Cost Effective Zinc Nutrition

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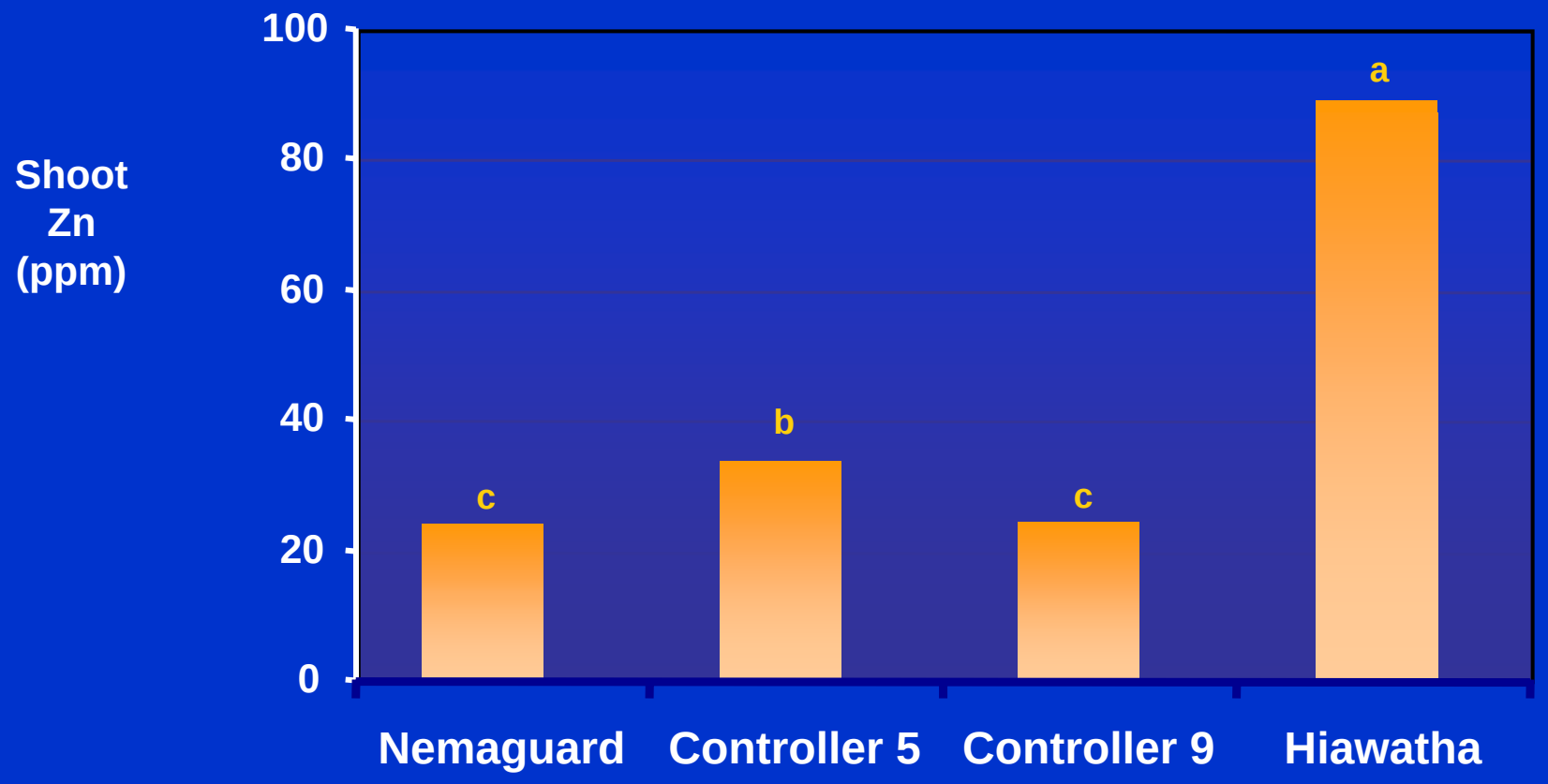
Kearney Ag Center

Hiawatha

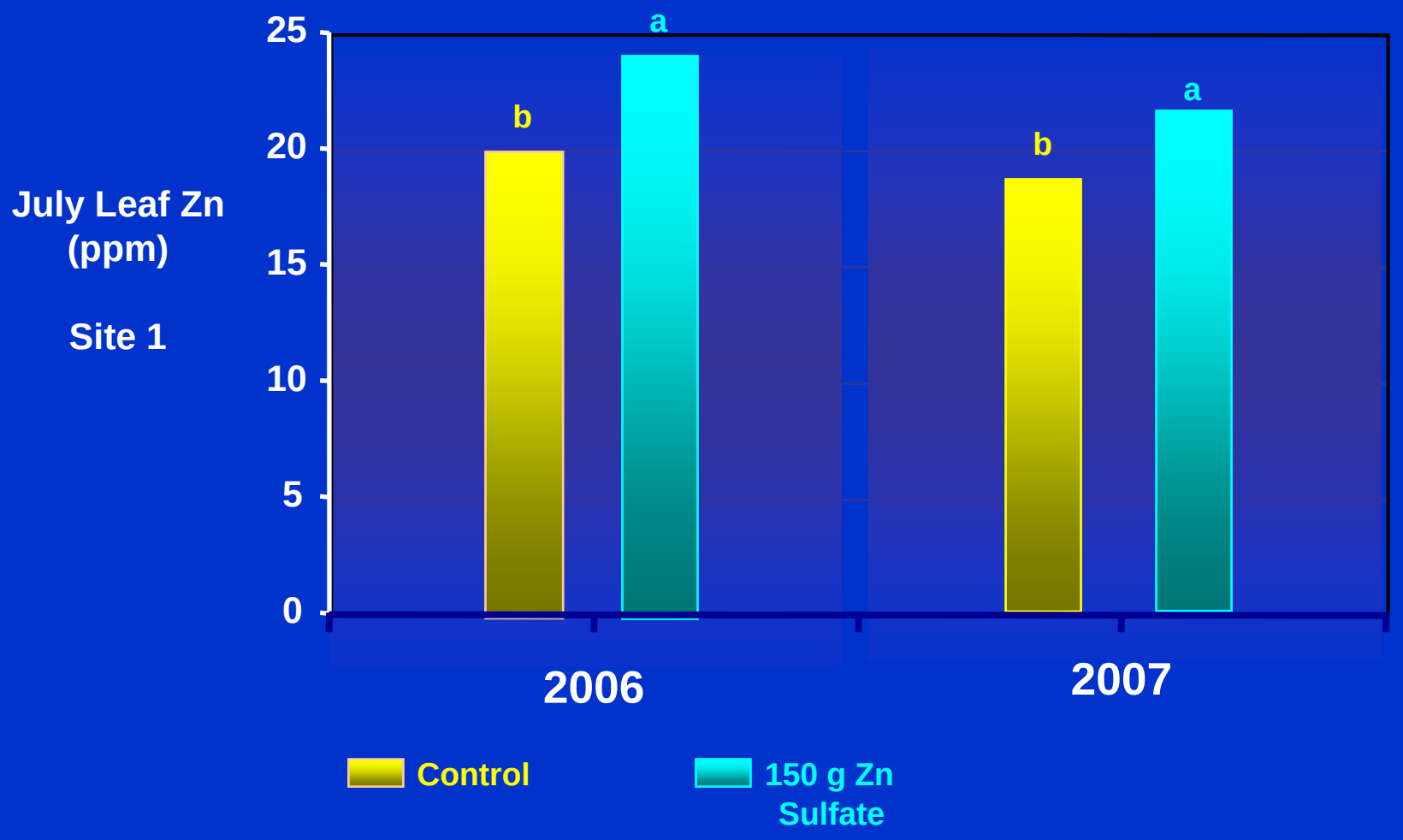
Nemaguard

Peach Rootstocks and Zn Uptake

December 2006 Shoot Zn



Applying “Root Bags” with Sulfur, Urea and Zinc Sulfate to the Planting Hole in Spring 2006



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 MINIMIUM GARANTIE

Soufre (S) 65.00%
Zinc (Zn) 18.00%

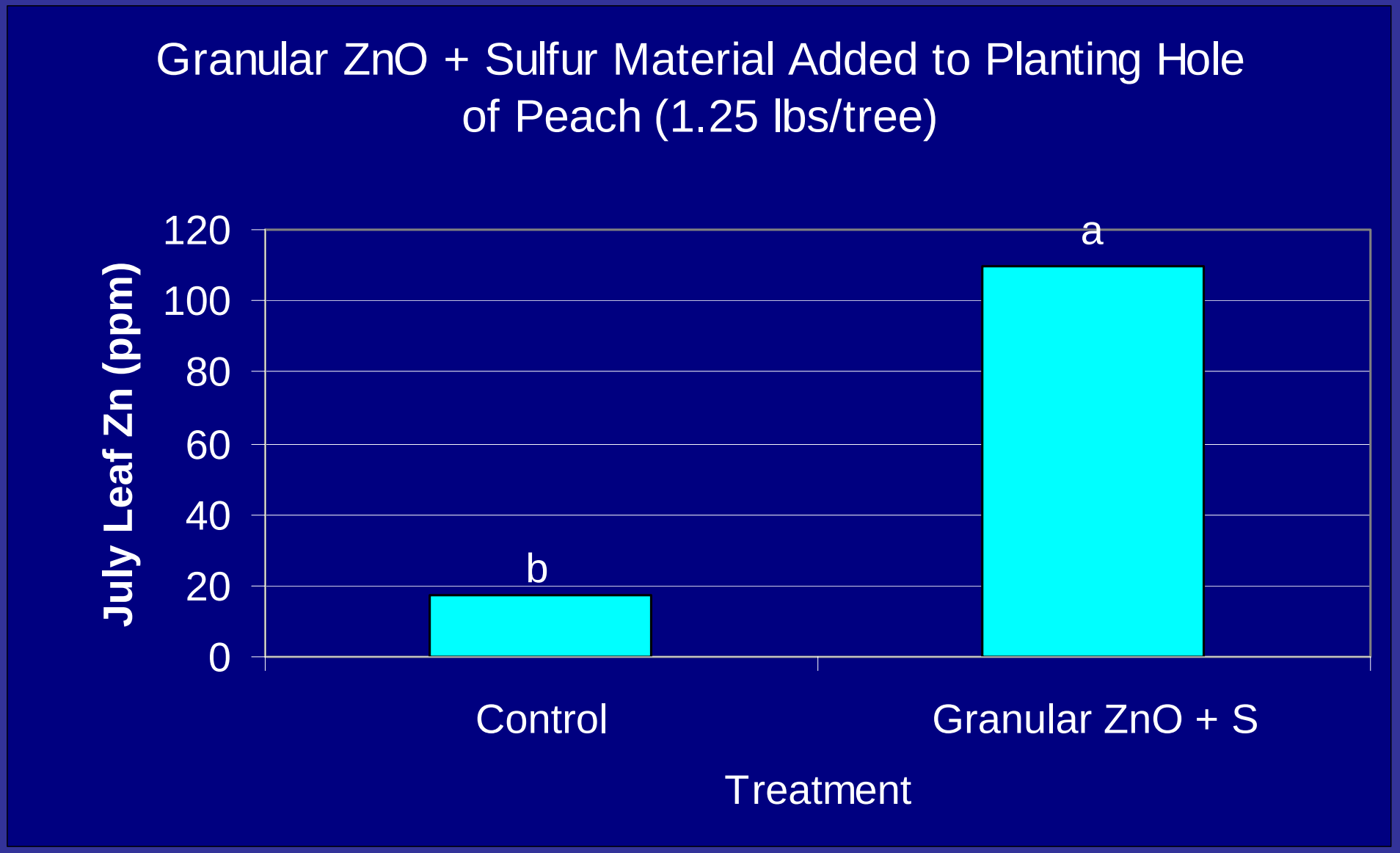
CONSEILS : Pour que les micro nutriments Tiger fassent de l'effet, il faudrait les répandre à la surface et les incorporer au moins un an avant de planter.
PRÉCAUTION : cet engrais contient du zinc et ne devrait être utilisé qu'en suivant leaconseils. Il peut s'avérer dangereux s'il n'est pas utilisé correctement. Il faut toujours

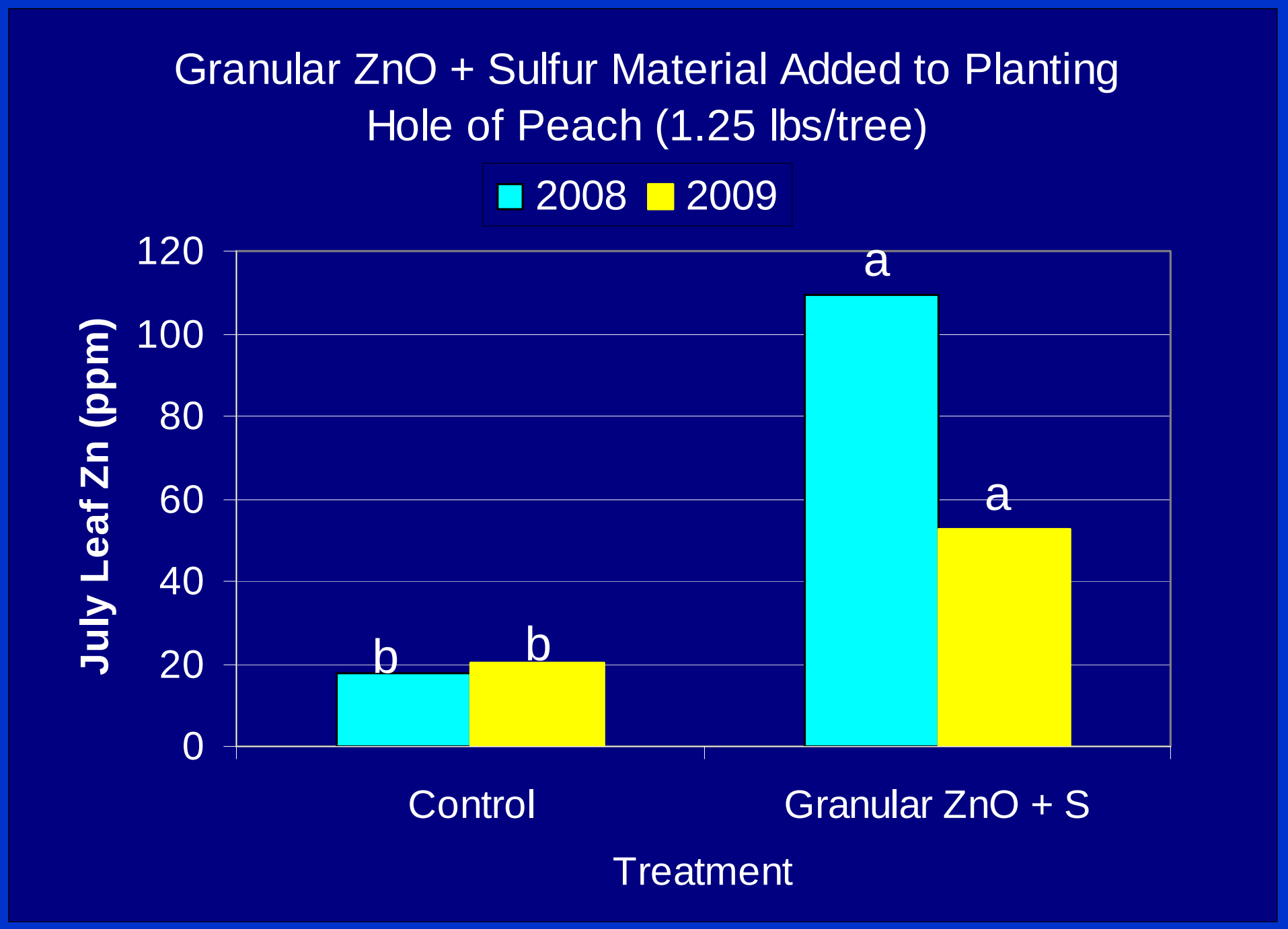
TO BE USED IN BLENDING FERTILIZER FOR SOIL APPLICATION

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:
Flush thoroughly with water for at least 15 minutes if irritation

POUR EMPLOI EN MELANGE D'ENGRAIS POUR APPLICATION AU SOL

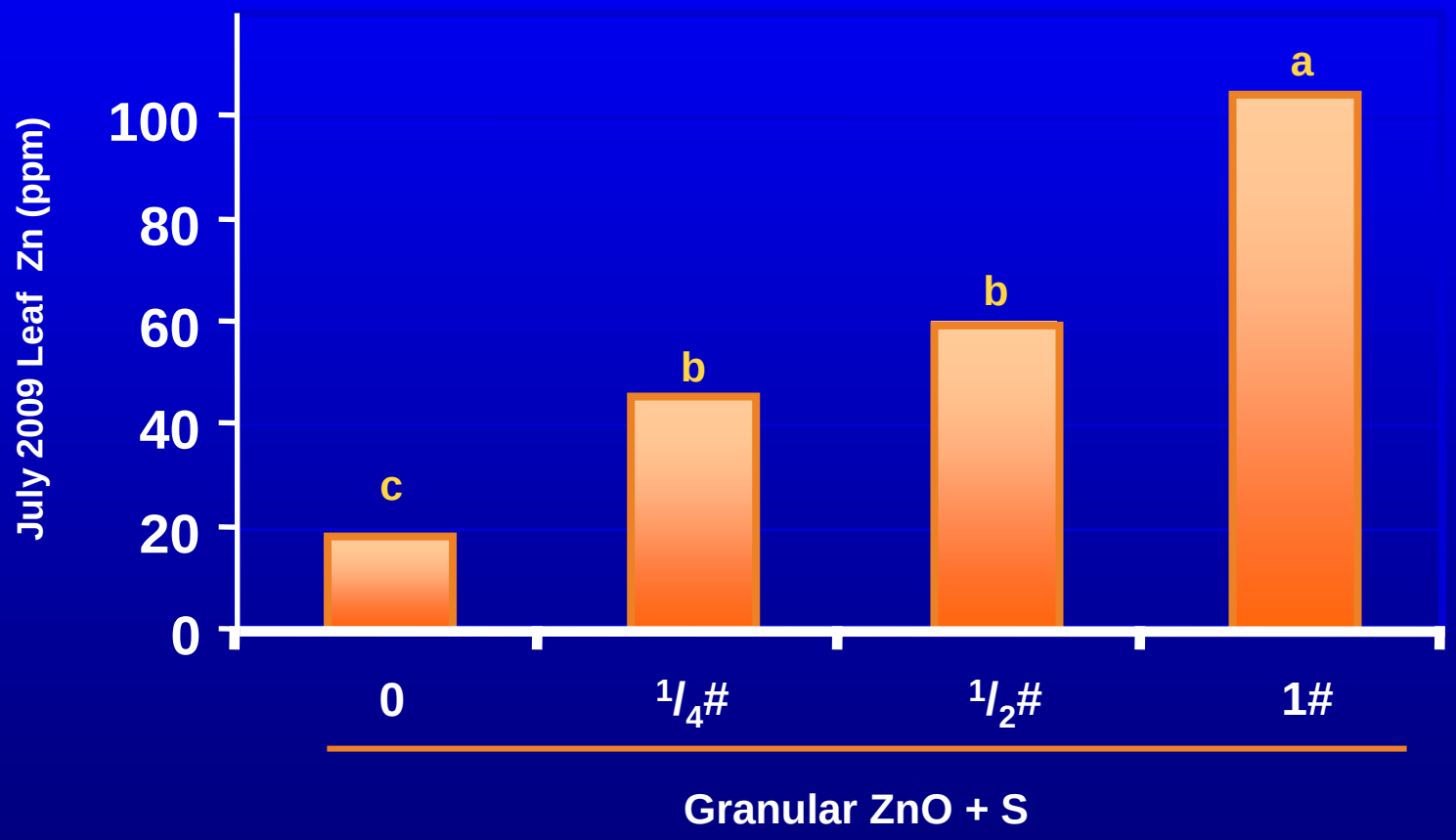
RISQUES:
AVERTISSEMENT - POISON - L'ingestion peut entraîner la mort.
Risque d'irritation pour les yeux, la peau et les voies respiratoires.
PRÉCAUTIONS:
Ne pas ingérer. Éviter tout contact avec les yeux ou la peau. Ne pas respirer les poussières. Entreposer dans un endroit frais, sec et bien ventilé. 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:
Rincer abondamment à l'eau pendant au moins 15


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
a
b
Control
Granular ZnO + S
Treatment


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

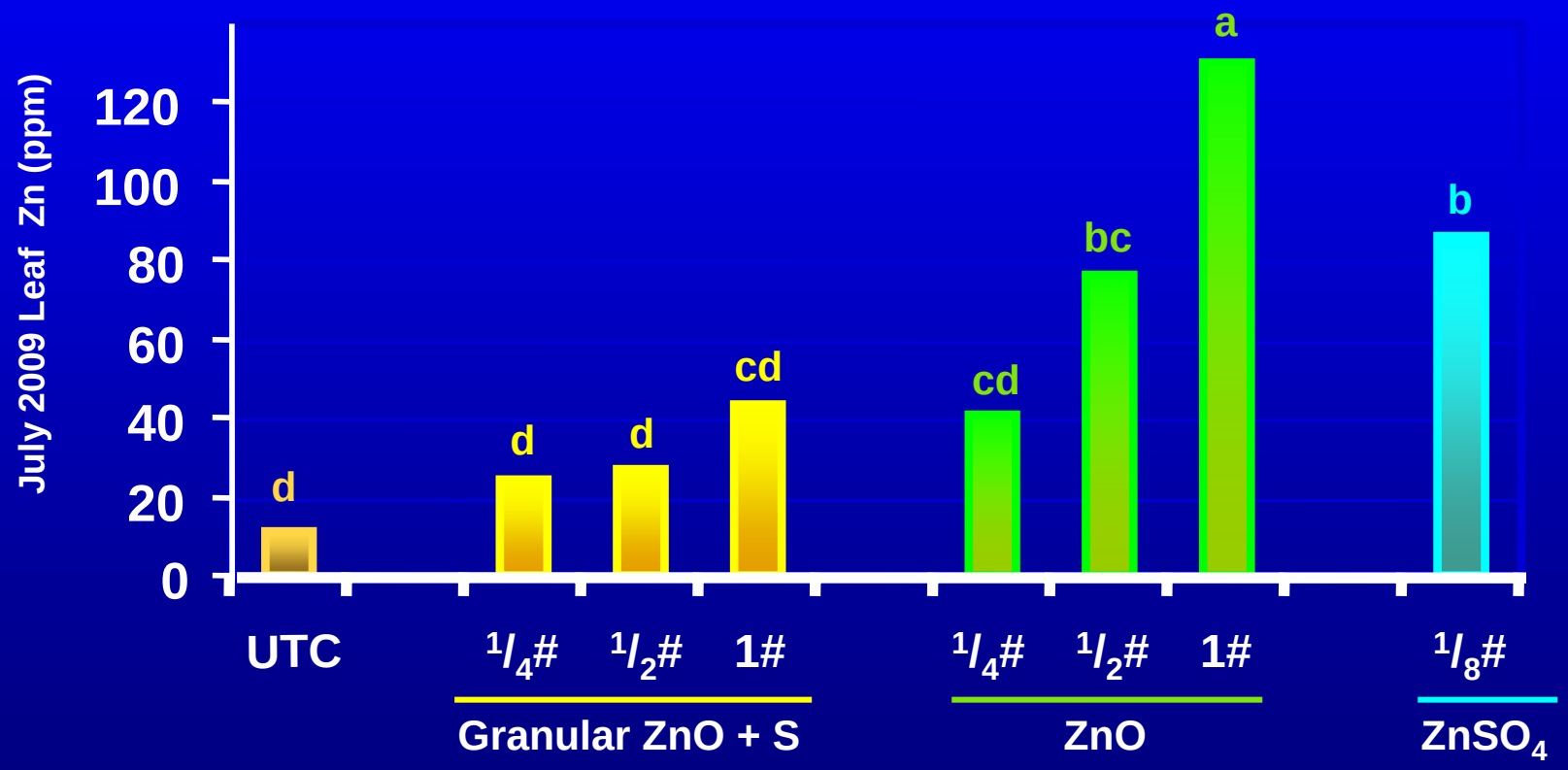
Granular ZnO + Sulfur Added to Planting Hole of Zee Fire Nectarine

January 2009



Zinc Materials Added to Planting Hole of Friar / Nemaguard Plums

February 2009



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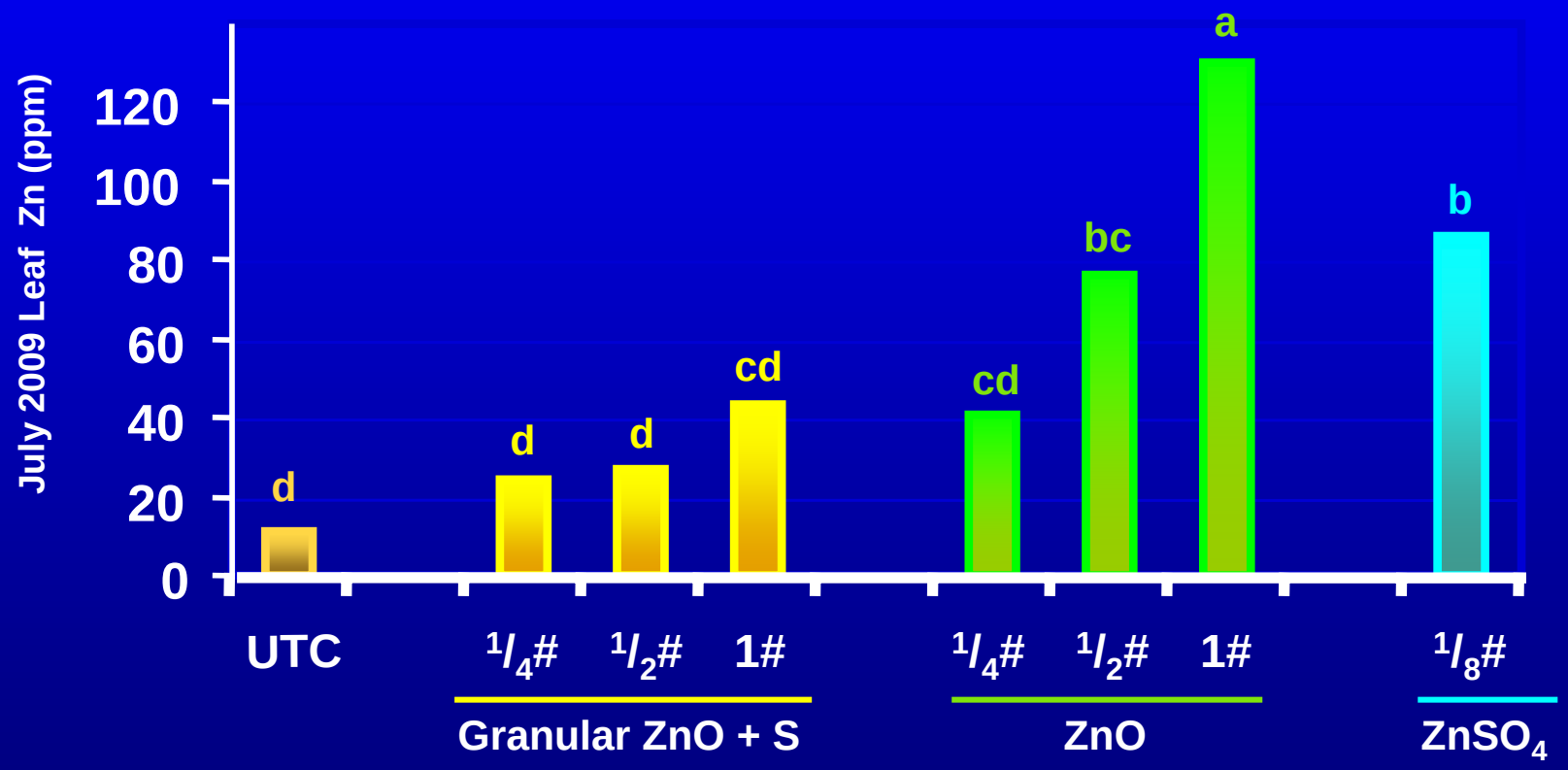
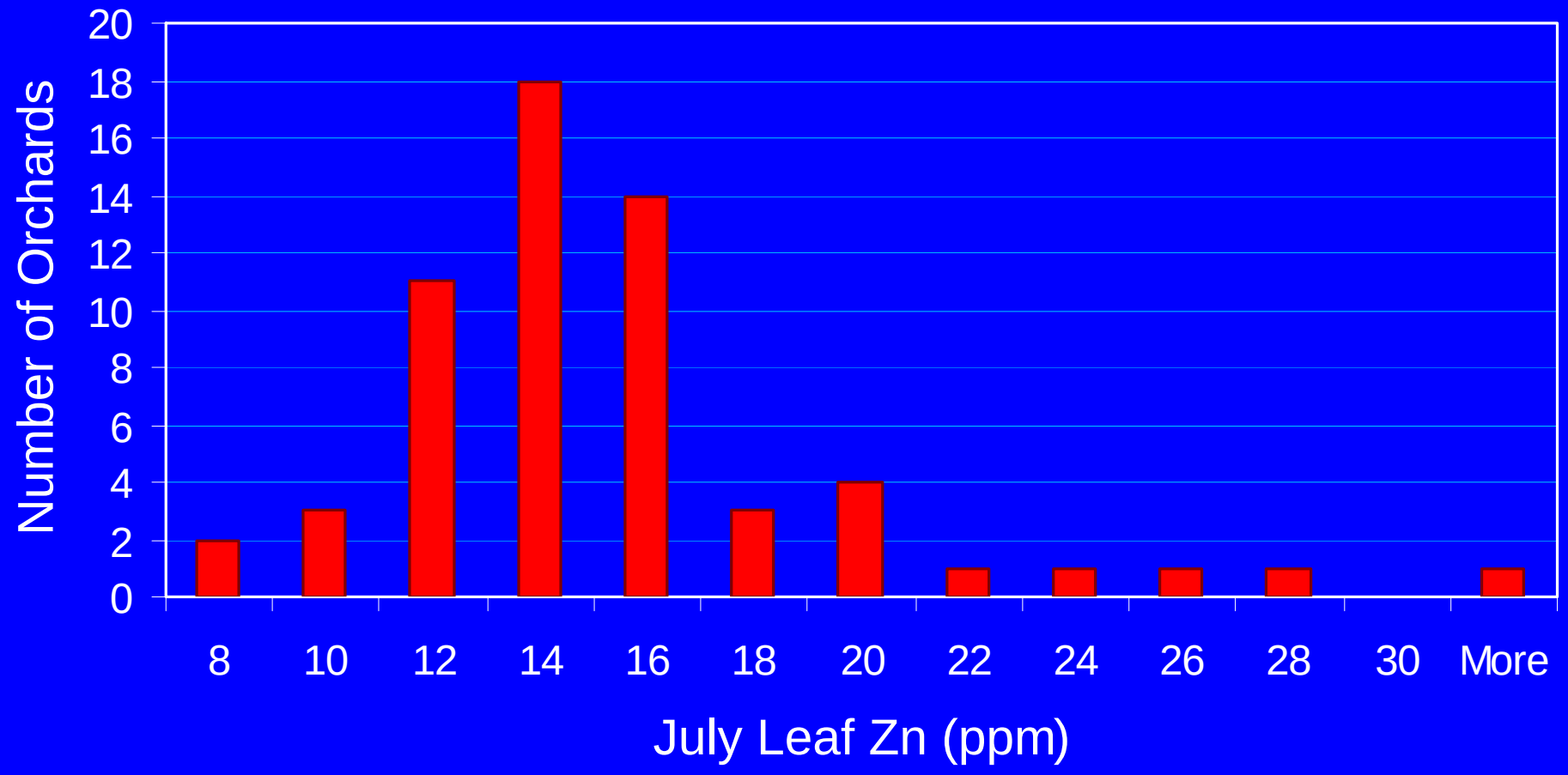


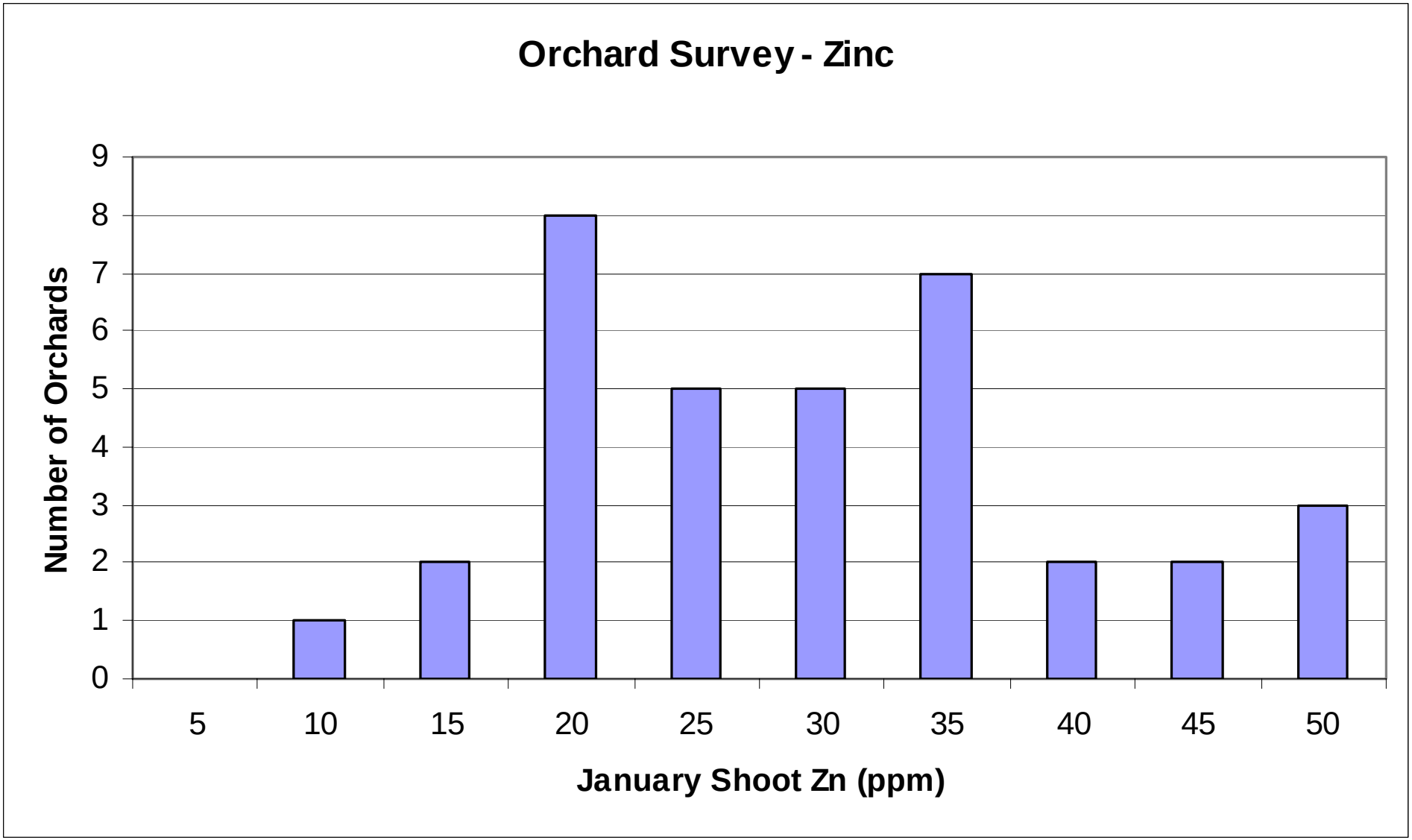
Nutrient Elements in Stone Fruit

	Level in leaves					
	PEACHES AND NECTARINES			PLUMS		
	Deficient below	Optimum range	Toxic over	Deficient below	Optimum range	Toxic over
	%	%	%	%	%	%
N	2.3	2.6 - 3.0	-	-	2.3 - 2.8	-
P	-	0.1 - 0.3	-	-	0.1 - 0.3	-
K	1.0	Over 1.2	-	1.0	Over 1.1	-
Ca	-	Over 1.0	-	-	Over 1.0	-
Mg	0.25	Over 0.25	-	0.25	Over 0.25	-
Cl	-	-	0.3	-	-	0.3
S	-	-	-	-	-	-
	p p m					
Fe	60	Over 60	-	-	-	-
Mn	20	Over 20	-	20	Over 20	-
Zn	15	Over 20	-	18	Over 18	-
B	18	20 - 80	100	25	30 - 60	80
Cu	-	Over 4	-	4	Over 4	-
Mo	-	-	-	-	-	-


Orchard Survey - Zinc
Number of Orchards
20
18
16
14
12
10
8
6
4
2
0
8
10
12
14
16
18
20
22
24
26
28
30
More
July Leaf Zn (ppm)

Zinc in Dormant Shoots (ppm)

Deficient	Sufficient	High
6.4	13.7	26.5
8.1	21.6	50.0
10.1	35.6	74.5


Orchard Survey - Zinc
Number of Orchards
0
1
2
3
4
5
6
7
8
9
5
10
15
20
25
30
35
40
45
50
January Shoot Zn (ppm)

Zinc in September Shoots (ppm) – Low in the Canopy

Deficient	Sufficient	High
6.4	26.0	92.0

Zinc Materials

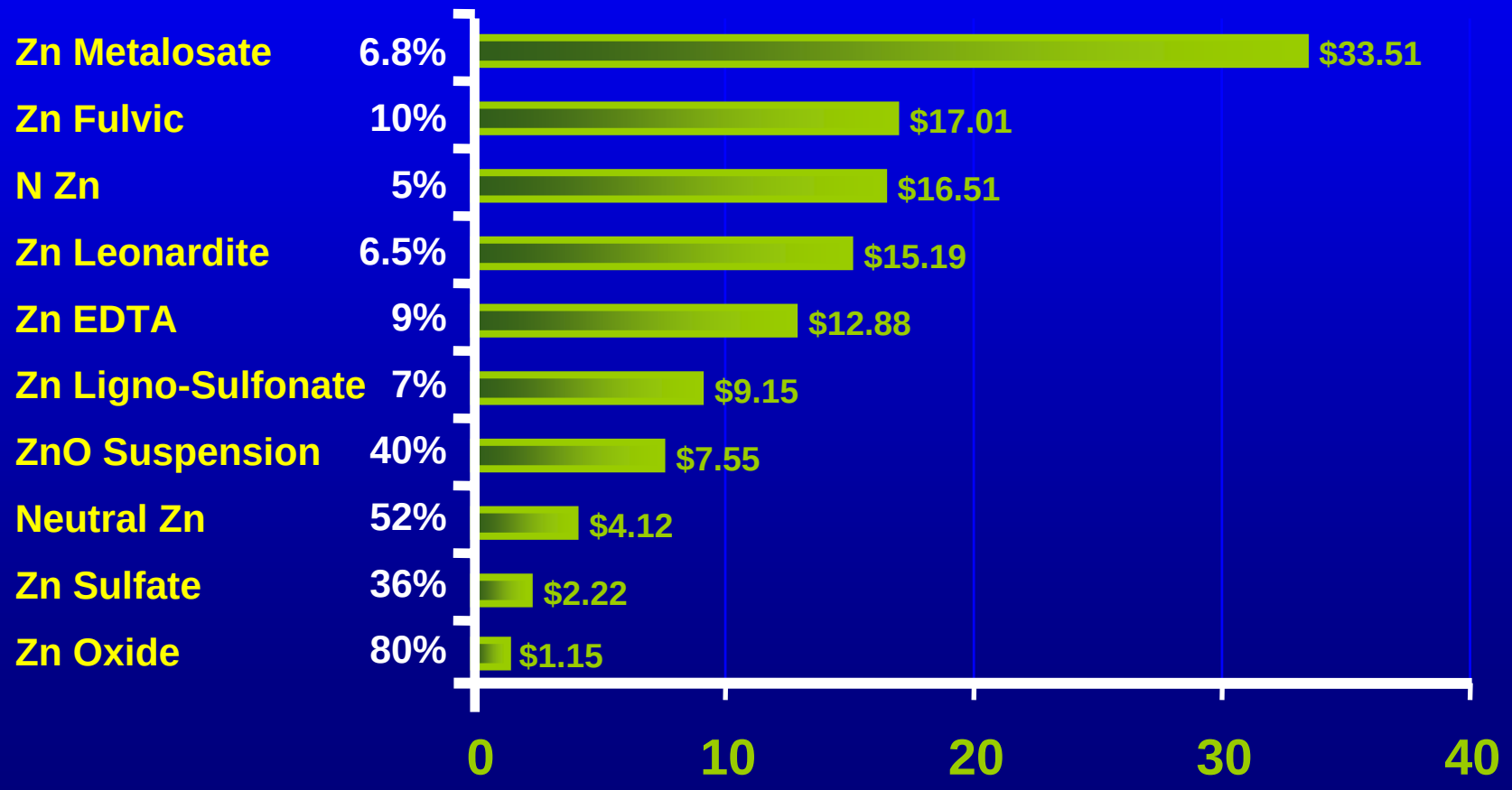
Basic Chemicals

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

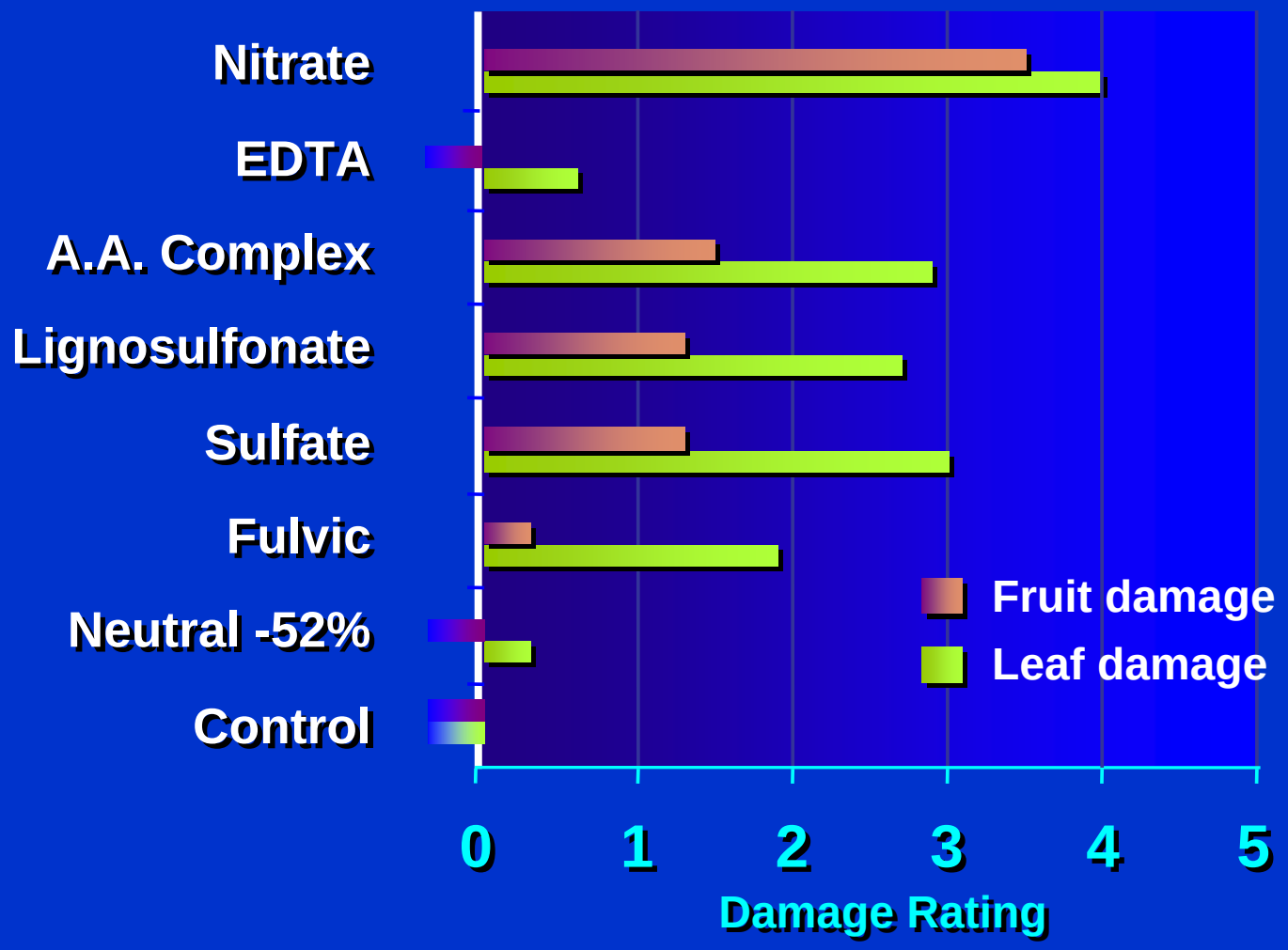
Chelates & Complexes

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

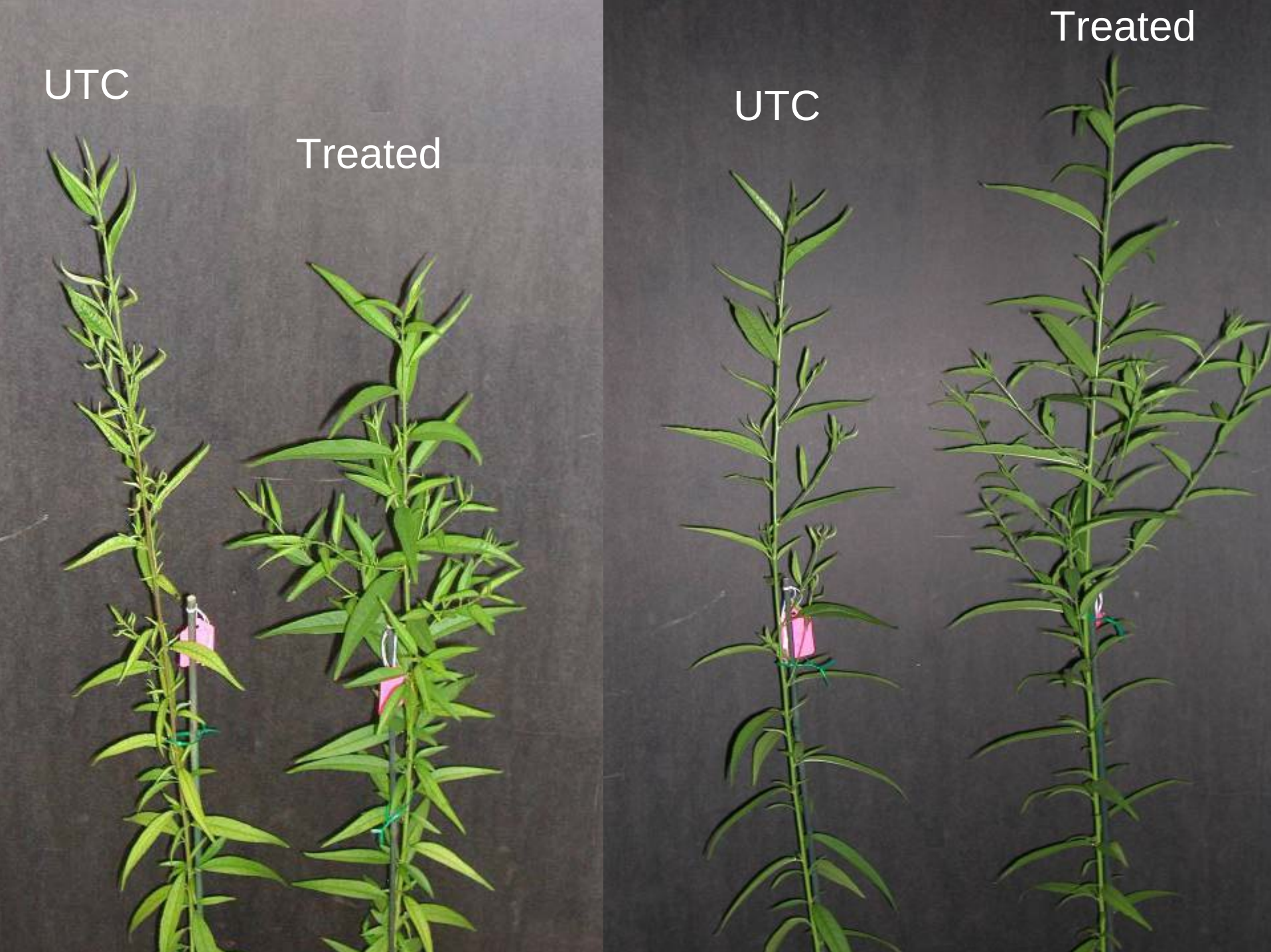
Cost of Zinc Materials - October 2007

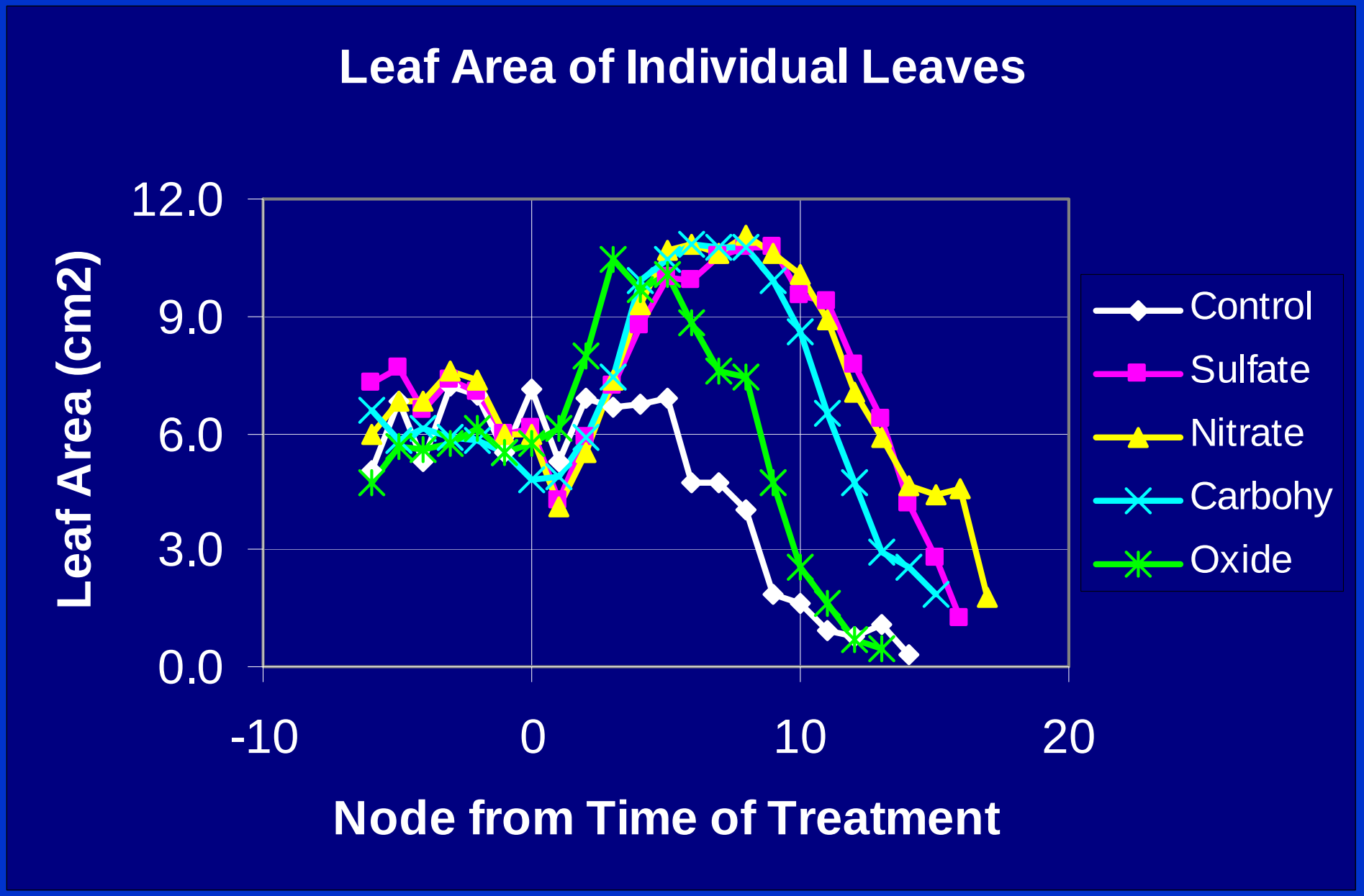


Leaf & Fruit Damage on Peach, Plum and Apricot Trees Sprayed in April with Different Formulations of Zn at 1,000 ppm



Zion 4


UTC
Treated
UTC
Treated


Leaf Area of Individual Leaves
Leaf Area (cm2)
12.0
9.0
6.0
3.0
0.0
-10
0
10
20
Node from Time of Treatment
Control
Sulfate
Nitrate
Carbohy
Oxide

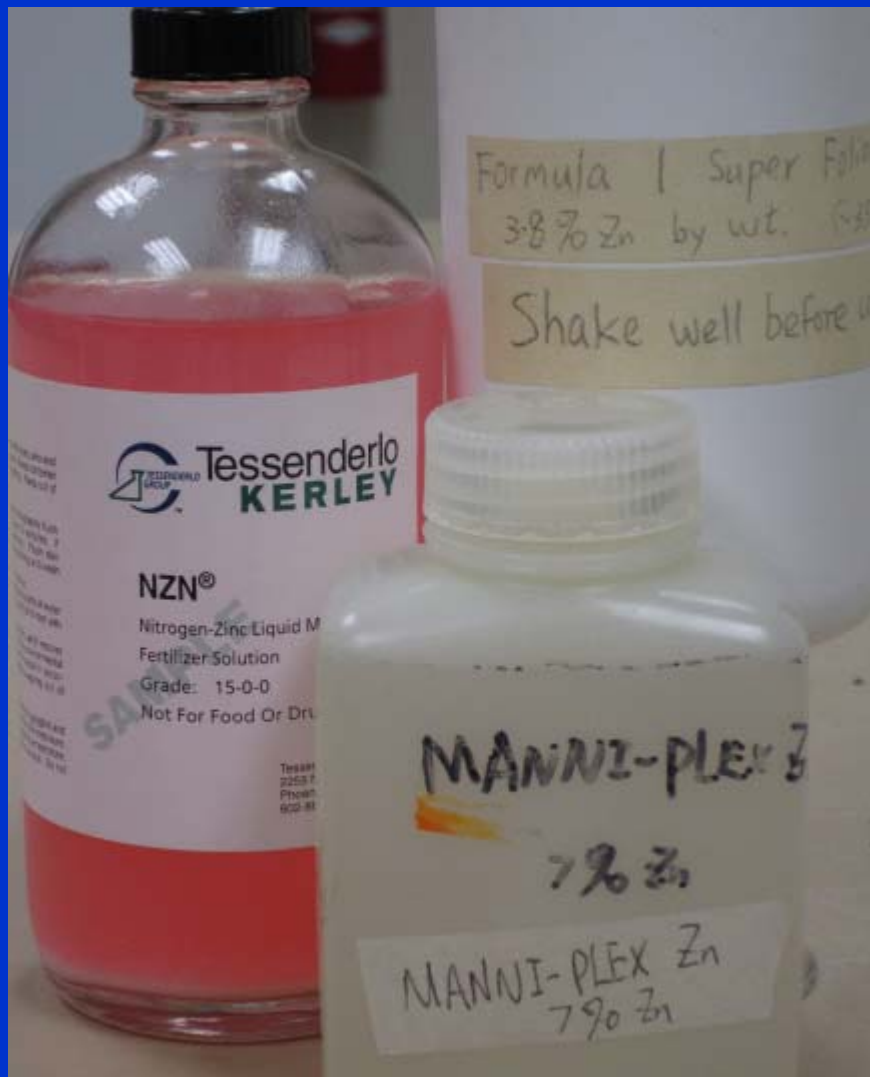
Comparing Zinc Formulations

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

<u>Zinc Nitrate Mixes</u>

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



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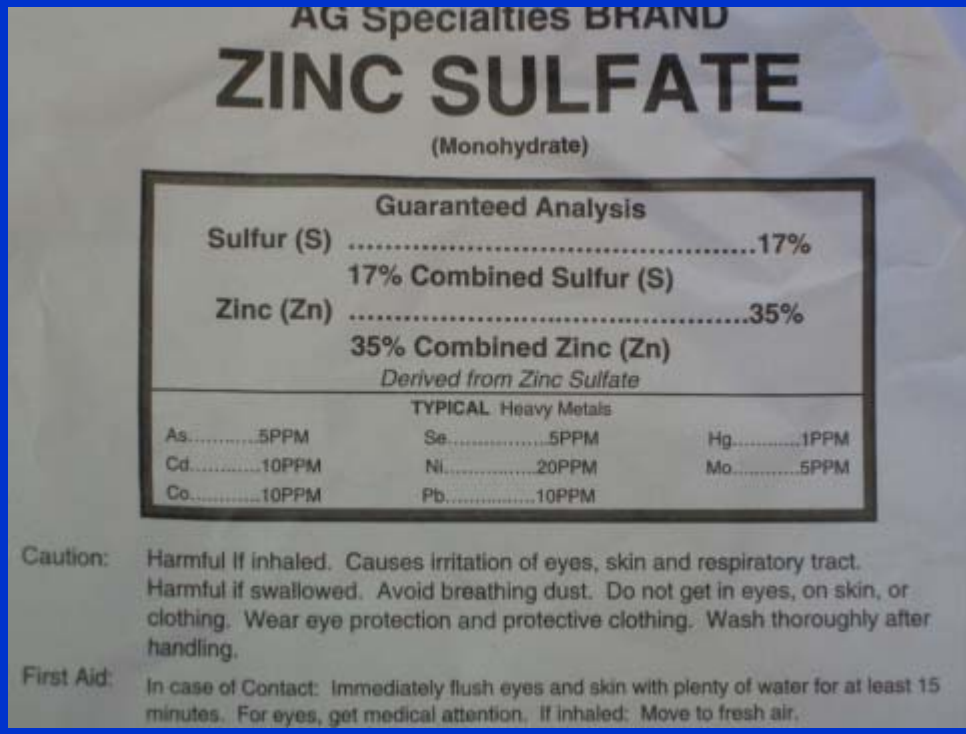
Zinc Materials

Zinc Sulfate

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



AG Specialties BRAND

ZINC SULFATE

(Monohydrate)

Guaranteed Analysis

Sulfur (S) 17%

17% Combined Sulfur (S)

Zinc (Zn) 35%

35% Combined Zinc (Zn)

Derived from Zinc Sulfate

TYPICAL Heavy Metals

As.....5PPM	Se.....5PPM	Hg.....1PPM
Cd.....10PPM	Ni.....20PPM	Mo.....5PPM
Co.....10PPM	Pb.....10PPM	

Caution: Harmful if inhaled. Causes irritation of eyes, skin and respiratory tract. Harmful if swallowed. Avoid breathing dust. Do not get in eyes, on skin, or clothing. Wear eye protection and protective clothing. Wash thoroughly after handling.

First Aid: In case of Contact: Immediately flush eyes and skin with plenty of water for at least 15 minutes. For eyes, get medical attention. If inhaled: Move to fresh air.

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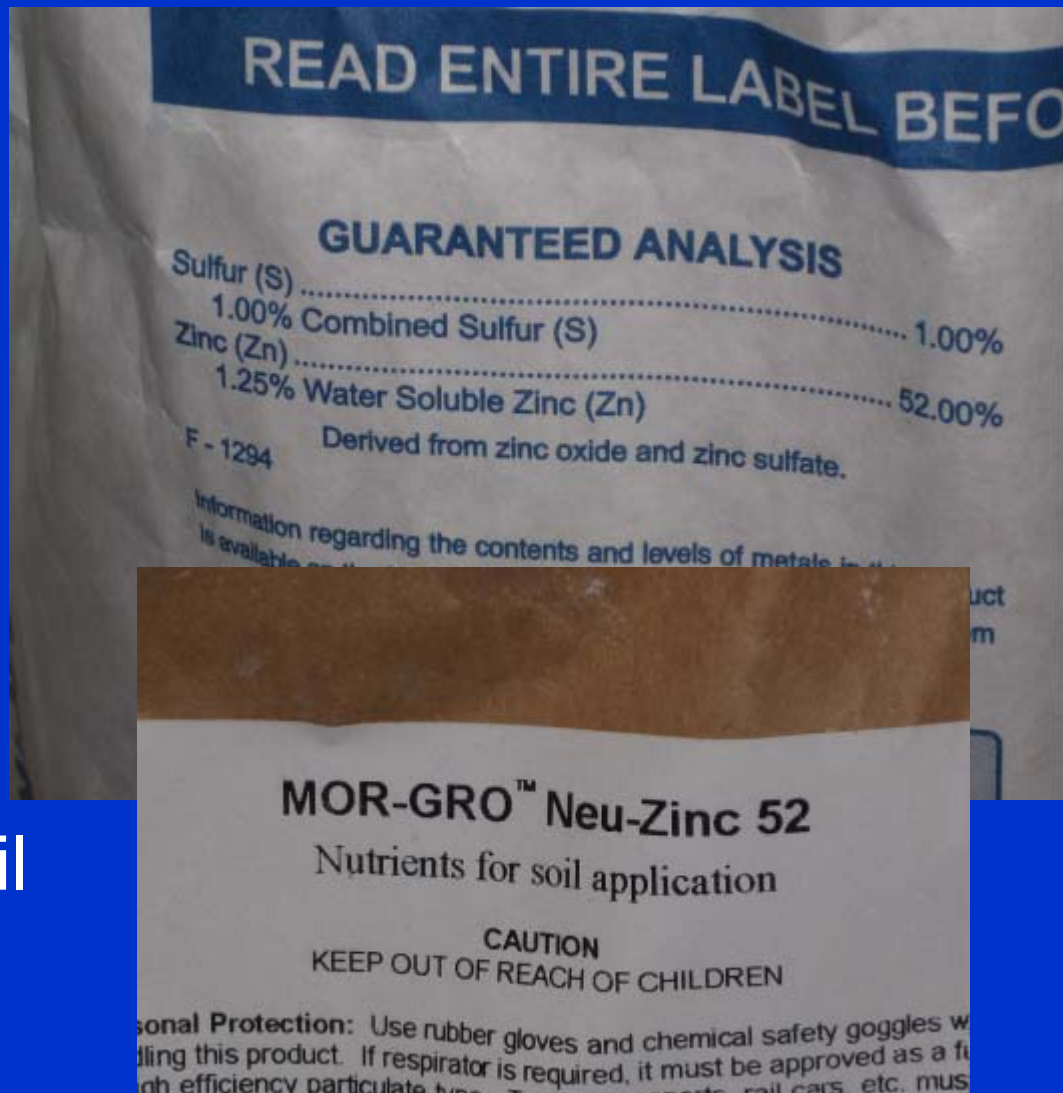
Zinc Materials

<u>Basic or Neutral Zinc</u>

- Cost = 2x Zn sulfate
- Mostly insoluble
- Widely used
- Considered to be effective
- Not phytotoxic
- Can be mixed with oil



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

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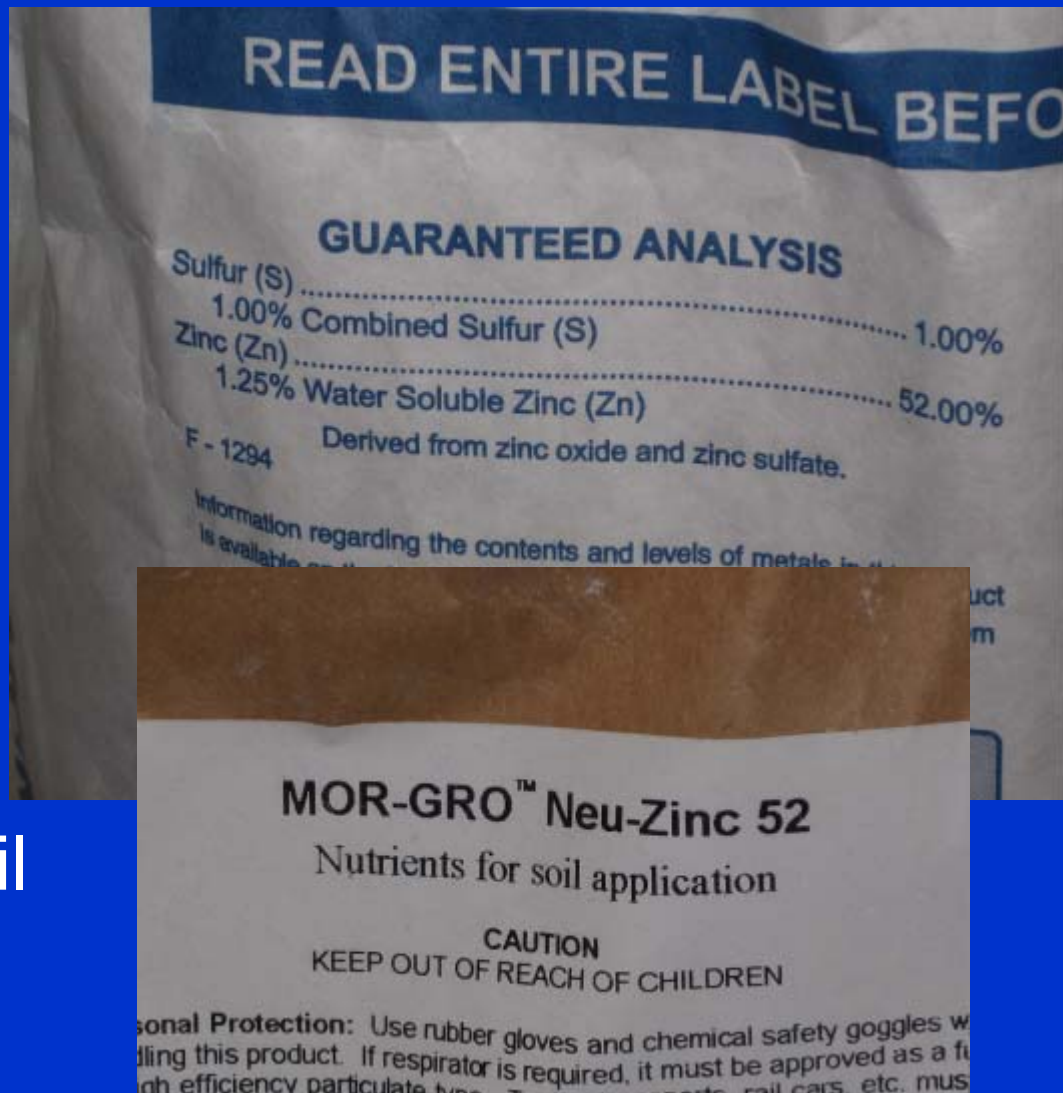

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(Timing, Rate, etc)

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   Zn Oxide or Neutral Zn?

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Strategies with Zinc Sulfate
(Timing, Rate, etc)

1. Spring – Phytotoxicity concerns

   Zn Oxide or Neutral Zn?

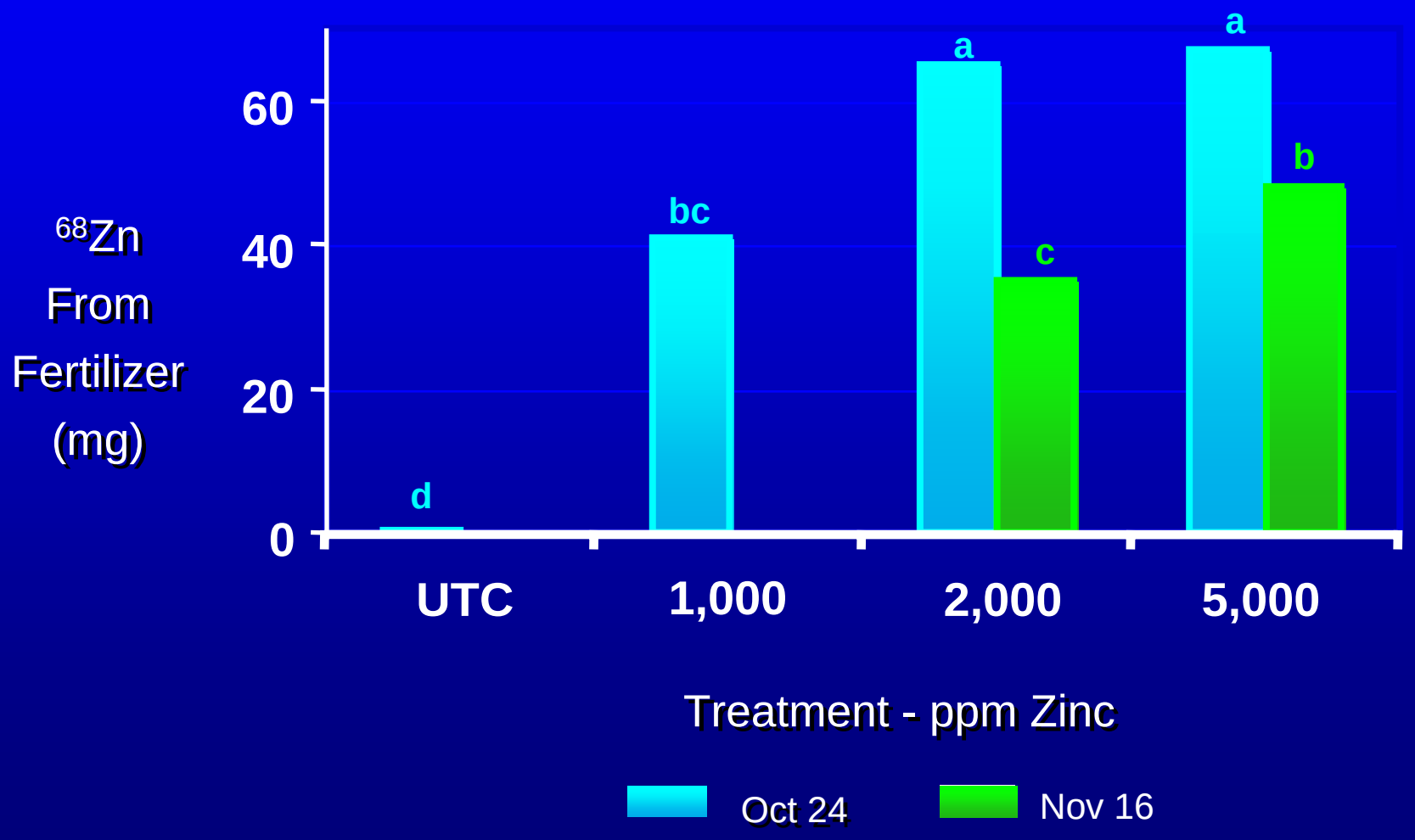
2. All Season – Low rate

   Efficiency?

3. Fall or Dormant

Nursery Trees in Pots - Fall Foliar $^{68}ZnSO_4$

Rates and Timing - ^{68}Zn in Plant



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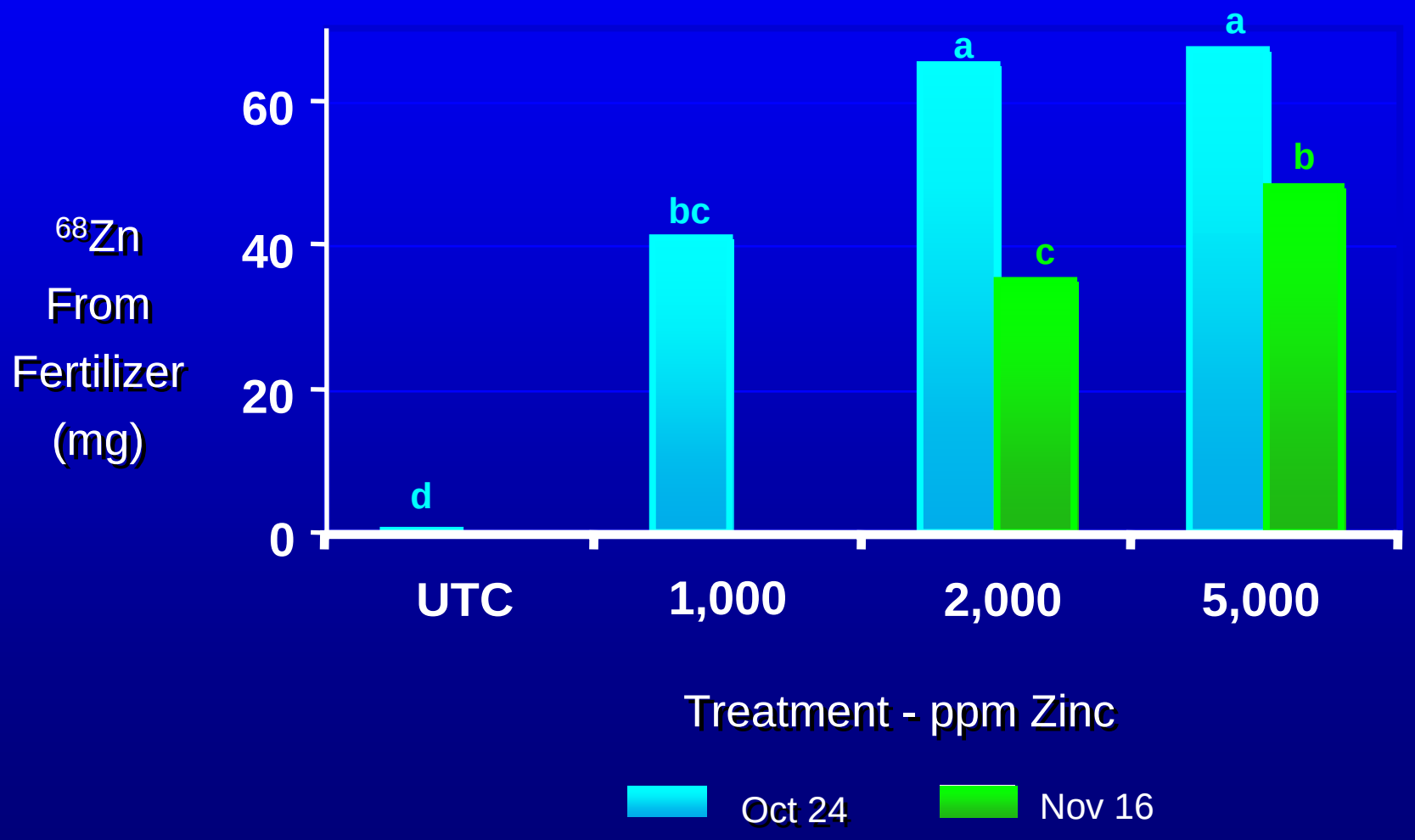

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(Timing, Rate, etc)

1. Spring – Phytotoxicity concerns

   Zn Oxide or Neutral Zn?

2. All Season – Low rate

   Efficiency?

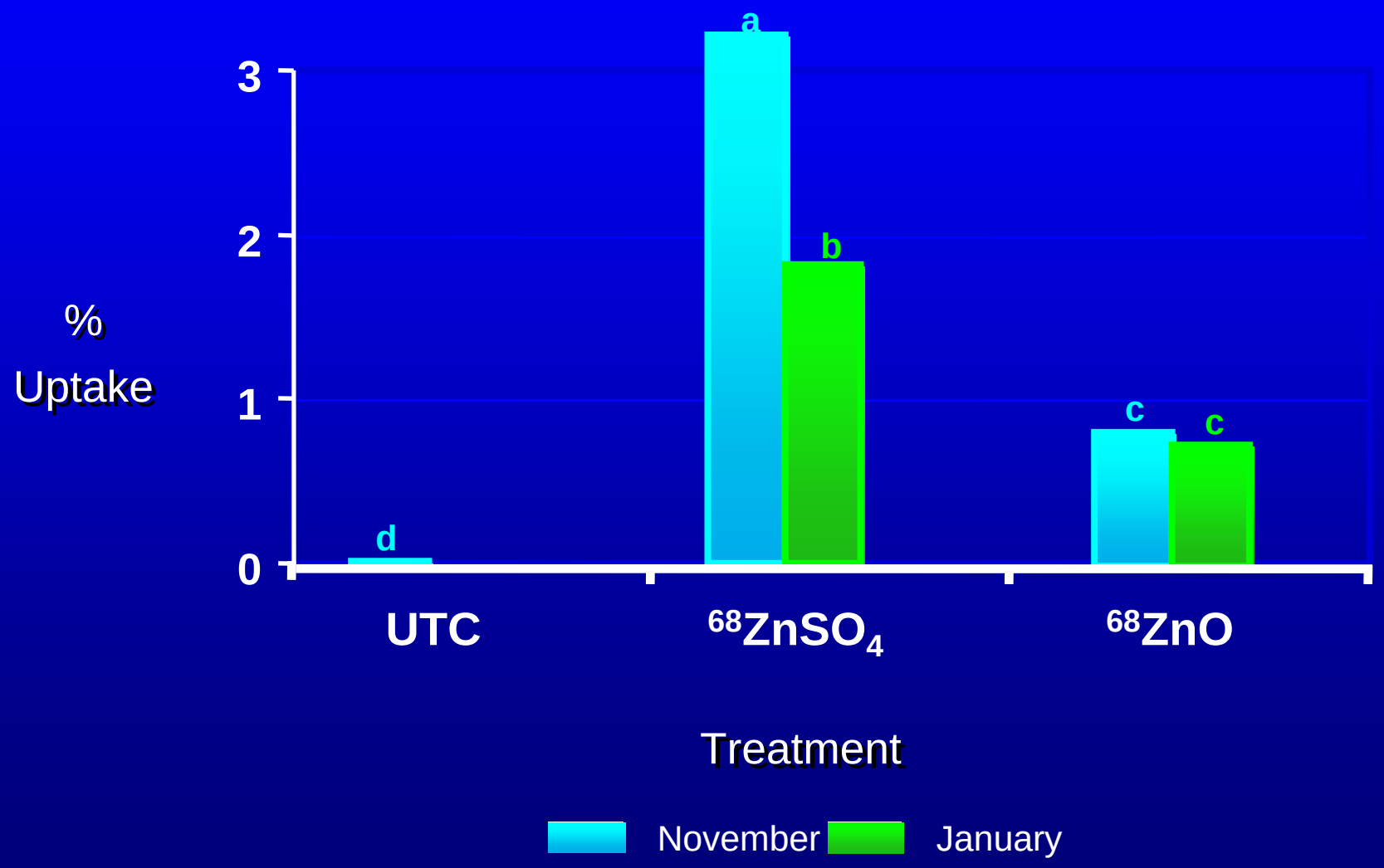
3. Fall or Dormant

   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



Surface Area of a Peach Shoot

$\underline{cm^2}$

Leaves = 1405

Shoot = 38

(1/40)

Buds = 7.6

(1/200)

Scars = 0.7

(1/2000)

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