

California Citrus Nursery Board
PROGRESS REPORT FY 2009

"Good Bud, Bad Bud"

Year 1 of 3

Project Leaders:

Robert Krueger (primary contact)
USDA-ARS National Clonal Germplasm Repository
1060 Martin Luther King Blvd
Riverside, CA 92507
909-787-4399
909-787-4398 (fax)
rkrueger@ucr.edu

Carol Lovatt
Dept of Botany & Plant Science
University of California
Riverside, CA 92521
951-827-4663
951-827-4437 (fax)
lovatt@ucr.edu

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Introduction

The results of three studies conducted at UCR (Lord and Eckard 1985, Hake 1995, Lovatt unpublished) provided clear evidence of the distinct phenotypical differences between floral and vegetative mother branches related to their floral intensity and fruiting potential. Mother branches with many flowers produced daughter branches with many flowers, whereas mother branches that were long with many thorns tended to produce daughter branches that had many thorns. Moreover, the correlation coefficient between thorns and the number of flowers per branch was negative and significant. These results strongly suggested that bud wood source could have a significant effect on the productivity of the tree. The goal of our research is to test this possibility so that if proven correct, nurserymen can take advantage of this information in tree propagation and maintenance of nursery bud wood trees.

Objectives:

Determine whether buds obtained from floral mother branches produce trees that are more productive than those produced from buds obtained from vegetative mother branches.

a. Summary of activities that are underway to accomplish the objective.

Trees of 'Washington' navel orange and 'Tahiti' lime were budded on 'Carrizo' citrange rootstocks in 2006. Ten trees of each cultivar were propagated from buds obtained from each of the two mother branch types (floral and vegetative). These trees, now 3 years old, are established in the field at UC-Riverside. In winter 2008-2009, trees were harvested and yield determined. In spring and summer 2009, extensive measurements of phenotypical characteristics were made.

b. Modifications made to planned activities or procedures, if any.

No modifications were made.

c. Include data summaries and graphs as appropriate.

Yield was determined in winter 2008-2009 and phenotypic characteristics were determined in spring and summer 2009. Typical of the first crop produced by 3-year-old trees, yield was low for all trees. 'Tahiti' lime and 'Washington' navel orange scions produced from buds from floral mother branches had a numerically greater number of fruit per tree than trees produced from buds from vegetative mother branches. However, the differences were small and non-significant: 54 vs. 49 and 4 vs. 2 for 'Tahiti' lime and 'Washington' navel orange trees, respectively. Note: the 'Washington' navel orange trees were inadvertently pruned in early fall 2008.

'Tahiti' lime trees produced from buds from floral mother branches produced a significantly greater number of leafless inflorescences, total leafless inflorescences and total floral shoots per shoot and had fewer thorns per shoot than trees for which buds from vegetative mother shoots were used for the scion (Table 1). By August, 'Tahiti' lime trees derived from buds from floral mother shoots set and retained a significantly greater number of fruit per shoot and had shoots with significantly fewer nodes and thorns, and with smaller leaves (Table 3). The results obtained thus far with 'Tahiti' lime are consistent with our hypothesis. In contrast for 'Washington' navel orange, bud source had no statistically significant effects at the 5% level on the number of floral shoots (either leafy or leafless) or vegetative shoots that developed during spring bloom (Table 2). Only the number of leaves per shoot was significantly influenced by bud source. Bud source also had no effect on 'Washington' navel orange tree phenotype parameters quantified in August 2009 (Table 4). At this point we cannot ascertain whether the results obtained for 'Washington' navel orange are in contrast to our hypothesis or are a result of pruning. This question will likely be resolved by the results obtained in year 2 of the research.

Literature Cited:

- Hake, K.D. 1995. Regulation of flowering in *Citrus limon* by water-deficit stress and nitrogen compounds. Ph.D. Dissertation, University of California, Riverside, CA 92521
- Lord, E. and K.J. Eckard. 1985. Shoot development in *Citrus sinensis* L. (Washington el orange). I. Floral and inflorescence ontogeny. Bot. Gaz. 146:320-326.

Table 1. Effect of bud source used as the scion on phenotypic characteristics of 3-year-old 'Tahiti' lime trees in March 2009.

Mother branch type (bud source)	Floral shoots									
	Vegetative shoots	Leafy	Leafless	Single leafless	Total leafless	Total floral shoots	Leaf length (cm)	Nodes	Leaves	Thorns
Floral	11.75	29.50 a ^z	9.63 a	4.75 a	14.38 a	43.88 a	7.54	12.95	2.96	6.51 b
Vegetative	16.75	20.88 b	4.88 b	1.13 b	6.00 b	26.88 b	7.40	11.55	3.16	7.90 a
<i>P-value</i>	0.1736	0.0820	0.0209	0.0704	0.0084	0.0042	0.5717	0.1483	0.2641	0.0480

^z Values in a vertical column followed by different letters are significantly different at the specified *P-value* by Fisher's Protected LSD Test.

Table 2. Effect of bud source used as the scion on phenotypic characteristics of 3-year-old 'Washington' navel orange trees in March 2009.

Mother branch type (bud source)	Floral shoots									
	Vegetative shoots	Leafy	Leafless	Single leafless	Total leafless	Total floral shoots	Leaf length (cm)	Nodes	Leaves	Thorns
Floral	33.44	26.44	1.11	1.56	2.67	29.11	8.13	11.00	3.07 a ^z	1.23
Vegetative	21.80	40.60	4.80	1.10	5.90	46.50	7.95	11.39	2.66 b	0.98
<i>P-value</i>	0.2805	0.1492	0.2742	0.2178	0.4219	0.1756	0.6226	0.9401	0.0138	0.5672

^z Values in a vertical column followed by different letters are significantly different at the specified *P-value* by Fisher's Protected LSD Test.

Table 3. Effect of bud source used as the scion on phenotypic characteristics of 3-year-old 'Tahiti' lime trees in August 2009.

Mother branch type (bud source)	Fruit	Nodes	Thorns	Leaf length
	----- <i>No. per shoot</i> -----			---- <i>cm</i> ----
Floral	0.59 a	7.77 b	3.00 b	6.53 b
Vegetative	0.40 b	9.25 a	3.69 a	7.01 a
<i>P-value</i>	0.0235	0.0004	0.0535	0.0002

^z Values in a vertical column followed by different letters are significantly different at the specified *P-value* by Fisher's Protected LSD Test.

Table 4. Effect of bud source used as the scion on phenotypic characteristics of 3-year-old 'Washington' navel orange trees in August 2009.

Mother branch type (bud source)	Fruit	Nodes	Thorns	Leaf length
	----- <i>No. per shoot</i> -----			---- <i>cm</i> ----
Floral	0.15	7.32	0.67 a	7.44
Vegetative	0.19	6.72	0.50 b	6.92
<i>P-value</i>	0.2908	0.6074	0.0757	0.5949

^z Values in a vertical column followed by different letters are significantly different at the specified *P-value* by Fisher's Protected LSD Test.

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