

**UF/IFAS**  
**Citrus Research and**  
**Education Center**  
**Lake Alfred, Florida**



UNIVERSITY OF  
**FLORIDA**

**IFAS**

MH Field Day  
17 Jan 2007

UF, IFAS, CREC: A World Class Research, Graduate Teaching & Extension Center of Excellence  
From citrus genomics, new varieties and horticulture,  
TO citrus production, pest and disease management--  
TO harvesting, postharvest, processing, food  
science, economics and marketing.



Mechanical Harvesting and Tree Health

# Recent FAQ fact sheet (EDIS)

1. Leaf loss

2. Loss of root function

3. Bark loss “Barking”

... Research studies using healthy, repeatedly mechanically harvested trees for 5 to 7 years and commercial harvesting experience have shown NO reductions in yield or tree health for ‘Hamlin’, ‘Pineapple’ & ‘Marsh’.

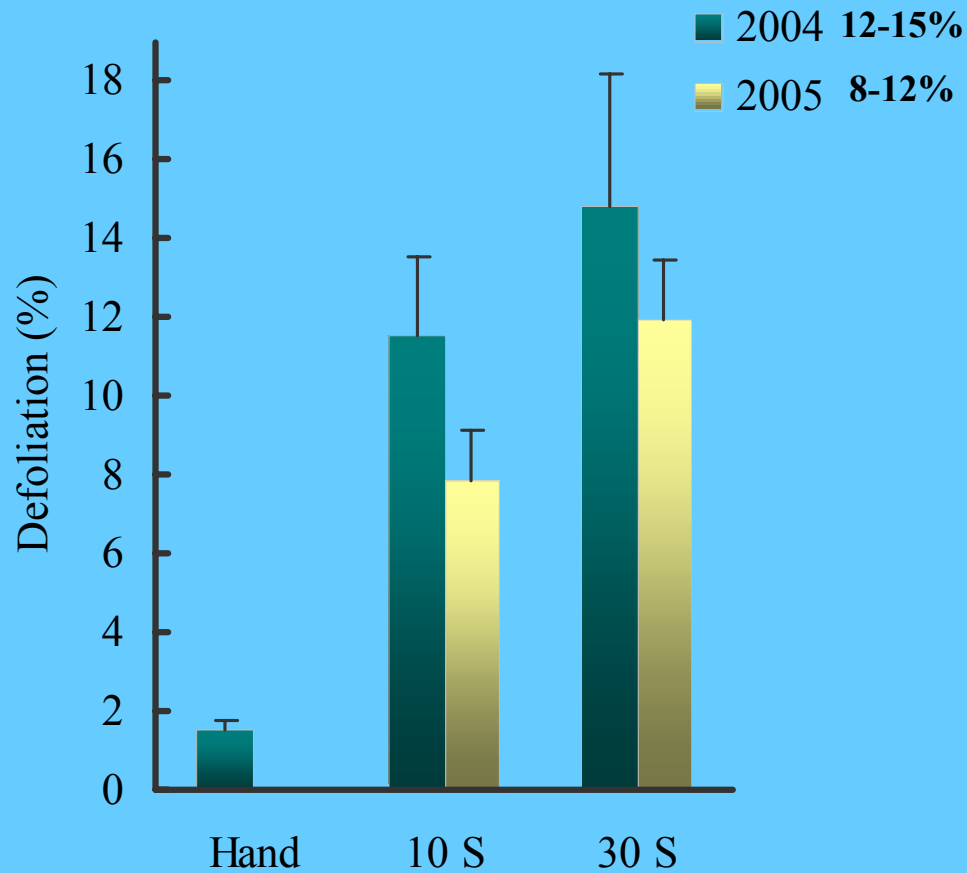
(1968 –present)

? Problem:

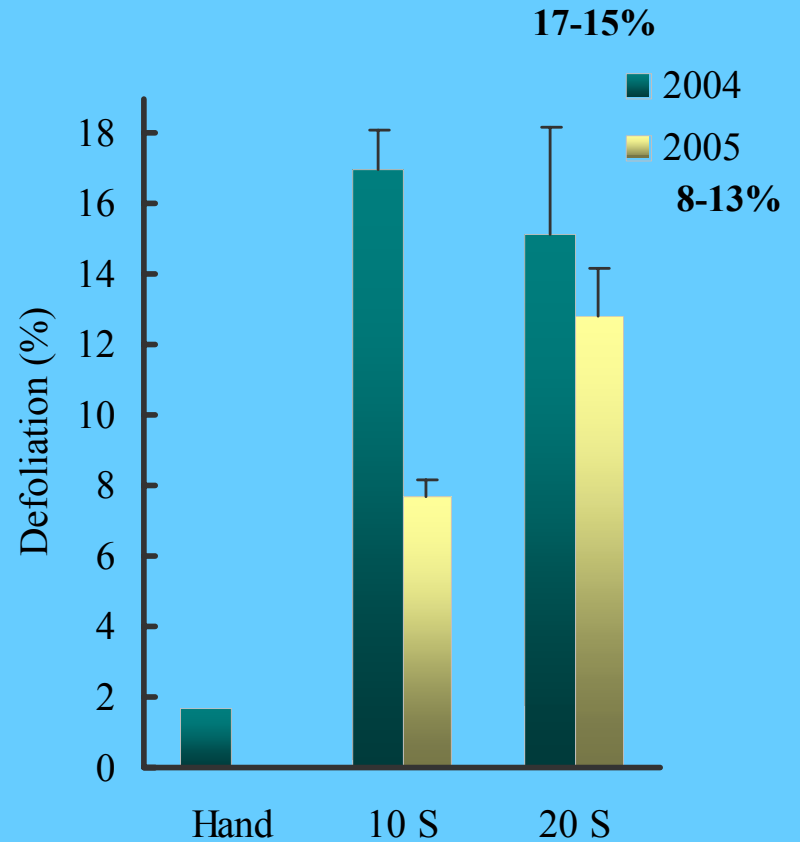
Growers see leaf loss ,  
roots emerging from soil &  
bark loss and assume  
tree health will decline &  
yields will decrease .

? Leaf loss

# Defoliation percentage



'Hamlin' (Jan)

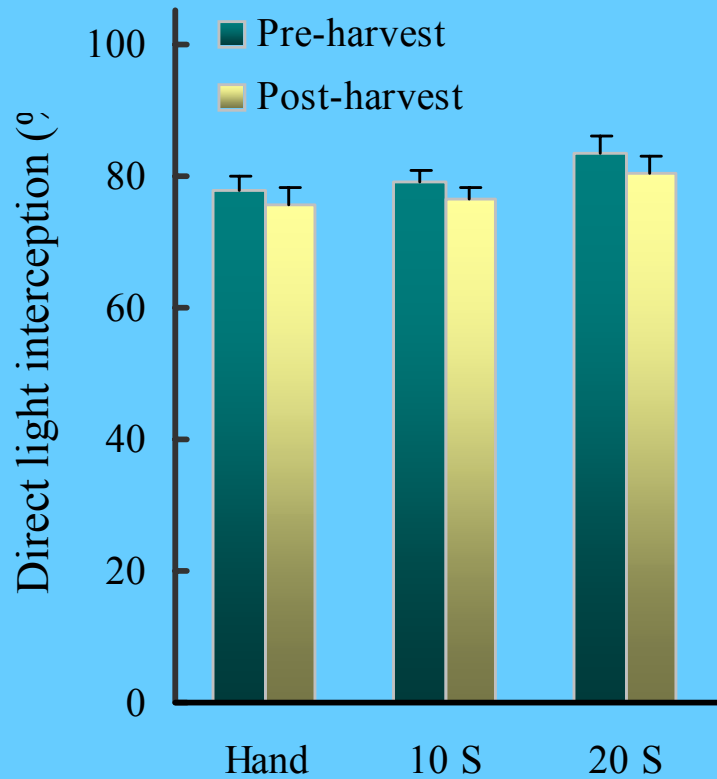


'Valencia' (March)

?Light interception

# Light interception (%)

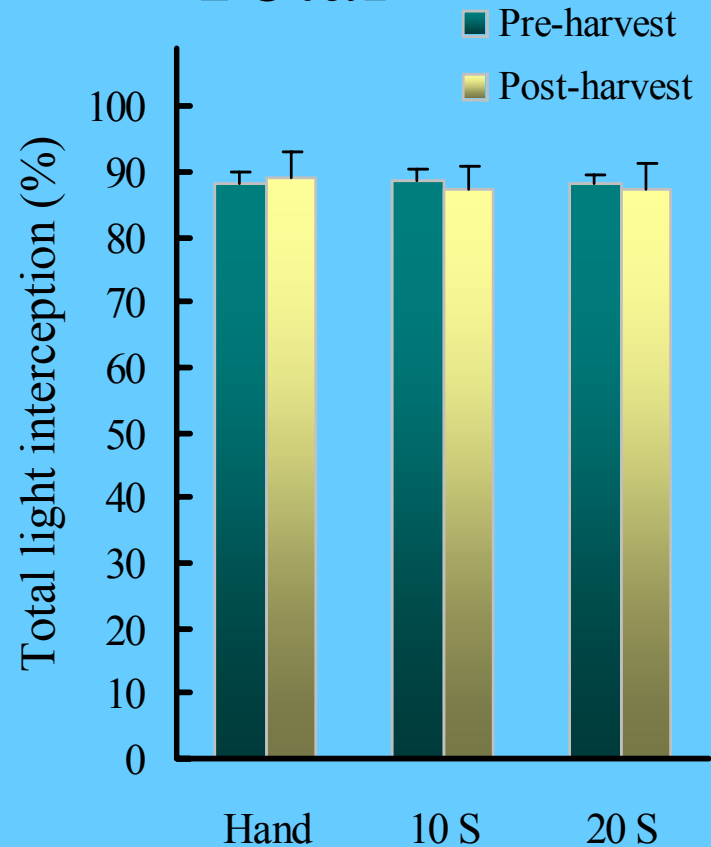
## Direct



'Hamlin' (Jan)

# No difference

## Total



'Valencia' (March)

# How much leaf loss is too much?

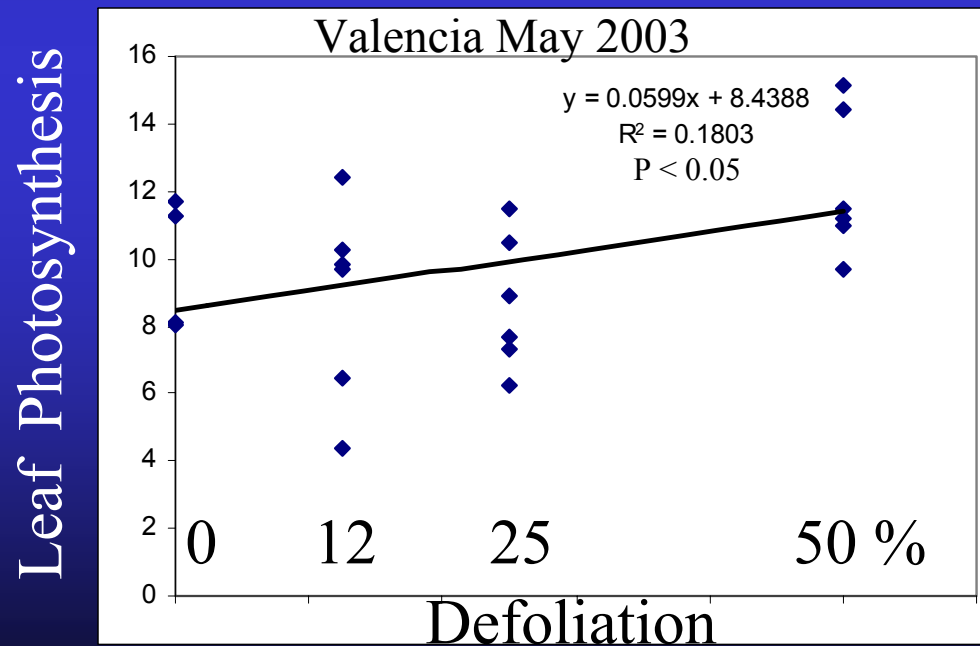
Mechanical harvesting and abscission chemicals

Defoliation from 0 to 50 % in

‘Hamlin’ and ‘Valencia’ for 2 years

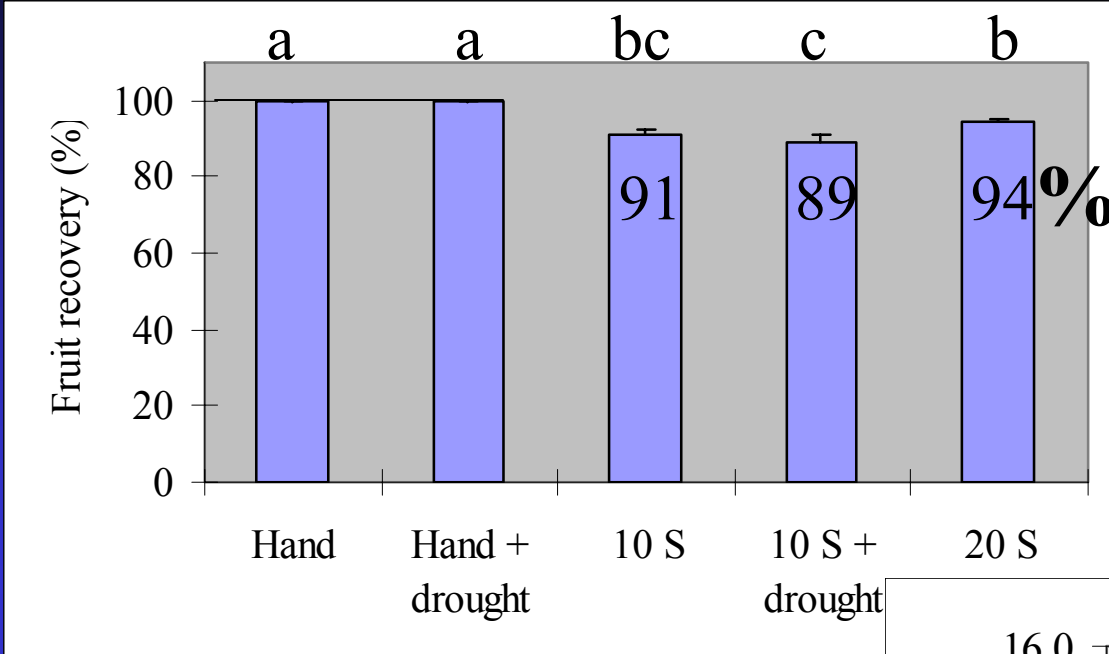
No reduction in yield yet even at 50 % defoliation

Burns et al. 2001-03



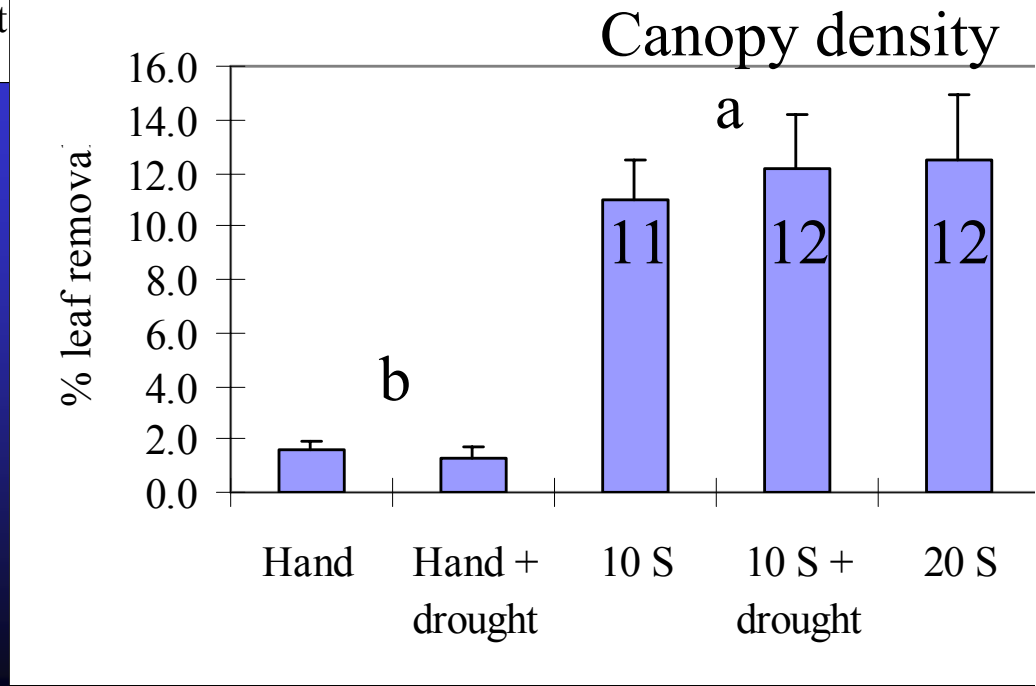
Photosynthesis of remaining leaves tends to Increase

# 'Hamlin' Jan 2004 % of Fruit Harvested



With Drought

**% Leaf Loss**



**Drought Stress ?**



## Manual Defoliation studies:

1. no decrease in yield after removing 50 % of leaves for 2 years.
2. Photosynthesis increases in remaining lvs.

## Interaction with Drought Stress:

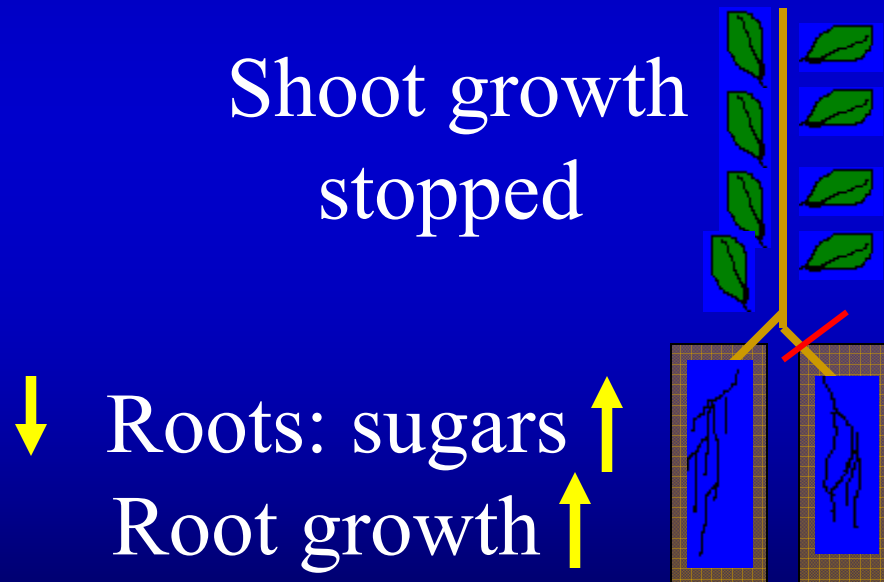
1. 20 sec. shake (Excessive):
  - a. removes ~12 % of leaves
  - b. No effect on water stress if trees irrigated
  - c. Similar to no irrigation
  - d. Effects disappeared after rainfall.

# ? Root loss ?

## Compensation

W/I 4 weeks

Root- Pruned 50%



1. Reduced water and nutrient supply fully recovered after 4 wks.

2. No effect on leaf photosynthesis



Video of Repeated  
measurements

No change in  
root growth  
through time



? Bark Injury ?      Competition

Girdling (Ringing)      C(H<sub>2</sub>O)<sub>n</sub>

Girdling in spring, increases :

Carbohydrates, Flowering

Fruit set, fruit size

Yield . ('Orlando' ↑↑ 50%)

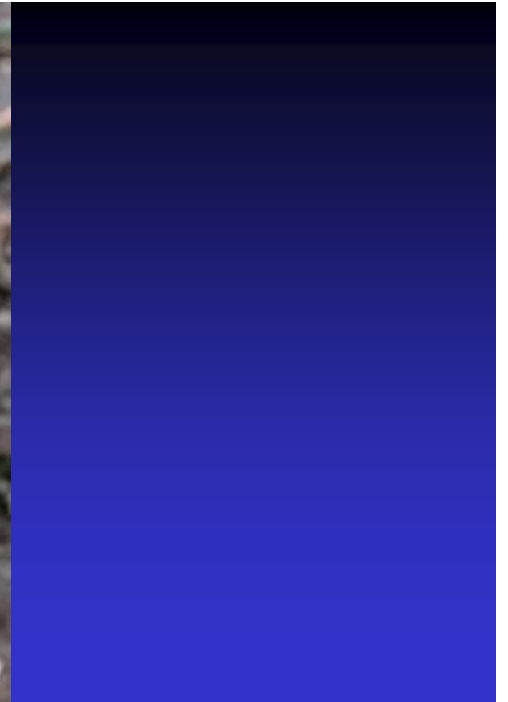
No tree damage after 7 consecutive  
years; yield normal Yr 8.

(Kretdorn & Wiltbank 1968)

‘Valencia’ Blk 24.



No measured  
effect on  
Tree growth  
or yield.



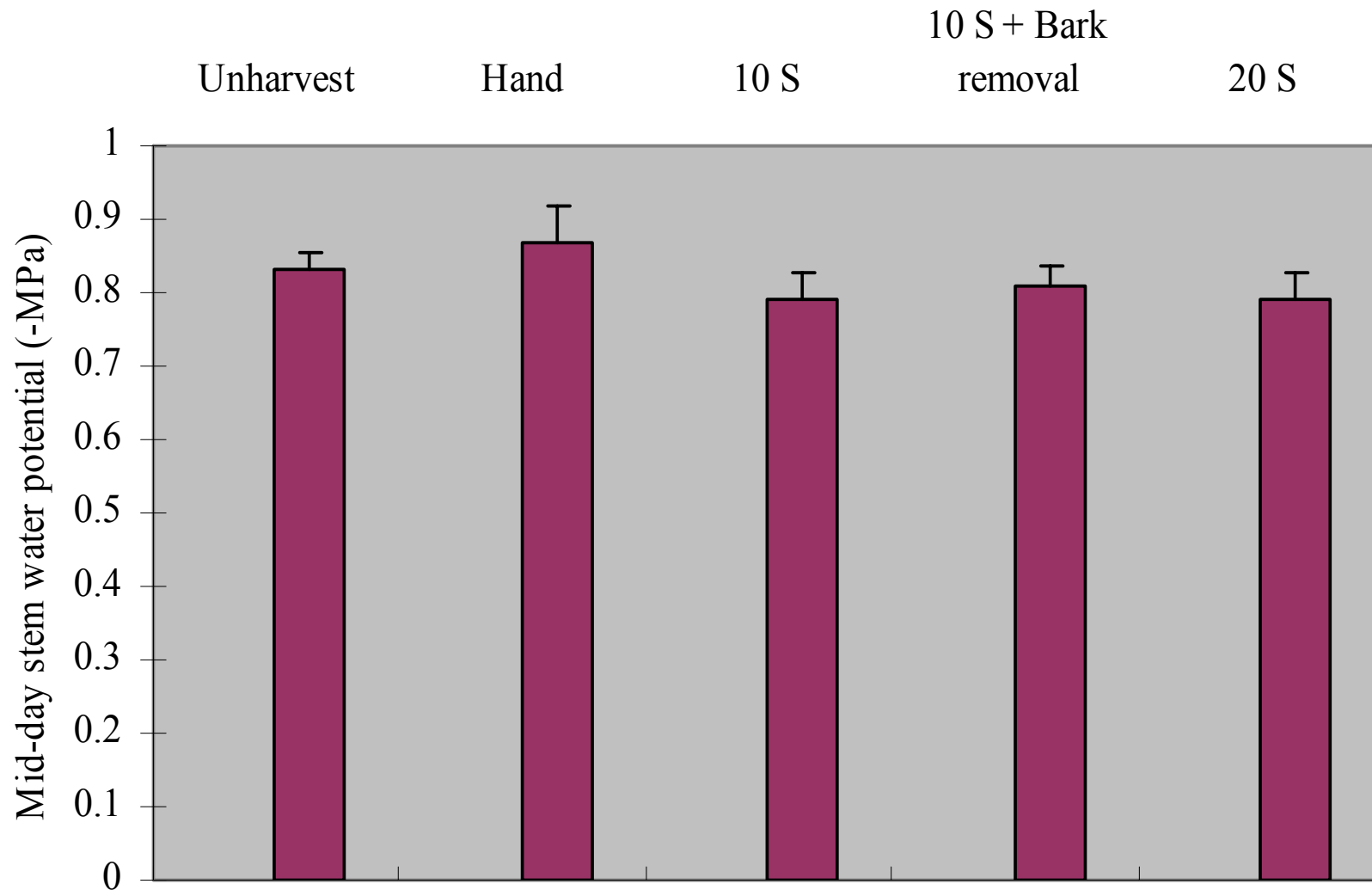
Bark patch removal  
(pocket knife)



Drought?

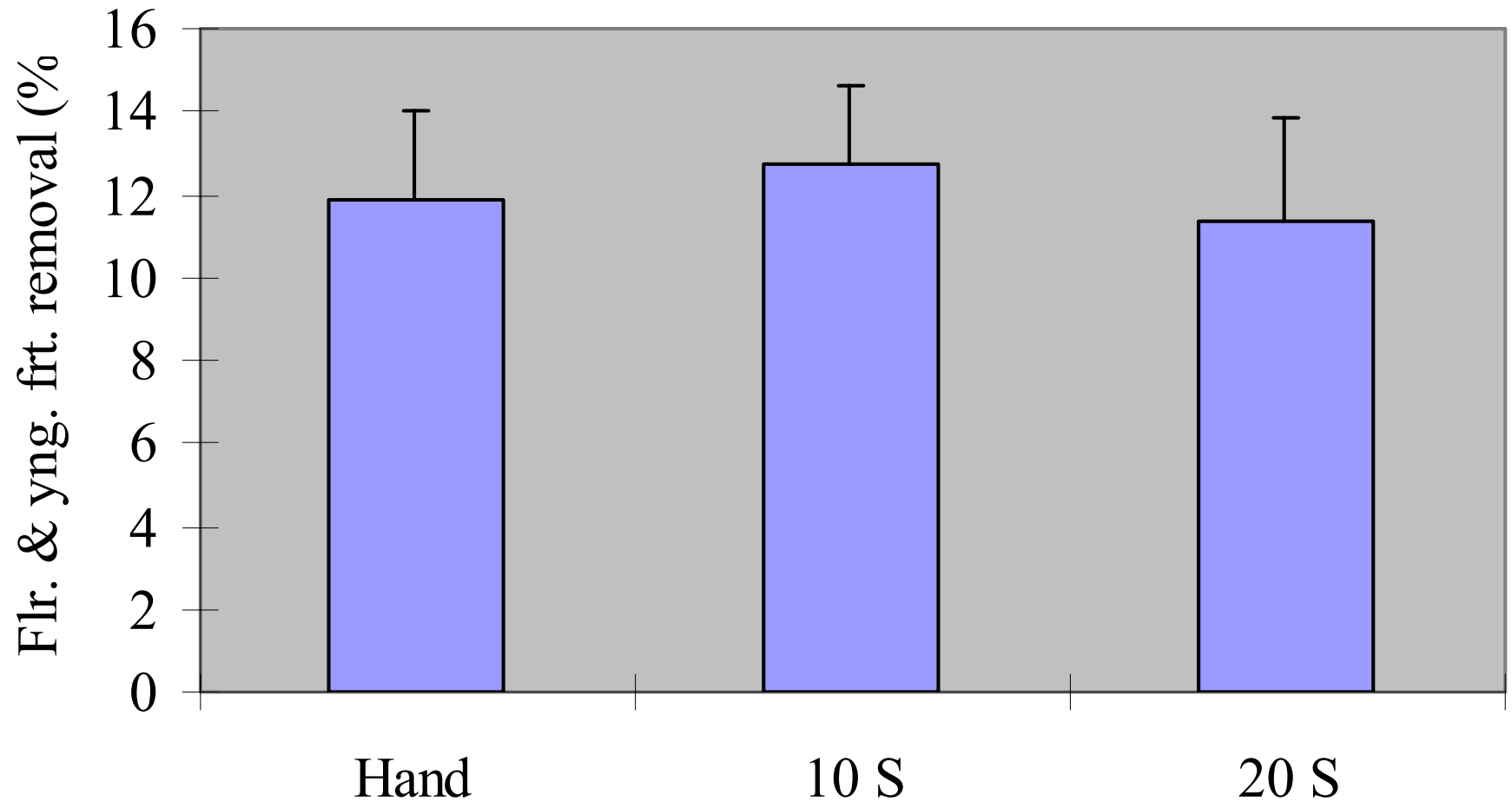
# Drought Stress, one day after Harvest

## 20 Mar 2004 (Corner Blk.)



? Loss of flowers & fruitlets.?

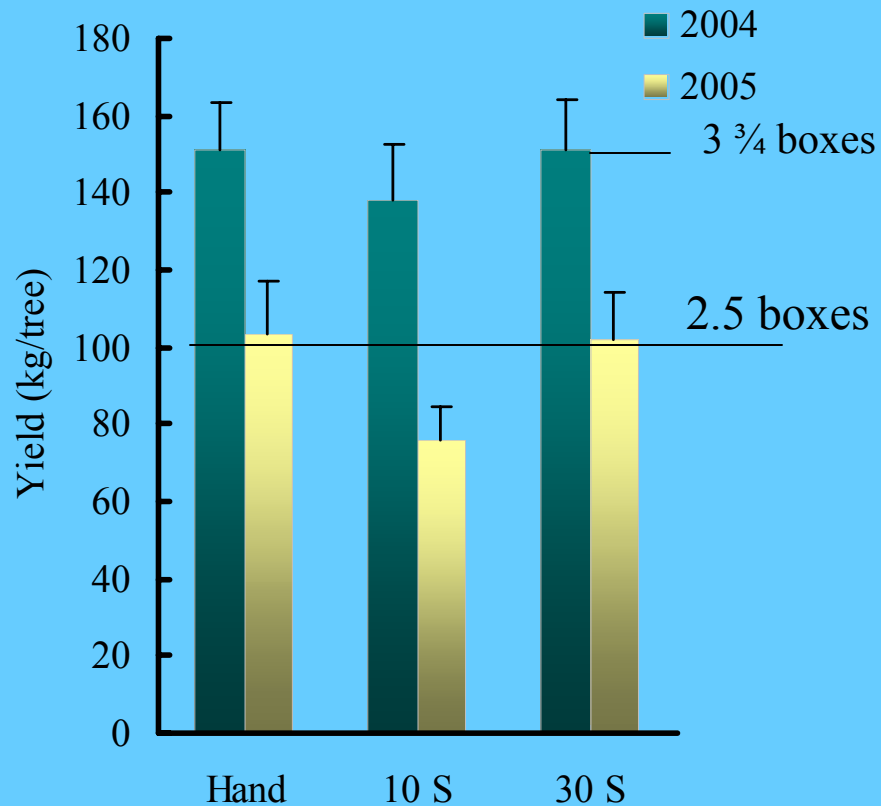
# Flower and Yng Fruit Loss from MH of 'Valencia' on 19 Mar 2004 (Corner Blk)



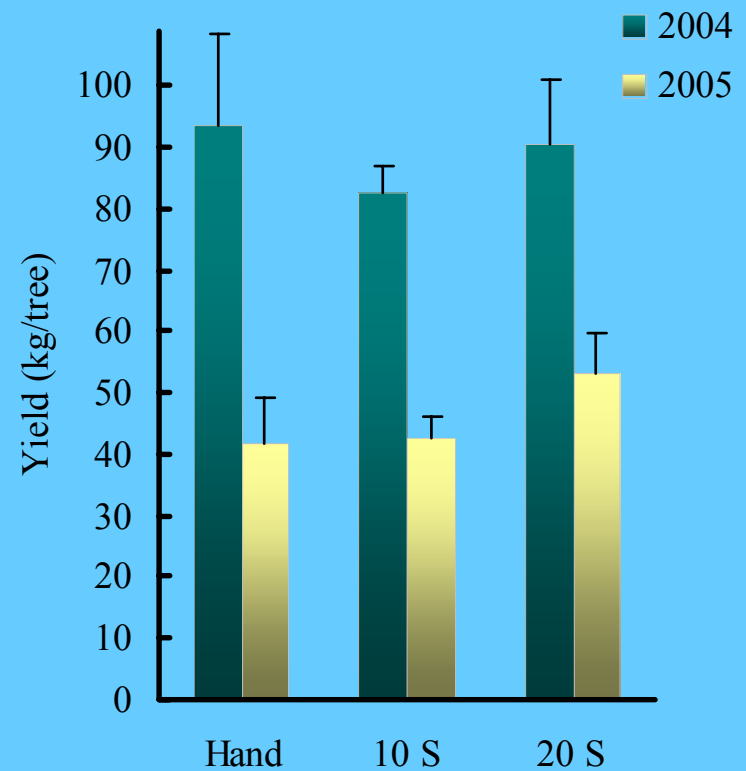
(K-T Li et al. 2004)



# Return yield after 2003 & 2004



‘Hamlin’ (Jan)



‘Valencia’ (March)

Hedged 2004, hurricane losses

## 2004 Drought Stress 2004 vs. 2005

Fruit removal 88 - 96 %

Defoliation, (17 % max)

20s > 10s > H H

But No effect on Light interception

Flower loss in 'Valencia' 10, 20 s.

No effect of shake time

% nodes Flowering or Return yield

Goal: Define safe conditions for M H

hedging, pruning, root health

? Bark damage from  
Canopy Shaker?

1<sup>st</sup> year vs.  
latter years ?

Direction in row?



# Effect of Mechanical harvesting on Tree Health and Yield

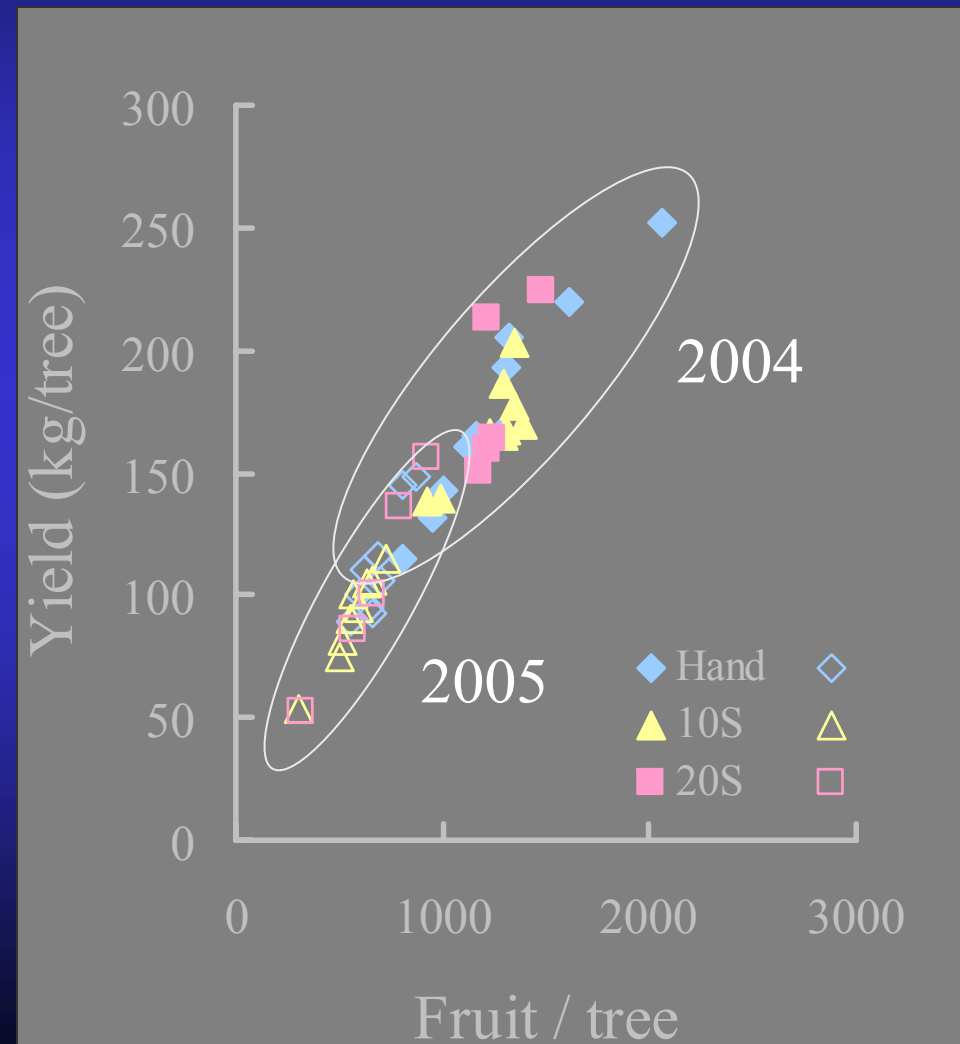
## Summary



Annual variation in yield is not related to harvest methods



Visible Injuries by mechanical harvesting do not affect Tree Physiology, Health and Return Yield



# Effect of Mechanical harvesting on Tree Health and Yield

## Exception



Harvesting 'Valencia' after May can remove young fruit and reduce yield of next crop



# Publications :

1. Mechanical harvesting and tree health. 2004.  
Buker, R.S., J.P. Syvertsen, J.K. Burns, F.M. Roka,  
W.M. Miller, M. Salyani, and G. Brown.  
EDIS..ifas.ufl.edu/HS199. 3 pp.
2. Does Mechanical Harvesting Hurt Your Trees ? 2004.  
Li, K.-T. and J. Syvertsen.  
Citrus Industry Magazine 85 (8): 30-33.
3. Injuries from mechanical harvesting have little effect on  
tree vigor and productivity in citrus. 2005.  
Li, Kuo-Tan, J.P. Syvertsen, and Jacqueline Burns.  
Proc. FSHS.
4. Li, Kuo-Tan and J.P. Syvertsen. 2005. Mechanical  
harvesting has little effect on water status and leaf gas  
exchange in citrus trees. J. Amer. Soc. Hort. Sci.