

# *Development of Alternative Thinning Strategies*

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# *The Most Important Single Spray?*

- ❖ Crop load mgt. important for good:
  - fruit size
  - fruit quality
  - return bloom
- ❖ Concerns:
  - Consistency of response
  - Cost
  - Regulatory/ Market issues



# *New Thinners Needed*

- ❖ New MOA, timings for use in multiple thinner programs.
- ❖ Carbaryl concerns:
  - Possible FQPA actions,
  - IFP restrictions on UK exports.
- ❖ Organically acceptable options.



# *Fish Oil + Lime Sulfur (FOLS)*

- ❖ Liquid Lime Sulfur reduced fruit set when used as a pesticide in early era.
- ❖ Burns flowers / Reduced assimilation.
- ❖ Certain cultivars susceptible (Macs).
- ❖ Role of Fish Oil?
  - Surfactant/penetrant.
  - Also reduces assimilation.

# Materials:


## ❖ FOLS

- Crocker's Fish Oil (G.S. Long),
  - ◆ Dilute Rate: 2 gal./100.
- Liquid lime sulfur (Miller Chemical),
  - ◆ Dilute Rate: 2.5 gal./100.
- ❖ NC 99 calcium/magnesium brine
  - G. S. Long Co., Yakima, WA,
    - ◆ Dilute Rate: 4 gal./100.
- ❖ Ammonium Thiosulfate (ATS) 1 gal/100.



# *Hudson Valley Study, 2000*

- ❖ Mature Delicious / M. 7 trees.
- ❖ Transitional block.
- ❖ Applied air-blast @ 120 gal./ acre.
- ❖ Materials concentrated to dilute equiv.
- ❖ Timings: 80% bloom or  
20% + 80% bloom.
- ❖ Dates: 2 May, and 5 May, 2000.



# *Western N.Y. Study, 2000*

- ❖ Mature McIntosh, Cortland and Delicious trees on seedling rootstock.
- ❖ Certified Organic block.
- ❖ Single application at 80-100% bloom.
- ❖ Applied air-blast, 100 gal / acre.
- ❖ Materials not concentrated.
- ❖ Date: May 8, 2000.



# *Delicious, Hudson Valley, 2000*

Treatment	Set (%)	Yield / tree (kg)
Control	138 a	150 a
FOLS	67 bc	102 b
FOLS (2)	40 bc	121 ab
NC99	98 ab	125 ab
NC99 (2)	106 ab	141 ab





# *Delicious, Hudson Valley, 2000*

Treatment	Wt. (g)	Dia. (in.)
Control	157 b	2.77 b
FOLS	200 a	3.02 a
FOLS (2)	180 ab	2.89 ab
NC99	185 a	2.94 a
NC99 (2)	183 a	2.94 a




## *Delicious, W. N.Y., 2000*

Treatment	Set (%)	Size (g)	Yield (kg)
Control	42 a	168 b	65 a
FOLS	26 b	186 a	59 a
NC 99	21 b	170 ab	68 a
ATS	46 a	176 ab	66 a



## 2000 Summary

- ❖ Both NC 99 and FOLS show promise as blossom thinners for apple.
- ❖ Double applications were slightly better than a single spray at 80% bloom.
- ❖ No russetting in 2000.



# *Gala Set & Yield, 2001*

<b>Treatment</b>	<b>Fruit Set (%)</b>	<b>Yield/ tree (lb)</b>
Control	79 a	111 a
NC 99 x 1	62 ab	109 a
NC 99 x 2	47 bc	75 ab
FOLS x 1	52 b	75 ab
FOLS x 2	57 ab	69 ab
FOLS PF + FC	25 c	47 b
Wilthin	76 a	101 a



# *Gala Fruit Size , 2001*

<b>Treatment</b>	<b>Fruit dia. (in)</b>	<b>Fruit wt. (g)</b>
Control	2.4 b	116 b
NC 99 x 1	2.5 b	126 b
NC 99 x 2	2.8 a	150 a
FOLS x 1	2.5 b	124 b
FOLS x 2	2.8 a	151 a
FOLS PF + FG	2.8 a	167 a
Wilthin	2.4 b	117 b



# *Gala Phytotoxicity, 2001*

<b>Treatment</b>	<b>Leaf Burn</b>	<b>Russet</b>
Control	0 d	1 b
NC 99 x 1	2 b	1 b
NC 99 x 2	3 a	1 b
FOLS x 1	1 c	1 b
FOLS x 2	3 a	2 a
FOLS PF + FC	1 c	1 b
Wilthin	0 d	1 b

# *Post-bloom FOLS*

## *Timing, 2002*

- ⇒ 12-year-old Empire and McIntosh/M.26 trees.
- ⇒ RCBD with 4 reps in Empire and 5 reps in McIntosh.
- ⇒ Tank mixed and applied with a high pressure hand gun sprayer.



# Treatments



- Control
- 1 week after petal fall (WAPF)
- 2 WAPF
- 3 WAPF
- 1 and 2 WAPF
- 2 and 3 WAPF

Sprays were applied on May 6, 16, and 22.

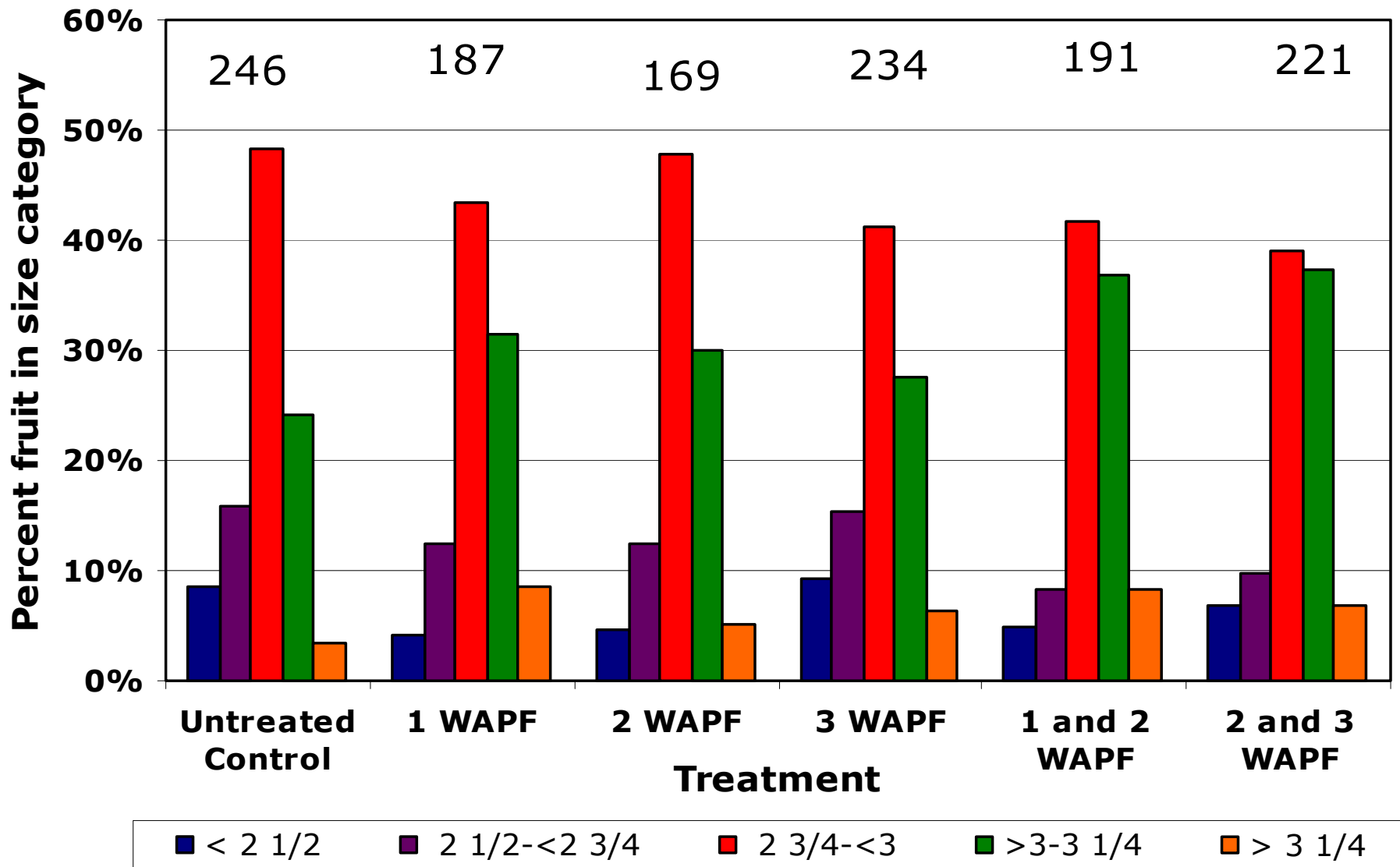




# *FOLS Timing: McIntosh, 2002*

Treatment	Set (%)	Fruit wt (g)	3 in. & up (%)
Control	120 a	164	27
5 DAPF	89 b	180	40
15 DAPF	74 bc	173	35
21 DAPF	83 bc	172	34
5 + 15	69 bc	180	45
15 + 21	55 c	181	44

# McIntosh Fruit Size Distribution



# Fruit Russet

## Fruit Russet (1-5 scale)

Treatment	Empire	McIntosh
Control	1.3 c	1.9 b
1 WAPF	2.2 a	2.2 ab
2 WAPF	1.4 bc	2.3 a
3 WAPF	1.4 c	2.2 ab
1 and 2 WAPF	1.9 ab	2.4 a
2 and 3 WAPF	1.5 bc	2.3 a



No differences in L:D ratio or seed number



# ***Return Bloom 2003***

## Blossoms/LCSA

Treatment	Empire	McIntosh
Untreated control	10.9	8.4
1 WAPF	16.9	8.5
2 WAPF	10.8	6.9
3 WAPF	15.0	8.0
1 + 2 WAPF	10.7	9.2
2 + 3 WAPF	16.6	7.9



# *McIntosh Summary*

- ⇒ FOLS reduced fruit set in all treatments.
- ⇒ Double applications and early thinning of FOLS resulted in the largest fruit.
- ⇒ FOLS slightly increased fruit russet.



# *Post Bloom Timing Conclusions*

- ⇒ Post-bloom FOLS applications were effective, especially on McIntosh.
- ⇒ Later timing more effective, but may not result in larger fruit.
- ⇒ Growers will have to accept noticeable amounts of leaf burn.
- ⇒ More studies are needed before FOLS is recommended.



# *Liberty Thinning, 2002*

Treatment	Rate	Dates applied
Control	--	--
FOLS	2% + 2.5 %	22, 28 May
Kerry seaweed extract	22 fl. oz./ 100	16, 22, 28 May & 2 June
6BA (Valent)	150 ppm	16, 22 May



# *Liberty Thinning, Fruit Size, 2002*

Treatment	Juice	Bags	120 ct	100 ct	80 ct
Control	28 a	34 a	35 c	3 c	0.4 b
FOLS	5 b	16 b	61 a	17 b	0.6 b
Kerry	32 a	39 a	25 d	3 c	0.3 b
6BA	6 b	12 b	47 b	31 a	4 a





# *FOLS Negatives*

- ❖ Smelly, corrosive, hard to wash off.
- ❖ Limited availability of FO.
- ❖ Potentially phytotoxic.
- ❖ Not Cheap: \$US 45-\$90 / Acre.
- ❖ Not fully researched.



# *LS Concentration & LS:FO Ratio*

Lime Sulfur (%)	Fish Oil (%)
0.0	0
1.5	0
2.5	0
0.0	1
0.0	2
1.5	1
1.5	2
2.5	1
2.5	2

# *LS Concentration & LS:FO Ratio*

Treatment	Crop Load	Fruit wt.	Leaf burn
Control	9.4 ab	98 b	0.2 c
LS 1.5	9.8 ab	122 a	0.7 b
LS 2.5	10.1 a	109 ab	0.4 bc
FO 1.0	8.3 abc	113 ab	0.7 b
FO 2.0	6.1 cd	126 a	0.4 bc
1.5: 1.0	6.4 cd	128 a	0.6 bc
1.5 : 2.0	7.6 bc	113 ab	0.5 bc
2.5 : 1.0	6.5 cd	118 ab	0.8 b
2.5 : 2.0	8.1 abc	114 ab	0.4 bc
NC99 4%	5.4 d	130 a	2.4 a



# *FOLS Summary*

- ❖ Effective, consistent thinner.
- ❖ Broad application window.
  - Effective blossom thinner,
  - Excellent post-bloom activity.
- ❖ FOLS shows promise as a replacement for carbaryl & as an organic thinner.
- ❖ More research underway.



# *FOLS Research Needs*

- ❖ Alternatives to Crocker's fish oil.
- ❖ Effect of timing on efficacy and on fruit size.
- ❖ Effect of spray volume and concentration on efficacy, \$/acre, and crop safety.
- ❖ Confirm MOA.
- ❖ Pest Mgt. implications need study (scab, beneficials).



# *Co-investigators & Cooperators*

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