

Nut Crop Nutrition

Understanding the Principles to Optimize the Practices.

Fruit Growers Lab Conference

Tulare, March 16, 2010

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Kings County

<http://ceking.ucdavis.edu/>

WALNUT

PRODUCTION MANUAL



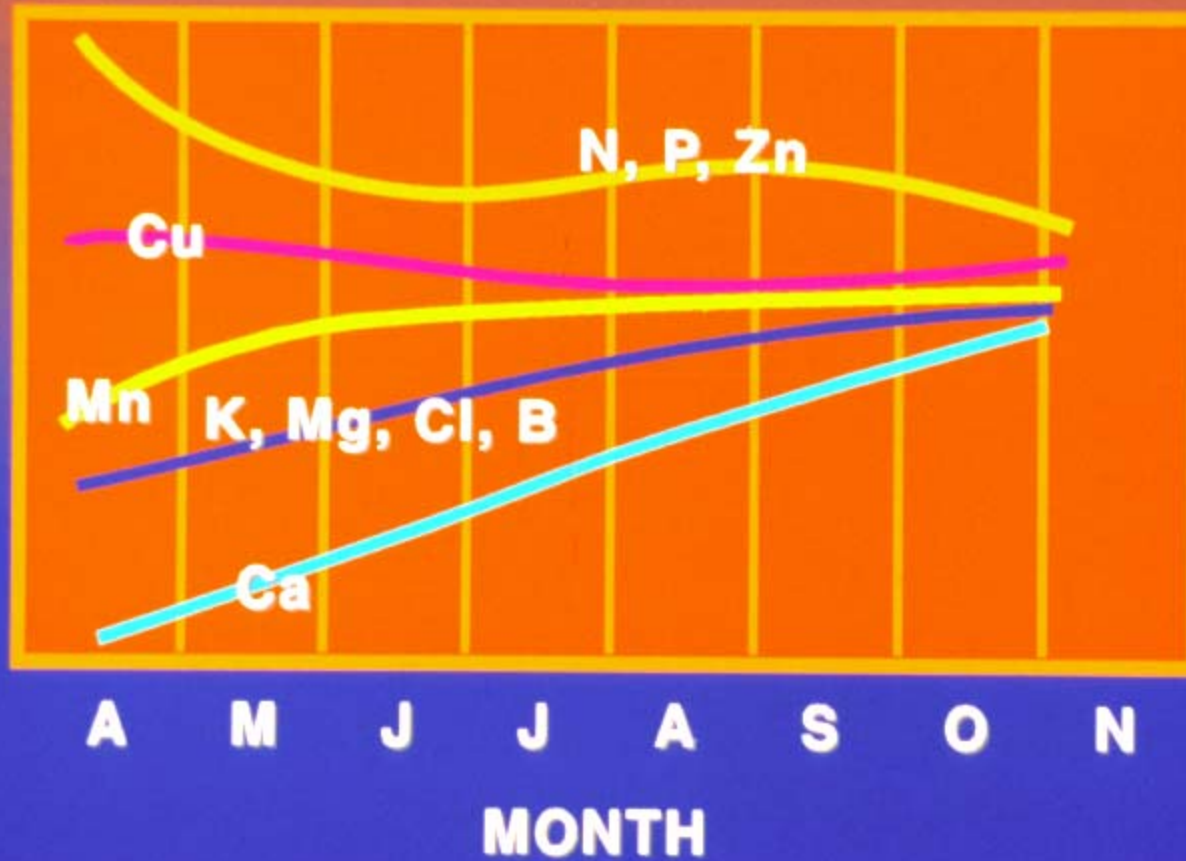
UNIVERSITY OF CALIFORNIA
DIVISION OF AGRICULTURE AND NATURAL RESOURCES
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Nutrition Management Involves

Knowledge of:

- Site/Soil characteristics and chemistry
- Plant requirements
- Cropping history
- Fertilizer inputs
- Cultural practices (Irrigation, vegetation management, pruning)
- Tissue analysis
- Observation and judgement

Nutrient Curves through Season



Annual Leaf Tissue Sampling:

- A plant-based measurement which integrates all the factors associated with nutrient extraction from the soil that it inhabits.**
- Provides cause for further evaluation of soil and water quality, and fertilization practices.**
- Best performed in July. Sample good and bad trees separately. Sample trees suspected of deficiency any time. Compare to good trees.**

Effect of rootstock on micronutrient concentration in 'Kerman' pistachio leaves

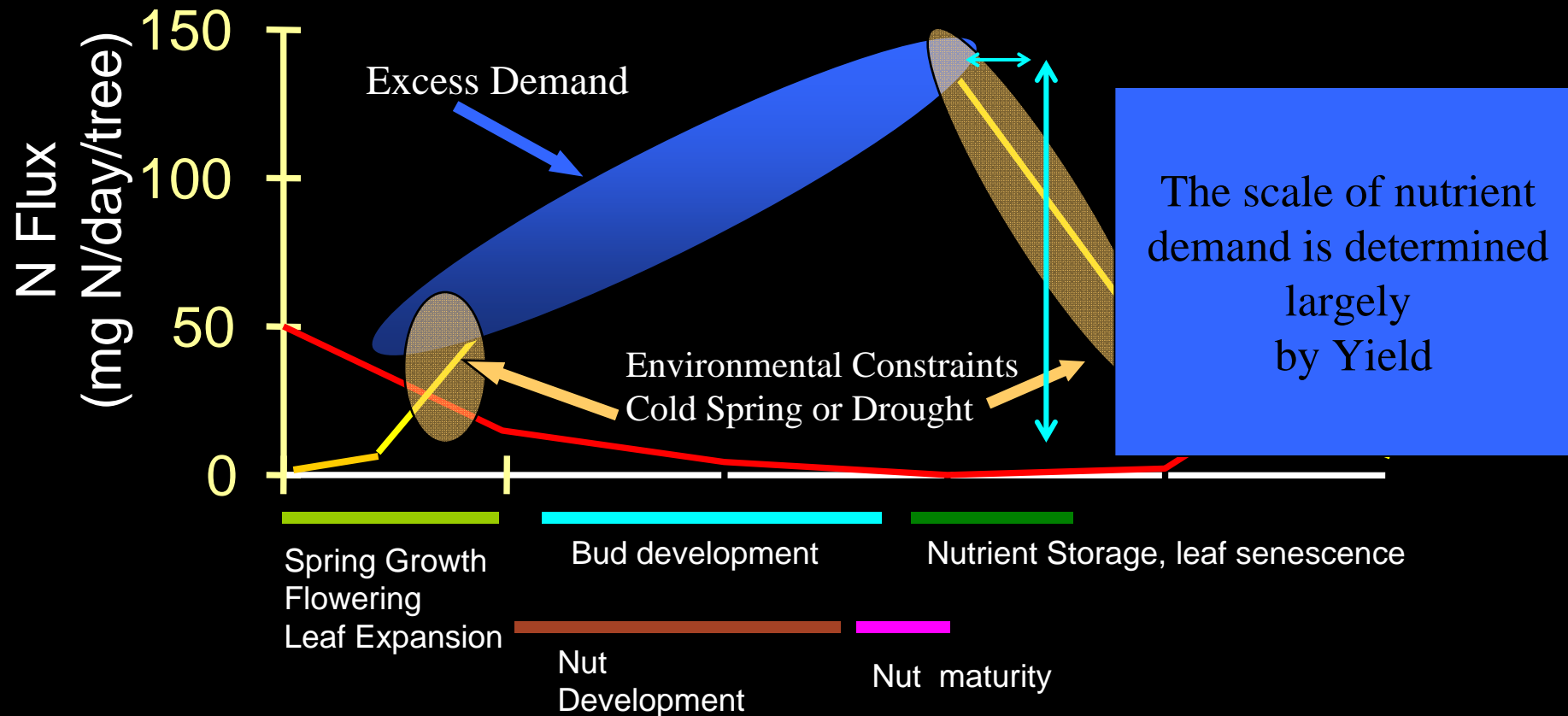
rootstock	B	Zn	Cu
	ppm	ppm	ppm
atlantica	194 a	16 b	15 b
integerrima	164 a	14 a	12 b
atl. x int.	148 b	14 a	13 b

Information courtesy of Louise Ferguson, et al.

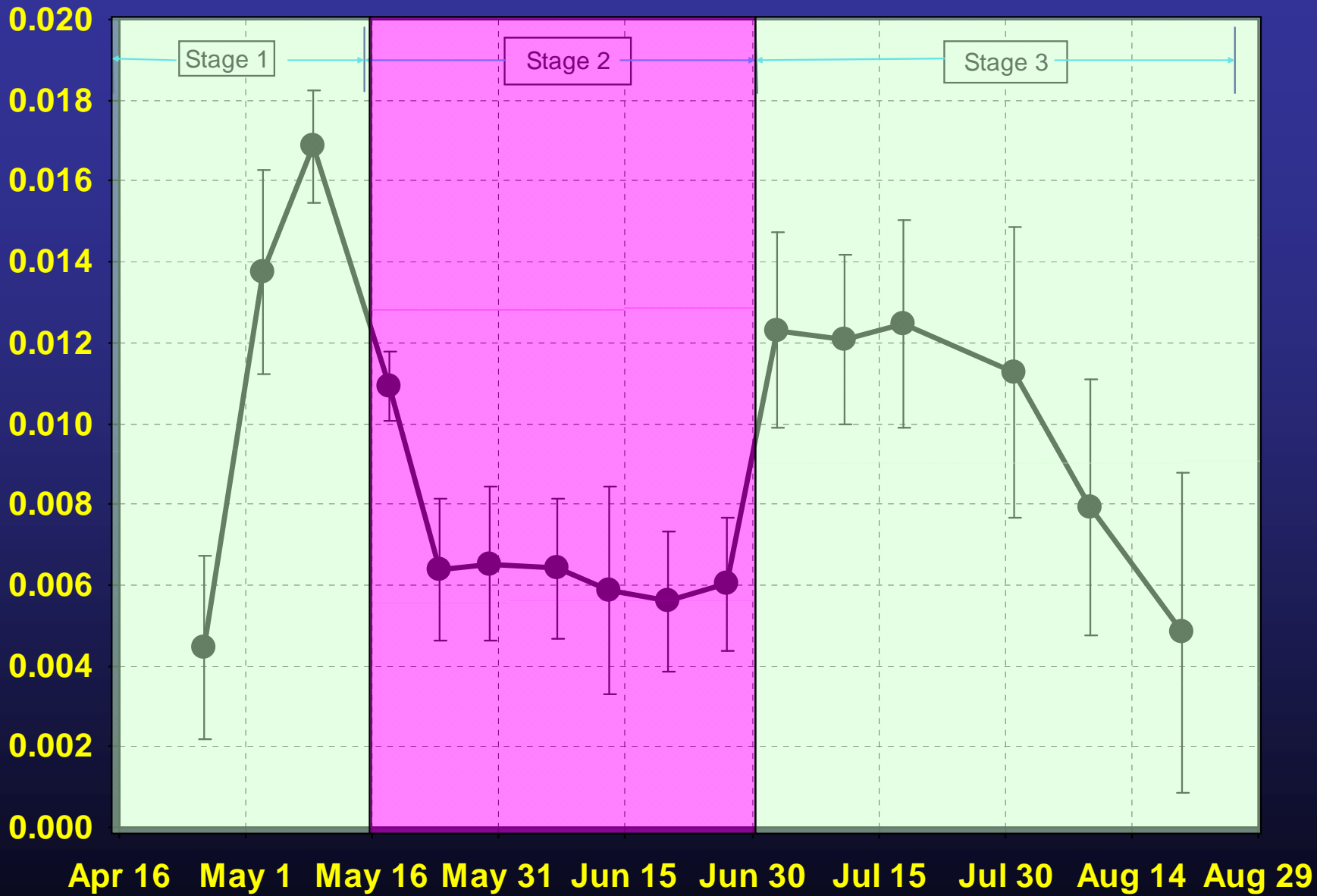
Nutrient Fluxes (N, K, S, P) in Walnut

— Stored Nutrients

— Current Year Uptake



Fruit Dry Weight Gain Rate (g/d)



Occurrence of Nutrient Deficiencies in California

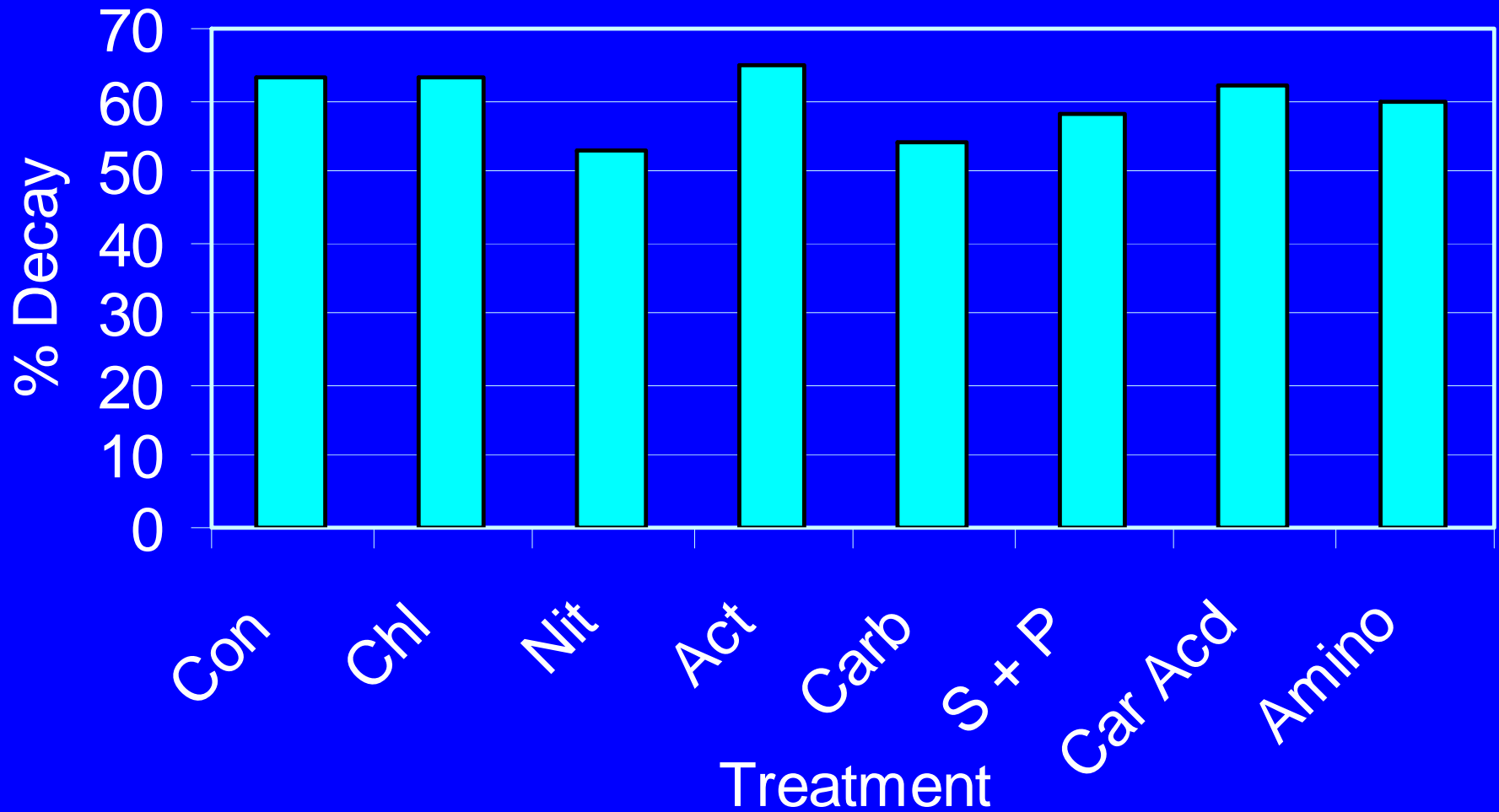
- Common
 - Nitrogen
 - Zinc
 - Iron
- Occasional
 - Potassium
 - Magnesium
 - Manganese
- Rare
 - Phosphorus
 - Boron
 - Copper
- Unknown
 - Calcium
 - Sulfur
 - Molybdenum

Foliar Calcium Formulations

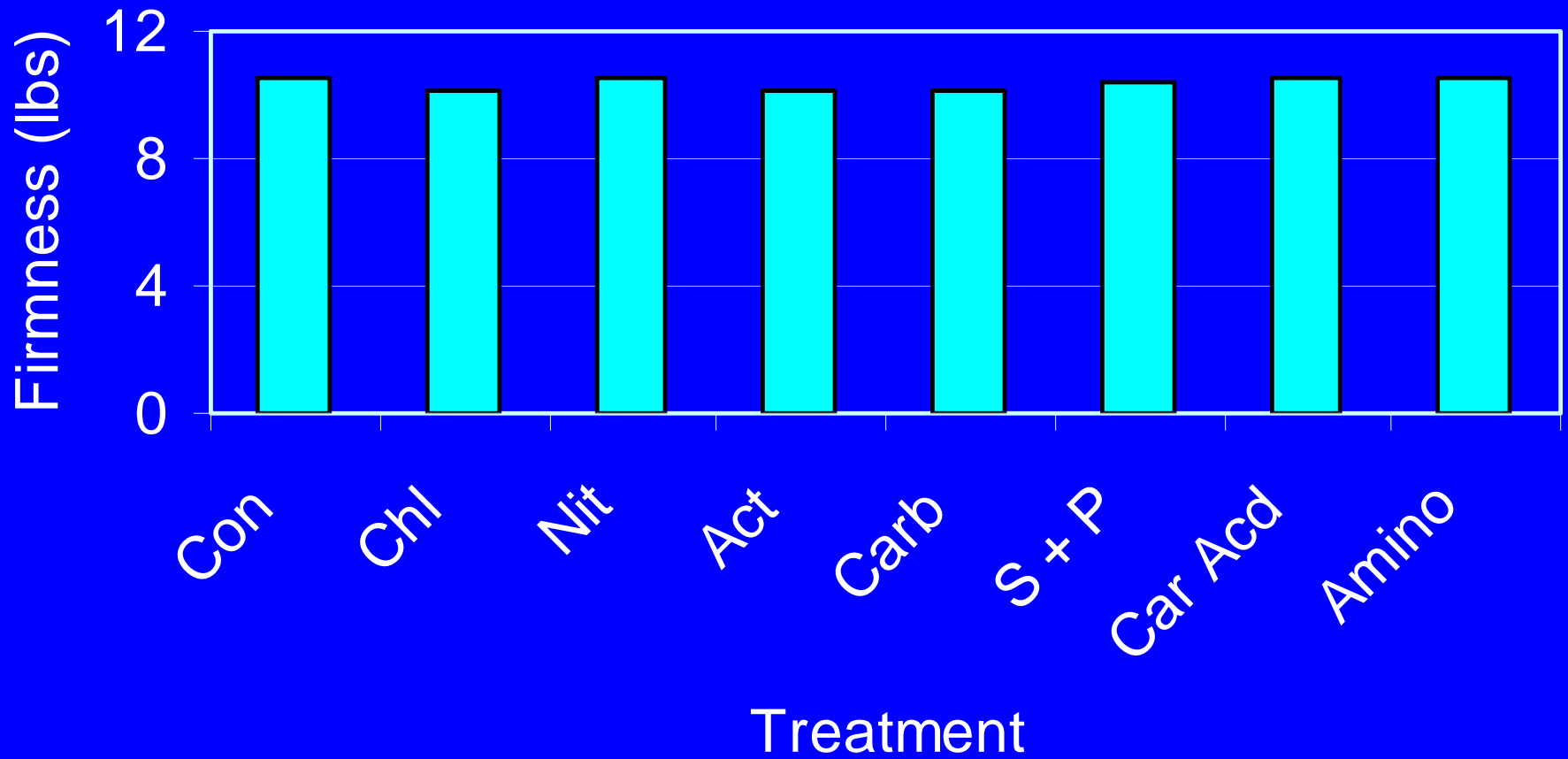




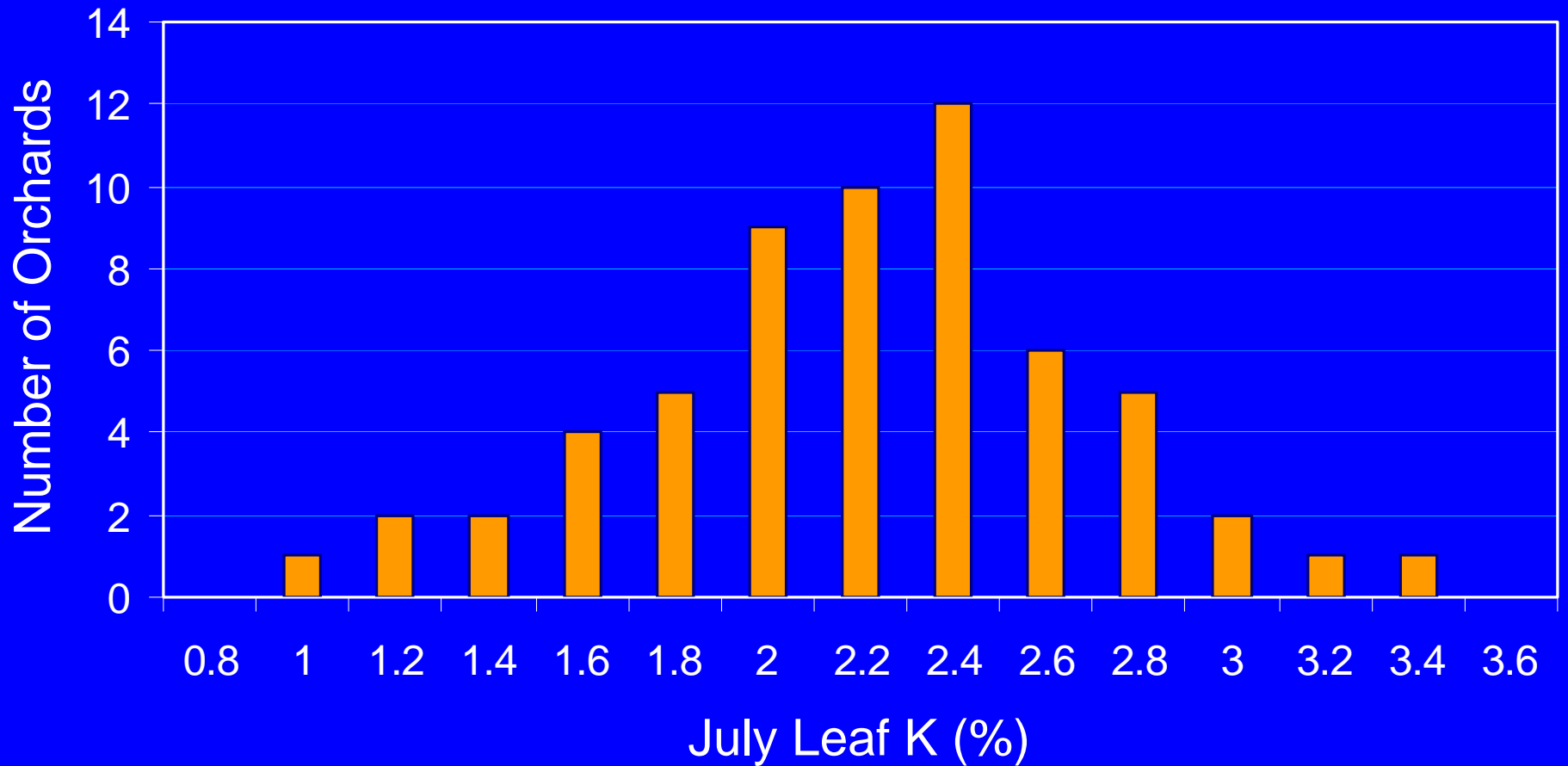
Foliar Calcium Trial
Flavorcrest Peach
% Decay after 3 wks at 32F



Foliar Calcium Trial
Flavorcrest Peach
Firmness at Harvest



Orchard Survey - Potassium



Nitrogen Deficiency



Nitrogen Response

Low N



High N



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



MICRONUTRIENT DEFICIENCIES IN NUT CROPS:

HOW COMMON ARE THEY?

	Zn	B	Fe	Cu	Mn	Ni
ALMONDS	3	2	2	0	2	0
WALNUTS	3	1	0	0	2	0
PISTACHIOS	3	3	0	3	2	0
PECANS	3	0	0	0	2	0

VISUAL SCALE: 0= never seen, 1= rarely, 2= occasional, 3= often

The Role of Zinc in Plants

1. Required for Auxin (NAA) formulation
2. Auxin involved in cell elongation
3. Associated with chloroplast formulation
4. Essential for pollen development, flower bud differentiation and fruit set

February 7, 2005



Zn Deficient



Zn Sufficient

February 22, 2005



Zn Deficient

Zn Sufficient

Symptoms of zinc deficiency

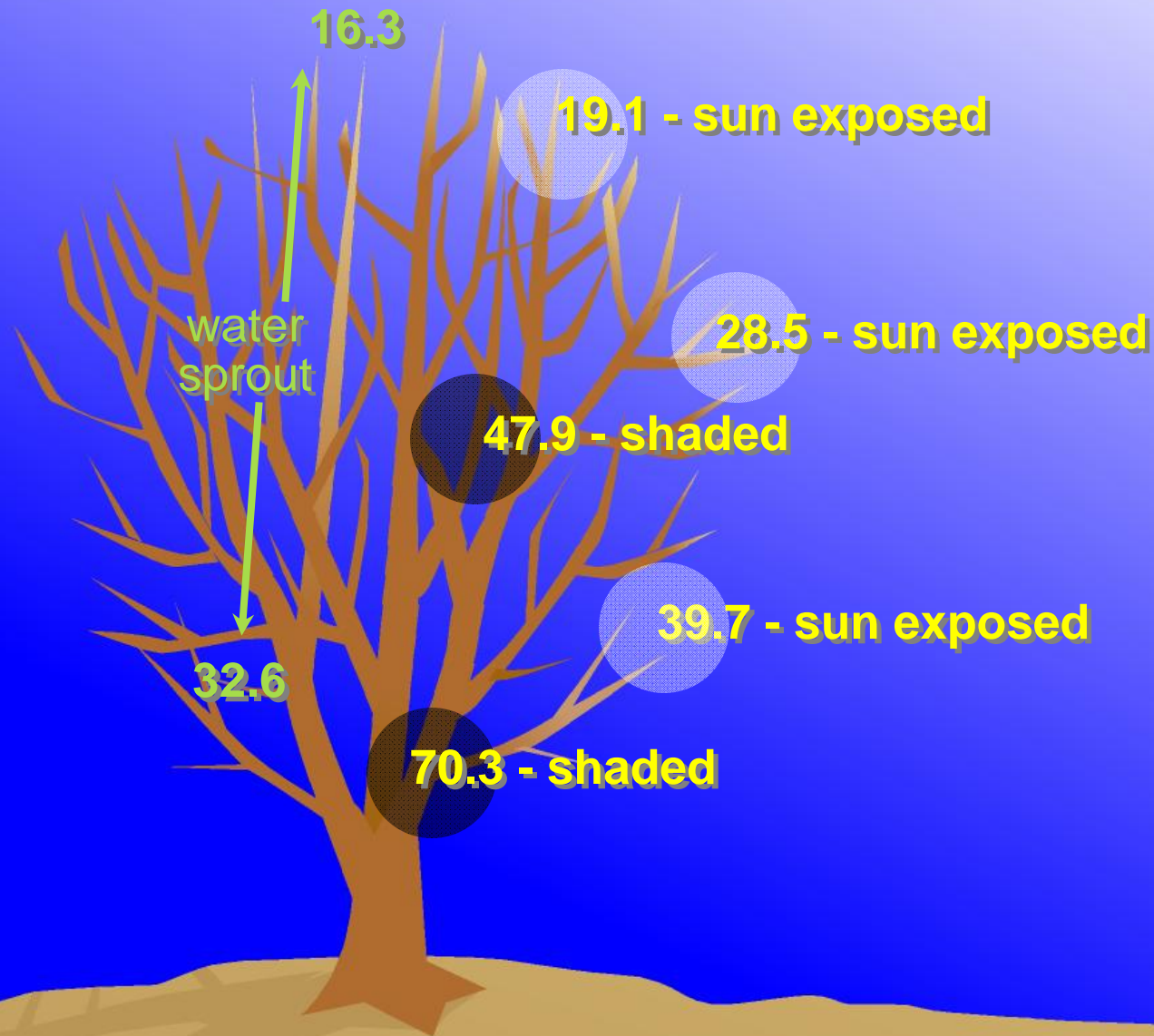
**Optimal leaf tissue
concentration: 10 – 15 ppm**







**Shoot Zn
Distriution
Through
A
Dormant
Peach
Tree
(ppm)**



Effect of Concentrated Fall 36% Zinc Foliar Application on % Leaf Drop

Lonnie Hendricks and Ron Bekey- Merced County, 10/20/1983

ZN RATE (LBS/GALLONS)	10 DAT		18 DAT	
	Nonpareil	Price	Nonpareil	Price
0	8	0.4	13	10
10/25	61	36	94	64
20/25	65	83	95	97
40/25	95	92	97	97
20/100	95	75	100	96
40/100	96	96	97	99

Shoot bud drop >only @ 50lb/25 gpa. Flower drop> @rates above 20lb/25 gpa



Comparing Zinc Formulations

Most Effective = Nitrate (Patrick's mix)

Sulfate – 36%

Carbohydrate (Zicron)

Polyamine

EDTA

Leonardite

Oxysulfate – 52%

Least Effective = ZnO Suspension



Comparing Zinc Formulations

Phytotoxicity

Nitrate (Patrick's mix)	High
Sulfate – 36%	Med
Carbohydrate (Zicron)	Med
Polyamine	Med
EDTA	Low
Leonardite	Low
Oxysulfate – 52%	None
ZnO Suspension	None

SPRING FOLIAR TREATMENT RECOMMENDATIONS FOR NUT CROPS:

PECANS:

- A. BEGIN AT FIRST FLUSH, PRIOR TO BLOOM. APPLY 4-6 LBS 36% Zn AND 2-3 LBS L.B. UREA OR 2-3 LBS POTASSIUM NITRATE PER 100 GALS., 200 GPA.
- B. REPEAT 2 WEEKS LATER
- C. REPEAT 2 WEEKS LATER
- D. REPEAT MONTHLY UNTIL LATE AUGUST
- E. APPLICATIONS DURING BLOOM HAVE YET TO SHOW BURN

PISTACHIOS:

- A. IF MARGINAL IN ZINC, APPLY 20 LBS ZN 36% IN 100 GPA OR 5 GALS OF 12% LIQUID ZN AT BUD SWELL (LATE FEB-EARLY MARCH). APPLY NO LATER THAN GREEN TIP.
- B. AT 50% LEAF EXPANSION (LATE APRIL), APPLY 2 LBS 36% ZN IN 100 GPA . ACIDIFY TO pH=5 WITH CITRIC ACID, NOT PHOS ACID (MAKES ZN PHOSPHATE). OK TO ADD CHELATED CU

The Role of Boron in Plants:

- Functions in the differentiation of new cells
- When deficient, cells may continue to divide, but their structural parts are not properly or completely formed
- Regulates carbohydrate metabolism
- Low Boron limits pollen germination and pollen tube growth
- Does not move from old leaves to young leaves from old ones (immobile)

Correcting Boron (B) Deficiency

- Because B is phloem immobile in pistachio, adequate amounts must be present in the soil for uptake with water.
- For correction the following spring, soil treatments must occur by the end of August. Treat sooner if symptoms appear.
Rate: 2-4 ounces of Solubor product per tree. (16-32 lbs/acre). Easily applied through the drip system or in the herbicide spray.
- To improve fruit set under marginal B levels, apply 5 pounds of Solubor per acre in the delayed dormant period (late February to early March). If combined with zinc, buffer to pH=5.0 for improved Zinc uptake.
- Monitor leaf and soil levels to avoid toxicity. Boron is VERY insoluble in the soil. Hence, it does NOT leach easily!

Symptoms of copper (Cu) deficiency



Correcting Copper Deficiency

- Apply one-third to one-half pound of 14.5% Copper EDTA as a foliar treatment at 50% leaf expansion (late April)
- Can be mixed with Zinc and pyrethroid insecticide treatment
- Include in nutrient mixes to be applied several times in the spring

THANK YOU!

Don't Forget:

Area-Wide Symposium on Navel
Orangeworm and Plant Bugs in
Almonds and Pistachios
Tuesday, April 20, 2010
Ag-Expo Building