Corylus fargesii: A New and Promising Introduction From China©

Anthony S. Aiello and Shelley Dillard
Morris Arboretum, University of Pennsylvania, 9414 Meadowbrook Ave. Philadelphia, Pennsylvania Pennsylvania 19118 U.S.A.
Email: aiello@upenn.edu

INTRODUCTION

As an ornamental group of plants, hazelnuts (*Corylus*) are grown for their showy spring catkins, ornamental habits, red-colored foliage, and as stress-tolerant street and boulevard trees (*C. americana*, *C. avellana* 'Contorta' and 'Fuscorubra', and *C. colurna*, respectively) (Dirr, 1998; Flint, 1997). Most of these are familiar landscape plants but less familiar is *C. fargesii*, a fast-growing and highly ornamental tree introduced in the mid-1990s from China into several North American arboreta.

Although it was virtually unknown in North America prior to 1996, *C. fargesii* is now well-established in several American arboreta as a result of seed collected by the North American China Plant Exploration Consortium's (NACPEC) 1996 expedition to Shaanxi and Gansu provinces, in the People's Republic of China. The trees have highly attractive bark patterning, exfoliating to reveal patches of copper and russet, and this ornamental characteristic rivals the most attractive birches. In 2005 additional seed was collected on NACPEC's expedition to Gansu province (Aiello, 2006).

Research is ongoing to discover reliable techniques for vegetative propagation to enable this desirable tree to be distributed more widely. This paper provides background information on this horticulturally promising tree and presents the results of seed, cutting, and grafting propagation.

BACKGROUND

Corylus fargesii was first described in China by Western botanists in the late 1800s and early 1900s (Wilson, 1913). Although herbarium specimens were collected during this "golden age" of plant exploration, there is no evidence that living specimens were grown in older arboreta and botanic gardens from these early collections.

Until the introduction of seed of *C. fargesii* into the U.S.A. in 1996, little was known or written about this species. *Corylus fargesii* was collected on the 1996 NACPEC expedition (QLG-231) and the collectors described it as a truly beautiful tree with exquisite copper and tan exfoliating bark. The parent trees had reached 12–15 m tall with DBH of 15–25 cm and were found growing approximately 2 m above a stream in open woodland.

Trees from the 1996 collection are doing particularly well at the Morris Arboretum, where we have 10 plants (MOAR# 96-574) from this accession, all of which show a remarkable similarity in growth habit and size (Fig. 1). These trees have grown quickly, reaching 25 ft (≈8 m) after 10 years, with strong central leaders and very regularly broadly ovate habits (Figs. 1, 2); the trees exhibit some variation in the level of exfoliation and color of the bark, which ranges from a deep copper to a pale cream color (Figs. 3 and 4). The leaves of *C. fargesii* have clean summer foliage with no insect or disease problems (Fig. 5), turning a good yellow in autumn. Our

plants are growing in several locations, with slight differences in soil pH and all with evenly moist, well-drained soils.

In addition to the Morris Arboretum's plants, *C. fargesii* from the 1996 collection is also growing successfully at the following locations:

- The Arnold Arboretum of Harvard University (#3-98, 112-98), Jamaica Plain, Massachusetts.
- The Holden Arboretum (#97-298), Kirtland, Ohio.
- Longwood Gardens (#1999-0001), Kennett Square, Pennsylvania.
- The Morton Arboretum (#29-98, 258-98), Lisle, Illinois.
- The Scott Arboretum of Swarthmore College (#98-135), Swarthmore, Pennsylvania.
- U.S. National Arboretum (NA 67862), Washington, D.C.
- U.S. National Germplasm Repository — Corvallis (PI 637902 through 637907), Corvallis, Oregon.
- Willowwood Arboretum (#981045-A), Gladstone, New Jersey.

Based on the locations at which *C. fargesii* is growing, this species appears to be able to cope with high summer temperatures and humidity as well as cold winters. Although the complete range of its adaptability remains untested, the diversity of conditions under which it is growing successfully indicates broad adaptability from the central Midwest to New England and south to the Mid-Atlantic States. Based on these observations, the species appears to be fully hardy in USDA hardiness Zones 5A through 7B.

Additional seed of *C. fargesii* was collected on the 2005 NACPEC expedition to southern Gansu province (NACPEC05-047; Fig. 6). The parent plants were growing in a mesic mixed deciduous forest and were located a few meters above a stream (Aiello, 2006). Many *C. fargesii* were seen throughout the area and all of the plants had been coppiced but had re-sprouted vigorously. The collectors were impressed with the highly attractive exfoliating bark of these plants. As of the time of this paper, seed of this collection had germinated successfully, with plants growing on in the production facility at the Morris Arboretum, and several plants distributed to other arboreta in the northeast United States.

An additional introduction of *C. fargesii* was through the Quarryhill Botanic Garden, Glen Ellen, California, (QBG 1992.360) where two plants are growing currently.

PROPAGATION RESULTS

Seed. We have successfully germinated seed of *Corylus fargesii* on three occasions. Our germination protocols were as follows:

- 1996 and 1997 (QLG 231).
  - Three months cold stratification in moist perlite
  - Seed treated with Triathlon™ and captan (1996), no fungicide (1997).
  - High germination rate (≈60 seedlings germinated), although the exact germination percentage is unknown.
- 2005 (NACPEC05-047).
  - Three months cold stratification in moist perlite and peat (60 : 40, v/v)
  - Germination 60% (12/20 seeds)

Cutting. Cutting propagation of *Corylus* species is generally found to be very difficult with low rooting percentages. Two factors limit cutting propagation of filberts: poor root initiation or abscission of the vegetative buds on well-rooted cuttings (Proebsting and Reihs, 1991).

Despite many attempts at rooting stem cuttings of *C. fargesii*, we have had no success with this method of propagation. Although we have not done replicated trials, we have varied several factors in cutting propagation, with no success. From 2002 through 2006, cuttings were taken in June, July, or August. We used a range of formulations and concentrations of rooting hormone, including KIBA, IBA, and NAA. And, we took cuttings from several different individual plants at the Morris Arboretum. At best, we have seen some root callus and root initiation but these cuttings did not overwinter successfully.

In communication with other I.P.P.S. members (Kris Bachtell and Charles Tubesing, pers. commun.), they also report no success with cutting propagation of *C. fargesii*.

Grafting. In comparison to vegetative cutting propagation, there are several reports that winter grafting provides the best opportunity for vegetative propagation of *C. fargesii*. Two reports on successful grafting are as follows:

Mark Krautmann, Heritage Seedlings, Inc., Salem, Oregon (pers. commun.).

- Successfully grafted *C. fargesii* by the "hot callus" method (Lagerstedt 1981a, Lagerstedt 1981b).
- Plants were grafted in winter by cutting off the top of the understock entirely and using a wedge or whip and tongue graft.
- Bare root *C. colurna* rootstock was placed in moist sawdust, and the graft union was placed inside a slotted section of pipe with a warm water line inside. The scion tops were exposed to the cold air, the roots were in cold sawdust, while the scion was warmed to 75 °F (24 °C)
- Healing took place with generous callus formation in 3 weeks, with ≈90% success rate.
- Plants were potted and held in a warm greenhouse for several months and then carefully planted out in May with drip irrigation.

Brian Upchurch, Highland Creek Nursery, Fletcher, North Carolina (pers. commun.).

- Rootstock (*C. colurna*) was established for one growing season in Anderson square containers (3-5/8 inches × 3-5/8 inches × 6 inches) prior to grafting. Plants were brought into the propagation house in early December 2006. The propagation house reached as low as 36–38 °F (2–3 °C) at night, depending on outside temperatures. The exhaust thermostat was set at 65 °F (18 °C). The rootstock was not watered prior to grafting in January 2007.
- Dormant scions (Morris Arb.# 96-574*A, G, J) were grafted in late February 2007, using a modified veneer graft (side wedge graft) (Upchurch, 2006).
- As their buds swelled, the plants were irrigated thoroughly and fertilized at 1/2-rate with control released 5–6 month 18–6–8 fertilizer.
- Plants remained in the propagation house until the threat of frost had passed.
- Success rate ≈55%.

Joseph Postman (U.S. National Germplasm Repository — Corvallis, Oregon) and Thomas Molnar (Department of Plant Biology & Pathology, Rutgers University, New Jersey) describe successfully grafting *C. fargesii* onto *C. avellana* (pers. commun.). But, compared to using *C. colurna* understock they report problems with suckering of the *C. avellana* understock.

CONCLUSION

Corylus fargesii has been propagated successfully by seed and grafting propagation, but with no success with cuttings. Seed production of *C. fargesii* should be an excellent means of producing trees due to their uniformity of habit and bark. Trees from the 1996 collection of *C. fargesii* are planted in three locations at the Morris Arboretum. Over the past several years these trees have begun to flower and in September 2007 we collected the first seed from one of our plants (96-574*H) indicating that our trees are reaching sexual maturity. Trees from the 2005 collection will be planted adjacent to the existing trees with the goal of increasing the possibility of seed production.

The level of resistance of *C. fargesii* to eastern filbert blight (EFB) has not been fully tested. Observations at the Morris Arboretum and at Rutgers University indicate that trees appear to be able to outgrow or compartmentalize EFB infection but further research is needed to clarify their level of disease resistance. Scions of *C. fargesii* will graft onto both *C. colurna* and *C. avellana*. It is not clear if *C. colurna* understock influences the disease resistance of *C. fargesii* scions. Also, the heavy suckering of *C. avellana* makes this species a less than ideal understock.

Corylus fargesii promises to be an excellent addition to landscapes of the central and eastern United States. Its highly ornamental exfoliating bark and rapid growth rate indicate great potential as an ornamental tree for a range of situations. The species' successful establishment at arboreta across the northern United States has shown this species to be adaptable to a range of environmental conditions. Further testing across an even wider range of locations is warranted based on its performance to date.

As *C. fargesii* becomes more widely evaluated, and as propagation techniques become refined and production is increased, this promising tree species should gain wider acceptance.

Acknowledgements. The author would like to thank Kris Bachtell, Charles Tubesing, Brian Upchurch, Mark Krautmann, Thomas Molnar, and Joseph Postman for their comments and input.

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Figure 1. Trees of *Corylus fargesii* at the Morris Arboretum grown from seed collected in China in October 1996 (MOAR# 96-574). Photograph taken, September 2007.

Figure 2. *Corylus fargesii* at the Morris Arboretum grown from seed collected in China in October 1996 (MOAR# 96-574). Photograph taken, October 2003.

Figure 3. Close-up of bark of *Corylus fargesii* (MOAR# 96-574).

Figure 4. Close-up of bark of *Corylus fargesii* (MOAR# 96-574).

Figure 5. Close-up of leaves of *Corylus fargesii* (MOAR# 96-574).

Figure 6. Collecting location of *Corylus fargesii* (NACPEC05-047) in southern Gansu province, China, September 2005. Photo courtesy of Kris Bachtell.