Cost Effective Zinc Nutrition

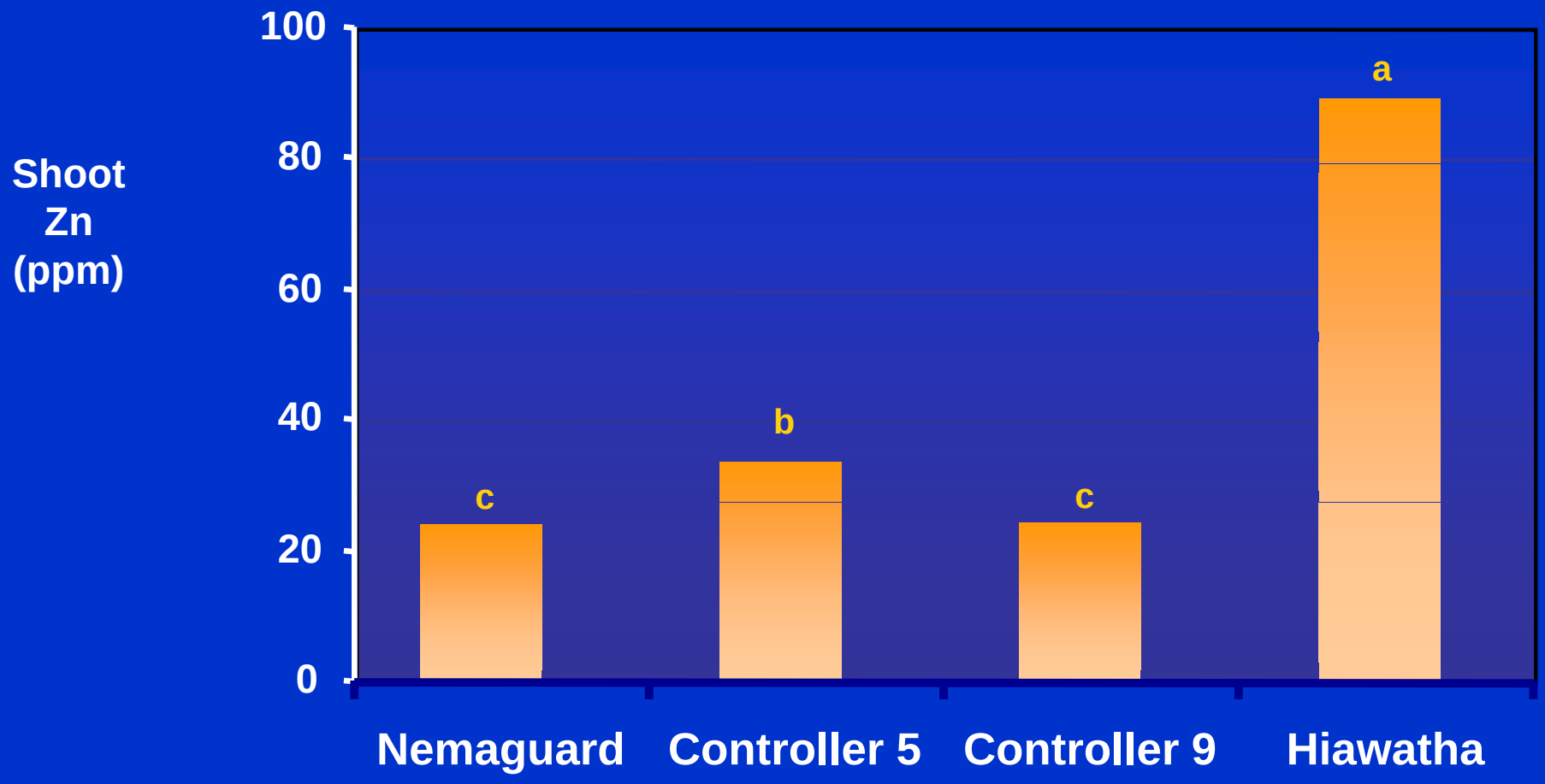
Scott Johnson – UC Pomology Specialist
Kearney Ag Center

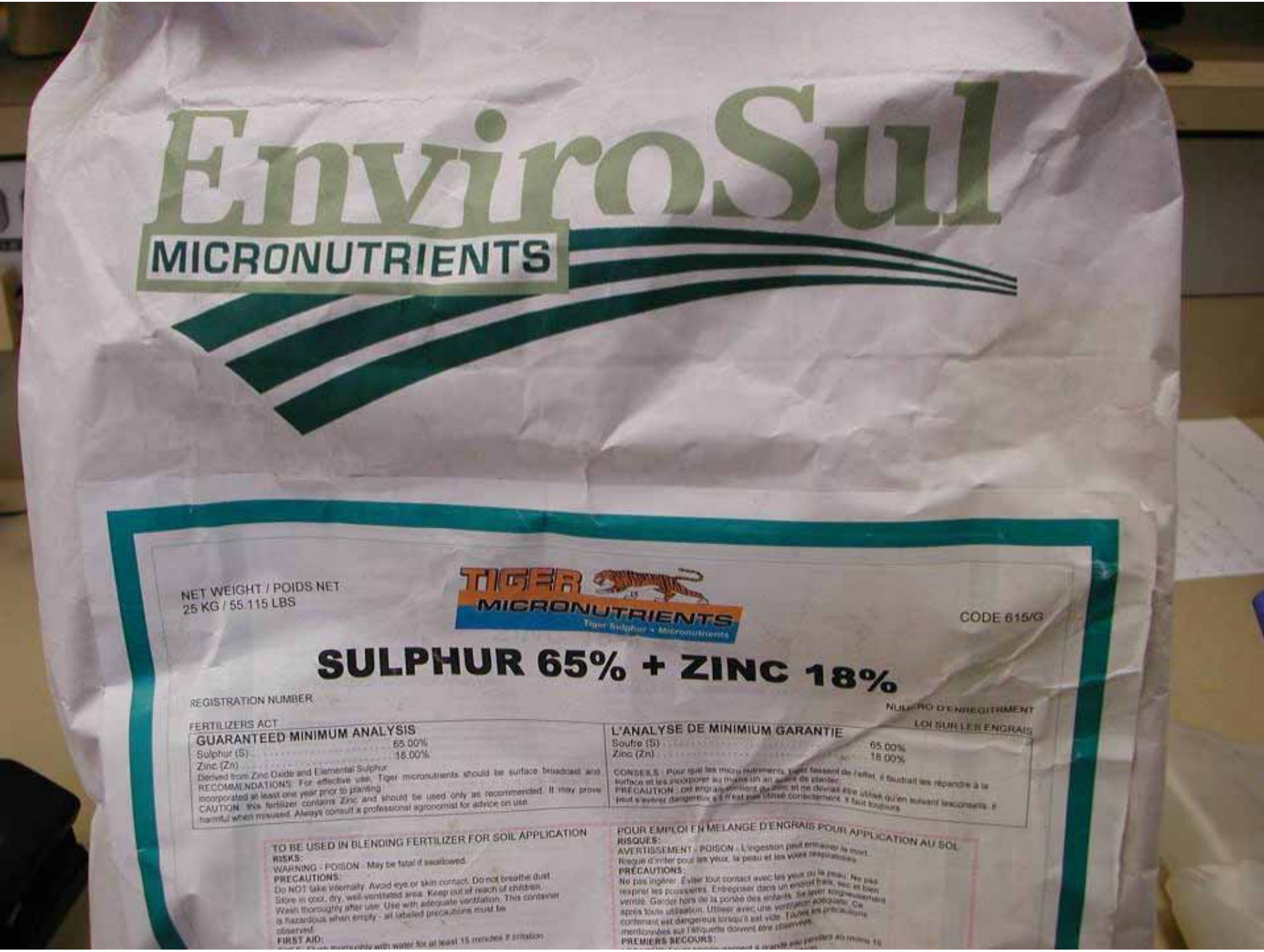
Hiawatha

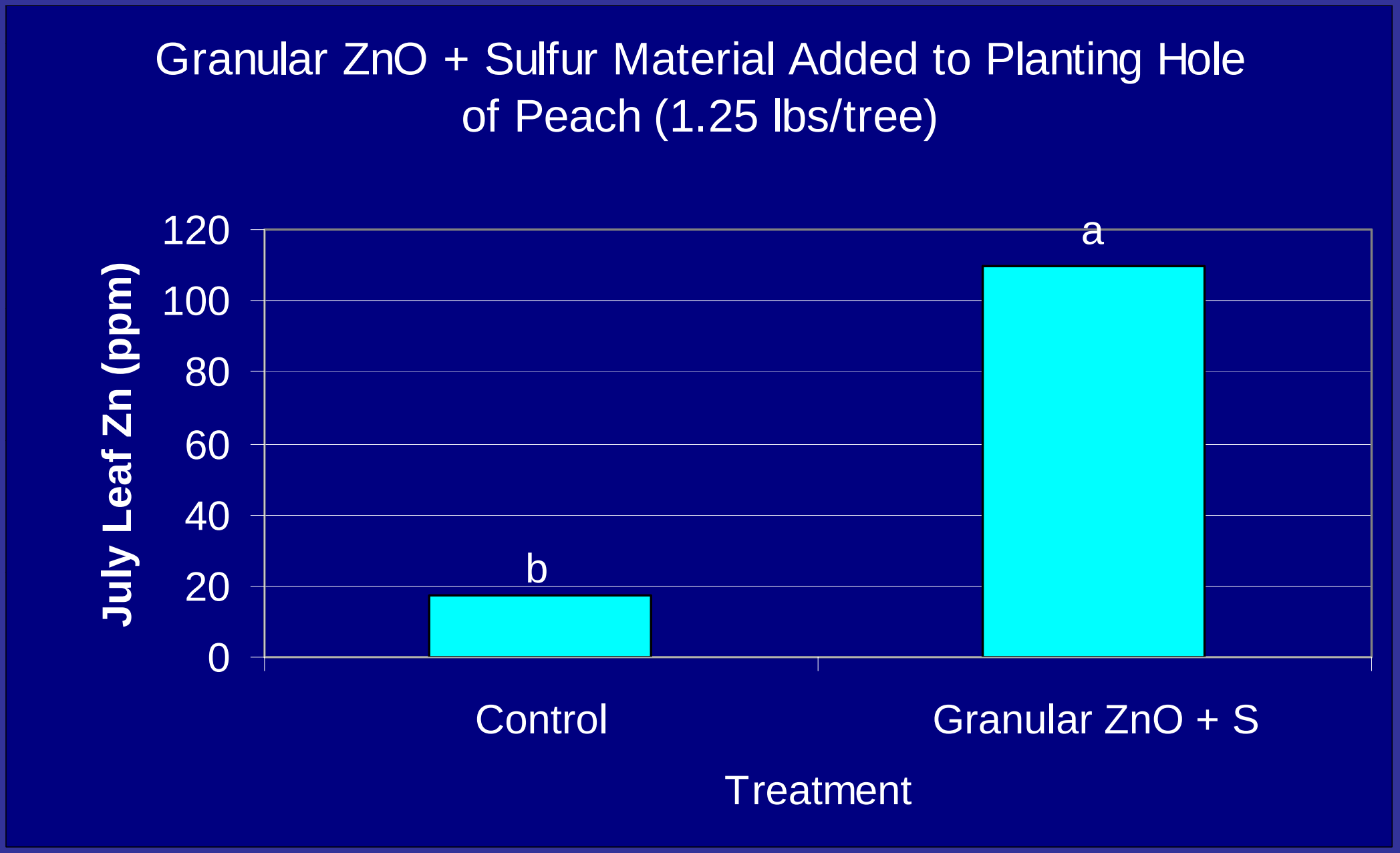
Nemaguard

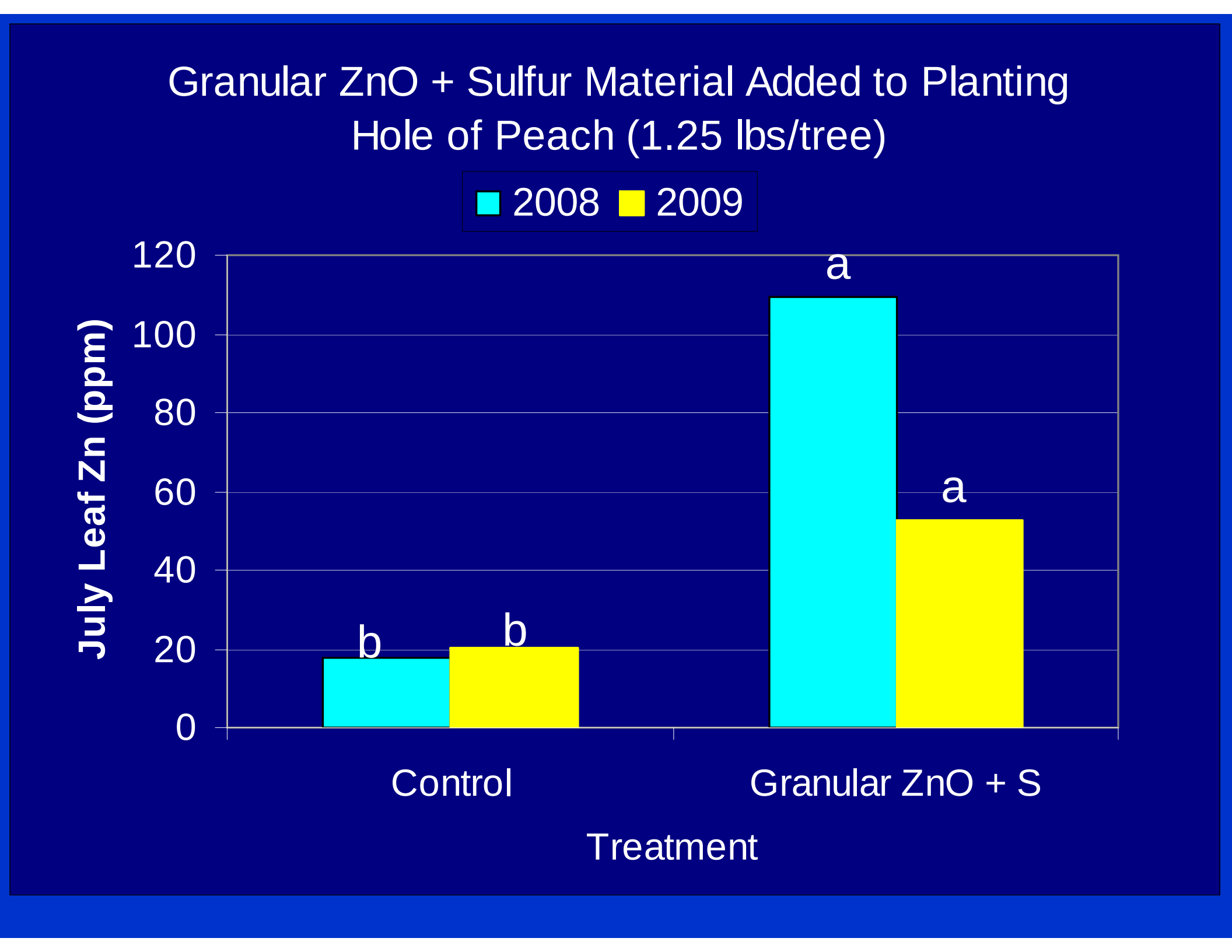
Peach Rootstocks and Zn Uptake

December 2006 Shoot Zn



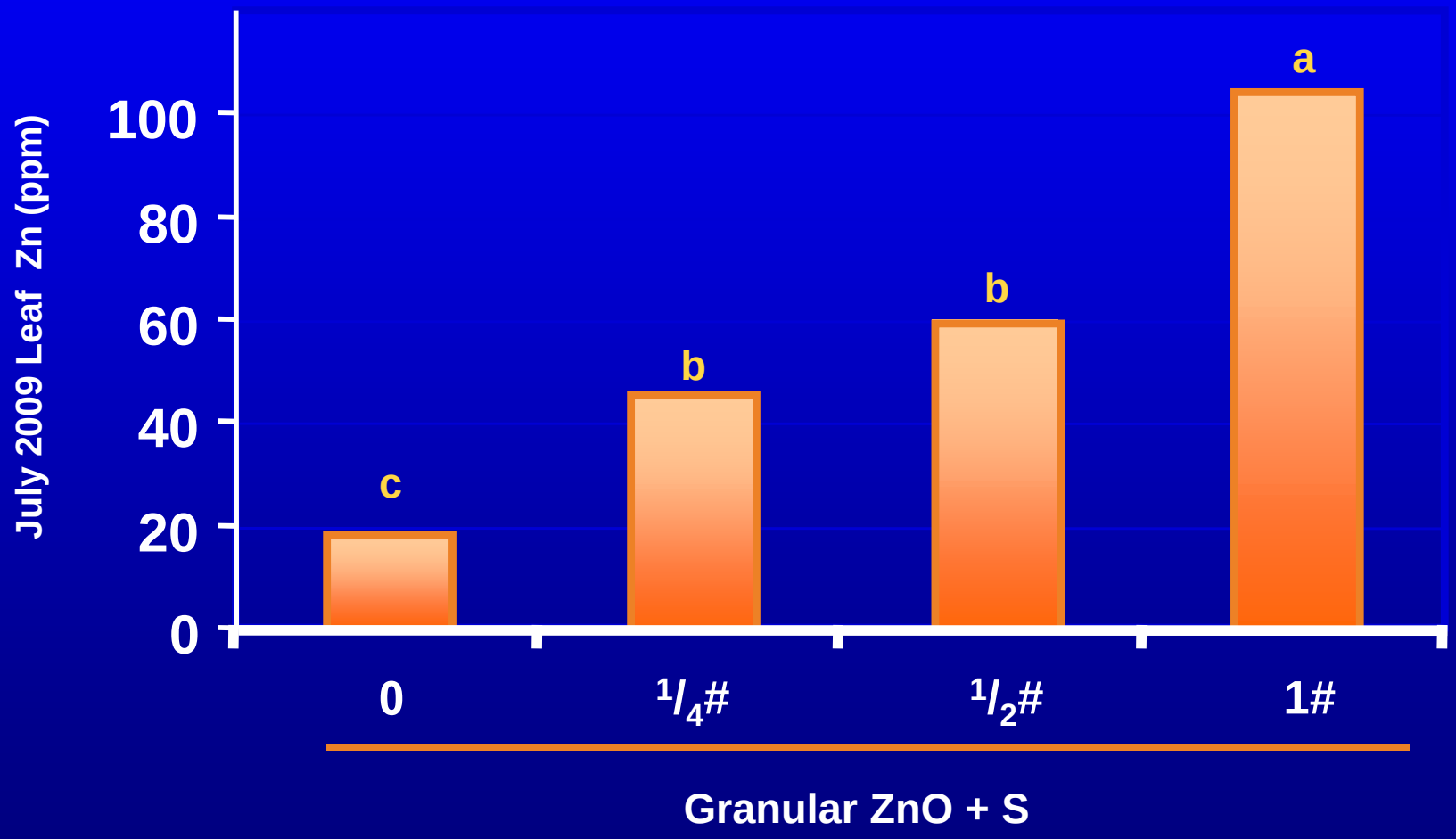

EnviroSul
MICRONUTRIENTS
NET WEIGHT / POIDS NET
25 KG / 55.115 LBS
TIGER
MICRONUTRIENTS
Tiger Sulphur + Micronutrients
CODE 615/G
SULPHUR 65% + ZINC 18%
REGISTRATION NUMBER
NUMERO D'ENREGITRMENT
FERTILIZERS ACT
LOI SUR LES ENGRAIS
GUARANTEED MINIMUM ANALYSIS
Sulphur (S) 65.00%
Zinc (Zn) 18.00%
Derived from Zinc Oxide and Elemental Sulphur.
RECOMMENDATIONS: For effective use, Tiger micronutrients should be surface broadcast and
incorporated at least one year prior to planting.
CAUTION: this fertilizer contains Zinc and should be used only as recommended. It may prove
harmful when misused. Always consult a professional agronomist for advice on use.
L'ANALYSE DE MINIMUM GARANTIE
Soufre (S) 65.00%
Zinc (Zn) 18.00%
CONSEILS : Pour que les micro nutriments Tiger fassent de l'effet, il faudrait les répandre à la
surface et les incorporer au moins un an avant de planter.
PRÉCAUTION : cet engrais contient du zinc et ne devrait être utilisé qu'en suivant les conseils. Il
peut s'avérer dangereux s'il n'est pas utilisé correctement. Il faut toujours
TO BE USED IN BLENDING FERTILIZER FOR SOIL APPLICATION
RISKS:
WARNING - POISON - May be fatal if swallowed.
PRECAUTIONS:
Do NOT take internally. Avoid eye or skin contact. Do not breathe dust.
Store in cool, dry, well-ventilated area. Keep out of reach of children.
Wash thoroughly after use. Use with adequate ventilation. This container
is hazardous when empty - all labeled precautions must be
observed.
FIRST AID:
POUR EMPLOI EN MELANGE D'ENGRAIS POUR APPLICATION AU SOL
RISQUES:
AVERTISSEMENT - POISON - L'ingestion peut entraîner la mort.
Risque d'irriter pour les yeux, la peau et les voies respiratoires.
PRÉCAUTIONS:
Ne pas ingérer. Éviter tout contact avec les yeux ou la peau. Ne pas
respirer les poussières. Entreposer dans un endroit frais, sec et bien
ventilé. Garder hors de la portée des enfants. Se laver soigneusement
après toute utilisation. Utiliser avec une ventilation adéquate. Ce
contenant est dangereux lorsqu'il est vide. Toutes les précautions
mentionnées sur l'étiquette doivent être observées.
PREMIERS SECOURS:


Granular ZnO + Sulfur Material Added to Planting Hole of Peach (1.25 lbs/tree)
July Leaf Zn (ppm)
120
100
80
60
40
20
0
b
a
Control
Granular ZnO + S
Treatment


Granular ZnO + Sulfur Material Added to Planting Hole of Peach (1.25 lbs/tree)
2008
2009
120
100
80
60
40
20
0
July Leaf Zn (ppm)
a
a
b
b
Control
Granular ZnO + S
Treatment

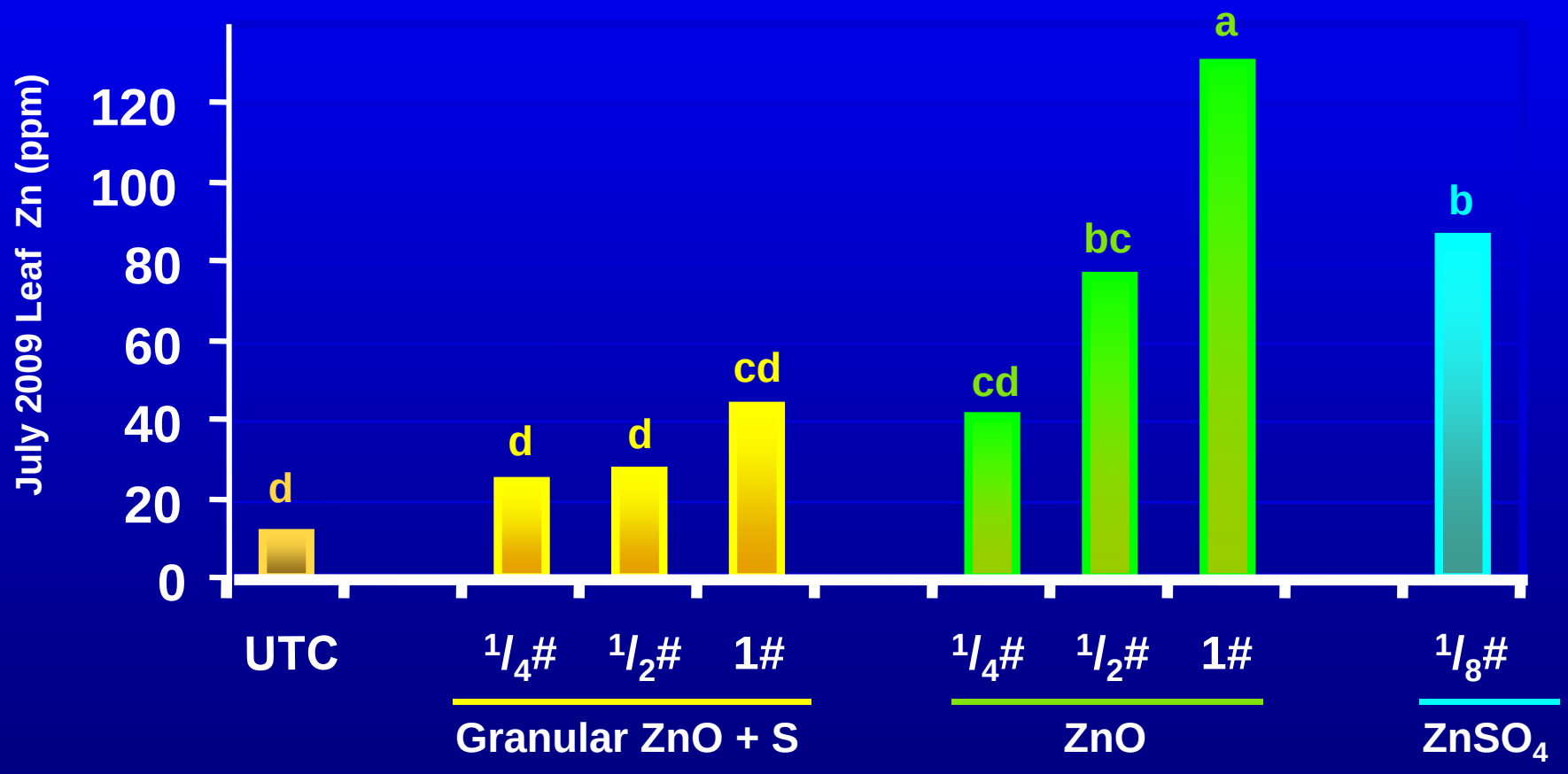
Granular ZnO + Sulfur Added to Planting Hole of Zee Fire Nectarine

January 2009



Zinc Materials Added to Planting Hole of Friar / Nemaguard Plums

February 2009



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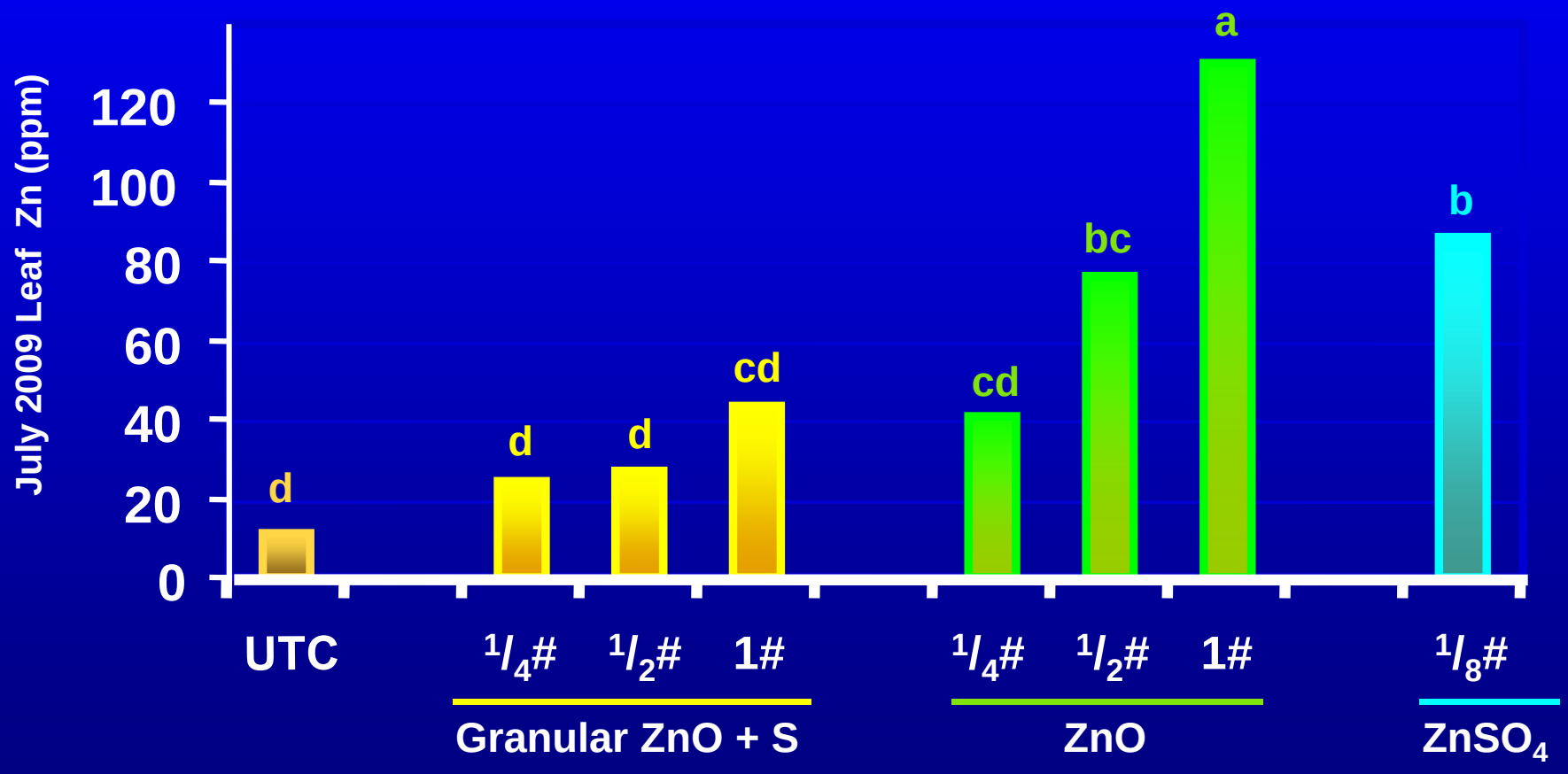


Zinc Materials

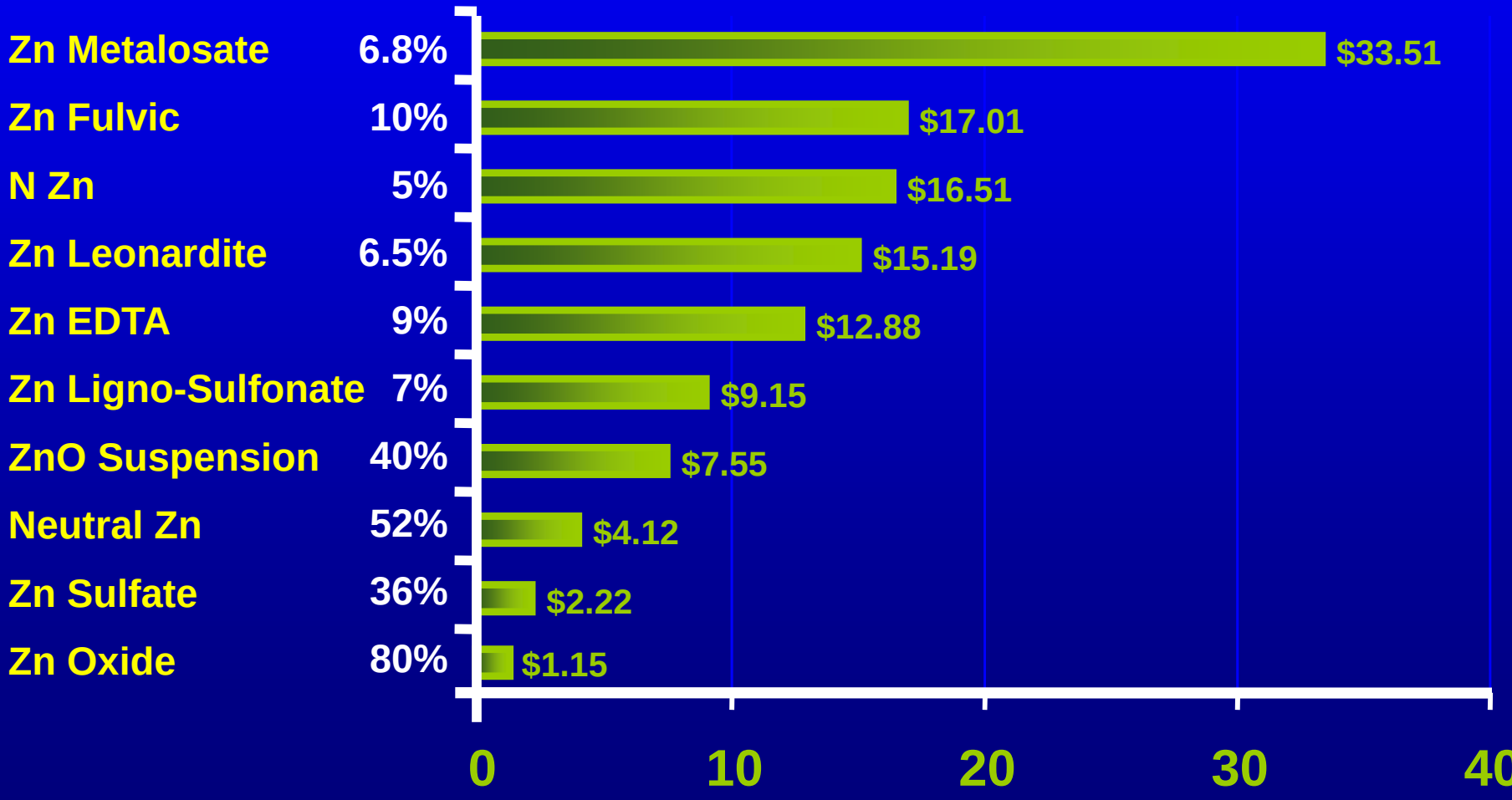
Basic Chemicals

- Zn sulfate
- Zn oxide
- Zn carbonate
- Zn chloride
- Zn oxysulfate
- Zn nitrate

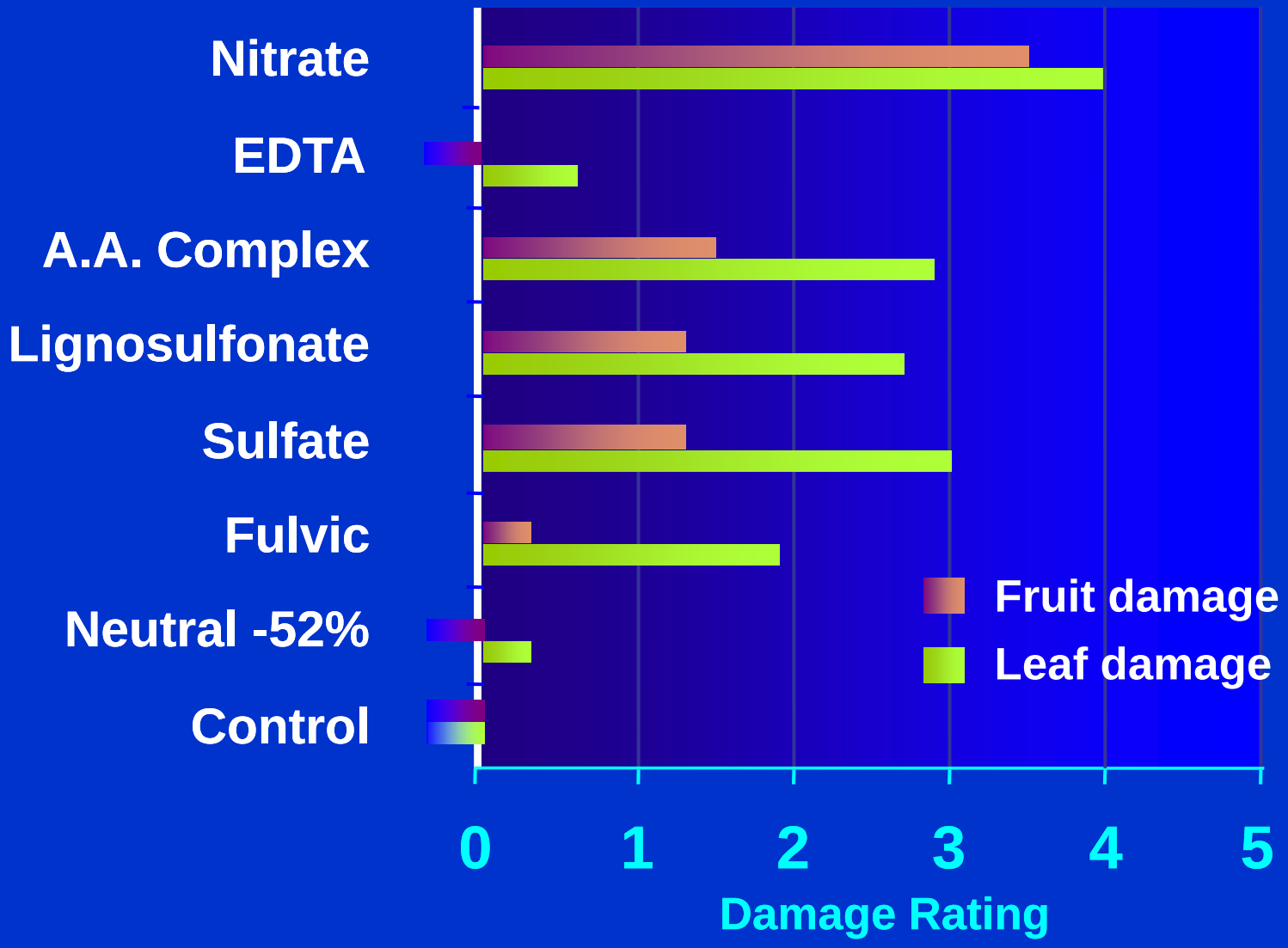
Chelates & Complexes

- EDTA
- Lignosulfonate
- Amino acid
- Sugar
- Citric acid
- Fulvic acid, humic acid

Cost of Zinc Materials - October 2007



Leaf & Fruit Damage on Peach, Plum and Apricot Trees Sprayed in April with Different Formulations of Zn at 1,000 ppm



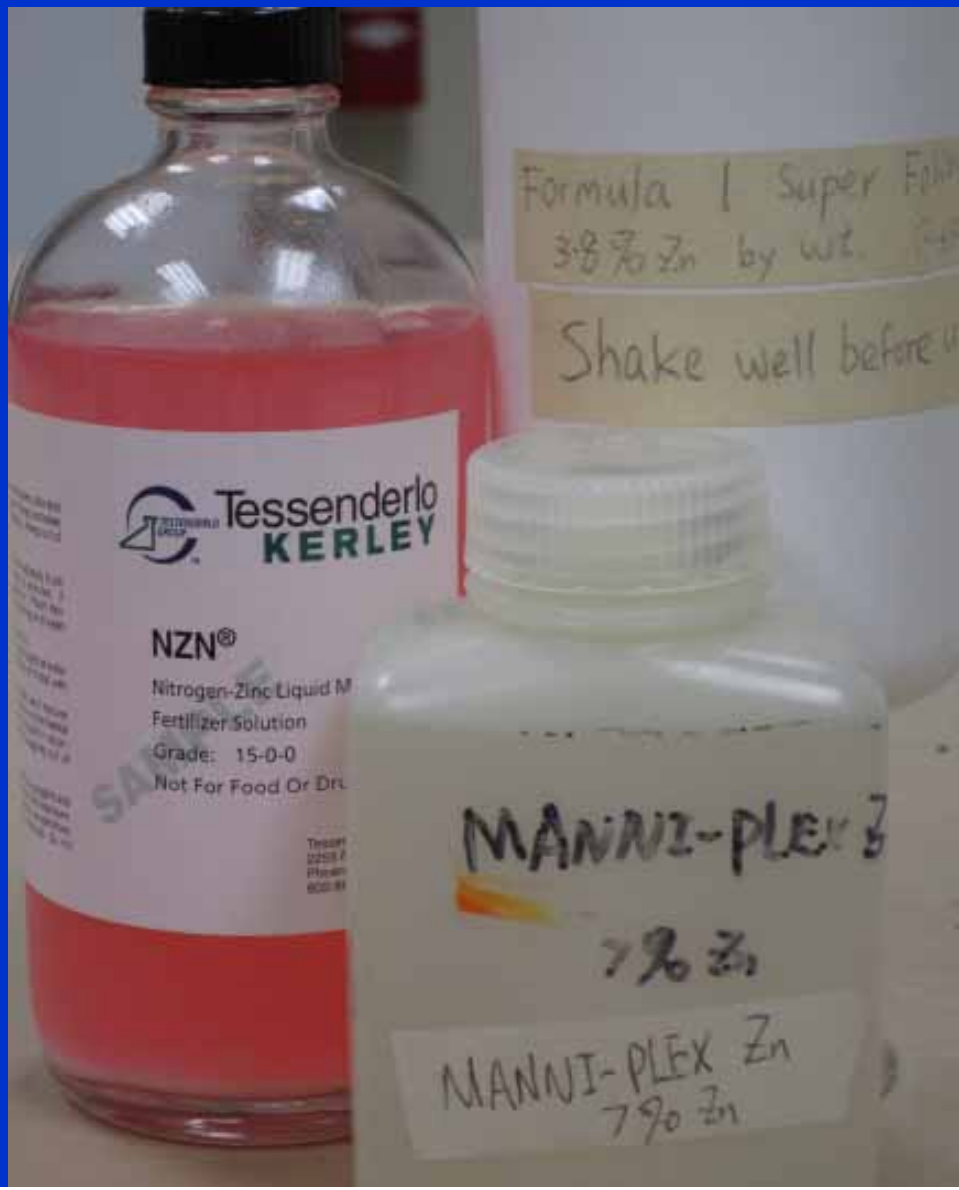
Comparing Zinc Formulations

Ranking	Formulation	Anion Size	Solubility (g/100 H_2O)	Phytotoxicity
Most Effective	Zinc Chloride	35	432	High (58*)
Almost As Good	Zinc Nitrate	62	324	High (54)
	Zinc Nitrate Mix	62 & 96	324	High (59)
Next Best	Zinc Sulfate	96	50	Moderate (12)
	Zinc Carbohydrate	96 & ?	High	Moderate
	Zinc Polyamine	96 & 75-204	High	Moderate
	Zinc Glycine	96 & 75		Moderate (15)
Less Effective	Zinc EDTA	292	High	Low
	Zinc Leonardite	1000+	High	Low
	Zinc Oxysulfate	16 & 96	1.3	None
Least Effective	Zinc Phosphite	79	?	Low (17)
	Zinc Oxide Suspension	16	Insoluble	None

Zinc Materials

Zinc Nitrate Mixes

- Not cheap
- Very soluble
- Very phytotoxic
- Not used much
- 4 to 7% zinc



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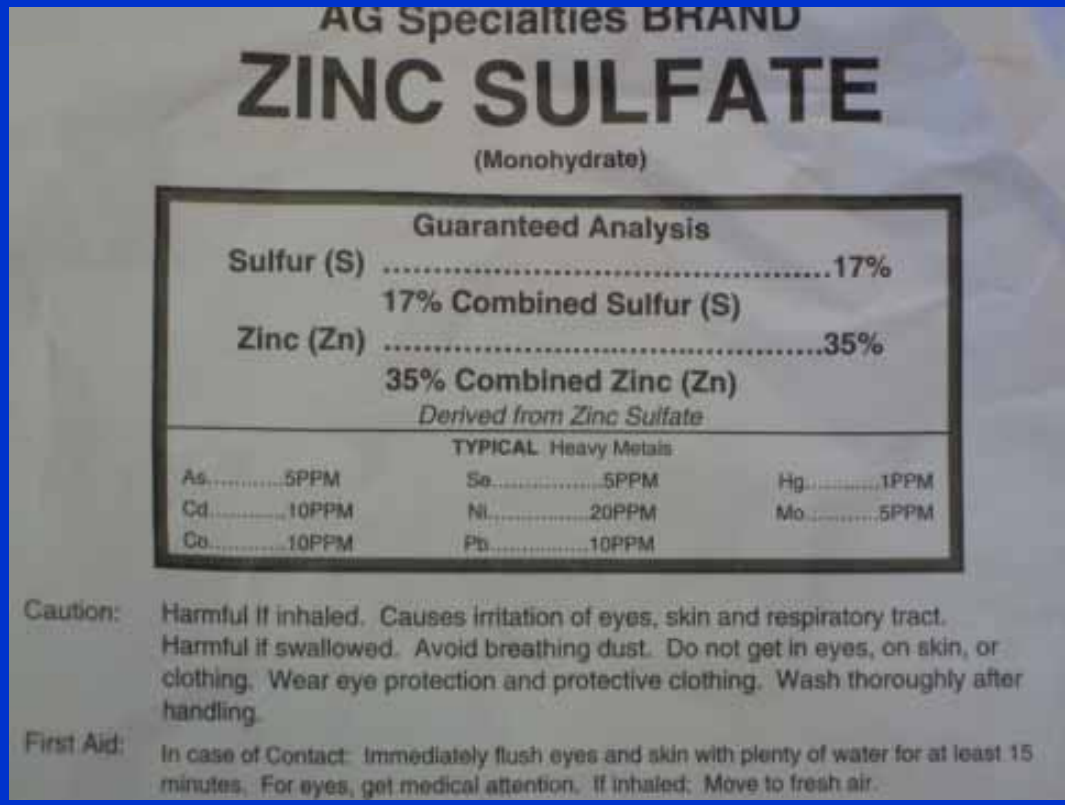
	Zinc Oxide Suspension	16	Insoluble	None

Zinc Materials

Zinc Sulfate

- Inexpensive
- Very soluble
- Widely used
- Considered to be effective
- Can be phytotoxic

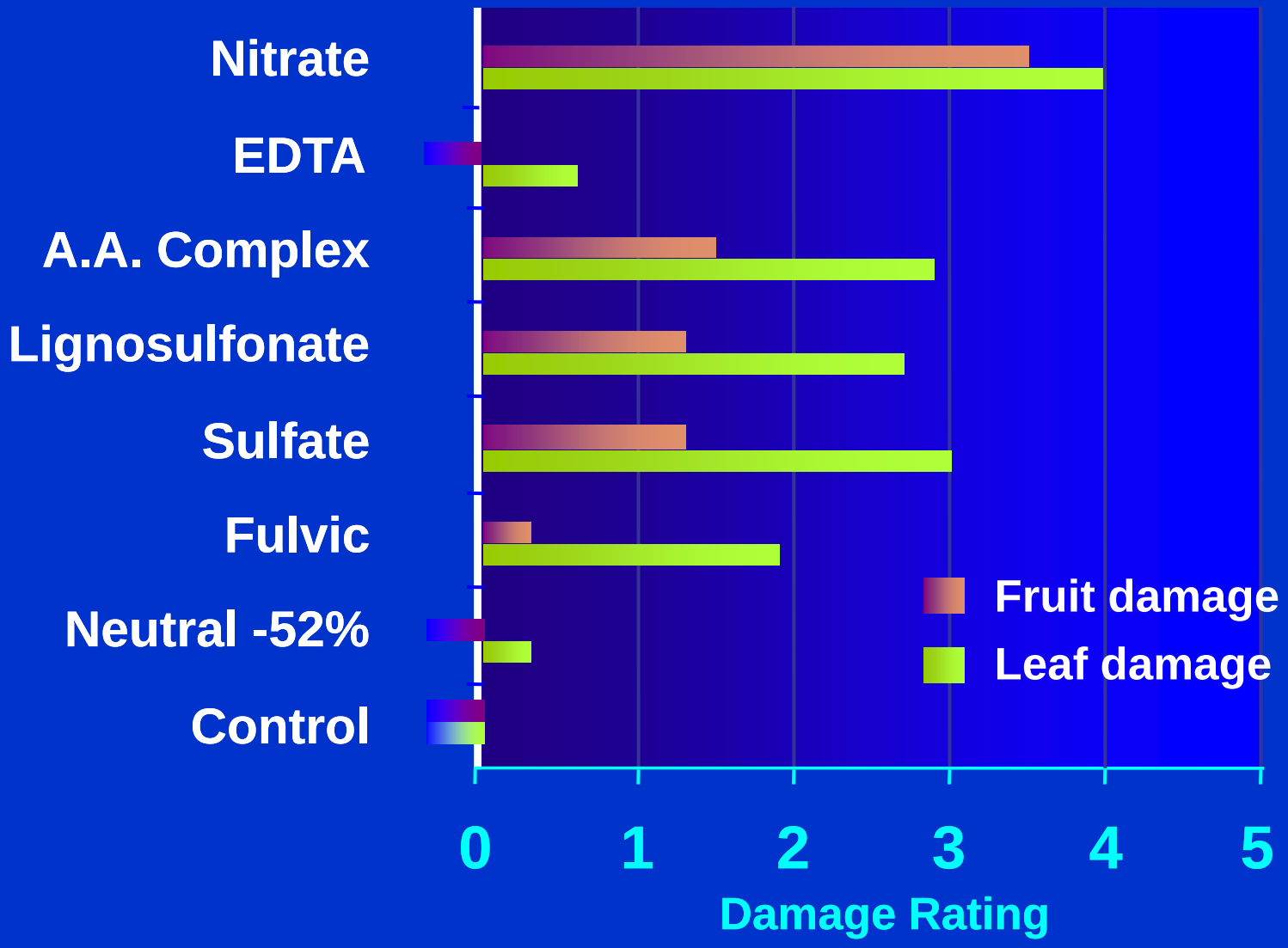


Strategies with Zinc Sulfate
(Timing, Rate, etc)

1. **Spring – Phytotoxicity concerns**
2. **All Season – Low rate**
3. **Fall or Dormant**

Fruit Damage from Zinc Sprays

Leaf & Fruit Damage on Peach, Plum and Apricot Trees Sprayed in April with Different Formulations of Zn at 1,000 ppm



Strategies with Zinc Sulfate
(Timing, Rate, etc)

1. Spring – Phytotoxicity concerns

   Zn Oxide or Neutral Zn?

2. All Season – Low rate
3. Fall or Dormant

Strategies with Zinc Sulfate
(Timing, Rate, etc)

1. Spring – Phytotoxicity concerns

   Zn Oxide or Neutral Zn?

2. All Season – Low rate

   Efficiency?

3. Fall or Dormant

Strategies with Zinc Sulfate
(Timing, Rate, etc)

1. Spring – Phytotoxicity concerns

   Zn Oxide or Neutral Zn?

2. All Season – Low rate

   Efficiency?

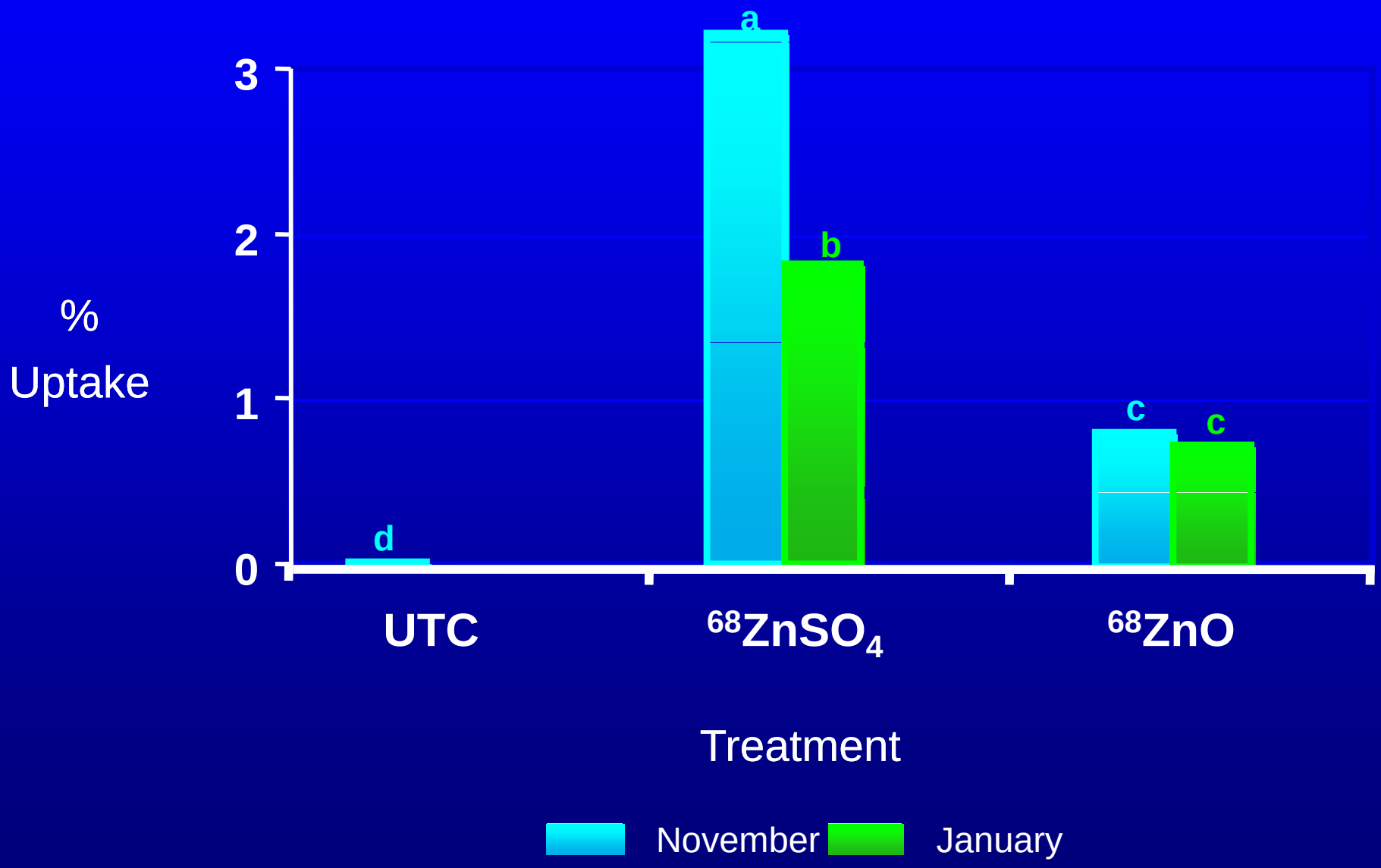
3. Fall or Dormant

   Early fall better than late fall

   Use rate that doesn't defoliate quickly

Nursery Trees in Pots - Application to Dormant Shoots

$^{68}ZnSO_4$ vs. ^{68}ZnO - % of Applied Taken Up



Strategies with Zinc Sulfate
(Timing, Rate, etc)

1. Spring – Phytotoxicity concerns

   Zn Oxide or Neutral Zn?

2. All Season – Low rate

   Efficiency?

3. Fall or Dormant

   Early fall better than late fall

   Use rate that doesn't defoliate quickly

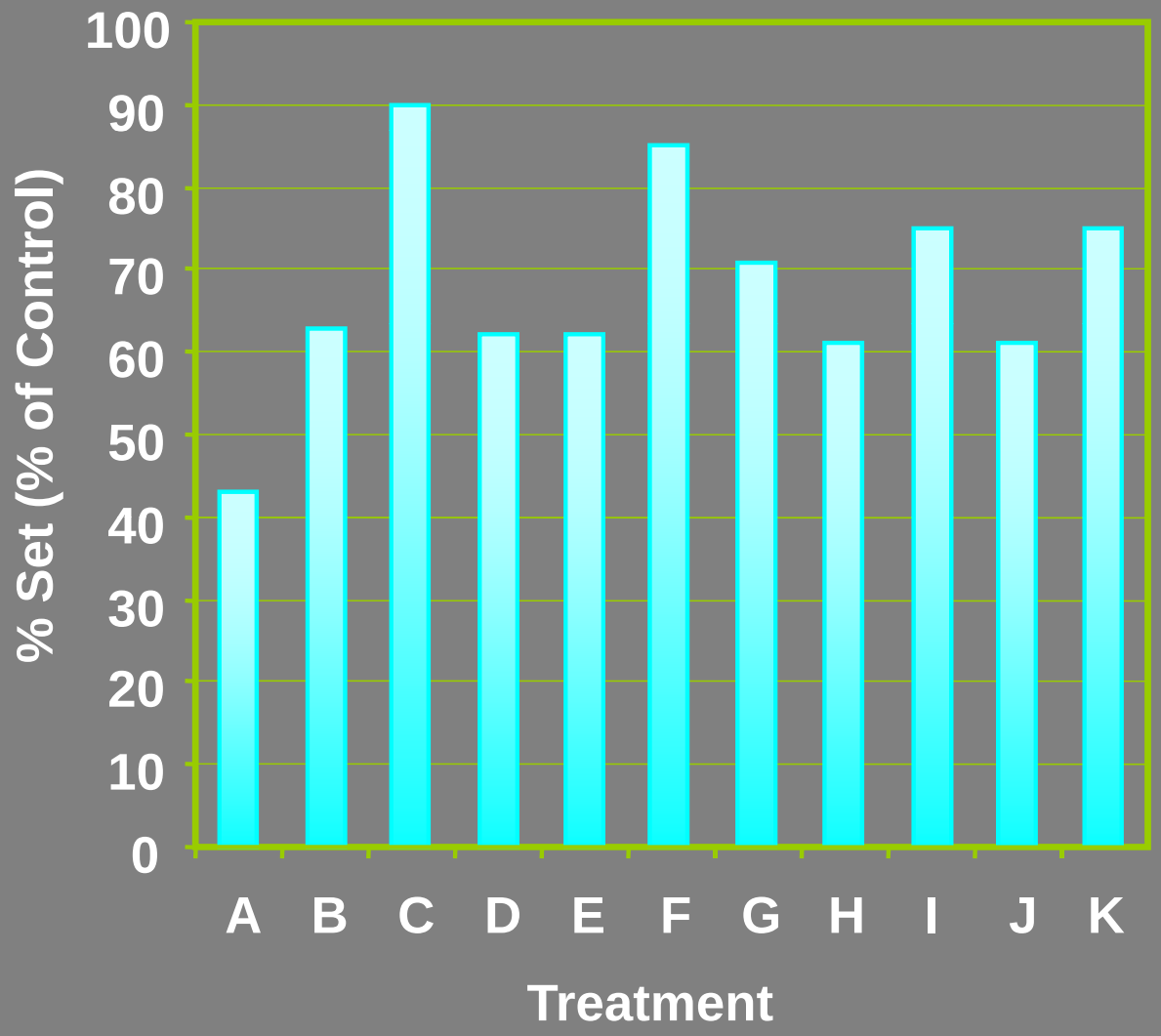
   Fall better than dormant

Chemical & Mechanical Thinning

R. Scott Johnson – University of California Extension Specialist

Chemical Blossom Thinning Using Armothin (Entry)

Commercial Peach and Nectarine Orchards - 1996 - 98



A	96 Spring Lady	2.5%
B	97 Crown Princess	2%
C	97 Sparkling June	2%
D	97 Loadel	2%
E	97 O'Henry	2%
F	98 Mayglo	2.5%
G	98 Spring Bright	3%
H	98 Loadel	3%
I	98 Summer Diamond	3%
J	98 Summer Lady	3%
K	98 Carnival	3%

Chemical Blossom Thinner

Fatty Acid Amine Polymer

Armothin = Entry

Now called N-TER (Wilbur Ellis)


NO STEP


SHOCK WAVE

Darwin String Thinner

- Developed in Germany for blossom thinning apples
- Penn State CE tried it in peaches with some success
- Multi-state research project funded by the Specialty Crops Research Initiative & the CA Canning Peach Association

Before

After

Before

After

Before

After

Before

After

Darwin Thinning Experiment 2009

- Summer Fire Nectarine
- Planted 6’x 16’ – Trained to Kearney “V”
- Pruned for Darwin Thinner
- Flowering – light; Fruit set – 50% (frost)
- Plots = 24 tree rows; Harvested 10 trees
- 3 Picks; 1 week apart; Separated into 10 size categories
- 5 Treatments; 6 Reps

Summer Fire – Darwin Thinning

Treatment	**Strings**	**Gaps**	**RPM**
Control	Hand thinning		
Trt 1	New–2 rows	1 string	175
Trt 2	Old-2 rows	4 strings	200
Trt 3	Old-2 rows	None - top	200
Trt 4	Old-2 rows	None - top	275

Summer Fire – Darwin Thinning

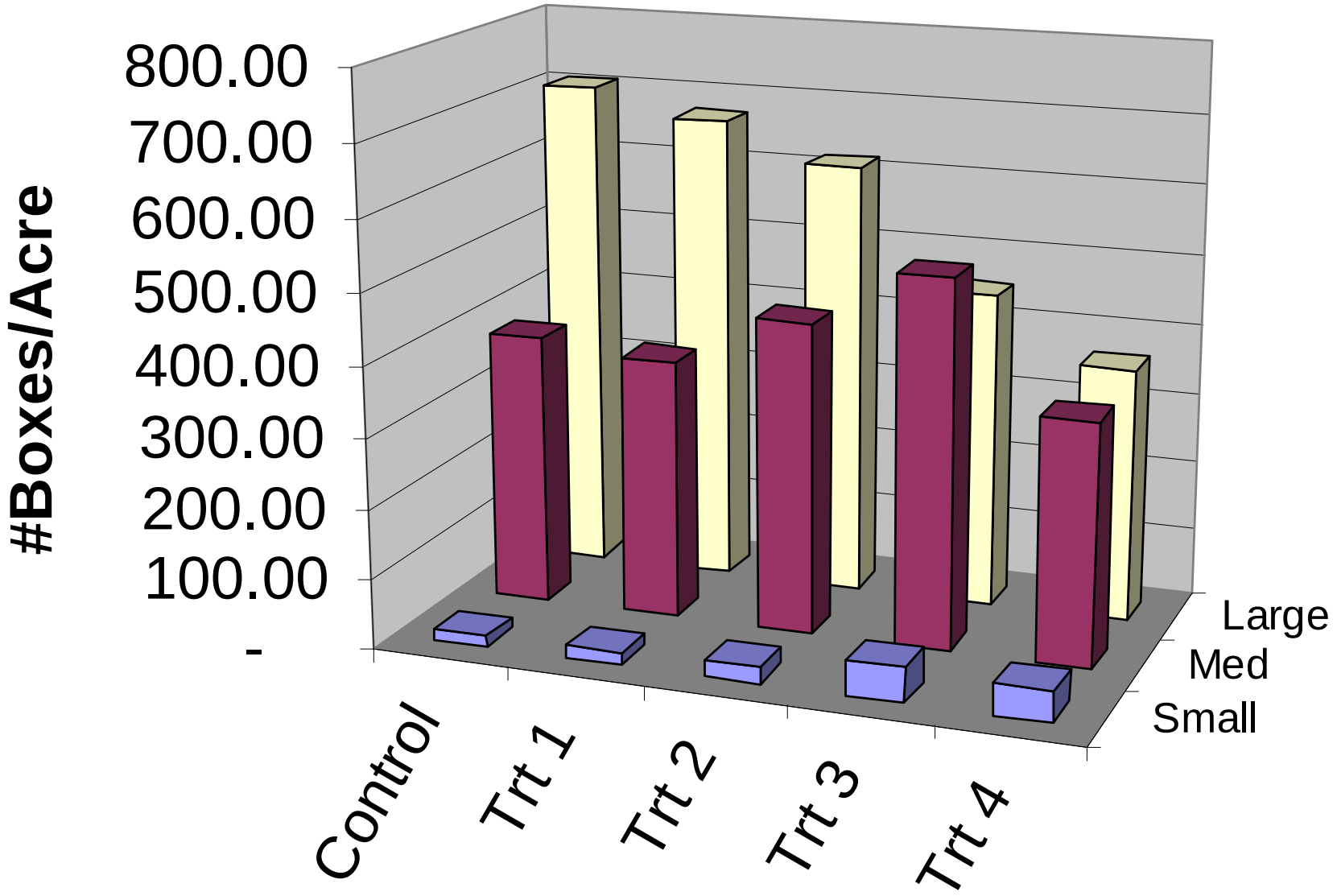
Treatment	**% Flowers Removed**	**Hand Thinning**	**Fruit Load Harvested**
Control	0	99 hrs/ac	159 frt/tree
Trt 1	25	43 hrs/ac	154 frt/tree
Trt 2	25	38 hrs/ac	162 frt/tree
Trt 3	35	9 hrs/ac	170 frt/tree
Trt 4	60	None	125 frt/tree

Summer Fire – Darwin Thinning

Treatment	**% Undersize**	**Ave Fruit Weight**	**Fruit Value $/Acre**
Control	0.8	187.9g	
Trt 1	1.2	185.6g	
Trt 2	1.3	181.9g	
Trt 3	2.4	172.3g	
Trt 4	2.3	175.9g	

Summer Fire - Darwin Thinning

Fruit Size Distribution



Summer Fire – Darwin Thinning

Treatment	**Ave Fruit Weight**	**Fruit Value $/Acre**	**Loss in Fruit Value**
Control	187.9g	$18,497	-
Trt 1	185.6g	$17,642	$855
Trt 2	181.9g	$17,886	$611
Trt 3	172.3g	$16,452	$2,045
Trt 4	175.9g	$12,050	$6,447

Summer Fire – Darwin Thinning

Treatment	Fruit Value $/Acre	Loss in Fruit Value	Savings in Hand Thinning	Net Savings Or Loss
Control	$18,497	---	---	---
Trt 1	$17,642	$855	$666	-$189
Trt 2	$17,886	$611	$721	+$110
Trt 3	$16,452	$2,045	$1,062	-$984
Trt 4	$12,050	$6,447	$1,166	-$5,298

B-VK Tuolumnes

Effect of Darwin String Thinner on Hand Thinning Costs

B-VK Tuolumnes. April 30, 2009.

Thinning Time (hours / acre)		Thinning Cost ($ / acre)*		Reduction in thinning costs $$
Check	Darwin	Check	Darwin	
118.5	92.0	$1328	$1031	$297

*Hand thinning costs based on $11.20 per hour ($8.00 + 40%)

Preharvest Fruit Counts
B-VK Tuolumnes

Average number of fruit per tree	
Darwin	Check
360	359

*Target ~ 275 – 300 fruit / tree

Counted 24 trees in each treatment

B-VK Tuolumne Harvest Data

July, 2009

	Tons per Acre			
	No. 1	No. 2	Smalls	Total salable*
Darwin	28.0	0.7 (2.4%)	0.1 (0.4%)	28.7
Check	24.3	1.2 (5.1%)	0.3 (1.3%)	25.5

*Total salable = number 1 fruit + 10% number 2 fruit

Effect of Darwin String Thinner on Yield & Gross Income

	Yield (tons per acre)		Gross Income ($ / acre)*		Difference in Gross $$
	Check	Darwin	Check	Darwin	
Tuolumne	25.7	28.7	$8173	$9127	+$954

*Based on price of $318 / ton for Tuolumnes and $356 for Loadels

Effect of Darwin String Thinner on Net Income

	Decrease in thinning costs	Increase in Gross Income (higher yield)	Total Increase in Net Income per acre
Tuolumne	$297	$954	+$1251
Loadel	$386	$997	+$1383

Darwin String Thinner

Avoid:

- Open vase trees
- Low setting varieties
- Varieties with lots of doubles
- Plums

Darwin String Thinner

Avoid:

- Open vase trees
- Low setting varieties
- Varieties with lots of doubles
- Plums

Darwin String Thinner

Good potential if:

- Trees trained right
- Trees pruned right
- Heavy set of good fruit
- Used on peaches and nectarines