HortScience 41(6):1386–1388. 2006.

×*Gordlinia grandiflora* (Theaceae): An Intergeneric Hybrid Between *Franklinia alatamaha* and *Gordonia lasianthus*

Thomas G. Ranney[1,2]
Department of Horticultural Science, Mountain Horticultural Crops Research and Extension Center, North Carolina State University, 455 Research Dr., Fletcher, NC 28732-9244

Paul R. Fantz[1]
Department of Horticultural Science, Box 7603, North Carolina State University, Raleigh, NC 27695-7609

Additional index words. Gordonia alatamaha, *Gordonia pubescens*, distant hybridization, intergeneric hybridization, plant breeding, wide hybridization

***Abstract. Franklinia alatamaha* Bartr. ex Marshall represents a monotypic genus that was originally discovered in Georgia, USA, but is now considered extinct in the wild and is maintained only in cultivation. Although *Franklinia* is very ornamental, with showy flowers and crimson/maroon fall foliage, it tends to be short lived when grown as a landscape tree and is known to be susceptible to a variety of root pathogens. *Gordonia lasianthus* (L.) Ellis is an evergreen tree native to the southeastern United States, typically growing in riparian habitats. *Gordonia lasianthus* has attractive foliage and large, white, showy flowers, but limited cold hardiness. Hybridization between *F. alatamaha* and *G. lasianthus* could potentially combine the cold hardiness of *F. alatamaha* with the evergreen foliage of *G. lasianthus* and broaden the genetic base for further breeding and improvement among these genera. Controlled crosses between *F. alatamaha* and *G. lasianthus* resulted in intergeneric hybrid progeny. A morphological comparison of parents and the progeny is presented. ×*Gordlinia grandiflora* Ranney and Fantz (mountain gordlinia) is proposed as the name for these hybrids and is validated with a Latin diagnosis.**

A small population of *Franklinia alatamaha* Bartr. ex Marshall (Theaceae D. Don) was discovered by John and William Bartram along the banks of the Altamaha River in Georgia, USA, in 1765 (Fry, 2000). Seeds were collected from these trees for a number of years, but the species has not been seen in the wild since 1790. Although *F. alatamaha* is considered extinct in the wild, it persists in cultivation and makes an attractive landscape tree. This species is valued for its showy white flowers and bright-crimson/maroon fall foliage. Considering its southern nativity, it is surprising that it tolerates winter temperatures as low as –38 °C (Dirr, 1998). However, *F. alatamaha* tends to be short lived in the landscape and is known to be very susceptible to *Phytophthora cinnamomi* Rands and *Phymatotrichum omnivorum* (Duggar) Hennebert (Horst, 2001; Koslow and Peterson, 1980; Peterson et al., 1975), thus limiting its usefulness in the landscape. *Franklinia* is considered to be a monotypic genus (Griffiths, 1994; Hillier Nurseries, 2002; Krüssman, 1986; Liberty Hyde Bailey Hortorium, 1976; Prince and Parks, 2001).

Gordonia lasianthus (L.) Ellis is an evergreen tree native to the Coastal Plains throughout the southeastern United States, and typically grows in riparian habitats (Radford, et al., 1987). *Gordonia lasianthus* is valued for its attractive evergreen foliage and large, white, showy flowers. However, cold hardiness is limited (U.S. Department of Agriculture zone 7b/8a). Recent molecular analyses support classifying *G. lasianthus* as a monotypic genus, distinct from the Asiatic genus *Polyspora spp.* Sweet (*Gordonia*) (Prince and Parks, 2001; Yang et al., 2004).

All existing plants of *F. alatamaha* originated from one small population, resulting in minimal genetic diversity and limited potential for breeding and improvement within this species. However, some attempts have been made to develop intergeneric hybrids using *F. alatamaha*. Ackerman and Williams (1982) conducted extensive crosses between *F. alatamaha* and *Camellia* L. spp. and produced two intergeneric hybrids, but their growth was weak and extremely slow. Ranney and colleagues (2003) reported successful hybridization between *F. alatamaha* and *Schima argentea* Pritz. In 1974, Dr. Elwin Orton, Jr. successfully crossed *G. lasianthus* with *F. alatamaha* and produced 33 hybrids (Orton, 1977). Orton (1977) further reported that the seedlings grew vigorously during the first growing season and that a number of them flowered the following year; however, all the plants eventually died, possibly because of some type of genetic incompatibility or a pathogen (e.g., *Phytophthora*). Although Orton's report was somewhat discouraging, hybridization between *F. alatamaha* and *G. lasianthus* could potentially combine the cold hardiness of *F. alatamaha* with the evergreen foliage of *G. lasianthus* and broaden the genetic base for further breeding among these genera. The objective of this report is to describe the history of and to validate new intergeneric hybrids between *F. alatamaha* and *G. lasianthus.*

Materials and Methods

Controlled crosses were made between *F. alatamaha* (female parent) and *G. lasianthus* (male parent) in Aug. 2002 at the Mountain Horticultural Crops Research Station, Fletcher, N.C. Pollen was collected from a specimen of G. *lasianthus* 'Variegata' (accession 2002–090), dried for 24 h at room temperature, and stored at 6 °C. Flowers of *F. alatamaha* (accession 1998–450) were emasculated before anthesis and pollinated the following day. About 75 flowers were pollinated. Seeds were collected in Sept. 2003, stratified in moist media for 90 d at 6 °C, and germinated under greenhouse conditions.

Results and Discussion

A total of nine hybrids were propagated from seed in Dec. 2003. Growth was fast and many of these progeny grew to more than 2 m tall and flowered within 9 months of germination. Characteristics of the progeny clearly demonstrated their hybrid nature (Table 1, Fig. 1). The hybrids resembled *Franklinia* in some characteristics, including broader leaves with teeth all along the margin, suborbicular sepals, longer filaments and styles, and conspicuous pubescence on the juvenile shoots, dormant terminal bud scales, and lower leaf surfaces. The hybrids resemble *Gordonia* with flowers that are prominently stalked and leaves that are acute and widest near the middle. Many characteristics of the hybrids were intermediate between the parents, including leaf duration (semievergreen), flower shape (partially cupped to flattened), short peduncles (10–25 mm), sepal length (7–9 mm), and lightly pubescent juvenile shoots, dormant terminal bud scales, and lower leaf surfaces. Hybrids generally exhibited larger sizes than either parent in lamina length (11–20 cm),

Received for publication 20 Mar. 2006. Accepted for publication 9 May 2006. The authors gratefully acknowledge the excellent technical assistance of Tom Eaker, Joel Mowrey, Nathan Lynch, and the staff at the Mountain Horticultural Crops Research Station. This research was funded, in part, by the North Carolina Agricultural Research Service, Raleigh, N.C., the North Carolina Association of Nurserymen, Raleigh, N.C., and the J. Frank Schmidt Family Charitable Foundation, Boring, Ore.

[1]Professor.

[2]To whom reprint requests should be addressed; e-mail tom_ranney@ncsu.edu.

Table 1. Comparison of *Franklinia alatamaha* (female), *Gordonia lasianthus* (male), and hybrid progeny.

Characteristic	Franklinia alatamaha (♀)	Hybrids	Gordonia lasianthus (♂)
		Young Shoots	
Shoot pubescence	Silky	Lightly pubescent	Glabrous
		Dormant terminal vegetative bud	
Length	10–16 mm	10–20 mm	10–16 mm
Width	4–6 mm	3–4 mm	3–4 mm
Pubescence	Silky	Lightly pubescent	Glabrate
		Leaves	
Leaf duration	Deciduous	Semievergreen	Evergreen
Leaf shape	Obovate	Lance-elliptic	Oblong to lance-elliptic
Leaf apex	Obtuse	Broadly acute	Acute
Leaf margin	Crenately serrulate	Serrulate	Apically shallowly serrate, entire below
Lamina length	9–15 (20)[z] cm	(8) 11–20 (27) cm	5–15 (20) cm
Lamina width	3.5–6 (8) cm	2.5–6 (9) cm	2–4 (8) cm
Lamina pubescence below	Dense, silky	Lightly pubescent	Glabrate
		Flowers	
Shape	Cup	Partially cupped to flattened	Flattened
Peduncle	Subsessile	Short	Elongate
Peduncle length	3–6 mm	10–25 mm	45–90 mm
Flower diameter	6–8 cm	8–10 cm	7–8 cm
Bracts	2, minute, inconspicuous	Lacking	2, large, prominent
Bract size	2–3 × 1–2 mm	NA	12–22 × 7–10 mm
Sepals	Suborbicular	Suborbicular	Obovate
Sepal size	6–7 × 6–7 mm	7–9 × 7–9 mm	8–10 × 5–6 mm
Petal length	25–35 mm	35–50 mm	25–40 mm
Petal width	20–30 mm	25–30 mm	20–25 mm
Filament length	4–15 mm	4–10 mm	3–6 mm
Style length	7–12 mm	7–9 mm	3–5 mm

[z]Numbers in parentheses indicate extreme ranges, but uncommon occurrences. Values for progeny are based on eight individuals.

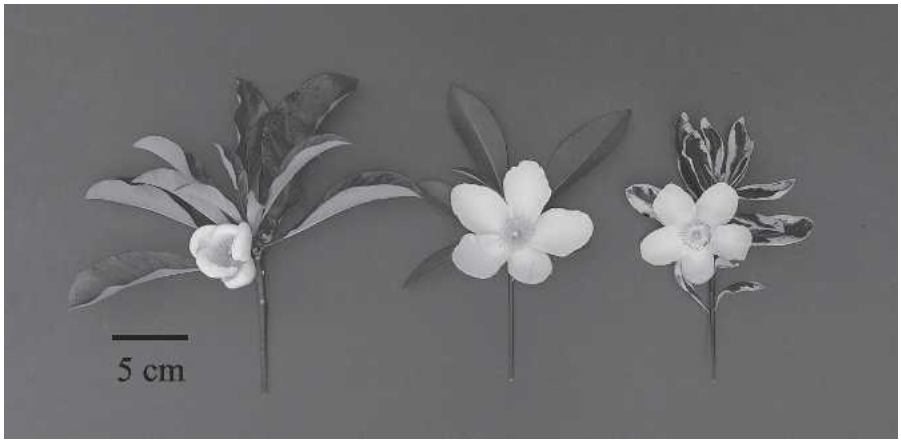

Fig. 1. Flowering shoots of *Franklinia alatamaha* (left), ×*Gordlinia grandiflora* (center), and *Gordonia lasianthus* 'Variegata' (right).

Fig. 2. Flower of ×*Gordlinia grandiflora.*

flower diameter (8–10 cm), sepal width (7–9 mm), and petal length (35–50 mm), demonstrating some heterosis. The hybrid trait of larger flower size was used in selecting the epithet for hybrid progeny (Fig. 2).

Hybrids propagated from rooted cuttings were ≈25% taller than cuttings of both parents after one growing season. All these plants and subsequent cuttings continue to grow well, and are now being evaluated for their potential as nursery and landscape plants. Fall foliage color ranges from orange to maroon. Most pollen grains appeared malformed upon microscopic examination.

Conclusion

Intergeneric hybridization between *F. alatamaha* and *G. lasianthus* was successfully achieved. The nothogenus ×*Gordlinia* Ranney and Fantz is proposed for the generic name in accordance with Article H.6.2 (Greuter et al., 2000) that requires the nothogeneric name of a bigeneric hybrid to be a combination of the parents' generic names. The new hybrid species is described as follows: *Nothospecies* ×*Gordlinia grandiflora* Ranney and Fantz [*Franklinia alatamaha* (♀) Bartr. ex Marshall ×*Gordonia lasianthus* (♂) Pritz.] *distinguibili flore grandi (diametro 8–10 cm), cupulato ad plano, portato brevipeduculo, sepalis lato (7–9 mm), et petalis elongato (35–50 mm).* Trees, 3.5 m tall after two growing seasons. Juvenile shoots are lightly pubescent, trichomes short, appressed, with terminal dormant vegetative bud scales lightly pubescent and ciliolate. Leaves are alternate, short petiolate, simple, semievergreen, dark lanceolate-elliptic, serrulate, apically broadly acute, basally long tapering and attenuate, green and glabrate above, pale green and lightly pubescent below on major veins. Flowers are partially cupped to flattened, large (diameter 8–10 cm), borne on short peduncles, 10 to 25 mm long. Bracts caducous, lacking in bud and floral state. Sepals are five, green, suborbicular, silky pubescent, ciliolate, 7 to 9 mm diameter. Petals are five, white, obovate, 35 to 50 mm long, 25 to 30 mm wide. Stamens are numerous, fused basally in bundles; filaments are deep yellow and 4 to 10 mm long; anthers are yellow. The style is 7 to 9 mm long. Holotype: container plant, 3.5 m tall, progeny H2004–024–004, Mountain Horticultural Crops Research Station, Fletcher N.C., 16 Sept. 2005, *Fantz and Ranney 8510* (NCSC). Isotype: NA. Paratypes: *Fantz and Ranney 8511* (2004–024–005), *8512* (2004–024–002), and *8513* (2004–024–009).

Fantz and Ranney 8508 (NCSC,NA) is the voucher of the female parent, *Franklinia alatamaha* (no. 1998–450), used in producing the intergeneric hybrid. *Fantz and Ranney 8509* is the voucher of the male parent, *Gordonia lasianthus* (no. 2002–090). A representative sample of leaf variation (*8515*) and flower variation (*8516*) from the progeny were vouchered.

Literature Cited

Ackerman, W.L., and M. Williams. 1982. Intergeneric crosses within Theaceae and the successful hybridization of *Camellia japonica* and *C. sasanqua* with *Franklinia alatamaha*. HortScience 17:566–569.

Dirr, M.A. 1998. Manual of woody landscape plants: Their identification, ornamental characteristics, culture, propagation and uses. 5th ed. Stipes Publishing, Champaign, Ill.

Fry, J.T. 2000. *Franklinia alatamaha*, a history of that "very curious" shrub. Part I: Discovery and naming of the Franklinia. Bartram Broadside, Spring, pp. 1–23.

Greuter, W., J. McNeill, F.R. Barrie, H.M. Burdet, V. Demoulin, T.S. Filgueiras, D.H. Nicholson,

P.C. Silva, J.E. Skog, P. Trehane, N.J. Turland, and D.L. Hawksworth. 2000. International code of botanical nomenclature (St. Louis code). Koeltz Sci. Books, Köenigstein, Germany.
Griffiths, M. 1994. Index of garden plants. Macmillan Press, London.
Hiller Nurseries. 2002. The Hillier manual of trees and shrubs. David and Charles, Devon, UK.
Horst, R.K. 2001. Westcott's plant disease handbook. 6th ed. Kluwer, Boston.
Koslow, G. and J.L. Peterson. 1980. Phytophthora root and crown rot of *Franklinia* trees. J. Arbor. 6:89–92.
Krüssman, G. 1986. Manual of cultivated broadleaved trees and shrubs. Timber Press, Portland, Ore.
Liberty Hyde Bailey Hortorium. 1976. Hortus third: A concise dictionary of plants cultivated in the United States and Canada. Macmillan Publishing, New York.
Orton, E.R., Jr. 1977. Successful hybridization of *Gordonia lasianthus* (L.) Ellis × *Franklinia alatamaha* Marshall. Amer. Assoc. Bot. Garden Arb. Bul. 11:81–84.
Peterson, J.L., E.R. Orton, and G. Koslow. 1975. Wilt and die-back of Franklinia trees caused by *Phytophthora* spp. Proc. Amer. Phytopathol. Soc. 2:104.
Prince, L.M. and C.R. Parks. 2001. Phylogenetic relationships of Theaceae inferred from chloroplast DNA sequence data. Amer. J. Bot. 88: 2309–2320.
Radford, A.E., H.E. Ahles, and C.R. Bell. 1987. Manual of the vascular flora of the Carolinas. Univ. N.C. Press, Chapel Hill, N.C.
Ranney, T.G., T.A. Eaker, P.R. Fantz, and C.R. Parks. 2003. ×*Schimlinia floribunda* (Theaceae): A new intergeneric hybrid between *Franklinia alatamaha* and *Schima argentea*. HortScience 38:1198–1200.
Yang, S.-X., J.-B. Yang, L.-G. Lei, D.-Z. Li, H. Yoshino, and T. Ikeda. 2004. Reassessing the relationships between *Gordonia* and *Polyspora* (Theaceae) based on the combined analyses of the molecular data from the nuclear, plastid, and mitochondrial genomes. Plant Syst. Evol. 248:45–55.