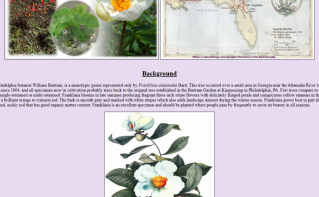
Mitotic Analysis of *Franklinia alatamaha* Root Tips

Heather Gladfelter Plant Cytogenetics (PBSG 8890) April 25, 2017



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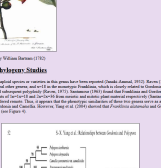
Introduction



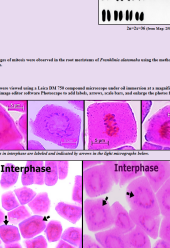
Background

Franklinia, named for Benjamin Franklin by the Philadelphia botanist William Bartram, is a monotypic genus represented only by *Franklinia alatamaha* Marsh. This tree occurred over a small area in Georgia near the Alatamaha River (see map in upper right showing the travels of William Bartram). It has not been found in the wild since 1804, and all specimens now in cultivation probably trace back to the original tree established at the Bartram Garden in Kingessing in Philadelphia, PA. Tree trees compare to the beauty of Franklinia. The tree grows up to 25' tall and has a single trunk with a pyramidal form. The leaves are dark green, 4-6" long, and have a leathery texture. Flowering occurs from late July through early September with the peak of flowering occurring in late August. The flowers are 3" in diameter, have a long period, often into the fall when the foliage becomes a brilliant orange to crimson red. The bark is smooth gray and marked with white stripes which also adds landscape interest during the winter season. Franklinia grows best in part shade - morning sun and shade from the hot afternoon sun is ideal - and evenly moist, well-drained, acidic soil that has good organic matter content. Franklinia is an excellent specimen and should be planted where people pass by frequently to serve its beauty in all seasons.

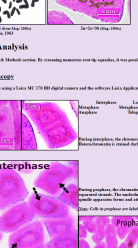
Franklinia alatamaha by William Bartram (1782)

Cytology and Phylogeny Studies

Cytological work in the family Theaceae had established 2n=2x=30 as the normal diploid number of Camellia, some triploidal and hexaploid species or varieties in this genus have been reported (Sunda Ahmed, 1952). Raven (1975) documented that in Theaceae, n=22 on the related genus *Adinandra* and *Eurya*, with n=21 and n=23 in other genera of *Eurya*. In the genus *Stewartiana* n=15, n=17 in several other genus, and n=18 in the monotypic Franklinia, which is closely related to Gordonia and Stewartia with n=15, a number also found in the Asian Schima. It might be that n=7 is the original basic chromosome number for the family with increasing aneuploidy and subsequent polyploidy (Raven, 1975). Sustersonne (1963) found that Franklinia and Gordonia could be distinguished on distinct genera based on chromosome morphology, karyotype, and the presence of a satellite on the short arm of chromosome 1 in Gordonia but not in Franklinia. Cytological evidence supports the separation of Franklinia from Gordonia based on the variety of floral species and limited distribution of Franklinia and Gordonia, the possibility that both belong to the same genus is considered remote. Thus, it appears that the phylogenic similarities of these two genera serve as a mark to some basic chromosomes. Based upon cytological evidence, the taxonomic relationship between Gordonia and Franklinia is probably more distant than that between Gordonia and Camellia. Moreover, Tang et al. (2004) observed that *Franklinia alatamaha* and *Gordonia lasianthus* were very closely related when demonstrating the phylogenetic relationships between genus within the family of Theaceae using ITS, trnL-F, and rbcL sequences (see Figure 4).



Sustersonne (1963)


C
S-5, Yang et al. Relationships between Gordonia and Polyspora
Polyspora axillaris
Polyspora chrysandra
Gordonia yunnanensis var. parvifolia
Stapfiaparvifolia
Stewartia pteropetiola
Stewartia sinensis
Franklinia alatamaha
Gordonia lasianthus
Stewartia ovata
Stewartia pseudocamellia
Stewartia monadelpha
Stewartia rostrata
Stewartia grandiflora
Camellia
Camellia japonica
Camellia sinensis
Camellia oleifera
Camellia reticulata
Camellia cuspidata
Camellia sasanqua
Camellia fraternus
Camellia crapnelliana
Camellia yunnanensis
Camellia pitardii var. pitardii
Camellia pitardii var. cornuta
Camellia polyodonta
Camellia lenis
Camellia rosiflora
Camellia ptilophylla
Camellia lutchuensis
Camellia lutchuensis var. flavescens
Camellia lutchuensis var. lutea
Camellia lutchuensis var. rubescens
Camellia lutchuensis var. albescens
Camellia lutchuensis var. albescens
Camellia lutchuensis var. alb