Philippine Journal of Science
149 (S1): 11-14, Special Issue on Nuclear S&T
ISSN 0031 - 7683
Date Received: 13 Jun 2019

DOST-PNRI Mutant Variety: *Dracaena* 'Sun Beam'

Fernando B. Aurigue*

Department of Science and Technology – Philippine Nuclear Research Institute (DOST-PNRI)
Commonwealth Avenue, Diliman, Quezon City, Metro Manila 1101 Philippines

***Dracaena braunii* is one of the priority ornamental plants. *Dracaena* 'Sun Beam' (NSIC 2014 Or 85) is a chlorophyll mutant of *D. braunii* developed by gamma irradiation (Cobalt-60 source) of 15-cm stem cuttings and registered by the DOST-PNRI with the National Seed Industry Council of the Bureau of Plant Industry, Department of Agriculture (DA-BPI-NSIC) and to the Mutant Variety Database of the Joint Food and Agriculture Organization of the United Nations / International Atomic Energy Agency (FAO/IAEA) Program. In all aspects, *D.* 'Sun Beam' is similar to the parent material except for the shorter leaf and its broad bar. The propagation of the mutant is true-to-type by cutting (top cutting, stem cutting, and nodal cutting) and separation of suckers. *D.* 'Sun Beam' is very attractive and shoots or top cuttings may be used as cut foliage in flower arrangements or grown individually or in a group as containerized plants, materials for terrariums, dish gardens, and landscaping.**

Keywords: chlorophyll mutant, *Dracaena braunii*, *Dracaena sanderiana*, gamma irradiation, mutation induction, ornamental plant

INTRODUCTION

The genus *Dracaena* (Family Asparagaceae) is comprised of at least 113 accepted species and six subspecies or varieties (TPL 2013). Plants have a diverse growth habit as well as leaf shape, structure, and color. From such variations in characteristics within the genus, it has been considered suitable to be developed into a new group of gorgeous ornamental crop (Wannakrairoj 2010). In addition, many *Dracaena* species will thrive in a small amount of water that they can be utilized for global warming conditions both indoor and outdoor (Wannakrairoj 2014).

Four native species are found in the Philippines, namely: *Dracaena angustifolia* (Medik.) Roxb., *D. bangueyensis* Merr., *D. multiflora* Warb. ex Sarasin, and *D. roxburghiana* (Schult. f.) Byng & Christenh. (Pelser *et al*. 2018). However, introduced species like *D. braunii* Engl., *D. fragrans* (L.) Ker Gawl. (syn. *D. massangeana* Rodigas), *D. goldieana* W. Bull ex Mast. & Moore, *D. reflexa* Lam., and *D. surculosa* Lindl. became more popular as ornamental plants for indoor use or outdoor landscaping. In fact, the cultivars Ivory and Gold of *D. braunii* (formerly known as *D. sanderiana* Sander) and the cultivars Florida Beauty and Milky Way of *D. surculosa* (formerly known as *D. godseffiana* Sander ex Mast.) are grown commercially as foliage crops or pot plants for the local and export markets. It has been observed that the marketability of certain species is related to the commercial or common names of the different cultivars, which are recommended by Feng Shui masters to bring luck to its owners. Examples of these names are Fortune plant, Good luck plant, and Lucky bamboo. In 1996, the Integrated Ornamental Horticulture Research and Development Program of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) included *D. braunii* and *D. surculosa* as priority ornamental plants.

*Corresponding Author: fbaurigue@pnri.dost.gov.ph

In 2001, the DOST-PNRI developed and registered with the DA-BPI-NSIC *Dracaena* 'Marea' as NSIC 2001 Or 60 through mutation induction by gamma irradiation of *D. braunii* stem cuttings that measured a maximum of 15.24 cm each. From the same batch of planting materials treated with acute gamma radiation from a Cobalt-60 source way back in 1997, DOST-PNRI researchers continued to observe and purify selected mutants to develop a new variety for the Philippine floriculture industry.

This paper documents the history of the development of the new mutant variety, *D.* 'Sun Beam,' and compares its characteristics with the traits of the parent material.

MATERIALS AND METHODS

Identification and Selection of New Putative Mutant
Remnants of an experiment conducted in 1997, when stem cuttings about 15 cm long were treated with 10, 20, and 30 Gy of acute gamma radiation from a Co-60 source (Gammacell 220 manufactured by Atomic Energy of Canada Limited) were utilized from 2004 to 2014. Similar stem cuttings that were not irradiated served as the control. All variations from the control plant observed were considered putative mutations because only one mutant (*D.* 'Marea') was selected from this lot. The putative mutants were classified based on the type of chlorophyll mutation they exhibited as reported by Lapade and co-workers (2001). One putative mutant with novel characteristic was chosen for its rarity.

Generation Advancement and Purification of Selected Putative Mutant
The selected putative mutant plant was propagated asexually using its suckers and the new shoots produced by its decapitated stems to advance the vegetative generation and test the stability of chlorophyll mutation. Cuttings were rooted on coarse-grade horticultural perlite (Hortiperl™ supplied by US Asia-Pacific Minerals, Incorporated) kept constantly moist by sprinkling with tap water, while suckers were planted directly in 15-cm plastic pots with a potting mixture composed of garden soil, aged rice hull, and compost at 4:2:1 by volume. Rooted cuttings were transplanted using the same potting mixture after 2–3 wk. Later on, garden soil, river sand, coconut coir dust, and compost at 2:1:1:1 by volume were combined as a potting medium for the final evaluation of the plants. Watering was done every other day, while foliar fertilizer was sprayed on the leaves on a monthly basis. The technology for mass propagation and commercial production developed by PCARRD (2000) was applied. The guidelines published by Poole and co-authors (1991) and adopted by Aurigue (2008) were followed for care and maintenance of the plants.

Characterization of Selected Mutant
The mutant plant was characterized following the descriptive terms prepared by Radford and co-authors (1974) and Simpson (2010), and the leaf colors were identified using RHS Colour Chart (RHS 2007). UPOV (2008, 2012) was consulted for colors not found in the RHS Colour Chart and the color names. The selected mutant was also compared with other chlorophyll mutants and commercial cultivars available in the market.

RESULTS AND DISCUSSION

Characteristics of the Selected Mutant
The distinguishing characteristics of the mutant and the control *D. braunii* plants have been shown in Table 1. The prominent differences between the mutant variety and the parent material are the length of the leaf and the presence/absence of a broad bar on the leaf. The descriptions were used in the filing of the application for registration with the NSIC. Figure 1 shows a clump of *D.* 'Sun Beam' plants.

Propagation Method and Uses of the New Mutant Variety
Dracaena 'Sun Beam' is propagated by asexual means such as by cutting (top cutting, stem cutting, and nodal cutting) and separation of suckers. Higher light intensities but lower temperatures result in better color combination.

Shoots or top cuttings may be used as cut foliage in flower arrangements or grown individually or in a group as pot plants using various growth media (moist floral foam, water, or nutrient gel) in various containers (plastic or clay pots, ceramic or glass vases, *etc.*).

Small plants can be used as materials for terrarium and dish gardens. Large containerized plants can be displayed indoors for a limited time or grown permanently outdoors under filtered sunlight. As landscaping materials, it may be used in plant boxes or grown as a hedge plant or for borders.

Registration of the Mutant Variety
Application for registration of *D.* 'Sun Beam' was filed with the NSIC on 25 Aug 2009. *D.* 'Sun Beam' has been officially registered on 29 Aug 2014 after the breeding history was fully clarified and it was proven that no similar variety is available commercially. The registration number is NSIC 2014 Or 85 which has been published in the NSIC Seed Catalogue: Crop Varieties CY 2014. The mutant has also been registered to the Mutant Variety Database (MVD), FAO/IAEA on 22 Jul 2015. The Mutant

Table 1. Morphological characteristics of the original parent material (*Dracaena braunii*) and the registered mutant variety (*Dracaena* 'Sun Beam').

Parameter	*Dracaena braunii*	*Dracaena* 'Sun Beam'
Leaf size, length x width	up to 39.5 cm x up to 5.3 cm	up to 29.5 cm x up to 5.3 cm
Leaf shape	narrowly elliptic	narrowly elliptic
Leaf margin	entire	entire
Leaf base	sheathing	sheathing
Leaf tip	aristate	aristate
Leaf color, upper surface	moderate olive green (146A)[a]	moderate olive green (146A) with strong yellowish-green (144A-B) broad bar of various width at the center, but usually about 1/3 of the blade width
Leaf color, lower surface	moderate yellowish green (147B-C)	moderate yellowish green (147B-C) with strong yellowish-green (144A-B) broad bar
Height of tallest plant available	185.0 cm	100.0 cm

[a]Alpha-numeric color code based on the RHS Colour Chart (2007).

Figure 1. *Dracaena* 'Sun Beam' (NSIC 2014 Or 85; MV ID No. 3439).

Variety ID No. 3439 was assigned in 2016. The cultivar name, referring to solar radiation, symbolizes the warmth and mirth that plant life brings to human beings who use them for aesthetic purposes. A picture of the mutant plant has been used as one of the figures in the cover of the third edition book titled "Manual on Mutation Breeding" published by FAO/IAEA in 2018.

CONCLUSION

Acute gamma irradiation can induce genetic variations. Identification and isolation of mutants with desirable characteristics can be utilized to develop new or improved varieties. *Dracaena* 'Sun Beam' is the seventh NSIC-registered mutant variety of ornamental plant developed by DOST-PNRI using acute gamma radiation. It is also officially listed in the FAO/IAEA MVD under MV ID No. 3439. Propagation is done successfully by cutting (top cutting, stem cutting, and nodal cutting) and separation of suckers.

ACKNOWLEDGMENTS

The author appreciates the guidance of his former supervisors at DOST-PNRI Agriculture Research Section, Atomic Research Division: Ms. Lucia A. Marbella, retired Science Research Specialist II who conducted the experiment with the help of the PNRI Irradiation Services Unit personnel; and the late Ms. Avelina G. Lapade, former section head and project leader of Mutation Breeding of Priority Agricultural Crops: Component 1 – Ornamentals. Mr. Remon N. Arquines and Mr. Jayson D. Vasquez, on-the-job trainees from Rizal Technological University, and Mr. Joseph Lester S. Sanchez, a contractual staff (job order), are gratefully acknowledged for propagating the selected mutant. Likewise, Mr. Jorge R. Sahagun is appreciated for helping in the maintenance of the plants, while Ms. Mary Jane C. Manrique is acknowledged for helping in the determination of colors using RHS Color Chart. Lastly, the anonymous reviewers are gratefully appreciated for their valuable suggestions to improve the manuscript. Funds for supplies and maintenance operations came from DOST-PNRI General Appropriations Act.

REFERENCES

AURIGUE FB. 2008. Choose and produce your Sander's *Dracaena*. Agriculture 12(2): 8–10.

[IAEA] International Atomic Energy Agency. 2019. Mutant Variety Database. Retrieved from https://mvd.iaea.org/#!Search?Criteria[0][val]=Dracaena on 06 Feb 2019

LAPADE AG, VELUZ AMS, MARBELLA LJ, RAMA MG. 2001. Induced mutation and *in vitro* culture techniques for the genetic improvement of ornamental. Philipp Nucl J 13: 23–31.

[NSIC] National Seed Industry Council. 2014. Seed Catalogue: Crop Varieties CY 2014. Manila: Bureau of Plant Industry.

[PCARRD] Philippine Council for Agriculture, Forestry and Natural Resources Research and Development. 2000. Mass propagation of *Dracaena sanderiana* 'Ivory' and 'Gold' [Information Bulletin No. 183/2000]. Los Baños, Philippines.

PELSER PB, BARCELONA JF, NICKRENT DL eds. 2011 onwards. Co's Digital Flora of the Philippines. Retrieved from www.philippineplants.org on 06 Feb 2019.

POOLE RT, CHASE AR, OSBORNE LS. 1991. CFREC-A Foliage Plant Research Note RH-91-14: *Dracaena* production guide. Apopka, FL: University of Florida, IFAS Central Florida Research and Education Center. Retrieved from http://mrec.ifas.ufl.edu/Foliage/folnotes/dracaena.htm

RADFORD AE, DICKISON WC, MASSEY JR, RITCHIE BELL C. 1974. Vascular plant systematics. New York: Harper & Row. 891p.

[RHS] Royal Horticulture Society. 2007. The RHS Colour Chart. London.

SIMPSON MG. 2010. Plant systematics. Singapore: Elsevier Academic Press. 740p.

[TPL] The Plant List. 2013. Version 1.1. Retrieved from http://www.theplantlist.org/ on 06 Feb 2019

[UPOV] International Union for the Protection of New Varieties of Plants. 2012. Revision of Document TGP/14, Section 2: Botanical Terms, Subsection 3: Color [TWC/30/25]. Geneva.

[UPOV] International Union for the Protection of New Varieties of Plants. 2008. Addendum to TGP Documents: Conclusions of the Workshop on Document TGP/14, Section 2, Subsection 3: Color [TWO/41/3 Add]. Geneva.

WANNAKRAIROJ S. 2014. *Dracaena*. In: Newsletter of the Ornamental Plant Variety Developers Club 2000. p. 10–23, 32–46.

WANNAKRAIROJ S. 2010. *Dracaena* of the world. In: Newsletter of the Ornamental Plant Variety Developers Club 2000. p. 20–23.