HortScience 60(3):455–456. 2025. https://doi.org/10.21273/HORTSCI18236-24

‘Donglin Zisheng’, a New *Chrysanthemum morifolium* Cultivar

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Keywords. chrysanthemum, cultivar, ornamental

Chrysanthemum morifolium, considered one of the four premier cut-flower varieties globally, presents robust resistance, vibrant flower color, low stature, and compact floral structure (Wen et al. 2022). The plant is versatile across various applications in landscaping, food processing, and pharmaceutical manufacturing (Gu et al. 2022; Lin and Harnly 2010). According to customs statistics from China, the country’s fresh-cut chrysanthemum exports reached an impressive $1.996 million in FY2023. In the first half of 2024, this figure surged to $592,000, underscoring the country’s strong demand and significant growth potential in international markets. Therefore, the active cultivation of new chrysanthemum varieties is directed not only to enhance market sales and yield substantial economic benefits for the associated industrial chain but also to serve as a crucial catalyst for advancing regional agricultural industry upgrades and stimulating economic development. This initiative has considerable economic value while holding profound implications for bolstering the international competitiveness of China’s floral sector, diversifying market supply, and addressing various consumer demands.

Northeastern China is characterized by prolonged frigid seasons, with temperatures frequently plummeting below zero during fall, accompanied by brisk winds, which present significant challenges to chrysanthemum cultivation. Low temperatures can lead to leaf chlorosis, branch damage, delayed flowering, and diminished flower quality in chrysanthemums, ultimately affecting their ornamental value (Knight and Knight 2012).

To address market demands, the development of new chrysanthemum varieties characterized by enhanced cold resistance and vibrant floral colors has emerged as a pivotal focus in scientific research and breeding efforts. In this context, the School of Landscape Architecture at Northeast Forestry University proudly introduces its significant achievement: *Chrysanthemum* Donglin Zisheng as a model cultivar. ‘Donglin Zisheng’ exhibits exceptional cold tolerance and maintains its stature amid vigorous fall winds. Its distinctive vibrant hues make it an excellent choice for autumnal floral products. The successful development of this cultivar has created new opportunities for the chrysanthemum industry in northeastern China and other frigid regions.

Origin

In Fall 2014, crosses were performed at the Northeast Forestry University nursery using A as the male parent and B as the female parent, resulting in the harvest of F1 generation hybrid seeds during the winter of the same year. The F1 generation seeds were initially sown in a greenhouse at Northeast Forestry University and subsequently transplanted to field conditions in the same nursery in May 2015. Strain 14-Z-01 presented dense inflorescences, vibrant coloration, and extended flowering periods. From 2015 to 2020, strain 14-Z-01 plants exhibited stable trait performance through cutting propagation and homozygous population assessments. In 2022, the plant received official recognition as *C.* ‘Donglin Zisheng’ (CNA20201003018) after successfully passing specificity identification and stability tests conducted by the Ministry of Agriculture and Rural Development of China.

Description

As shown in Fig. 1, the new variety *C.* ‘Donglin Zisheng’ features a solitary capitulum with densely arranged ligulate flowers that exhibit a deep red hue (NCS S 3060-R20B). The back of the petal is pink (NCS S 3040-R10B). *C.* ‘Donglin Zisheng’ height was 38.8 cm, which is significantly greater than that of *C.* ‘Zhandi Huanghua’ and *C.* ‘Zi Qiushang’. The number of branches was 23.1, representing a 1.3-fold increase compared with that of *C.* ‘Zi Qiushang’. The crown width was 66.58 cm, indicating a 1.45-fold increase over that of *C.* ‘Zhandi Huanghua.’ Additionally, leaf length averaged 5.57 cm, significantly exceeding that of *C.* ‘Zhandi Huanghua’ and *C.* ‘Zi Qiushang’, whereas leaf width did not exhibit significant differences. The average number of flowers per plant reached 235.8, representing an increase of 1.47 and 1.31 times compared with those of *C.* ‘Zhandi Huanghua’ and *C.* ‘Zi Qiushang’, respectively. Additionally, the diameter of individual flowers measured 5.17 cm, which is significantly larger than that observed in *C.* ‘Zhandi Huanghua’ and *C.* ‘Zi Qiushang’. The flowering period of *C.* ‘Donglin Zisheng’ is ∼2 months, ranging from the end of August to the end of October. The duration of flowering exceeds that of its parent (Table 1).

Cultivation Techniques

C. ‘Donglin Zisheng’ can be obtained by tillering and cutting propagation in both early spring and late autumn. It can be both potted and planted in the field. It prefers loose, well-drained, fertile, sandy soil. *C.* ‘Donglin Zisheng’ exhibits optimal growth in well-lit environments and should be planted with a spacing of 40 × 40 cm. Weeding practices should be adapted according to the specific conditions observed post-planting.

Habit and Application

In summary, *C.* ‘Donglin Zisheng’ is a low-growing species characterized by its dense and vibrant floral display, which can persist for up

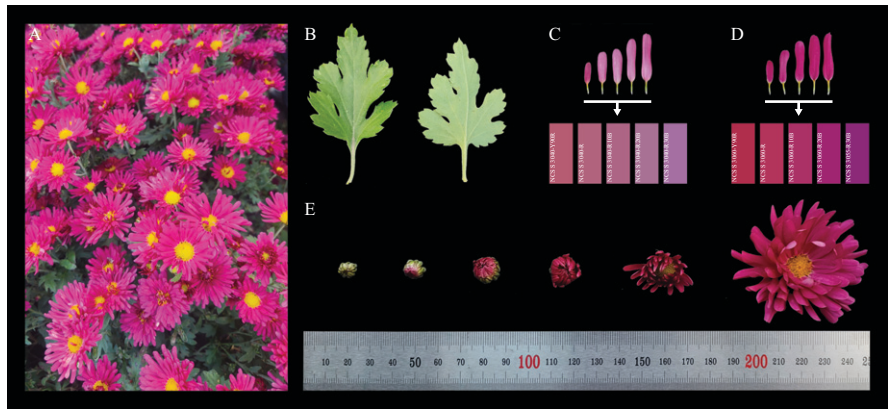

Fig. 1. Morphological characteristics of *Chrysanthemum* ‘Donglin Zisheng’. (**A**) Whole plant of *C.* ‘Donglin Zisheng’. (**B**) Leaf adaxial and abaxial surfaces. (**C**) The back of the petal. (**D**) Front petal. (**E**) Flower morphology in different stages.

Received for publication 24 Sep 2024. Accepted for publication 16 Oct 2024.
Published online 26 Feb 2025.
S.C. and L.Y. contributed equally to this work.
This work was supported by grants from the Natural Science Foundation of Heilongjiang Province (No. LH2021C018) and the National Key Research and Development Program of China (No. 2019YFD1001504).
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Table 1. Comparison of morphological characteristics of *Chrysanthemum* 'Donglin Zisheng' and its parents *C.* 'Zhandi Huanghua' and *C.* 'Zi Qiushang'.

Characteristics	*C.* 'Donglin Zisheng'	*C.* 'Zhandi Huanghua'	*C.* 'Zi Qiushang'
Plant ht (cm)	38.80 ± 1.81 a	22.76 ± 1.12 c	27.78 ± 0.87 b
Branch no.	23.10 ± 3.87 a	17.60 ± 3.98 b	17.10 ± 1.52 b
Crown breadth (cm)	66.58 ± 4.86 a	45.64 ± 3.20 c	49.47 ± 1.16 b
Leaf length (cm)	5.57 ± 0.18 a	4.96 ± 0.25 c	5.26 ± 0.28 b
Leaf width (cm)	3.81 ± 0.18 a	3.66 ± 0.18 a	3.64 ± 0.22 a
Flowers per plant	235.80 ± 16.20 a	160.30 ± 10.48 c	179 ± 10.02 b
Corolla diameter (cm)	5.17 ± 0.32 a	4.35 ± 0.17 c	4.79 ± 0.19 b
Flower period	26 Aug–30 Oct	8 Sep–6 Oct	28 Aug–9 Oct

All data are expressed as the mean of 10 biological replicates ± standard deviation. Statistical analyses were performed using SPSS 20.0 software to determine significance levels. Statistical significance was assessed using an independent samples *t* test. Different lowercase letters marked after each row of data indicate significant differences at the 0.05 level.

to 64 d. Furthermore, this cultivar exhibits remarkable hardiness, an extended green period, and ease of cultivation, making it suitable for use as a cut flower and indoor ornamental potted plant. Its potential applications are particularly significant in cold regions, such as Northeast China.

Availability

Requests for *C.* 'Donglin Zisheng' plant materials can be addressed to Professor Miao He (E-mail: hemiao@nefu.edu.cn) at the College of Landscape Architecture, Northeast Forestry University, Harbin, China.

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