PISTACHIO CANOPY MANAGEMENT AND ITS EFFECT ON YIELD COMPONENTS

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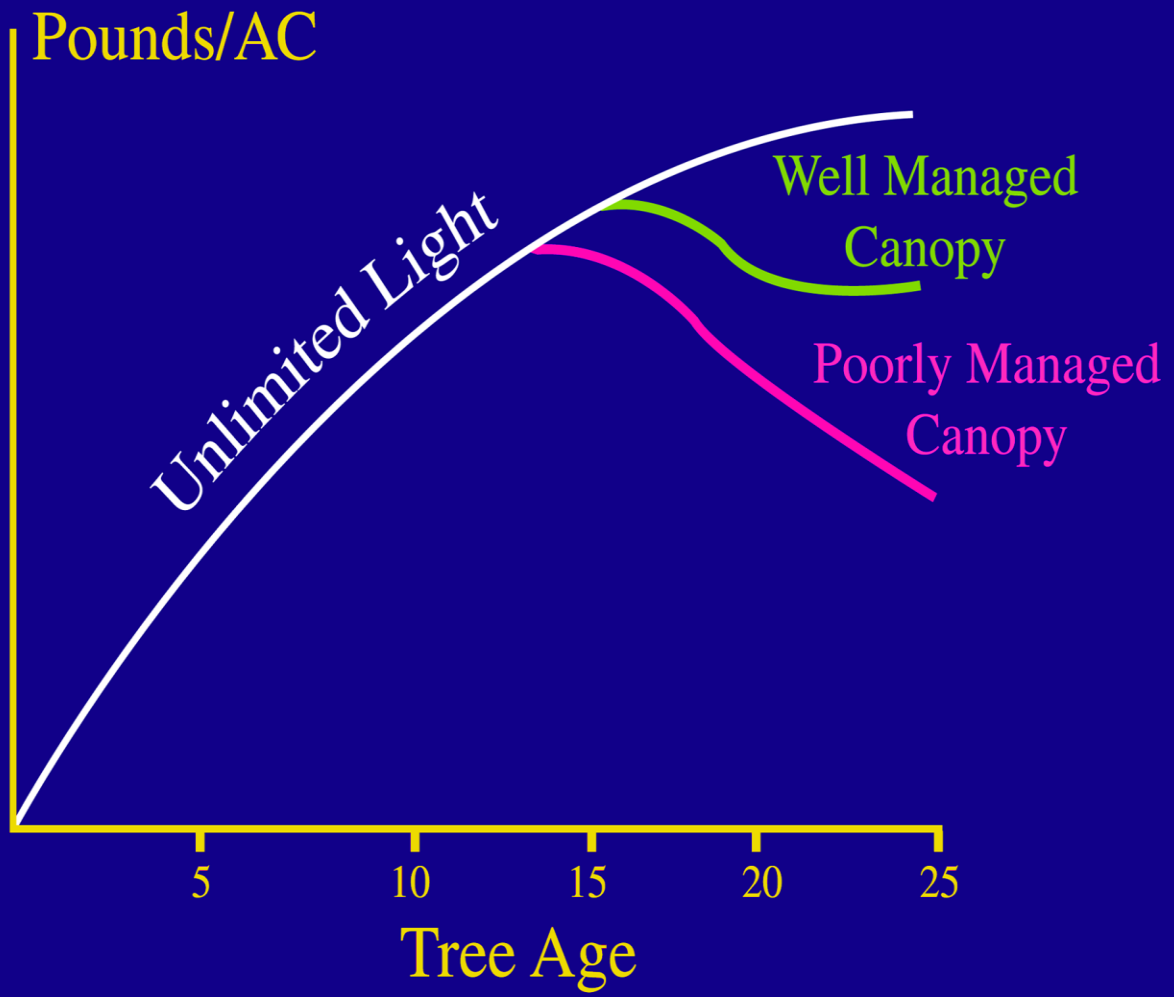
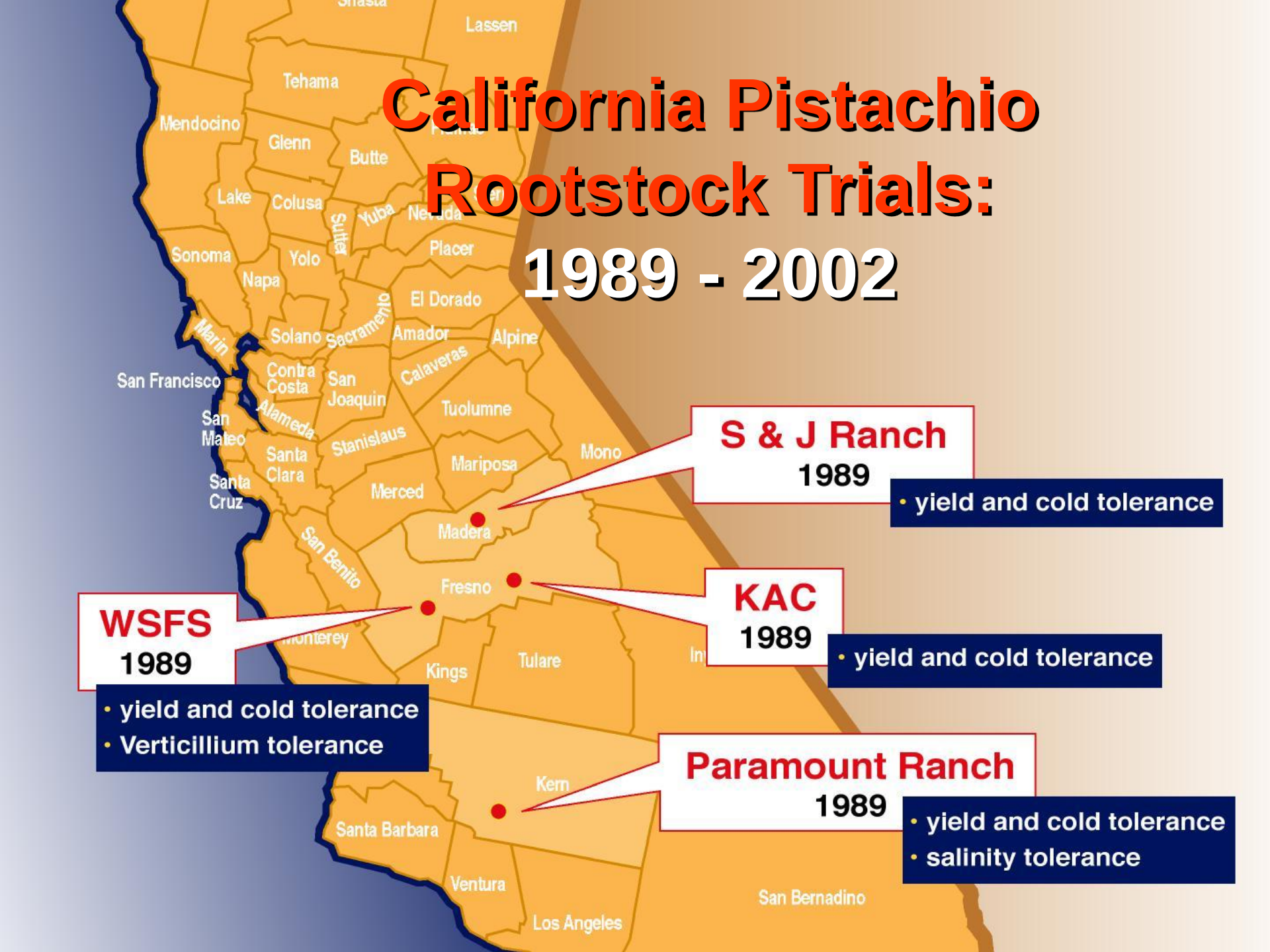
EMERITUS

8th Advances in PISTACHIO PRODUCTION

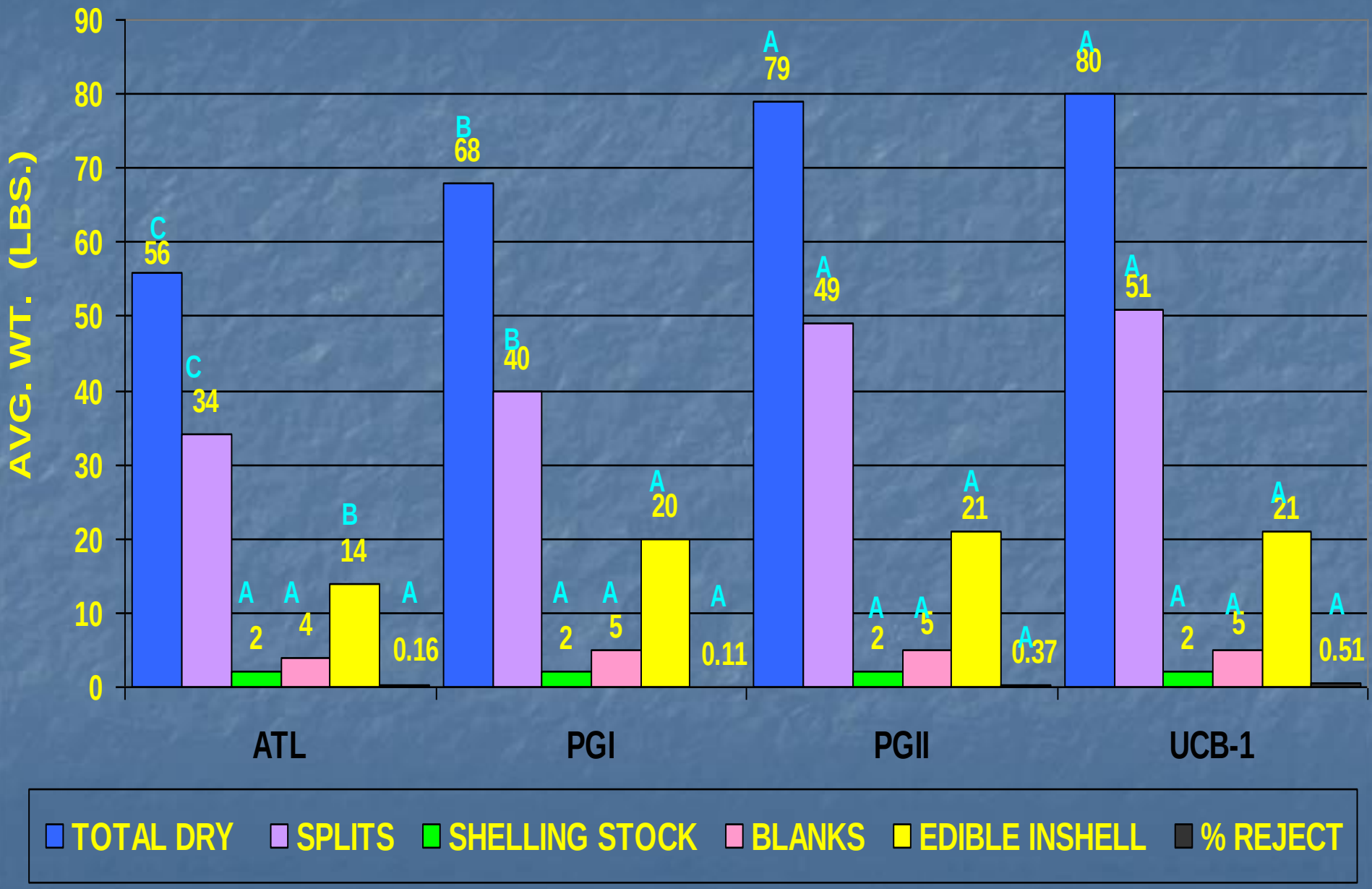
November 14-16, 2017

Pistachio Orchard
Yield Potential




California Pistachio Rootstock Trials:
1989 - 2002
Lassen
Tehama
Mendocino
Glenn
Butte
Lake
Colusa
Sutter
Yuba
Nevada
Placer
Sonoma
Yolo
Napa
El Dorado
Marin
Solano
Sacramento
Amador
Alpine
San Francisco
Contra Costa
San Joaquin
Calaveras
Alameda
Tuolumne
San Mateo
Stanislaus
Mariposa
Mono
Santa Clara
Santa Cruz
Merced
Madera
San Benito
Fresno
Monterey
Kings
Tulare
Kern
Santa Barbara
Ventura
Los Angeles
San Bernadino
S & J Ranch
1989
• yield and cold tolerance
KAC
1989
• yield and cold tolerance
WSFS
1989
• yield and cold tolerance
• Verticillium tolerance
Paramount Ranch
1989
• yield and cold tolerance
• salinity tolerance

Comparison of pistachio rootstock performance at the Kearney Agricultural Center, Parlier, CA. Yields represent an average of 90 trees per rootstock. Orchard age is 20 years.. RH BEEDE P.I.

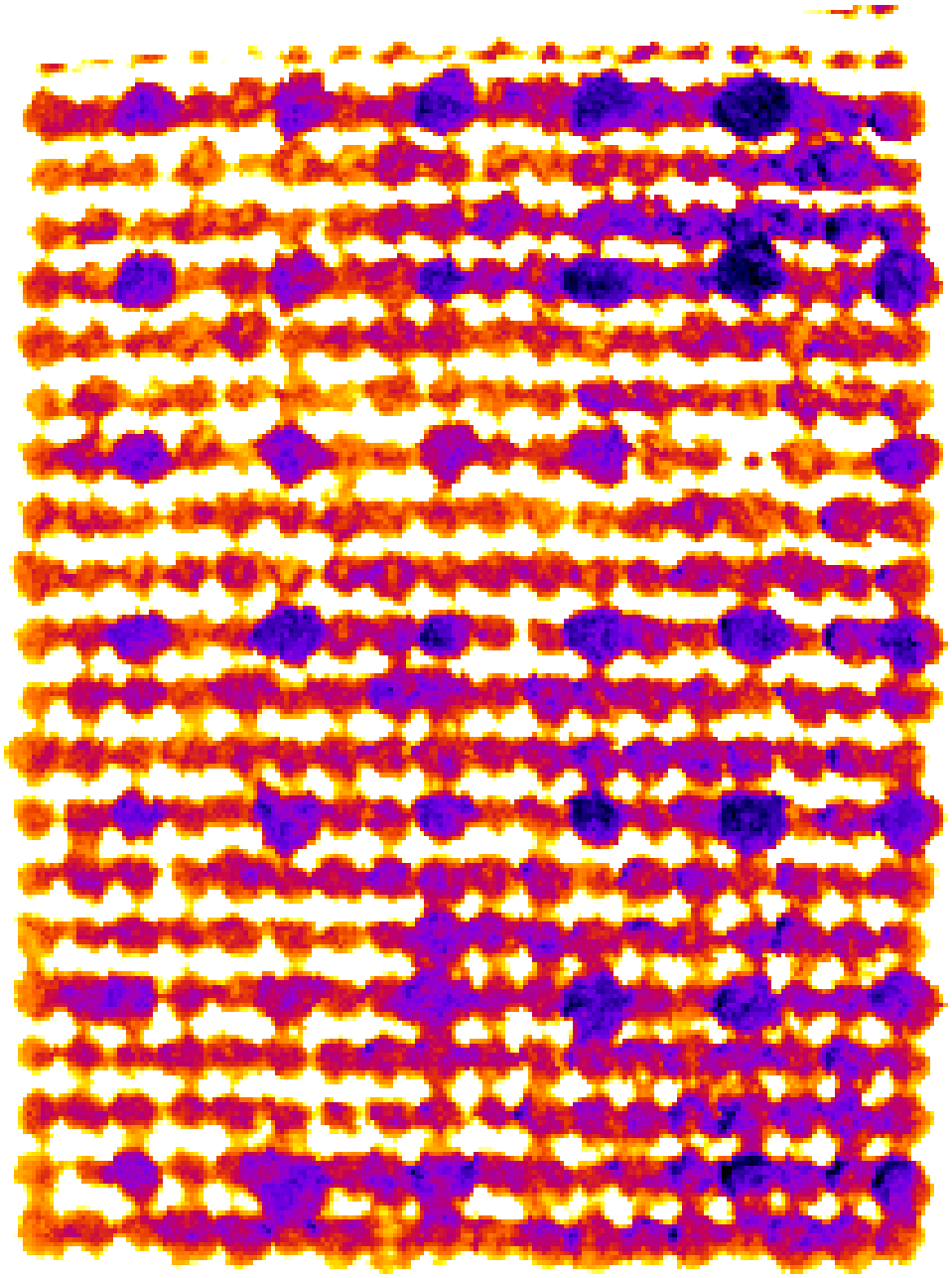


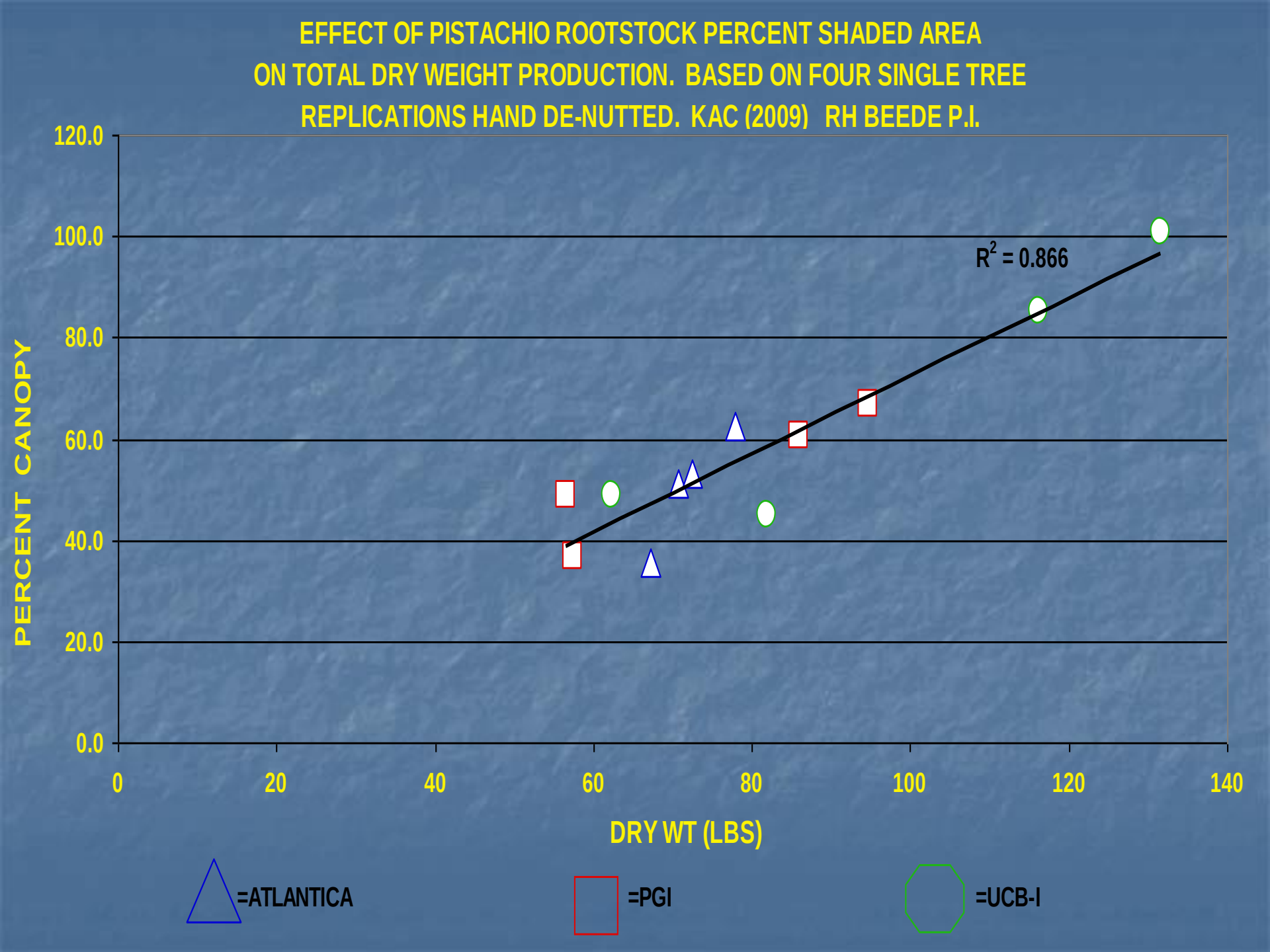
THE SEARCH FOR "SUPERIOR ROOTSTOCK"; WHAT IS YOUR DEFINITION OF " SUPERIOR"? GREATER YIELD? DISEASE, NEMATODE TOLERANCE?

IF YOU DEFINE "SUPERIOR" AS GREATER YIELD, THEN WHAT YIELD COMPONENT IS RESPONSIBLE?

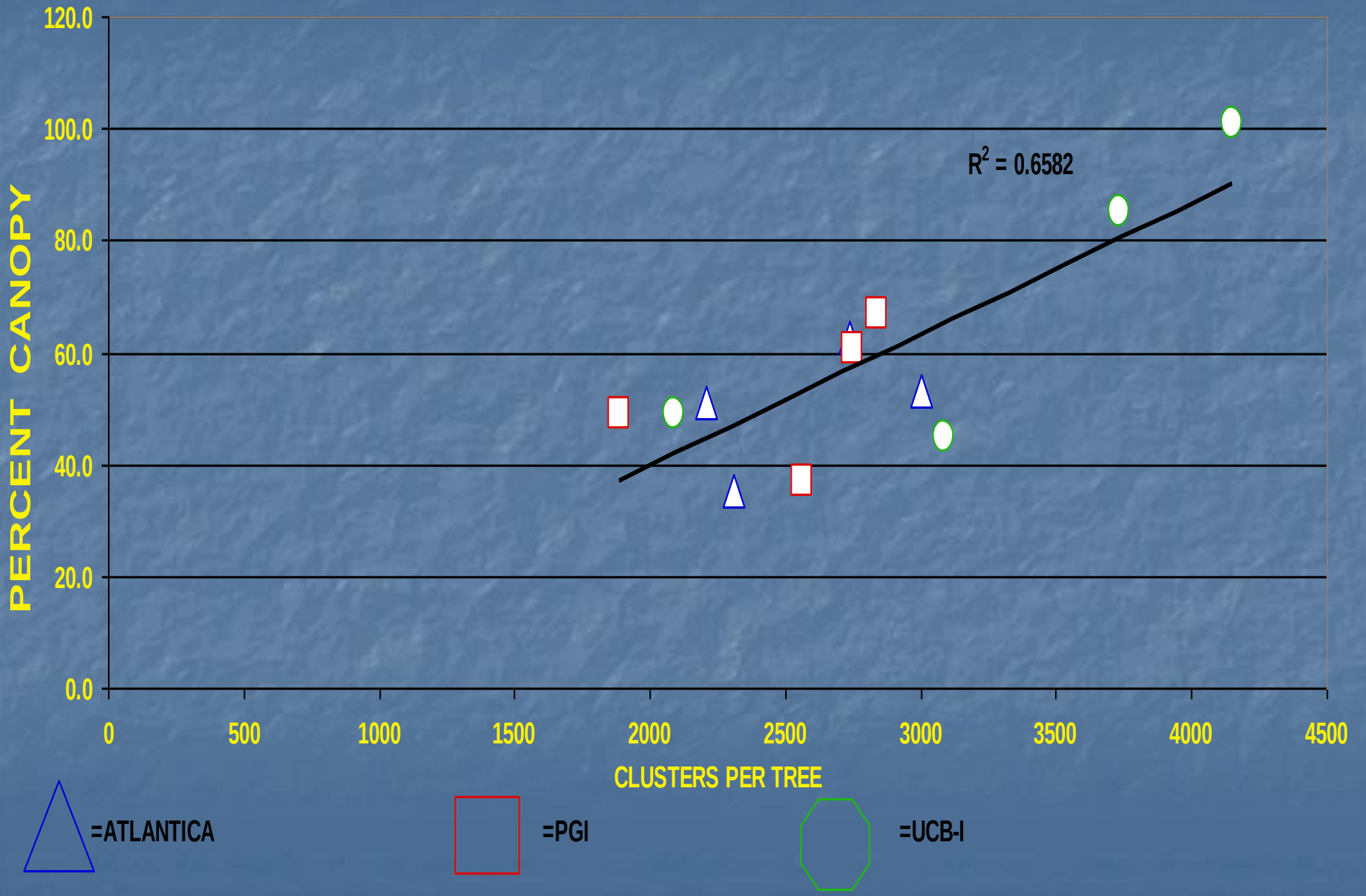
1. **GREATER FRUITING DENSITY? (i.e. more clusters per unit area)**
2. **GREATER NUMBER OF FILLED NUTS PER CLUSTER?**
3. **LARGER NUTS? OR……. IS IT SIMPLY….**
4. **LARGER TREE WITH MORE SURFACE FOR FRUIT WOOD?**

SPAIN'S AERIAL IMAGERY TEAM: KAC 2009

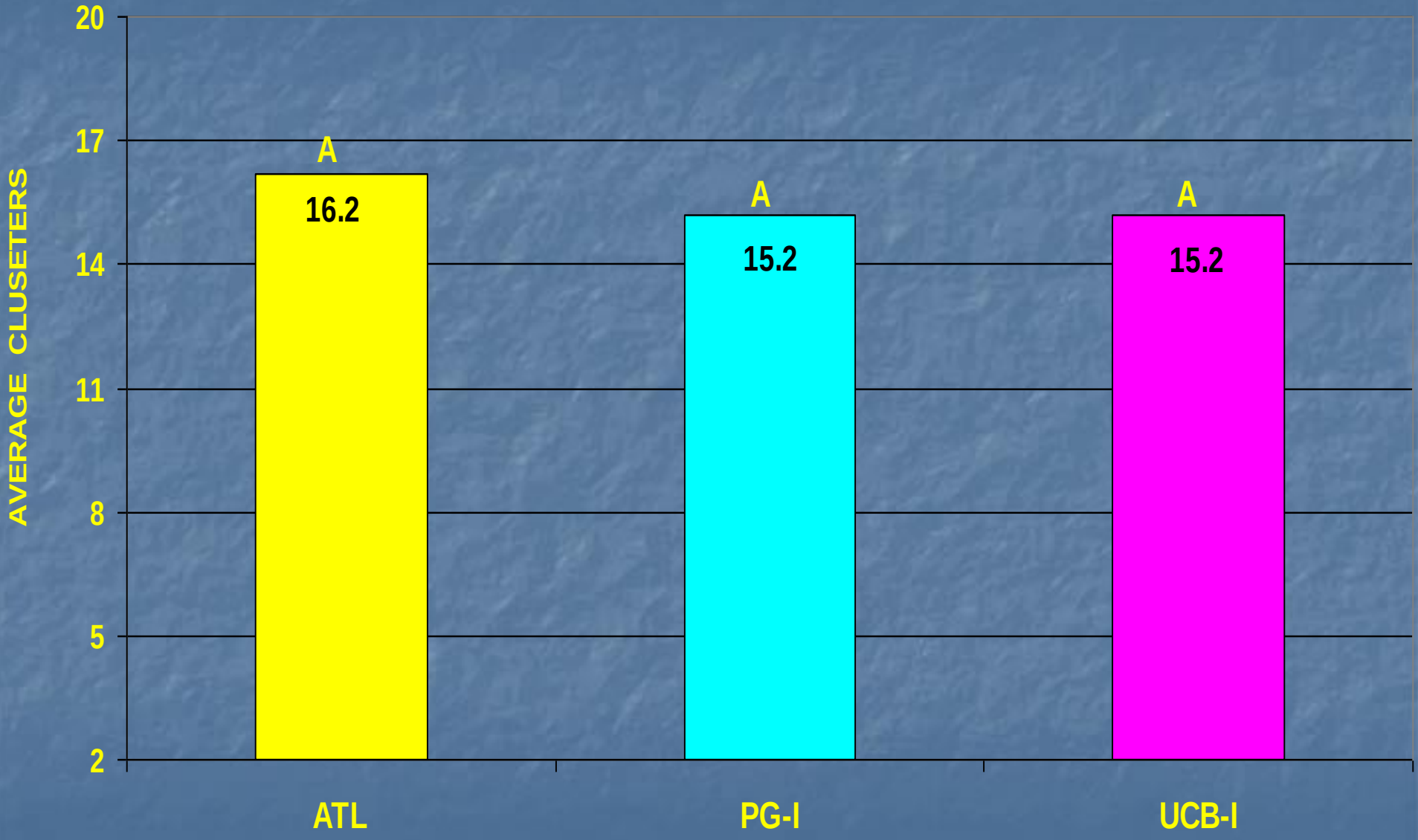



EFFECT OF PISTACHIO ROOTSTOCK PERCENT SHADED AREA
ON TOTAL DRY WEIGHT PRODUCTION. BASED ON FOUR SINGLE TREE
REPLICATIONS HAND DE-NUTTED. KAC (2009) RH BEEDE P.I.
PERCENT CANOPY
120.0
100.0
80.0
60.0
40.0
20.0
0.0
0
20
40
60
80
100
120
140
DRY WT (LBS)
R2 = 0.866
=ATLANTICA
=PGI
=UCB-I

EFFECT OF PISTACHIO ROOTSTOCK PERCENT SHADED AREA ON TOTAL CLUSTER NUMBER. BASED ON FOUR SINGLE-TREE REPLICATIONS HAND DE-NUTTED. KAC (2009). RH BEEDE P.I.



EFFECT OF PISTACHIO ROOTSTOCK ON THE AVERAGE NUMBER OF CLUSTERS PER UNIT AREA (FT^2) OF TREE CANOPY. KAC (2009). RH BEEDE P.I.

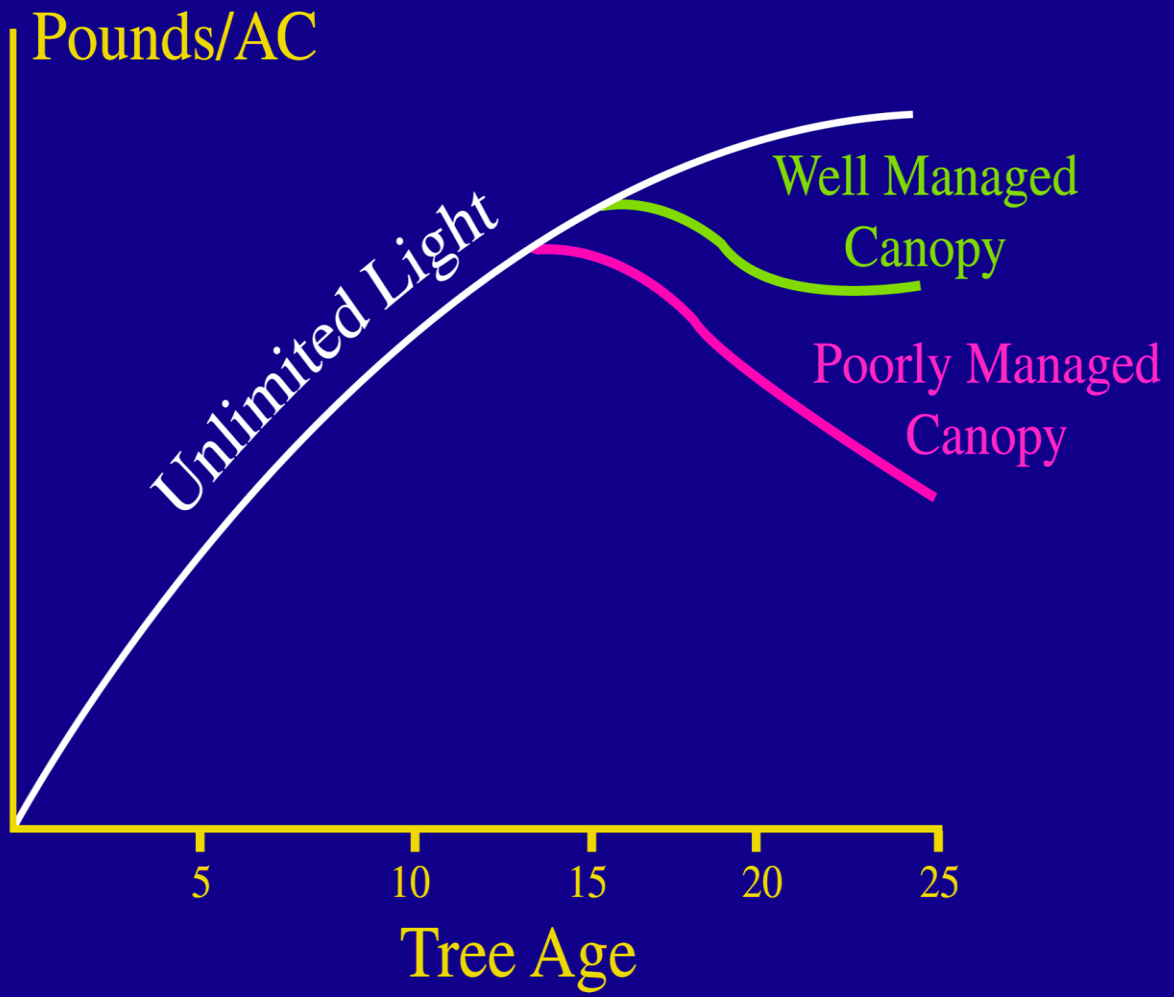


SUMMARY OF ROOTSTOCK RESEACH TO ASSESS REASON FOR YIELD SUPERIORITY OF UCB1 COMPARED TO P. INTEGERRIMA (e.g. PGI) AND P. ATLANTICA:

1. ASSESSMENT OF ROOTSTOCK YIELD BY PARTITIONING INDIVIDUAL TREES OF DIFFERENT CANOPY SIZE FOR DRY, IN-SHELL YIELD, TOTAL CLUSTER NUMBER, NUTS PER CLUSTER, AND NUT QUALITY PER CLUSTER REVEALS THAT PRODUCTION IS STRONGLY CORRELATED TO TREE SIZE, NOT GREATER FRUITING DENSITY (CLUSTERS PER UNIT AREA OF CANOPY).
2. YIELD DATA COLLECTED FROM THE UPPER AND LOWER HALF OF 20 YEAR OLD KERMAN TREES ON THREE DIFFERENT ROOTSTOCKS REVEALED THAT 75 PERCENT OF THE CROP IS IN THE UPPER HALF OF THE CANOPY. ATLANTICA TREES HAD ABOUT 30 PECENT OF THE CROP IN THE LOWER HALF DUE TO THEIR SMALLER CANOPIES AND SUBSEQUENT GREATER LIGHT EXPOSURE IN THE BOTTOM OF THE CANOPY.
3. YIELD SUPERIORITY THEREFORE APPEARS TO SIMPLY BE A FUNCTION OF TREE SIZE.

Beede 2009

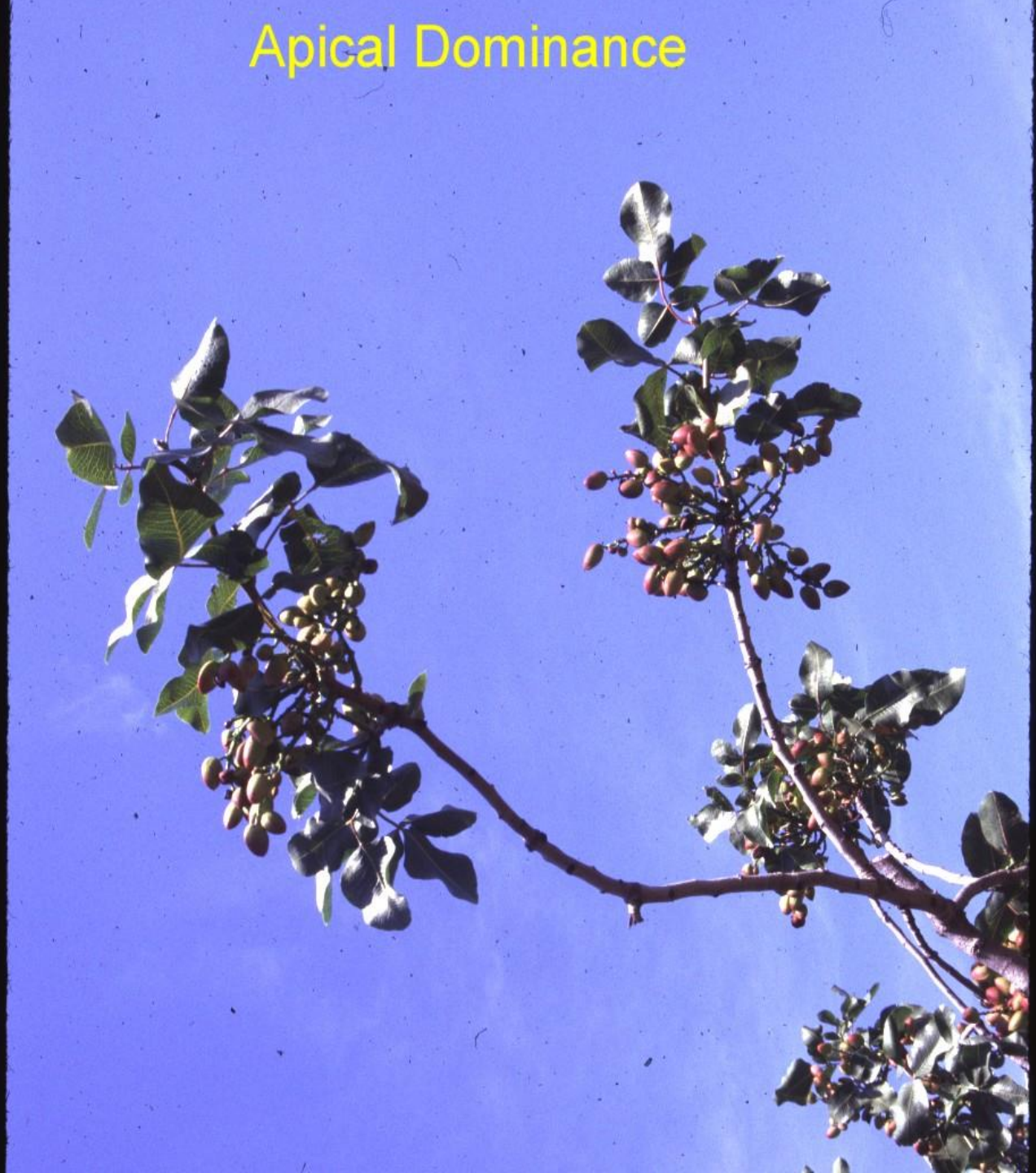
Pistachio Orchard
Yield Potential



Grower Goals for Pruning Mature Pistachios:

1. Control Tree Size
2. Facilitate Harvest
3. Improve Nut Removal
4. Maintain Fruitfulness
5. Minimize Yield Loss

Apical Dominance



GOALS FOR HAND PRUNING:

1. PRUNE THE CANOPY "BACK AND UP"
2. STIFFEN THE FRUITING BRANCHES TO ACHIEVE EFFICIENT REMOVAL
3. AVOID THE REMOVAL OF BRANCHES THAT CREATE "SNAKES" IN THE CANOPY
4. COMPRESS THE HEIGHT OF THE CANOPY BY PERFORMING HEADING CUTS DEEPER INTO THE UPPER PART OF THE TREE.
5. ELIMINATE "TRAFFIC"- CONJESTED BRANCHES SHADING ONE ANOTHER

MARVIN BRAND PRUNING HEAD; POPULAR DUE TO LIGHTER WEIGHT (CASTING RATHER THAN FORGING), WIDE ENOUGH MOUTH FOR MOST CUTS NOT NEEDING A SAW, AND REASONABLY PRICED. A SHARP BLADE IS A MUST FOR SPEED! CARRY A STONE, NOT A FILE!


Watch out for Snakes!

HEAVY CROP + APICAL DOMINANCE = MAJOR FRUITING LIMBS BENT OUT OF POSITION

PROPERLY CIRCLED TIED TREE: ONLY THE STRUCTURAL BRANCHES, NOT THE TEMPORARIES!

Effect of Mechanical Hedging on Pistachio Yield

L. Ferguson
B. Beede
J. Maranto
S. Goana
D. Castle
A. Garza
R. Fanucchi

EFFECT OF MECHANICAL HEDGING

	Yield (lbs/tree)		
	Hand-Pruned	Hedged 1-Side	Hedged 2-Sides
Before ON	29.2	29.5	25.2
Before OFF	37.0	37.4	36.9
Average	33.1	33.4	31.0

Mean 2 years/2 sites at Paramount
From: Ferguson et al. 1991

Conclusions from Hand Pruning Experiment Kings County

1. Severe thinning, heading or commercial pruning before the "on" year did not decrease yield compared to unpruned trees.
2. Pruned trees compensated for fruit bud reduction by setting more nuts per cluster. This is a unique pruning response for deciduous trees.

Conclusions from Hand Pruning Experiment Kings County

3. There was no carryover effect from "on" year pruning on fruit set, nut quality or yield for the following "off" year.

4. Thinned trees produced growth similar to those unpruned. Severely headed trees grew the least.

Pistachio Canopy Management Experiment

Cooperator: Munger Investment

Location: 17 miles south of Kettleman City

Project Began: 1996-97

Tree Age: 16 years

Pistachio Canopy Management Treatments

1. Hand pruned
2. Hedge 1 side
3. Hedge 1 side + top 1yr wood 50%
4. Hedge 1 side + top 1yr wood 100%

Pistachio Canopy Management Treatments

5. Hedge 2 sides
6. Hedge 2 sides + top 1yr wood 50%
7. Hedge 2 sides + top 1yr wood 100%
8. Top 1 yr wood 50%
9. Top 1 yr wood 100%

6 year Cumulative Yield

- Hedging Trial -

Treatment	Pounds/acre @ 5% Moisture			
	Total Dry Yield	Splits-Clean +Light Stain	Edible Closed Shell	Blanks
1. Hand Pruned	29469 a	18411 a	6808 b	1537 a
2. Hedge 1 side	28835 ab	17063 ab	7535 ab	1521 a
3. Hedge 1 side + mod. top	27087 bc	15889 bcd	7306 ab	1536 a
4. Hedge 1 side + severe top	24521 d	13672 e	6974 b	1568 a
5. Hedge 2 side	28221 ab	16488 bc	7805 a	1492 a
6. Hedge 2 side + mod. top	26806 bc	14982 cde	7907 a	1621 a
7. Hedge 2 side + severe top	25913 cd	14387 de	7497 ab	1475 a
8. Top one-year-old moderate	27275 bc	15751 bcd	7488 ab	1616 a
9. Top One-year old severe	24224 d	13329 e	6982 b	1570 a
LSD (P=0.05)	**1986**	**1630**	**745**	**260**

6 year Cumulative Yield

Contrasts

	Contrasts			
	Total Dry Yield	**Splits-clean +Light Stain**	**Edible Closed Shell**	**Blanks**
1. Hand Pruned		18411	6808	
vs.	N.S.	*	**	N.S.
1 or 2 side hedging		16775	7670	
2. Hedge 1 side			7272	
vs.	N.S.	N.S.	*	N.S.
hedge 2 sides			7736	
3. Hand pruned	29469	18411	6808	
vs.	***	***	*	N.S.
mechanical	26610	15195	7437	
4. Topped 50%	27056	15541	7567	
vs.	***	***	*	N.S.
topped 100%	24886	13796	7151	

N.S. = Not Significant at P= 0.05

* = Significant at P≤0.05

** = Significant at P≤0.01

*** = Significant at P≤0.001

Mechanical Hedging Summary

- **In this study, hand pruned trees were the most productive throughout the 6 year trial.**
- **Pistachios can be mechanically hedged without suffering economic yield loss.**
- **Fruit Buds lost from Pruning appeared partially compensated for by increased fruit set per remaining cluster.**
- **Less yield fluctuation by hedging one side every other year**
- **Fluctuation may lessen with repeated side hedging.**

Mechanical Hedging Summary con't

- **Yield differences between single and double sided hedging in any given year is also affected by the potential crop. (i.e. Two sided hedging should not be preformed prior to a low production year.**
- **Expect significant yield loss when mechanical topping is employed for managing pistachio canopy height.**
- **Yield loss from Topping is more correlated to the potential crop than physiological conditions associated with on and off-year bearing cycles.**

Mechanical Hedging Summary con't

- **Avoid Topping prior to an OFF year to minimize alternate bearing and excessively low yields.**
- **Experimentation with in-season re-topping to control vigorous re-growth has promise.**

REAL LIFE MECHANICAL PRUNING EXPERIENCE, KERN COUNTY

GOAL: MAINTAIN 80 PERCENT SHADED AREA

1. KERMAN ON PIONEER GOLD I PLANTED 1991 AT 20' X 17'
2. EXPERTLY TRAINED TREES WITH COMPACT STRUCTURAL BRANCHES
3. HEDGING AND TOPPING PROGRAM BEGAN IN YEAR NINE:
    A. SIDE HEDGE EVERY OTHER ROW EVERY YEAR, SIX FOOT SWATH
    B. CROSS HEDGE EVERY OTHER TREE MIDDLE EVERY YEAR, THREE FOOT SWATH
    C. TOPPED HALF THE GROWTH IN THE BEGINNING, THEN TRYING TO HOLD THEM TO 15.5 FEET FROM YEAR TWELVE ON
    D. IN ADDITION, HANDPRUNING PERFORMED ANNUALLY TO MAINTAIN LIGHT THROUGH THE CENTER OF THE CANOPY.
    E. COST: $30-35 PER PASS FOR THE HEDGER/TOPPER, $250 PER ACRE FOR THE HANDPRUNING. TOTAL ANNUAL: ~ $350/AC.
4. RESULT: AVERAGE YIELD OVER EIGHT YEARS: 4000 LBS., WITH 10% NON-SPLITS.
5. ALTERNARIA PROBLEM GREATLY REDUCED

SIDE HEDGING (SIX FOOT SWATH) EVERY OTHER ROW EVERY YEAR

CROSS HEDGED THREE FEET EVERY OTHER ROW EVERY YEAR

RELIANCE SOLELY UPON MECHANICAL PRUNING CAN RESULT IN LOSS OF LOWER FRUIT WOOD AND LOTS OF DEAD LIMBS. EFFECT OF OPENING UP THE CENTER? REDUCTION IN LIMB LOSS, BUT NO DATA ON YIELD EFFECT.

THE ROTATING STAR MECHANICAL PRUNER IN ACTION. NOT SUITABLE FOR SIDE HEDGING LARGE WOOD

ROTATING HEAD MOVES TOO FAST TO CUT LARGER LIMBS BEFORE SPLITTING THEM RECONSTRUCTIVE SIDE HEDGING BETTER PERFORMED WITH SAWS MOUNTED ON A STATIONARY BOOM

MIKE PELHAM'S STATIONARY BOOM; 20 FEET OF SPINNING STEEL!

PISTACHIO REJUVENATION AND ALTERNATE BEARING TRIAL

BEEDE AND FERGUSON, PI'S

FIRST YEAR SIDE HEDGING CUT 6.5 FEET FROM TREE AXIS

INITIATED PRIOR TO THE OFF BEARING

YEAR (2012)

REJUVANATION/ MITIGATION OF ALTERNATE BEARING TRIAL KEARNEY AGRICULTURAL CENTER. INITIATED IN OFF YEAR 2012. TOPPING PERFORMED AT 14 FEET. FIVE FEET REMOVED!

NEW DATA STILL IN THE PROCESS OF BEING SUMMARIZED

NOT AVAILABLE AT THE TIME OF BINDER PREPARATION

THANK YOU!

QUESTIONS?

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