Betula costata ‘CinnDak’ (Cinnamon Curls® Dwarf Korean Birch): A New Dwarf Compact Landscape Tree

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‘CinnDak’ is a new cultivar of *Betula costata* Trautv. (common names include Korean or costata birch). ‘CinnDak’ has a compact dwarf habit with a well-branched crown and ornamental exfoliating colored bark. ‘CinnDak’ is ≈2.7 m with a crown width of 2.4 to 2.7 m after 30 years where seasonal growth over the last 5 years averaged 18.0 cm. Based on species adaptation, ‘CinnDak’ should be well adapted to USDA cold-hardiness zones 3a–7 and a wide range of soil types. This compact selection is suitable as a small tree specimen in the landscape, with multiseason interest, as a result of high-quality summer foliage, reliable golden fall color, and high-quality ornamental exfoliating bark.

Betula costata is a deciduous woody tree in the family Betulaceae, within the subgenus *Neurobetula* (costate birches). *B. costata* was first described in 1859 by Carl Johann Maximovich (Russian botanist) in *Prim. Fl. Amur* 253. Other members of costate birches include *Betula calcicola*, *Betula chichibue-nis*, *Betula potaninii*, and *Betula nigra* (river birch). It is native to China (Hebei, Heilongjiang, Jilin, Liaoning, and Inner Mongolia); Korea, Democratic People’s Republic of; Korea, Republic of; Russian Federation (Amur, Primoryi, West Siberia) (Shaw et al., 2014). Shaw et al. (2014) reported that this species is seldom cultivated. The Korean species grown in European nurseries is mainly Erman’s birch (*B. ermanii* Cham.) and in Europe, *B. costata* is often listed incorrectly as a syn. of *B. ermanii* (The Plant List, 2013). There are no known cultivars of Korean birch other than ‘CinnDak’ (Cinnamon Curls®). The species is diploid ($2n = 2x = 28$) (Meier-Dinkel, 1992).

The outer bark exfoliates on the main trunk and structural branches (appearing in year 5 of growth), which curls in longitudinal strips to reveal the cinnamon-colored curling undersides, giving this selection more ornamental appeal, as well as multiseasonal interest

during the active growing and dormant seasons. Leaves are alternately arranged, simple, pubescent petiole with serrated margins. Summer foliage is a high-quality medium green with golden yellow fall color. ‘CinnDak’ is monoecious, with flowers consisting of catkins with small nutlets as fruiting structures, with wind-dispersed seed. Male catkins are typically found in single pairs terminally and up to 20 mm long, with female catkins ≈15 to 20 mm. Flowers are not considered of ornamental value. ‘CinnDak’ fruit ripens in late summer to early fall, unlike its close relative the river birch that ripens in late spring (Dirr, 2009).

Origin

‘CinnDak’ (dwarf Korean birch) was selected from a population of seedlings grown at the North Dakota State University Horticulture Research Farm (Absaroka, ND; lat. 46.9859° N, long. 97.3549° W) from open-pollinated seed collected in 1985 from Longwood Gardens (U.S. National Arboretum Accession no. NA39939; Kennett Square, PA). This source of *B. costata* has been evaluated since 1985 as NDSU trial selection TS85126. There were 34 seedlings in the original NDSU evaluation planting, which were propagated from NA39939, with one seedling being identified as uniquely different with a dwarf habit characteristic in 1987. The U.S. National Arboretum Accession no. NA39939 was originally collected as seed (collection no. K-269) by a E.G. Corbett and R.W. Lighty (agricultural explorers; Crops Research Division; USDA, Beltsville, MD) on an expedition to the Republic of Korea (South Korea) by Longwood Gardens along a trail on Mt. Deogyusan (elevation: 1614 m) in 1966 (USDA, 1969). The original tree in South Korea was described as a deciduous small-medium tree, with white exfoliating bark (USDA, 1969). The description of accession no. NA39939 indicates that it is a deciduous tree reaching a height of 30 m, branchlets are finely villous when young, glabrous when older, brown, bark is grayish brown, peeling in papery flakes, and leaves are ovate to oblong-ovate, 5 to 8.0 cm long, 2.5 to 4.0 cm wide, long acuminate, veins

prominent, in 10 to 16 pairs, petiole pubescent (Kevin Conrad, Woody Landscape Plant Germplasm Repository, U.S. National Arboretum, Beltsville, MD, personal communication). ‘CinnDak’ was selected in soils that are classified as an Antler–Wyand loam with a pH of 7.8. The color of various plant parts was determined under natural light using the Royal Horticultural Society (RHS) Color Chart (Royal Horticultural Society, 1986).

Description. ‘CinnDak’ is a unique seedling selection of Korean birch (*B. costata*) that has a dwarfed, compact form and habit as compared with the species (Fig. 1). The height of ‘CinnDak’ at 30 years of age is ≈2.7 m with a crown width of 2.4 to 2.7 m. Mature growth parameters typically listed for the species are 19.8 to 27.4 m in height with a 7.6 to 12.2 m spread, mature height is listed as 30 m in *Hortus Third* (Liberty Hyde Bailey Hortorium, 1976). ‘CinnDak’ has a trunk diameter of 10.8 cm at 30.5 cm from the root flare. It is also winter hardy in USDA cold-hardiness zone 3a, and has survived recorded temperatures of –34.5 °C. Foliage is a high-quality lustrous medium green (RHS green group 137A above and 137C beneath) during the summer months and has exhibited no symptoms of chlorosis growing on a soil pH in excess of 8.0 (Fig. 2). Leaves are ovate to oblong-ovate, 3.5 to 5.5 cm long, 2.0 to 3.5 cm wide, veins are prominent, and petioles pubescent. Fall foliage coloration is a golden yellow (RHS yellow-orange group 15A), typically turning color in early October in a USDA hardiness zone 3b.

The outstanding feature of ‘CinnDak’ is its exterior creamy white (RHS greyed-white group 156C) exfoliating bark on the main trunk and structural branches (appearing in year 5 of growth), which curls in longitudinal strips to reveal the cinnamon-colored (RHS greyed-orange group mixed 165B, 166B, and 166C) curling underside (Fig. 3). This feature is evident at all times of the year, but is especially noticeable and pleasing during the dormant (winter) months when the entire branching structure of the plant is viewable (Fig. 4).

The compact appearance of the rounded crown of the original selection of ‘CinnDak’ is a result of the short annual terminal growth, which produces multiple closely spaced buds. Total stem growth over the last 5 years averaged 18.0 cm with 2.85 cm average current annual seasonal growth, 2.85 cm average 2nd year annual seasonal growth and 3.80 cm average 3rd year annual seasonal growth, which suggests that ‘CinnDak’ is slow growing at maturity. The bark on the current annual seasonal growth is a cinnamon color (RHS greyed-orange group 165A), heavy with lenticels, quickly changing the color to a grey (RHS grey group 201A) in the 2nd year annual seasonal growth. The dwarf habit was confirmed through grafting trials and progeny seedling propagation. Propagation trials were successful with side grafts onto potted

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Fig. 1. Mature height comparison between (A) *Betula costata* Trautv. and (B) NDSU selection 'CinnDak' (Cinnamon Curls® dwarf Korean birch). Both (A) and (B) originated from seedlings from the same NDSU planting accession and are the same age and from the seed lot (1985; TS85126). This NDSU accession is from seed collected from Longwood Gardens (Kennett Square, PA) (accession no. NA39939).

paper birch (*Betula papyrifera*) rootstocks maintaining the dwarfed growth trait. Seed was also collected from 'CinnDak' and germinated to test for dwarf habit. The resulting seedlings varied greatly with overall height and compact growth. Dwarf plants were present with half the growth rate of standard seedlings, which had similar growth rates as seedlings produced from seeds collected from the standard size *B. costata* of the same accession number (TS85126) collected from the same location as 'CinnDak'.

Comparable commercial cultivars are found within related species of river birch (*B. nigra*). The two compact dwarf river birch cultivars are Little King (Fox Valley®) and Studetec (Tecumseh Compact™) and are not reliably hardy as tested by NDSU in USDA cold-hardiness zones 3a to 4a. Both of these cultivars also suffer from leaf chlorosis on high-pH soils and branch dieback as a result of marginal hardiness in USDA cold-hardiness zones 3a to 4a as tested by NDSU (unpublished). 'CinnDak' adapts well to these harsher growing conditions and should also perform well into zones 5 and 6 based on growth observations of *B. costata* growing at Longwood Gardens and the Morton Arboretum (Lisle, IL).

Culture. 'CinnDak' has performed well in an Antler-Wyard loam soil with a pH of 7.8. The compact growth habit of 'CinnDak' resulted in no structural pruning being necessary for proper crown development.

Resistance to pests and stress. *Betula costata* has shown to be relatively pest resistant. *Betula costata* is resistant to birch leaf-miner [*Fenusa pusilla* (Lepelletier)] maintaining high-quality foliage during the growing season

(Fiori and Craig, 1987). Bronze birch borer has unaffected 'CinnDak' in the 30 years of evaluation at the NDSU Dale E. Herman Research Arboretum. Bronze birch borer is well established at the NDSU Dale E. Herman Research Arboretum and has negatively affected many other birch species.

'CinnDak' has also performed well during periodic drought events. In July 2012, the NDSU Dale E. Herman Research Arboretum was classified to be in extreme drought based on the Palmer Z Index number (−2.75 and below) (NOAA, 2012). During this extended drought period in 2012, 'CinnDak' did not exhibit drought symptoms, no leaf margin burning or premature leaf senescence, which was typical of many of the *Betula* sp. at the NDSU Dale E. Herman Research Arboretum.

Outstanding characteristics and use. Recommended use of 'CinnDak' is in limited space landscapes, such as commercial businesses and residential entryways, patios, and small outdoor living space areas where an attractive focal point plant is desired. 'CinnDak' has multiseason interest as a result of high-quality summer foliage, reliable golden fall color, and high-quality ornamental exfoliating bark.

Propagation. 'CinnDak' can be propagated by vegetative cuttings, micropropagation, or grafting. For vegetative cutting propagation, softwood shoots can be rooted (60% to 80% success rate) when taken in late June to early July and treated with a quick-dip 1000 ppm IBA-solution. 'CinnDak' has successfully been propagated using tissue culture by a commercial nursery for rooted liner production. Microshoot propagation

Fig. 2. 'CinnDak' (Cinnamon Curls® dwarf Korean birch) (A) summer profile with high-quality medium green foliage and (B) golden-yellow fall color.

Fig. 3. Exfoliating bark on 'CinnDak' (Cinnamon Curls® dwarf Korean birch) main trunk and structural branches displaying creamy outer with cinnamon inner bark.

Fig. 4. Dormant (winter) form and canopy structure of 'CinnDak' (Cinnamon Curls® dwarf Korean birch).

number is four from one every 6 weeks with microshoot growth rates of 6 cm per 6-week subculture period. 'CinnDak' can be bud grafted onto *B. costata* rootstock or other compatible rootstocks such as *B. papyrifera*. *Betula costata* seed is available through commercial seed production companies to be used for rootstock production.

Availability

'CinnDak' is sold under the trademark Cinnamon Curls® (U.S. Trademark Reg. No. 4,668,972, registered 6 Jan. 2015) and is available for nonexclusive licensing. For more information, contact Dale Zetocha, Executive Director, NDSU Research Foundation, 1735 NDSU Research Park Drive, Suite 124, Department 4400, P.O. Box 6050, Fargo, ND 58108-6050; phone: (701) 231-8931; E-mail: dzetocha@ndsrf.

org. The cultivar was released in 2014. Plant material for vegetative propagation may be obtained from the NDSU Department of Plant Sciences Woody Plant Improvement Program, or designated nursery, subject to availability. There is a horticultural royalty of \$1.00 per plant through the NDSU Research Foundation.

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