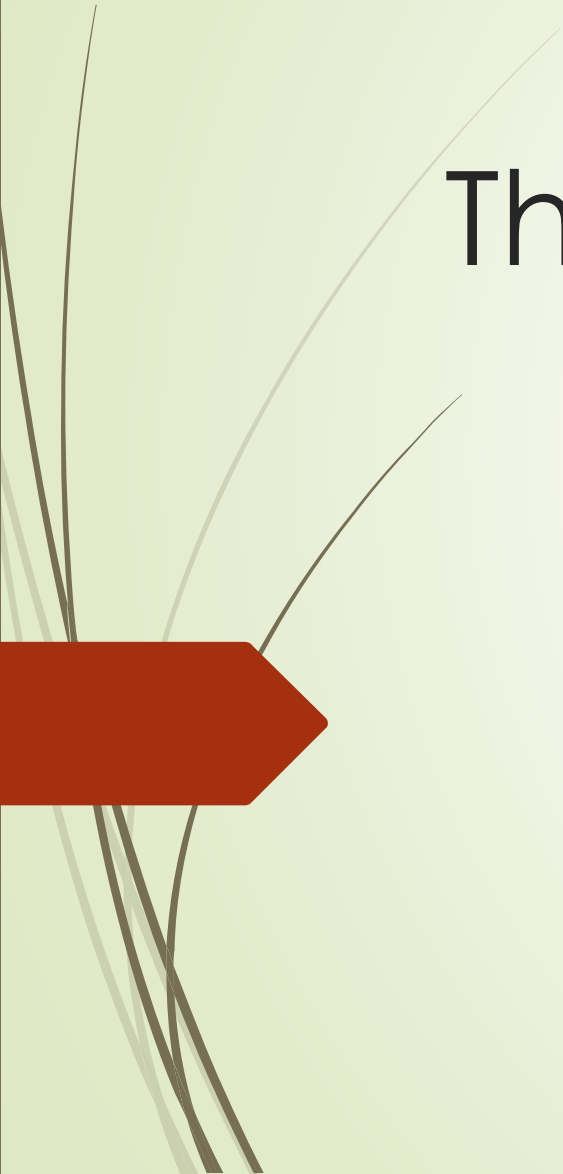




The California Nursery Evolution Bareroot to Container



The role of tissue culture

John Driver
Driver Consulting, Inc.
Waterford, California USA



Size of California Nursery Industry:

- **Deciduous fruit and nut trees
sold by California nurseries: 2019**

Number of Trees Sold	Total Value	Average Price / Tree
45,660,027	\$375,312,000	\$8.22



Leading California Nurseries:



History of Micropropagation (Tissue Culture) in California:

- 1981 (PRL) Plant Research Laboratories (John Driver)
- 1983 PRL / Burchell Nursery
- 1989 (DCL) Dry Creek Laboratories (John Driver)
- 1991 DCL / Duarte Nursery
- 2002 North American Plants (Sales to nurseries)
- 2010 Micro Paradox (Sales to nurseries)
- 2012 Sierra Gold Nurseries



Micropropagation has allowed the adoption of clonal rootstocks on a mass scale

- Walnut
- Pistachio
- Almond
- Peach
- Cherry
- Plum / Prune
- Apple
- Pear

Rootstock breeders are now able offer new rootstocks, because tissue culture allows propagation.



Micropropagated Rootstocks Being Sold to Other Nurseries as Liners

Tree Fruit and Nut Rootstocks



Type	Varieties	
Apple Rootstocks (<i>Malus</i>)	BUD 10 VC* GENEVA® 'G.11' PP11,070 VC* GENEVA® 'G.202' PPAF VC* GENEVA® 'G.210' PP23,337 VC* GENEVA® 'G.214' PP23,516 VC* GENEVA® 'G.222' PP24,834* GENEVA® 'G.41' PP17,139 VC* GENEVA® 'G.890' PP23,327 VC* GENEVA® 'G.935' PP17,603 VC* GENEVA® 'G.939' PP24,073 VC* M9-RN29 VC*	
Fig Varieties (<i>Ficus carica</i>)	Brown Turkey Celeste	
Peach, Almond, Cherry and Plum Rootstocks (<i>Prunus</i>)	BH® 5 PPAF* BH® 106* Cadaman® VC* Empyrean® 1 VC* Hansen 536 VC PARAMOUNT® 'GF.677', PPAF Colt VC Krymsk® 1 PP15,995 VC* Krymsk® 5 PP15,723 VC* Krymsk® 6 PP16,114 VC* Krymsk® 7 PP16,363 VC* Krymsk® 86 PPAF VC* F12/1 Mazzard VC GM 61/1 (Damil) VC MaxMa® 14 VC* Weirroot™ 158 VC* Tabel™ * Mariana M-24 VC Mariana M-40 PP11,403 VC* Marielle 'MAR 4001' VC* Performer Mahaleb VC ROOTPAC -R PP21,556* ROOTPAC -70 PP21,432* ROOTPAC -90 PP21,792* Tempropac PP21,533*	
Pear Rootstocks (<i>Pyrus communis</i>)	OHxF.87 VC OHxF.97 VC OHxF.69 OHxF.513 VC Pyro™ 2-33 PP12,771 VC*	
Pistacio Rootstock (<i>Pistacia</i>)	Platinum Pistacio Rootstock UCB-1 Pistacio Rootstock	
Walnut Rootstocks (<i>Juglans</i>)	Vlach VK211® and RX1® Paradox Rootstock*	



ALMONDS

Krymsk® 86
SG1®
Hansen 536
Bright's Hybrid®
Viking

WALNUT

RX1
VK 211
Vlach
Grizzly

PISTACHIO

Platinum™
UCB-1

APPLES

Geneva® 11
Geneva® 41
Geneva® 210
Geneva® 214
Geneva® 814
Geneva® 890
Geneva® 935
Geneva® 969
Bud 118
Bud 10

APRICOT

Krymsk® 86
M40 Marianna
Clifton
Controller 6

CHERRIES

Krymsk® 5
Krymsk® 6
Krymsk® 7
Gisela® 3
Gisela® 5
Gisela® 6
Gisela® 12
MaxMa 14
Performer Mahaleb
Colt

NECTARINES

Krymsk® 86
Controller 6
MP-29

PEACH

Krymsk® 86
Controller 6
MP-29

PEARS

OHxF.87
OHxF.97
Pyro™ 2-33
Homer 4

PLUM

Krymsk® 86
Myro 29C
Clifton
Controller 6
M40 Marianna
MP-29

PRUNE

Krymsk® 86
Myro 29C
Clifton
M40 Marianna
MP-29
Viking



Liner Catalog

Walnut

- ✓ VQ211
- ✓ RX1
- ✓ Vlach
- ✓ Grizzly

Pistachio

- ✓ UCB-1

Almonds

- ✓ Hansen 536
- ✓ Viking
- ✓ Atlas
- ✓ Micrografted (your choice of variety on your choice of rootstock)

Cherry

- ✓ MaxMa 14
- ✓ Performer Mahaleb
- ✓ Colt
- ✓ Gisela® 6

Apple

- ✓ Geneva® 11
- ✓ Geneva® 41
- ✓ Geneva® 210





Because micropropagation requires high-tech facilities and greenhouses, the next logical step was to bring the field to the greenhouse.

The Potted Tree Evolution



This integration began in the early 1990's with Duarte Nursery and Dry Creek Laboratories... it continues to this day.

- Duarte had a successful container production system for greenhouse grapevine propagation.
- DCL and Duarte developed container production methods for tree crops.
- Initial industry reaction was skepticism. Growers who were early adapters proved the value of the system.
- Other nurseries then began to develop their own container nurseries. Growers demanded new rootstocks, and nursery competition drove adaptation.
- Today container produced trees are mainstream, comprising 30 – 40 percent of trees sold.
- The container market continues to grow, and bareroot declines.



A leading nursery's story:



The tissue culture process:



Tissue Culture Enhances Cutting Rootstock Propagation

DID YOU KNOW? **EP. 1 - HARDWOOD CUTTINGS**



(530) 674-1145
SIERRAGOLDTREES.COM



Ellepot is the next level of production progress:

DID YOU KNOW?
EP. 5 - ELLEPOTS®



(530) 674-1145
SIERRAGOLDTREES.COM



Rate of Nursery Industry Evolution

Year	Tissue Culture	Tissue Culture Source	Container Growing
1985		In-house Lab (PRL)	
1990		In-house Lab (DCL)	
1995		In-house Lab	
2000	 	Purchase from lab	
2010	  	Purchase from lab	
		In-house Lab	
2020			



Conclusions:

40 Year Evolution

The California nursery industry continues to evolve. Tissue culture has driven change and nursery industry growth.

Tissue culture and container grown trees will continue to increasingly allow growers new rootstock choices. Growers demand these rootstocks.

Higher tree quality is provided by container production. Enhanced phytosanitary (nematode/disease/virus) status, benefits both nurseries and growers.

