Ulmus davidiana var. *japonica* 'Burgundy Glow' (Northern Empress® Japanese Elm): A New Fall Color Tree

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Additional index words. Ulmaceae, Dutch elm disease, ornamental landscape tree, cold hardiness

'Burgundy Glow' is a new cultivar of *Ulmus davidiana* Planch. var. *japonica* (Sarg. ex Rehd.) Nakai (common name is Japanese elm). 'Burgundy Glow' is a winter hardy, small- to medium-sized elm with a rounded crown, open branching, and attractive summer and fall foliage. Fall foliage of 'Burgundy Glow' changes from green to apricot-orange to burgundy-red before leaf senescence. 'Burgundy Glow' is ≈8.5 m tall with a crown width of 7.0 to 7.5 m after 35 years, and is a smaller statured tree compared with the species and botanical variety. It is well adapted to USDA cold hardiness zones 3b to 7, and performs well on a wide range of soil types. The smaller rounded crown and habit of 'Burgundy Glow' make it an outstanding ornamental tree for the urban landscape. This is especially relevant where available space or overhead power lines are a concern, and where hardiness of other elm cultivars may be problematic.

Ulmus davidiana var. *japonica* is a deciduous tree in the family Ulmaceae and is often listed synonymously with *Ulmus japonica* (Rehder) Sarg. [USDA (NGRP), 2016]. It is commonly referred to as Japanese elm. It is native to China (Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jilin, Liaoning, Ningxia, E-Qinghai, Shaanxi, Shandong, Shanxi, Zhejiang, and Inner Mongolia); Japan (Hokkaido, Honshu, Shikoku, Kyushu); Democratic People's Republic of Korea, Republic of Korea, Mongolia; and the Russian Federation (Eastern and Central Siberia, Sakhalin) (Hassler, 2016). Dirr (2009) listed Japanese elm as USDA cold hardiness zone 5 to 7, but has been found to be cold hardy to USDA cold hardiness zone 3b as tested by North Dakota State University (NDSU, unpublished data). Ware (1995) reported that some seedlings within the species produce a subdued wine-colored foliage in autumn, which is rare in elms. To date, there is only one elm cultivar that produces a burgundy fall color, *Ulmus* × 'Frontier'. 'Frontier' elm (NA55393) is a hybrid cultivar resulting from crossing *Ulmus minor* (female

parent, smoothleaf elm) with *Ulmus parvifolia* (male parent, lacebark elm) from the U.S. National Arboretum elm breeding program [USDA (NAPIP), 2016]. 'Frontier' has good resistance to Dutch elm disease (DED), moderate resistance to elm leaf beetle (*Xanthogaleruca luteola* Müller), and a high level of tolerance to elm yellows (phytoplasmas) [USDA (NAPIP), 2016]. 'Frontier' elm has been evaluated by NDSU and has been found to lack winterhardiness in USDA cold hardiness zone 4b resulting in complete tree failure (NDSU, unpublished data). A second elm, *U. parvifolia* 'Emer II' PP 7552 (Allee® Chinese elm), can produce a yellow-red fall color in a good year, but is not reliable as it typically produces a yellow fall color (Dirr, 2009). *Ulmus parvifolia* has also been evaluated by NDSU and been found to lack winterhardiness in USDA cold hardiness zone 4b (NDSU, unpublished data).

Origin

'Burgundy Glow' was selected from a population of seedlings grown at the NDSU Dale E. Herman Research Arboretum (Absaraka, ND; lat. 46.9859, long. -97.3549) from open-pollinated seed collected in 1978 from Heilongjiang Forest Botanical Garden (Forestry Department of Heilongjiang Province, Ha Ping Road, Dongli District, Harbin, Heilongjiang 150040, China; lat. 45.7611, long. 126.6500). This source of *U. davidiana* var. *japonica* has been evaluated since 1980 as an NDSU trial selection TS80262. There were three seedlings in the original NDSU evaluation planting that were propagated from this elm seed source, with one seedling being identified as uniquely different with superior structural branching, foliage quality, and color.

The color of various plant parts was determined under natural light using the reprint of the Royal Horticulture Society (RHS) color chart (Royal Horticulture Society, 1986).

Description

'Burgundy Glow' has a more compact form and habit with a full rounded crown, as compared with the species and botanical variety (Fig. 1). Japanese elm typically has

a spreading vase-shaped habit similar to American elm (*Ulmus americana*). The height of 'Burgundy Glow' at 35 years of age is ≈8.5 m, with a crown width of 7.3 m. Mature growth parameters typically listed for the species are 10.7 to 16.8 m in height with a 7.6 to 10.7 m spread, mature height can reach 30.5 m (Dirr, 2009). 'Burgundy Glow', like the species and botanical variety, supports a dense canopy, casting medium to heavy shade. It is winter hardy in USDA cold hardiness zone 3b, and has survived recorded temperatures of -34.5 °C. Leaves are simple, and they emerge with a slight reddish (RHS red group 46B) tint, then fade to a medium to dark green (RHS green group 137A/B above and 147C beneath) during the summer months. The foliage has exhibited no chlorosis growing on soil pH in excess of 8.0 (Fig. 2). Leaves are obovate to elliptical, 7.6 to 8.9 cm long, 4.4 to 5.1 cm wide, margins are doubly serrate, with an oblique base. Leaf veins are prominent, with 12–16 vein pairs present. The adaxial surface of the leaf is scabrous with a pubescent abaxial surface. The petiole is 0.6 cm long and densely pubescent. Bud arrangement is alternate, with a brown (RHS grayed-orange group 165c) bud, averaging 0.6 cm in length. Fall foliage coloration ranges from apricot-orange (RHS yellow-orange group 23B to grayed-orange

Fig. 1. *Ulmus davidiana* var. *japonica* 'Burgundy Glow' (NDSU Sel. 80262, Northern Empress® Japanese elm) exhibiting rounded habit with green summer foliage.

Fig. 2. *Ulmus davidiana* var. *japonica* 'Burgundy Glow' (NDSU Sel. 80262, Northern Empress® Japanese elm) close-up quality green summer foliage with minimal damage from black leaf spot of elm and resistance to elm leaf beetles.

Received for publication 7 July 2016. Accepted for publication 5 Aug. 2016.

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Fig. 3. *Ulmus davidiana* var. *japonica* 'Burgundy Glow' (NDSU Sel. 80262, Northern Empress® Japanese elm) close-up early apricot-orange fall foliage in late September to early October at the North Dakota State University Dale E. Herman Research Arboretum (Absaraka, ND).

Fig. 4. *Ulmus davidiana* var. *japonica* 'Burgundy Glow' (NDSU Sel. 80262, Northern Empress® Japanese elm) close-up later burgundy-red fall foliage in mid to late October before leaf drop at the North Dakota State University Dale E. Herman Research Arboretum (Absaraka, ND).

Fig. 5. *Ulmus davidiana* var. *japonica* 'Burgundy Glow' (NDSU Sel. 80262, Northern Empress® Japanese elm) rounded habit with late burgundy red fall foliage in mid to late October before leaf drop at the North Dakota State University Dale E. Herman Research Arboretum (Absaraka, ND).

group 168B) beginning in late September to early October (Fig. 3) with further color development to burgundy-red (RHS red group 46A/B) in mid to late October before

leaf drop (Fig. 4). This fall color is one of the key outstanding features of 'Burgundy Glow', which sets it apart from nearly all other elm species and cultivars that have yellow fall color. In addition, 'Burgundy Glow' is cold hardy to zone 3b, whereas the other elm cultivar with purple-red fall foliage, 'Frontier', is killed in USDA cold hardiness zone 3b. The bark begins smooth and becomes longitudinally fissured with orange undertones starting in the 3rd year of growth. The bark matures into a gray-brown color (RHS gray group 201B) with shallow longitudinal fissures, maintaining the orange undertone.

Resistance to Pest and Stress

Ulmus davidiana var. *japonica* is reported to be resistant to DED [USDA (NGRP), 2016; Ware, 1995]. 'Burgundy Glow' is minimally affected by black leaf spot of elm [*Stegophora ulmea* (Fr.) Syd. & Syd.] and is resistant to elm leaf beetles (Fig. 2). As a result, 'Burgundy Glow' has demonstrated high-quality foliage during the growing season, as compared with other elm species and cultivars in NDSU elm evaluations. Ware (1995) reports that *U. davidiana* is resistant to elm yellows (phytoplasmas).

Outstanding Characteristics and Use

The smaller rounded crown and habit of 'Burgundy Glow' make it an outstanding small- to medium-sized ornamental tree for the urban landscape (Fig. 5). Elms as a group are urban tolerant, wound tolerant, and do exceptionally well in restricted root spaces making 'Burgundy Glow' an excellent cultivar for urban use. This is especially relevant where available space or overhead power lines are a concern and where hardiness of other elm cultivars may be problematic.

Propagation and Culture

'Burgundy Glow' was selected in soils that are classified as Warsing sandy loam with a pH of 7.7. It is easily transplanted and adapts well to a variety of soils including dense clay soils (Fargo, ND, evaluations; lat. 46.8772°N, long. 96.7898°W). 'Burgundy Glow' is a fairly fast-growing tree like many elms. Softwood cuttings can be easily rooted under mist using 8000 ppm indole-3-butyric acid talc powder. 'Burgundy Glow' can also be propagated by micropropagation or grafting. 'Burgundy Glow' has successfully been propagated using tissue culture for liner production (West and Maren, 2015). Microshoot multiplication rates of 13.2 shoots in 6 weeks can be expected, with shoot sizes reaching 4.5 to 5.0 cm in length. 'Burgundy Glow' can be side grafted on *U. davidiana* var. *japonica* rootstock or other compatible rootstocks such as *Ulmus pumila* L. (siberian elm). Side-grafted 'Burgundy Glow' trees produced

by the NDSU Woody Plant Improvement Program were 2.85 cm diameter at breast height and were 3.65 m tall after 3 years of growth.

Very few seeds are present with few female flowers being observed on the original 'Burgundy Glow' tree, so invasiveness is not expected with this genotype. 'Burgundy Glow' will require modest structural pruning during commercial production and landscape development to maintain form and proper architecture.

Availability

'Burgundy Glow' is sold under the trademark Northern Empress® (U.S. Trademark Reg. No. 4,662,503, registered 30 Dec. 2014) and is available for nonexclusive licensing. For more information, contact Dale Zetocha, Executive Director, NDSU Research Foundation, 1735 NDSU Research Park Drive, Suite 124, Dept. 4400, P.O. Box 6050, Fargo, ND 58108-6050; Phone: (701) 231-8931; E-mail: dzetocha@ndsuf.org. The cultivar was released in 2014. Plant material for vegetative propagation can be obtained from NDSU Department of Plant Sciences, Woody Plant Improvement Program or designated nursery, subject to availability. There is a horticultural royalty of \$1.50 per plant through the NDSU Research Foundation upon licensing this plant for commercial production.

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