

## A NEW HYBRID CITRUS ROOTSTOCK FOR FLORIDA: US-852

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**Abstract.** US-852 is a citrus rootstock cultivar released by the USDA, ARS in 1999 for use in Florida. Greenhouse and laboratory testing have suggested that US-852 is resistant to *Phytophthora nicotianae*, citrus tristeza virus, and citrus nematode. Information on long-term field performance is limited to one trial in Osceola county where 'Hamlin' on US-852 rootstock produced healthy, uniform, medium-size trees that have yielded exceptionally large crops of high quality fruit through the first 8 harvests. In addition, trees on US-852 in this trial have produced essentially no root sprouts. Small-scale but widespread commercial trials with this rootstock are desirable to determine its suitability for use with other scions and in other production areas.

A new citrus rootstock, US-852, was released by the USDA, ARS in August 1999 for use in commercial trials in Florida. US-852 is one superior hybrid selected from several dozen siblings produced by a cross of Changsha mandarin (*Citrus reticulata* Blanco) with English Large Flowered Trifoliolate Orange (*Poncirus trifoliata* [L.] Raf.) completed by Dr. Joe Furr at Indio, California in 1965. The major attributes of this new rootstock cultivar are its resistance to several important diseases, low production of root sprouts in the field, and its favorable effects on scion tree size, fruit quality, and productivity. Seed is not available for US-852 at this time, but tissue culture-propagated plants are available and appear to be a viable alternative.

### Description

Plants of US-852 are similar to other hybrids of citrus with trifoliolate orange in general appearance, bearing trifoliolate leaves with jointed petioles. Despite similarities, seedlings of US-852 can be distinguished from seedlings of Swingle citrumelo and Carrizo citrange on the basis of leaf shape (Fig. 1). Under well-watered and fertilized conditions in the greenhouse, the central leaflet of US-852 has a relatively pointed apex and measures about 42 × 17 mm. US-852 plants also have spines that are longer than those of Carrizo citrange or Swingle citrumelo. Fruit of US-852 normally have a fairly smooth rind surface and are orange (or mottled green and orange) when mature and similar in size to fruit of Carrizo. Fruit of US-852 is typically spheroid-oblate and more flattened at the stem and blossom ends than fruit of Carrizo. The fruit has orange flesh

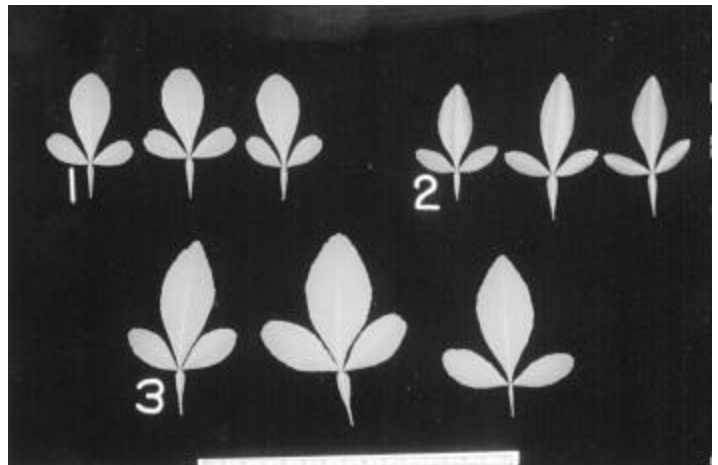


Figure 1. Seedling leaves of Carrizo (1), US-852 (2), and Swingle (3).

and fewer seeds than other common trifoliolate hybrid rootstocks like Carrizo or Swingle.

### Performance

Long-term field trial data is available with 'Hamlin' scion from the St. Cloud area of Osceola County, Florida. During the first 7 years after field planting, US-852 produced significantly more fruit and more soluble solids per tree than most other rootstocks in the trial (Wutscher and Hill, 1995). High yields occurred despite the fact that trees on this rootstock were significantly shorter than trees on other highly productive rootstocks (Wutscher and Hill, 1995). Production was significantly greater on US-852 than on Swingle (Wutscher and Hill, 1995), although tree size and fruit quality were similar for 'Hamlin' on the two rootstocks (Table 1). During the next 4 years (years 8-11), trees on US-852 continued to produce more fruit and soluble solids than trees on Swingle (Table 2). During the 6 harvest seasons from age 6-11, trees on Swingle averaged 231 kg fruit per tree per year, while trees on US-852 averaged significantly more at 274 kg. The shorter stature of trees on Swingle and US-852 in comparison to some other common rootstocks allows

Table 1. Fruit quality of 'Hamlin' orange on US-852 and Swingle rootstocks at St. Cloud field trial (from Wutscher and Hill, 1995).

Rootstock	US-852	Swingle
Fruit weight (g)	172.0	173.8
Fruit diameter (cm)	7.0	7.0
Peel color <sup>†</sup>	H	H
Rind thickness (mm)	3.4	3.4
Juice content (%)	50.2	49.2
Total soluble solids (%)	9.6	9.7
Total acids (%)	0.79	0.80
TSS:TA <sup>*</sup>	12.2	12.1
Juice color <sup>**</sup>	33.3	33.2

<sup>†</sup>Peel color according to color tables in Harding et al. (1940).

<sup>\*</sup>TSS:TA = total soluble solids: total acids ratio.

<sup>\*\*</sup>Juice color as color number determined with chromameter (model CE 200; Minolta Camera Co., Osaka, Japan).

Mention of a trademark, warranty, proprietary product, or vendor does not imply an approval to the exclusion of other products or vendors that also may be suitable. Rootstock development by the USDA is supported in part by the Florida Citrus Production Research Advisory Council [Project 981-301] and the Florida Citrus Research Foundation.

Table 2. Tree yield, size, and survival of 'Hamlin' orange on US-852 and Swingle rootstocks at St. Cloud field trial (some data from Wutscher and Hill, 1995).

	US-852	Swingle
Tree height, m (7 years in the field)	3.0	3.0
Tree volume, m <sup>3</sup> (7 years)	11.4	9.1
Yield (kg fruit/tree)		
year 1 (4 years in the field)	108	90
year 2	154	122
year 3	272	204
year 4	235	178
year 5	306	249
year 6	257	224
year 7	305	271
year 8	269	261
Average for years 3-8	274	231
Tree loss from natural causes (%)	0	11

a more rapid and economical harvest of the fruit crop and may translate into a higher yield efficiency.

During field testing and in preliminary laboratory and greenhouse testing, trees on US-852 rootstock have appeared resistant or field tolerant to several biotic factors that frequently damage citrus trees. Trees on US-852 rootstock suffered no apparent damage from *Phytophthora* during the field trial in Osceola County, while trees on other rootstocks were visibly damaged. US-852 rootstock was tested for resistance to *Phytophthora nicotianae* by stem inoculation of potted greenhouse plants and found significantly more resistant to damage than several common rootstocks, including Sour orange and Carrizo citrange (data not shown). Laboratory testing with citrus nematode (*Tylenchulus semipenetrans*) indicated that US-852 was resistant to this nematode species (data not shown). Trees of 'Hamlin' on US-852 rootstock were observed to grow and yield well in the presence of severe Florida isolates of citrus tristeza virus (CTV) in Osceola County. Results of testing plants inoculated with CTV by ELISA and molecular marker analysis suggest that US-852 carries the *Ctv* resistance gene from *Poncirus trifoliata* (data not shown). All of these preliminary indications of disease resistance need to be confirmed by additional testing. Despite the good performance of US-852 in the St. Cloud field trial and possible resistance to some common diseases, much is still not known about this new rootstock. There is some indication that US-852 may be unacceptable for use where there is high salinity or pH. Growers should use caution by emphasizing small-scale testing of US-852, so that their trials will provide additional performance information but that any failures will not result in undue financial hardship.

### Propagation

Although seed propagation is preferred for citrus rootstocks in general, it is inefficient for US-852 due to relative unfruitfulness,



Figure 2. Plants of US-852 from tissue culture (left 2) and nucellar seed (right 2).

a low number of seed per fruit, and a high proportion of off-type seedlings. Only about half of seedlings recovered are of nucellar (apomictic) origin so that they have uniform morphology typical of US-852. Cuttings of US-852 root easily, but a sizable proportion of these never develop well-anchored plants that produce vigorous growth of scion buds. Although they are more expensive to produce, tissue culture propagated plants of US-852 appear healthy, true-to-type, and develop strong root systems in the nursery. In the near future, it is anticipated that tissue culture propagation will be the method by which most US-852 liners are produced (Fig. 2). Establishment of large numbers of bearing trees might eventually make large-scale seed propagation possible for US-852.

The field trial with Hamlin on US-852 in St. Cloud may be examined by appointment with Mr. Orie Lee. Young trees with 'Hamlin' orange, 'Sunburst' tangerine, and 'Orlando' tangelo scions on US-852 rootstock may be inspected by appointment at the USDA Whitmore Foundation Farm in Lake County, Florida. Young trees with 'Valencia' orange and 'Flame' grapefruit scions may be inspected at the USDA Ft. Pierce Farm Center, St. Lucie County, FL.

A patent application has been filed for this cultivar. Plants of US-852 will be distributed for commercial use under license by Twyford International (11850 Twitty Road, Sebring, FL 33870). Additional information and a limited quantity of plant material for research purposes may be obtained from: Kim D. Bowman (USH-RL, USDA, ARS, Ft. Pierce, FL).

### Literature Cited

Wutscher, H. K. and L. L. Hill. 1995. Performance of 'Hamlin' orange on 16 rootstocks in East-central Florida. *HortScience* 30:41-43.