

# Should I plant trees on Sour Orange?



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*[Retired, but still opinionated.]*

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The question posed in this slide remains critical and demanding especially in the face of HLB or greening disease and the possible role of rootstock selection in reducing the incidence and/or severity of greening disease. Another way to ask the question is: Given that growers are regularly spraying for psyllid management, is it now safe to use sour orange because the BrCA or Brown Citrus Aphid is coincidentally managed via the insecticides used for the psyllid?

## Are Certain Traits of Sour Orange More Relevant Today?

- Soil adaptation.
- Scion compatibility.
- HLB tolerance?
- Final Answer? Maybe today, sour orange is a suitable choice for a broader than usual set of reasons.

Sour orange is a well known rootstock among Florida citrus growers especially those with groves in the Indian River District. The traits of the rootstock are well established. However, it's a different world today given the HLB environment in Florida and other changes. Furthermore, there are two very active breeding programs within Florida leading to the release of many new scion and rootstock options for growers. As a result, some of the presumably less important traits of sour orange may have a new life and others are possibly being discovered. For example, as stated in this slide, sour orange is broadly adapted to soils and, thus, is often chosen because it is the only rootstock that will grow in certain situations.

Of the new scions being released, many are mandarins and they have not been tested for their compatibility with trifoliolate orange-based rootstocks like Swingle citrumelo and Carrizo or Kuharske citranges. Compatibility is not expected to be an issue with sour orange rootstock. Most importantly perhaps, are cumulating grower observations that trees on sour orange appear to be less affected by HLB. All of these reasons support the increasing interest in sour orange as a viable rootstock choice. Of course, any use of this rootstock must be balanced by its major deficiency, susceptibility to citrus tristeza virus.

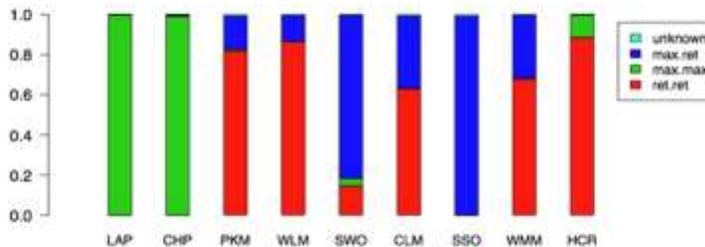
<i>Rootstock</i>	<i>2013 use</i>	<i>Scions</i>		
SWINGLE	28%	Grapefruit 6%; Mand. 14%; Swt. O. 31%		
<b>SOUR ORANGE</b>	<b>18</b>	<b>Grapefruit 73%; Mand. 35%; Swt. O. 12%</b>		
KUHARSKE	17	1%	2%	20%
CARRIZO	10	5%	5%	10%
US 812	6	2%	1%	7%
x639	5	6%	3%	6%
US 897	3	4%	12%	2%
CLEOPATRA	3	0%	15%	3%
US 802	3	1%	1%	3%
VOLKAMER LEMON	2	0%	3%	2%

Source: Annual Report, FDACS, DPI, Citrus Budwood Registration Office, Winter Haven.

Sour orange was the 2<sup>nd</sup> most popular rootstock in 2013 as recorded by the Citrus Budwood Registration Office. Among grapefruit scions, 73 % of the trees across all rootstocks were propagated on sour orange. Perhaps more surprising, however, is that among all rootstocks, 35% of mandarins were propagated on sour orange which supports the contention that compatibility might be a meaningful concern leading to increased use of sour orange. It is interesting to note that the three trifoliolate orange-based rootstocks, Swingle citrumelo, Kuharske citrange and Carrizo citrange, still accounted for 55% of all nursery propagations.

# What exactly is Sour Orange?

Admixture Proportion in 9 Citrus Genomes



- 1) no pure *C. ret* among 8 genomes  
PKM has *max/max* segments
- 2) SWO is mostly *max/ret*, but also has *ret/ret* and *max/max*
- 3) SSO is an F1 cross = *max* x *ret*

 **Sour orange**

Courtesy Dr. Fred Gmitter, Jr.

Part of the sour orange story is this question: What is its genetic background? From sophisticated genetic studies conducted by Dr. Fred Gmitter and his colleagues from around the world, the answer is very cleanly this: It is a hybrid of a pummelo and a mandarin. That information is important in trying to understand the behavior of sour orange and in trying to make a better sour orange.

If you use sour orange, you are  
taking a **RISK!**

危險

**CRISIS**

**OPPORTUNITY**

Choosing to use sour orange is a risk as with any other rootstock. In searching the internet for information about risk, the Chinese word for risk was discovered. It consists of two symbols, one meaning crisis and the other, opportunity. Together those two symbols give risk a meaningful and useful definition.

# What is Risk?

“**Risk** is part of every human endeavor.”

“.....most successful firms in any industry get there not by avoiding **risk** but by actively seeking it out and exploiting it to their own advantage.”

“Two ingredients needed for **risk** to exist: uncertainty about the potential outcomes and the outcomes have to matter.”

And what exactly is the difference between **RISK** and **UNCERTAINTY**? [*quantifiable*]

...Quotes from NYU Stern School of Business

Spending a moment with the word RISK should be a part of the decision-making process leading to the use of sour orange as a rootstock. In searching further on the internet, one will find a book chapter on risk from which the quotes above were taken. The first one above might be deemed a platitude which it is, but it nevertheless, has value for its perspective. The 2<sup>nd</sup> quote establishes that risk of and in itself is not necessarily a bad thing. There are those who see it as something to pursue and manage to an advantage. That attitude applies to using sour orange specially among growers familiar with the risks and managing those risks. The 3<sup>rd</sup> quote addresses the matter of why risk exists at all in any situation. The answer is the existence of uncertainty and having outcomes that matter. Clearly, if an action leads to outcomes that don't matter, then there is essentially no risk. And what is the difference? As stated above, risk is quantifiable. That would not be so true with choosing sour orange, i.e., putting numbers to the decision. **HOWEVER, choosing sour orange does have the advantage of the rootstock being a so-called KNOWN QUANTITY!**

# What is Risk Management?

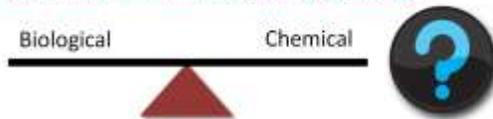
It's a combination of :

- Risk assessment.
- Hedging your bet!  
[Planting more than one rootstock.]
- Investing in or taking a risk and seeking advantages.

RISK involves at least assessment and management. As those concepts apply to sour orange use, the risks are well known and to some degree, management has been long practiced. A form of the latter that should be practiced is to hedge your best by not investing in only one rootstock, but several. And, **ALL growers** should be investing in small-scale rootstock plantings as a hedge against the future.

## Does spraying for ACP eliminate aphids? Entomologists' Perspective

- Insecticides incompatible with biological control of psyllids and aphids.
- Negative effect on predators: ladybeetles, lacewings, syrphid flies and spiders.
- Given the CTV strains in Florida, is the fight against HLB more important than the fight against CTV?
- Aphids reproduce faster than psyllids, thus, "control" may have different meanings.
- 2006-2007: 90% mortality of psyllid immatures mainly by ladybeetles, predators of aphids.
- Study: Impacts of intensive insecticide management programs against ACP on beneficial fauna and ACP biological control. Abundance and seasonality of ladybeetles, spiders and ants were negatively affected.



A major factor leading to reconsideration of sour orange use is the purported incidental control of the citrus tristeza virus [CTV] vector by way of the management programs in place for the Asian Citrus Psyllid. The view among many entomologists in Florida is expressed in the comments presented on this slide. Basically, biological control and chemical control are incompatible, but there is some evidence that under the right conditions, various predators especially ladybeetle can be voracious feeders on the psyllid. Whether the two approaches to vector management can be integrated remains to be determined, but sharp observers may note something of importance in groves. The BrCA is still present in Florida, but the dynamics of the grove environment apparently are not fully discovered yet.

## Are Growers Planting Trees on Sour Orange? A Survey



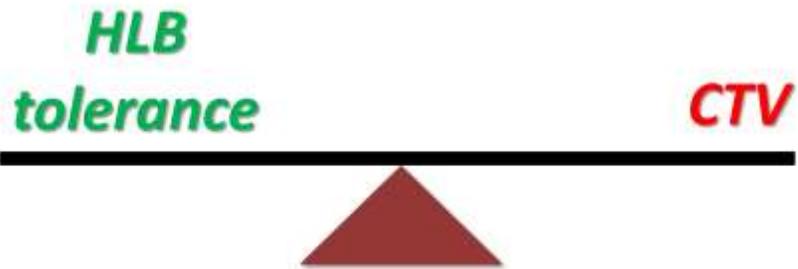
- 15/54 responses. 50-50 split re SO use.
- Why? SO good traits; Fear of CTV.
- Good: HLB tolerance [50% yes; 50% ??]. Less fruit drop. Poor soils.
- Poor soils: **DIAPREPES-PHYTOPHTHORA**
- **x639**; SwC; Cleo; US 812; US 897

54 growers across the State were surveyed by email to assess their use of sour orange. There were 15 responses that seemed to the author as representative of the industry as a whole. The first question on the survey was: Are you using sour orange? Among the respondents, about 50% were using sour orange and 50% were not. The latter group consisted mostly of growers not in the Indian River District. For those using the rootstock, most indicated they were willing to take the citrus tristeza virus [CTV] risk with sour orange and take advantage of the rootstock's well known good traits. Those not using the rootstocks were still mostly concerned about the aphid vector and the disease.

Growers using the rootstock have planted 10s of thousands of trees on sour orange in the past 5 years and have noticed, in some instances, less fruit drop on those trees and less incidence of HLB. However, those are only casual observations, not research data. Furthermore, one grower-respondent noted that in the weaker, poorer soils of the River such as Winder, Diaprepes root weevil often was problematic, leading to Phytophthora root rot problems. That complex is a serious one regardless of the rootstock.

The last question asked growers to name those rootstocks they were using if not sour orange. The most common reply was x639 followed by others listed on the slide.

# What's the balance?



So, if you are thinking about using sour orange, then there is a balance of risks and rewards to be considered.

## Certain Traits of Sour Orange More Relevant Today?

**Final Answer?** Maybe today, sour orange is a suitable choice for a broader than usual set of reasons.

**I agree!**

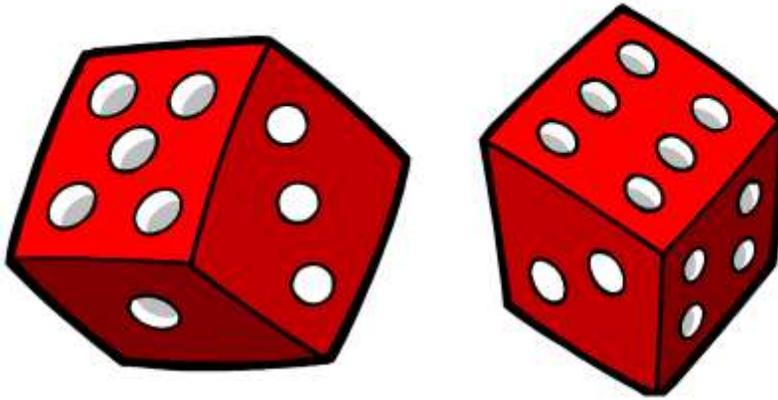
- Risk assessment.
- Well thought-through circumstances.
- Monitor/manage grove environment.

Back to the beginning: SOUR ORANGE, among all rootstock options presently available in Florida, is a known risk. In the author's opinion, it is a good risk given that a grower engages in risk assessment beforehand [e.g. are BrCA present in my groves? Am I considering the rootstock mostly or only to use in places where I have no other choices?] and remains vigilant.

# What's the balance?



To make the choice to use sour orange, the balance board must be fairly stacked with all factors that make affect the outcomes experienced.



**RISK-REWARD**  
**Remain Vigilant!**

At the end of the day, RISK cannot be completely eliminated, therefore, there is always the element of uncertainty. One must still roll the dice and influence the outcomes as much as possible! [Bill Castle: [bcastle@ufl.edu](mailto:bcastle@ufl.edu); 863.956.1151]