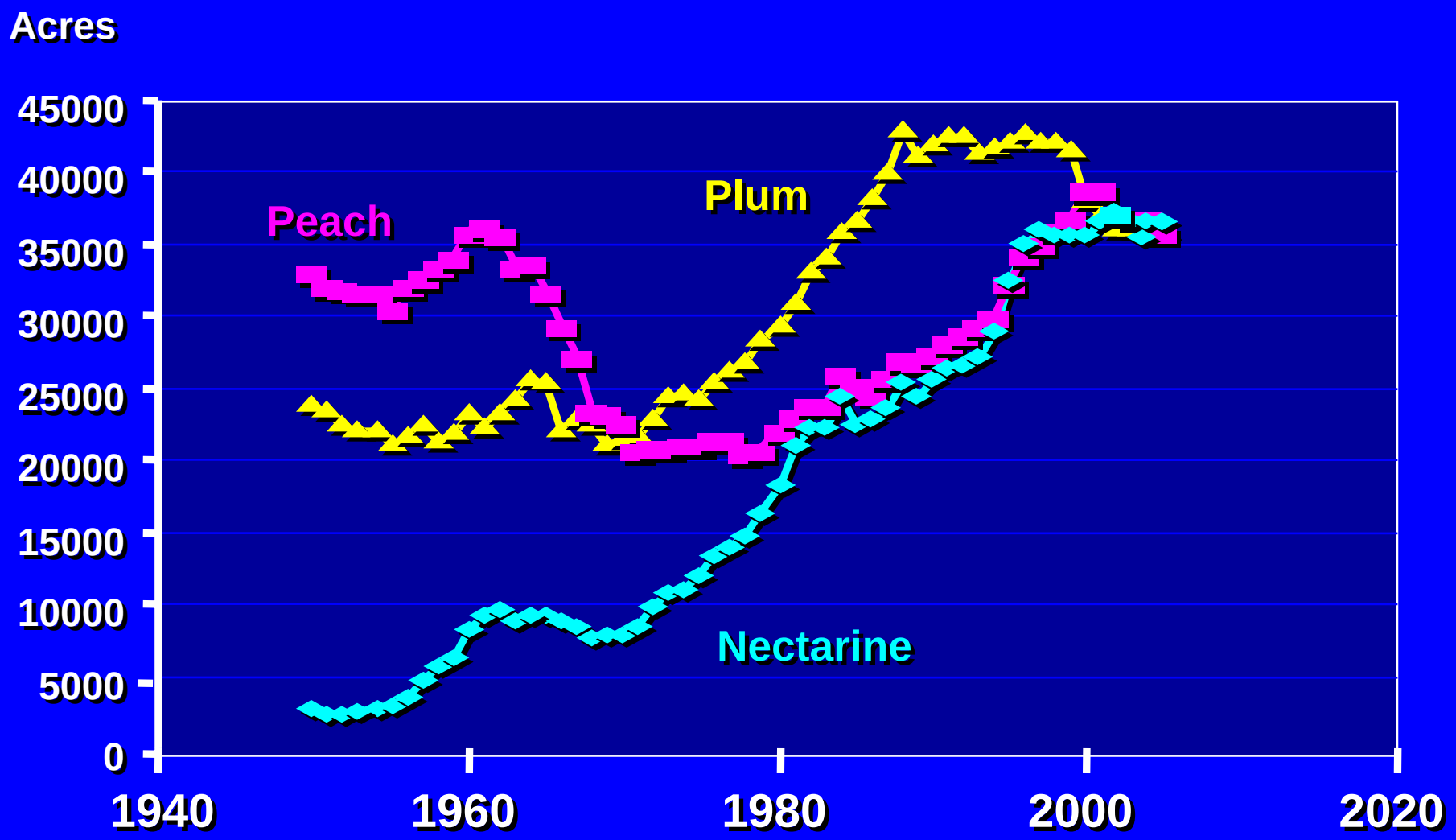
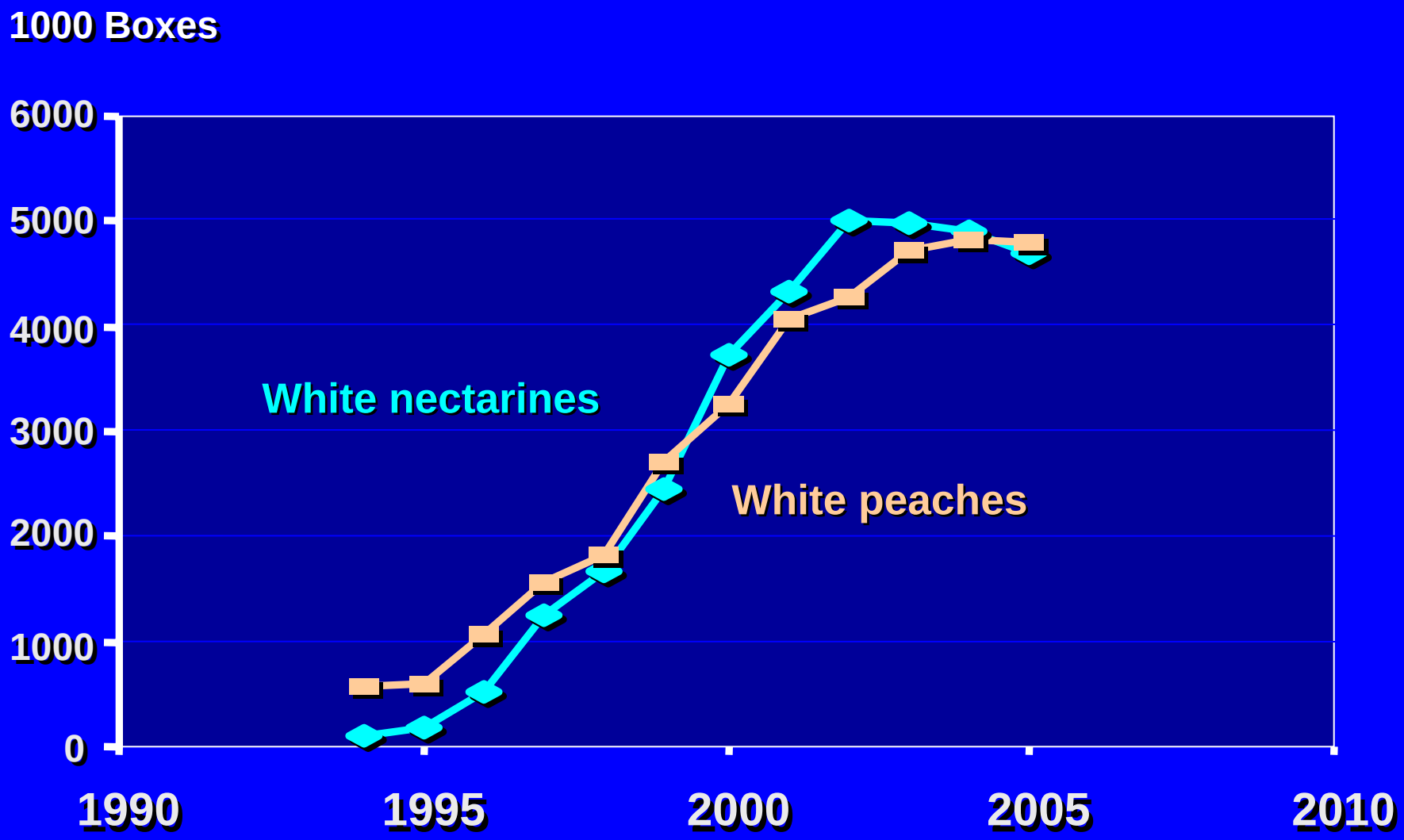

Optimizing Stone Fruit Nutrition

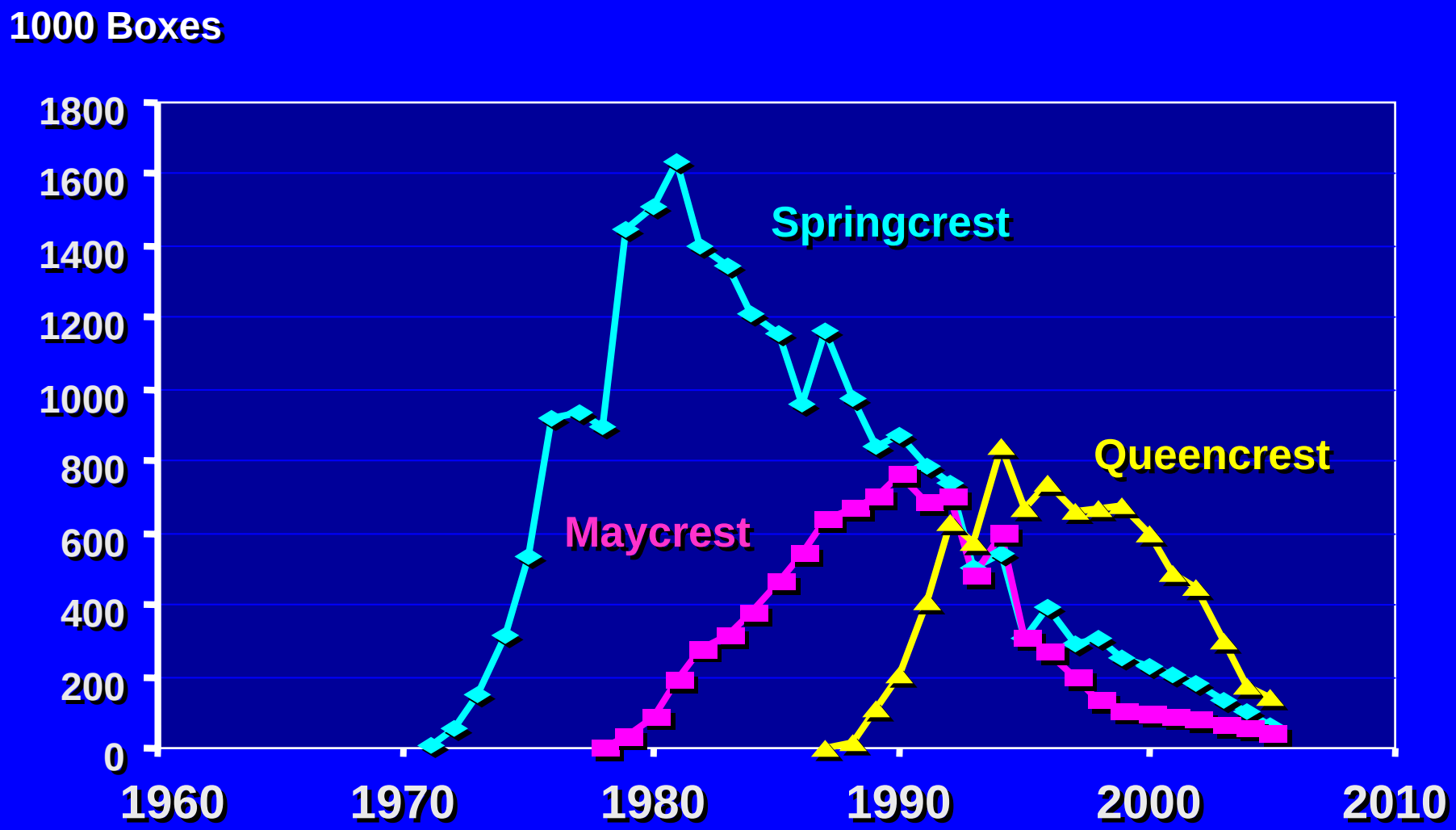
California Stone Fruit Acreage

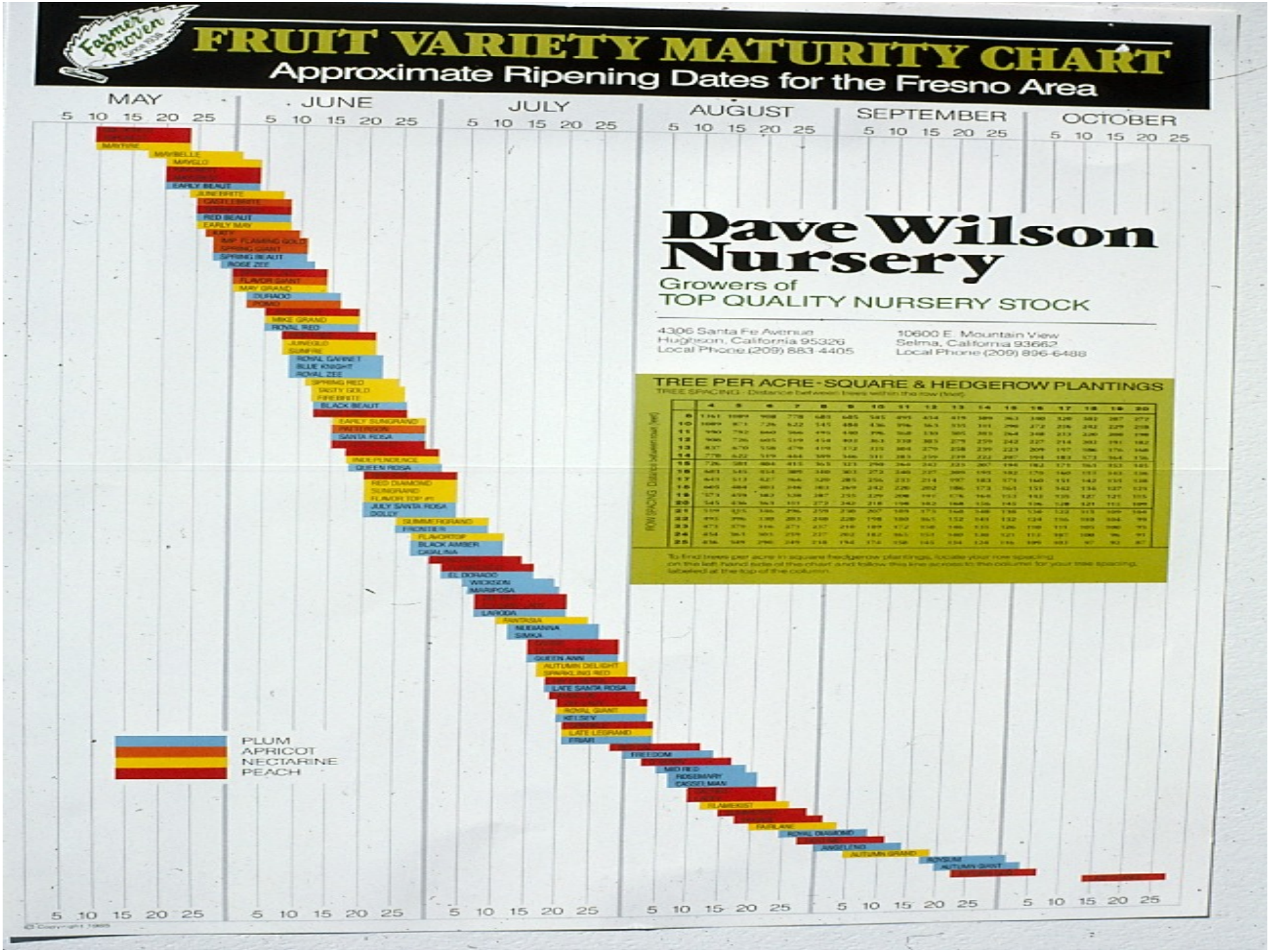


California Production of White Flesh Fruit

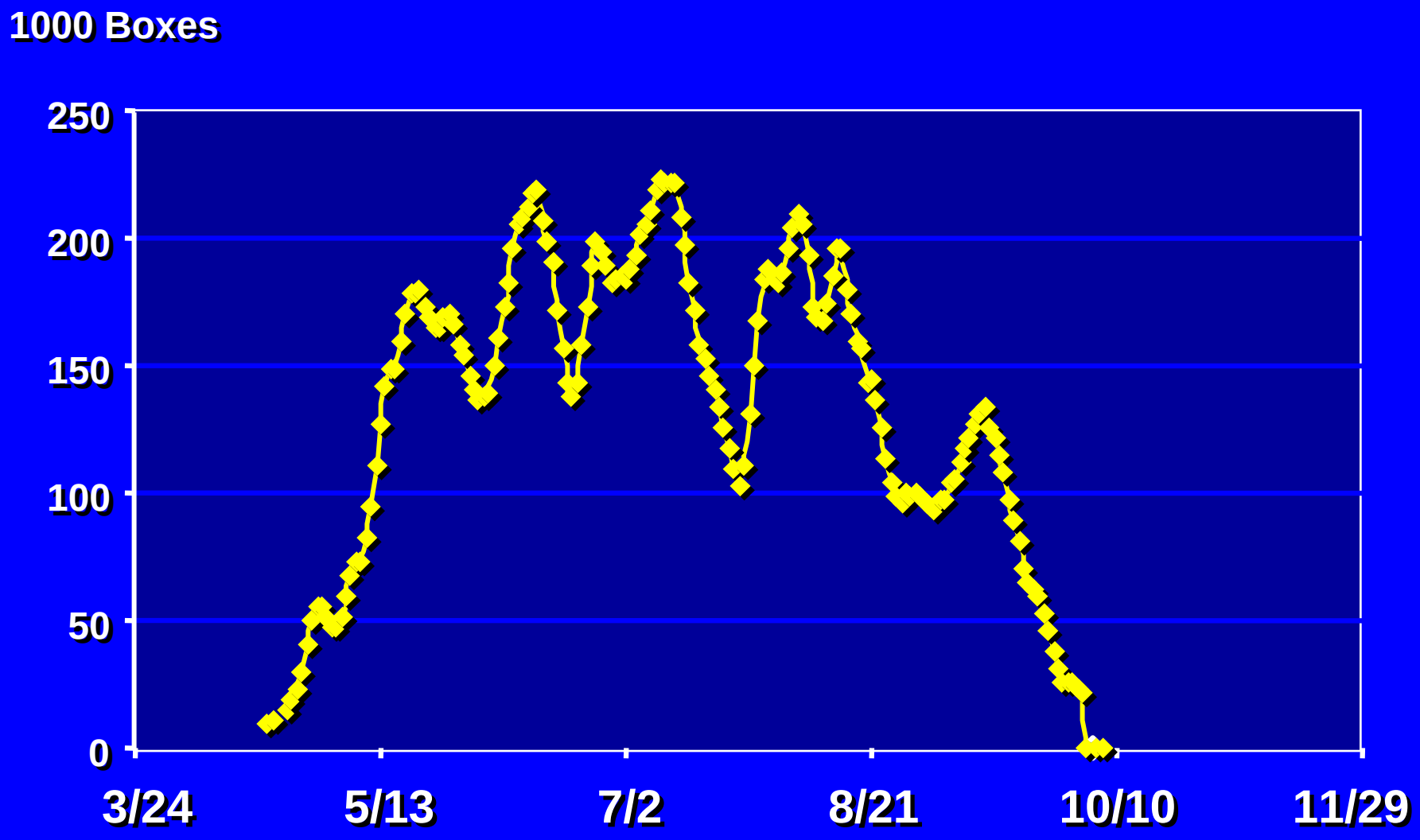


Early Peach Varieties

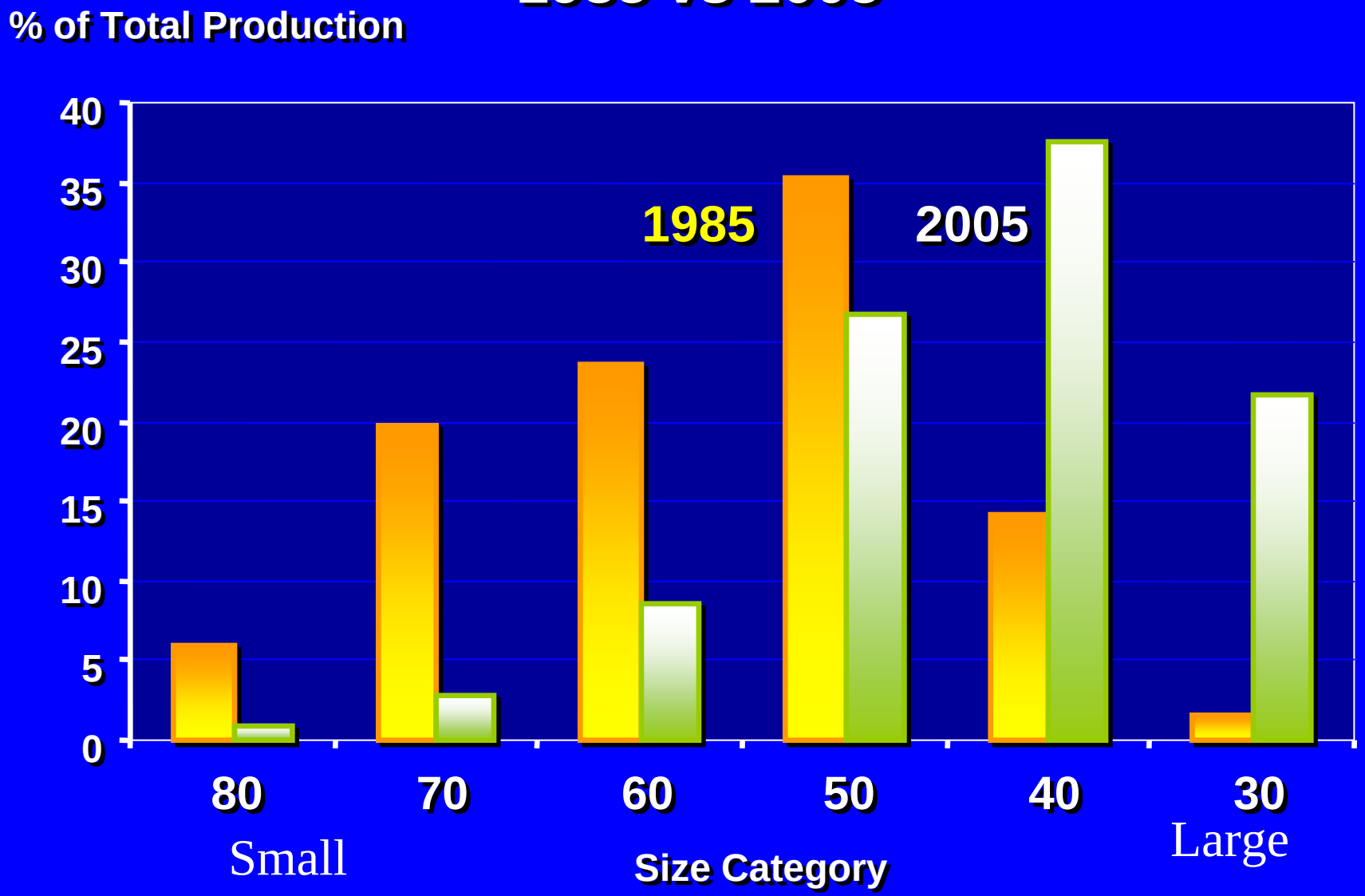


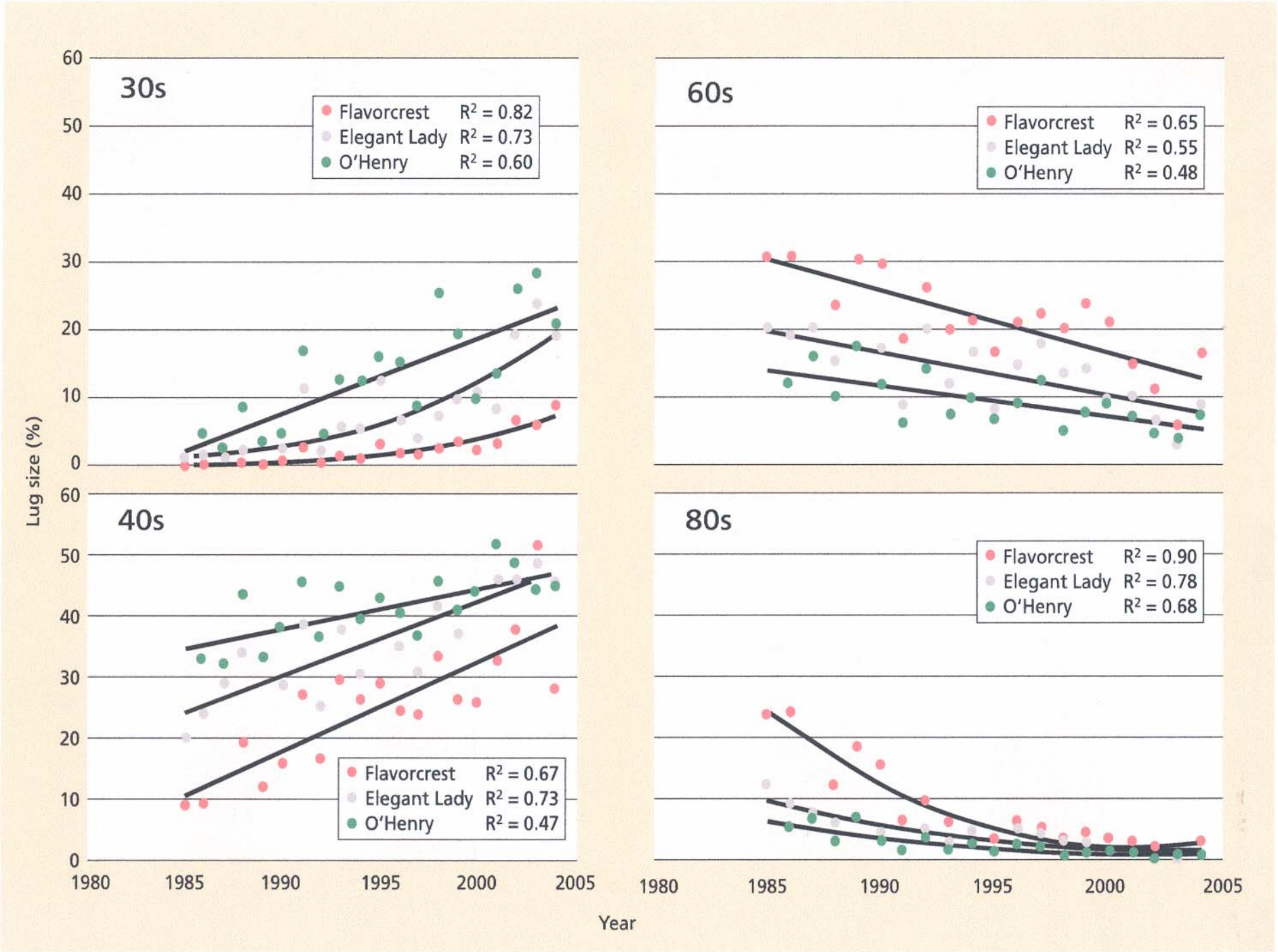

Farmer Proven
FRUIT VARIETY MATURITY CHART
Approximate Ripening Dates for the Fresno Area
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
5 10 15 20 25
MAYFIRE
MAYBELLE
MAYGLO
EARLY BEAUT
JUNEBRITE
CASTLEBRITE
RED BEAUT
EARLY MAY
IMP FLAMING GOLD
SPRING GIANT
SPRING BEAUT
ROSE ZEE
FLAVOR GIANT
MAY GRAND
DURADO
POMO
MIKE GRAND
ROYAL RED
JUNEGLO
SUNFIRE
ROYAL GARNET
BLUE KNIGHT
ROYAL ZEE
SPRING RED
TASTY GOLD
FIREBRITE
BLACK BEAUT
EARLY SUNGRAND
PATTERSON
SANTA ROSA
INDEPENDENCE
QUEEN ROSA
RED DIAMOND
SUNGRAND
FLAVOR TOP #1
JULY SANTA ROSA
DOLLY
SUMMERGRAND
FRONTIER
FLAVORTOP
BLACK AMBER
CAGALINA
EL DORADO
WICKSON
MARIPOSA
LARODA
FANTASIA
NUBIANNA
SIMKA
QUEEN ANN
AUTUMN DELIGHT
SPARKLING RED
LATE SANTA ROSA
ROYAL GIANT
KELSEY
LATE LEGRAND
FRIAR
FREEDOM
MID RED
ROSEMARY
CASSEL MAN
BLAMEKIST
FAIRLANE
ROYAL DIAMOND
ANGELENO
AUTUMN GRAND
ROYSUM
AUTUMN GIANT
PLUM
APRICOT
NECTARINE
PEACH
Dave Wilson Nursery
Growers of
TOP QUALITY NURSERY STOCK
4306 Santa Fe Avenue
Hughson, California 95326
Local Phone (209) 883-4405
10600 E. Mountain View
Selma, California 93662
Local Phone (209) 896-6488
TREE PER ACRE - SQUARE & HEDGEROW PLANTINGS
TREE SPACING - Distance between trees within the row (feet)
ROW SPACING - Distance between rows (feet)
To find trees per acre in square hedgerow plantings, locate your row spacing on the left hand side of the chart and follow this line across to the column for your tree spacing, labeled at the top of the column.

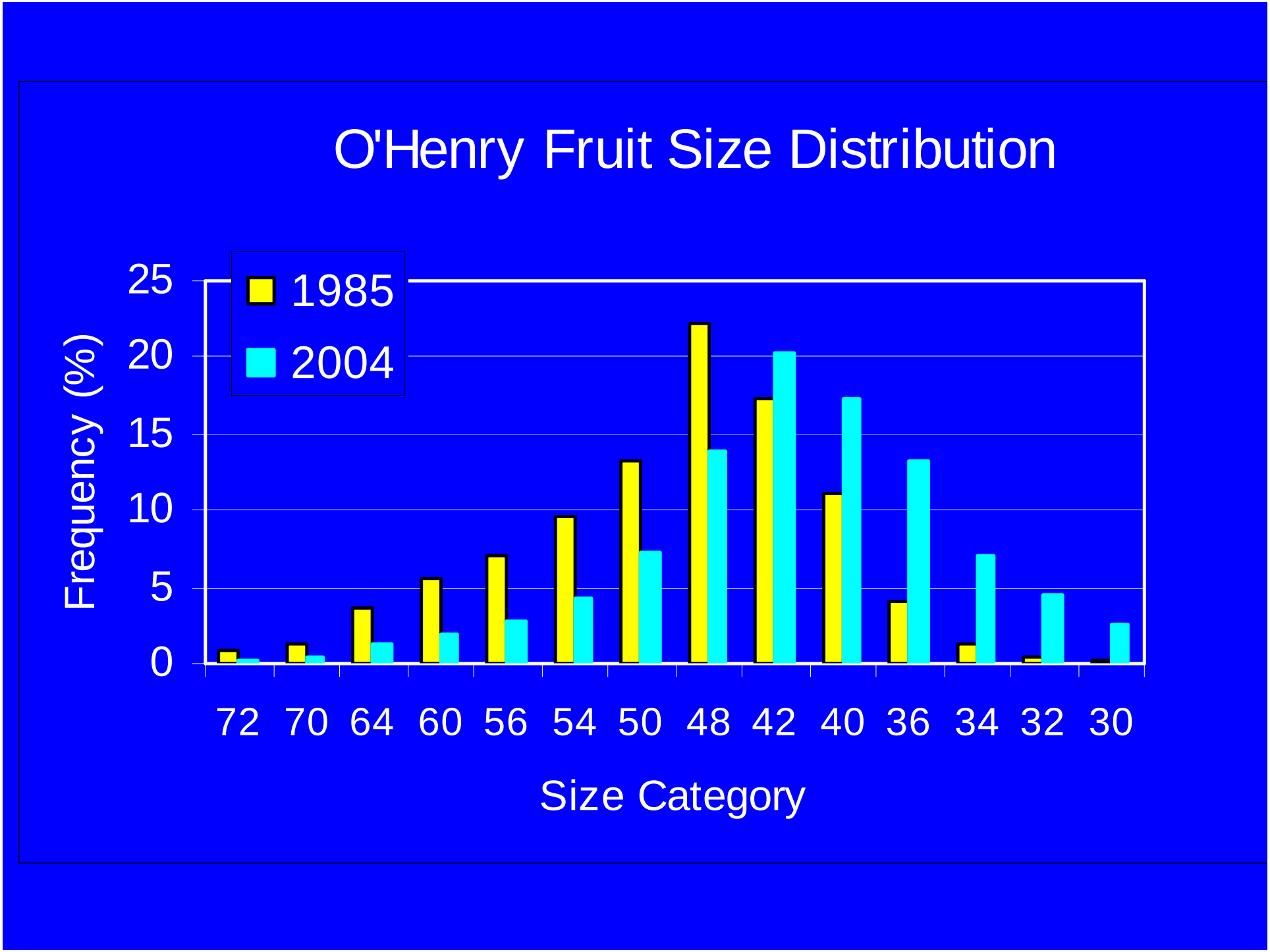
Daily Peach Packout 2005



Size Distribution of California Peaches
1985 vs 2005




30s
Flavorcrest R² = 0.82
Elegant Lady R² = 0.73
O'Henry R² = 0.60
60s
Flavorcrest R² = 0.65
Elegant Lady R² = 0.55
O'Henry R² = 0.48
40s
Flavorcrest R² = 0.67
Elegant Lady R² = 0.73
O'Henry R² = 0.47
80s
Flavorcrest R² = 0.90
Elegant Lady R² = 0.78
O'Henry R² = 0.68
Lug size (%)
0
10
20
30
40
50
60
1980
1985
1990
1995
2000
2005
Year


O'Henry Fruit Size Distribution
1985
2004
Frequency (%)
25
20
15
10
5
0
72 70 64 60 56 54 50 48 42 40 36 34 32 30
Size Category

O’Henry Peach Comparison

1985	2004
48 Peak Size	42 Peak Size
976 Fruit/Tree	523 Fruit/Tree
2770 Boxes/Acre	1660 Boxes/Acre


SPALDING.
Settlers
Catan









Trees Planted in Sand Tanks

Zee Lady Peach
Grand Pearl Nectarine
Fortune Plum



Sand Tank Treatments

1. All Nutrients
2. No Nutrients
3. No Nitrogen
4. No Phosphorus - 2
5. No Potassium - 2
6. No Calcium - 2
7. No Sulfur
8. No Magnesium - 2
9. No Micronutrients - 3

(Mn, B, Zn, Cu, Fe, Mo)



Deficiency Symptoms





Zee Lady Fruit Size





Occurrence of Nutrient Deficiencies in California

- Common
  - Nitrogen
  - Zinc
  - Iron
- Occasional
  - Potassium
  - Magnesium
  - Manganese
- Rare
  - Phosphorus
  - Boron
  - Copper
- Unknown
  - Calcium
  - Sulfur
  - Molybdenum



Nitrogen



Nitrogen Deficiency





Nitrogen Deficiency





Nitrogen Response

Low N

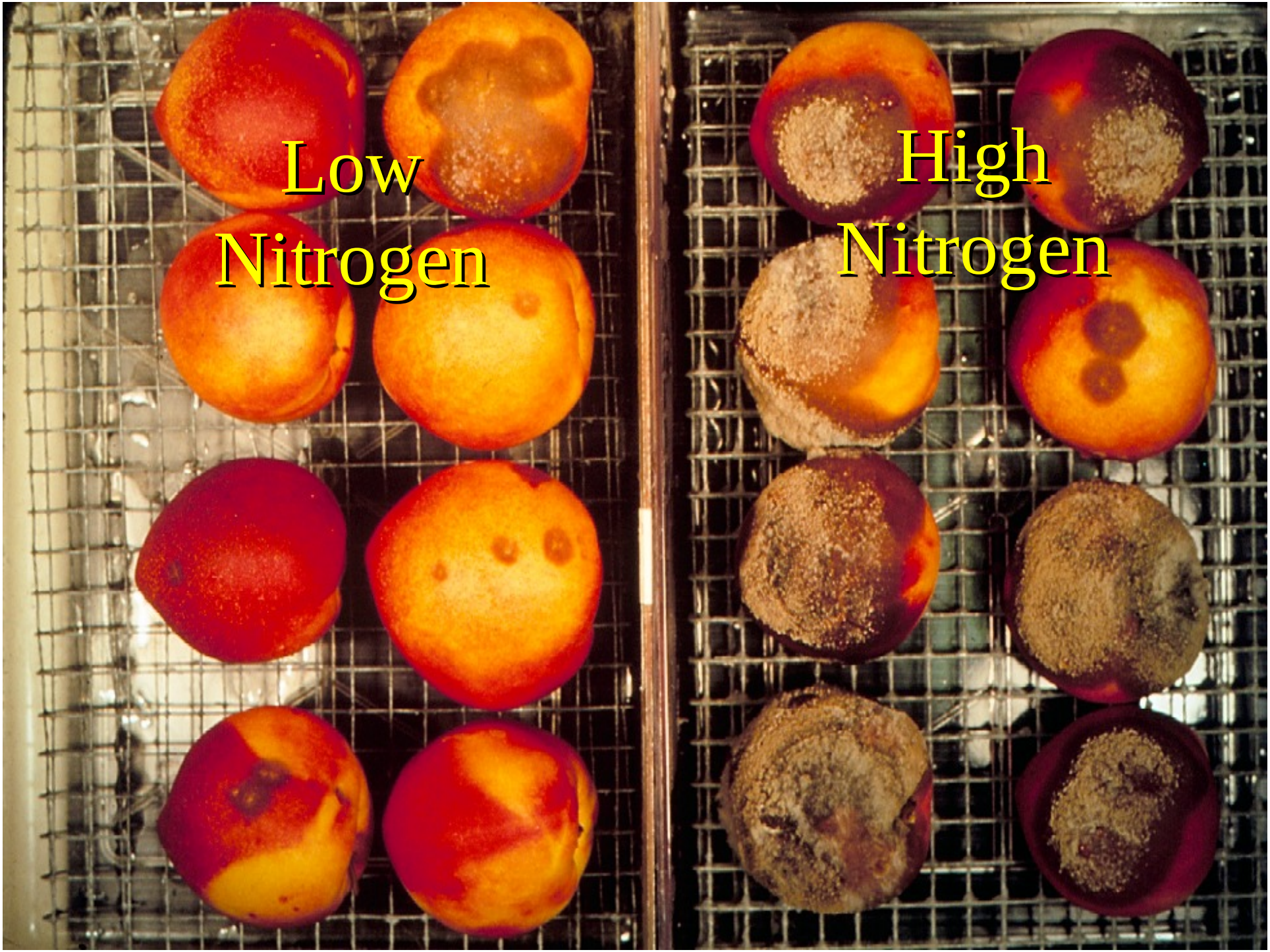
High N










Low
Nitrogen
High
Nitrogen




100 lbs N
175 lbs N
250 lbs N
325 lb

Nitrogen Fertilization

- 1980s survey
  - 150 lbs N/acre
- Recent experience
  - 50 to 75 lbs N/acre
- Improved efficiency
  - N in well water
  - Split applications
  - Better timing
  - Fertigation

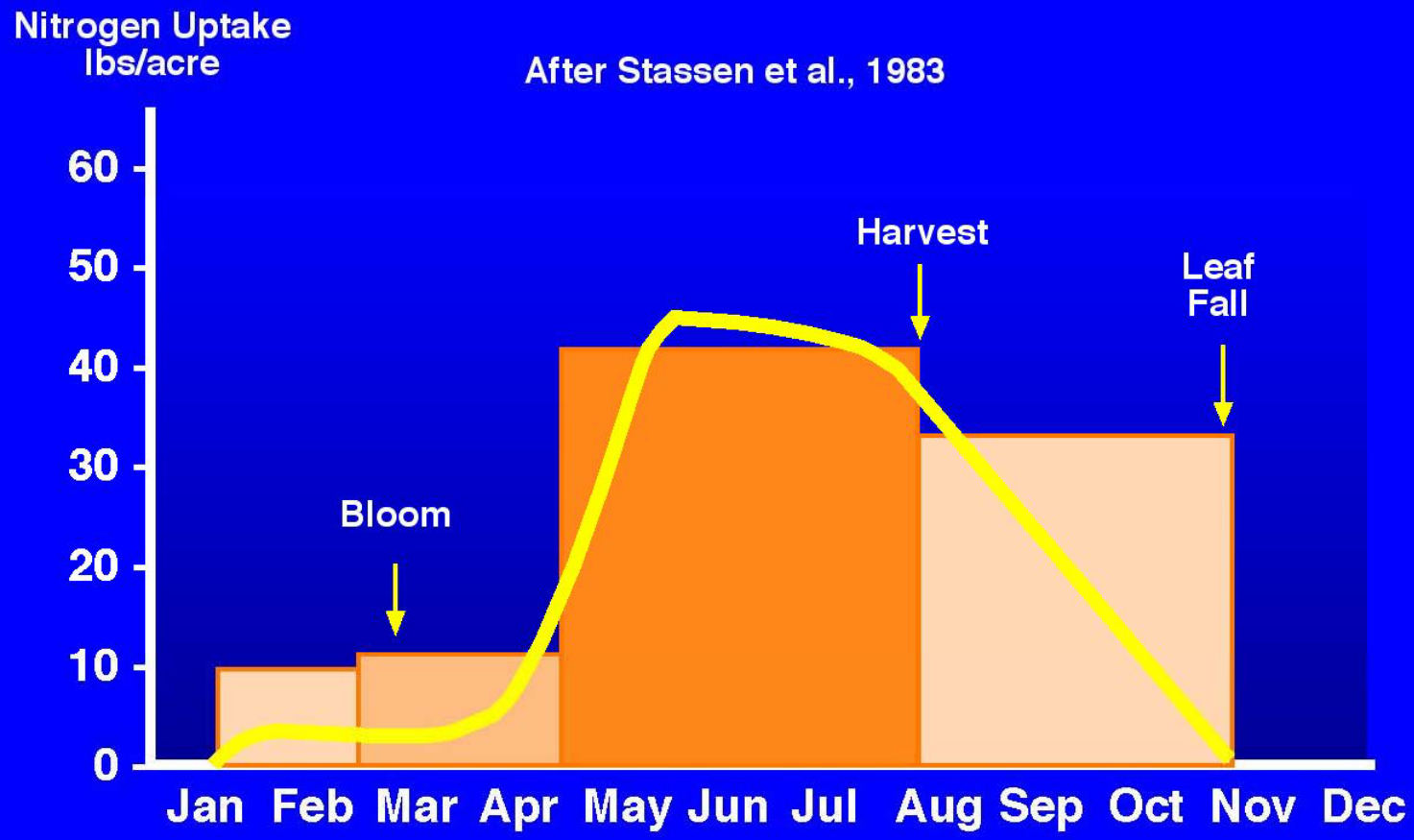


Nutrient Elements in Stone Fruit

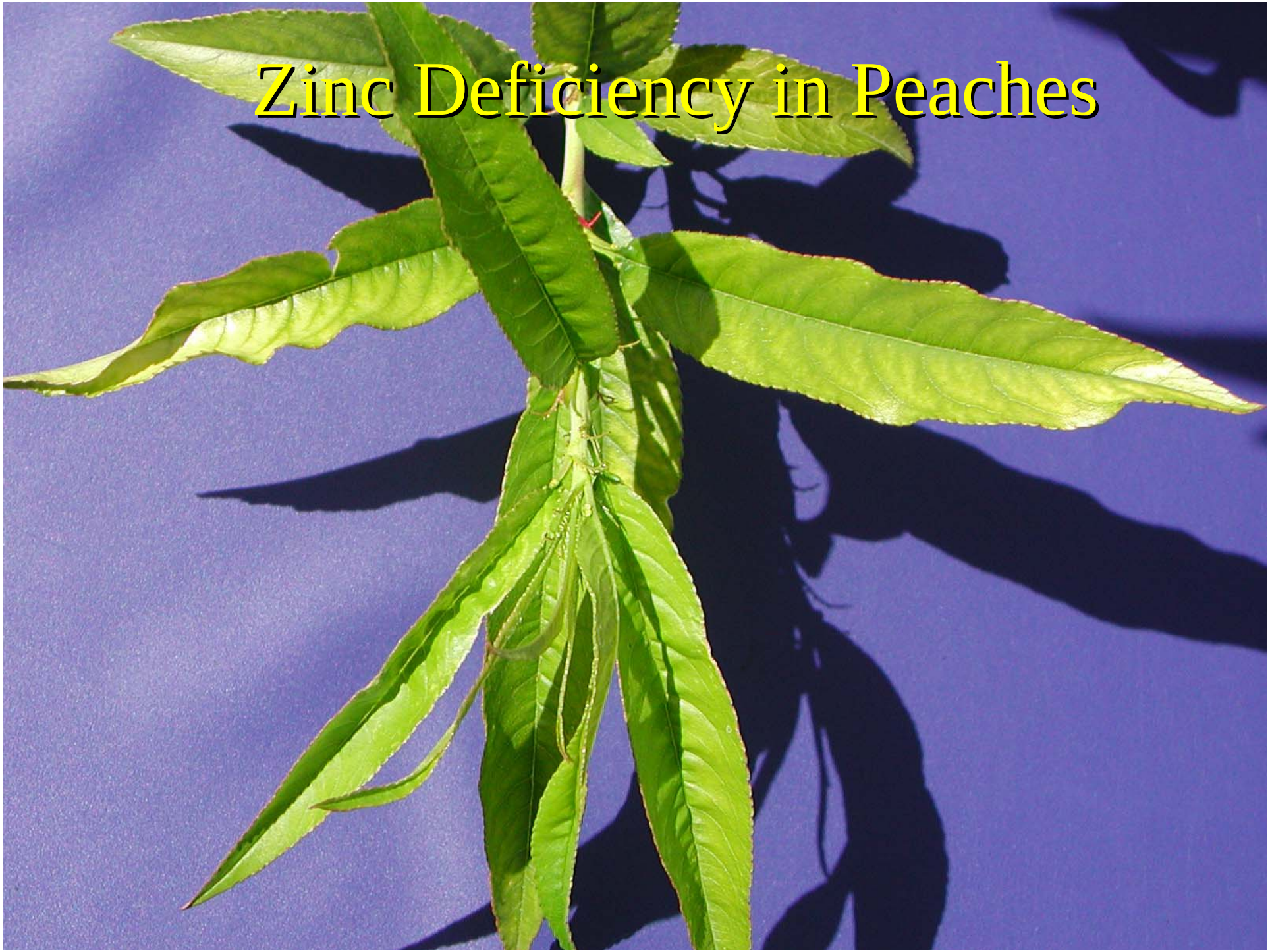
Level in leaves

	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	-	-	-	-	-	-

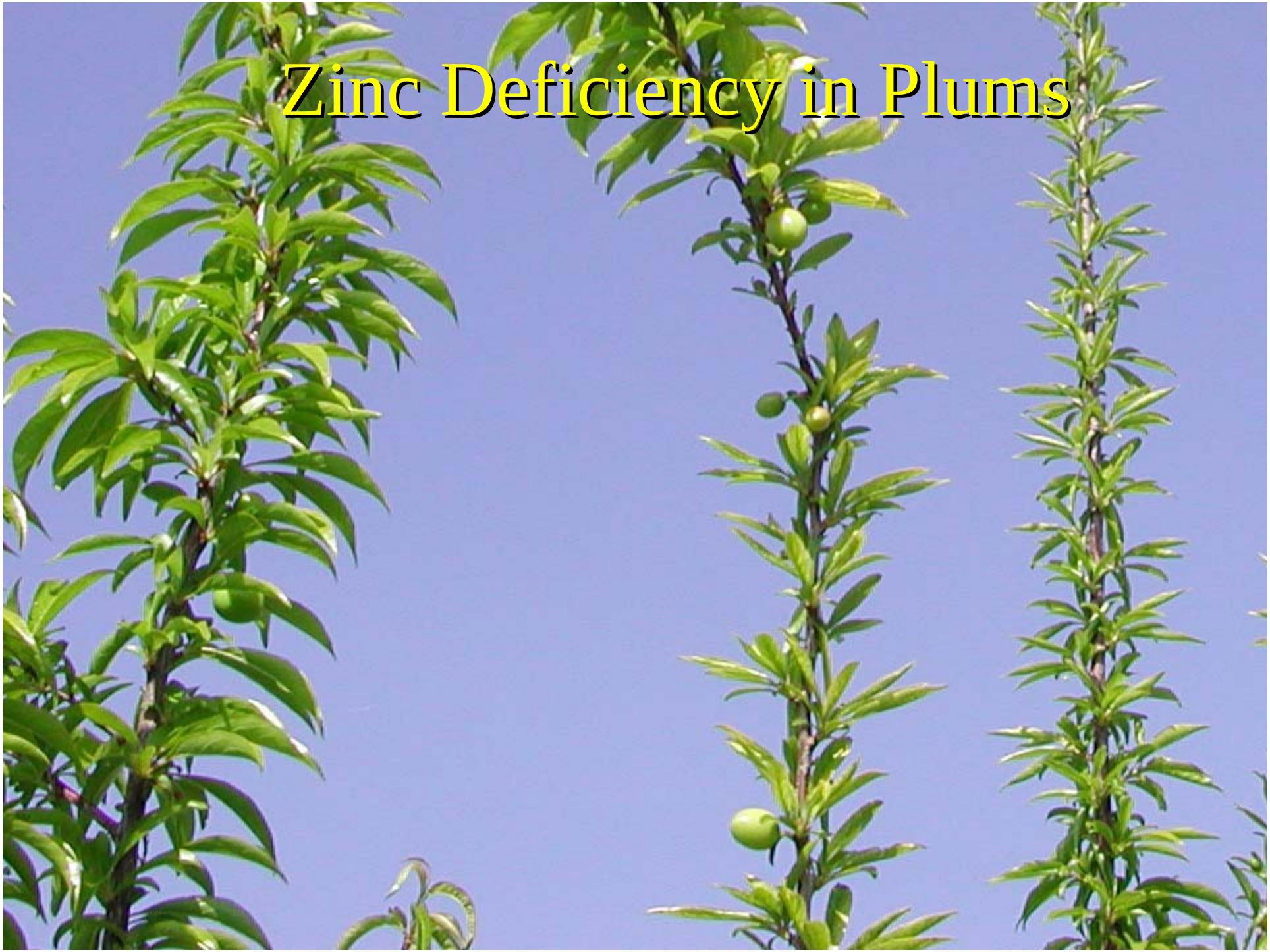
Nitrogen Uptake by Mature Peach Trees




Zinc Deficiency
“Little Leaf” Disorder


Zinc Deficiency in Peaches


Zinc Deficiency in Plums


Zinc Deficiency in Plums

Zinc Deficiency in Peaches









February 7, 2005





Zn Deficient

Zn Sufficient

February 14, 2005





Zn Deficient

Zn Sufficient

February 22, 2005





Zn Deficient

Zn Sufficient

February 25, 2005



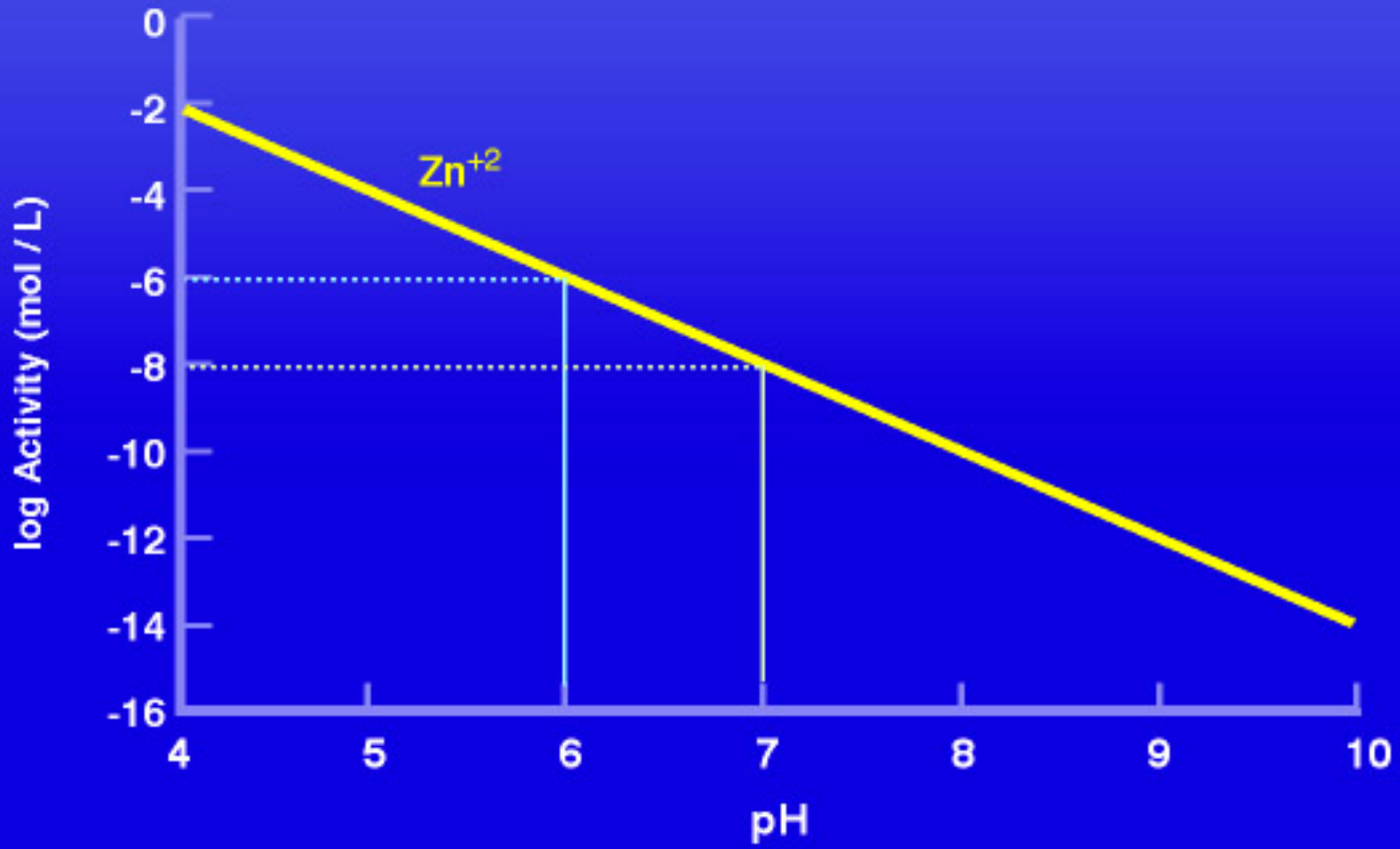


Zn Deficient

Zn Sufficient

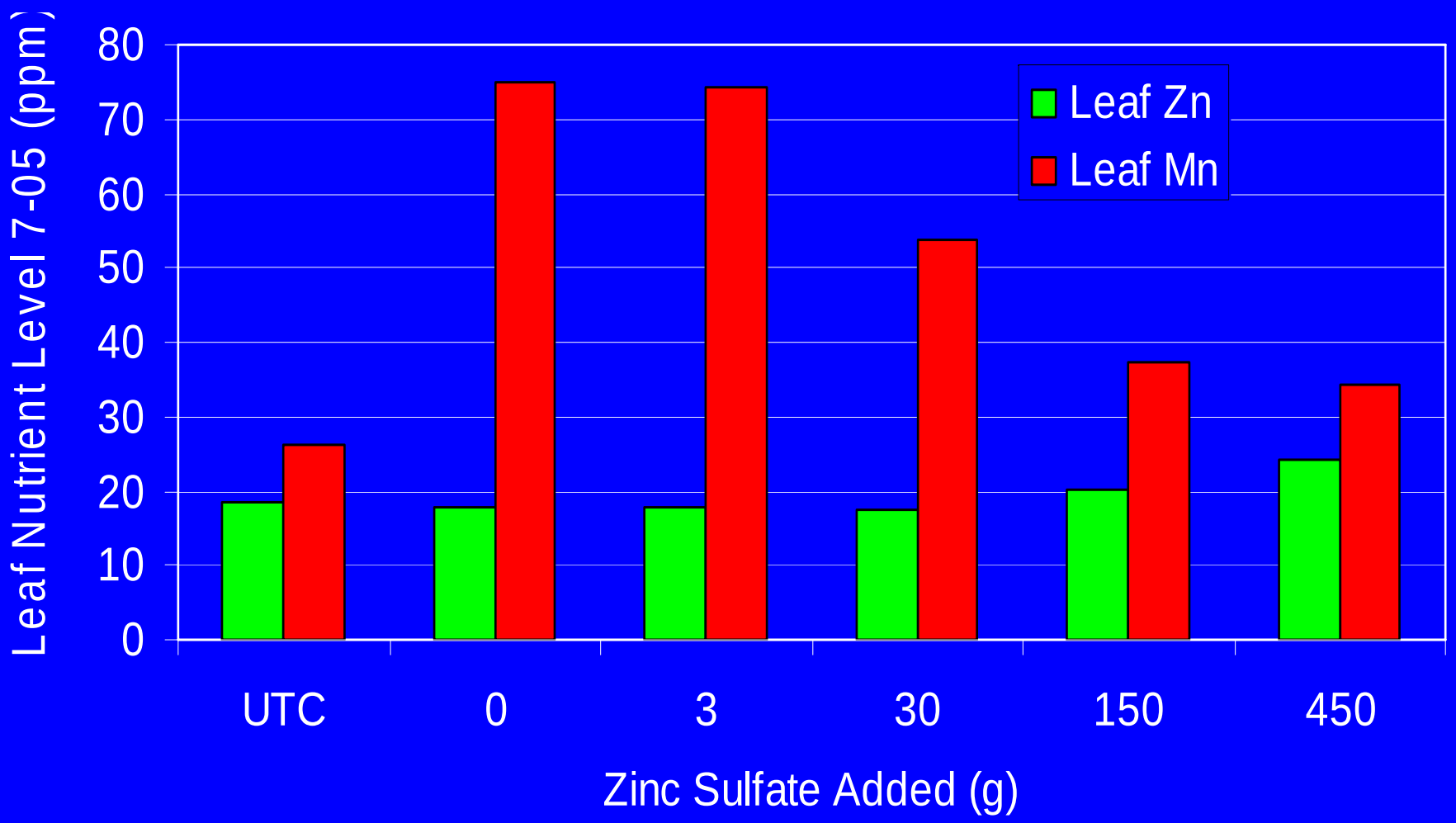
Soil Approaches to Correcting Zn Deficiency

Drop from pH 7 to 6
= 100x more Zn^{+2} in Soil Solution

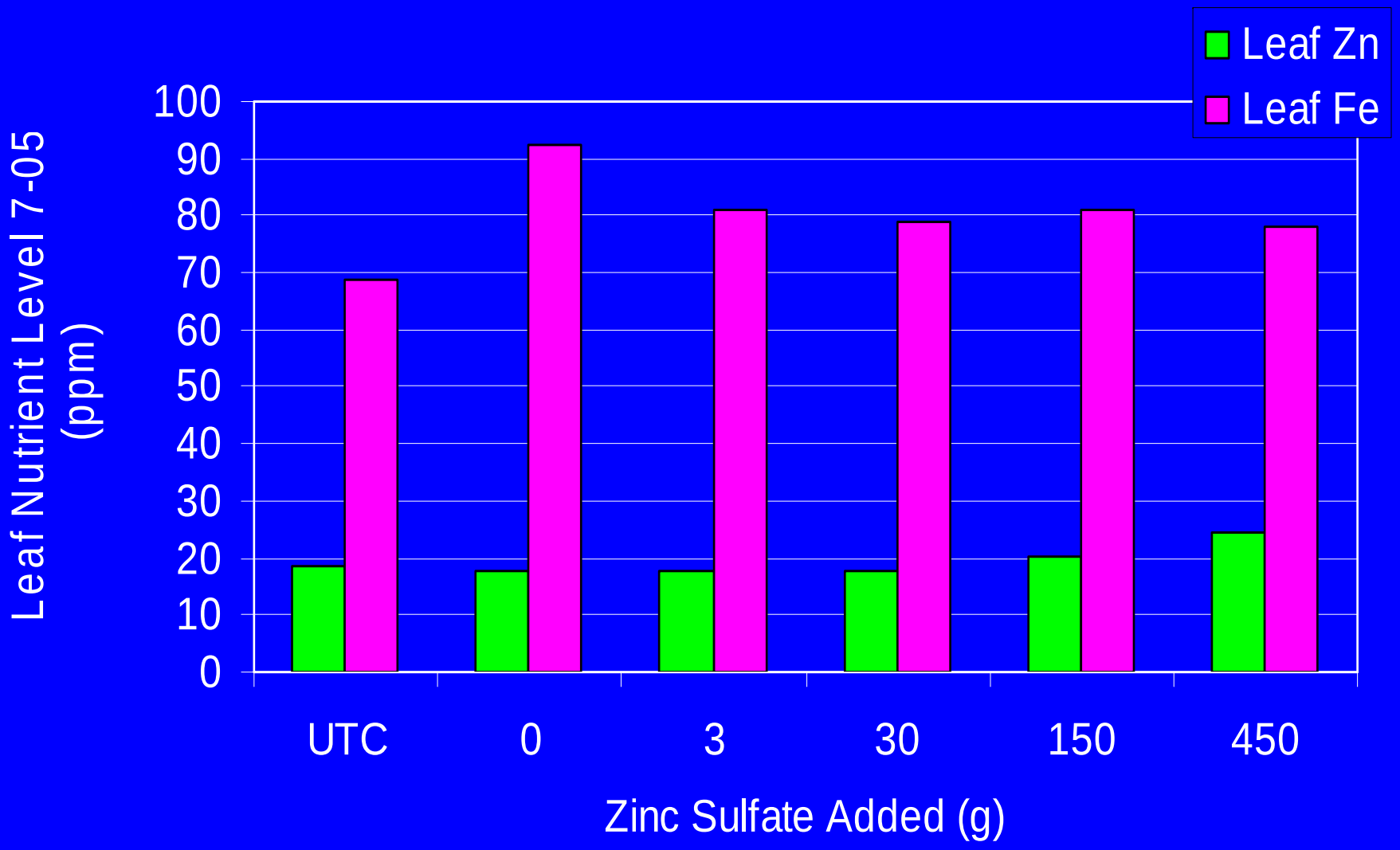




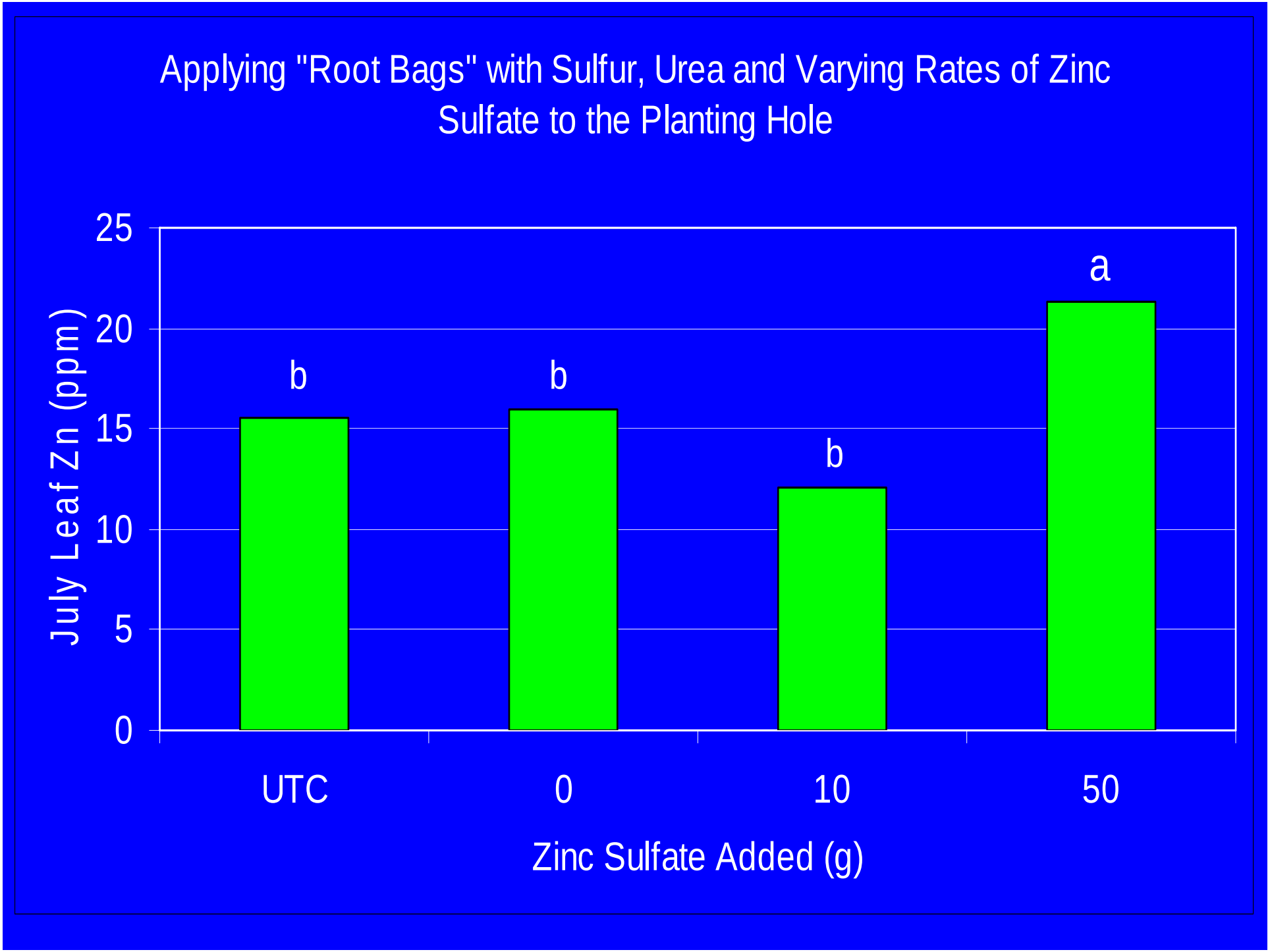
Adding Sulfur, Urea & Varying Rates of Zinc Sulfate to Peach Root Zone 7-04

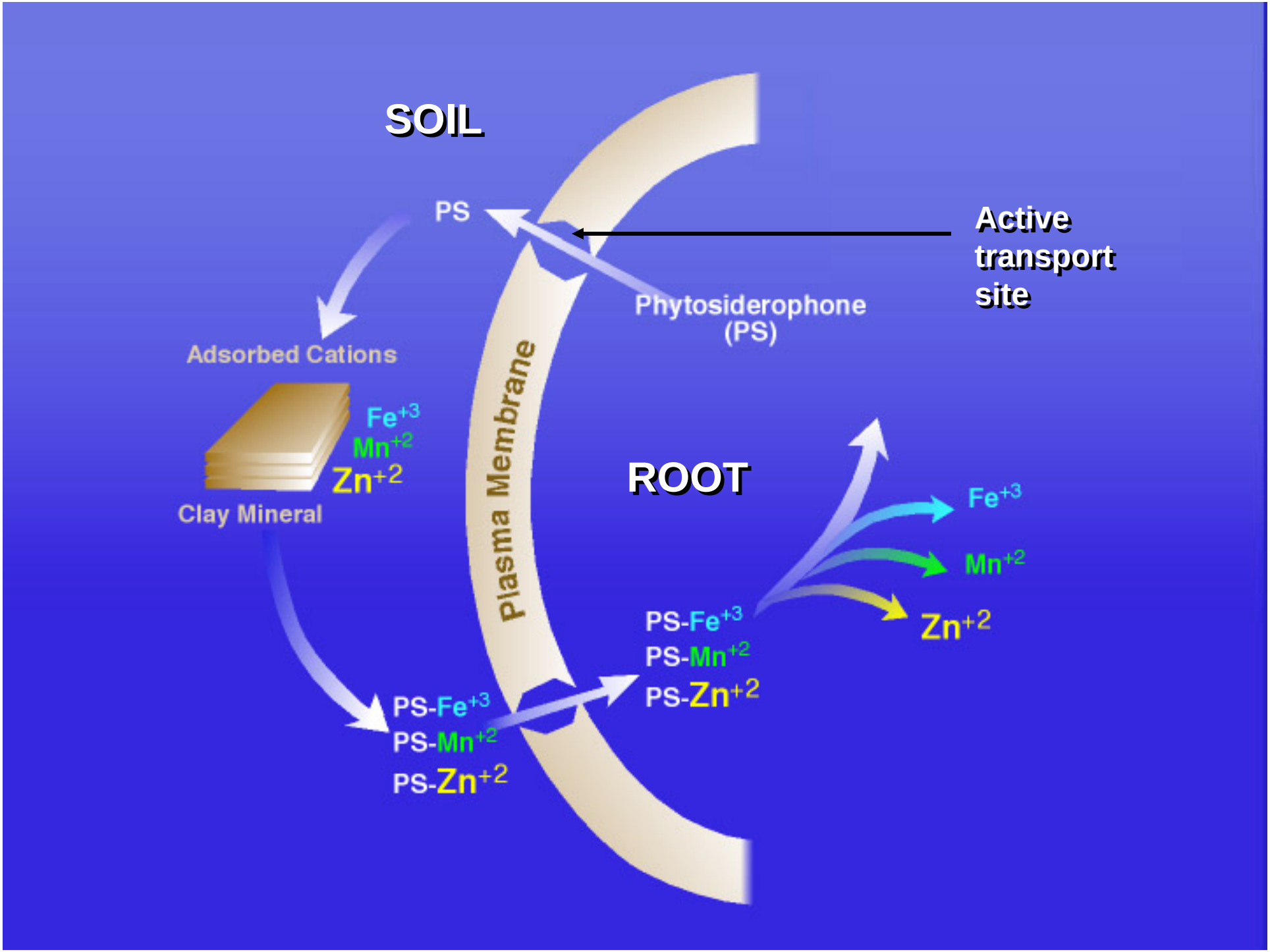


Adding Sulfur, Urea & Varying Rates of Zinc Sulfate to Peach Root Zone 7-04



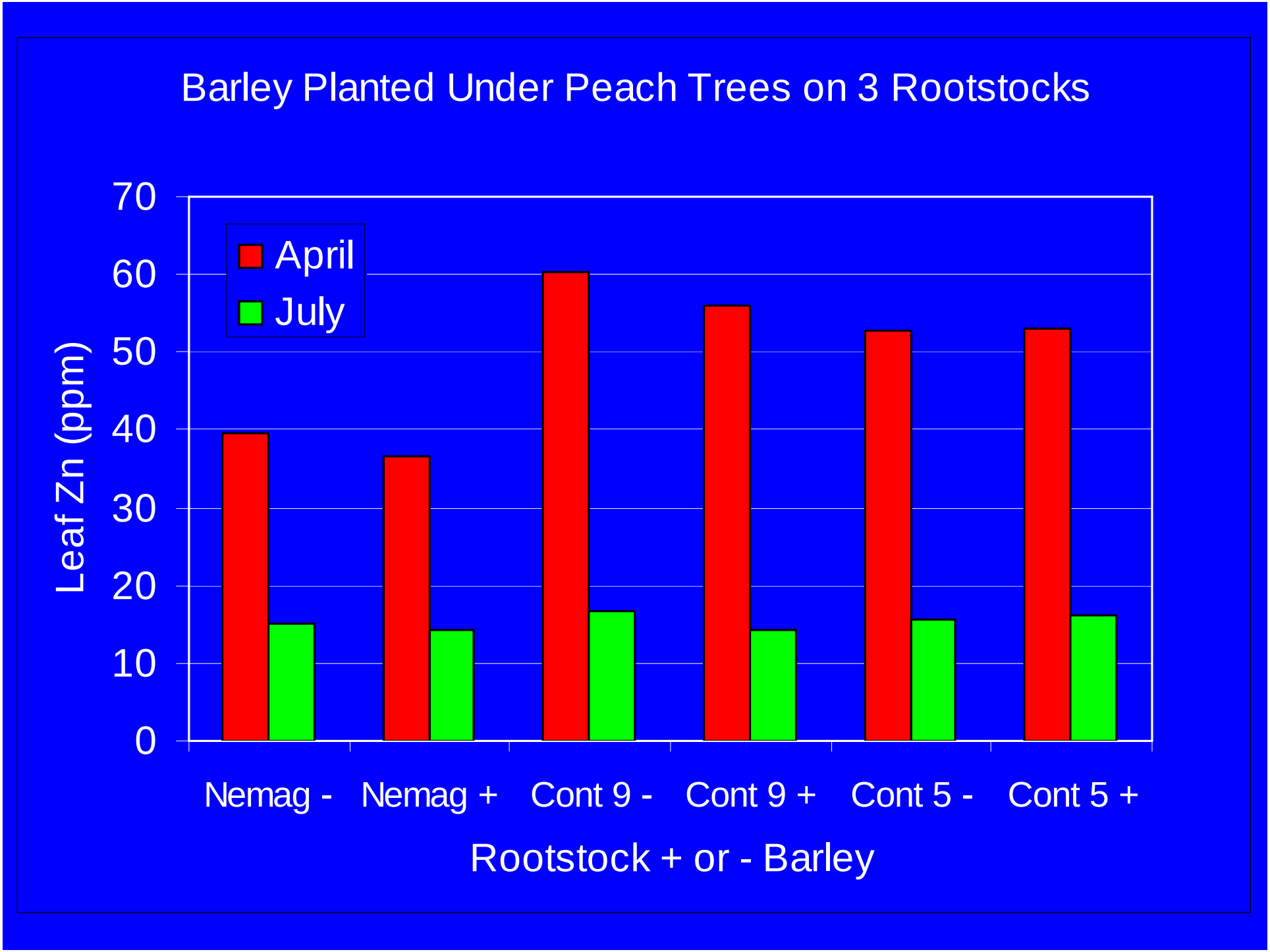



Applying "Root Bags" with Sulfur, Urea and Varying Rates of Zinc Sulfate to the Planting Hole
July Leaf Zn (ppm)
25
20
15
10
5
0
b
b
b
a
UTC
0
10
50
Zinc Sulfate Added (g)


SOIL
PS
Active transport site
Phytosiderophone (PS)
Adsorbed Cations
Fe+3
Mn+2
Zn+2
Clay Mineral
Plasma Membrane
ROOT
Fe+3
Mn+2
Zn+2
PS-Fe+3
PS-Mn+2
PS-Zn+2
PS-Fe+3
PS-Mn+2
PS-Zn+2






Barley Planted Under Peach Trees on 3 Rootstocks
Leaf Zn (ppm)
70
60
50
40
30
20
10
0
April
July
Nemag -
Nemag +
Cont 9 -
Cont 9 +
Cont 5 -
Cont 5 +
Rootstock + or - Barley





Foliar Zinc Formulations

1. Zn Nitrate
2. Zn Chelate - EDTA
3. Amino Acid Complex
4. Zn Lignosulfonate
5. Fulvic Acid Complex
6. Zn Sulfate – 36%
7. Neutral Zn – 52%





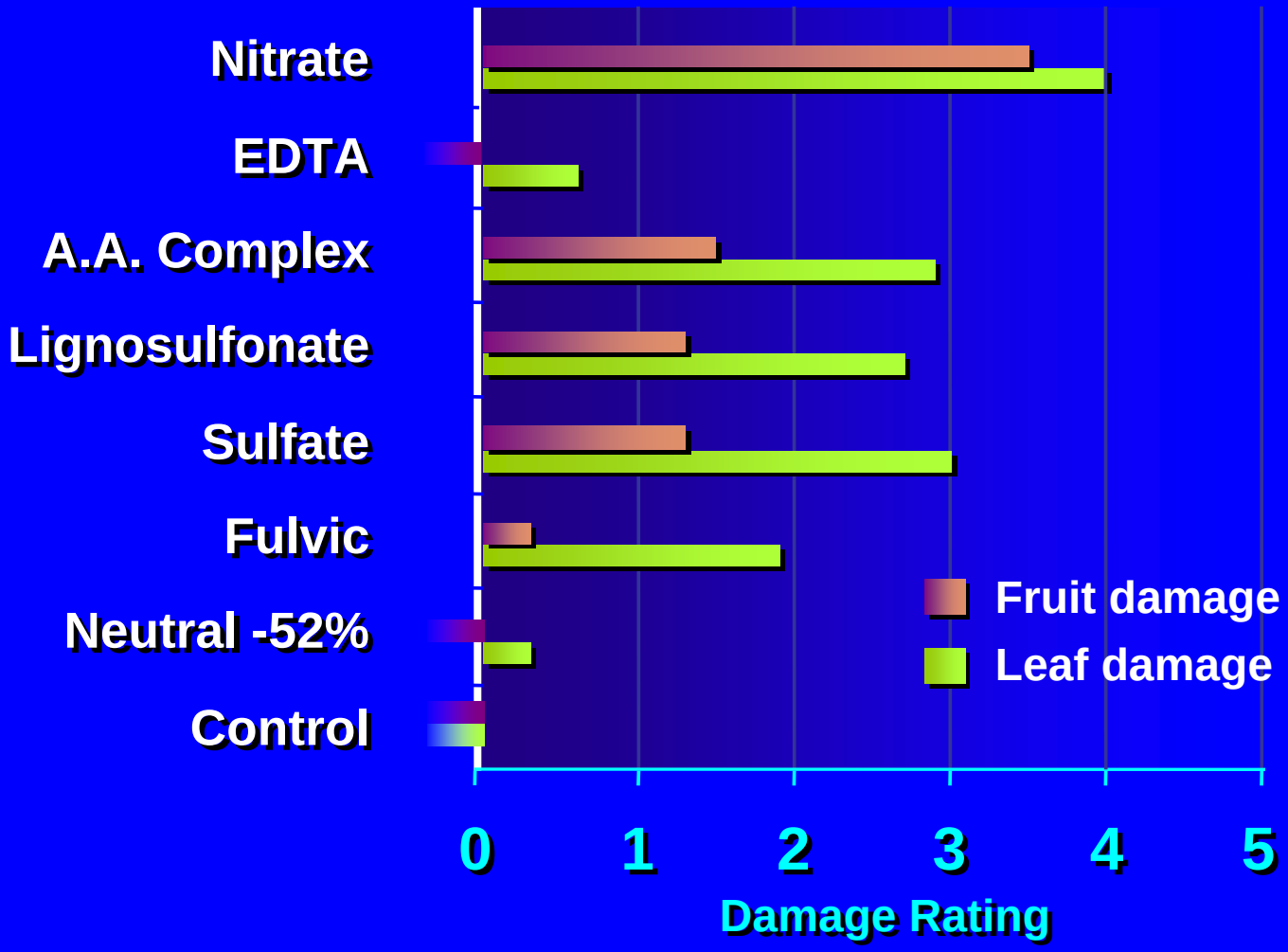






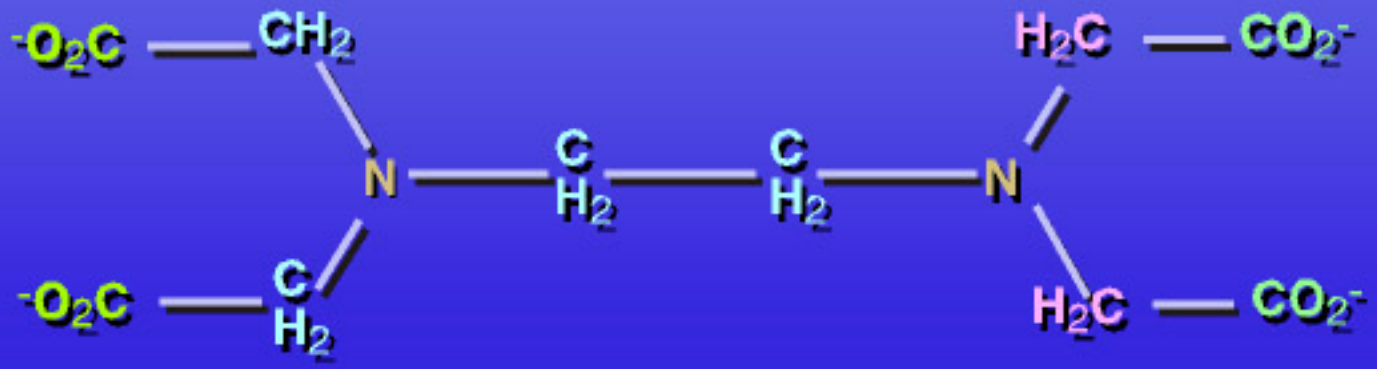


Leaf & Fruit Damage on Peach, Plum and Apricot Trees Sprayed in April with Different Formulations of Zn at 1,000 ppm

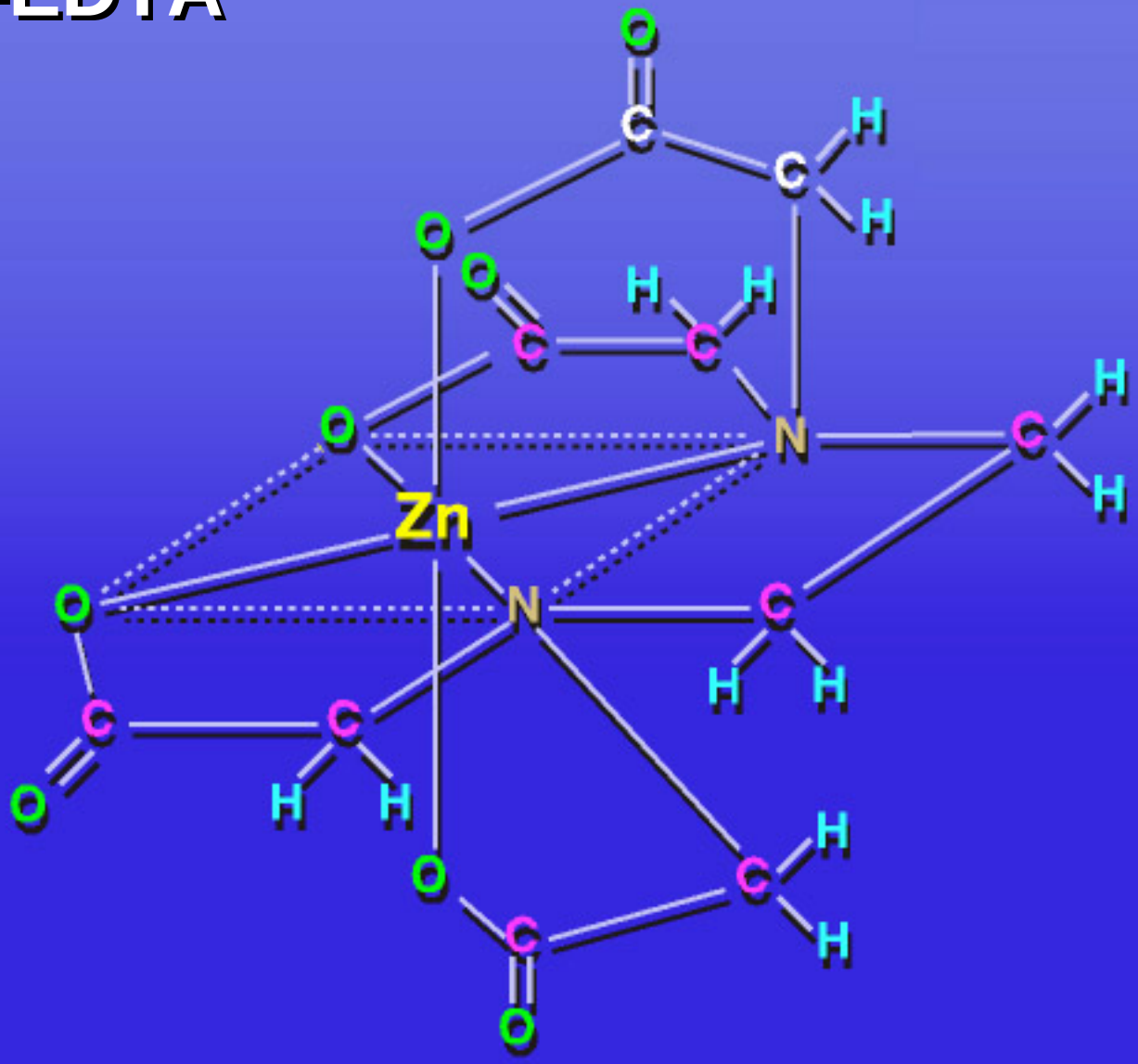




EDTA



Zn-EDTA



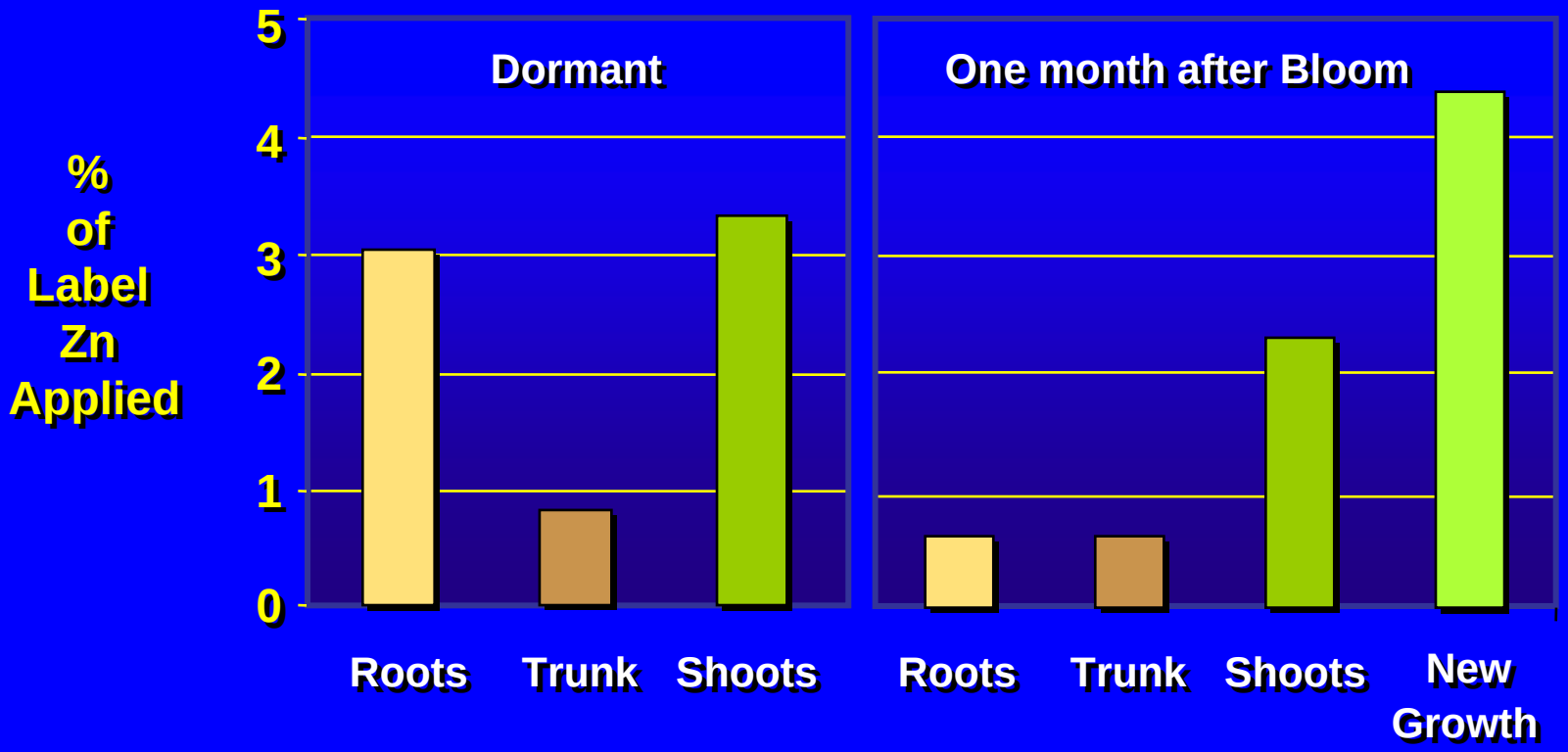








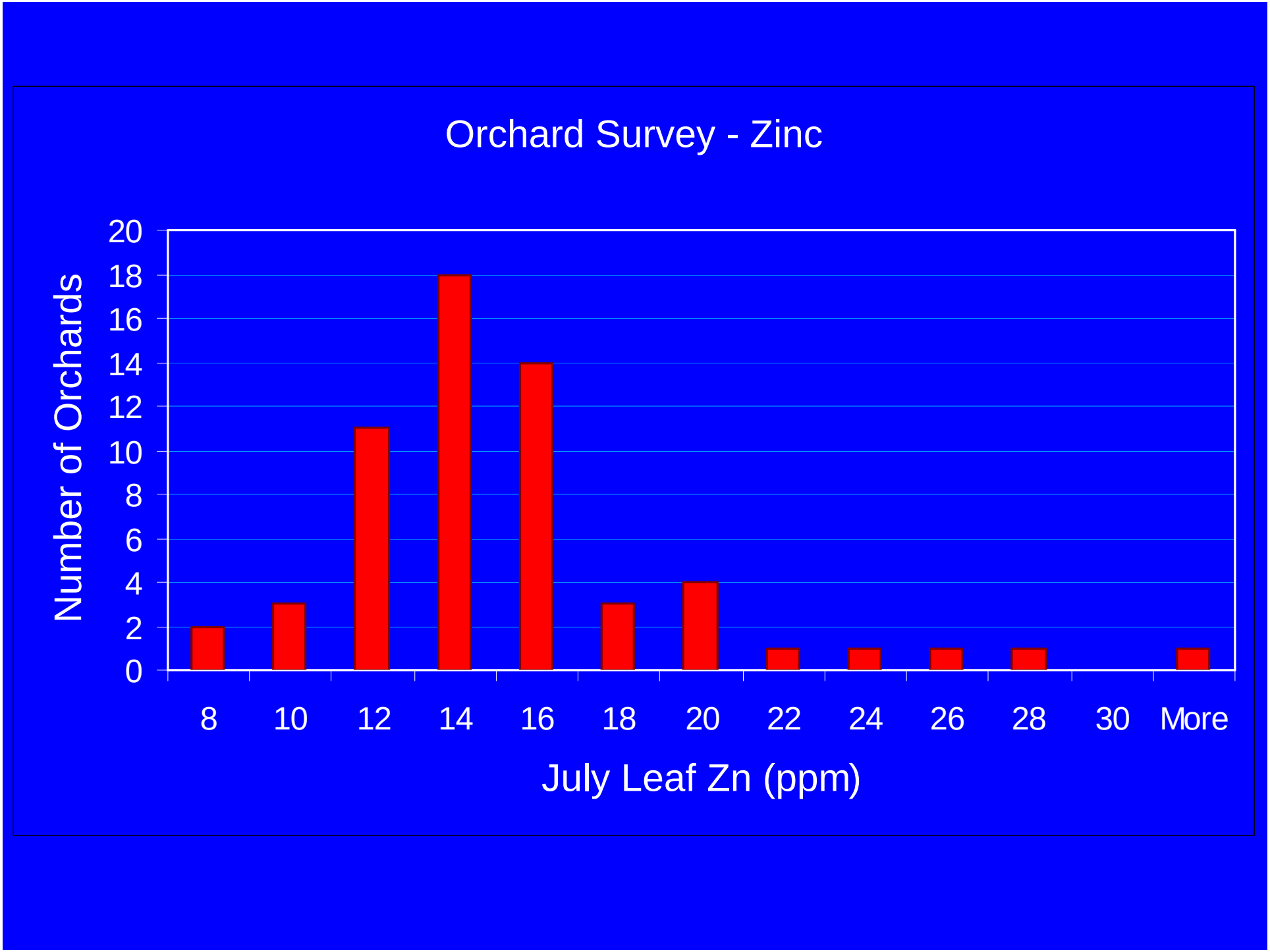
Recovery of Labelled ^{68}Zn Sulfate Applied to Leaves of One-Year-Old Peach Trees in the Fall



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
0
2
4
6
8
10
12
14
16
18
20
8
10
12
14
16
18
20
22
24
26
28
30
More
July Leaf Zn (ppm)

Zinc Fertilization

- Apply if symptoms appear or leaf Zn < 10 to 12 ppm
- May not see leaf symptoms as low as 5 ppm
- 10 to 15 lbs/acre of zinc sulfate (36% Zn) in fall
- 10 to 15 lbs/acre of basic zinc (52% Zn) in winter or spring
- Zinc chelates in spring and summer



Iron (Fe)

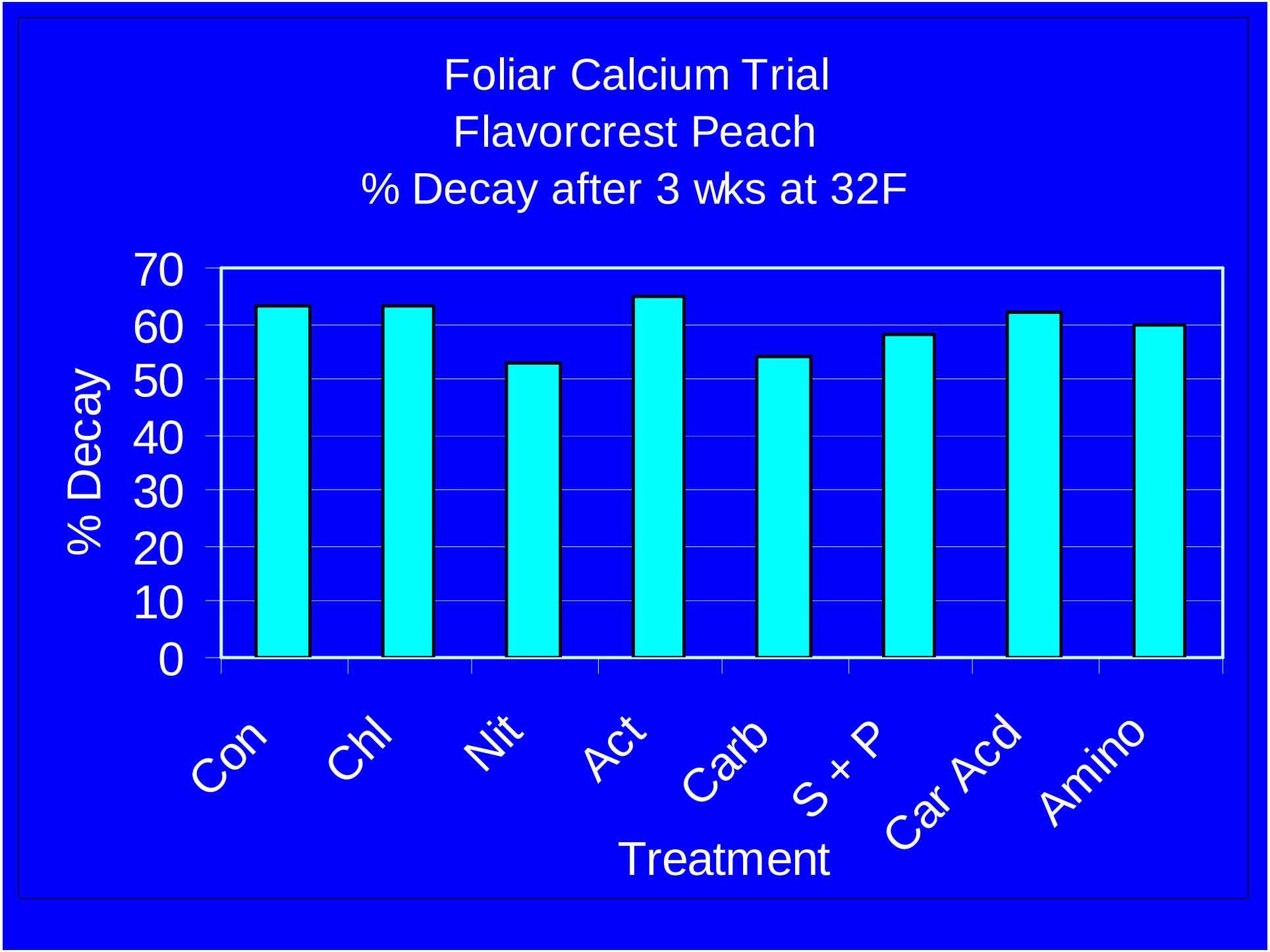
- Deficient below 60 ppm (May sample)
- May not see leaf symptoms as low as 30 ppm
- Iron deficiency can:
  - Reduce fruit size
- Add soil sulfur or sulfuric acid to portion of rootzone to decrease pH

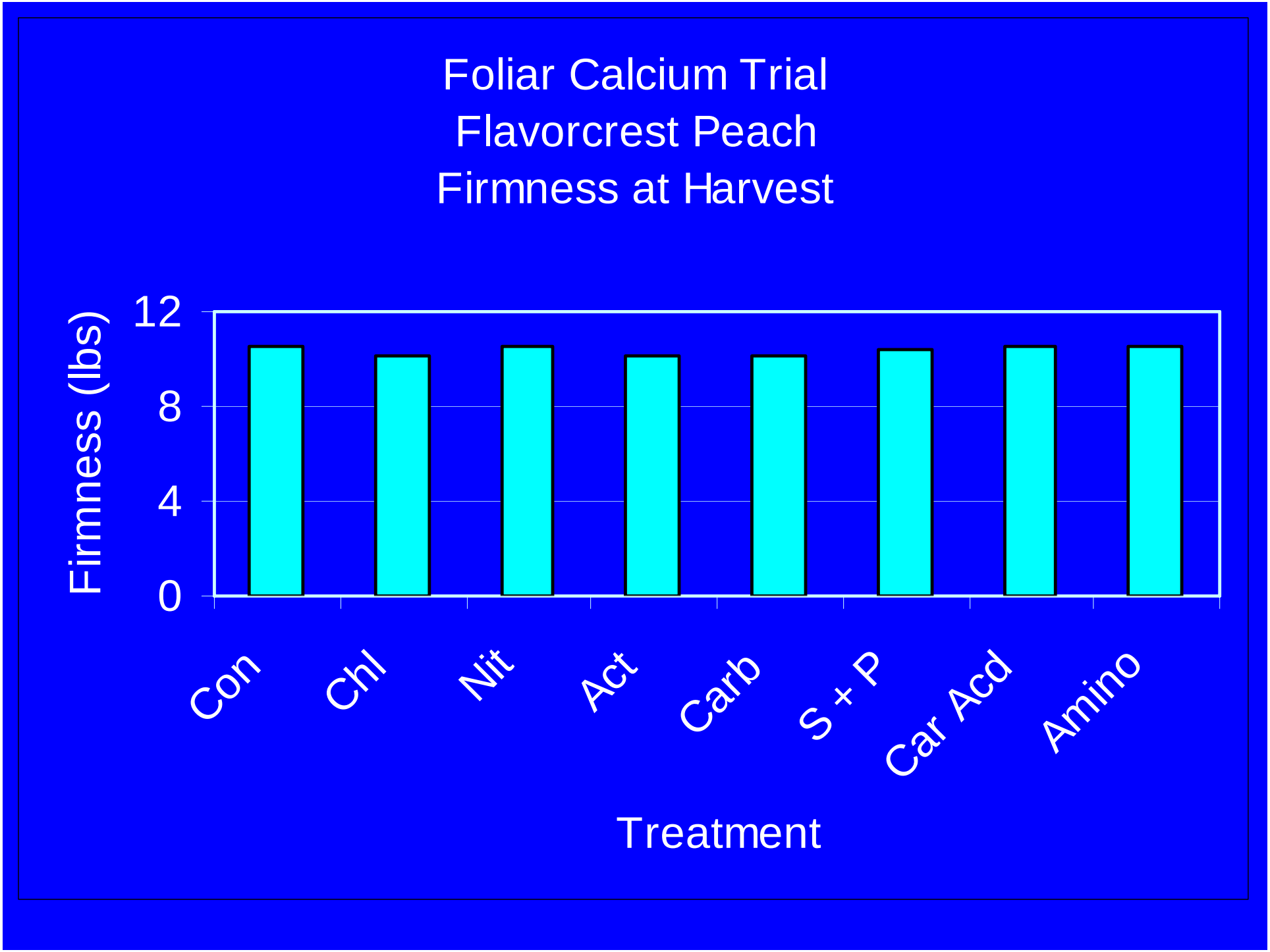


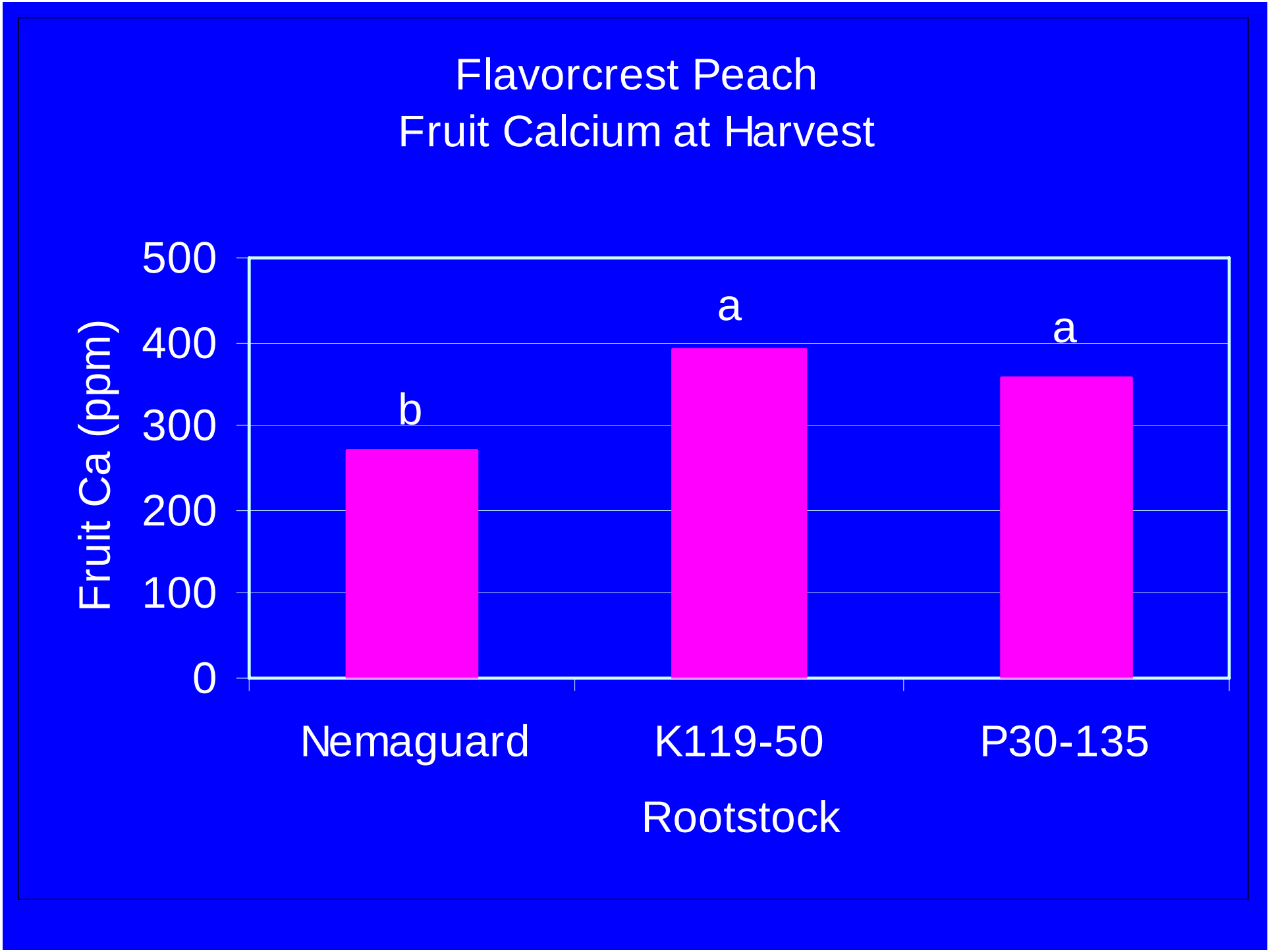
Foliar Calcium Formulations






Foliar Calcium Trial
Flavorcrest Peach
% Decay after 3 wks at 32F
% Decay
70
60
50
40
30
20
10
0
Con
Chl
Nit
Act
Carb
S + P
Car Acd
Amino
Treatment


Foliar Calcium Trial
Flavorcrest Peach
Firmness at Harvest
Firmness (lbs)
12
8
4
0
Con
Chl
Nit
Act
Carb
S + P
Car Acd
Amino
Treatment


Flavorcrest Peach
Fruit Calcium at Harvest
Fruit Ca (ppm)
500
400
300
200
100
0
b
a
a
Nemaguard
K119-50
P30-135
Rootstock

Calcium (Ca)

- Some symptoms and fruit disorders below 1.0% Ca in leaves
- Calcium deficiency can:
  - Reduce fruit set
  - Increase skin cracks
- Deficiency not found in the field
- Foliar sprays show no benefit



Phosphorus



Phosphorus Deficiency











Nutrient Elements in Stone Fruit

Level in leaves

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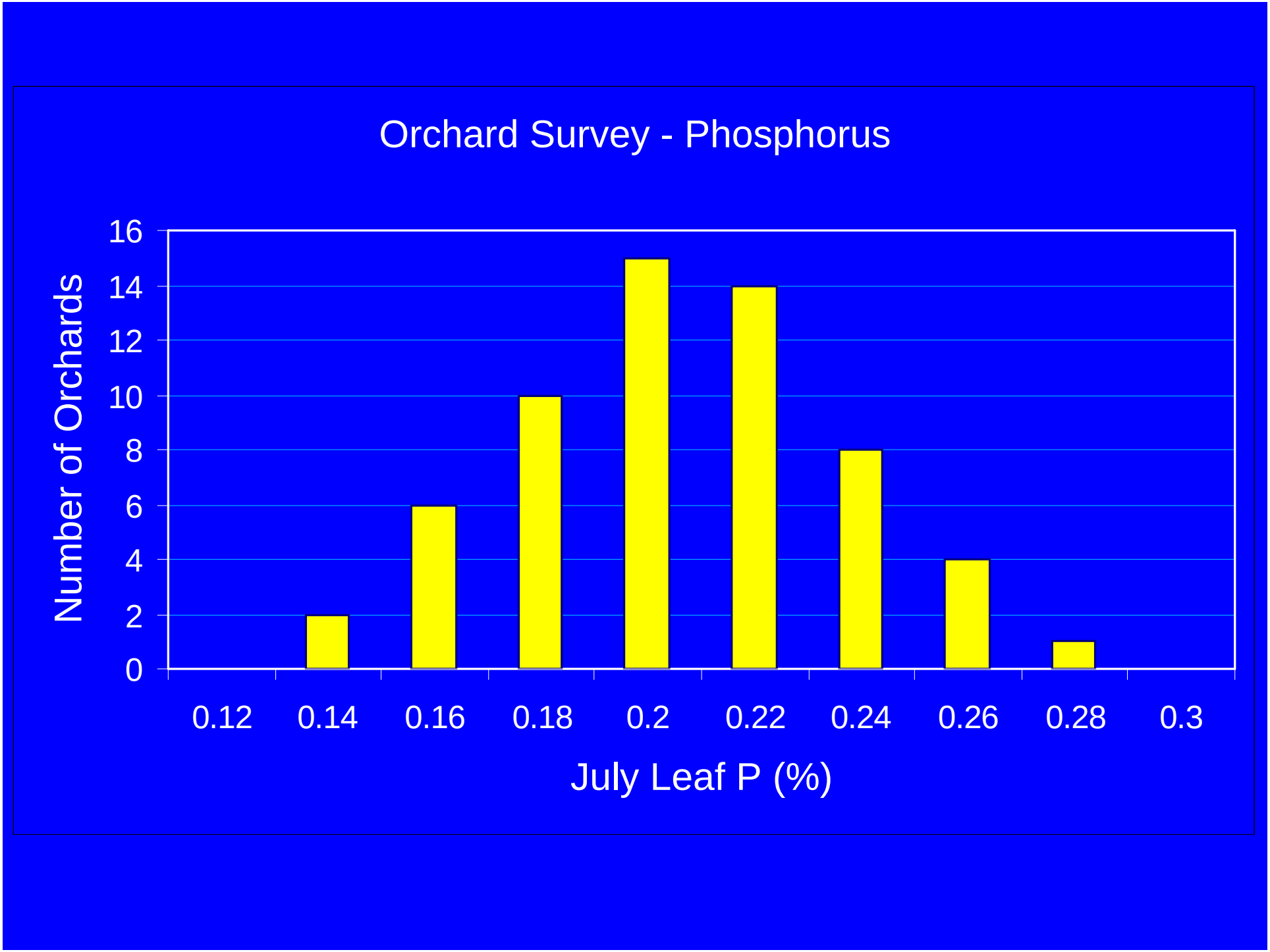
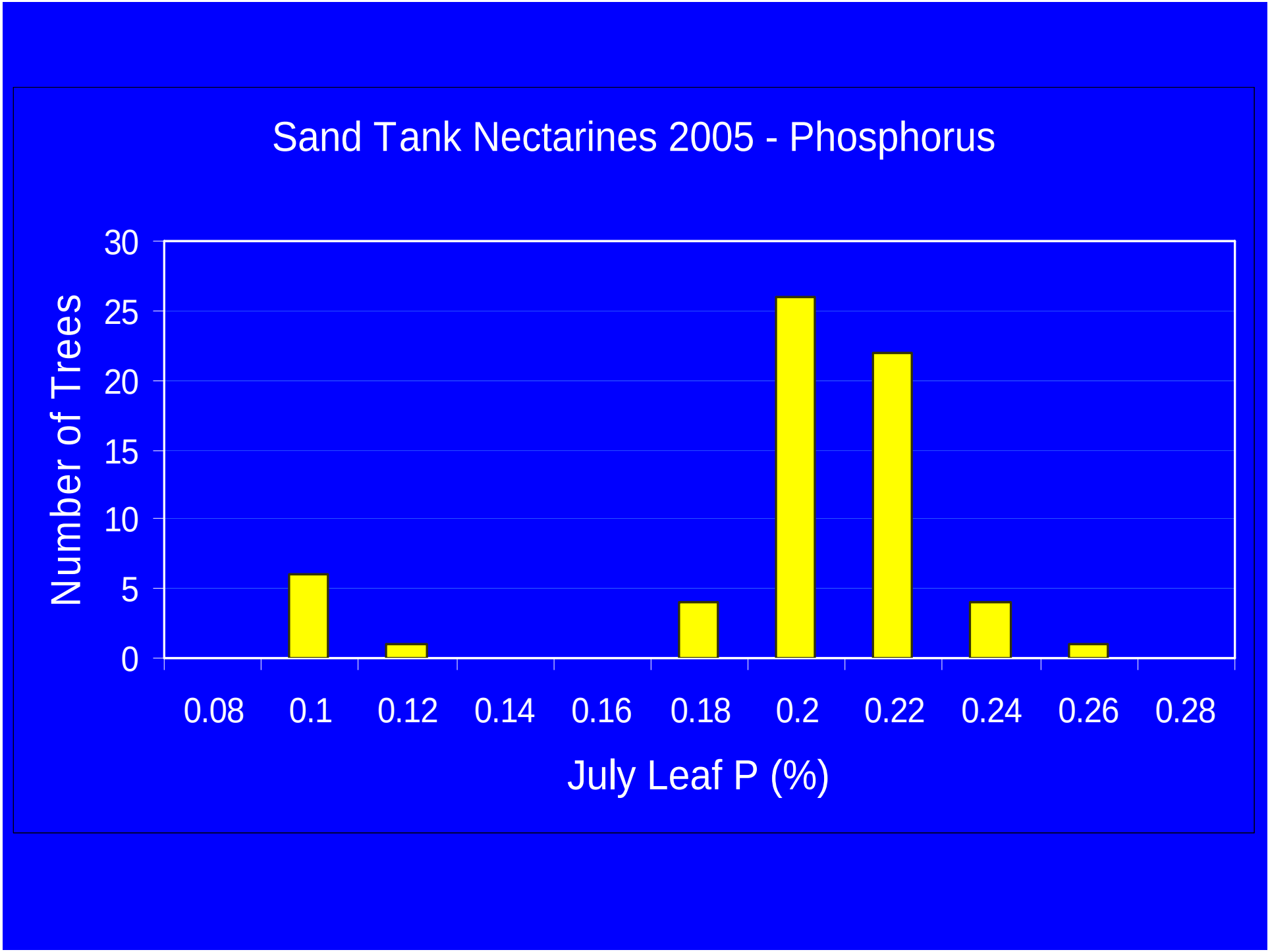
	Deficient below	Optimum range	Toxic over	Deficient below	Optimum range	Toxic over
	%	%	%	%	%	%
N	2.3	2.6 - 3.0	-	-	2.3 - 2.8	-
P	-	0.1 - 0.3	-	-	0.1 - 0.3	-
K	1.0	Over 1.2	-	1.0	Over 1.1	-
Ca	-	Over 1.0	-	-	Over 1.0	-
Mg	0.25	Over 0.25	-	0.25	Over 0.25	-
Cl	-	-	0.3	-	-	0.3
S	-	-	-	-	-	-
	p p m					
Fe	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 - Phosphorus
Number of Orchards
16
14
12
10
8
6
4
2
0
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
0.3
July Leaf P (%)


Sand Tank Nectarines 2005 - Phosphorus
Number of Trees
30
25
20
15
10
5
0
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
July Leaf P (%)



Potassium

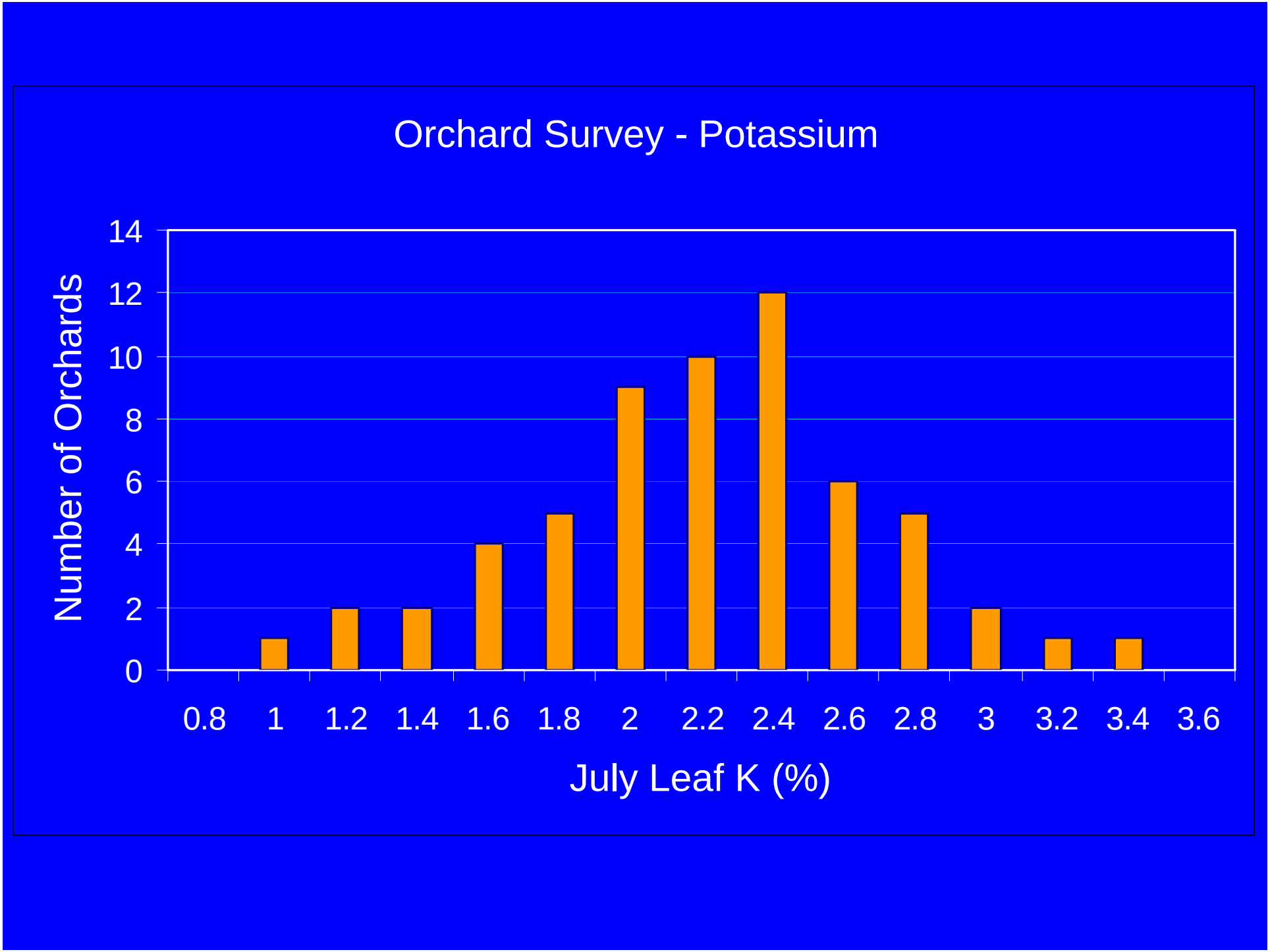



Potassium

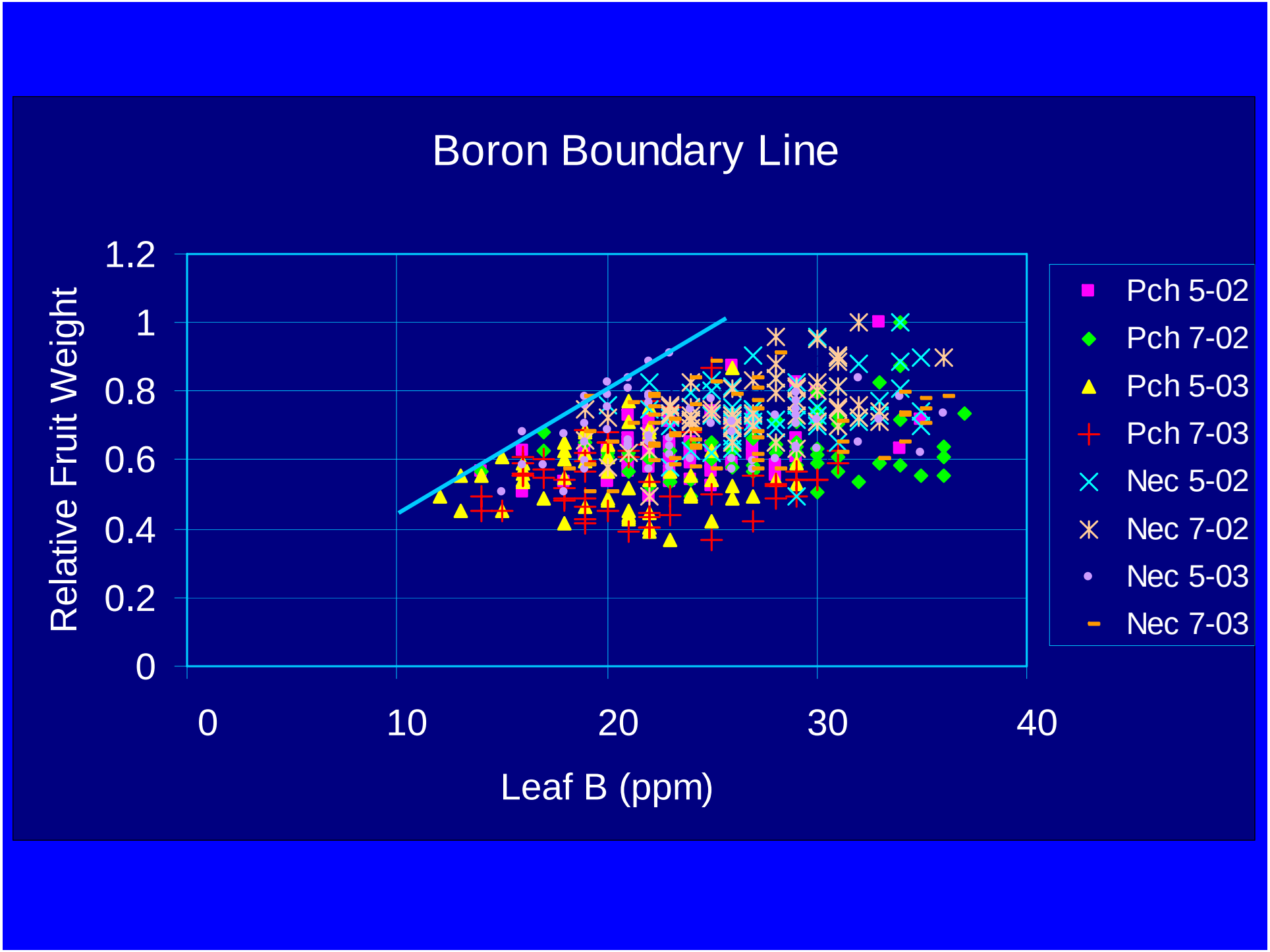
Nutrient Elements in Stone Fruit

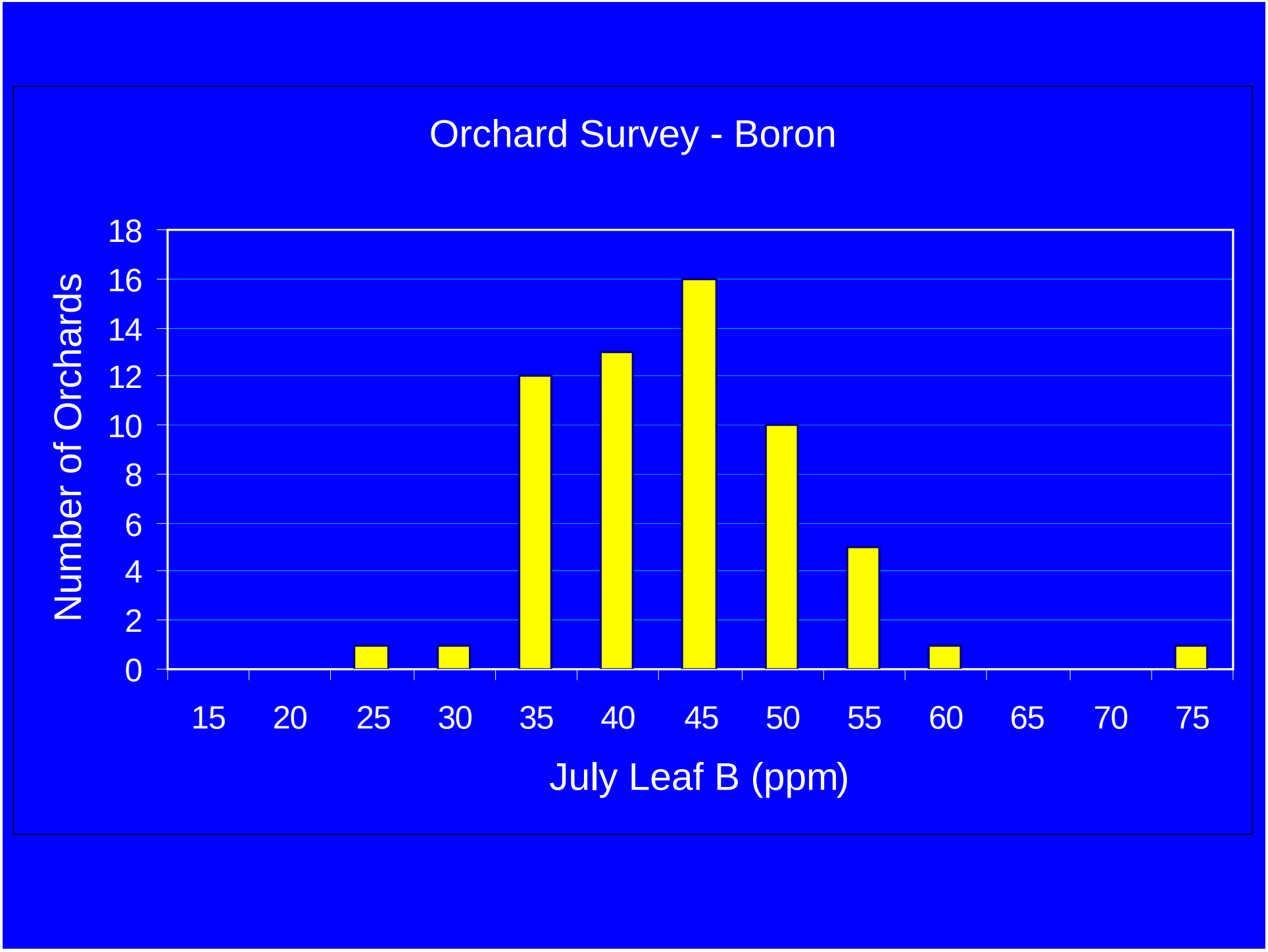
Level in leaves

	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 - Potassium
Number of Orchards
0
2
4
6
8
10
12
14
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
July Leaf K (%)


Boron

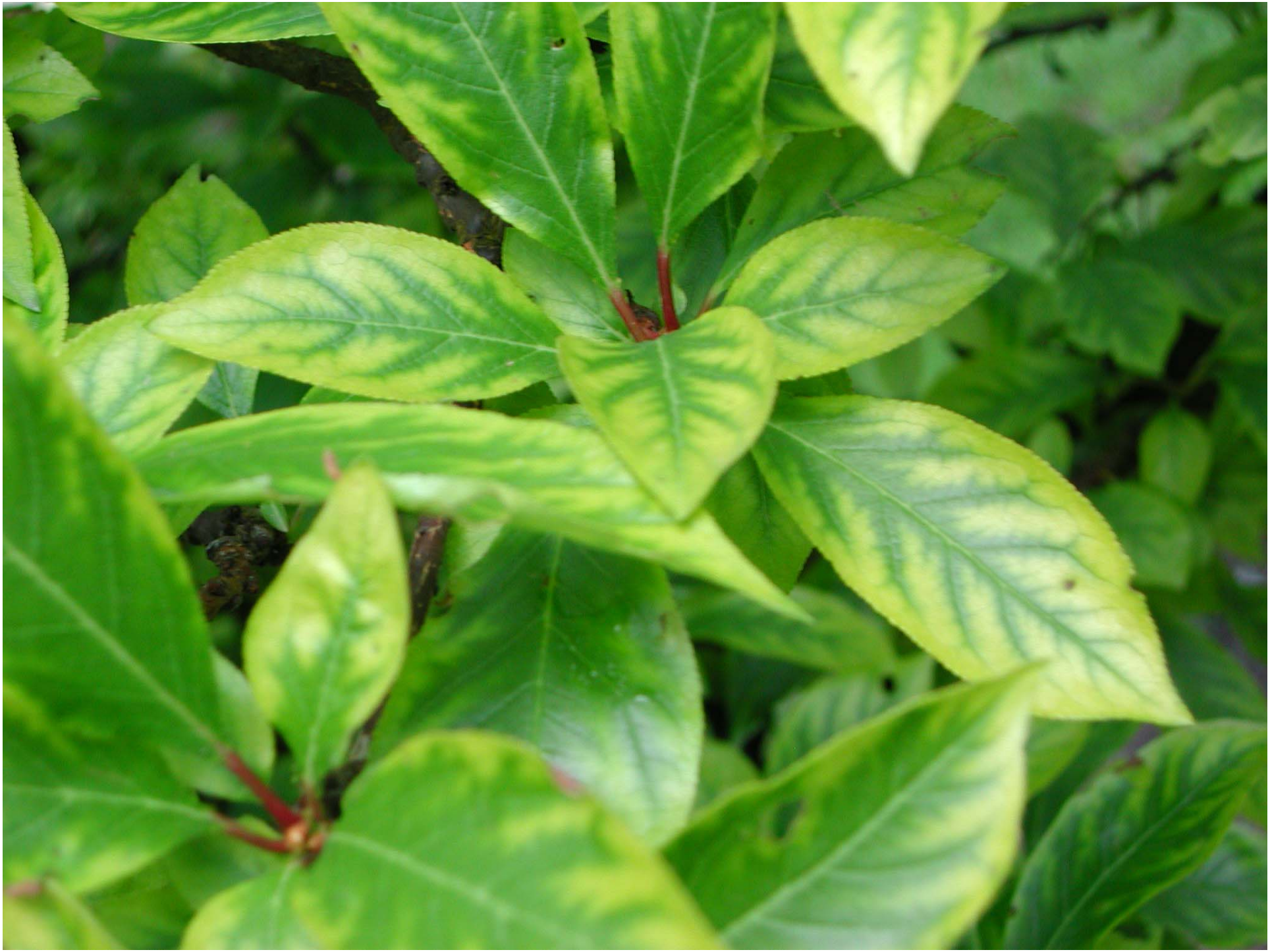

Boron Boundary Line
Relative Fruit Weight
1.2
1
0.8
0.6
0.4
0.2
0
0
10
20
30
40
Leaf B (ppm)
Pch 5-02
Pch 7-02
Pch 5-03
Pch 7-03
Nec 5-02
Nec 7-02
Nec 5-03
Nec 7-03


Orchard Survey - Boron
Number of Orchards
0
2
4
6
8
10
12
14
16
18
15
20
25
30
35
40
45
50
55
60
65
70
75
July Leaf B (ppm)

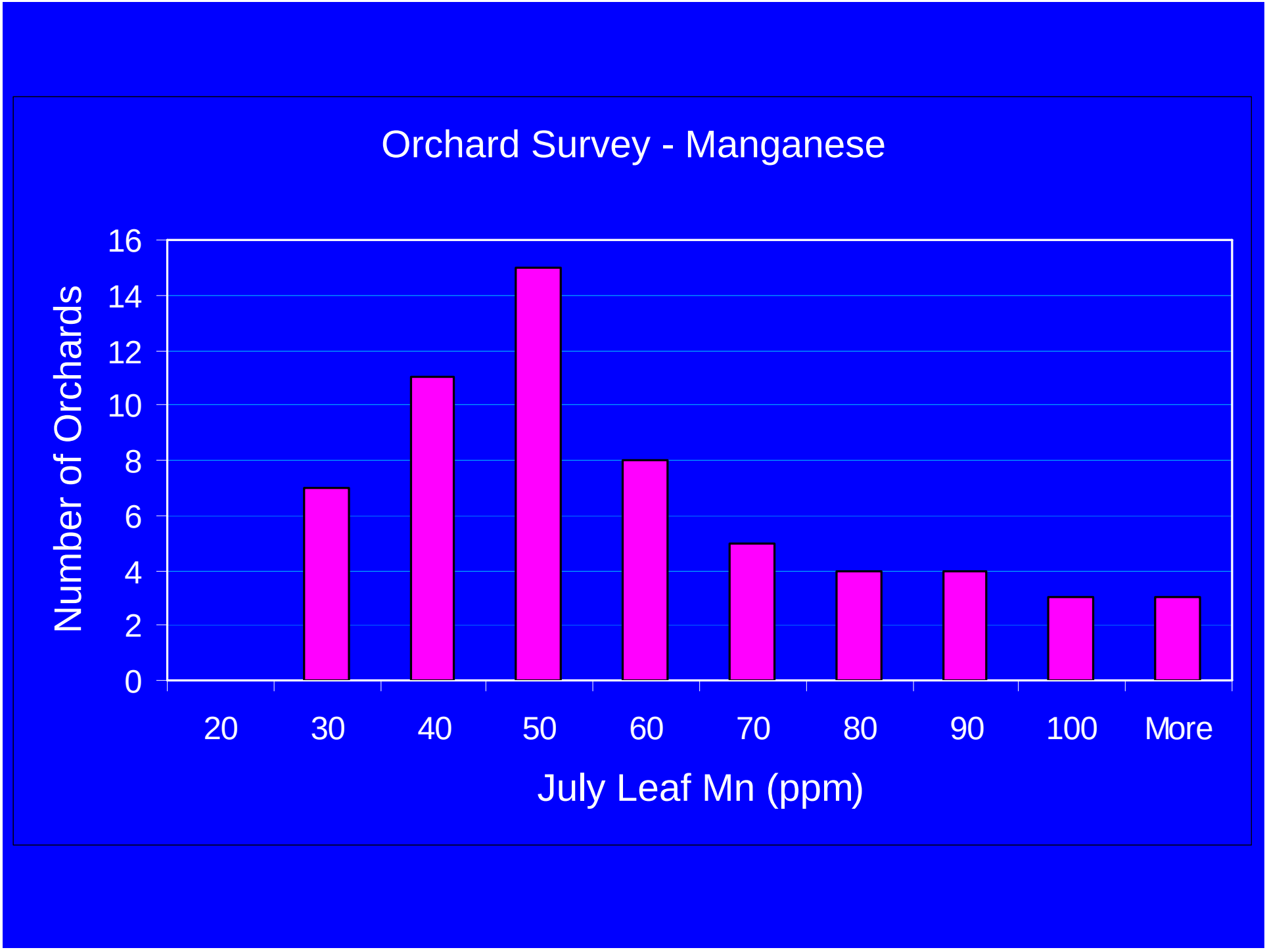
Boron (B)

- Deficient below 22 to 25 ppm (Published=18)
- May not see symptoms as low as 12 ppm
- B deficiency can:
  - Reduce fruit set
  - Reduce fruit size
- Correct deficiency by:
  - Soil application - .25 to .50 lbs/tree borax
  - Foliar application – 2 lbs/acre Solubor
- Danger of B toxicity above 100 ppm








Orchard Survey - Manganese
Number of Orchards
16
14
12
10
8
6
4
2
0
20
30
40
50
60
70
80
90
100
More
July Leaf Mn (ppm)

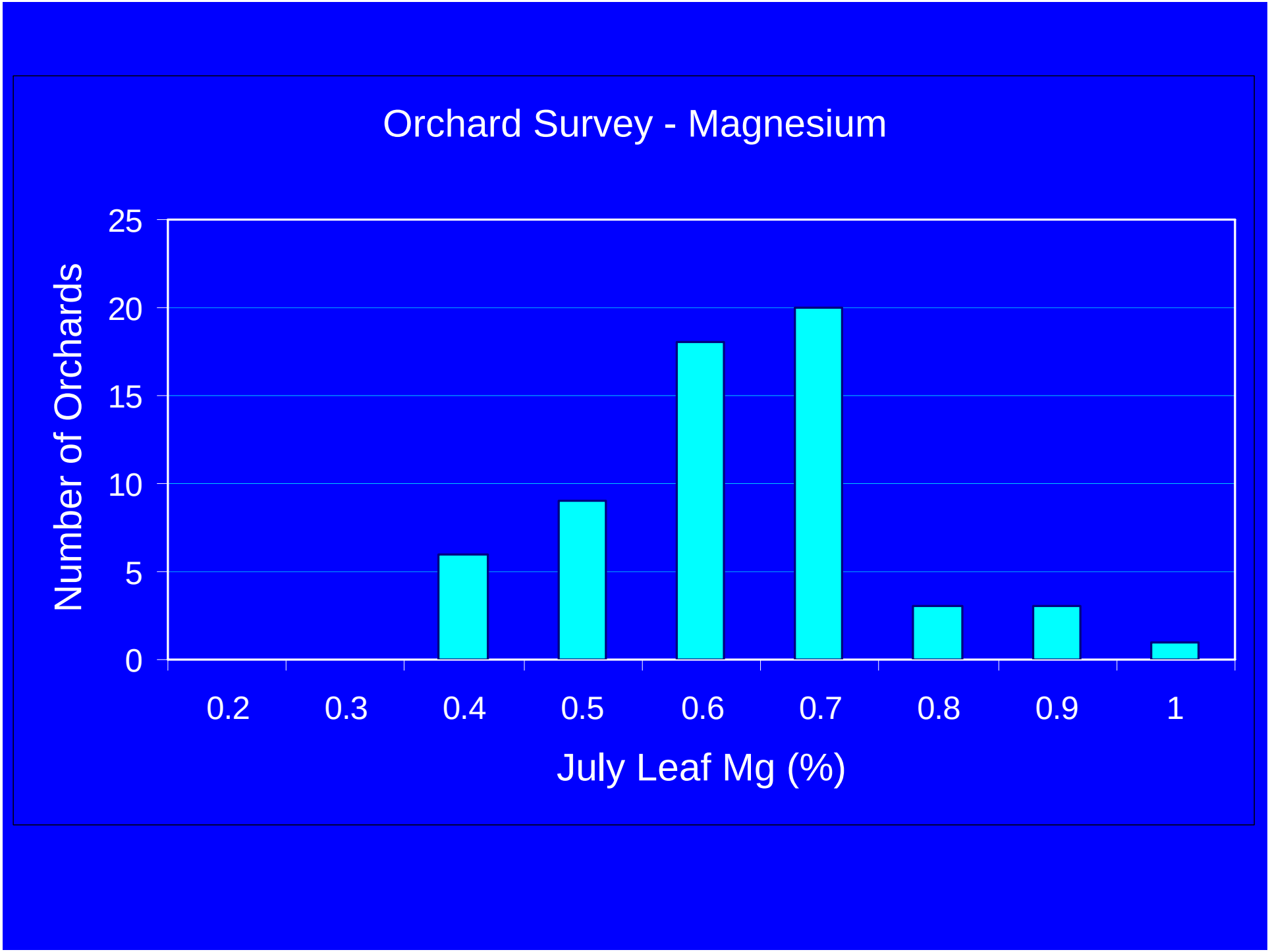
Magnesium



Magnesium Deficiency






Orchard Survey - Magnesium
Number of Orchards
25
20
15
10
5
0
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
July Leaf Mg (%)