

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
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NOTICE TO FRUIT GROWERS AND NURSERYMEN RELATIVE TO THE NAMING AND
RELEASE OF THE US-802 CITRUS ROOTSTOCK

The Agricultural Research Service, U.S. Department of Agriculture hereby releases to nurserymen and growers the US-802 citrus rootstock. This rootstock selection originated from a cross of Siamese pummelo (*Citrus grandis*) × Gotha Road Trifoliolate Orange (*Poncirus trifoliata*). Field testing of US-802 was planned and conducted by Drs. Don Hutchison, Heinz Wutscher, and Kim Bowman (all of USDA, ARS, USHRL, Florida) in collaboration with or support from industry partners, including Florida Citrus Research Foundation, Florida Citrus Production Research Advisory Council, Mr. Orie Lee, Becker Groves, Florida Research Center for Agricultural Sustainability (Vero Beach), and University of Florida. During field testing, this hybrid rootstock was identified by code numbers FF5-23-65, HRS-802, or US-802. In all field evaluations, US-802 rootstock yielded vigorous and productive trees that were tolerant to endemic disease and pest problems and exhibited excellent survival. The major positive attributes of this new rootstock are resistance or tolerance to citrus tristeza virus, citrus blight, *Phytophthora palmivora*, and *Diaprepes* root weevil, induction of high vigor and good fruit productivity on grafted scions, and ease of seed propagation. Notable negatives may be the tendency for trees grafted on US-802 rootstock to become very large and produce fruit with intermediate or low soluble solids concentration.

US-802 rootstock has been field tested at several locations and with several different scions. The longest and most studied field test involving this rootstock is a replicated cooperative trial with Mr. Orie Lee in Osceola County (Florida). In this trial, 'Hamlin' sweet orange trees on US-802 were compared with a similar number of trees on 15 other rootstocks through the first 18 years after field planting. Fruit production of 'Hamlin' on US-802 was measured through the first seven harvest seasons and found to be outstanding (Table 1). Fruit quality characteristics of 'Hamlin' on US-802 were evaluated periodically during the 18-year period and found to be acceptable. Soluble solids concentration and brix/acid ratio of fruit from trees on US-802 was similar to or less than those on Swingle citrumelo, and significantly poorer than the quality of fruit produced on some other rootstocks (Tables 2 and 3). Fruit size and juice color from trees on US-802 were found to be similar to trees on Swingle and many other rootstocks (Tables 4 and 5). Evaluation of tree size and survival at 8 and 17-18 years of age indicated that US-802 produced a large tree with an excellent rate of survival at 8 years and still 83% survival at 17 years (Tables 6 and 7). The rootstock also appeared to induce good cold hardiness in the trees during the Florida freeze of December 1989 (Table 7).

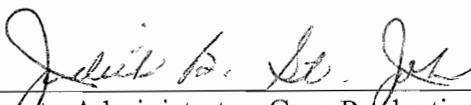
Growth, production, and survival of trees on US-802 rootstock have also been good in other trials, including a 'Marsh' grapefruit trial in Martin County, a 'Valencia' sweet orange trial on a high pH site in St. Lucie County, and a 'Hamlin' trial in Lake County (Table 8). Fruit quality testing in these other trials has consistently indicated that soluble solids production by trees on

US-802 rootstock are similar to or lower than those on Swingle or Carrizo rootstock, including situations where it is used with grapefruit scions (Table 9).

Preliminary test data suggests that US-802 is resistant or field tolerant to some common citrus disease and pest problems in Florida, including citrus tristeza virus (CTV), citrus nematode (*Tylenchulus semipenetrans*), *Phytophthora nicotianae* and *Phytophthora palmivora* foot and root rot, and *Diaprepes* root weevil. During field evaluation at the Florida Research Center for Agricultural Sustainability (Vero Beach), grapefruit trees on US-802 rootstock that were exposed to severe infestation with *Diaprepes* root weevil, *Phytophthora palmivora*, and *P. nicotianae* grew exceptionally well, while trees on other common rootstocks like Swingle and Carrizo declined or died (Table 10). Some trees on US-802 have been observed with symptoms of a citrus blight-like decline, although the incidence was relatively low in comparison to other rootstocks. This suggests that US-802 is resistant but not immune to citrus blight. Observations on soil adaptation, insect, nematode, and disease resistance will need to be confirmed by more widespread and long-term studies in the field environment.

US-802 produces apomictic seed by nucellar polyembryony, and is thus very easy to propagate uniformly by seed. Nursery studies have indicated that US-802 produces vigorous and true to type seedlings at a frequency similar to or better than that of most other commercial rootstocks (Table 11). US-802 has not been tested for response to viroid diseases, but is expected to be sensitive to exocortis infection and only scion sources free of viroid diseases should be used for propagations with this rootstock.

Source plant material for US-802 has been tested and found free of citrus viroids, psorosis, and CTV by the Florida Bureau of Citrus Budwood Registration, Winter Haven, and at the USDA, ARS, USHRL, Ft. Pierce. Budwood for source trees of US-802 will be distributed by the Florida Bureau of Citrus Budwood Registration, 3027 Lake Alfred Road (Highway 17), Winter Haven, Florida 33881. Limited quantities of seed will be distributed by the Florida Citrus Research Foundation (A.H. Whitmore Foundation Farm, 23402 USDA Road, Groveland, Florida 34736) and the Southwest Florida Research and Education Foundation (2686 State Road 29 N., Immokalee, FL 34142). Small quantities of US-802 plant material for professional research and additional information may be obtained from Kim D. Bowman, USDA, ARS, USHRL, 2001 South Rock Road, Ft. Pierce, Florida 34945. Genetic material of this release will be deposited in the National Plant Germplasm System where it will be available for research purposes, including development and commercialization of new cultivars. Appropriate recognition should be made if this germplasm contributes to the development of a new breeding line or cultivar.



Deputy Administrator, Crop Production and Protection
Agricultural Research Service, U.S. Department of Agriculture

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Date

Table 1. Fruit yield of ‘Hamlin’ sweet orange on US-802 and selected rootstocks in cooperative trial with Mr. Ori Lee in Osceola County. Eighteen trees on each rootstock were planted in 1986. Soil is Myakka fine sand at pH 5.5; tree spacing is 4.2 x 6.6 m. Yearly average yield is for years 8, 9, and 10.

<u>Rootstock</u>	<u>Fruit yield per tree (kg)</u>				
	<u>Year 4-7</u>	<u>Year 8</u>	<u>Year 9</u>	<u>Year 10</u>	<u>Yearly Ave.</u>
US-802	781 a	364	303	348	338 a
US-852	769 a	307	258	307	291 ab
Swingle	597 c	250	225	270	248 bc
US-801	622 b	237	188	262	229 cd
US-896	536 cd	229	172	237	213 cd
US-897	462 d	168	151	205	175 d

Mean separations for significant ANOVA within columns were by Duncan’s multiple range test at P<0.05

Table 2. Fruit total soluble solids at harvest of ‘Hamlin’ sweet orange on US-802 and selected rootstocks in cooperative trial with Mr. Ori Lee in Osceola County.

<u>Rootstock</u>	<u>Juice total soluble solids (brix)</u>		
	<u>Years 4-7</u>	<u>Years 15-17</u>	<u>Average</u>
US-896	10.1 a	10.7 a	10.4
US-897	9.4 b	10.6 a	10.0
US-852	9.6 b	10.4 ab	10.0
Swingle	9.7 b	10.1 b	9.9
US-801	9.2 c	10.3 ab	9.8
US-802	9.0 c	10.1 b	9.6

Mean separations for significant ANOVA within columns were by Duncan’s multiple range test at P<0.05

Table 3. Juice brix/acid ratio at harvest of ‘Hamlin’ sweet orange on US-802 and selected rootstocks in cooperative trial with Mr. Ori Lee in Osceola County.

<u>Rootstock</u>	<u>Juice brix/acid ratio</u>		
	<u>Years 4-7</u>	<u>Years 15-17</u>	<u>Average</u>
US-897	12.7 b	15.1 a	13.9
US-896	12.6 bc	15.1 a	13.8
US-801	13.1 a	14.4 a	13.7
US-852	12.2 bc	15.1 a	13.6
Swingle	12.1 c	13.3 b	12.7
US-802	12.3 bc	13.0 b	12.6

Mean separations for significant ANOVA within columns were by Duncan’s multiple range test at P<0.05

Table 4. Fruit weight at harvest of ‘Hamlin’ sweet orange on US-802 and selected rootstocks in cooperative trial with Mr. Ori Lee in Osceola County.

<u>Rootstock</u>	<u>Individual fruit weight (g)</u>		
	<u>Years 4-7</u>	<u>Years 15-18</u>	<u>Average</u>
US-801	191 a	160	175
Swingle	174 b	160	167
US-852	172 b	162	167
US-802	169 b	162	165
US-896	174 b	157	165
US-897	175 b	153	164

Mean separations for significant ANOVA within columns were by Duncan’s multiple range test at P<0.05

Table 5. Juice color at harvest of ‘Hamlin’ sweet orange on US-802 and selected rootstocks in cooperative trial with Mr. Ori Lee in Osceola County. Values measured as color number (CN) with Greytag MacBeth Color Eye Spectrophotometer.

<u>Rootstock</u>	<u>Juice color (CN)</u>			
	<u>Year 15</u>	<u>Year 16</u>	<u>Year 17</u>	<u>Average</u>
US-802	35.4	35.4	35.4	35.4
US-801	35.7	35.1	35.5	35.4
US-896	35.3	35.0	35.5	35.3
US-852	35.1	35.0	35.7	35.3
US-897	35.0	35.0	35.7	35.2
Swingle	35.0	35.0	35.6	35.2

There were no significant ANOVA within columns for this characteristic.

Table 6. Tree size of ‘Hamlin’ sweet orange on US-802 and selected rootstocks in cooperative trial with Mr. Ori Lee in Osceola County.

<u>Rootstock</u>	<u>Tree height 8 yrs (m)</u>	<u>Canopy volume 8 yrs (m³)</u>	<u>Tree height 18 yrs (m)</u>
US-802	4.0 a	17.7 a	6.1 a
Swingle	3.0 b	9.1 c	4.8 b
US-801	2.5 c	6.8 c	4.4 b
US-852	3.0 b	11.4 b	3.7 c
US-896	2.6 c	8.4 c	3.3 c
US-897	2.4 c	6.6 c	2.7 d

Mean separations for significant ANOVA within columns were by Duncan’s multiple range test at P<0.05

Table 7. Tree survival and response to 1989 freeze for ‘Hamlin’ sweet orange on US-802 and selected rootstocks in cooperative trial in Osceola County.

	Freeze damage rating at 3 years (1= no damage)	Tree replacement through 8 years (%)	Tree replacement through 17 years (%)
US-852	1.2	0	6
US-896	2.4	0	6
Swingle	1.8	11	11
US-802	1.1	0	17
US-801	1.1	11	28
US-897	2.5	0	33

Tree replacement and freeze damage rating were not tested by statistical analysis.

Table 8. Yield of ‘Hamlin’ sweet orange on US-802 and selected rootstocks in field trial in Lake County.

<u>Rootstock</u>	<u>Fruit/tree (kgs)</u>		
	<u>Year 6</u>	<u>Year 7</u>	<u>Years 4-7 Cumulative</u>
Carrizo	107 a	129 a	342 a
US-812	66 abc	75 ab	310 ab
US-802	94 ab	116 a	307 ab
US-896	105 ab	85 ab	298 ab
Swingle	64 bc	80 ab	236 b
Flying Dragon	46 c	52 b	136 c

Mean separations for significant ANOVA within columns were by Duncan’s multiple range test at P<0.05

Table 9. Fruit quality at harvest of 4 year old Flame grapefruit trees in St. Lucie County.

<u>Rootstock</u>	<u>Individual fruit weight (g)</u>	<u>Total soluble solids (brix)</u>	<u>Total soluble solids per box (kg)</u>
US-896	254 bc	8.6 a	1.9 a
US-897	227 c	8.5 ab	1.9 a
Swingle	295 ab	8.5 ab	1.8 ab
US-812	279 abc	8.2 ab	1.8 ab
Carrizo	289 ab	8.1 ab	1.7 bc
US-802	321 a	8.0 b	1.6 c

Mean separations for significant ANOVA within columns were by Duncan's multiple range test at P<0.05

Table 10. Grapefruit tree size in Indian River County field trial at 3 years old under heavy Diaprepes weevil pressure and inoculated with *Phytophthora nicotianae* and *P. palmivora*.

<u>Rootstock</u>	<u>Scion Trunk Cross Sectional Area (mm²)</u>	<u>Rootstock Trunk Cross Sectional Area (mm²)</u>
US-802	2284 a	5694 a
US-897	1912 ab	3460 b
Cleopatra	1897 ab	2732 bc
US-896	1662 b	2031 cd
US-852	1538 b	1683 d
US-812	1523 b	2025 cd
Carrizo	987 c	1395 d
Swingle	880 c	2052 cd

Mean separations for significant ANOVA within columns were by Duncan's multiple range test at P<0.05

Table 11. Nursery performance of US-802: Seedling vigor and trueness to type. 'Usable seedlings' is calculated as percent strong seedlings \times percent true to type among strong.

<u>Rootstock</u>	<u>Strong seedlings (%)</u>	<u>True to type among strong (%)</u>	<u>Usable seedlings (%)</u>
US-897	76 a	100 a	76
US-802	76 a	90 bc	68
Cleopatra	66 bc	100 a	66
Swingle	65 bc	97 ab	63
Volkamer	58 c	97 ab	56
Kinkoji	63 bc	86 c	54
Smooth Flat Seville	67 b	37 d	25

Mean separations for significant ANOVA within columns were by Duncan's multiple range test at $P < 0.05$