

***HANDROANTHUS* ×*LEWISII* (BIGNONIACEAE),  
A NEW HYBRID FROM CULTIVATION**

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**ABSTRACT**

*Handroanthus ×lewisii*, an unusually handsome hybrid of *Handroanthus heptaphyllus* and *H. umbellatus* (trumpet trees, Bignoniaceae), is now well established at the Los Angeles County Arboretum and Botanic Garden in Arcadia, California, near Los Angeles, where it was first developed, and at several other locations in Southern California. Because it is gaining in popularity and might soon be marketed to retail nurseries, we provide formal botanical and common names for this hybrid.

*Handroanthus* Mattos comprises arguably the showiest winter- and spring-flowering trees in Southern California. Established in 1970 (Mattos 1970), the genus includes about 30 species of trees from Mexico to Argentina (Grose & Olmstead 2007) that most authors (e.g., Gentry 1992) previously included in *Tabebuia* Gomes ex. DC. Indeed, *Handroanthus* was largely unaccepted until the publication of Grose and Olmstead in 2007. When Mattos (1970) segregated out *Handroanthus*, he noted that it differed from *Tabebuia* in its palmately compound leaves and eight to nine ovules/locules per ovary (vs. simple leaves and three to four ovules/locules per ovary in *Tabebuia*). However, Gentry (1972, 1992) insisted that *Tabebuia* was a natural lineage and should not be divided, and he was loathe to accept *Handroanthus*, which he never did. Based on more recent molecular studies, Grose and Olmstead (2007) divided *Tabebuia* into three genera: (1) *Handroanthus*, comprising mostly yellow-flowered species with various degrees of hairs covering the leaves and calyx and extremely dense wood containing large quantities of lapachol; (2) *Roseodendron* Miranda, including just two species having spathaceous calyxes with a texture similar to that of the corolla; and (3) *Tabebuia*, restricted to species having white to red or rarely yellow flowers with stalked or sessile lepidote scales.



Figure 1. *Handroanthus* includes the most spectacular winter- and spring-flowering trees in southern California, as here with *H. heptaphyllus*, the pistillate parent of *H. × lewisii* (Whittier, California) (© D.R. Hodel).

The two most common species in Southern California are (1) the pink-flowered *Handroanthus heptaphyllus* (Vell.) Mattos [*Tabebuia heptaphylla* (Vell.) Toledo], heretofore known as *H. impetiginosus* (Mart. ex DC.) Mattos [*T. impetiginosa* (Mart. ex DC.) Standl.], a name misapplied to material in Southern California and perhaps elsewhere (Hodel et al. 2015) (Fig. 1) and (2) the yellow-flowered *H. chrysotrichus* (Mart. ex DC.) Mattos [*T. chrysotricha* (Mart. ex DC.) Standl.]. The Los Angeles County Arboretum and Botanic Garden in Arcadia is primarily responsible for introducing these two species to the southern California nursery trade and landscape, where they are popularly known as pink or yellow trumpet trees (respectively) or pink or yellow tabs, the latter word being an abbreviated derivation of their former genus name. Other species sometimes encountered and mostly confined to botanical gardens and arboreta include the yellow-flowered *H. ochraceus* (Cham.) Mattos [*T. ochracea* (Cham.) Standl.] and *H. umbellatus* (Sond.) Mattos [*T. umbellata* (Sond.) Sandwith] (Fig. 2). *Tabebuia* still exists, though, and includes 67 species, one of which, the pink flowered *T. heterophylla* (DC.) Britton, is in the desert plant collection in Balboa Park in San Diego.

The extremely variable but typically larger *Handroanthus heptaphyllus* can flower from November through April with a peak in February and March while the other species, mostly yellow-flowered and generally of smaller habit flower mostly in February and March. Because they bloom in dense, large, many-flowered clusters at the ends of bare branches when most or all of the leaves have dropped, they are nothing short of spectacular and garner much well deserved attention when in full flower.

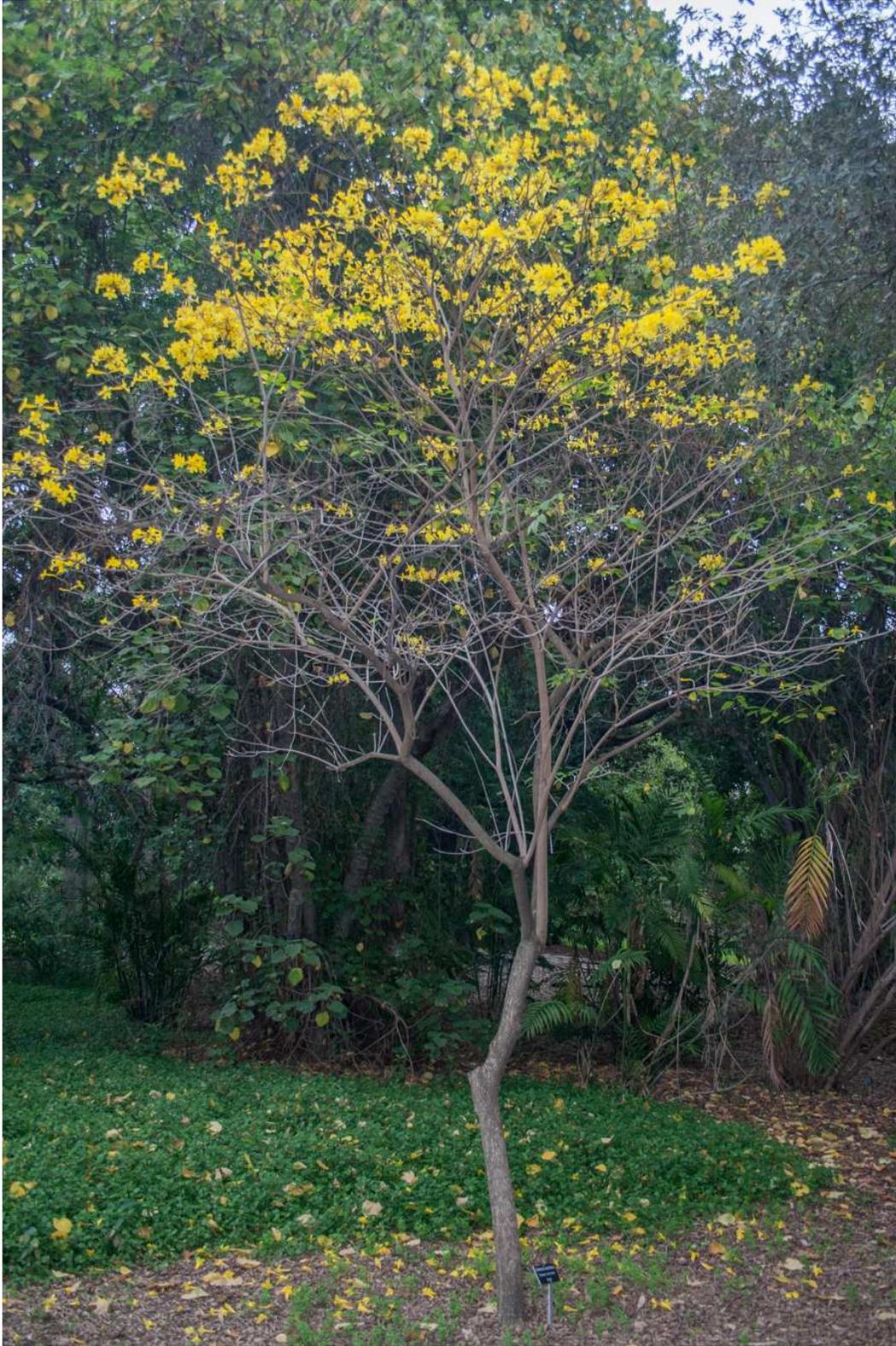
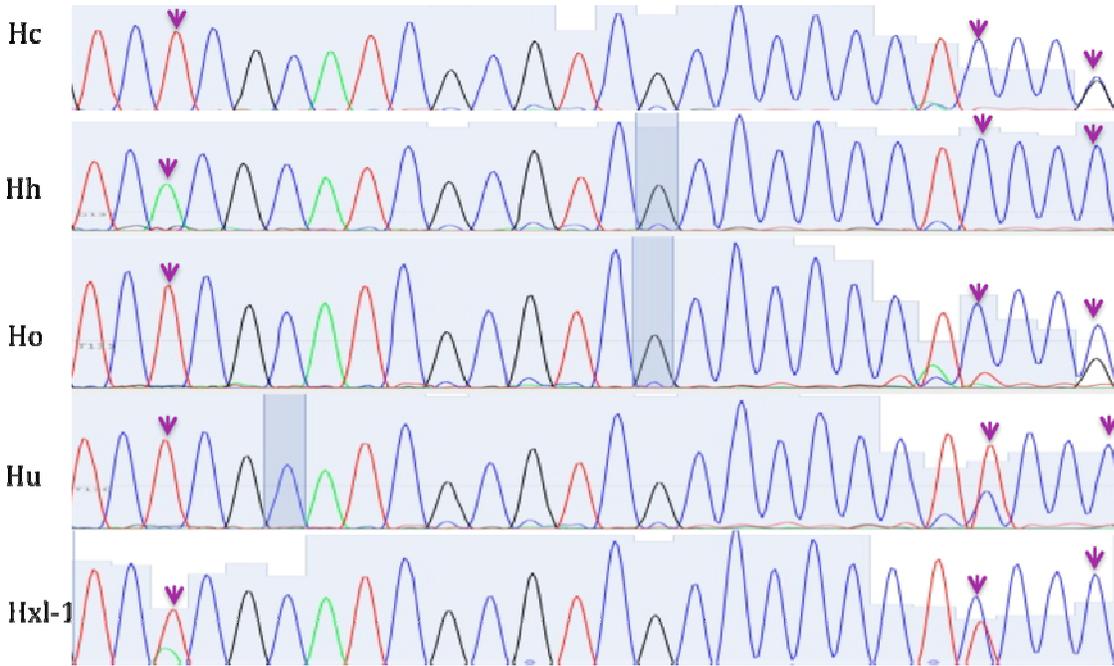


Figure 2. *Handroanthus umbellatus*, the staminate parent of *H. × lewisii*, is one of the yellow-flowered species in the genus (Los Angeles County Arboretum and Botanic Garden, 1967-1455-P\*3) (© D.R. Hodel).

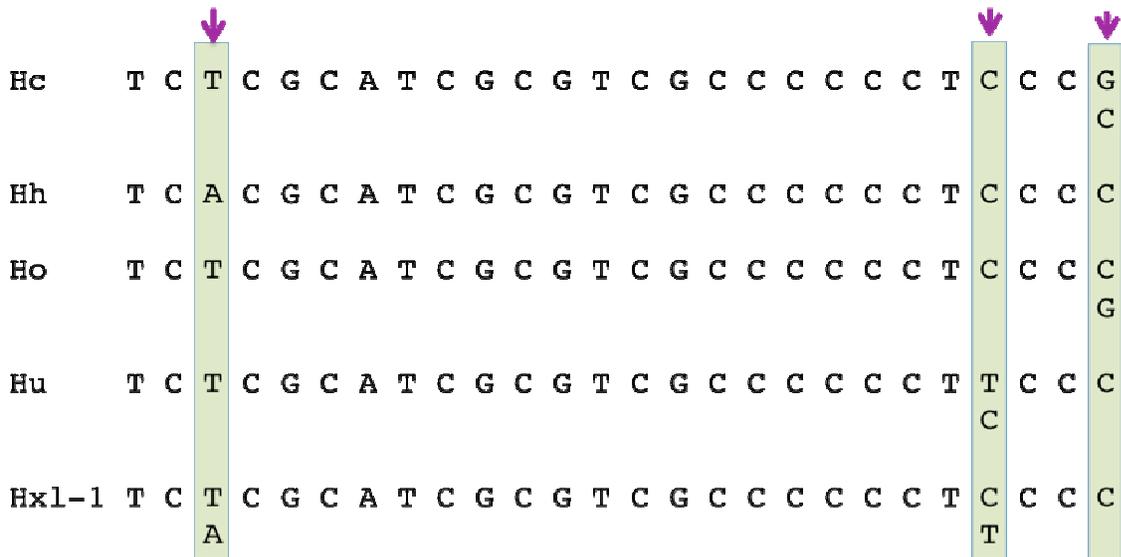
In 1970, the late George Lewis, a senior gardener at the Los Angeles County Arboretum and Botanic Gardens, first made the hybrid (now popularly known as the apricot tab) between *Handroanthus heptaphyllus* (he referred to it as *Tabebuia impetiginosa*) and, as it turns out, *H. umbellatus*. However, the identity of one of the latter parent was not specified and has only recently been resolved. Lewis's records clearly show that *H. impetiginosus* (1955-2559-S, ex Porto Alegre, Brazil) was the pistillate (seed) parent. Unfortunately, he did not specify the staminate (pollen) parent; however, because *H. chrysotrichus* was by far the most common yellow-flowered taxon in the Arboretum at the time, we initially assumed it was the staminate parent. At least four accessions from 1953 to 1966 totaling 24 plants of *H. chrysotrichus*, which possibly would have been sufficiently mature to flower by 1970, were extant in the Arboretum as late as 2007. In contrast, one accession from 1953, totaling two plants of *H. ochraceus* and three accessions from 1966 to 1968, totaling five plants of *H. umbellatus*, which possibly would have been sufficiently mature to flower by 1970, were extant in the Arboretum as late as 2007. The Arboretum featured and promoted *H. chrysotrichus* in particular, formally introducing it to the nursery trade in April 1964. Another possibility is that the staminate parent was not even at the Arboretum and Lewis had pollen sent to him from elsewhere.

Nonetheless, and despite this seemingly overwhelming evidence favoring *Handroanthus chrysotrichus* as the staminate parent, we became suspicious of this parentage when comparing the habit and leaf indumentum of the hybrid with its putative staminate parent. Coauthor Greby first noted that the branching structure of the hybrid was much more similar to that of *H. umbellatus* than that of *H. chrysotrichus*. The hybrid and *H. umbellatus* tend to have two to three strongly co-dominant leaders while *H. chrysotrichus* has a more central leader. Also, the smaller, much less hairy leaflets of the hybrid are more similar to those of *H. umbellatus*. These suspicions prompted us to look for a more definitive resolution of the staminate parent. We determined the staminate and confirmed the pistillate parents of the hybrid by comparing DNA sequences (ITS2) of four candidate parents with that of samples from two hybrid trees, one from the Arboretum's original cross and one from a landscape street tree of unknown origin in Whittier, California, about 40 km distant. At three positions where the candidate parents differ from each other, the hybrids display a sequence trace resulting from the combination of the two parents (*H. heptaphyllus* and *H. umbellatus*) (Figs. 3A and B, 4A and B).

Figure 3. A comparison of DNA sequences (5.8S-ITS2) from four parental candidates to that of the hybrid *Handroanthus x lewisii* (Hxl-1) at the Los Angeles County Arboretum and Botanical Garden, Arcadia, California. *Handroanthus hepataphyllus* was known to be one of the parents.

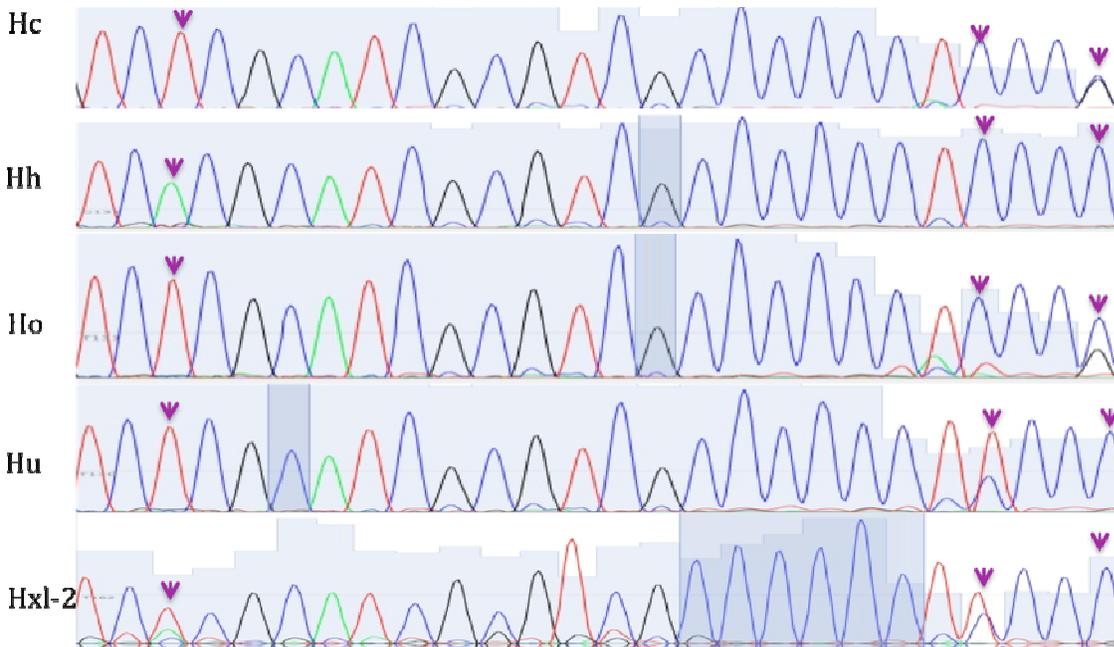


A. Sequence traces of four parental candidates and the hybrid. Arrows point to three positions, which show variations among the potential candidates. The hybrid Hxl-1 shows a combined trace for *H. hepataphyllus* and *H. umbellatus*. Hc, *H. chrysotrichus*; Hh, *H. hepataphyllus*; Ho, *H. ochraceus*; Hu, *H. umbellatus*.

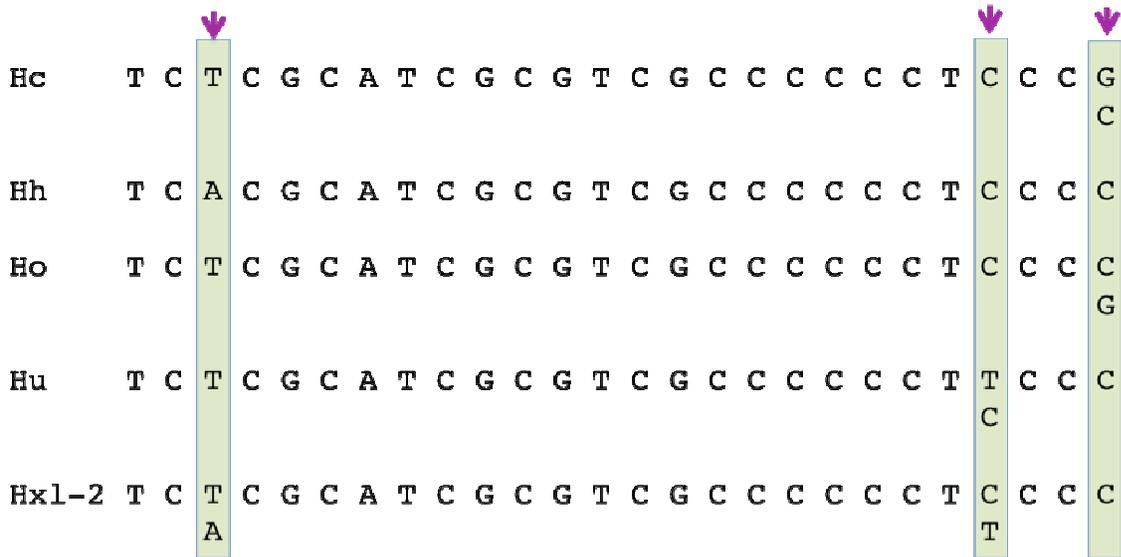


B. Translation of the traces to nucleotide sequences. Arrows point to the three positions identified in part A. The hybrid Hxl-1 shows a combined sequence for *H. hepataphyllus* and *H. umbellatus*. Hc, *H. chrysotrichus*; Hh, *H. hepataphyllus*; Ho, *H. ochraceus*; Hu, *H. umbellatus*.

Figure 4. A comparison of DNA sequences (5.8S-ITS2) from four parental candidates to that of the hybrid *Handroanthus x lewisii* (Hxl-2) at Whittier, California. *Handroanthus hepataphyllus* was known to be one of the parents.



A. Sequence traces of four parental candidates and the hybrid. Arrows point to three positions, which show variations among the potential candidates. The hybrid Hxl-2 shows a combined trace for *H. hepataphyllus* and *H. umbellatus*. Hc, *H. chrysotrichus*; Hh, *H. hepataphyllus*; Ho, *H. ochraceus*; Hu, *H. umbellatus*.



B. Translation of the traces to nucleotide sequences. Arrows point to the three positions identified in part A. The hybrid Hxl-2 shows a combined sequence for *H. hepataphyllus* and *H. umbellatus*. Hc, *H. chrysotrichus*; Hh, *H. hepataphyllus*; Ho, *H. ochraceus*; Hu, *H. umbellatus*.

**Handroanthus × lewisii** Hodel, Henrich, Greby & Yansura, **nothosp. nov.** [*Handroanthus heptaphyllus* (Vell.) Mattos × *H. umbellatus* (Sond.) Mattos]. **TYPE: CULTIVATED. U.S.A. California.** Los Angeles County: Arcadia, Los Angeles County Arboretum and Botanic Garden, 7 Mar 2015, 1970-0966-S\*1, J. Henrich & D.R. Hodel 627 (holotype: LASCA).

This new hybrid shares characters of both parents. In habit and branching structure it is more like *Handroanthus umbellatus*; in its glabrous or glabrescent leaves it is similar to both parents but the toothed leaflet margins are similar to those of *H. heptaphyllus*; in flower it is more like *H. umbellatus* initially with more yellow but aging to more like *H. heptaphyllus* with more pink or lavender, and in its mealy pubescent calyx is more similar to that of *H. heptaphyllus*; in its mostly glabrous fruit it is similar to both parents but lacks the strongly striate ridges of *H. heptaphyllus*. Table 1 and Figures 5 and 6 provide a comparison of characters of *Handroanthus × lewisii* and its parents. Figures 5-18.

**Tree**, small to medium tree (Fig. 7), to ca. 15 m tall after 45 years but typically flowering when as small as 3-5 m tall. **Trunk** to ca. 30 cm DBH, typically with 2-3 strongly co-dominant leaders (Fig. 8); bark pebbly, grayish, tan in crevices between “pebbles” (Fig. 9); irregularly branched but typically scaffold branches regularly spaced and spreading horizontally to give “layered” look. **Leaves** palmately compound (Fig. 10), to ca. 23 × 19 cm, glossy green adaxially, paler abaxially, red-brown when young; petiole ca. 10 cm long, ca. 1.5 mm diam.; leaflets 5(-7), 2 or 3 paired lateral and one terminal); terminal leaflet with petiolule ca. 4.5 cm long, ca. 0.9 mm diam., leaflet blade to 10.5 × 4.5 cm, margins coarsely toothed in distal 4/5, 10 main lateral nerves on either side of midrib; distal lateral leaflets with petiolule to ca. 3 cm long, ca. 0.8 mm diam., leaflet blade 9 × 3 cm, margins coarsely toothed in distal 2/3; proximal lateral leaflets with petiolule to ca. 2 cm long, ca. 0.8 mm diam., leaflet blade to 6 × 2 cm, margins coarsely toothed in distal 2/3 (Fig. 10); petiole and petiolules grooved and +/- flattened adaxially, rounded abaxially, green, moderately to lightly covered with short, tan to whitish tomentum, all leaflets broadly lanceolate to oblong-elliptic, apex acute to acuminate, abruptly rounded, base cuneate, midrib abaxially with short, tan to whitish tomentum. **Inflorescence** a terminal, compact, vertically compressed, up to 16-flowered raceme to ca. 20 cm wide (Fig. 11). **Flowers** ( Figs. 14-15) bisexual, zygomorphic, densely placed along a short rachis, paired or in threes, pedicels to 11 mm long, green, mealy pubescent. Calyx urn-shaped or campanulate, with gland pits toward distal end, to ca. 12 × 9 mm, green proximally, lavender distally, glabrous adaxially (inside), mealy pubescent with yellow-brown stellate hairs abaxially (outside), slightly angled longitudinally, 5-lobed, lobes ca. 5 mm long, swollen (saccate) , rounded to acute. Corolla ca. 8 × 6.5 cm, tubular or funnel-shaped, bi-laterally symmetrical (bilabiate), compressed to create horizontally open (oval-shaped) throat; 5-lobed, lobes ca. 2 × 2.5 cm, membranous, pale yellow, distal margin irregularly scalloped, erose, undulate; adaxially (inside) golden or dark yellow, on ventral surface with conspicuous, depressed, reddish brown or burgundy nerves and long, straight hairs, dorsal surface not so conspicuously nerved, abaxially (outside) with short, branched hairs on ventral surface and golden with slight suffusion of magenta, dorsal surface with heavy suffusion of magenta. Stamens 4, didynamous (2 long and 2 short), long to ca. 30 mm long, short to ca. 25 mm long; filaments slender, ca. 8 mm diam. at base and there adnate to corolla and with glandular hairs, ca. 0.5 mm diam. distally and glabrous; anthers ca. 7 mm long, divergent; staminode 1, to ca. 7 mm long. Pistil ca. 45 mm long; ovary ca. 7 × 1.2 mm, green, glabrous; style to ca. 35 mm long, ca. 0.7 mm diam., very light green; stigma flattened, ca. 2 × 1.5 mm, very pale yellow, eventually bi-lobed. Pistil with 5, laterally fused, quadrat nectary glands at base, these to ca. 2 × 1.5 mm. **Fruits** few (less than 20 per tree), to ca. 50 × 1 cm, cylindrical, green, glabrous (Fig. 12); seeds ca. 10-15 × 5-10 mm, thin, bialate, with hyaline-membranaceous wings clearly demarcated from the body, rarely fertile.



Figure 5. A comparison of inflorescences of *Handroanthus × lewisii* (center, 1970-0966-S\*1, J. Henrich & D. R. Hodel 627, holotype) and its two parents, *H. umbellatus* (left, 1967-1455-P\*3) and *H. heptaphyllus* (right) at the Los Angeles County Arboretum and Botanic Garden (© D.R. Hodel).



Figure 6. A comparison of flowers of *Handroanthus × lewisii* (center, 1970-0966-S\*1, J. Henrich & D. R. Hodel 627, holotype) and its two parents, *H. umbellatus* (left, 1967-1455-P\*3) and *H. heptaphyllus* (right) at the Los Angeles County Arboretum and Botanic Garden (© D.R. Hodel).

Table 1. Comparison of *Handroanthus × lewisii*, *H. heptaphyllus*, and *H. umbellatus*.

	<i>H. heptaphyllus</i>	<i>H. × lewisii</i>	<i>H. umbellatus</i>
Leaflet shape.	Broadly lanceolate to ovate or oblong-elliptic.	Broadly lanceolate to oblong-elliptic.	Narrowly obovate to oblong-elliptic.
Leaflet margin.	Evenly serrate.	Evenly but coarsely toothed.	Entire.
Leaflet indumentum.	Lepidote abaxially and adaxially; pubescent with simple trichomes in axils of lateral nerves abaxially; or glabrescent.	Moderately to lightly covered with short, tan to whitish tomentum abaxially, glabrous adaxially; midnerve with short, tan to whitish tomentum abaxially; or glabrescent.	Lepidote abaxially and adaxially; stellate-rufescent abaxially and adaxially with few-branched trichomes along midnerve adaxially and in axils of lateral nerves adaxially; or glabrescent.
Inflorescence.	Terminal panicle.	Terminal, compact, vertically compressed, raceme.	Contracted, +/- fasciculate terminal cluster.
Flower color.	Magenta, throat yellow.	Yellow with suffusion of magenta; throat yellow.	Yellow.
Calyx.	Mealy pubescent with thick-stellate trichomes or glabrescent with lepidote scales.	Lightly mealy pubescent with yellow-brown stellate trichomes.	With sparse thick-stellate rufescent trichomes.
Fruit.	Glabrescent, strongly striate-ridged.	Glabrous, smooth.	Glabrous, smooth.



Figure 7. *Handroanthus × lewisii* is typically a small to medium tree (Los Angeles County Arboretum and Botanic Garden) (© D.R. Hodel).



Figure 8. *Handroanthus × lewisii* typically has two to three codominant leaders (Los Angeles County Arboretum and Botanic Garden) (© D.R. Hodel).



Figure 9. The bark of *Handroanthus × lewisii* is pebbly and grayish (Los Angeles County Arboretum and Botanic Garden) (© D.R. Hodel).



Figure 10. Leaves of *Handroanthus × lewisii* are palmately compound with five to seven leaflets with coarsely toothed margins (© Los Angeles County Arboretum and Botanic Garden) (© D.R. Hodel).



Figure 11. Inflorescence of *Handroanthus × lewisii* are a terminal, compact, vertically compressed, up to 16-flowered raceme to 20 cm wide (Los Angeles County Arboretum and Botanic Garden) (© D.R. Hodel).



Figure 12. Fruits of *Handroanthus × lewisii* are few, cylindrical, green, and glabrous (Los Angeles County Arboretum and Botanic Garden) (© D.R. Hodel).

**Additional specimens examined. CULTIVATED. USA. California.** Los Angeles Co.: Arcadia, Los Angeles County Arboretum and Botanic Garden, 1970-0966-S\*2, *Henrich & Hodel* 628 (LASCA.), 1970-0966-S\*3, 629 (LASCA); Whittier, 9923 Colima Rd. (33°56'49.349"N, 118°00'29.005"W) *Henrich et al.* 622 (LASCA), 10145 Colima Rd. (33°56'37.648"N, 118°00'37.919"W) *Henrich et al.* 621 (LASCA.)

#### DISCUSSION

The epithet honors the late George Lewis, who first made the hybrid cross and who had a 33-year career with the Los Angeles County Arboretum and Botanic Garden, from 1957 to 1970, where he rose to the rank of senior gardener, and then later at Descanso Gardens, La Cañada Flintridge, from 1970 to 1990, where he rose to the rank of superintendent. We designate the cultivar name 'Apricot' and the common name apricot tab because they refer to the general color of the flowers and were originally coined by Arboretum staff.

The flower color of *Handroanthus × lewisii* deserves a detailed discussion. When viewed from a distance the flowers appear to be apricot-colored, a light yellowish orange (Fig. 13). However, when viewed closely, individual colors contributed by each parent are clearly evident (Fig. 14). The adaxial or inside surface of the corolla is golden yellow, the color darkest proximally and lightest distally where the lobes are nearly membranous. The abaxial or outside surface of the corolla is golden yellow with a light suffusion of magenta on the ventral side and a heavy suffusion on the dorsal side. The suffusion of magenta on the dorsal side is heaviest or darkest proximally and lightest distally.

All of these flower colors transition as they age; generally the flowers open more yellow, more like *Handroanthus umbellatus*, and less magenta, less like *H. heptaphyllus*, then age to less yellow and more magenta. The yellow fades adaxially nearly to white and abaxially to whitish or ivory with irregular tinges of magenta. The yellow actually masks the magenta; fading away it leaves or reveals the magenta base, intensifying the magenta. Once fallen on the ground, the magenta intensifies even more. Also, one's distance and angle from the tree, angle of the sun, and one's position relative to the sun tend to influence flower color.

Three trees from Lewis's original 1970 cross are extant at the Los Angeles County Arboretum and Botanic Garden. Located at the top of Tallac Knoll, the three are about 20 feet apart in a line and are accessioned as 1970-0966-S\*1 (Fig. 16), 1970-0966-S\*2, and 1970-0966-S\*3, respectively north to south. Similar in habit, size, and flowers, they are about 15 m tall; have trunks 42.9 cm (25.9 + 17.0), 29.9 cm, and 24.3 cm DBH, respectively; and bloom in February and March. Also, at least eight of the grafted apricot tabs are planted elsewhere at the Arboretum, and several more were distributed through Arboretum plant sales and as gifts to other botanical gardens. Notable trees are at the South Coast Botanic Garden in Palos Verdes Peninsula and on Colima Road south of Whittier Blvd. in Whittier (Figs. 17-18), both in Los Angeles County; the home of plant enthusiast Brent Wigand in Wildomar, Riverside County; and several other private gardens. Most of these grafted plants are in the same or similar age/size class, are about 5 m tall and wide and have trunks 10 to 15 cm DBH.

Others have made this hybrid in recent years. Eric Schmidt (pers. com.) of Harry P. Leu Gardens in Orlando, Florida notes that Bernie Peterson of Rockledge Gardens in Cocoa, Florida has made several hybrids involving various combinations of *Handroanthus chrysotrichus*, *H. heptaphyllus*, *H. impetiginosus*, and *H. umbellatus*. One of the hybrids made was perhaps *H. × lewisii*.



Figure 13. When viewed from a distance the flowers of *Handroanthus × lewisii* appear to be apricot colored, a light yellowish orange (Los Angeles County Arboretum and Botanic Garden, 1970-0966-S\*1, *J. Henrich & D.R. Hodel* 627, holotype) (© D.R. Hodel).



Figure 14. When viewed closely, individual colors contributed by each parent are clearly evident in flowers of *Handroanthus × lewisii* (Los Angeles County Arboretum and Botanic Garden, 1970-0966-S\*1, J. Henrich & D.R. Hodel 627, holotype) (© D.R. Hodel).



Figure 15. Flowers of *Handroanthus × lewisii* are bisexual, zygomorphic, densely placed along a short rachis, and yellow with suffusion of magenta (Los Angeles County Arboretum and Botanic Garden) (© D.R. Hodel).

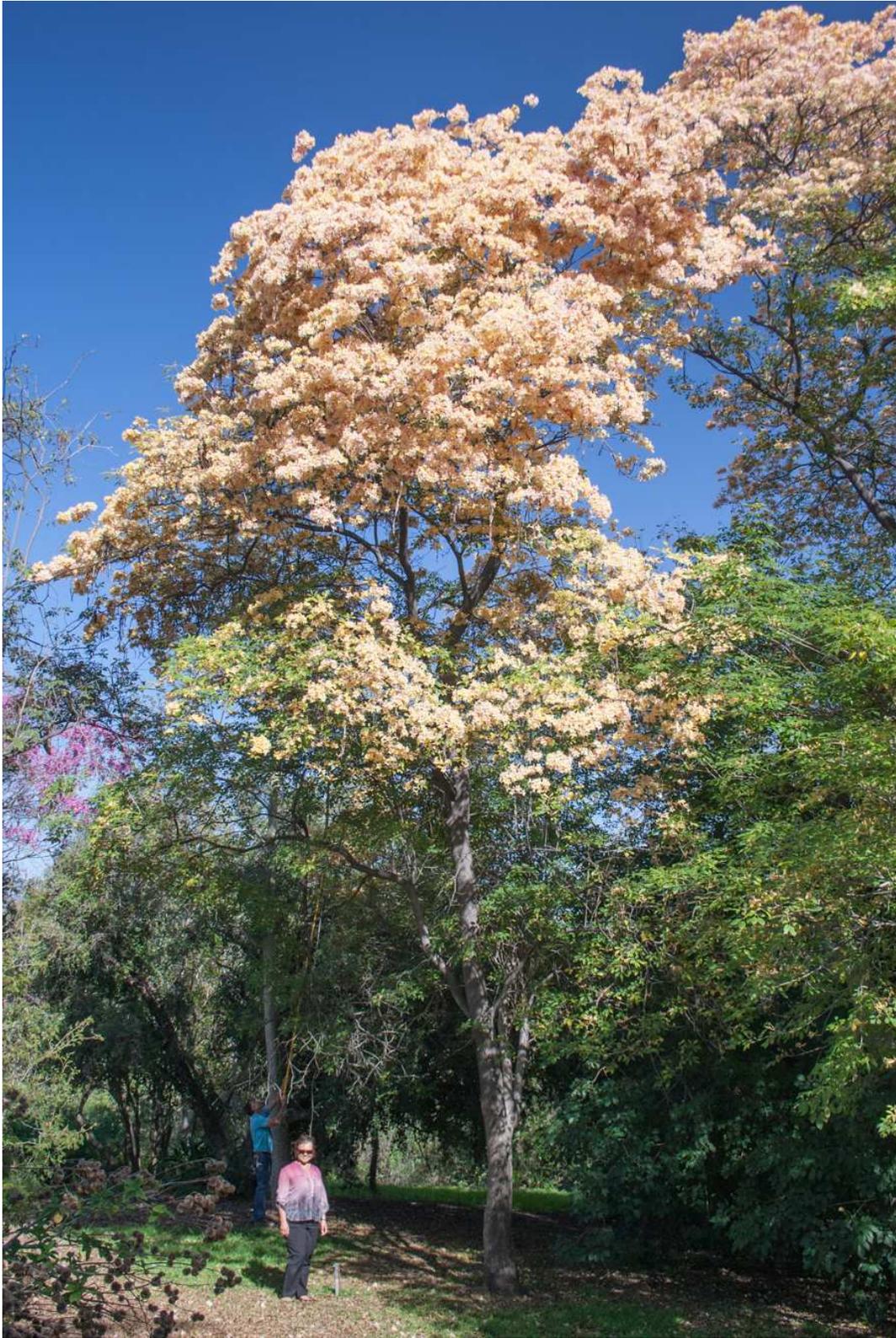


Figure 16. Marianne Hodel (foreground) and coauthor James E. Henrich provide scale for one of the three trees of *Handroanthus × lewisii* from Lewis's original 1970 cross (Los Angeles County Arboretum and Botanic Garden, 1970-0966-S\*1, *Henrich & Hodel* 627, holotype) (© D.R. Hodel).



Figure 17. The more northerly tree of *Handroanthus × lewisii* at 9923 Colima Road in Whittier is likely from Lewis's original 1970 cross (*J. Henrich et al.* 622) (© D.R. Hodel).

#### CULTIVATION AND MANAGEMENT

The apricot tab does not readily produce fruits, which is advantageous for those managing this tree in the landscape. Managers have to contend with little fruit and seed litter and no seedlings appearing as weeds. In contrast, *Handroanthus heptaphyllus* and *H. umbellatus*, especially the former, produce abundant fruits that are rather unattractive when persisting on the tree and liberate great quantities of seeds, many of which germinate in the landscape and become weeds.

The apricot tab is readily propagated by grafting. Mary Foote, the Arboretum's plant nursery manager in the 1980s and early 1990s, successfully grafted it, using *Handroanthus heptaphyllus* as the root stock. Scion wood was from one or more of the original three extant trees on Tallac Knoll but which particular tree or trees were not always specified. Current nursery manager Sherry Tobin used the cleft graft technique to propagate the Apricot Tab successfully on to seedling-grown *H. heptaphyllus*. The apricot tab can also likely be propagated from semi-hardwood tip cuttings made after flowering and prior to growth flushing; the use of rooting hormone, bottom heat, overhead mist, and high light would probably yield the best results. Air layering is another possible method to propagate the apricot tab. However, plants grafted on to seedlings might develop a deeper, well structured root system that would provide better anchorage and support than cutting-grown or air-layered trees. This situation has occurred in Hawaii with the rainbow shower (*Cassia × nealiae* H.A. Irwin & Barneby), where grafting was recommended over air layering because of its stronger root system (Hickok 1954). Indeed, seedlings of *H. heptaphyllus* typically develop a rather deep, central taproot from which other roots then arise, and they are unusually difficult to pull out of the garden as weeds.



Figure 18. The more northerly tree of *Handroanthus × lewisii* at 9923 Colima Road in Whittier has exceedingly handsome flowers in their brightness, intensity, purity, and demarcation of the magenta and yellow colors (*J. Henrich et al.* 622) (© D.R. Hodel).

Little training and pruning are necessary to achieve a well structured apricot tab because it tends to grow upright with several strong leaders and layers of horizontal branches radially and vertically well spaced along the trunk. However, if necessary, prune and train to a central leader, subordinating lateral branches until the desired height is attained, and a handsome, well structured tree will result.

Pests, diseases, and nutritional disorders are unknown for the apricot tab in the landscape in southern California. Providing proper cultivation, including planting, mulch, and judicious irrigation, will preclude most problems. The most limiting factor in their cultivation might be cold, but the apricot tab has tolerated temperatures to about -6 C for short periods at night with little or no damage and has recovered with damage from even colder temperatures. Based on the distribution and ecology of its parents and their performance in southern California, the apricot tab could probably be classified as a low water user and, once well established in the landscape, would likely require deep irrigation (to 30 cm deep) only one to two times a month in the summer and much less frequently at other times, especially if there is sufficient rain. Indeed, the two trees in Whittier, in a paved-over median with 75 cm cutouts, apparently receive little or no irrigation and at the end of nearly four years of severe drought are still performing adequately if not outstandingly; thus, like many other woody trees and shrubs, the apricot tab likely needs only about 30 to 40% of reference evapotranspiration for the site (ET<sub>o</sub>) once well established.

### ACKNOWLEDGEMENTS

We thank Mike Montoya, John Provine, Brent Wigand, Sherry Tobin, Susan Eubank, and Joan DeFato for answering our many queries concerning the Apricot Tab. Michael H. Grayum, curator at the Missouri Botanical Garden and esteemed student of Mesoamerican plants, generously reviewed the manuscript.

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