

New Varieties and Clonal Rootstocks

Chuck Leslie
Gale McGranahan

Walnut Improvement Program
UC/USDA Researchers
Farm Advisors



Nursery Participation



Grower Participation



- **Breeding for new scion varieties**
 - Breeding
 - Sexton, Gillet, Forde, **Ivanhoe**

- **Developing improved rootstocks**
 - Rootstock screening and production
 - Commercial clonal rootstocks

Breeding for New Varieties

Goals:

- **Early Harvest date**
- **High yield**
- **Light color kernel**
- **High percent kernel**
- **Low PFA**
- **Ease of halves**
- **Precocity**
- **Laterally fruitful**
- **Blight resistance**
- **Nut size**
- **In-shell traits**



Controlled Crosses



Seedling Evaluation

- Phenology
 - Leafing date
 - Flowering dates
 - Harvest date
- Precocity
- Lateral bearing
- Yield
- Growth habit
- PFA
- Blight resistance

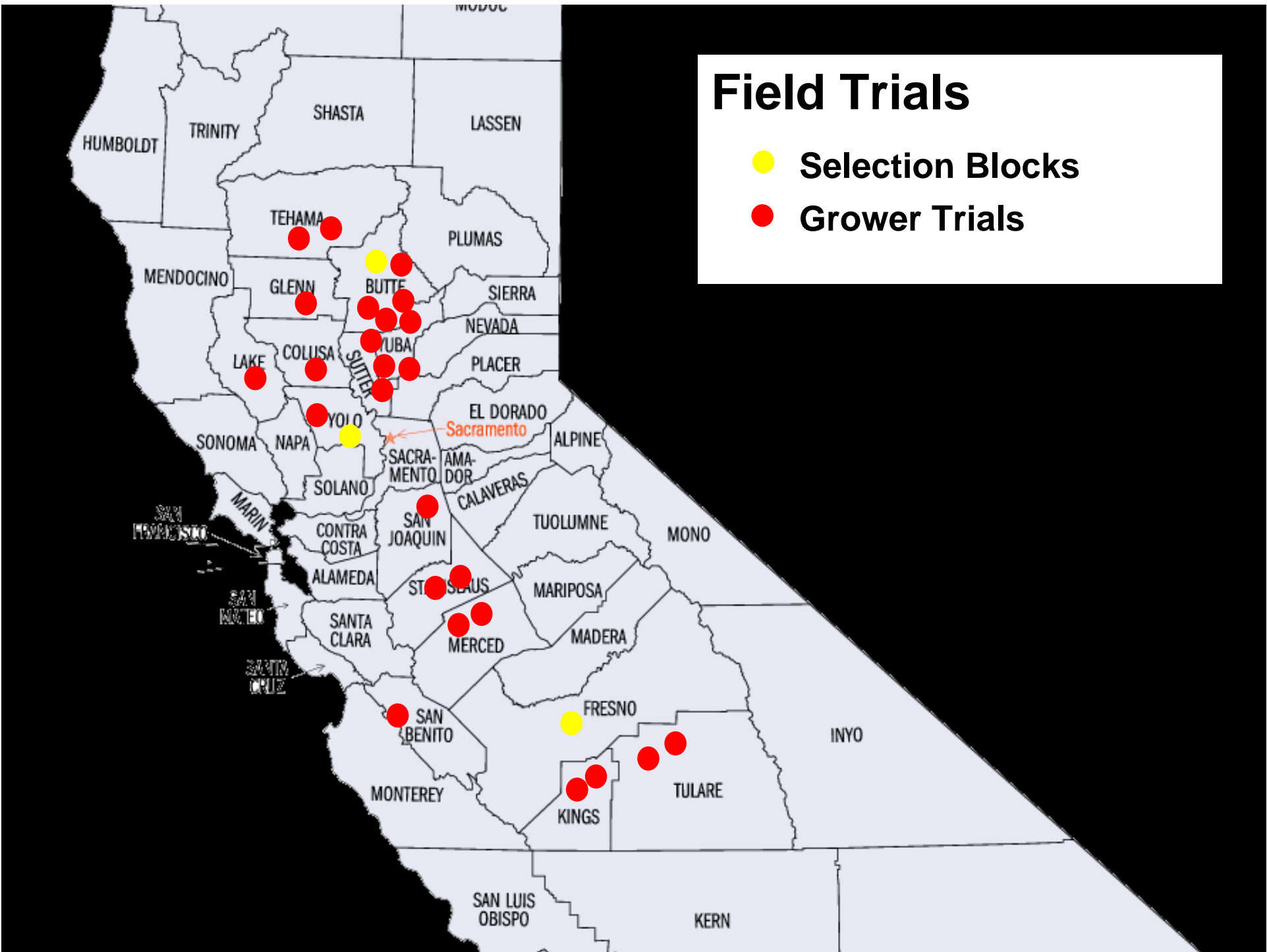


Nut Evaluation and Crackout Meeting



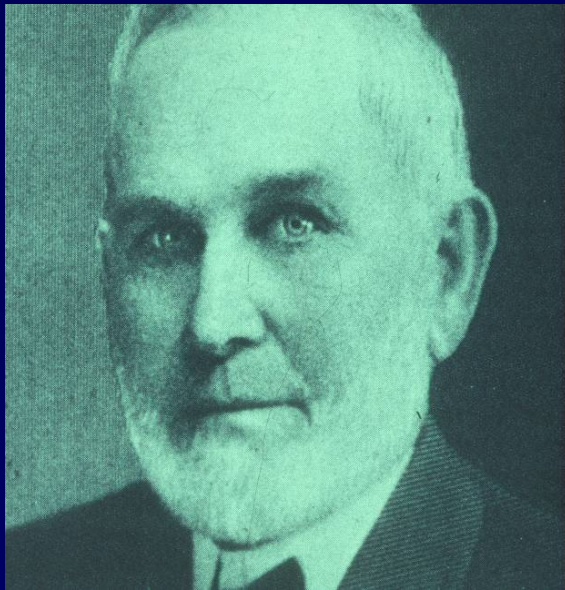
Field Trials

- Selection Blocks
- Grower Trials



Grower Trials and Selection Blocks





Joseph Sexton

Three Releases

2005

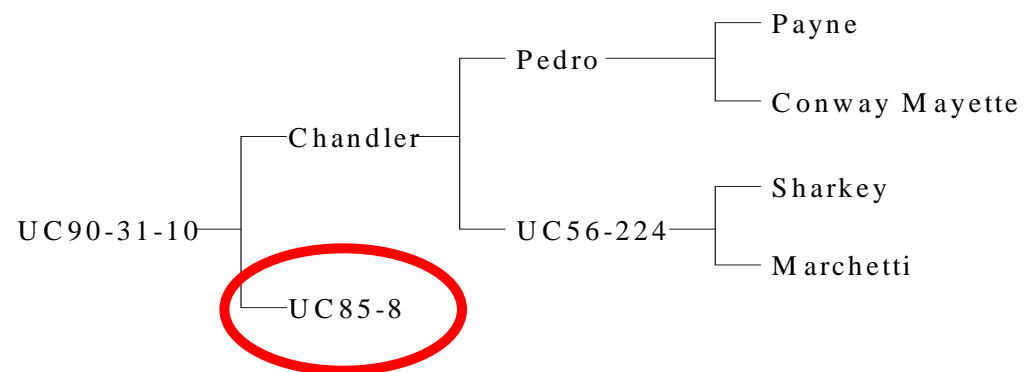
Felix Gillet



**Harold
Forde**



Sexton (90-31-10)



Sexton (90-31-10)



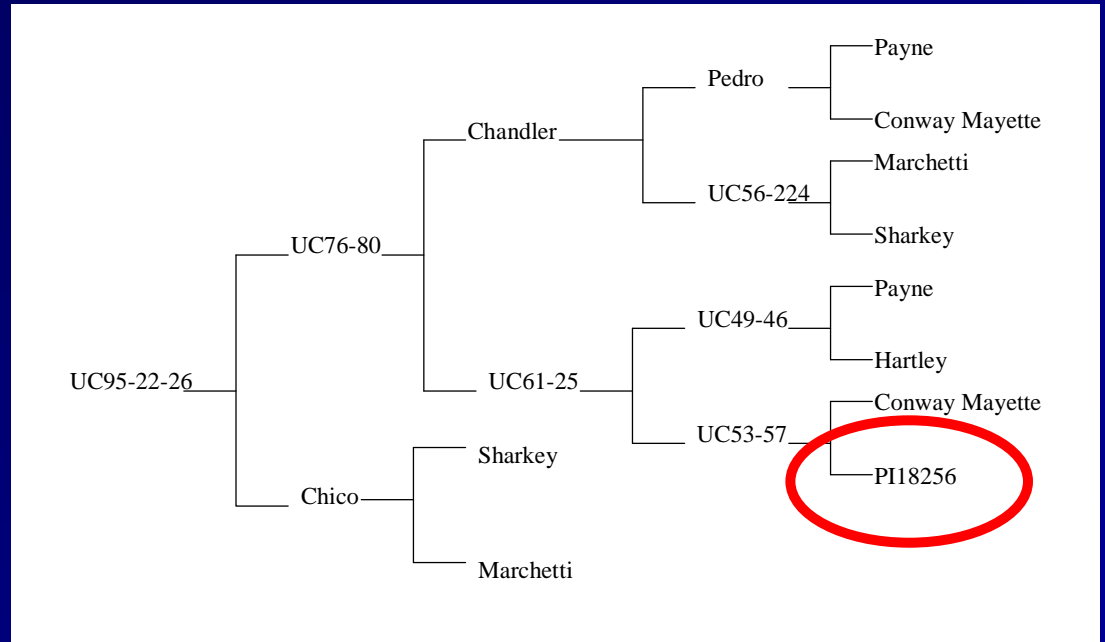
- **Leafs – Payne time**
- **Harvests – Week before Chandler**
- **Yield – excellent; very precocious**
- **Blight - low**
- **Kernel – 53%, 8.6g, mostly light**
- **Nut – smooth, round**
- **May be good in hedgerows**
- **Growth habit – spurs, narrow forks**







Gillet (95-22-26)





Ginkgo biloba



Meyer lemon



**Frank Meyer
USDA
1905- 1908
China**

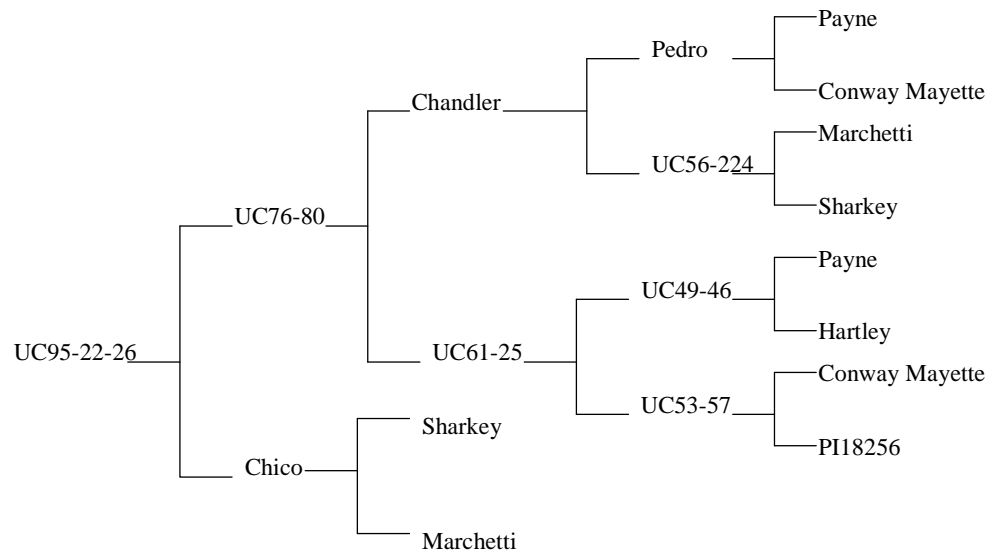


Soybeans

PI 18256

**Blight
Resistance**

Gillet (95-22-26)



Gillet (95-22-26)



- **Leafs – Payne time and a little later**
- **Harvests – 2 weeks before Chandler**
- **Yield – excellent**
- **Blight - low**
- **Growth habit – Large vigorous tree**
- **Kernel – 51%, 8.0g, light, easy halves**
- **Nut – relatively weak seals**



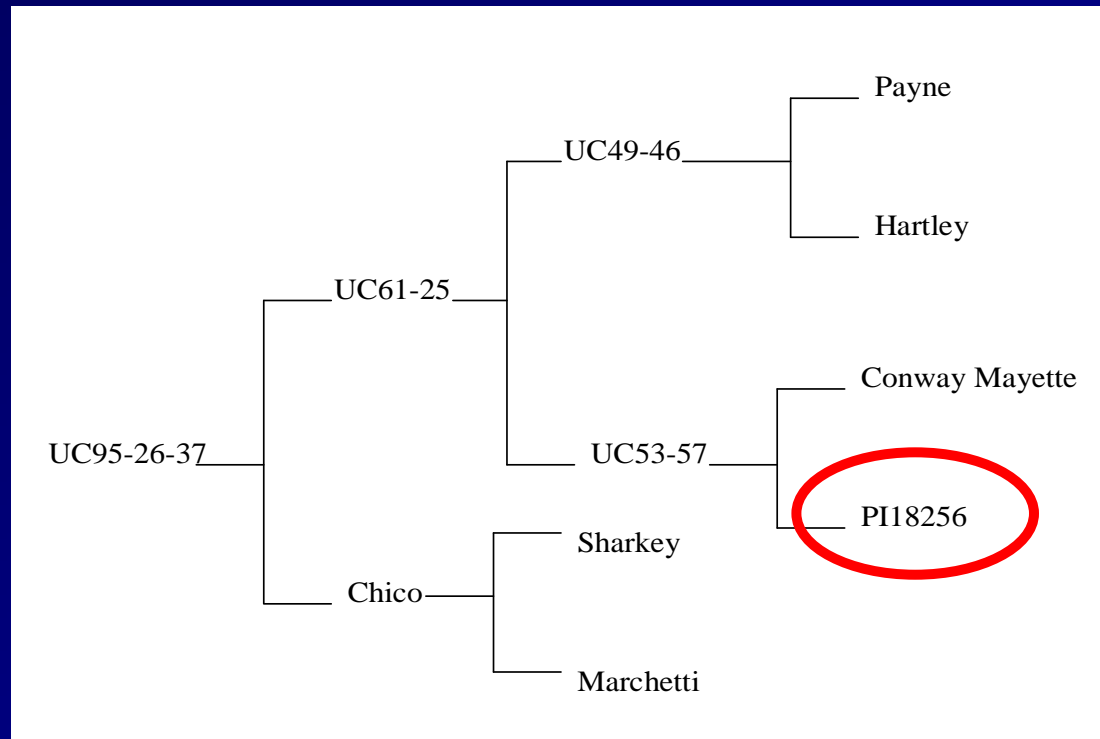


UC Walnut Variety Trial
Stanislaus County
Kathy Kelly Anderson



Variety	Mean yield (lbs/tree)	Mean yield (tons/acre)	Harvestable Date
Gillet	53.49	2.41	9/22
Tulare	49.69	2.24	9/30

Forde (95-26-37)



Forde (95-26-37)



- Leafs – a week or more after Payne
- Harvests – close to Chandler
- Yield – excellent
- More precocious than Chandler
- Plump, absence of shrivel, easy halves
- Low blight
- Nut – round, smooth
- Upright, moderately vigorous
- Kernel – 53%, 8.6g, light color



Woodland



Average Weight, Color, and Shriveled Data for Walnut Varieties

Variety	Nut wt	Kernel wt	% kernel		Ex Light	Light	Light Amber	Amber		Tip shrivel	<50% shrivel	>50% shrivel
Chandler	13.4	6.6	49.2		53	41	5	0		30	3	2
Howard	14.7	7.5	51.1		16	63	20	1		3	1	1
Tulare	14.3	7.7	54.0		4	77	18	0		6	4	3
Sexton	16.1	8.5	52.8		19	60	20	1		13	4	1
Gillet	15.6	8.0	51.2		15	73	12	0		10	2	0
Forde	16.2	8.6	53.0		34	56	10	0		3	0	1

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Sexton	16.1	8.5	52.8		19	60	20	1		13	4	1
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Jerry Moore - Venice Hills

Ivanhoe

(95-011-14)

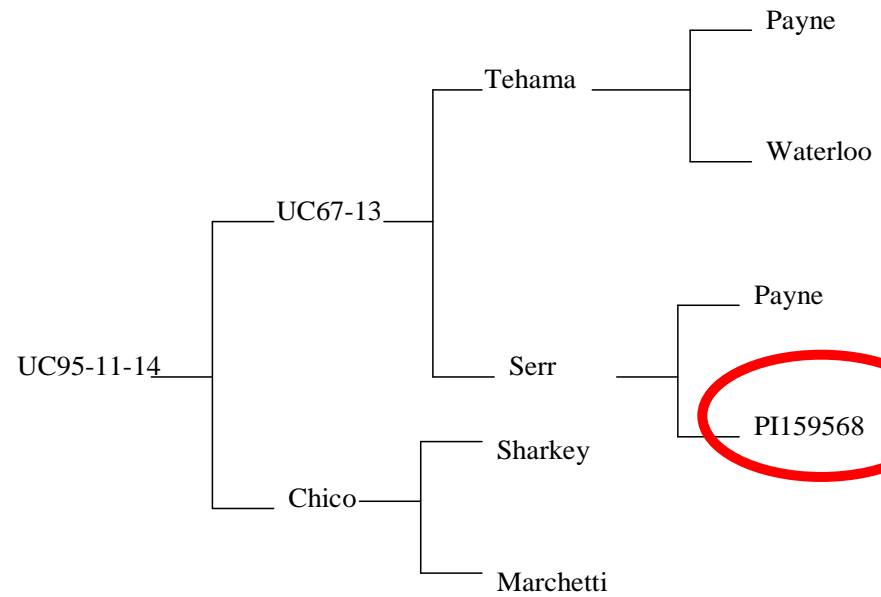
New Release !!

Payne harvest date

Light colored kernels



Ivanhoe (95-011-14)





PI 159568

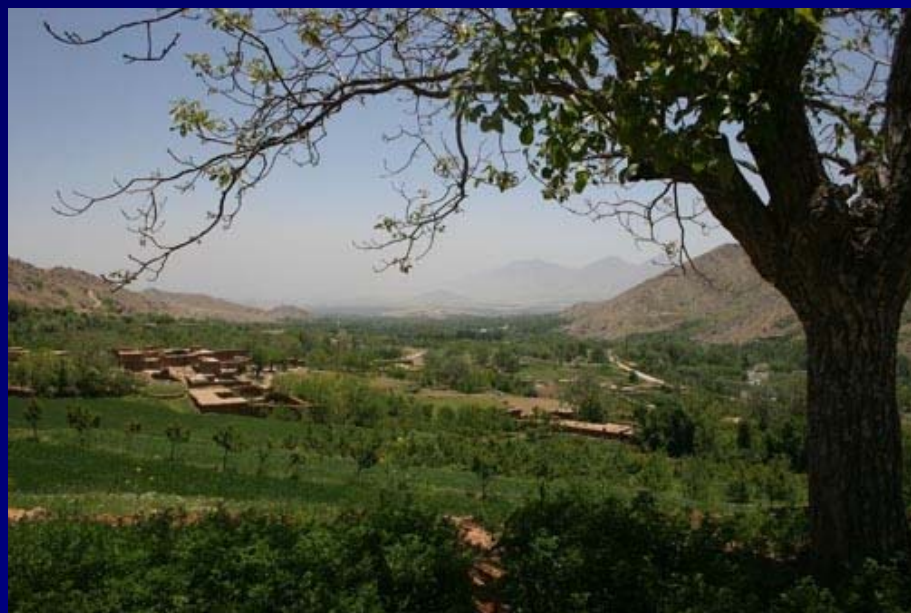
**Blight resistance
Large plump kernels**

Parent of: **Serr, Sunland**

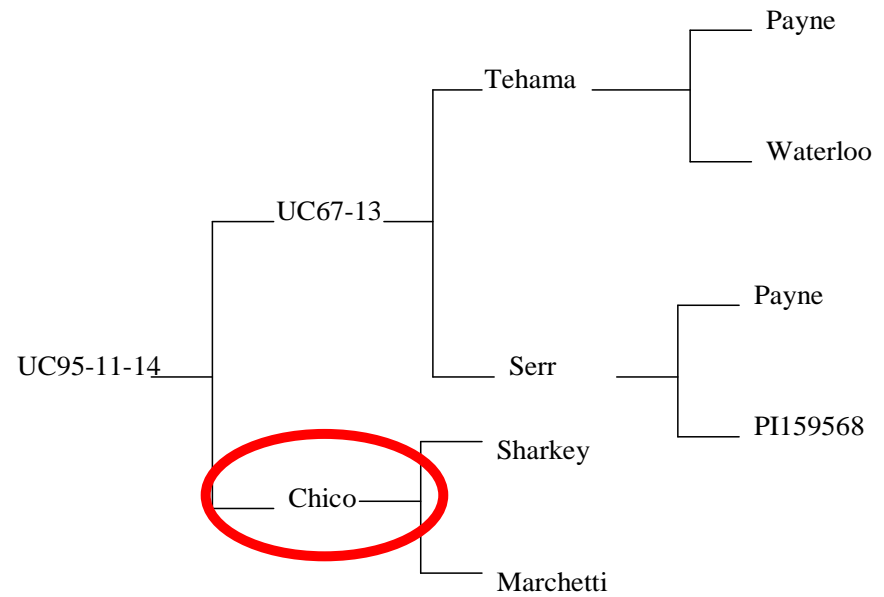
Grandparent of : **Tulare, 67-13**

Great-grandparent of: **Ivanhoe**

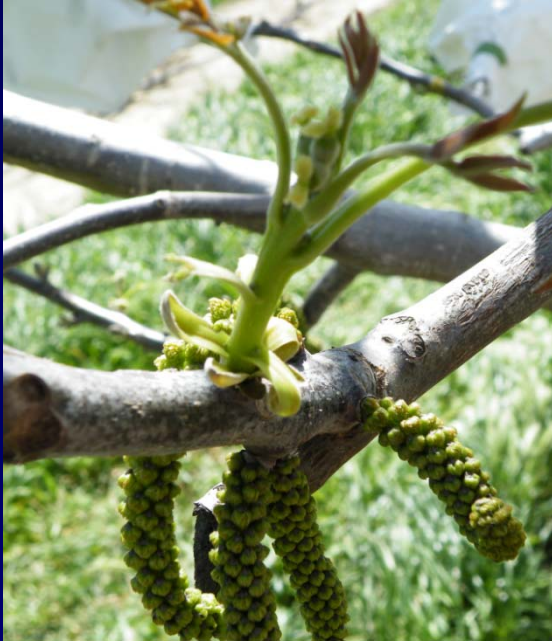
USDA Introduction from Afghanistan - 1937



Ivanhoe (95-011-14)



Ivanhoe (95-11-14)



- **Very early harvest date** (Payne/Serr)
- **Light kernel color**
- **High yield**
- **Blight susceptible**
- **Nut –smooth shells, watch size**
- **Growth habit – small stature, may stress**
Grow on Paradox
- **Kernel – 57%, 7.6g, easy halves**



Field Data Comparison

Trait	Ivanhoe	Serr	Chandler
Leafing date	3/19	3/18	4/03
Peak female	3/28	4/06	4/22
Peak male	4/08	3/31	4/11
Harvest	9/13	9/17	10/07
Yield	7	5	7
Blight	*		

Nut Data Comparison

Trait	Ivanhoe	Serr	Chandler
In shell wt. (g)	13.3 g	14.6	13.4 g
Kernel wt (g)	7.6 g	8.2	6.7 g
Percent kernel	57 %	56.1%	49 %
% Extra light	41 %	7%	53 %
% Light	51 %	70%	41 %

Ivanhoe 2009

1st Shake:

Edible: 55%

RLI: 54.0



2nd Shake:

% Edible: 53.4%

RLI: 52.3

Jumbo sound: 93%

ExL: 33%

Light: 45%

Nut wt.: 13.2 g



Davis



KAC



Grower Trial - Woodland - 2009

Variety	Sexton	Gillet	Forde	Ivanhoe	Chandler
Edible Yield	47.5	50.5	54.3	53.7	48.6
RLI	54	54	53.5	54	53.8
% Jumbo Sound	95.3	93.9	95.2	95.9	94.8
% Extra Lt kernels	52	74	53	74	48
% Light	38	8	26	13	44
% Lt Amber	10	13	17	9	8
% Amber	0	5	4	4	0
Avg nut weight (grams)	16.5	13.3	15.0	11.9	14.2

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Forde	16.2	8.6	53.0		34	56	10	0		3	0	1
Ivanhoe	13.3	7.5	56.6		41	51	7	1		1	0	2

Ivanhoe

(95-011-14)

Released: January 2010

Nurseries are licensed to sell



Evaluating Potential for Pistillate Flower Abscission

Table 5. 2009 Pistillate Flower Abscission counts following either pollen application or natural pollination controls.

Variety	Pollen Date	Count Date	Artificial Pollination			Natural Pollination		
			Total Flowers	Flowers Dropped	% Dropped	Total Flowers	Flowers Dropped	% Dropped
Gillet	4/2	4/23	100	7	7	100	5	5
Ivanhoe	3/28	4/18	100	22	22	92	22	24
Sinensis 5	3/26	4/16	100	24	24	100	45	45
Forde	4/7	4/28	100	30	30	100	23	23
Sexton	4/8	4/29	104	38	37	98	6	6
25-8	3/26	4/16	100	41	41	96	21	22
Tulare	4/13	5/4	100	46	46	100	24	24
0-20-1072	4/13	5/4	100	48	48	98	47	48
Marchetti	4/12	5/3	102	60	59	100	37	37
Sunland	4/12	5/3	104	75	72	98	29	30
Eureka	4/12	5/3	90	65	72	92	40	43
PI 159568	4/10	5/1	42	34	81	46	25	54
Payne	4/11	5/2	100	81	81	104	27	26
Cheinovo	4/13	5/4	98	86	88	100	70	70
Serr	4/8	4/29	102	98	96	100	70	70

Pollenizers

Sexton	Sexton , Howard, Tulare
Gillet	Payne, Serr, Vina, Sexton
Forde	Sexton, Ivanhoe, Howard, Tulare
Ivanhoe	Serr, Payne

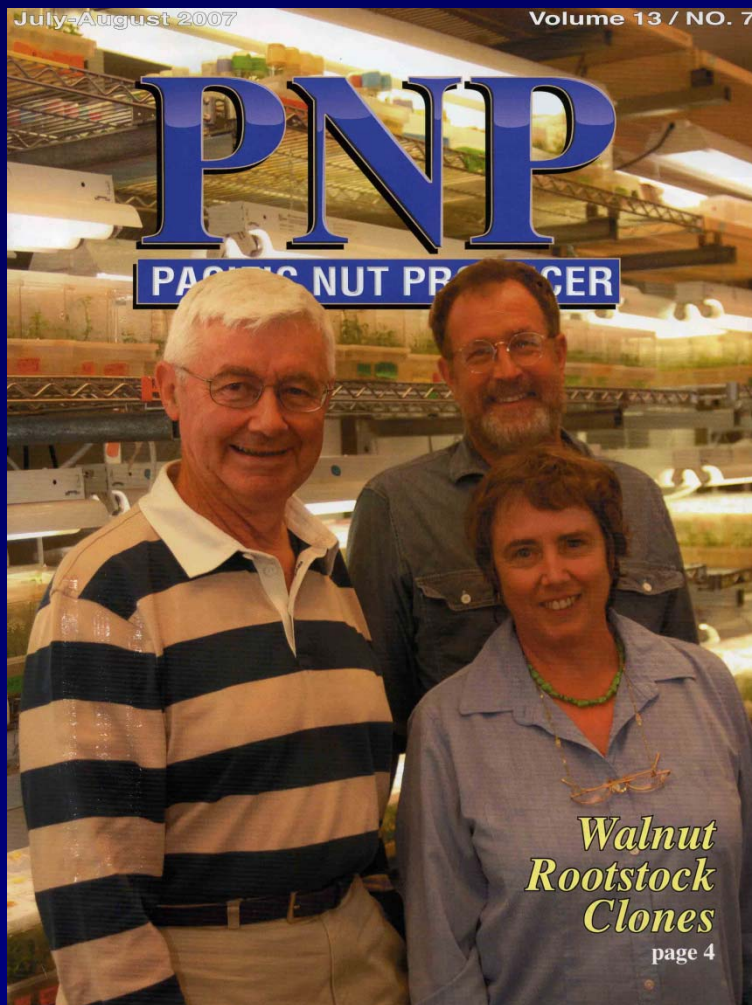
95-011-16



93-028-20



Clonal Rootstocks



Crown Gall resistance

Nematode resistance

Phytophthora resistance

Vigor



Micropropagation

Screening, Field trials



Nursery Growth and Grafting

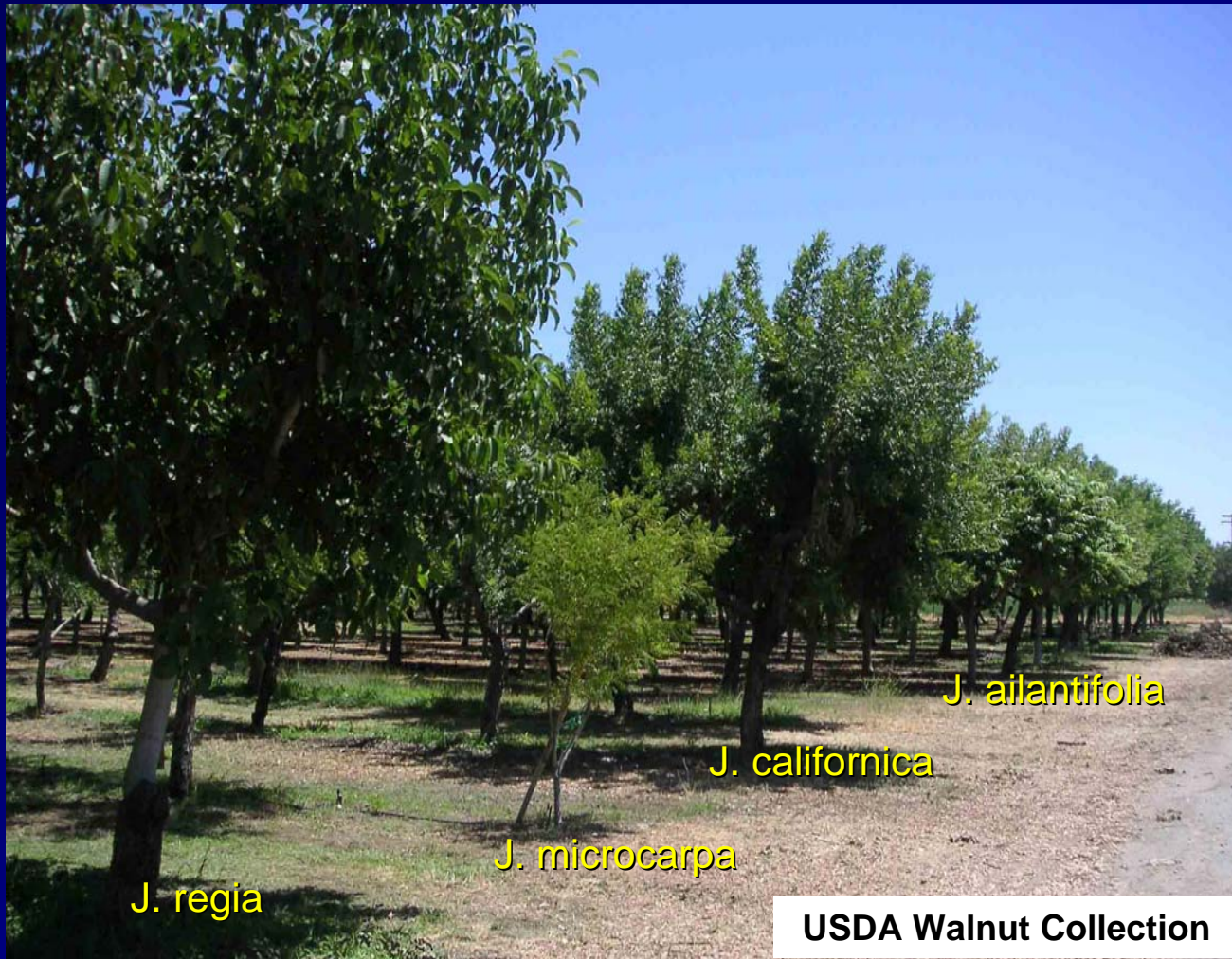


Rootstock Field Trials



Crown Gall Screening

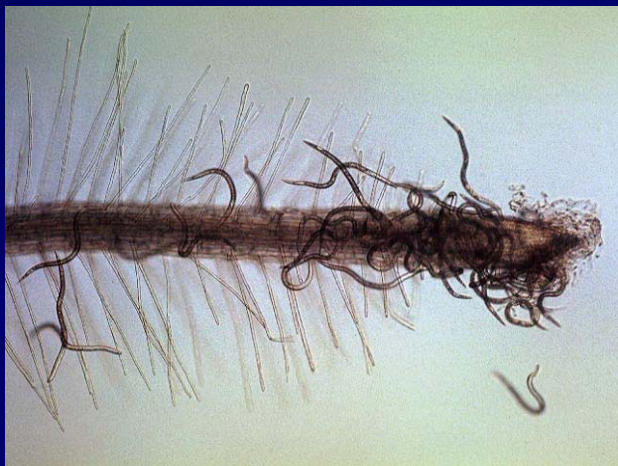
McKenna (UCD), Hasey (UCD)
Kluepfel (USDA)



One or two clones appear to have some resistance in greenhouse trials.

Screening for Nematode Resistance

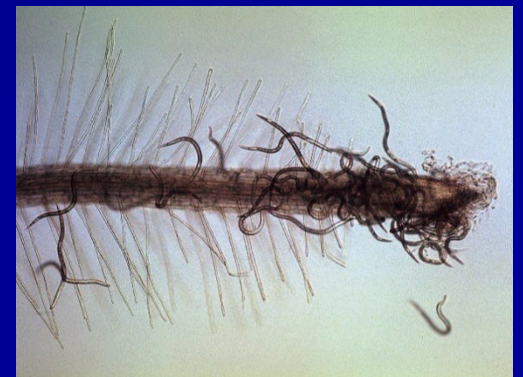
Mike McKenry – UC Riverside



VX211

Paradox (N. California Black x English)

- Exceptional **vigor**
- Tolerance to **nematodes**
- Some resistance to Phytophthora
- Excellent survival in orchard replant trials
- Additional trials are in progress
- VX211 is commercially available

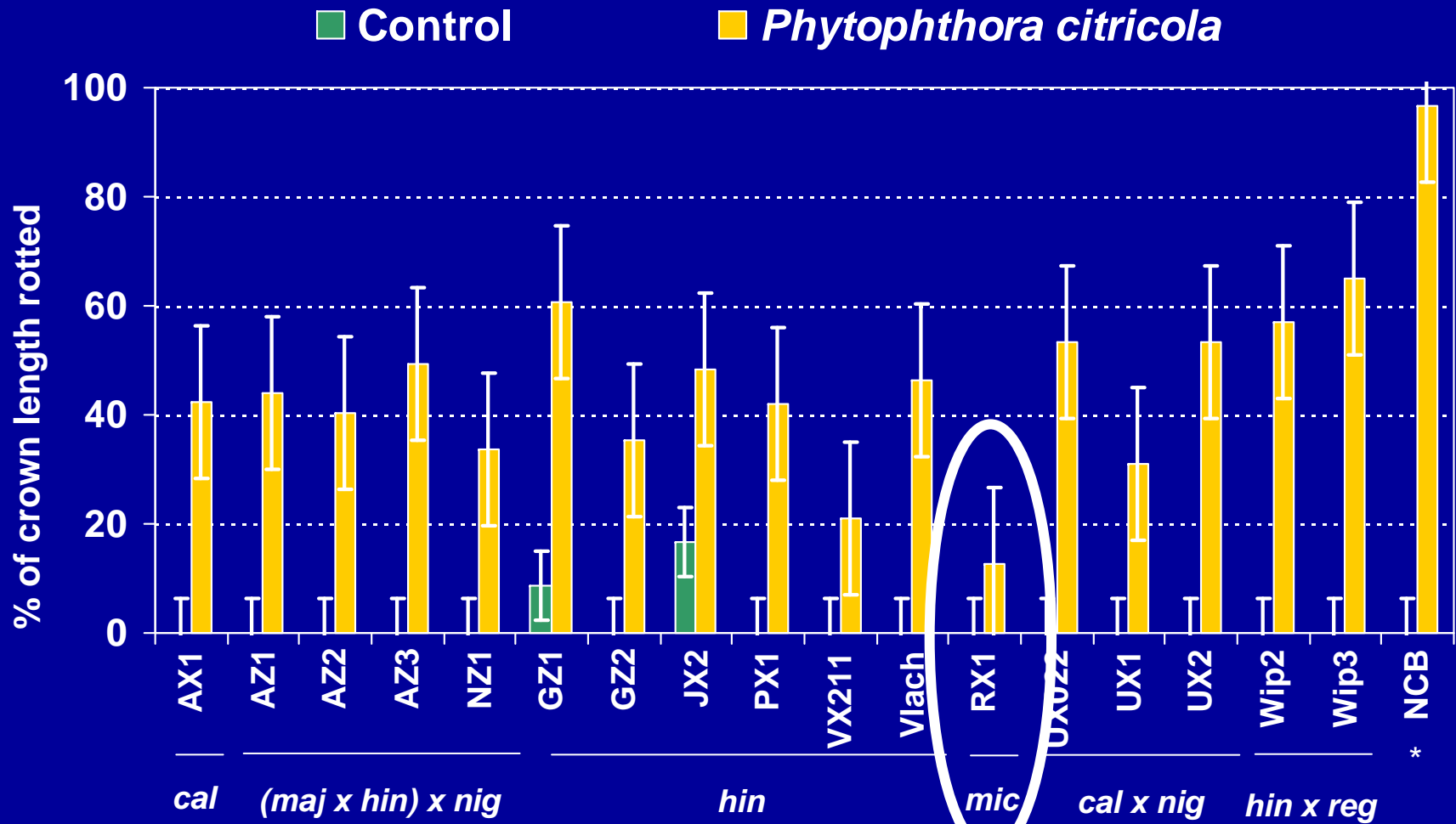


Phytophthora Resistance Screening

Greg Browne, USDA/ARS



Phytophthora citricola Greenhouse Evaluation



RX1

Field trial: wet site, *Phytophthora cinnamomi*



RX1

Texas black X English

- **Resistance to *Phytophthora***
P. citricola and *P. cinnamomi*
- **Smaller tree, less vigorous than VX211**
- **New field trials are underway**
- **RX1 is commercially available**



Vlach



- One of the first Paradox clones to be micropropagated
- 7-10 years in growers fields
- Is commercially available



Two Commercial Models



Clonal Rootstocks Status

- Crown gall – in the testing process
- VX211 – performs well in nematode screens
- RX1 – performs well in Phytophthora screens
- Vlach – longest field experience



Robert Livermore





1937

PI 159568:

**Blight resistance
Large plump kernels**

Paghman Gardens



1967



2007



RR4
CONT

RR4
CONT

J1 20A
IV/WHITE
10/31/08

J1 20A
IV/WHITE
10/31/08

