

Making Money Through Tree Canopy Management: Crop Load, Fruit Size, Return Bloom & Fruit Finish

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Notes on slides can be viewed by holding the cursor over the icon in the upper left corner.



CLM tools to make the big bucks!!



- 😊 Lime sulfur
- 😊 Smart hand-thinning
- 😊 Reflective fabrics
- 😊 Targeted pruning
- 😞 BA (not organic)
- 😊 Horizon technologies

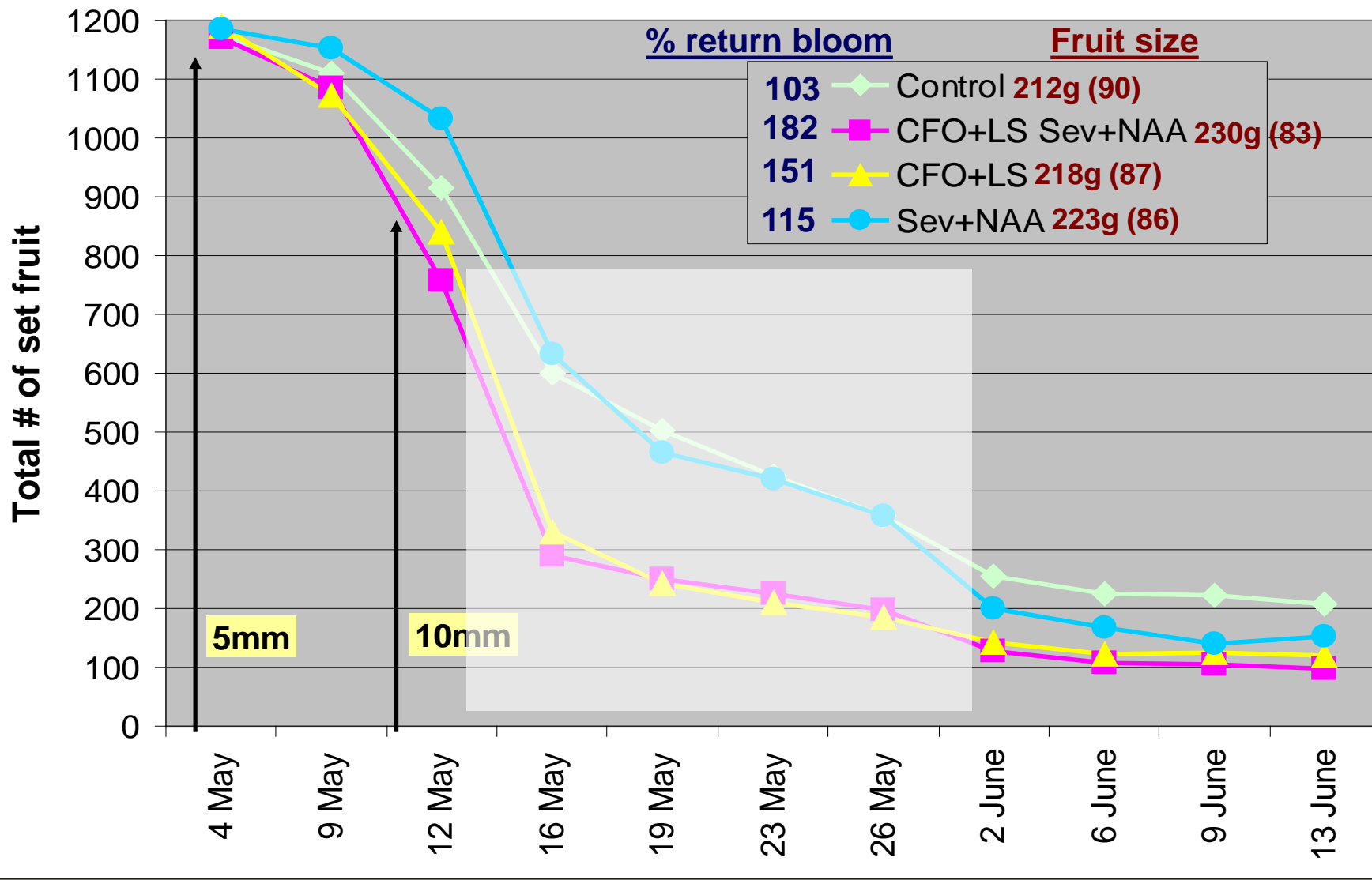
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Fruitlet retention patterns of chemical thinning programs

'Golden Delicious' / M.26 - Manson WA 2005



Blossom thinning



WTFRC Internal Program

Apple bloom thinning agents evaluated 1998-2010

(# of formulations tested in parentheses)

- ATS (3)
- Dormex
- Wilthin
- Water
- NC99 (2)
- Lime sulfur (2)
- Aliette
- ThinRite
- Cal Plex 12
- Sodium chloride
- Ju VOE
- New Zealand soap (3)
- Crocker's Fish Oil
- TetraSul
- Kaligreen
- Molasses
- Vinegar
- Tergitol
- Urea
- Ethrel
- Raynox
- Corn oil
- Canola oil
- Sulforix
- Soybean oil
- NAA
- GenThin
- Clove oil
- Potassium metabisulfite
- Potassium sulfate
- Matran
- Salicylic acid
- MaxCel
- Exilis Plus

WTFRC Internal Program

Oils/carriers for apple thinning agents evaluated 1998-2010
(# of formulations tested in parentheses)

OILS

- Crocker's Fish Oil
- VOE (Ju formulation)
- Saf – T – Side Oil
- JMS Stylet Oil
- Wilbur Ellis Supreme Oil
- Omni Supreme Oil
- Orcal Freedom Oil (4)
- Corn oil
- Soybean oil
- Canola oil

OTHER

- Hi Crop Liquid Fish
- Kelly Green Fish Emulsion
- Pacific Natural Fish Emulsion
- Latron
- Regulaid (3)
- Silwett
- Silgard
- Exit
- GSL 90

CHEMICAL THINNING GOALS

#1 Minimize production costs – indicated by fruit set/blossom cluster

#2 Optimize retention of high quality fruit (size, color, shape, finish, sugars, acids, etc.) – indicated by fruit size

#3 Promote consistent annual cropping by maintaining proper balance of vegetative and reproductive growth – indicated by return bloom

Proven chemical bloom thinners of apple

Incidence of results significantly superior to untreated control

WTFRC apple chemical bloom thinning trials 1999-2010

Treatment	Fruitlets / 100 blossom clusters	Harvested fruit diameter	Return bloom ¹
ATS	15 / 57 (26%)	10 / 60 (17%)	4 / 52 (8%)
NC99	15 / 32 (47%)	7 / 34 (21%)	2 / 28 (7%)
Lime sulfur	25 / 54 (46%)	12 / 48 (25%)	9 / 47 (19%)
CFO + LS	61 / 106 (58%)	26 / 97 (27%)	21 / 93 (23%)
JMS + LS	14 / 24 (58%)	8 / 23 (35%)	4 / 22 (18%)
WES + LS	14 / 27 (52%)	4 / 26 (15%)	4 / 26 (15%)
ThinRite	6 / 16 (38%)	0 / 17 (0%)	0 / 3

¹ Data from 2010 trials not included

Proven chemical postbloom thinners of apple

Incidence of results significantly superior to untreated control

WTFRC apple chemical postbloom thinning trials 2002-2010

Treatment	Fruitlets / 100 blossom clusters	Harvested fruit diameter	Return bloom ¹
BA	2 / 18 (11%)	0 / 19 (0%)	0 / 19 (0%)
Carb + BA	29 / 78 (37%)	9 / 77 (12%)	9 / 73 (12%)
Carb + NAA	12 / 52 (23%)	7 / 52 (13%)	5 / 50 (10%)
BA + NAA	5 / 15 (33%)	3 / 15 (20%)	1 / 11 (9%)
Carb + NAA + Ethephon	0 / 5	0 / 5	2 / 5
Carb + NAA + BA	0 / 8	0 / 8	3 / 8

¹ Data from 2010 trials not included

Proven chemical bloom thinners of apple

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BLOOM THINNER EFFECTS ON CROP LOAD

GOLDEN DELICIOUS/ M.7 – ROYAL CITY, WA 2006

	Fruitlets/ 100 clusters	% Blanks	% Singles	% Doubles	Weight (g)	Box Size
ATS	15 ns	88 ns	9 ns	3 a	191 ns	100
CFO+LS	17	84	16	0 b	197	97
LS	18	83	17	1 ab	194	98
NC99	15	87	11	2 ab	196	97
TergOpt	19	83	14	2 ab	199	96
Urea	20	83	15	2 ab	200	95
Vin+Oil	16	86	12	2 ab	196	97
VOE	18	84	14	2 ab	199	96
WES+LS	12	89	9	1 ab	187	102
Control	12	90	9	1 ab	187	102

Fringe benefits of LS



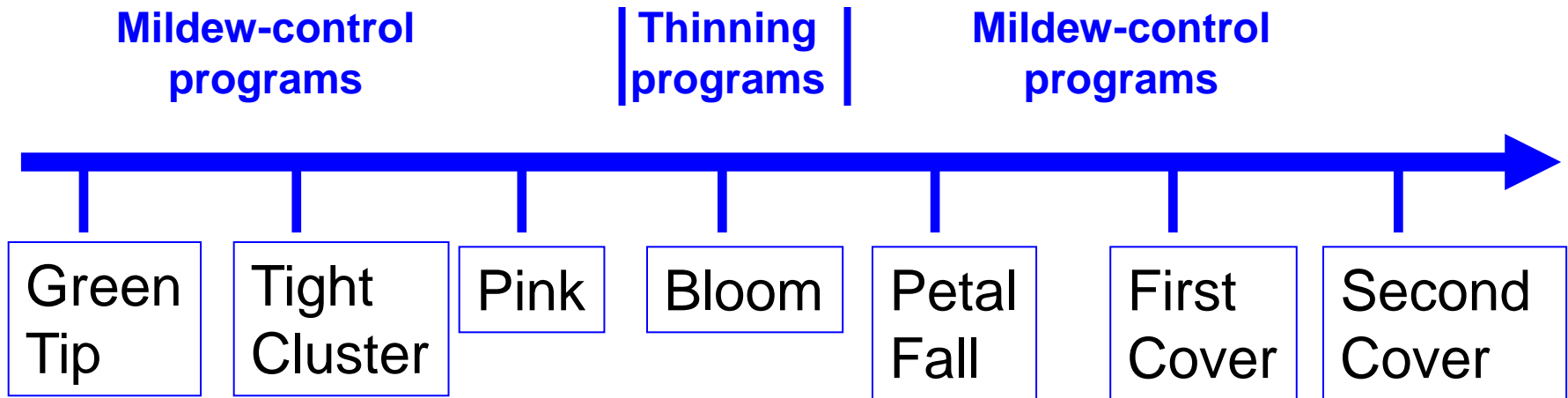
- Powdery mildew suppression (Xiao – WSU)
- Improved fruit finish
- Fire blight suppression? (Johnson – OSU)
- Reduced insect pressure?
- Multiple modes of action increase efficacy & reliability

Powdery mildew



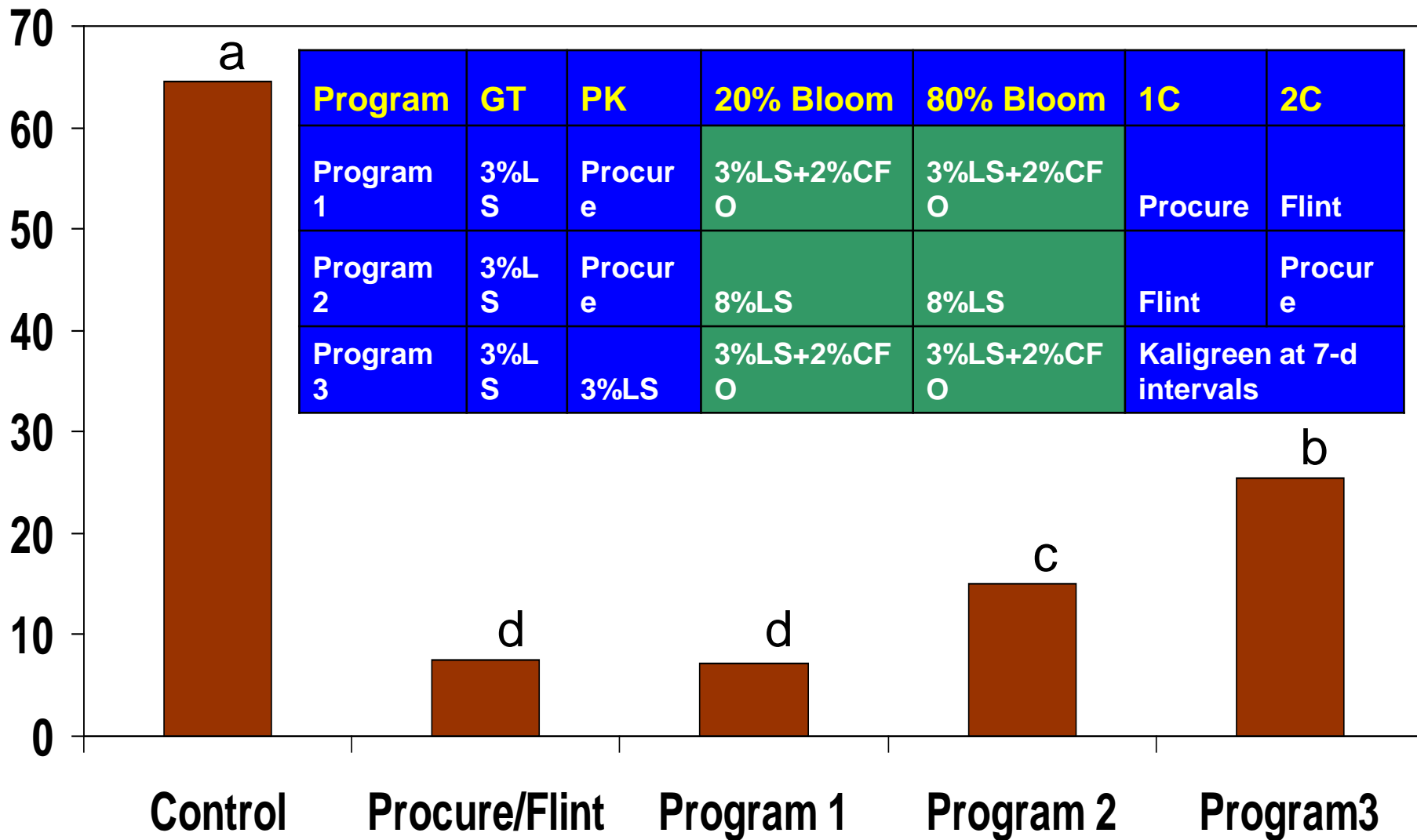
Part 5

Evaluation of chemical thinning products in combination with fungicide programs for bloom thinning and control of powdery mildew



Courtesy of Dr. Chang Lin Xiao – WSU Wenatchee

Bloom thinning programs in combination with fungicides for thinning and mildew control



Courtesy of Dr. Chang Lin Xiao – WSU Wenatchee

Fruit finish



Bloom Thinning – WTFRC Sample Data

Fuji/MM.106, 5th leaf, Royal City WA 2003

	Fruitlets per 100 blossom clusters	% blossom clusters blanked	% blossom clusters singled	Harvest fruit diam (cm)	Relative box size	Soluble solids (% Brix)	% titratable acids	% return bloom 2004
CFO + LS	84 b	42 a	37 b	8.1 ns	80	14.4 ns	0.35 ns	12 ns
LS	77 b	39 a	47 a	8.2	77	15.0	0.35	0
NC99	80 b	41 a	42 ab	8.1	80	14.7	0.34	0
Control	101 a	31 b	45 a	8.0	82	14.3	0.31	2

Bloom Thinning – Packout Data

Fuji/MM.106, 5th leaf, Royal City WA 2003

	Mean fruit weight (g)	% WAXF1 (Top grade)	% WAXF2 (2 nd grade)	% USXF (3 rd grade)	% culls
CFO + LS	228 ns	28 ns	35 ns	20 ns	17 ns
LS	229	30	32	14	24
NC99	228	31	32	14	23
Control	227	31	32	10	27

Bloom Thinning – Packout Data

Fuji/MM.106, 5th leaf, Royal City WA 2003

	Total yield (lbs)	Yield/tree (lbs)	Grower net return/bin (US\$)	Grower net return/tree (US\$)
CFO + LS	28,051	84.5	372 ns	41.22
LS	28,986	87.0	359	42.80
NC99	26,726	80.7	366	38.19
Control	29,143	84.5	350	39.28

Bloom Thinning – Financial Data

Fuji/MM.106, 5th leaf, Royal City WA 2003

	Grower net return/tree (US\$)	Hand-thin time/tree (min)	Hand thin costs/tree (US\$)	Spray costs/tree (inc. chemicals, labor, equip.) (US\$)	Estimated net/tree vs. control (US\$)
CFO + LS	41.22	2.8 ns	0.38	0.37	+1.69
LS	42.80	3.0	0.40	0.43	+3.19
NC99	38.19	2.8	0.36	0.25	-1.20
Control	39.28	no data	0.50?	0	---

Evaluation of the 'Size' method for Hand Thinning Apples

Steven McArtney and JD Obermiller

NC STATE UNIVERSITY

COLLEGE OF
AGRICULTURE & LIFE SCIENCES
ACADEMICS • RESEARCH • EXTENSION



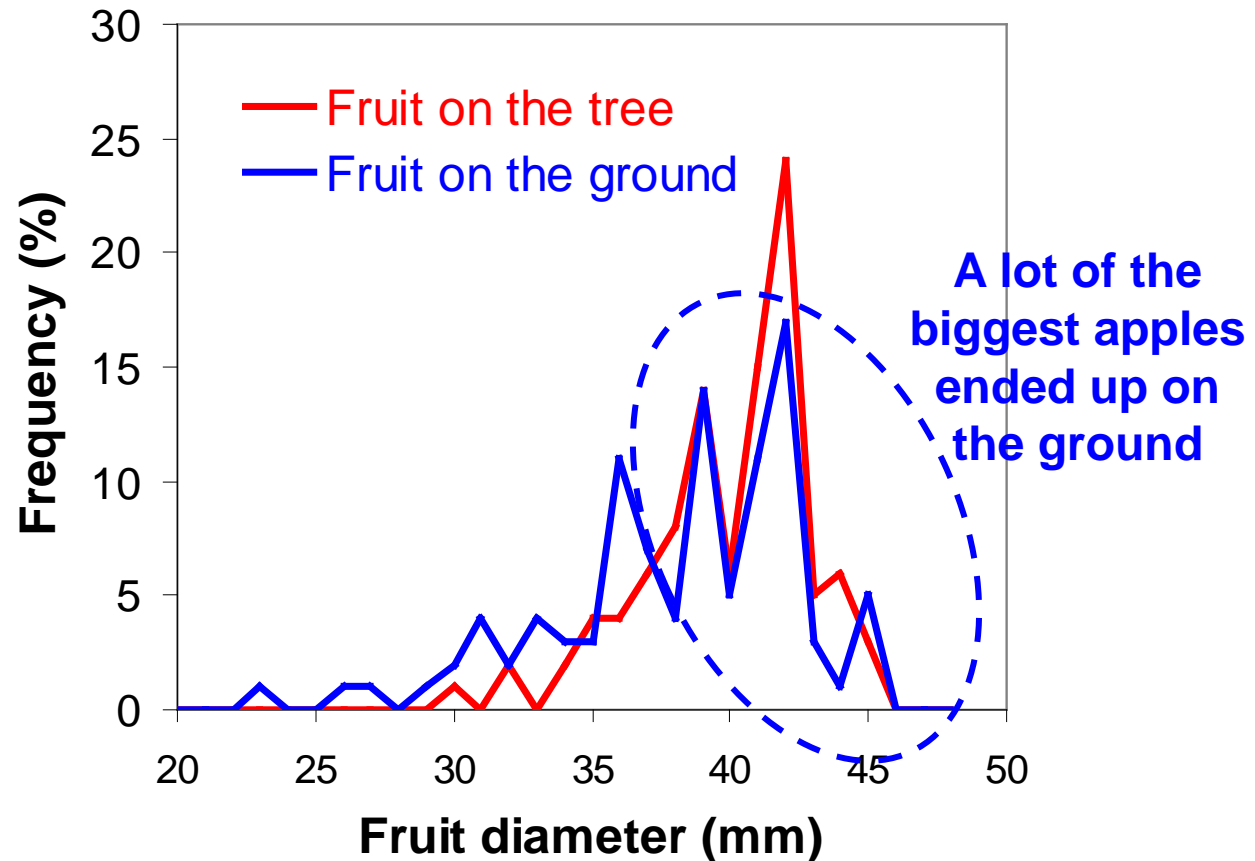
The University of Georgia

THE UNIVERSITY of
TENNESSEE

CLEMSON
UNIVERSITY

Conventional Hand Thinning Methods

either do not consider or place a low priority on fruit size



Fruit size distribution of thinned and retained fruit measured 1 day after hand thinning on a commercial orchard

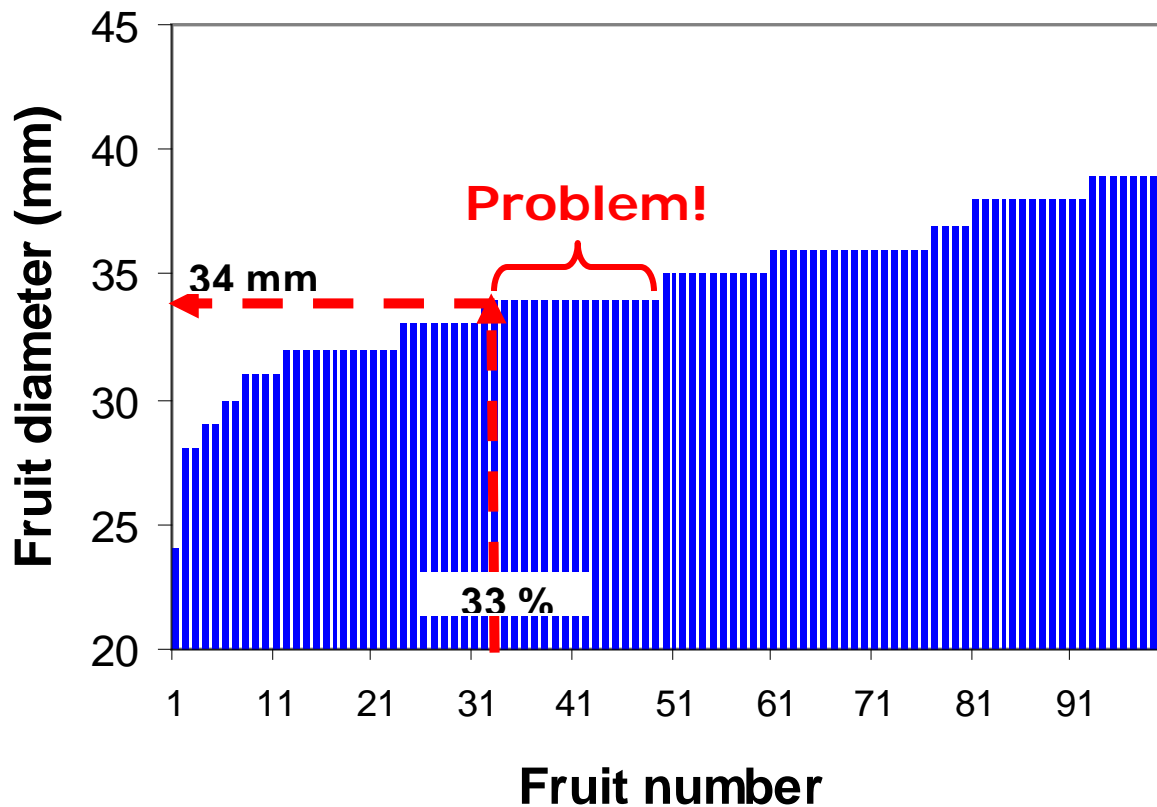
'Size Thinning' Method

Example...

- 1. Actual crop load from counts is 450 fruit per tree**
- 2. Target crop load is 300 fruit per tree**
150 fruit (33%) will have to be removed from each tree to reach the TARGET CROP LOAD
- 3. To make sure you remove the smallest 150 fruit (33%) you will need to check the diameter of the 33rd smallest fruit in the sorted size data.**

'Size Thinning' Method

Example...



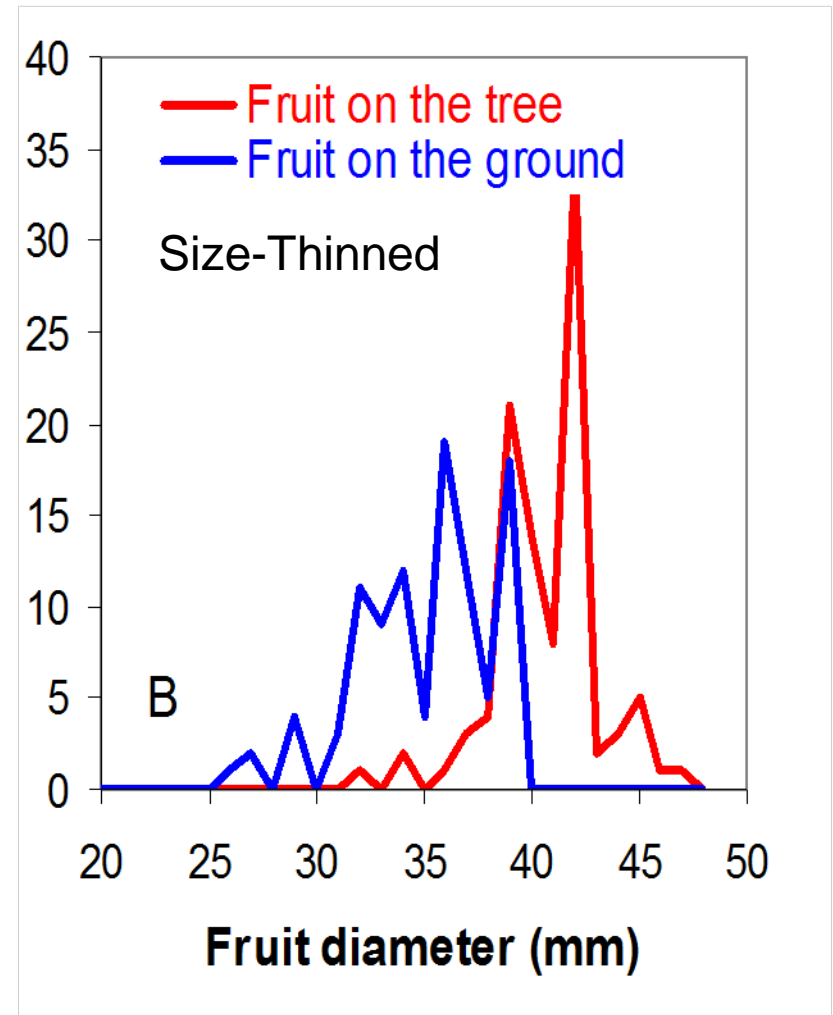
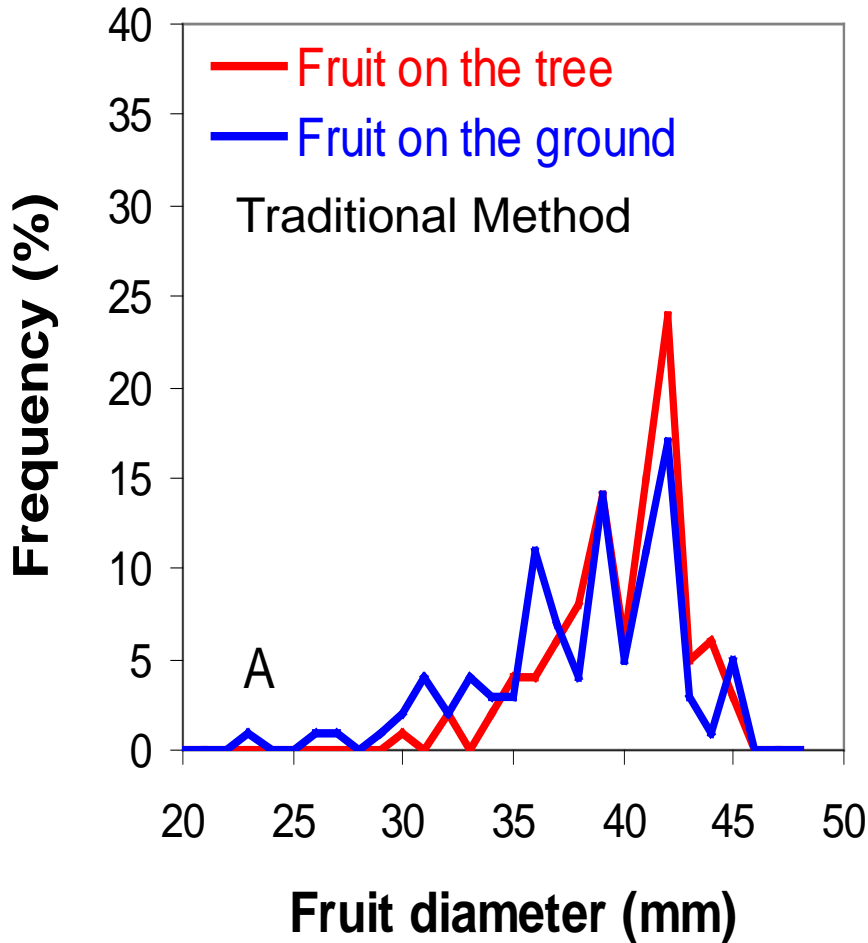
Hand your thinning crew a fruit that is 34 mm in diameter and instruct them to remove all fruit this size and smaller from the tree

Size Thinning achieves two things...

- it ensures that only the smallest fruit are removed, and*
- it ensures the crop load target is met (without having to count!)*

'Size Thinning' Method

fruit diameters of thinned and retained fruit (2008)



Fruit number, yield per tree, and mean fruit weight at harvest

Treatment	Fruit no. per tree	Fruit wt. (kg/tree)	Mean fruit wt. (g)
Unthinned	364a	52.7a	145
Hand thinned (Conventional)	231b	34.4b	151
Hand Thinned (Size)	218b	34.9b	160
<i>P-value</i>	<i>.0013</i>	<i>.0016</i>	<i>.119</i>

Reflective Fabrics



Fruit yield trends 2007-2010

Honeycrisp/Sup.4 – Selah, WA

Year	Treatment	Yield (kg/tree)	Fruit set (per tree)	Fruit wt (g)	WAXF (%)
2007	Extenday	98 a	496 ns	206 a	60 ns
	Control/Mylar	86 b	469	182 b	59
2008	Extenday	39 a	202 ns	219 a	79 a
	Control/Mylar	35 b	198	187 b	67 b
2009	Extenday	99 a	510 a	193 a	31 a
	Control/Mylar	71 b	442 b	174 b	14 b
2010	Extenday	97 a	472 a	228 a	52 ns
	Control/Mylar	70 b	361 b	209 b	53

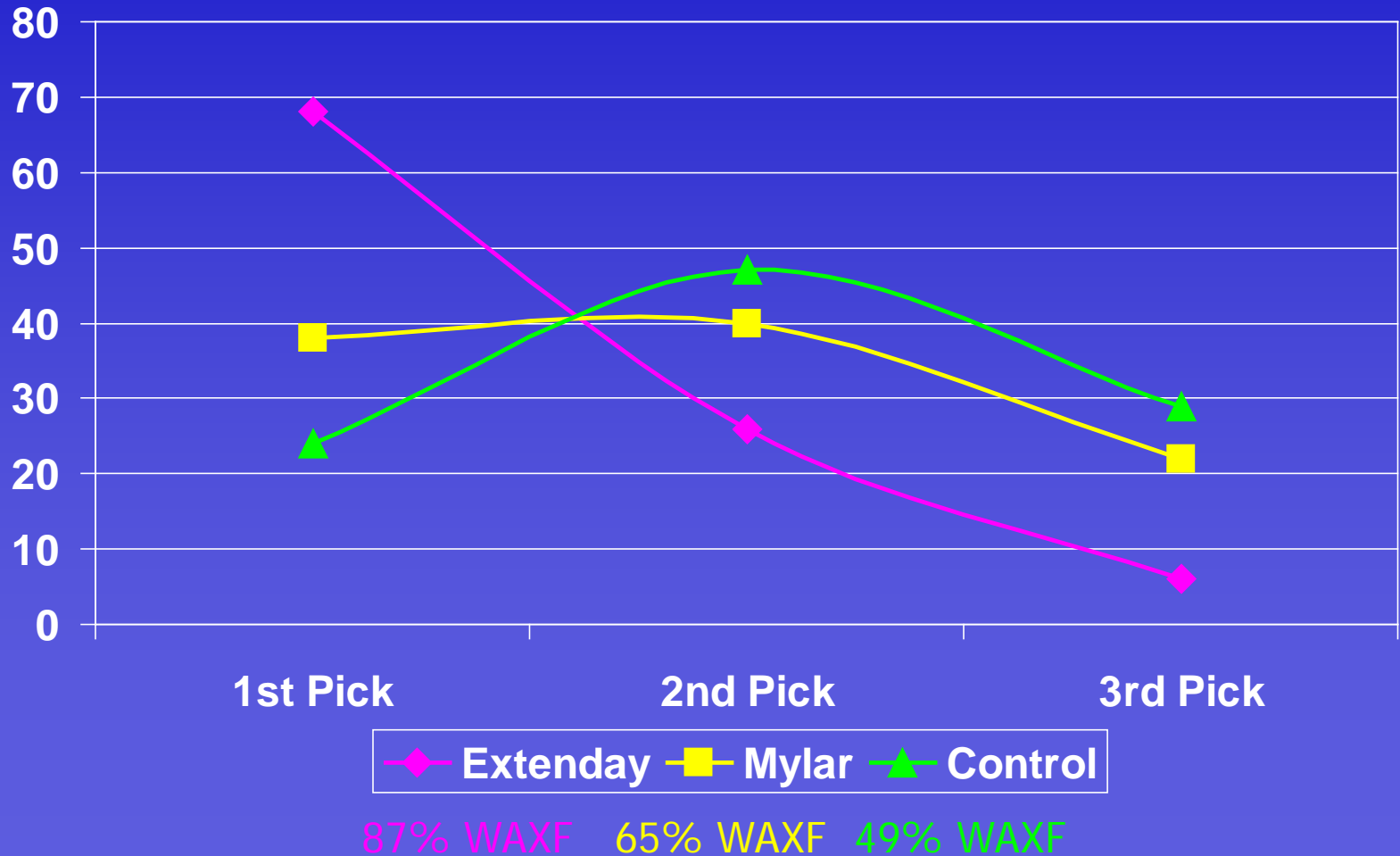
Mean cumulative yield effects of repeated season-long application of Extenday across all WTFRC apple trials 2005-2009

	Fruit set (per tree)	Fruit wt (g)	Total yield (kg/tree)
Year 1 (n=12)	+9%	+6%	+15%
Year 2 (n=7)	+24%	+2%	+26%
Year 3 (n=4)	+17%	+8%	+23%

10% wt difference = 1 box size

Reflective material effects on fruit color

Gala/M.9 – Othello, WA 2009



Dollars make sense??

Per acre costs for single block usage (est.)

	Extenday	Mylar
Material cost	2800	170
Initial install	150	60
Subsequent install	30	na
<u>Removal</u>	<u>40</u>	<u>20</u>
5 year total	\$3300	\$1250
Target fruit yield	+ 30-40%	+ 5-10%

What's on the horizon?

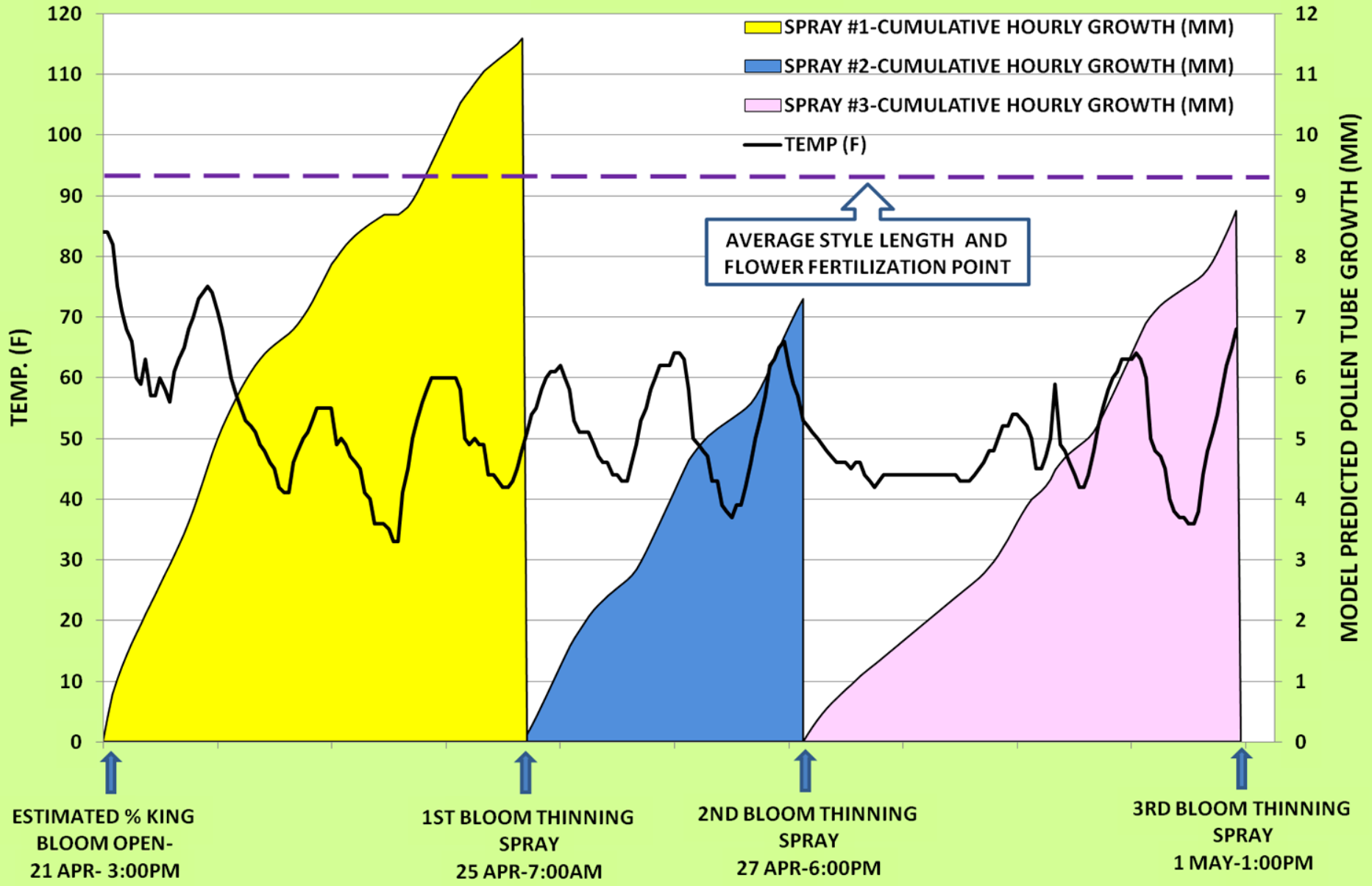


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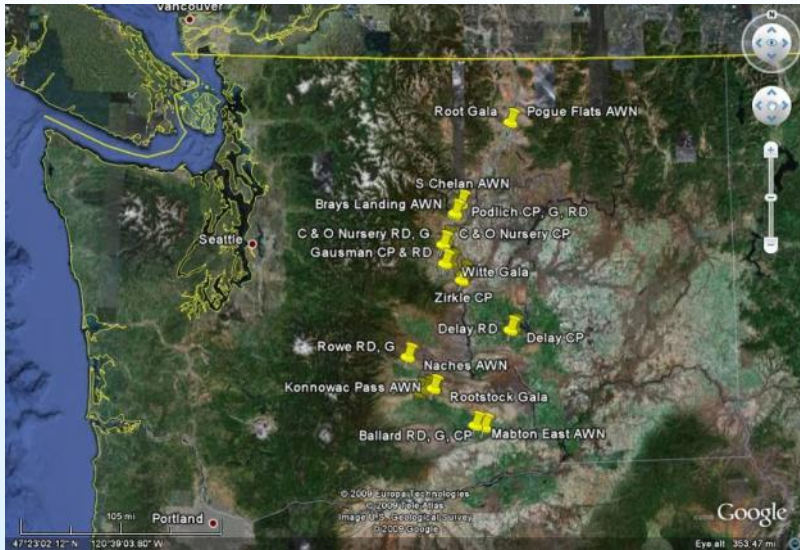
Models!



**GOOSE RANCH - FINLEY, WASHINGTON
 POLLEN TUBE GROWTH MODEL THINNING TEST
 BUCKEYE GALA (2009)**



Apple bloom phenology & fruit growth modeling project



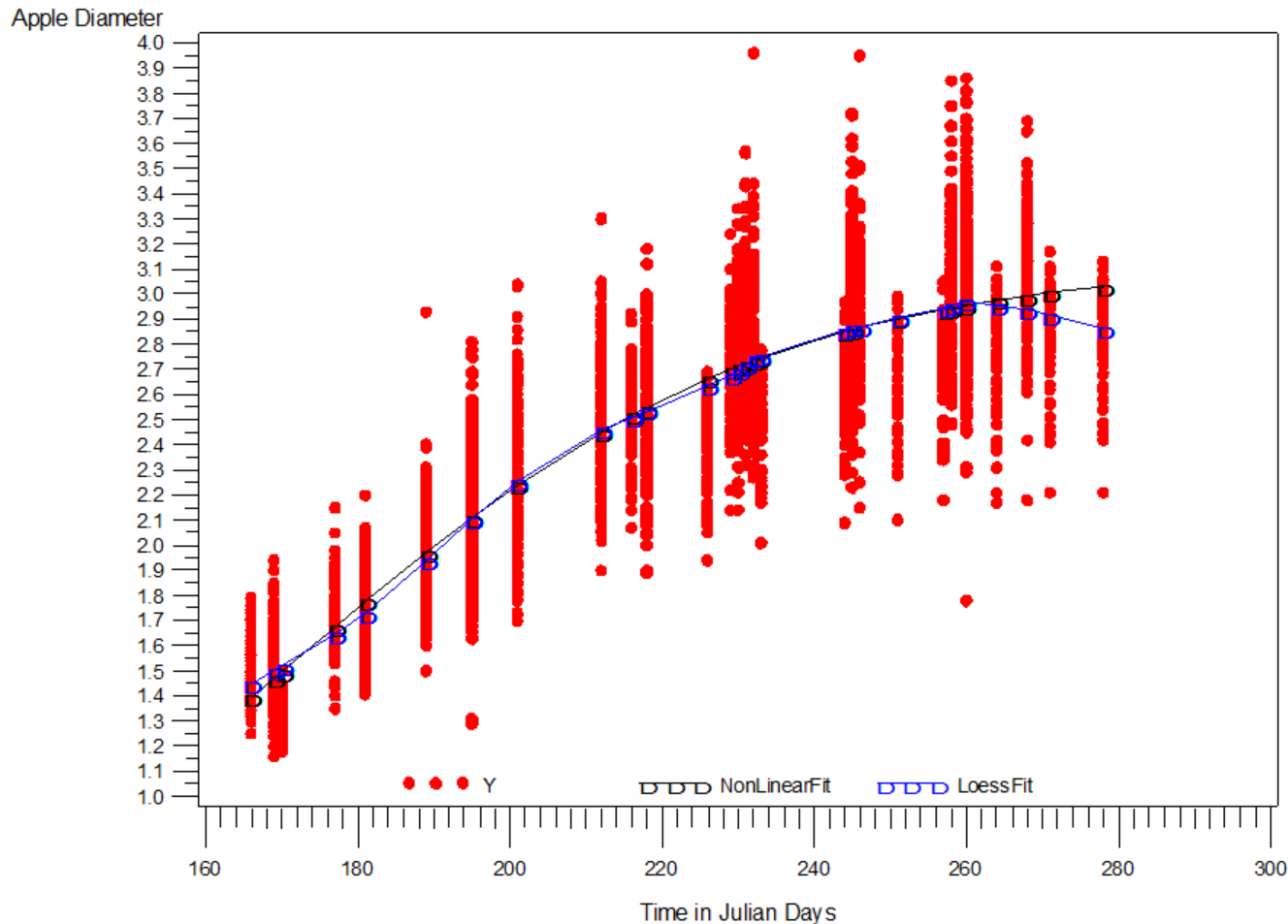
- WTFRC & WSU Extension
- Phenology: 11 Red Delicious, 11 Gala, 9 Cripps Pink
- Fruit growth: 11 Red Delicious, 10 Gala, 9 Cripps Pink
- Beta testing on AWN in 2012?



Preliminary models

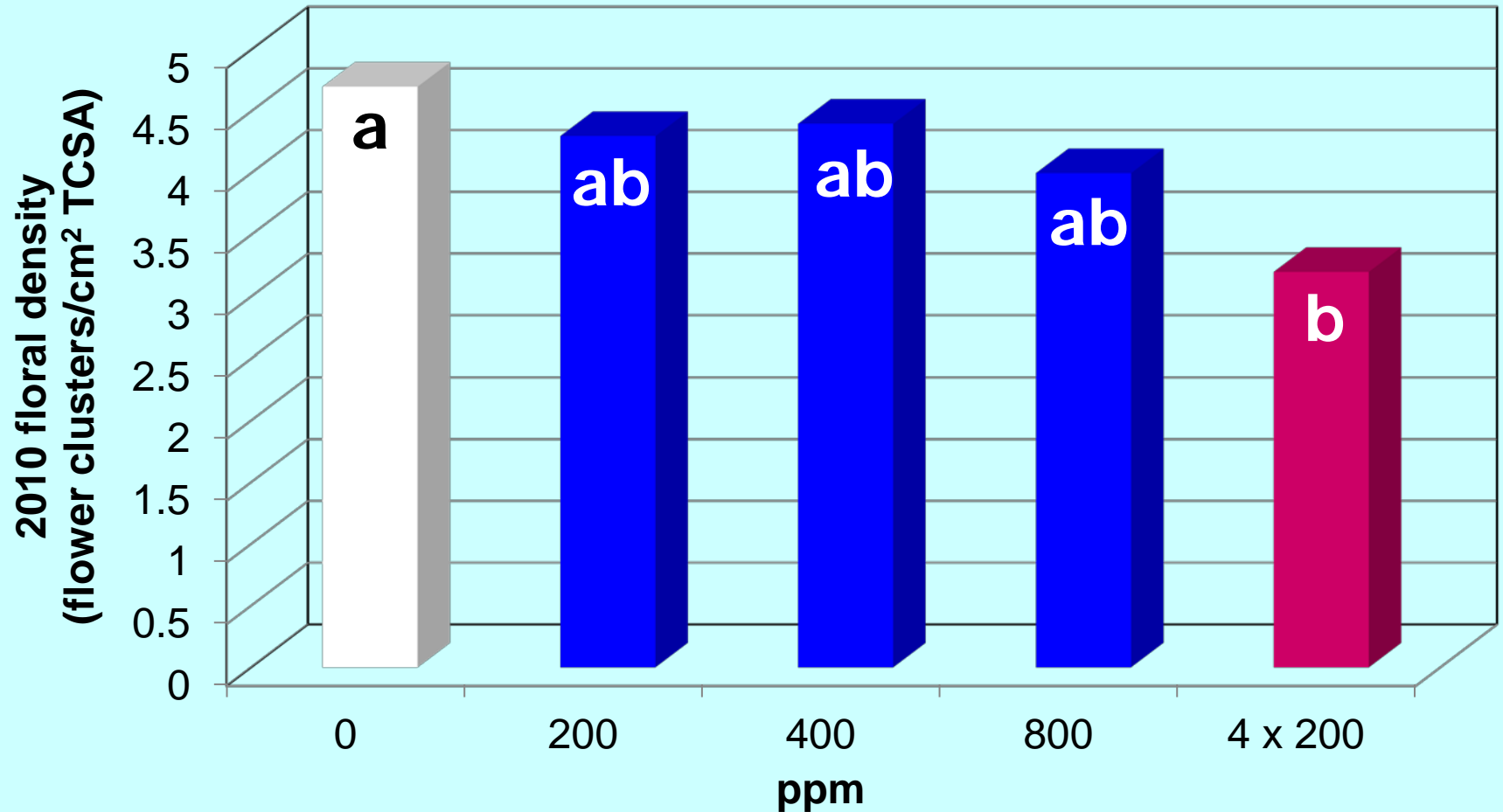


Figure 1: Plot of Apple growth over Time with our non-linear fit and loess fit



GA₃ effects on return bloom

Gala/M.26 – George, WA WTFRC 2009





Tractor mounted
mechanical thinner



Hand held mechanical thinner in cherries

Thanks!!

