Coning and shoot growth response of Fraser fir trees to paclobutrazol application

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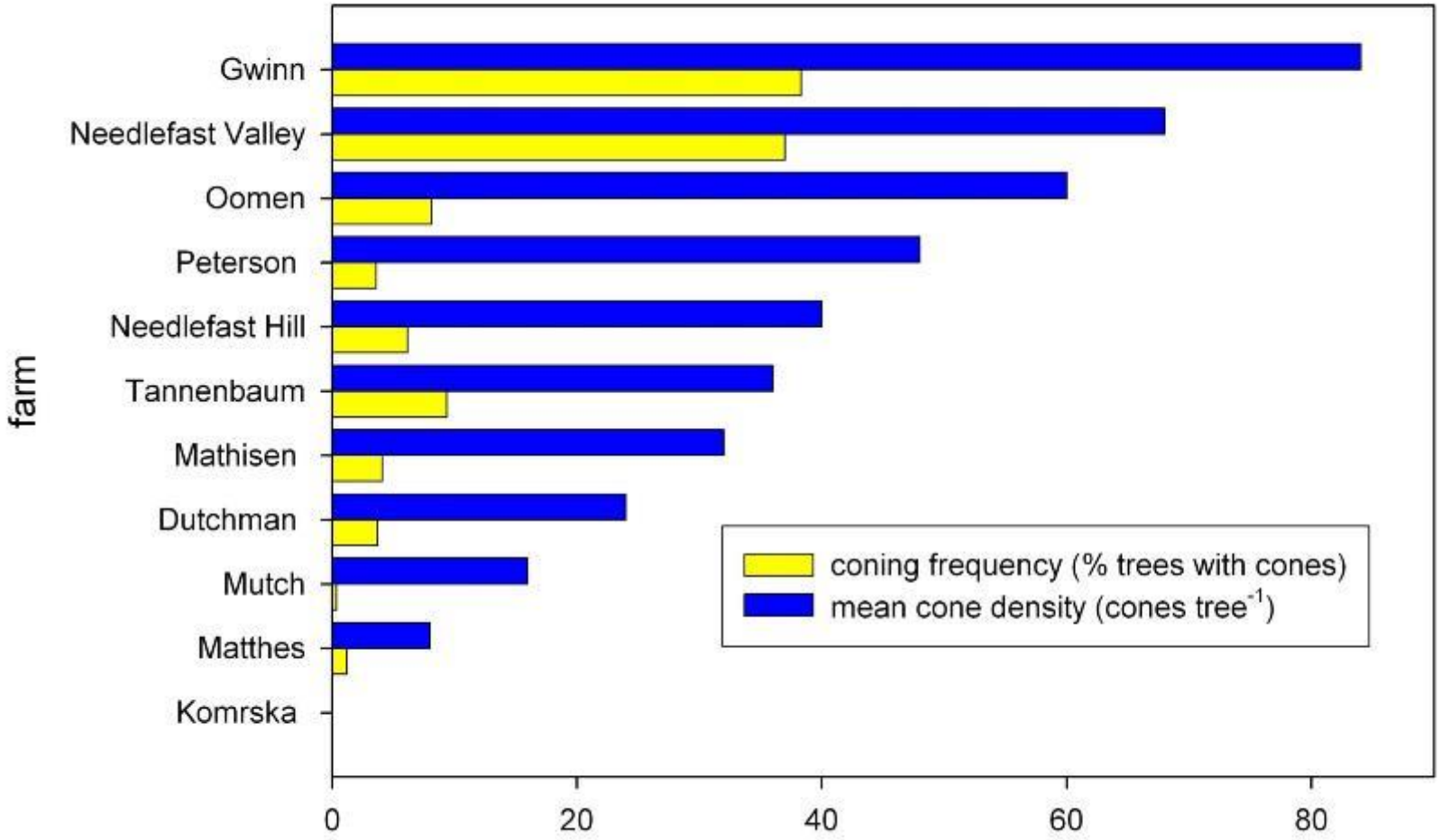
Flower production in firs follows a 2-year cycle under complex regulation by:

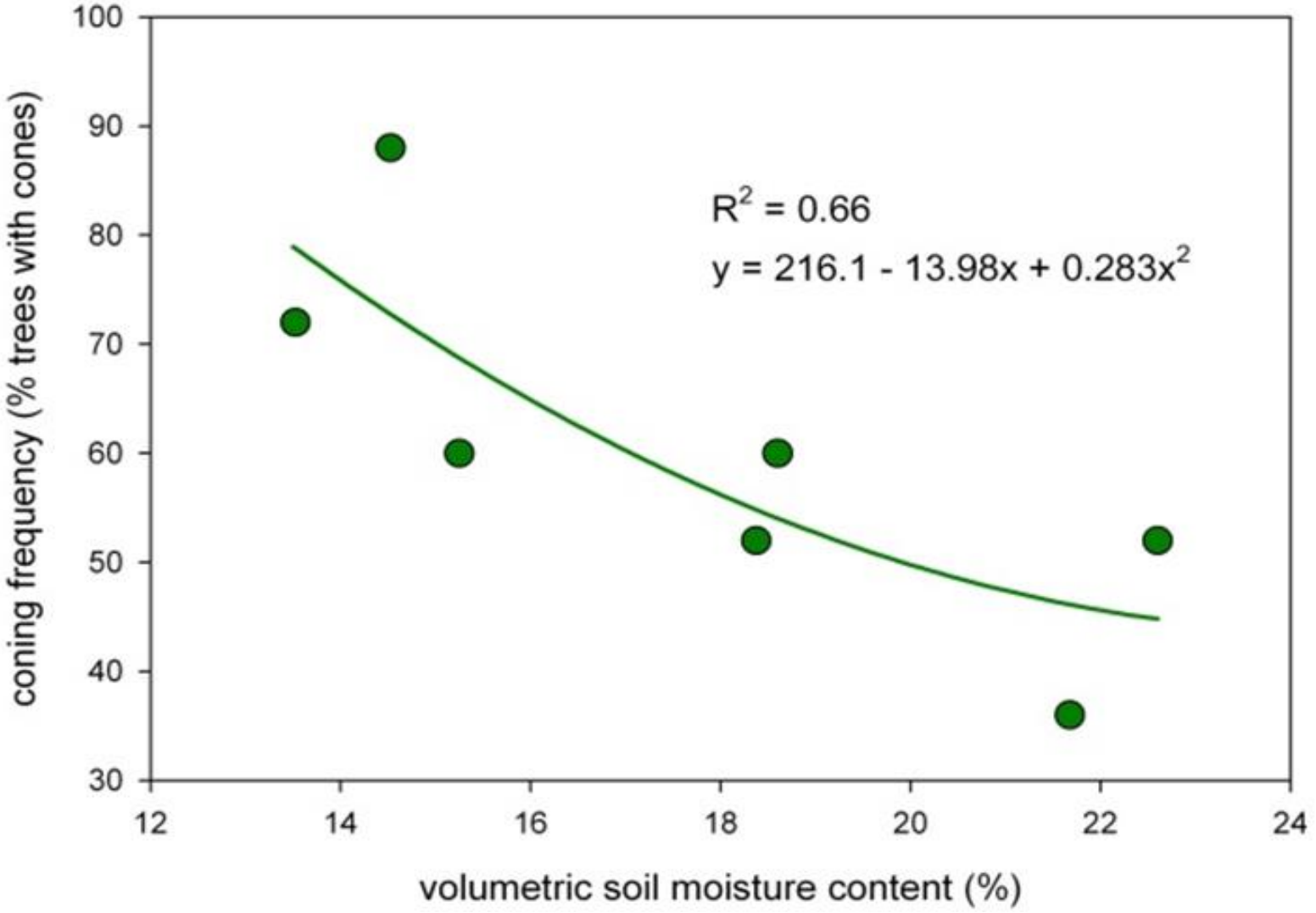
- Internal hormones
- Endogenous patterns
- Temperature
- Water availability
- Nutrition
- Tree size (age)

High variation in coning among farms

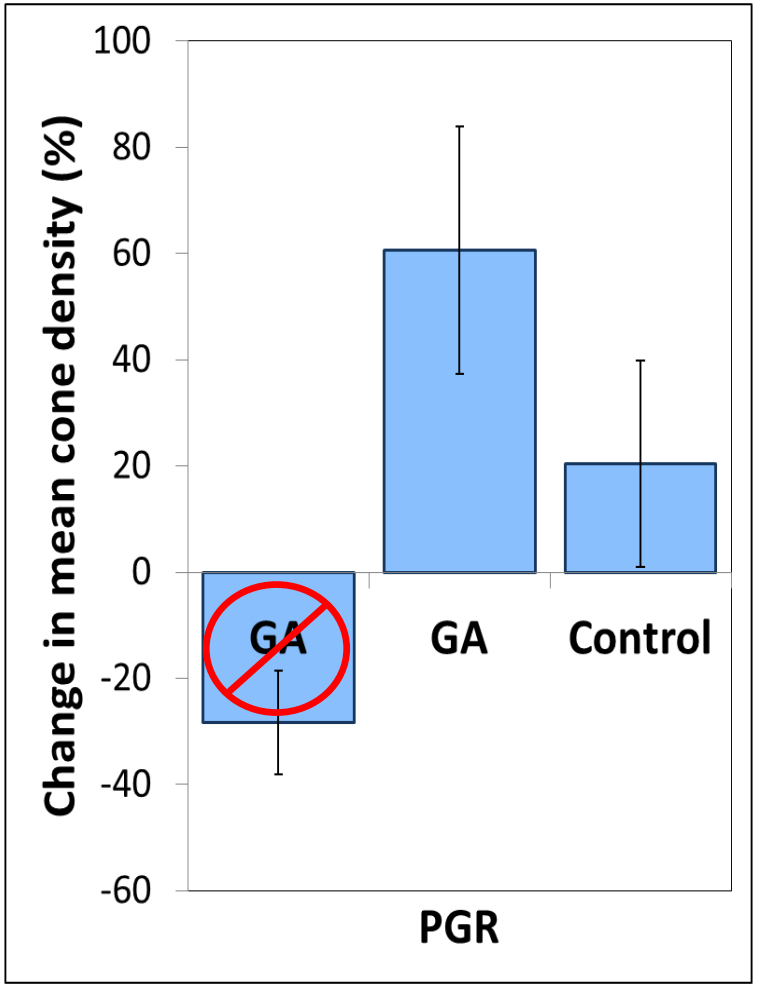


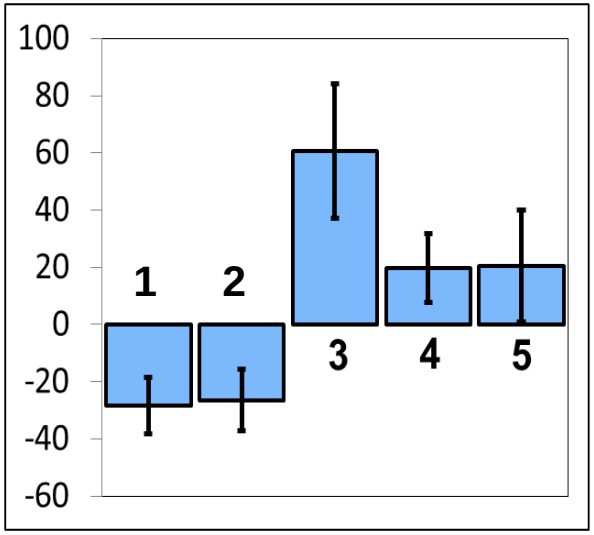
Factors that increase cone production

Lower soil moisture increases coning



Preliminary study: GA inhibitors decrease coning

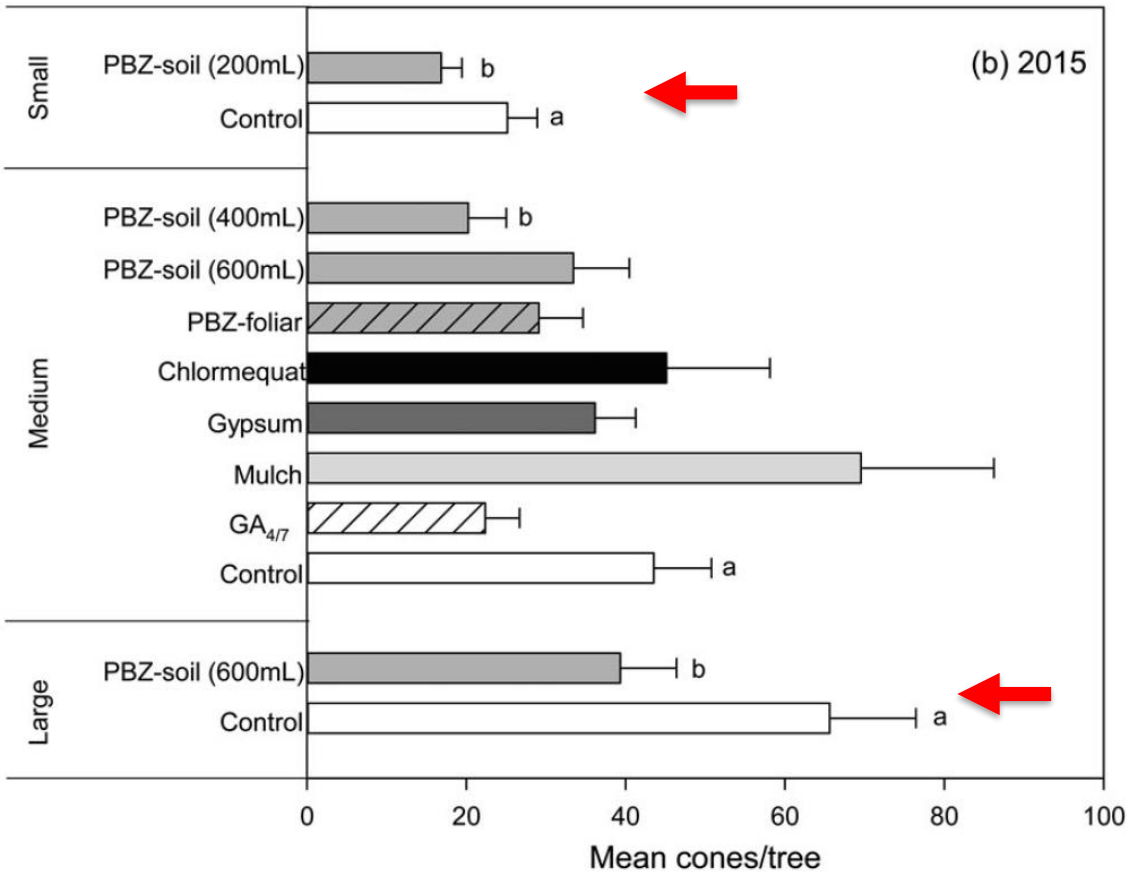




Plant Growth Regulators

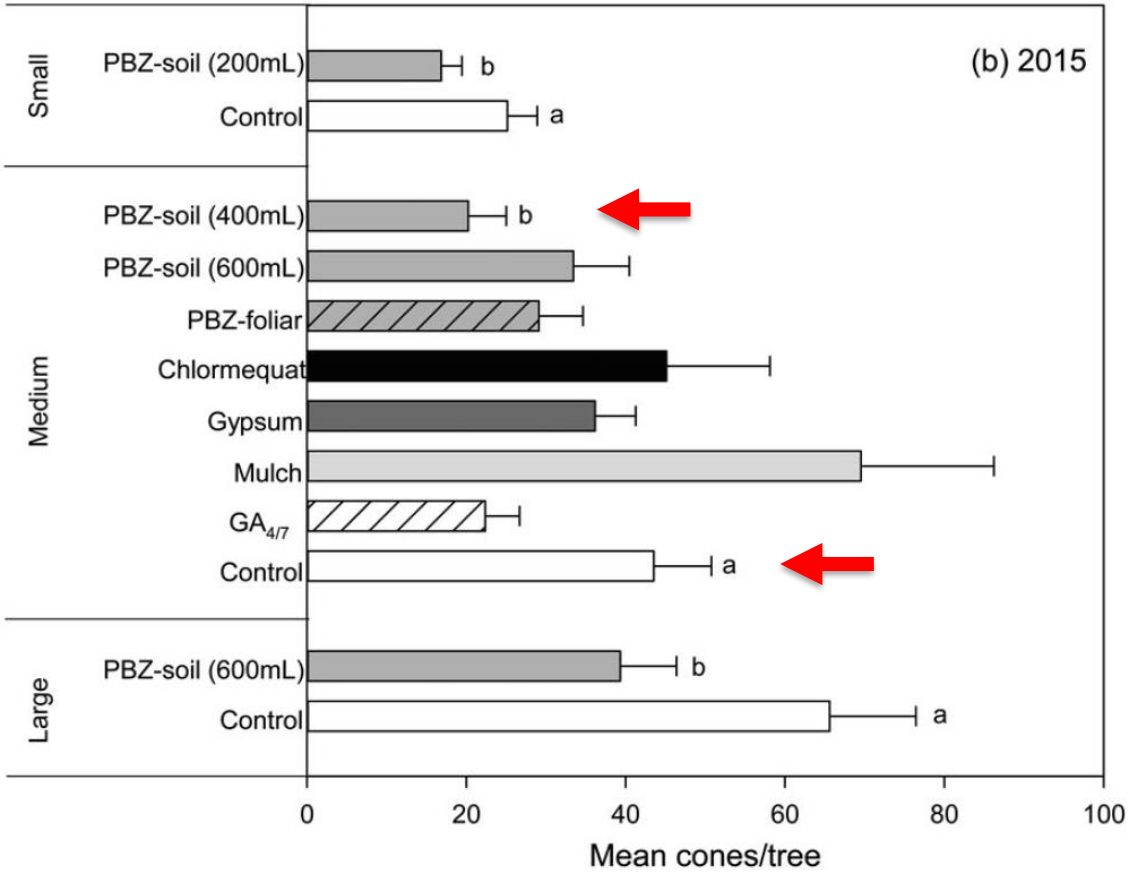
1) Cycocel (chlormequat)
2) Bonzi (paclobutrazol)
3) Provide ($GA_{4/7}$)
4) Florel (ethephon)
5) Control (water)

Paclobutrazol reduced coning in Fraser fir



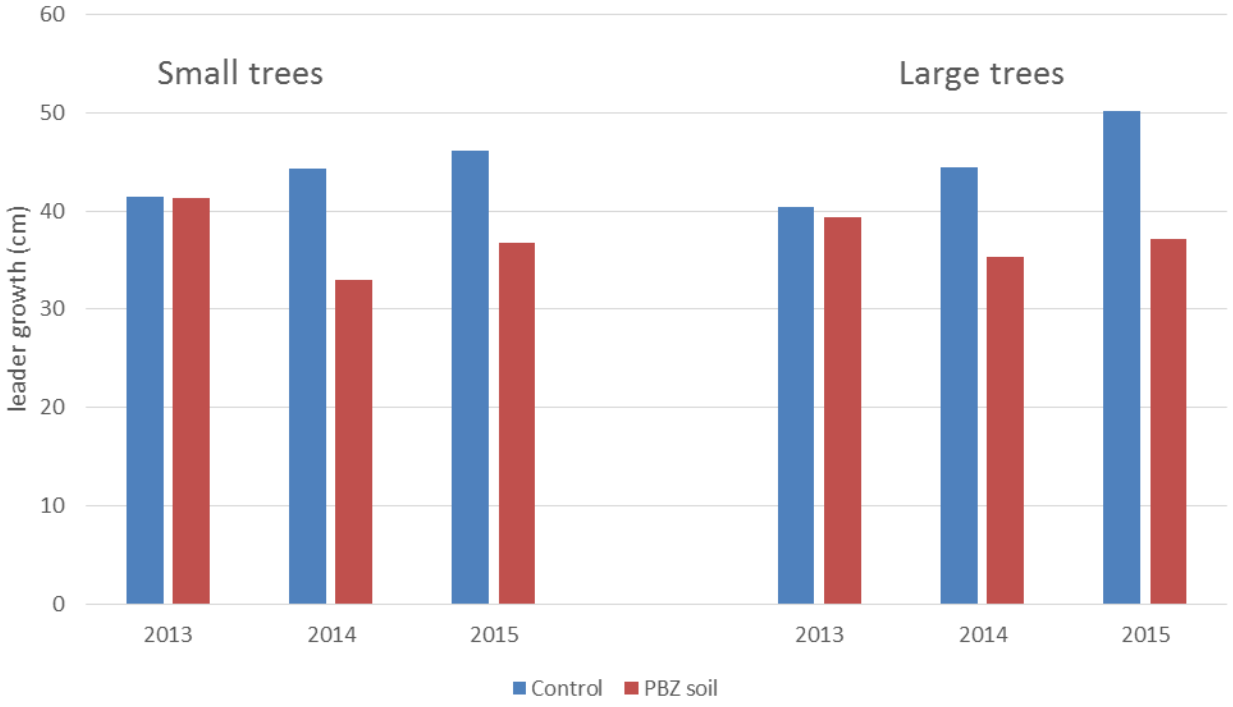
Crain and Cregg, 2017

Paclobutrazol reduced coning in Fraser fir



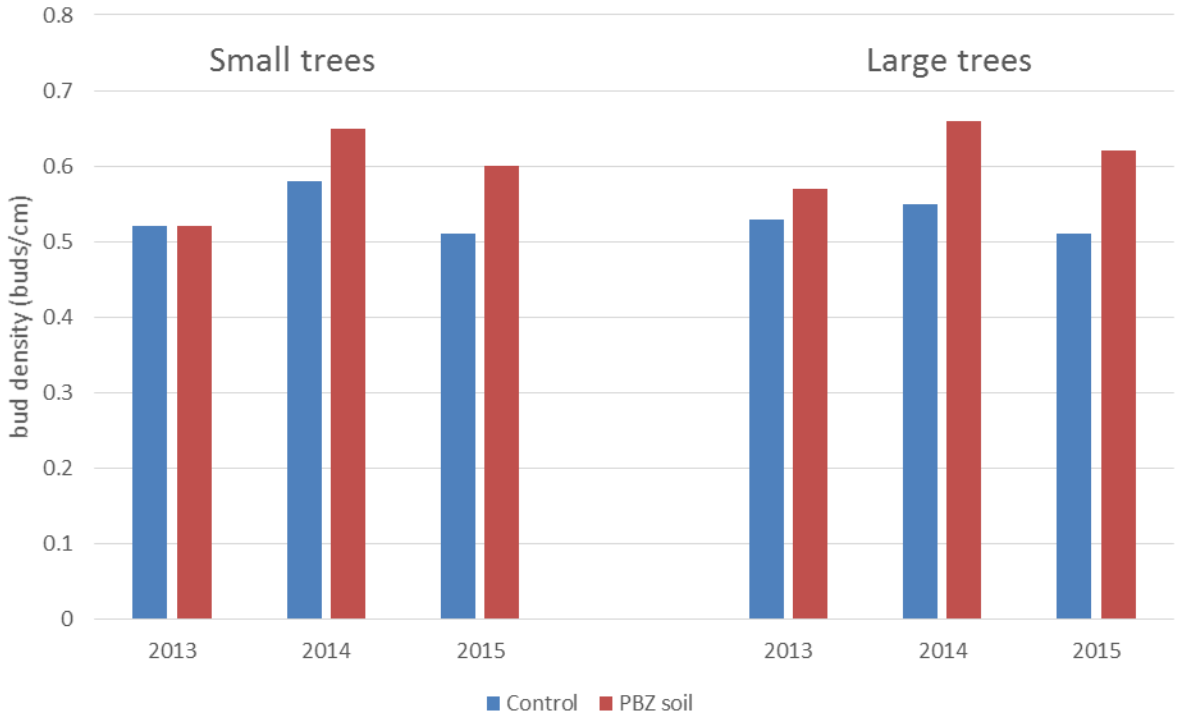
Crain and Cregg, 2017

Paclobutrazol reduced shoot growth in Fraser fir…



Adapted from Crain and Cregg, 2017

… and increased bud density



Adapted from Crain and Cregg, 2017

2016 PGR trial

- Change in approach
  - Apply to trees before reproductive onset
  - Prevent initiation of coning
  - Smaller trees = reduced chemical costs

  - But need to treat all trees

Plots installed at four cooperator farms in lower Michigan

Treatment	Description
Control	No treatment
Camb 100	100 ml paclobutrazol – soil injection
Camb 200	200 ml paclobutrazol – soil injection
Camb 300	300 ml paclobutrazol – soil injection
Trimtect	5% solution – foliar application

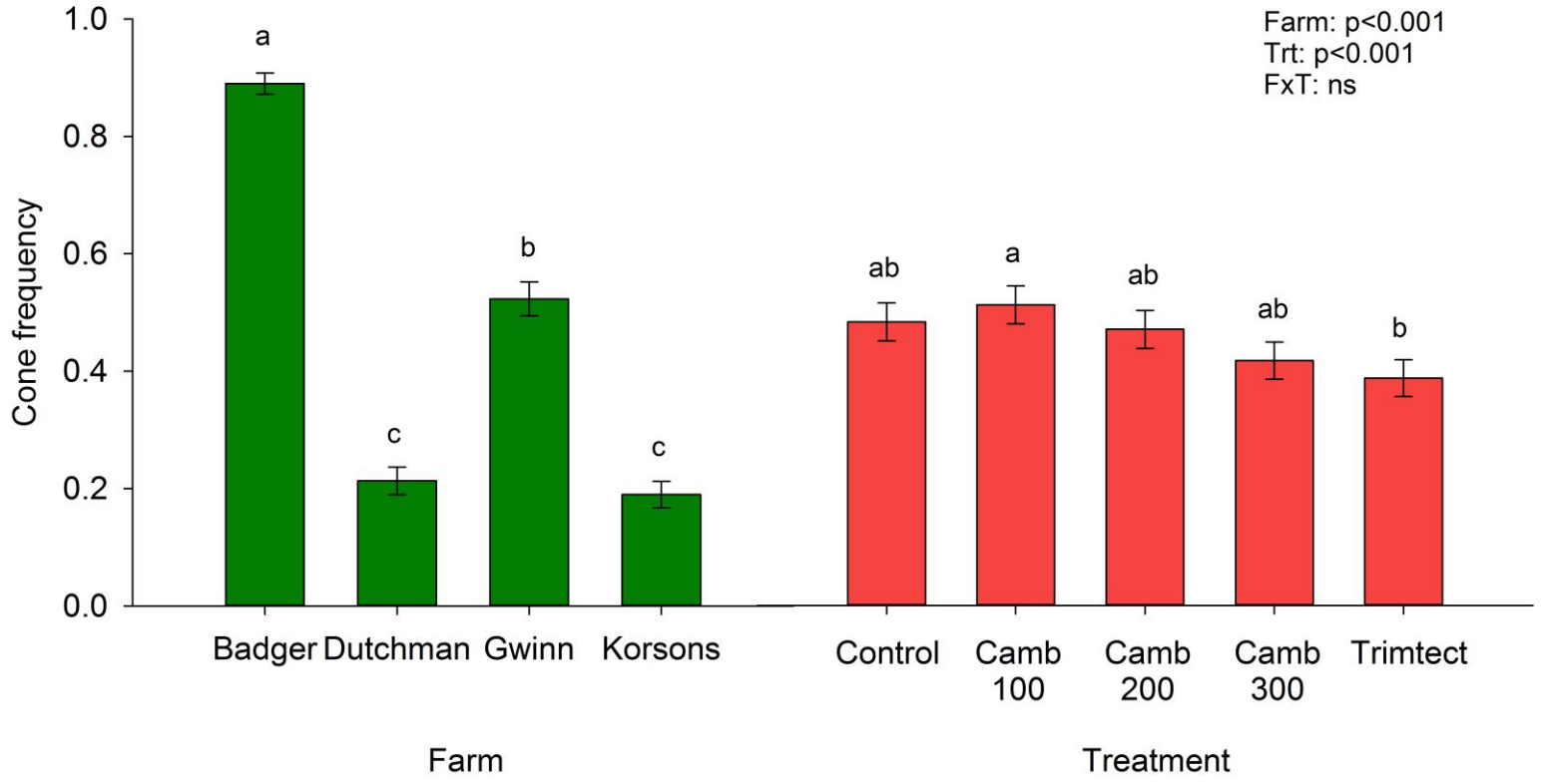
Study design:
10-tree row plots
6 reps
60 tree per treatment
@ each farm

Mean tree heights and cone status at study initiation - May 2016

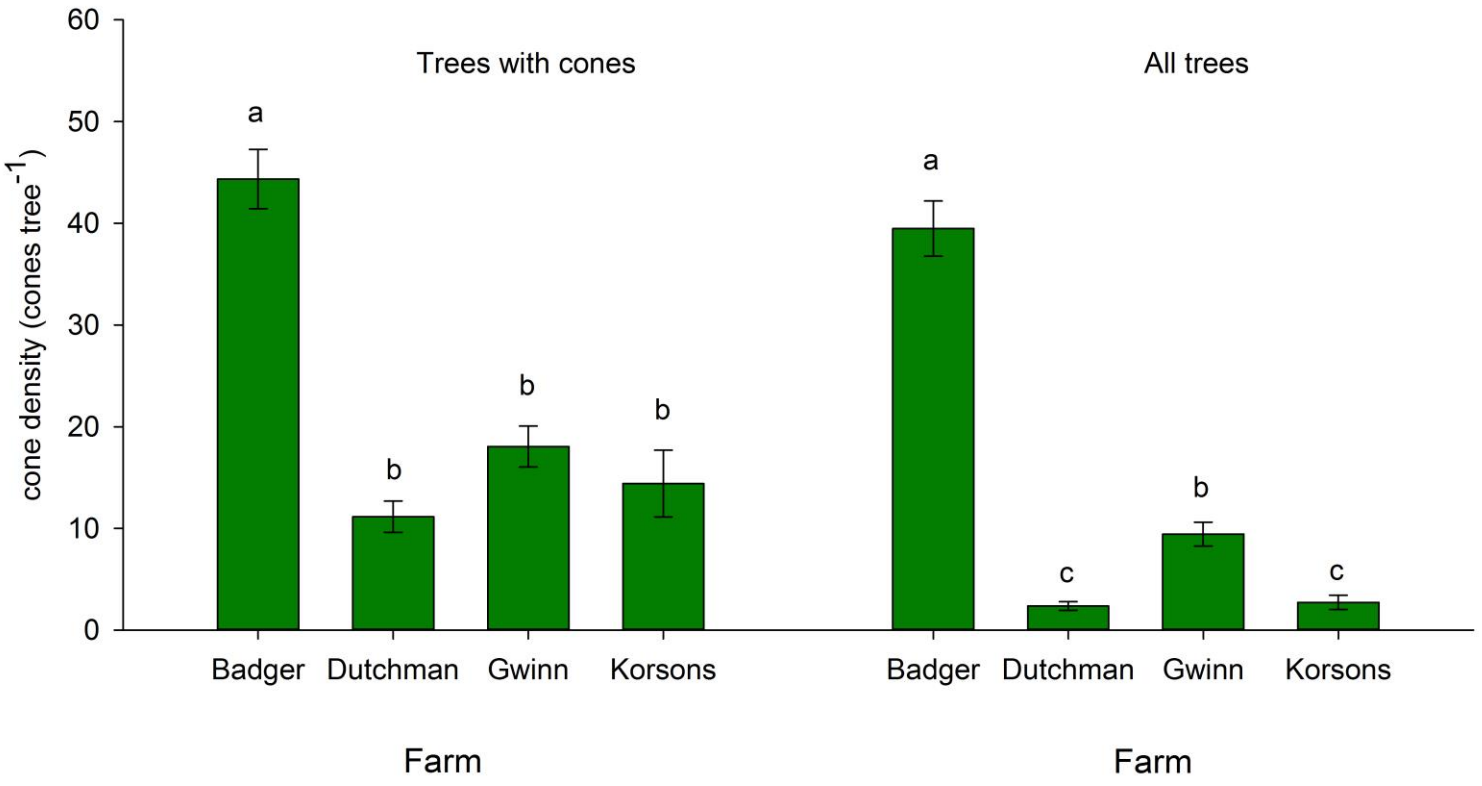
Farm	Height (m)	Cone frequency (trees with cones)	Cone density (cones tree^{-1})
Badger	1.40	0.28	9.7
Dutchman	1.63	0.11	4.1
Gwinn	1.25	0.04	5.1
Korson's	1.38	0.00	0.0

Results

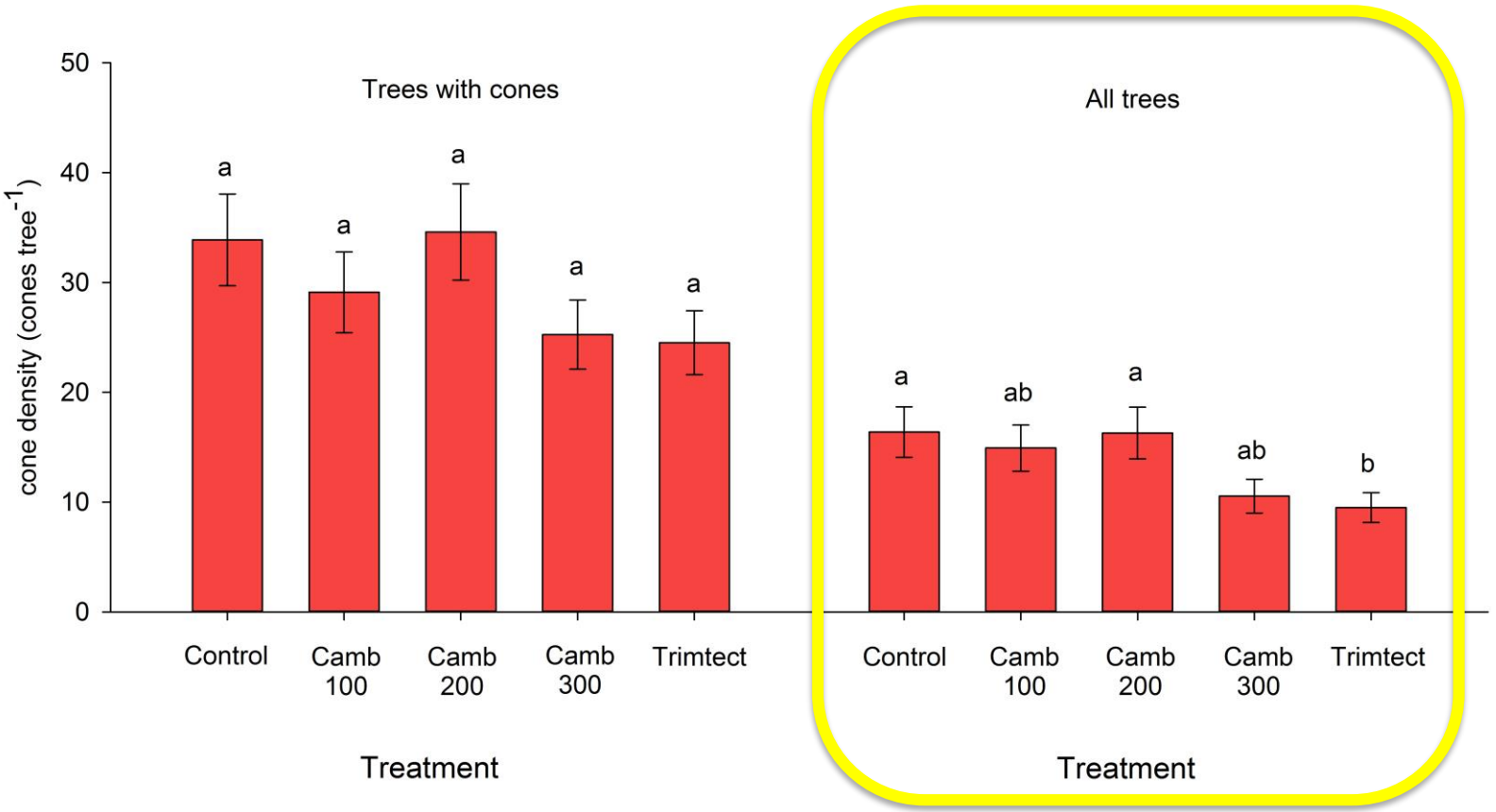
Treatments had modest effect on cone frequency relative to site



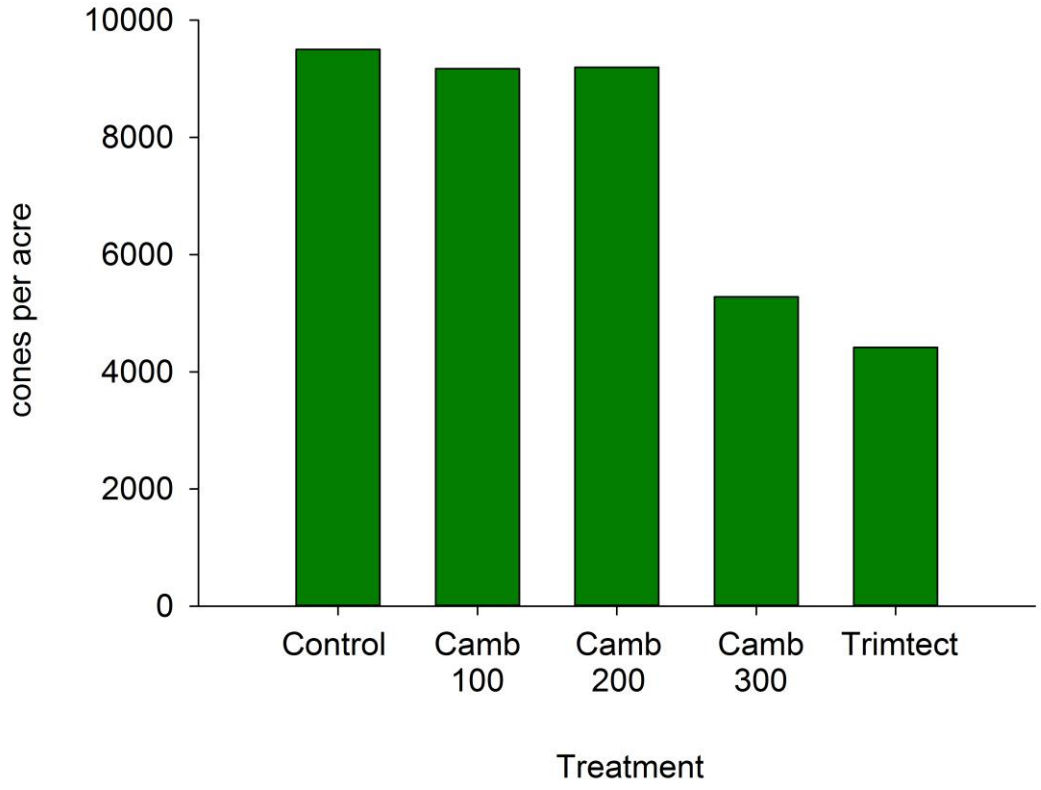
Variation in cone density reflects cone frequency



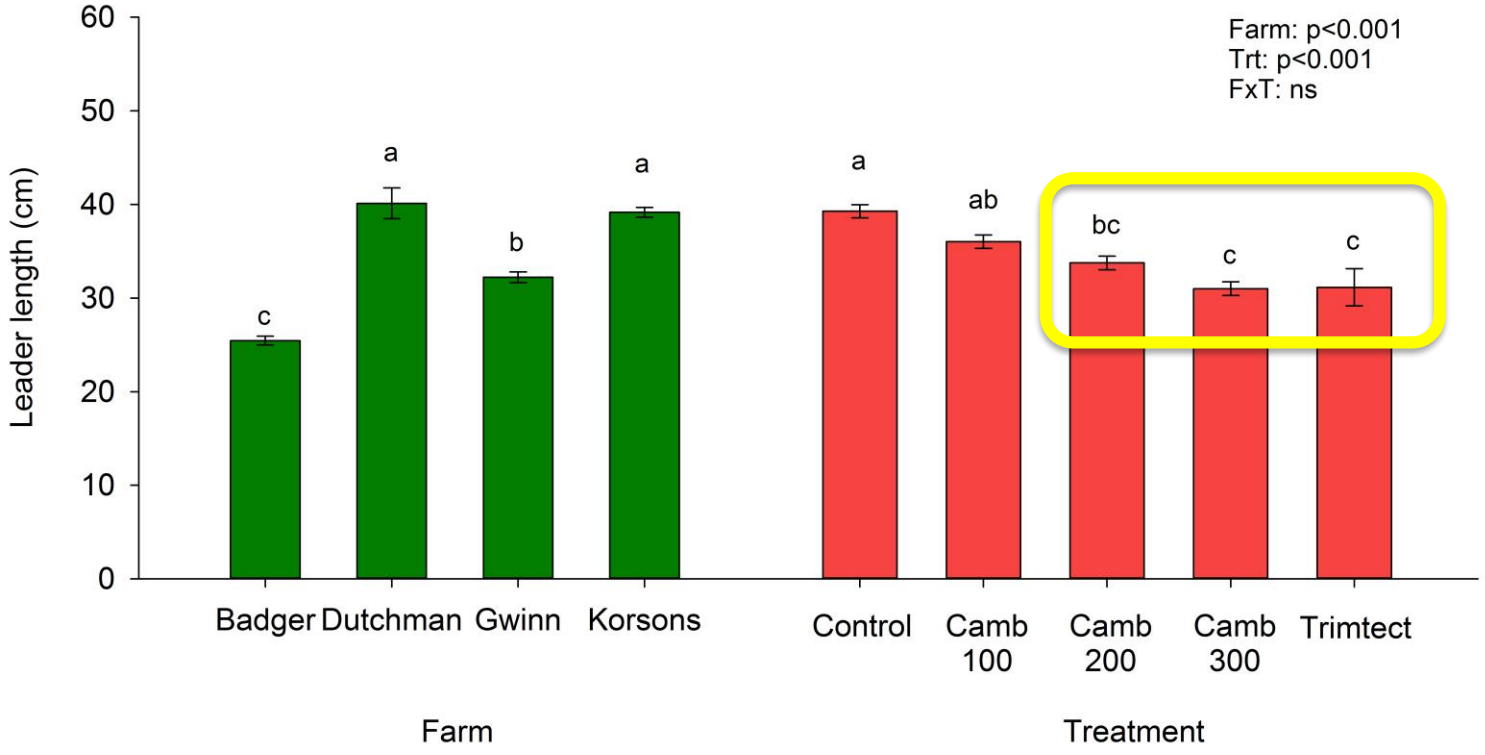
Overall, Trimtect reduced cone density



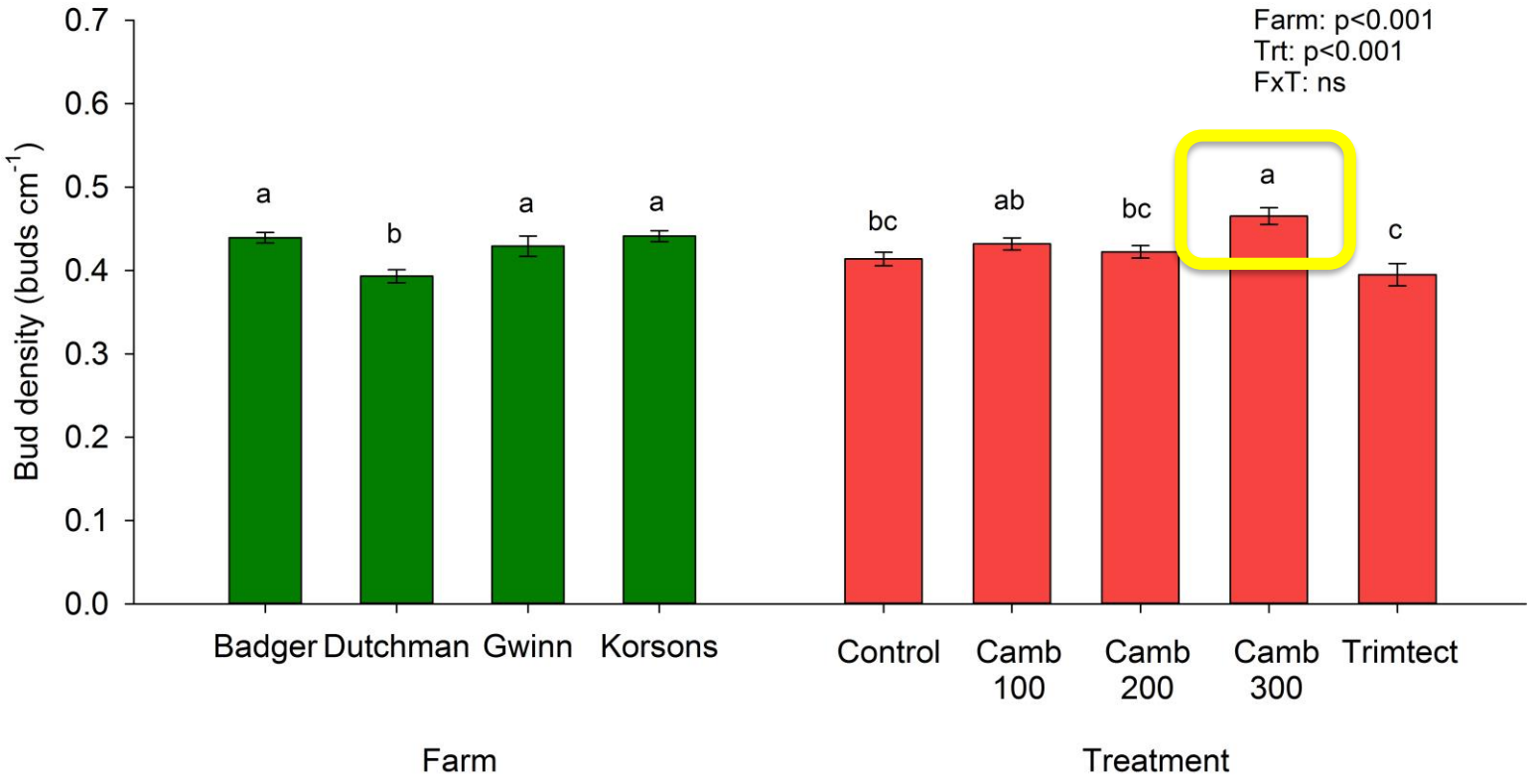
Cones per acre: Combining effects on cone density and cone frequency



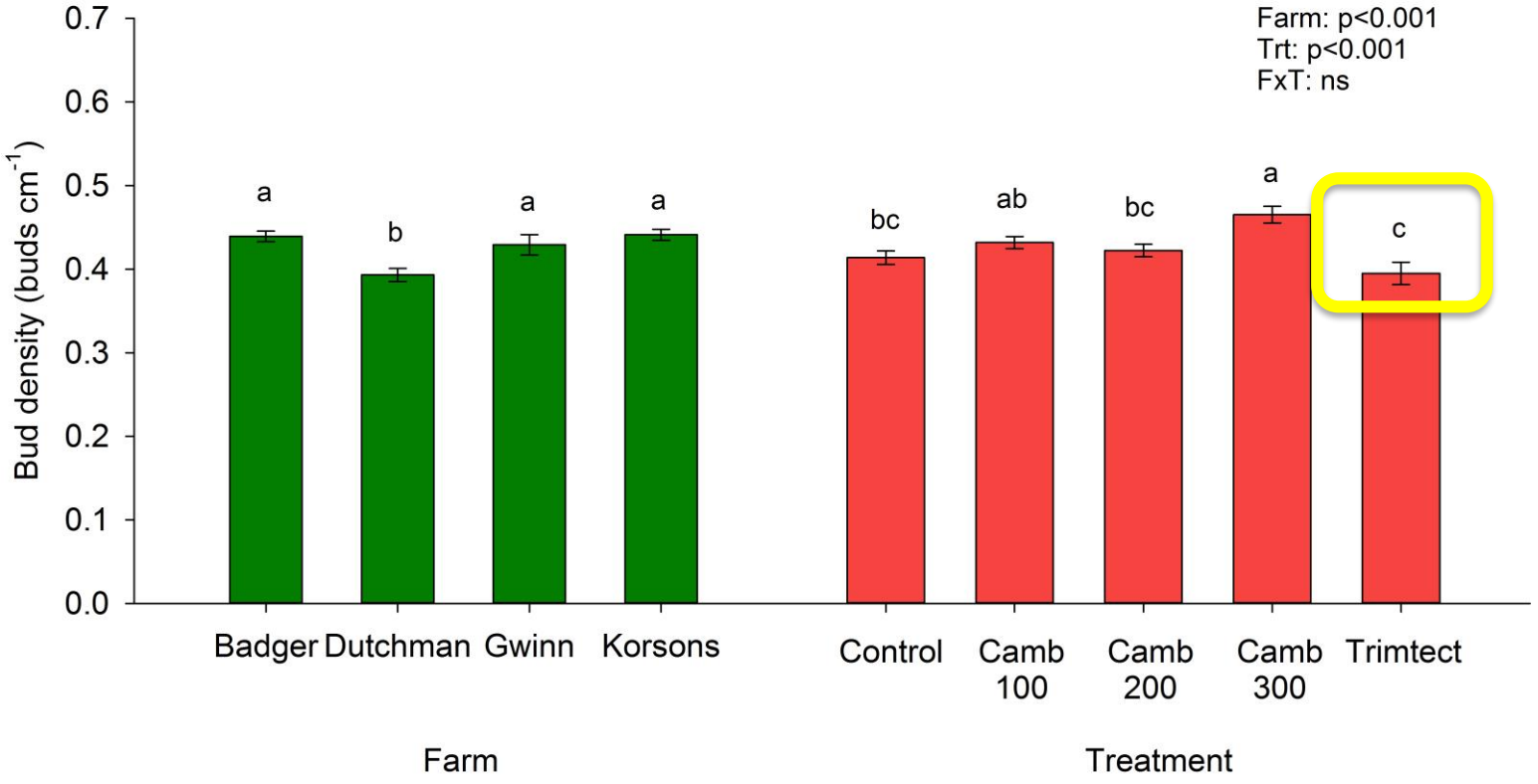
Paclobutrazol treatments reduced shoot growth



High rate of paclobutrazol increased bud density



Trimtect reduced shoot growth and total bud number resulting in reduced bud density



Summary

- Soil-applied and foliar-applied paclobutrazol reduced shoot growth
- High rate of soil-applied paclobutrazol increased bud density
- Foliar-applied paclobutrazol reduced cone density relative to control
- Trend toward lower cone density and frequency with high rate of soil-applied paclobutrazol

Summary (cont.)

- 50% overall reduction in total cones may be possible based on combined effects on cone frequency and density
- Price of material is decreasing

Looking ahead…

- 2016 study
  - Track 3rd year responses in 2018
  - Re-apply Trimtect
- 2017 Study
  - Track 2nd year responses
  - Re-apply Trimtect

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- Ellie Domer and Mary Tuski
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- Gwinn's Tree Farm

Christmas Tree PROMOTION BOARD

Rainbow Treecare Scientific Advancements

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Thanks for your attention!