

## Research Report

# Development of a Small Sized *Cymbidium* Variety 'Snow Bell' with Light Pink Colored Flower and Frangrance

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**Abstract:** A *Cymbidium* variety 'Snow Bell' (*C. kanran* × *C. Jack Frost*) was developed at the National Institute of Horticultural & Herbal Science, Rural Development Administration in 2011. A cross between *C. kanran* with small-sized greenish colored flowers and *C. Jack Frost* with bright pink colored flowers, was conducted in 1999. Based on flower color, leaf shape, flower stalk, and vigor one line was selected. Evaluation and selection trials were conducted from 2006 to 2010. 'Snow Bell' has a light pink sepal (RHS, R56D), red lip (R56A) and a leaf length of 47.5 cm. The average number of flowers on each peduncle is 13.8 and the flower diameter is 6.2 cm. The characteristics of petals and sepals show some incurve and some spreading. 'Snow Bell' has a vigorous growth and a round flower. It has an adequate peduncle height of 50.7 cm compared with leaf length of 47.5 cm, and start blooming in December. In electronic nose analysis, the degree of fragrance between 'Snow Bell' and the *C. kanran* was similar and both of them showed strong scents, although they had different fragrance patterns.

**Additional key words:** breeding, crossing, hybridization, orchid flower

## Introduction

*Cymbidium*, or boat orchid, is a genus of 52 evergreen species in the orchid family Orchidaceae. This genus is distributed in tropical and subtropical Asia (such as Northern India, China, Japan, Malaysia, Philippines, and Borneo) and Northern Australia. The larger flowered species from which the large flowered hybrids are derived grow at high altitudes (Du Puy and Cribb, 2007).

Most of *Cymbidium* species native to temperate regions, such as *C. kanran* and *C. ensifolium* have strong fascinating scents. On the other hand, most of the species that are native to subtropical regions have very weak or no scent, except for the *C. eburneum*, *C. canaliculatum*, *C. hookeerianum*, *C. suavissimum*, and *C. tracyanum* species which have strong scents (Du Puy and Cribb, 2007).

The classic hybrids are divided into two groups, called the standards and the miniatures. The standards are large-flowered and usually less fragrance, while the miniatures

are small-flowered, and some of them have light fragrance.

The fragrant *Cymbidium* hybrids are obtained from crossing classic types with species which are native to temperate regions. Some good examples of these hybrids are Peter Pan 'Greensleeves' (*C. ensifolium* × *C. Miretta*), Maureen Carter (*C. sinense* × *C. Sleeping Beauty*), and Golden Elf 'Sundust' (*C. ensifolium* × *C. Enid Haupt*). Also these hybrids are more manageable in size and more free-blooming than the classic hybrids. The commercially well-known *C. Golden Elf 'Sundust'*, having a parentage, *C. ensifolium* (50%) and *C. eburneum* (6.25%), has a strong fragrance. Recently, *Cymbidium* export has become a promising business compared with other flower crops in Korea. *Cymbidium* produced in Korea is exported to China during the Chinese New Year season, and export earnings amounted to about US\$ 15.2 M in 2011 (MFAFF, 2012). To establish a continuous and stable export system and domestic market, the supply of domestically produced seedlings and breeding of new fragrant cultivars are essential. Since 2003, thirty-three

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hybrids have been bred by the National Institute of Horticultural & Herbal Science (NIHHS) of the Rural Development Administration (Kim et al., 2006, 2010, 2011, 2012).

The most popular oriental, *C. kanran* has strong scented greenish flowers and blooms from the beginning of December. It produces about 10 sprays of beautiful flowers.

In some reports, in order to develop fragrant floricultural crops, the electronic nose was used to analyze patterns of scents (Been and Kim, 2003; Lee et al., 2003; Park et al., 2011). Mother plant, *C. kanran* has fragrance and attractive flowers, but grows slowly from 4 to 5 years from plantlets to flowering and has short flower longevity. The aim of this breeding program was to produce flowers with long base life, various colors, fragrance, and vigorous variety. This new hybrid combined the characteristics of *C. kanran* with strong fragrant flowers and spreading shape, and *C. Jack Frost* with light pink flower color and long vase life and vigorous growth to obtain a fragrant variety with bright colored, round flower, vigorous growth and flower longevity of more than 20 days.

**Origin**

The new cultivar, *C. Snow Bell*, is a cross bred between *C. kanran*, a small-sized fragrant plant, and *C. Jack Frost*, a small to medium sized plant with light pink petals and light red lip developed at the NIHHS in 2011. Fifty-five seedlings were obtained after planting and acclimatization was done in the greenhouse. Varietal evaluation, selection and breeding were done for nine years (1999-2010).

The characteristics were evaluated based on the manual for agricultural investigation and guidelines for the conduct

of tests for distinctness, uniformity and stability for *Cymbidium* (UPOV, 1999).

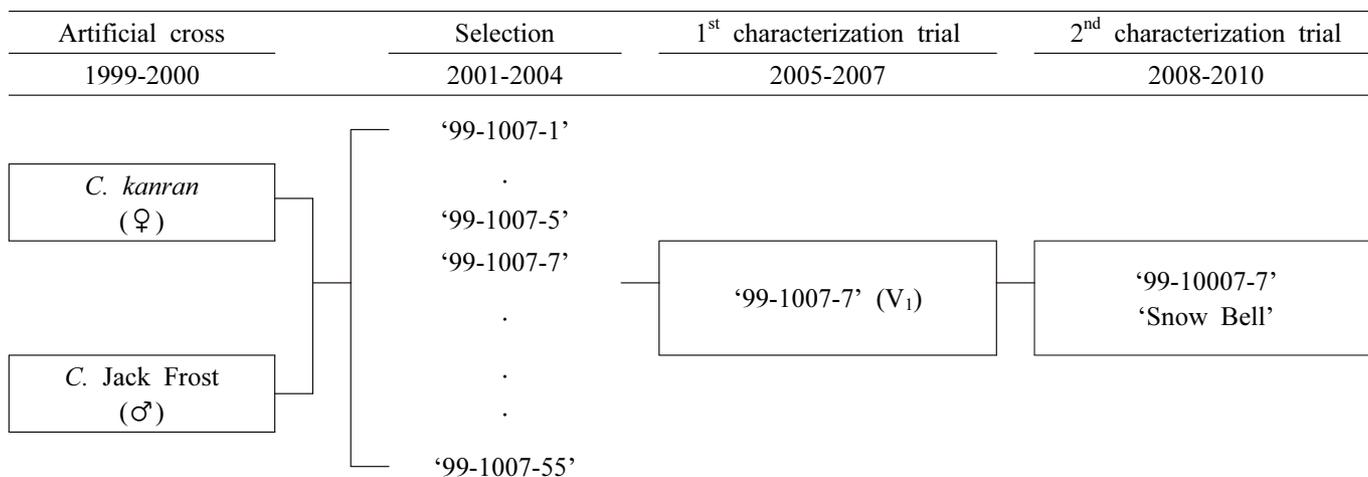
**Analysis of Fragrance Pattern**

Samples were collected through the solid phase micro extraction (SPME) method and analyzed using αFOX 2000 (Alpha-MOS, France) electronic nose with six (6) metal oxide semi-conductors. Each sample was analyzed three times. Principal component analysis (PCA) was used to distinguish the fragrance patterns obtained from the combination of responses of the six sensors. The Alpha Soft Version 12.0 statistical program was used for analysis.

**Description**

The cultivar named ‘Snow Bell’ (Fig. 1) was finally selected for its distinguishing characteristics such as flower color and shape, length of flower stalk, leaf attitude, and vigorous growth. This hybrid was bred with the objective of combining good qualities such as *C. kanran* fragrance and *C. Jack Frost* flower shape, bright color, vigorous growth and flower longevity of more than 20 days.

*C. kanran*, a mother plant with greenish colored flowers, some spreading flower shape, and small sized plant with relatively strong scent, was similar to the fragrance and small-sized plant of ‘Snow Bell’. In 2010, a consumer preference survey was conducted during the *Cymbidium* show in NIHHS to determine a new variety. By 2015, the orchid farmers will be supplied with ‘Snow Bell’ variety after producing more plantlets.



**Fig. 1.** Pedigree diagram of *Cymbidium* var. ‘Snow Bell’.

## Performance

### Plant

The *C. Snow Bell* is a sturdy, small sized plant with along straight leaf shape and a semi-upright flower spikes arising from pseudobulbs above the ground at approximately 35 mm. When mature, the plant displays multispiking characteristics in an 18 cm diameter pot. Plant height is approximately 47.5 cm from the base of the pseudobulb to the tip of the leaf. The leaf width is wider than the mother plant and leaf shape resembles that of the pollen parent (Table 1). This variety can withstand low temperature (5-7°C) during the winter season in Korea without damage or loss of flower buds.

### Flower

The light pink colored flower of 'Snow Bell' was mixed with *C. kanran*, as a female parent with greenish colored flowers and *C. Jack Frost*, as a male plant with light pink flowers. The type of flower and leaf was similar with female parent with some incurve and spreading shape.

The basal color of the flower is light pink (RHS, R56D close to white) with light red line (R56A) on the sepal and same colored (R56A) spotting on lip when it is fully

opened. This flower color is brilliant compared with pollen plant. The 'Snow Bell' has small bright pink fragrant flowers that are arranged bilaterally on the raceme. The petals and sepals show some incurve and spreading shape. The flowering season is mid-winter (December to February), under optimal cultural conditions (Sakamoto, 1996). Inflorescences that are uncut typically exceed 30 days in a wide range of environmental conditions. Spike habit is strong and erect without any arching (Table 2).

The flowers of 'Snow Bell' (Fig. 2) have a natural horizontal spread of 6.2 cm and a vertical spread of 5.1 cm, which are larger than those of *C. kanran* 5.6 cm and 4.5 cm, respectively. The flower size is reduced as compared with the pollen plant, but is much larger than the species.

The number of flowers per flower stalk is 13.8 when the plant is 36 months from in vitro deflasking and increased compared with the mother plant.

The length of flower stalk is about 50.7 cm and it produces 2.6 spikes per mature pseudobulb. The 'Snow Bell' is a middle-of-winter-season pot *Cymbidium*.

Also, the flower longevity of this new hybrid is about 20-25 days, extended to more than 10 days compared with the mother plant.

From these results, the hybrid was improved in more round flower shape and extended longevity compared with

**Table 1.** Leaf and plant characteristics of 'Snow Bell' compared with parents.

Cultivars	Length (cm)	Width (cm)	Leaf shape	Plant size	Pseudo bulb shape
<i>C. kanran</i> (Mother plant)	38.4 ± 2.7	1.1 ± 0.3	Upright	Small	Elliptic
Jack Frost (Pollen plant)	62.3 ± 4.9	2.1 ± 0.5	Semi-upright	Medium	Circular
Snow Bell	47.5 ± 5.4 <sup>z</sup>	1.6 ± 0.2	Semi-upright	Small	Circular
Silk Road (Control)	53.0 ± 4.8	1.7 ± 0.61	Straight	Small	Elliptic

<sup>z</sup>Mean ± standard error of 20 plants.

**Table 2.** Flower characteristics of *Cymbidium* 'Snow Bell' compared with parents.

Cultivars	Flower		Peduncle attitude	Fragrance	Bloomy	Flower longevity (day)
	Basal Color <sup>z</sup> (Lip)	Shape				
<i>C. kanran</i> (Mother plant)	YG144A (YGN144B + OR35B)	Some spreading	Upright	Strong	Jan.15-Jan.30 (Middle Winter)	9-12
Jack Frost (Pollen plant)	RP69A (R53C)	Some incurved, some spreading	Semi-upright	None	Dec.1-Feb.30 (Middle Winter)	30-35
Snow Bell	R56D (R56A)	Some incurved, some spreading	Semi-upright	Mild	Dec.15-Feb. 30 (Middle Winter)	20-25
Silk Road	R56A (WN155D)	Incurved, Some spreading	Semi-upright	Strong	Jan. 1-Feb. 20	15-20

<sup>z</sup>Based on the Royal Horticultural Society (RHS, 2001) color chart.

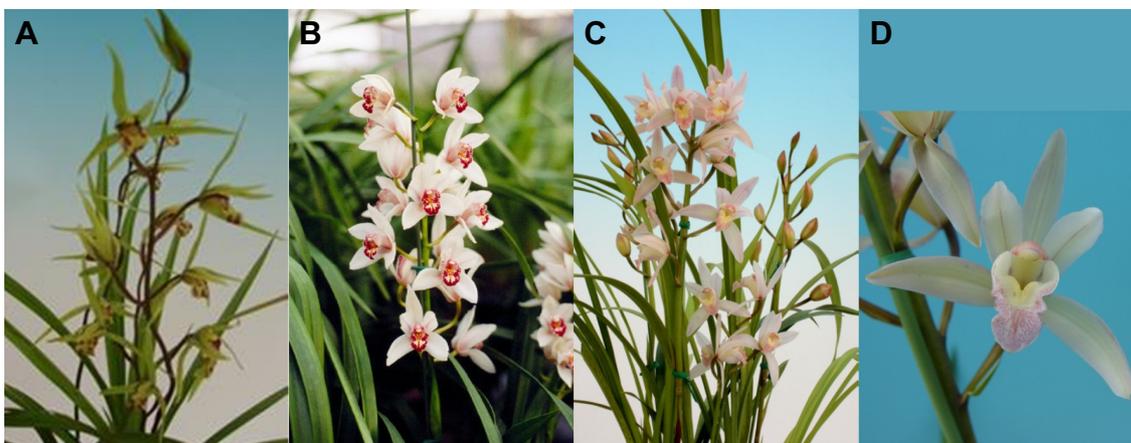


Fig. 2. Flower characteristics of the *C. kanran* (A), 'Jack Frost' (B), and 'Snow Bell' (C, D).

Table 3. Flower characteristics of *Cymbidium* 'Snow Bell' compared with parents.

Cultivars	Flower (cm)		Length of flower stalk (cm)	No. of flowers/flower stalk	No. of flower stalks	Preference <sup>y</sup>
	Width	Length				
<i>C. kanran</i> (Mother plant)	5.6 ± 1.2	4.5 ± 1.0	50.3 ± 3.1	10.2 ± 3.5	1.7 ± 0.8	-
Jack Frost (Pollen plant)	5.4 ± 1.7	5.9 ± 1.8	53.5 ± 2.7	16.2 ± 3.7	2.9 ± 2.5	-
Snow Bell	6.2 ± 0.3 <sup>z</sup>	5.1 ± 0.8	50.7 ± 6.3	13.8 ± 1.9	2.6 ± 1.0	3.7 ± 0.9
Silk Road	5.4 ± 1.7	4.7 ± 1.3	47.0 ± 3.5	5.8 ± 2.6	3.3 ± 1.2	3.9 ± 0.7

<sup>y</sup>Preference evaluation was conducted at the *Cymbidium* exhibition held at NHRI in 2003. Poor (1) - Excellent (5).

<sup>z</sup>Mean ± standard error of 20 plants.

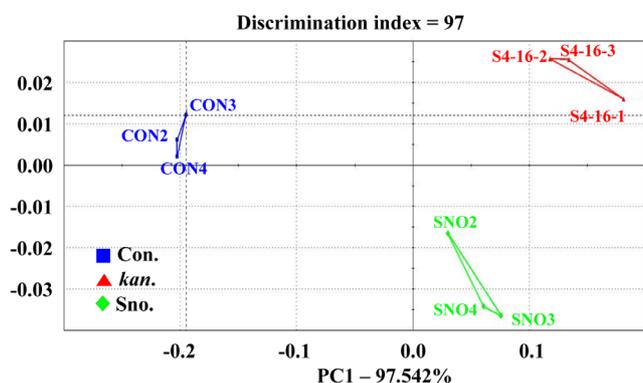


Fig. 3. Principal component analysis (PCA) plot of fragrant compound in *Cymbidium* using electronic nose (Con., Air; kan., *C. kanran*; Sno., *C. 'Snow Bell'*)

the mother plant. It can also be distinguished by its superior flower quality combined with good arrangement, flower shape and color.

To investigate the fragrance intensity of 'Snow Bell' variety,

fragrance pattern was analyzed using the electronic nose (Fig. 3). In the sensory evaluation of growers and consumers who participated in the evaluation meeting of new varieties of 'Snow Bell' variety was judged on the degree of scent to be weaker than the *C. kanran* (Table 3).

Fragrance components of Orchid using the Chromatography (GC) were first evaluated by Dodson and Hills (1966). Most of the flavor components are belonged to the three groups, such as phenyl-propanoids, fatty acid derivatives, and terpenoid systems (Croteau et al., 2000). For the investigation of flavor components in 'Snow Bell', GC analysis needs to be conducted in the future.

In the electronic nose analysis, the degree of fragrance of 'Snow Bell' was similar with the *C. kanran* and both of them showed mild or strong scent although they had different fragrance patterns (Fig. 3).

To objectively distinguish scent patterns of each *Cymbidium* hybrid, the value of principal component (PC) 1 and 2 was obtained using the response value of the metal oxide sensor of the electronic nose. As shown in Fig. 3, the value

of PC1 and PC2 was 97.542 and 2.251, respectively and this value was used for analyzing scent patterns.

From these results, the distribution value of *C. kanran*, mother plant and 'Snow Bell' was distinguished from the control (air). Also, results showed that the *C. kanran* and 'Snow Bell' have similar scents. Therefore, it was possible to confirm the scents of two varieties using the electronic nose. The gas chromatography (G/C) analysis will be done later to identify accurate aroma compounds.

With the impressive characteristics of 'Snow Bell', this study envisions to increase the income of farmers, as the result of the preference survey (Table 3). Also, a useful germplasm for fragrant *Cymbidium* breeding and increased consumption are expected.

#### Notes for Production

This new variety *C. Snow Bell* is relatively easy to grow by standard cultivating method of *Cymbidium*. It is possible to produce in early winter season (the end of November) by high land culture, though this variety belongs to a typical middle winter-blooming group (Table 2). Basal flower color of 'Snow Bell' is a light pink (Fig. 2), but if it is cultured under the 50% shade net, its color may be light greenish color. Therefore, it is necessary to remove the shade net in blooming season for expression of the brilliant pink colored petal.

#### Availability

An application for plant variety protection was filed for *C. Snow Bell* at the Korea Seed & Variety Service (Grant Number 4164). The variety will be available for production at the onset of 2014.

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