Controlling a Large Crop Pruning, Nutrition, Irrigation and Chemical Thinning

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California Table Olive Production

Year	Production
1995	66,000 tons
1996	150,000 tons
1997	92,000 tons
1998	77,000 tons
1999	102,500 tons
2000	53, 000 tons (est.)

Alternate Bearing in Olives

- Olives bear on previous season's growth
- Fruit receive resources at the expense of shoot growth
- Large crops, small size, limited value
- Limited shoot growth = limited return bloom and crop


Bearing Habit
fruit born on last years shoots

Factors Which Effect Fruit Size Or Shoot Growth

- Crop Load
- Nutrition
  - Nitrogen
  - Potassium
  - Boron
- Irrigation

Nitrogen Deficiency (<1.4%) Effects:

- Shoot growth
- Flower development
- Fruit set
- Fruit size

Foliar Nitrogen Study

- Single sprays low biuret urea, .4 lbs/tree
- 5 timing, April to November
- Manzanillo (Tulare), Sevillano (Glenn) and Mission (Butte)
- Nitrogen sufficient trees

Results

- N leaf levels raised within 3 days
- Persisted 1 month for sprays up to July and until after harvest for later sprays
- No effect on:
  - fruit size, shoot growth, yield etc.

Conclusions

- Foliar N sprays raise N levels quickly
- No benefit to N sufficient trees
- Suggest that N is not a limiting factor with alternate bearing.

Potassium Deficiency

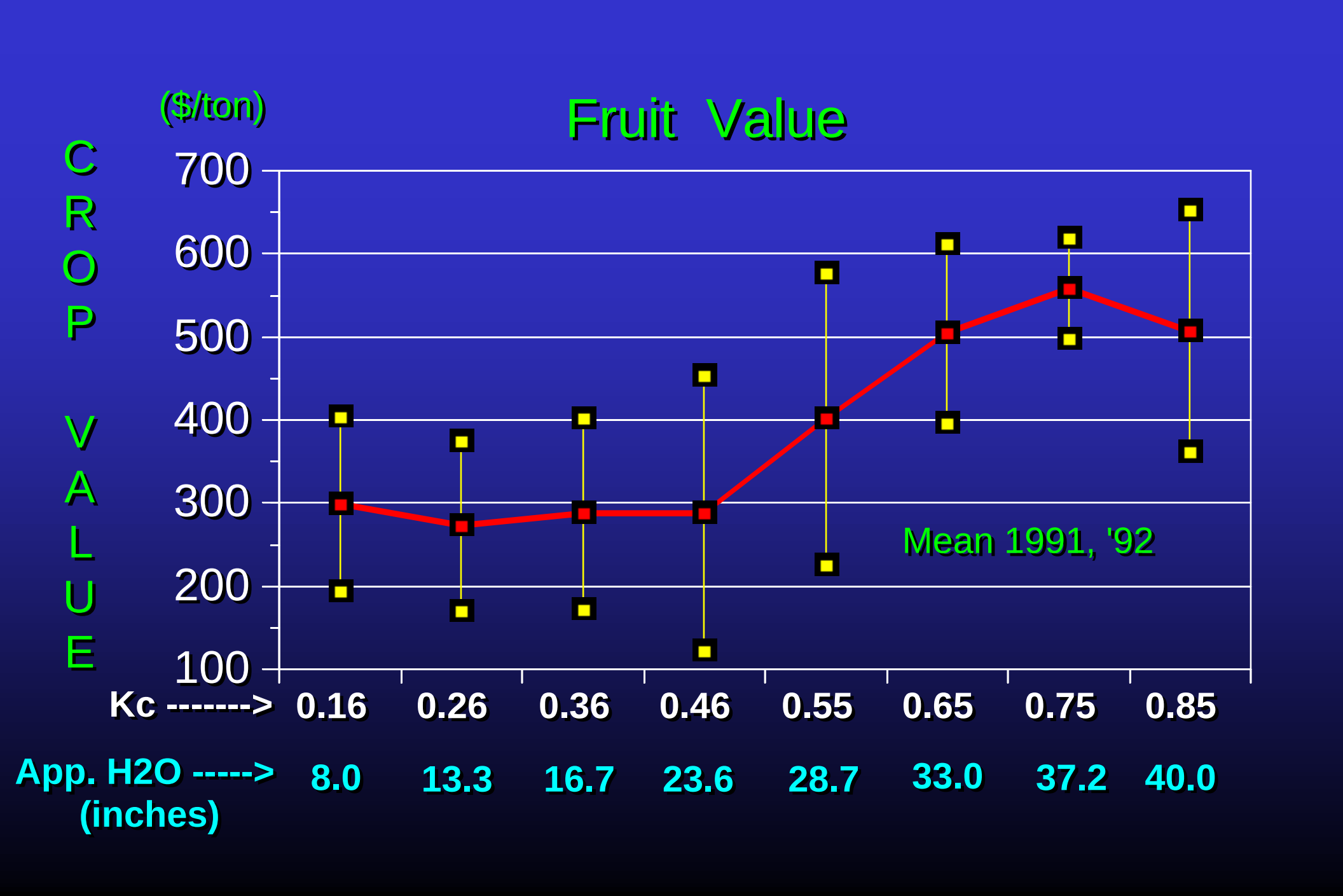
- Reduces:
  - Shoot growth
  - Bloom
  - fruit size
  - yield
- Adequate levels greater than .7 ppm

Boron Deficiency

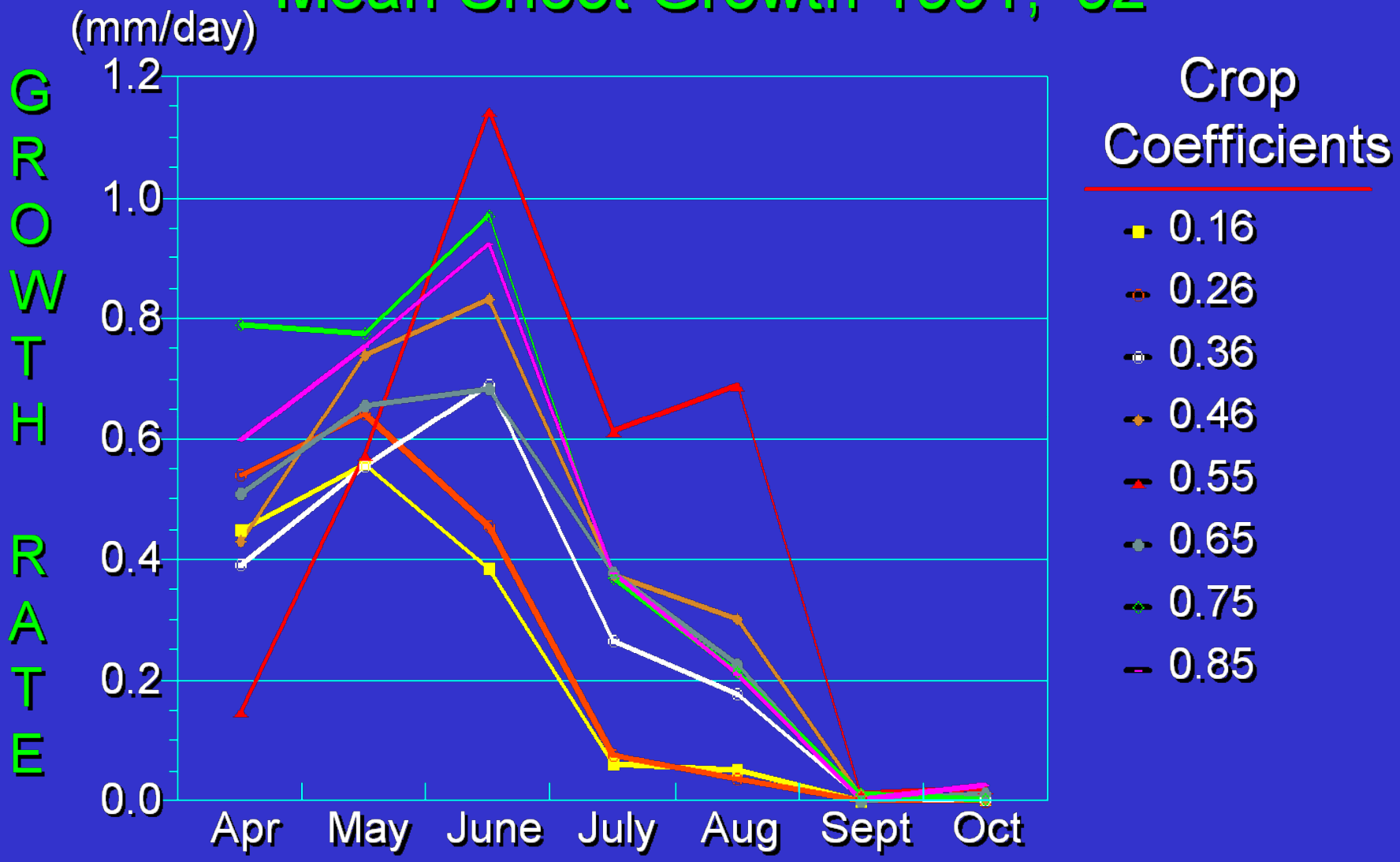
- Reduces fruit set
  - fruit drop 14-15 ppm
  - no bloom 7-13 ppm
- Adequate > 15 ppm

Irrigation

- Fruit set is difficult to effect
- Fruit size
- Shoot growth


Fruit Value
($/ton)
CROP VALUE
700
600
500
400
300
200
100
Mean 1991, '92
Kc ------->
0.16
0.26
0.36
0.46
0.55
0.65
0.75
0.85
App. H2O ----->
(inches)
8.0
13.3
16.7
23.6
28.7
33.0
37.2
40.0

Mean Shoot Growth 1991, '92




Pruning for Crop Control

Pruning

After bloom or crop set can be judged

According to bloom or crop load

Detailed pruning

Chemical Thinning of Olives With NAA

Fruit Size Method – 1/8 to 3/16 inch

Objectives

- Establish active ingredient necessary thinning
- Determine if spray oil or adjuvant increase efficacy.
- Test sequential sprays
- Test Sevillano
- Investigate post application temperature effects

1985 Manzanillo Thinning Summary
Dilute vs. Concentrate

Treatment	Tons/Ac	$/Ton	$/A - harvest	Return bloom
150 ppm - Dilute (144 oz)	5.13	522 A	1638	3.9 A
450 ppm - Conc.(108 oz)	5.93	509 A	1828	3.8 AB
300 ppm - Conc.(72 oz)	6.04	472 B	1638	2.6 BC
150 ppm - Conc.(36 oz)	4.35	442 C	1291	1.9 C
Control	6.66	423 C	1516	1.9 C

* Dilute = 400 GPA, Concentrate = 100 GPA

Olive Thinning Results 1985
Dilute vs. Concentrate

Treatments of 108 oz/ac applied as a concentrate spray resulted in equal value per ton and return bloom as 144oz applied as a dilute spray. All other treatments resulted in lower value per ton and return bloom.

Treatments

- 150ppm (36 oz.), 300 ppm (72oz.), 450 ppm (144oz.), 600 ppm (144oz.) in 100gpa vs 150 ppm in 400gpa (144oz./ac).
- 300 ppm in 100 gallons; alone, with 1% oil, and with 0.25% CS7.
- Two sprays 3 to 5 days apart with approximately 50 +50, 75 +25, and 75 +75% of recommended rate (108 oz/ac).

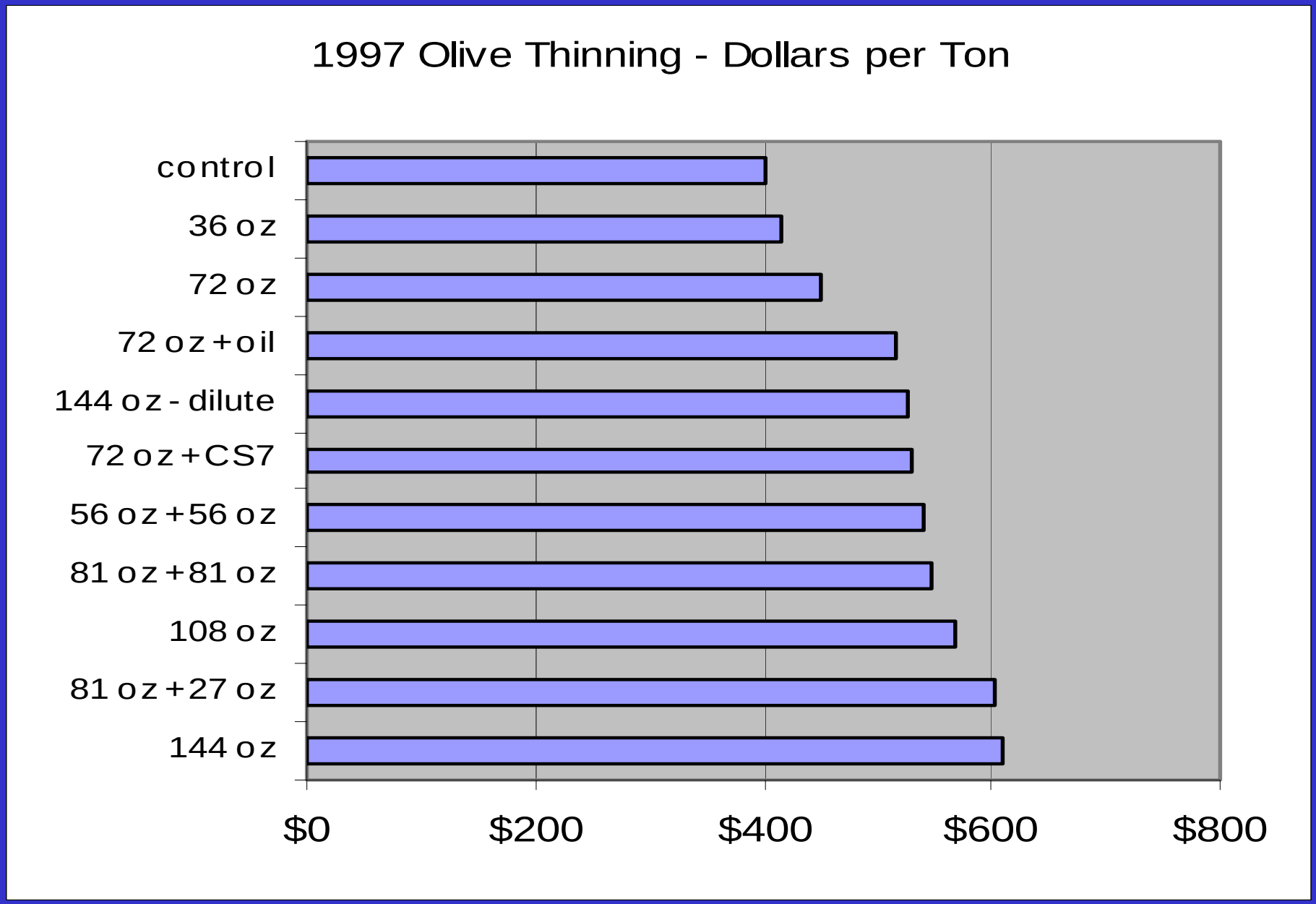
1997 Manzanillo Thinning Summary

Treatments (ppm &/or oz/A)	Fruit Set (per 10 nodes)	Tons/Ac	$/Ton	$/Ac-harvest
600 ppm (144 oz)	6.5	3.4	609 A	1342
81 + 27 = 108 oz	7.7	3.4	601 A	1243
450 ppm (108 oz)	6.9	3.9	569 AB	1344
81 + 81 = 162 oz	5.3	3.9	546 AB	1240
54 + 54 = 108 oz	5.7	4.2	541 AB	1337
300 ppm + 0.25% CS7 (144 oz)	8.0	3.8	530 ABC	1205
150 ppm - dilute (144 oz)	8.9	3.8	526 ABC	1136
300 ppm + 1% oil (72 oz)	6.2	3.5	518 ABCD	1032
300 ppm (72 oz)	7.8	4.2	449 BCD	1181
150 ppm (36 oz)	8.4	3.9	416 CD	738
control	8.8	4.5	402 D	740

*Full Bloom 5-8. 1st spray 5-21, 2nd spray 5-27.

1997 Results

Treatments of 108 oz/ac or greater and 72 oz/ac with oil or with CS7 did not differ statistically in value per ton from the highest value fruit.

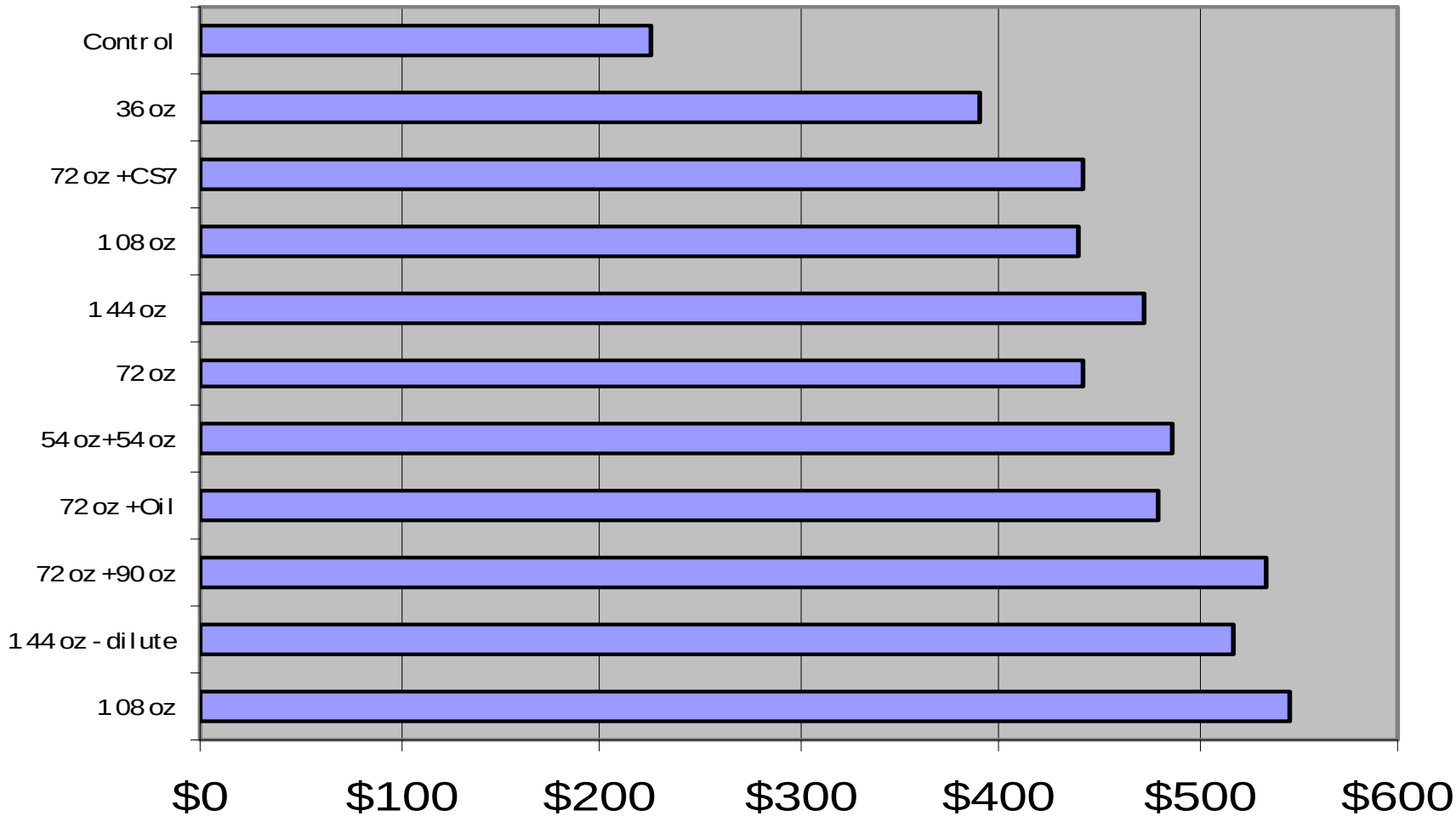

1997 Olive Thinning - Dollars per Ton
control
36 oz
72 oz
72 oz + oil
144 oz - dilute
72 oz + CS7
56 oz + 56 oz
81 oz + 81 oz
108 oz
81 oz + 27 oz
144 oz
$0
$200
$400
$600
$800

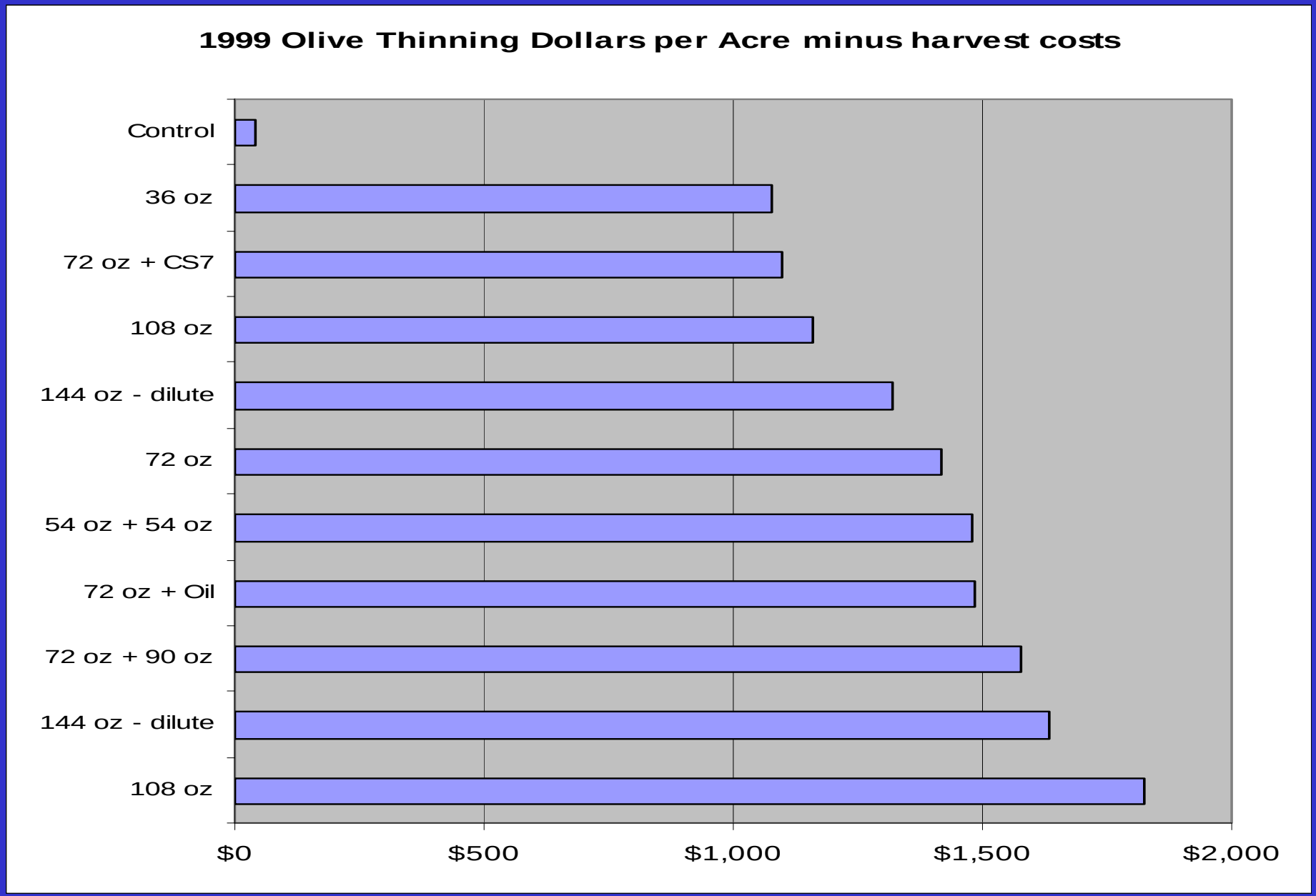
1999 Manzanillo Thinning Summary

NAA 200 Treatments (ppm & / or Oz/A)	Fruit set (per 10 Nodes)	Tons/A	$/Ton	$/A minus harvest costs
72 + 36 = 108 oz	5.1 AB	5.8 B	547 A	1823 A
150 ppm - dilute (144 oz)	5.3 AB	5.5 B	518 AB	1633 AB
72 + 90 = 162 oz	5.0 AB	5.1 B	534 AB	1578 ABC
300 ppm + 1% Oil (72 oz)	6.3 AB	5.9 B	480 BC	1484 ABCD
54 + 54 = 108 oz	3.7 A	5.8 B	487 ABC	1477 ABCD
300 ppm (72 oz)	6.1 AB	6.6 AB	443 CD	1420 ABCD
600 ppm (144 oz)	6.8 B	5.4 B	472 BC	1320 BCD
450 ppm (108 oz)	7.1 B	5.6 B	440 CD	1159 CD
300 ppm + 0.25% CS7 (72 oz)	6.2 AB	5.6 B	443 CD	1098 D
150 ppm (36 oz)	7.5 B	6.2 B	390 D	1075 D
Control	14.1 C	8.1 A	227 E	43 E

* Full bloom 5-21. Sprayed 6-7 @ 1/8" diameter, 2nd spray 6-10 @ 3/16" diameter.

1999 Olive Thinning - Dollars per Ton




1999 Olive Thinning Dollars per Acre minus harvest costs
Control
36 oz
72 oz + CS7
108 oz
144 oz - dilute
72 oz
54 oz + 54 oz
72 oz + Oil
72 oz + 90 oz
144 oz - dilute
108 oz
$0
$500
$1,000
$1,500
$2,000

1999 Results

- All treatments thinned fruit and improved value/ac minus harvest cost.
- 72oz or less with out oil or CS7 had lower value/ac minus harvest cost than all other treatments,
- Sequential sprays (3 days after the first) resulted in additional thinning

1998 Sevillano Thinning Trial

Treatment Timing (days after full bloom)	Set / 10 Nodes	
2	1.3	A
4	2.5	A
8	1.9	A
11	2.5	A
Control	3.1	B

1999 Sevillano Thinning Trial
Average Fruit and Shotberry Set per 10 Nodes

Treatment Timing (days after full bloom)	Fruit	Shotberries	Total Set
6	1.3	4.5	5.9
13	2.5	3.1	5.6
16	1.9	1.5	3.4
20	2.5	1.3	3.8
Control	3.1	1.2	4.3

Thinning Response Correlated To:

- Post bloom temperatures (3-4 days)
- Timing- DAFB
- Allow prediction of response within 3-4 days of application

Conclusions

- Greater than 72 oz. Of conc. 200 is necessary for adequate thinning.
- Sequential sprays 3-5 days after the first can have an additive thinning effect.
- Additives are not necessary
- Sevillano responds to chemical thinning
- Response related to post treatment temperature and timing