

California Pistachio Rootstocks

**Louise Ferguson
Plant Sciences Department
University of California Davis
LFerguson@ucdavis.edu**

What is a rootstock?

- *The trunk or root material to which buds or scions are inserted in grafting*





Why use a rootstock ?

- ***Disease tolerance***
 - ***Verticillium***
 - ***Phytophthora***
- ***Cold tolerance***
- ***Edaphic factors***
 - ***Salinity***
- ***Horticultural enhancement***
 - ***Yield or nut quality***

Pistachio rootstocks are sexually propagated:

- ***Seedlings***
 - ***Disadvantage; variability***
 - ***Advantage; diversity***
- ***Ability to identify superior individuals***





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LFerguson@ucdavis.edu

Pistachio rootstocks can be asexually propagated:

- *Tissue culture, air layering*
 - *Advantage; uniformity*
 - *Disadvantage; susceptibility*
- *A pathogen or pest spreads more quickly*



Rootstock breeding: 1980s

- *P. atlantica*
- *P. integrerrima* = Pioneer Gold I
- *P. atlantica* X *P. integrerrima*
- **UC Berkeley I: UCBI**
- - clones
- **Pioneer Gold II: PGII**

Factors in Rootstock Choice:

Limiting factors

- *Climate*
 - *Freezes*
- *Disease Tolerance*
 - *Verticillium*
 - *Phytophthora*
- *Soil adaptation*
 - *Salinity*

Factors in Rootstock Choice:

- *Horticultural Enhancement*
 - *Yield (growth habit)*
 - *buds or clusters/tree*
 - *nuts/cluster*
 - *nut weight*



Atlantica

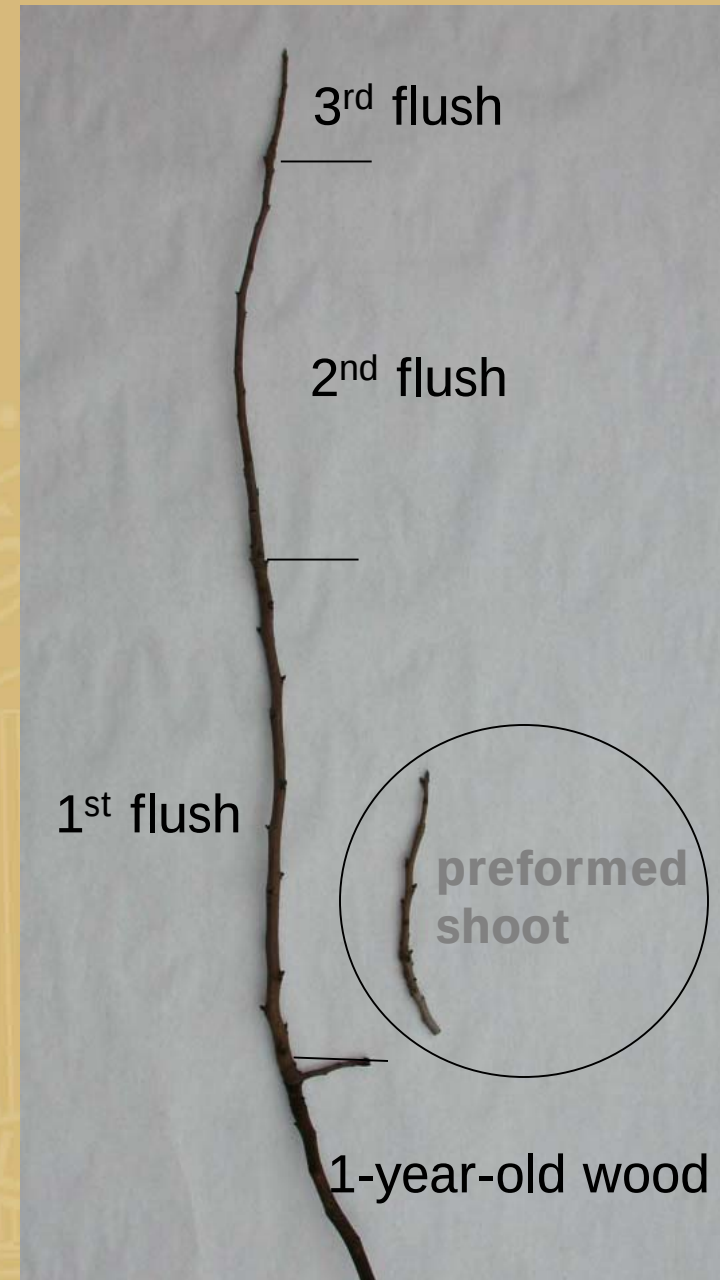
PG II

PGI

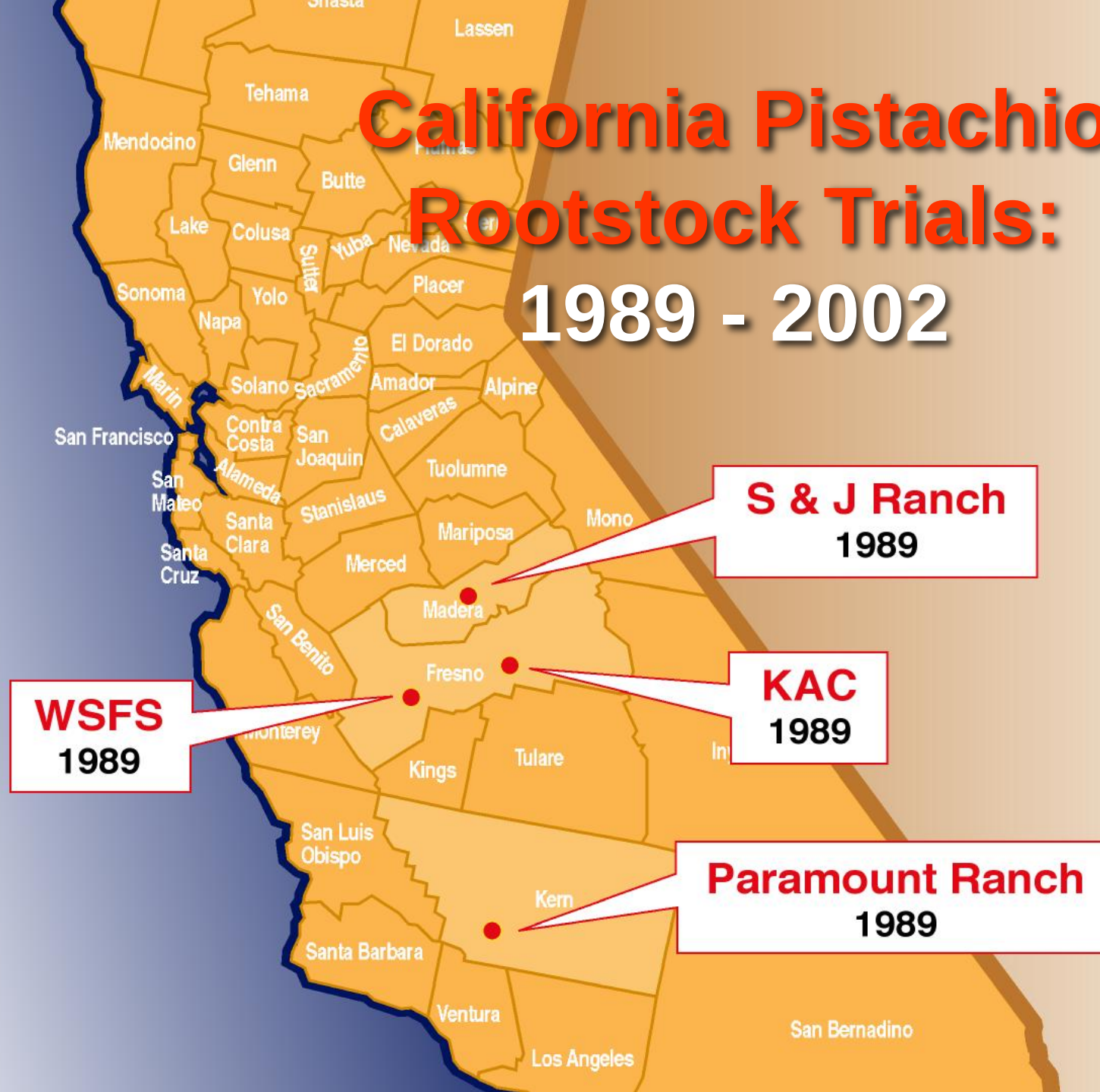
UCBI

Introduction

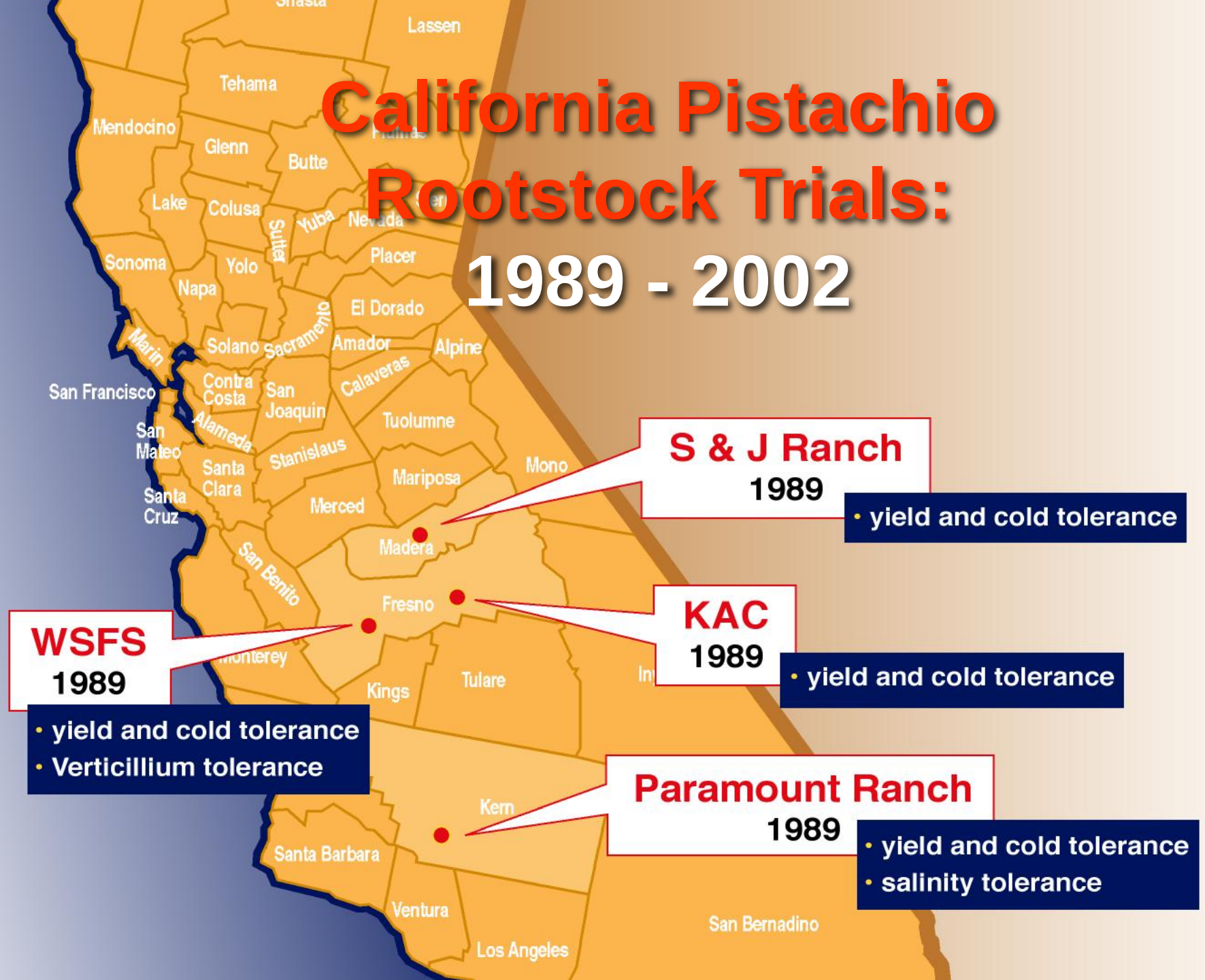
- Kerman on PG-I and UCB-1 produces multiple flushes
- Spring growth flush is preformed on all rootstocks
 - Temporal separation between node initiation and extension
- Later flushes are neoformed
 - Nodes are initiated and extended simultaneously



California Pistachio Rootstock Trials: 1989 - 2002



California Pistachio Rootstock Trials: 1989 - 2002



San Joaquin Valley Pistachio Rootstocks 1989 - 2002

Limiting Factor

Rootstock

12/1990: 11 nights @ 4-12* F

P. integerrima 41% died

P. atlantica No death

PGII 3% died

UCB1 No death

San Joaquin Valley Pistachio Rootstocks 1989 - 2002

Limiting Factor

Rootstock	Frost
<i>P. integerrima</i>	4
<i>P. atlantica</i>	1
PGII	3
UCB1	2

San Joaquin Valley Pistachio Rootstocks 1989 - 2002

Limiting Factor

Rootstock	Frost	Yield
<i>P. integerrima</i>	4	85%
<i>P. atlantica</i>	1	60%
PGII	3	86%
UCB1	2	100%

San Joaquin Valley Pistachio Rootstocks 1989 - 2002

Limiting Factor

Rootstock	Frost	Yield
<i>P. integerrima</i>	4	3
<i>P. atlantica</i>	1	4
PGII	3	2
UCB1	2	1

SCREENING PISTACHIO ROOTSTOCKS
FOR SALT TOLERANCE

— *In Cooperation With* —

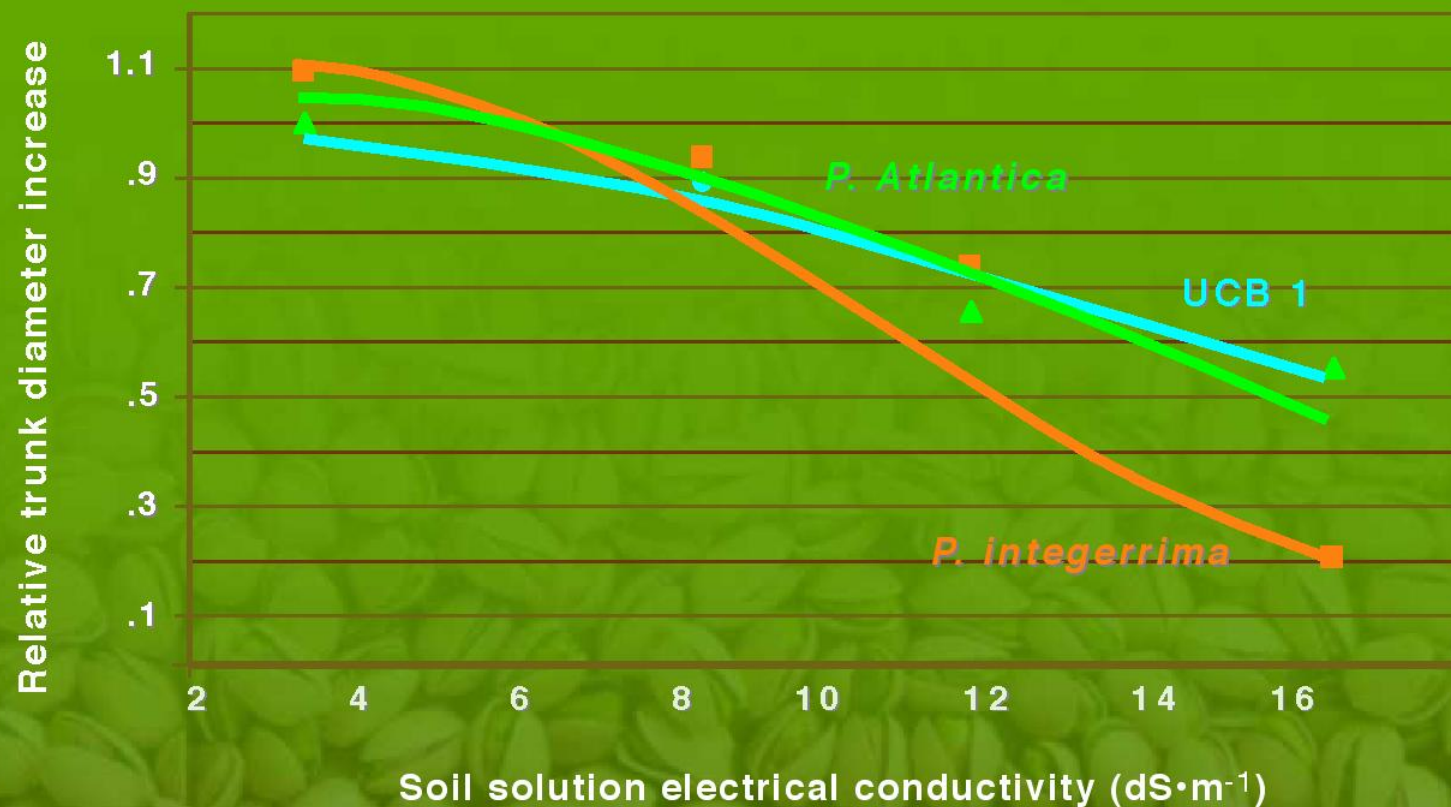
UNIVERSITY OF CALIFORNIA
COOPERATIVE EXTENSION
AND
CALIFORNIA PISTACHIO COMMISSION

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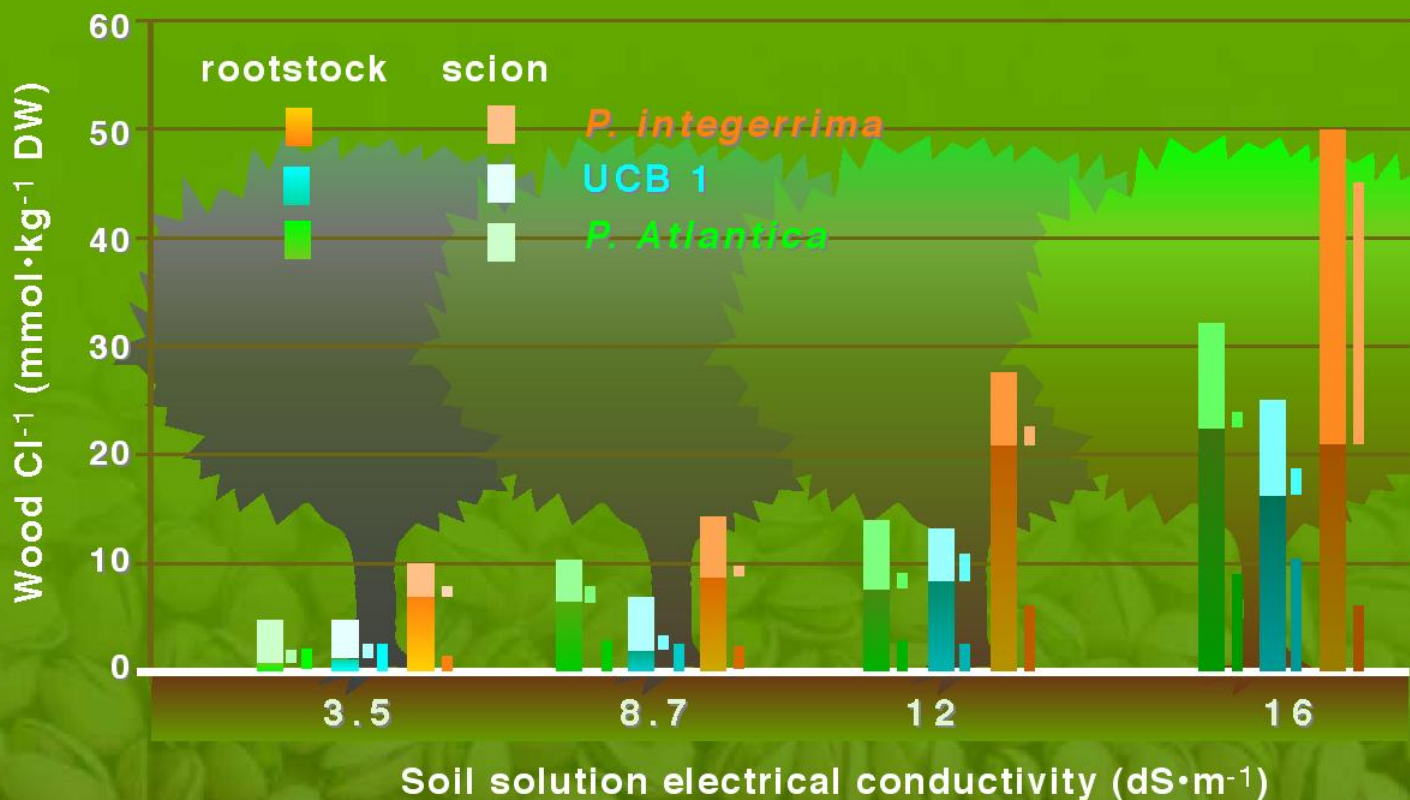


Trunk Diameter Increase of 'Kerman' Pistachio as a Function of Increasing Salinity

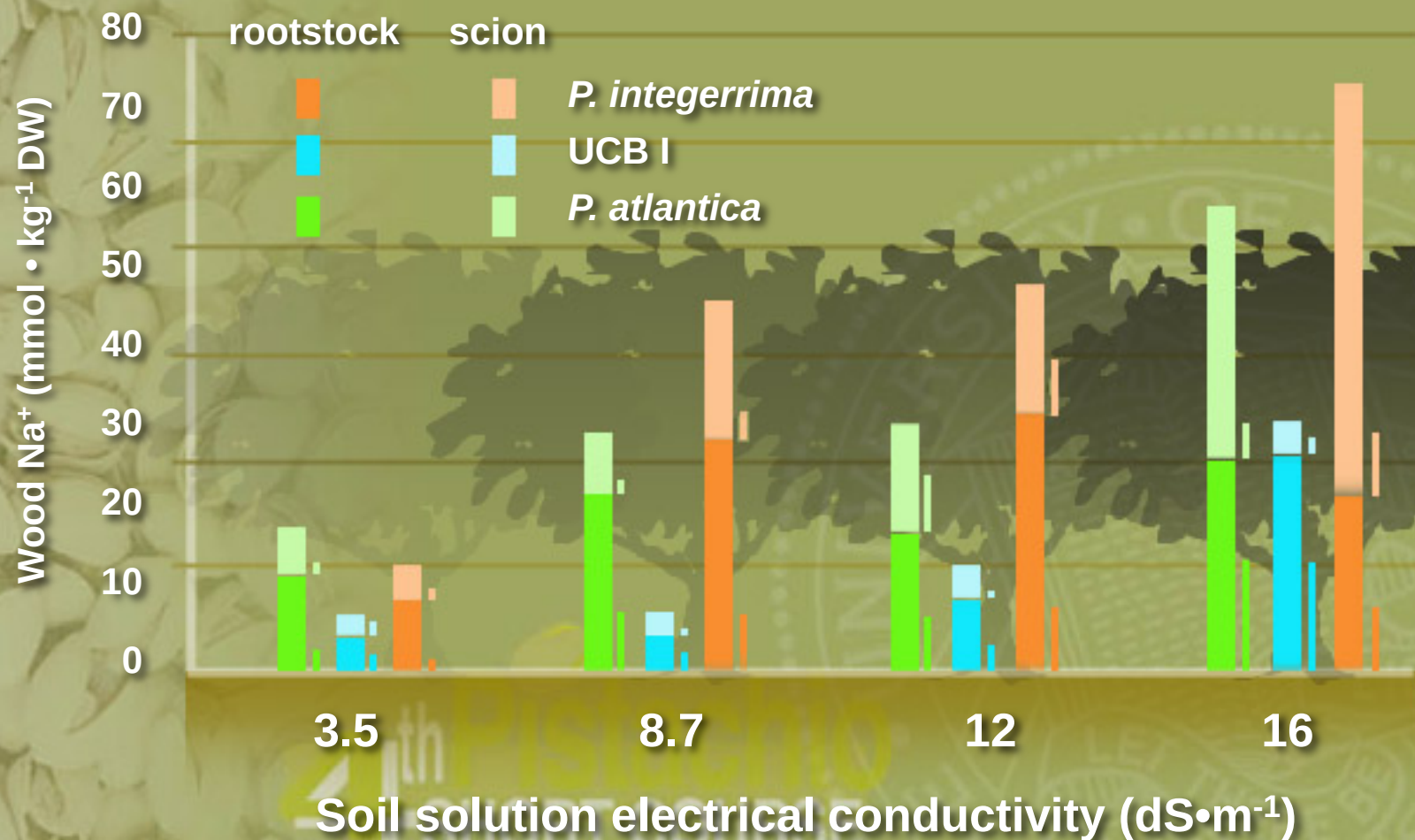


Partitioning of Cl^- Between 'Kerman' Pistachio Scion and Rootstock Wood as Influenced by Increasing Salinity

Chloride



Partitioning of Na⁺ between 'Kerman' Pistachio Scion and Rootstock Wood as Influenced by Increasing Salinity





Effect of Saline Irrigation on Average Annual Individual Tree Yield by Rootstock, 1997 - 2002



San Joaquin Valley Pistachio Rootstocks 1989 - 2002

Limiting Factor

Rootstock	Frost	Yield	Salinity
<i>P. integerrima</i>	4	2	3
<i>P. atlantica</i>	1	4	1
PGII	3	3	2
UCB1	2	1	2



P. Atlantica Rootstock



P. Atlantica Scion





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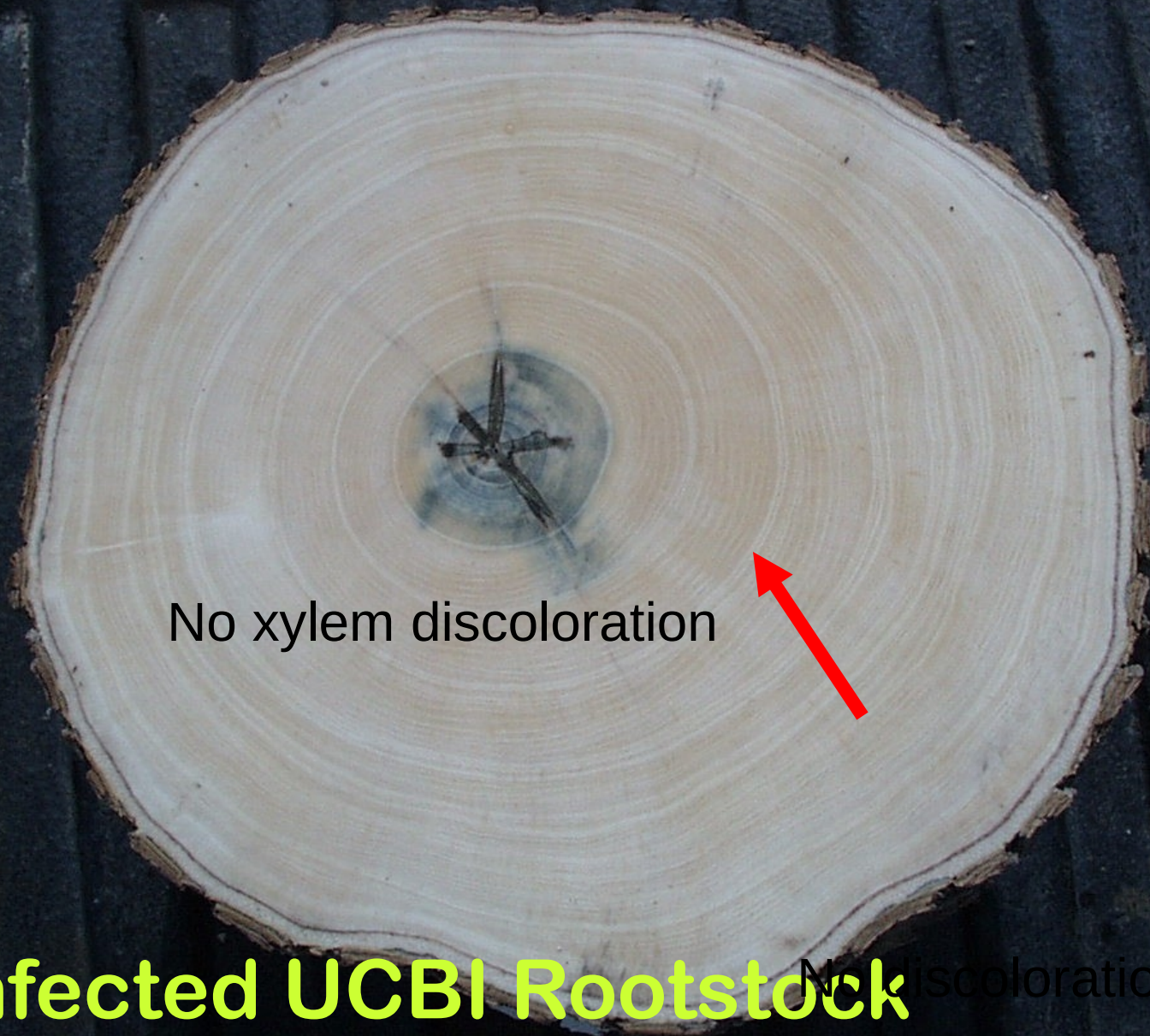
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Bud union





No xylem discoloration



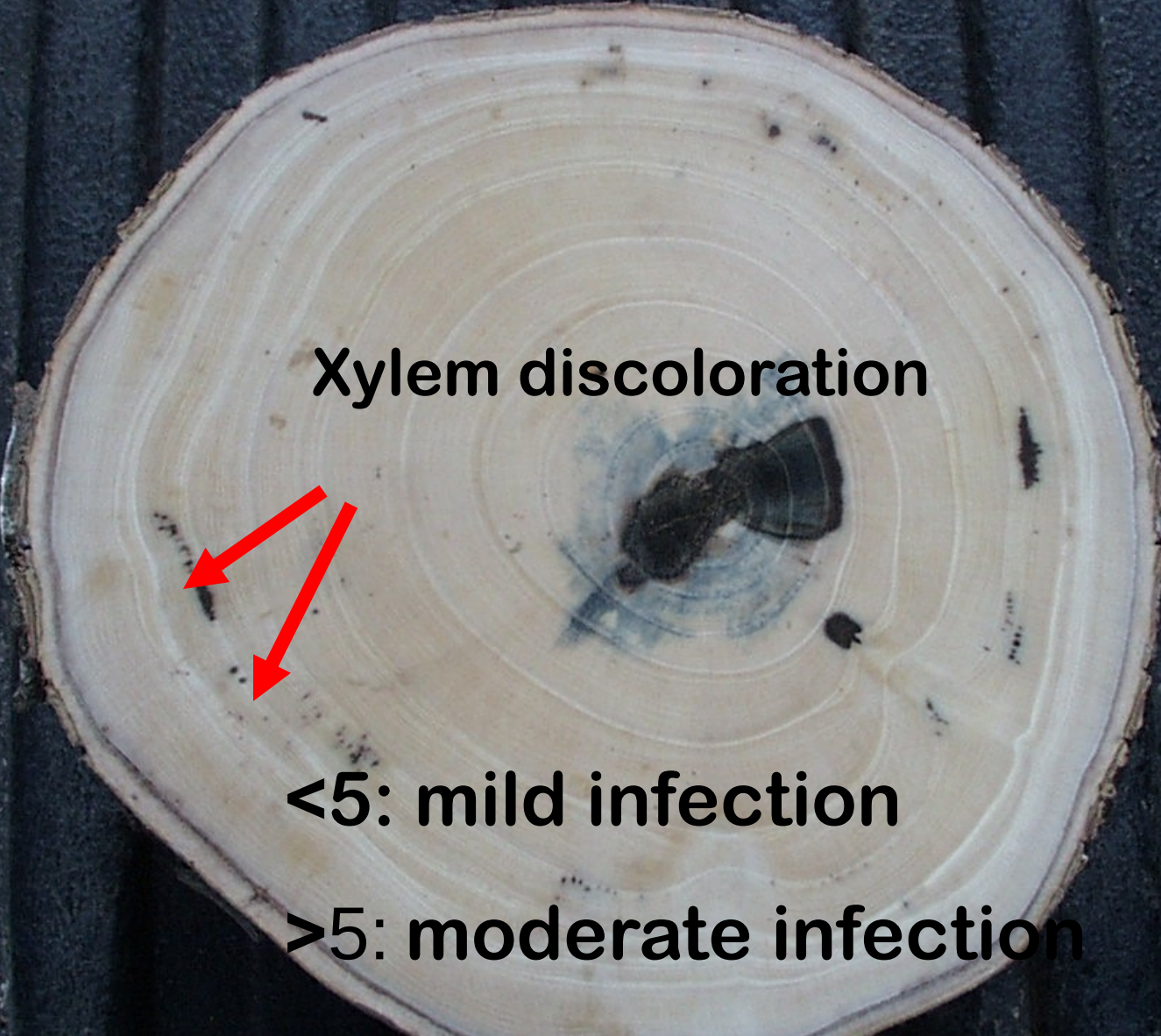
Uninfected UCBI Rootstock

No discoloration in

A cross-section of a wood graft union. The central part shows a darker, more textured area with concentric growth rings, representing the rootstock. The outer part is a lighter, smoother wood, representing the scion. The transition between them is gradual and follows the natural growth pattern of the wood, with no sharp lines or irregular discolorations.

No irregular discoloration

Uninfected Scion on UCBI Rootstock



A cross-section of a PGII rootstock is shown against a dark, textured background. The rootstock is roughly circular with a light tan color. Concentric growth rings are visible. In the center, there is a dark, irregularly shaped area. To the left of the center, there are two small, dark, elongated spots. Two red arrows point from the text 'Xylem discoloration' to these two spots. The text 'Xylem discoloration' is in black, bold font. Below it, the text '<5: mild infection' and '>5: moderate infection' are also in black, bold font. At the bottom, the text 'Infected PGII Rootstock' is in a bright yellow, bold font.

Xylem discoloration

<5: mild infection

>5: moderate infection

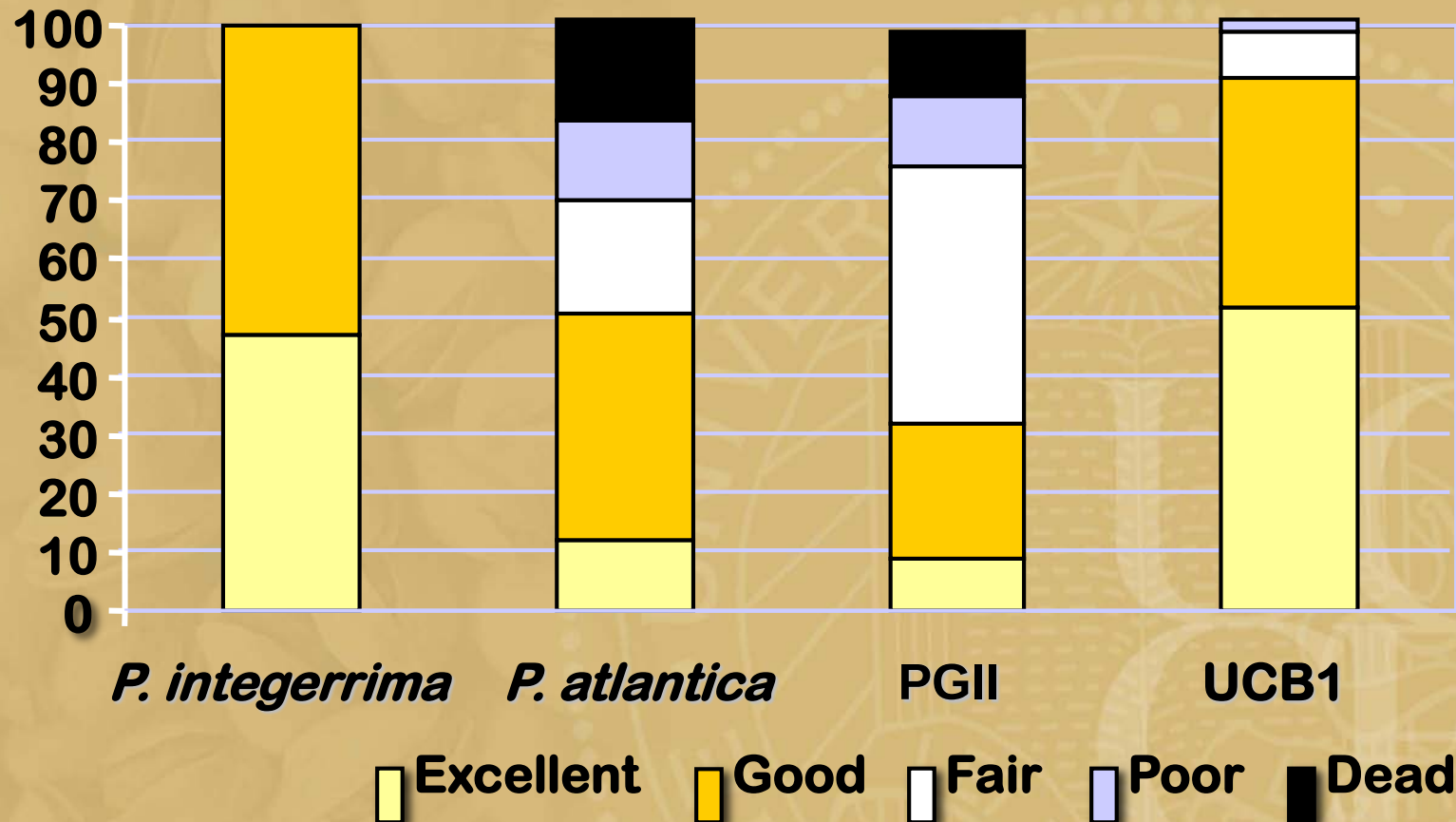
Infected PGII Rootstock



Infected Scion on PGII Rootstock

Tree Vigor Evaluation and Mortality 2002

% of Trees



PGI Rootstock



PGI Scion



***P. atlantica* Rootstock**



P. atlantica Scion



PGII Rootstock



PGII Scion



UCBI Scion



Scion Vigor : Infection Level

Rootstock	Vigor	Level of infection		
		Not infected	Mildly infected	Moderately or more infected
		Percentage of trees of each rootstock		
<i>P. integerrima</i>	Good or excellent	35	17	48
	Fair or poor	0	0	0
<i>P. atlantica</i>	Good or excellent	27	12	23
	Fair or poor	0	0	38
PGII hybrid	Good or excellent	4	8	23
	Fair or poor	6	2	58
UCB1 hybrid	Good or excellent	70	7	13
	Fair or poor	5	2	350

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San Joaquin Valley Pistachio Rootstocks 1989 - 2002

Limiting Factor

Rootstock	Frost	Yield	Salinity	Vert.
<i>P. integerrima</i>	4	2	3	1
<i>P. atlantica</i>	1	4	1	3
PGII	3	3	2	4
UCB1	2	1	2	2



Muchas Gracias

UCCE University of
California
Cooperative Extension

UC DAVIS

DEPARTMENT OF PLANT SCIENCES

College of Agricultural and Environmental Sciences

