

## **Scion/Rootstock Incompatibility as the Cause of Tree Decline in Fukumoto Navel**

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The objective of this research begun in 2003 is to explore scion/rootstock incompatibility as a possible cause of tree decline in Fukumoto navel. Tree decline in Fukumoto navel has been characterized by poor growth – especially of the scion – profuse sucker proliferation at the graft union, and sparse, yellow leaf canopies. The decline of some trees is common in almost all Fukumoto orchards on trifoliolate or trifoliolate hybrid rootstocks (i.e. citrange rootstock such as Carrizo and C-35), however the severity varies widely among orchards. Tree death has occurred in orchards, especially in some orchards planted on C-35, Carrizo or trifoliolate rootstocks.

The hypothesis guiding this experimental project is that the nature of the graft union between the Fukumoto scion and trifoliolate and trifoliolate hybrids may interfere with tree health and growth. An added stress, such as frost damage, poor irrigation, or alkaline soil may change a borderline incompatibility into a situation promoting rapid decline of the tree.

One of the major symptoms of decline in Fukumoto trees is the reduced diameter of the scion in comparison to the rootstock of affected trees. One objective of this study is to document the change in scion diameter and the ratio of scion diameter to rootstock diameter with time of Fukumoto navel in comparison to Washington navel.

An experiment was established at the UC Lindcove Research and Extension Center (LREC) in July 2004. The source of the budwood was from registered trees at the LREC foundation block. This replicated experiment compares various growth characteristics among Fukumoto navel, *Clemenules clementine* and Washington navel on four different rootstocks (rough lemon, C-35, Carrizo and Valencia/Carrizo interstock) under three different irrigation regimes (including under and over watering).

A second experiment was planted in June 2005 and is located at the University of California Cooperative Extension facility in Bakersfield. Similar growth characteristics to those measured at LREC will be monitored between Fukumoto and Washington navel trees on Carrizo rootstock, planted in large pots, under acid versus alkaline soil conditions.

Due to small tree size in these young plantings, initial measurements and comparisons are being made on scion and rootstock diameters, the ratio between the diameters of the scion and the rootstock, and sucker production. At the Lindcove site in September of 2005, Fukumoto navel scion diameters were similar on the Olinda interstock, rough lemon and C-35 rootstocks, and significantly smaller on Carrizo. The ratio of Fukumoto scion trunk diameter to rootstock diameter was not different among rootstocks. Scion diameter and the ratio of scion diameter to rootstock diameter were smaller in Fukumoto than in Washington navel. Irrigation level has not been a significant factor in tree growth so far. At the Lindcove site, tree trunks remain wrapped, and sucker production (defined as sprouts originating below a point 4 inches above the graft union) has been limited. The wraps will be removed in the spring.

At the UCCE/Bakersfield site, trunks were unwrapped. Fukumoto produced significantly more suckers in the period between planting and August 29 than did Washington navel (3.9 versus 1.0) with no difference in sucker production between varieties from August 30 through October 17. There was no difference in sucker production between pots receiving elemental sulfur and those receiving calcium hydroxide soil amendments.

Fukumoto bark rot, a disease or physiological disorder of Fukumoto normally seen in some orchards during the hot summer months on 2 or 3 year-old trees, has not been observed in either experimental plot to date.



*Blake Sanden, UC Cooperative Extension irrigation farm advisor, installs monitoring sensors adjacent to Fukumoto navel.*