pesticide trials 2012 Mario\_s Dio seed summary
- Pesticide trials 2012 Mario\_s lepto observations
- Pesticide trials 2012 Mario\_s Lepto seed summary
- Pesticide trials 2012 Patti\_s lepto observations
- Pesticide trials 2012 Patti\_s lepto seed summary
- Pesticide trials 2012 Seed Data for analysis
- Pesticide trials 2012 Seed Data summary
- Pesticide Trials 2012 Synanthedon
- Pesticide trials 2012 URMULE seed orchard priorities
- Pesticide Trials 2013 Bailey Fd 324
- Pesticide trials 2013 Contarinia half-cuts combined
- Pesticide trials 2013 Contarinia half-cuts Kalamalka
- Pesticide trials 2013 Contarinia half-cuts Sechelt
- Pesticide trials 2013 Contarinia
- Pesticide trials 2013 Cw midge WFP
- Pesticide trials 2014 Dioryctria Fd analysis
- Pesticide trials 2014 Dioryctria Fd cone damage assessments
- Pesticide trials 2014 Dioryctria Fd data
- Pesticide trials 2014 Dioryctria Fd printouts
- Pesticide trials 2014 Dioryctria Fd
- Pesticide trials 2014 half-cut data
- Pesticide trials 2014 laboratory assays
- Pesticide trials 2014 Matador area-wide seed data
- Pesticide trials 2014 Matador area-wide trial
- Pesticide trials 2015 Cw Movento
- Pesticide trials 2015 Delegate area-wide trial
- Pesticide trials 2015 Delegate half-cut data
- Pesticide Trials 2015 Matador and Harvest Timing Profile trial
- Pesticide trials 2015 Matador Delegate area-wide Apr 16 2015
- Pesticide trials 2015 Matador Delegate area-wide Jan 6 2016
- Pesticide trials 2015 Matador Rhyacionia
- Pesticide Trials 2016 Delegate 324
- Pesticide trials 2016 Movento Halldorson
- Pesticide trials 2016 Movento WFP conelet abortion
- Pesticide trials 2016 Movento WFP
- Pesticide trials 2016 Nova Tilt Eaglerock
- Pesticide trials 2017 Matador Permup Surround
- Pesticide trials 2017 Movento SaanichSO
- Pesticide trials 2017 Movento TimberWest
- Pesticide trials 2017 Movento WFP



# Recent URMULE successes

- Matador for *Leptoglossus* – AAFC funding
  - Registered in 2018
- Delegate for *Dioryctria* – PMTAC funding
  - Registered in 2016
- Movento for *Contarinia* – PMTAC funding
  - Registered in 2016
  - Label expanded to include *Kaltenbachiola* and *Mayetiola* based on *Contarinia* data as well



# Matador

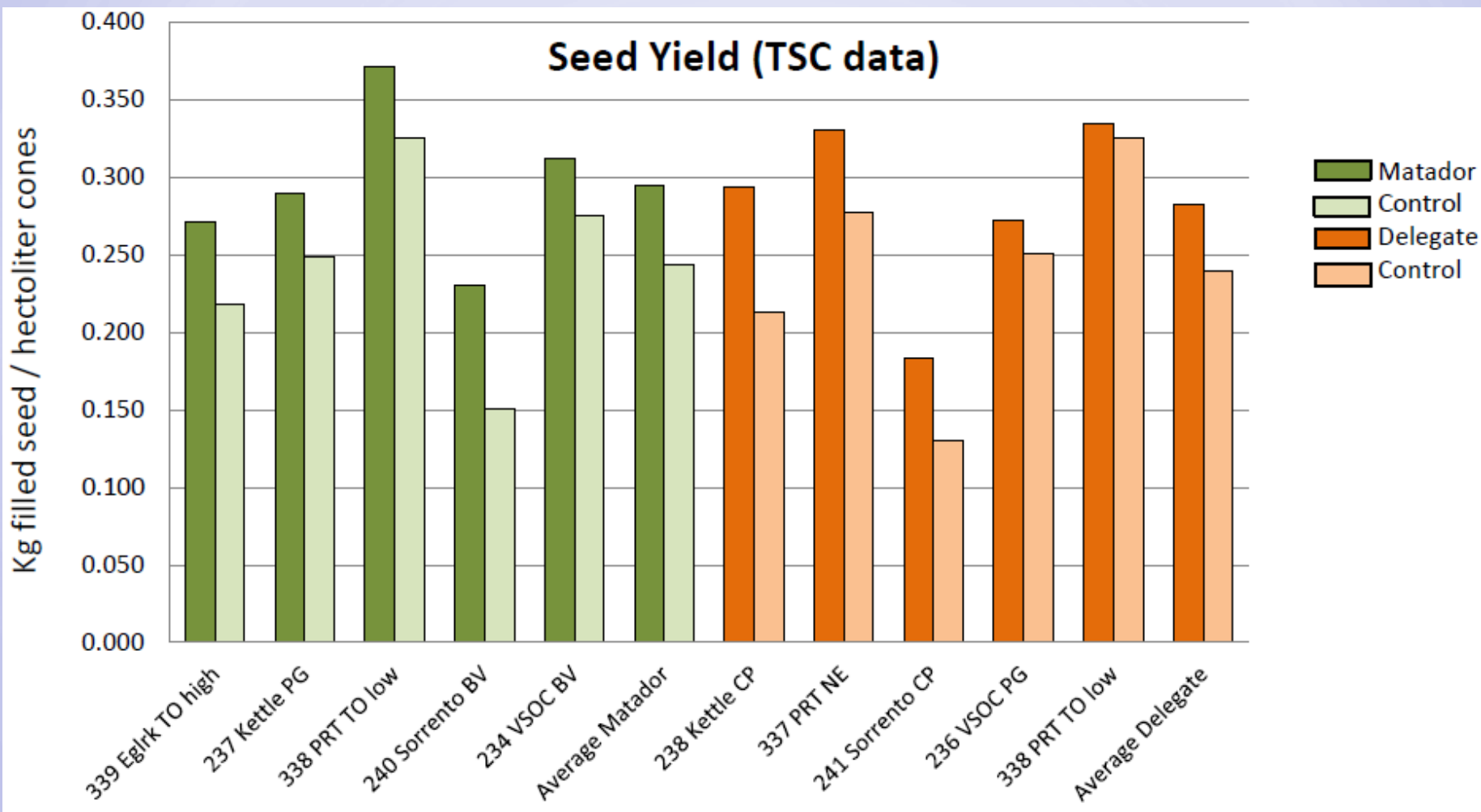
- Small-plot followed by commercial scale trials







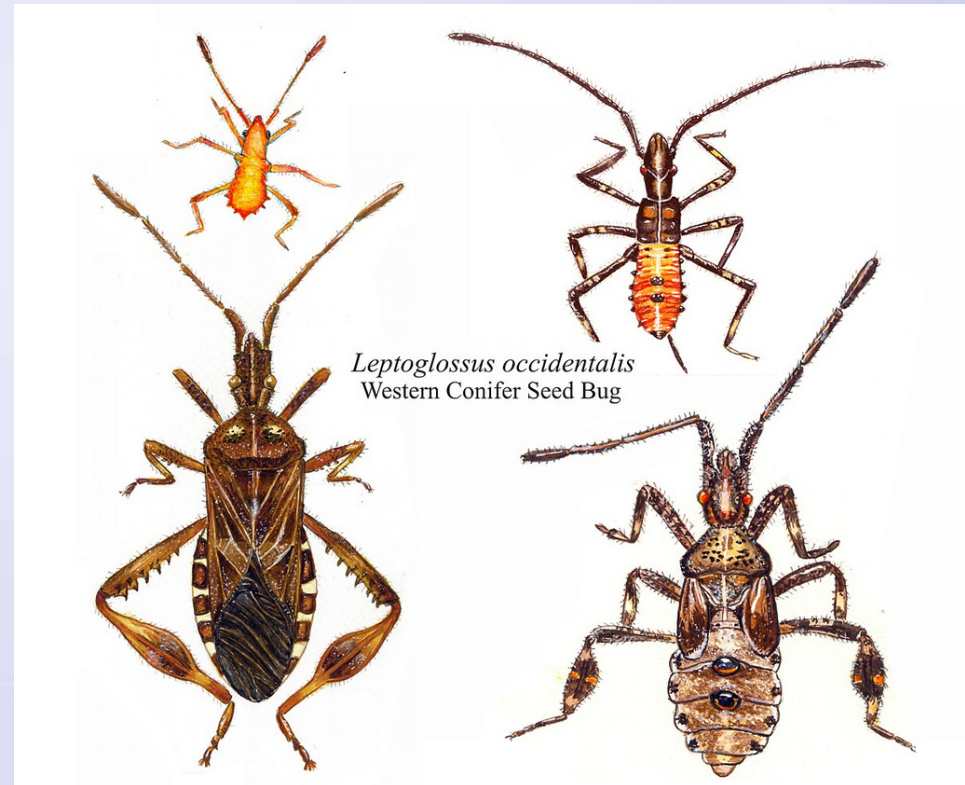
# Matador





# Matador

- Regulatory purgatory from 2014-2018
- On-label as of summer 2018





# Ongoing work

- Usage trials for Movento
- European Pine Shoot Moth
- Sequoia Pitch Moth







# European Pine Shoot Moth

- PMTAC and OTIP -Funded work conducted by Mario Lanthier at VSOC in 2017 & 2018
- Looked at efficacy of a number of treatments for control of EPSM (various chemical and timing combinations)



# Summer 2017 Spray

Orchard 218

Mean number of flagging shoots per tree (variance) n=50

Treatment	Rate	Damage	% control
Untreated		14.4 (51.67)	--
Delegate WG	420 g / ha	0.7 (1.10)	95 %
Matador 120EC	104 ml / ha	1.2 (2.75)	92 %

Orchard 219

Mean number of flagging shoots per tree (variance) n=40

Treatment	Rate	Damage	% control
Untreated		7.5 (26.67)	--
Delegate WG	420 g / ha	0.8 (2.23)	90 %
Matador 120EC	104 ml / ha	0.7 (3.44)	90 %

# Spring 2018 Spray

Mean per tree of terminal shoots flagging or recently dead (standard deviation)

Visual rating of damage typical of European pine shoot moth

Treatment	Rate	Spray	Damage	% control
Untreated			27.9 (13.1)	--
Lagon 480E	0.2 % (36 ml / 18 L)	April 23	12.4 (5.7)	55 %
Delegate WG	Label (7.56 g / 18 L)	April 23	1.1 (1.8)	96 %
Matador 120EC	Label (1.8 ml / 18 L)	April 23	3.0 (2.3)	89 %
Intrepid 240DF	Label (18 ml / 18 L)	April 23	0.2 (0.7)	99 %





# Sequoia Pitch Moth

Lots of ongoing work:

- Sprays
- Attract and Kill
- Mating disruption



UGA2252097b







## Attract and Kill

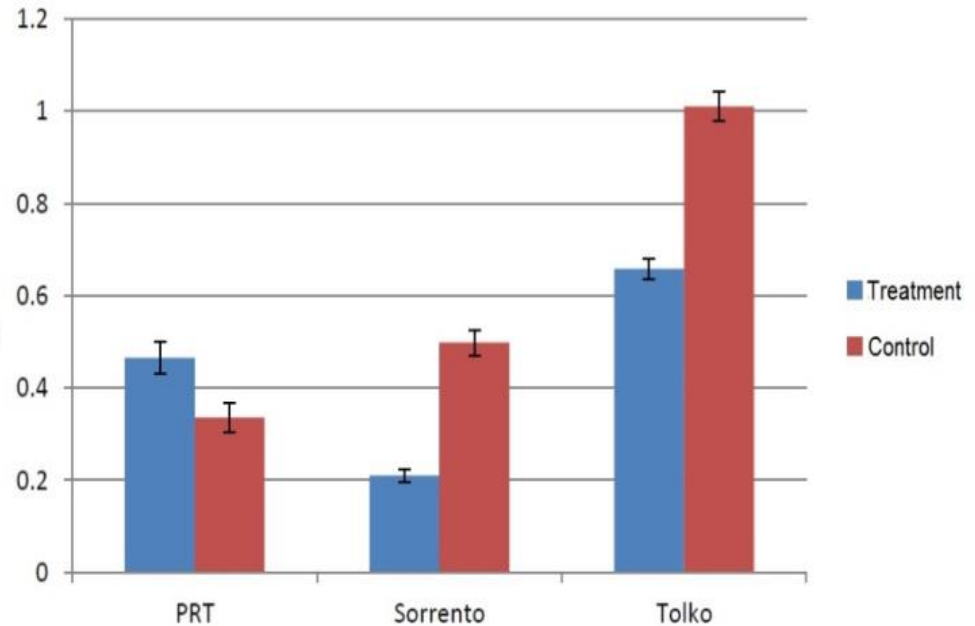
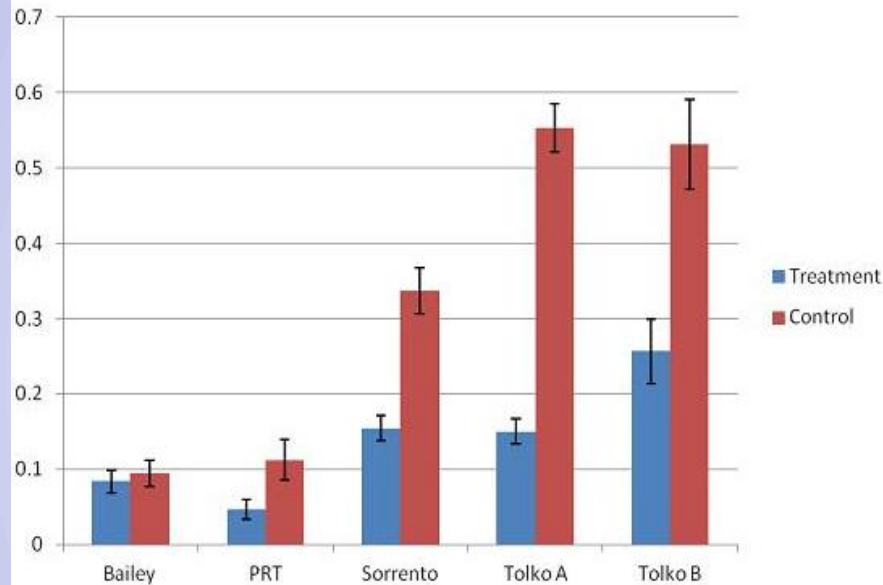
- Uses a mix of pheromone attractant and imidicloprid insecticide
- Applied to trunk of tree
- 30 day residual
- No overspray
- Minimal non-target effect
- Very safe for workers





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ANOVA summary: means  $\pm$  SE



## 2012

- Mean # pitch masses per tree
  - Treatment – 0.13
  - Control – 0.34

## 2013

- Mean # pitch masses per tree
  - Treatment – 0.48
  - Control – 0.70

P-value  $< 2.2e-16$ , (Kruskal-Wallis test)



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- Two Quesnel Pli orchards
- A&K applied every second row
- Completed 2016 and 2017
- No control 2015
- Pitch masses assessed fall 2017
  - Every tree assessed



Orchard	# pitch masses 2015	# pitch masses 2016	# pitch masses 2017
Orchard 244	2309	251	44
Orchard 245	379	95	7





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- The pheromone ingredient in this product is registered and available in Canada
- Imidicloprid however is under PMRA review and no registrations are being currently considered
- An important question comes from the efficacy of this product:

Is it the pesticide or the pheromone that is providing the control?



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The amount of pheromone applied with A&K is similar to mating disruption levels

Mating disruption has been effective in other orchard systems (eg. Coddling moth, Oriental Fruit Moth)

Mario Lanthier study @ Skimikin 2018 showed signs of effective mating disruption – more assessment is needed





## Trunk spray treatments

- Conducted by CropHealth Advising & Research
- Sprays applied to trunks in June and July at 14 Day intervals (10 days for entrust)
- Rated in September
- Excellent efficacy but low pest pressure

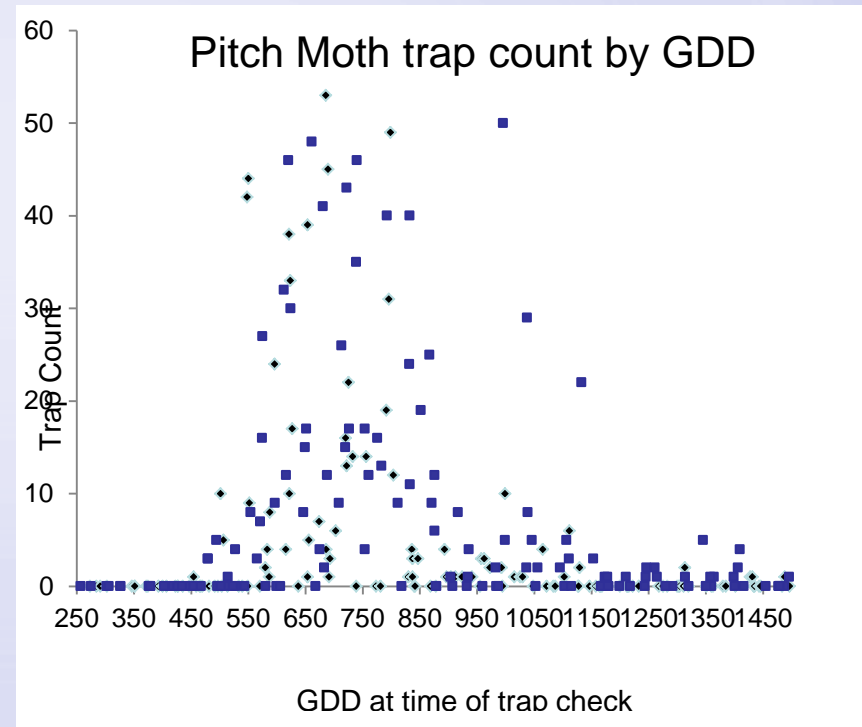
Treatment	Rate	% damage	% control
Untreated		10 (0.30)	--
Altacor	7.6 g / 12 L	0 (0.00)	100
Delegate	4.2 g / 12 L	0 (0.00)	100
Entrust	2.0 ml / 12 L	0 (0.00)	100
Rimon	16.8 ml / 12 L	15 (0.37)	0





# Final Comments

- Understanding pest biology is key
  - Pest monitoring is critical
  - Timing of applications based on biology
  - Awareness of what is happening at each site





# Final Comments

- Pesticide trials rely on the presence of pests
- Good years for cone crops are often bad years for pesticide trials
- Sometimes factors beyond our control slow the process, sometimes all we have to do is ask





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and **Rural Development**



**Thank you**