

# Diversity Induction with Gamma Irradiation on Orchid *Dendrobium odoardi*



Tilmiidzah Salma Fathin<sup>1)</sup>, Sri Hartati<sup>2,3)</sup>, and Ahmad Yunus<sup>2,3)</sup>

<sup>1</sup> Undergraduate Program in Agrotechnology Study Program, Faculty of Agriculture Sebelas Maret University

<sup>2</sup> Lecturer staff of Agrotechnology Study Program, Faculty of Agriculture Sebelas Maret University

<sup>3</sup> Center of Biotechnology and Biodiversity, Research and Development, Sebelas Maret University.

Author contact : yunus@staff.uns.ac.id

## Abstract

Orchid is an ornamental plant commodity that has potential to be developed. One species of orchid that is in demand is *Dendrobium odoardi*. The aims of this research is to determine the characteristics and morphological diversity of *Dendrobium odoardi* orchid irradiated gamma ray results and without gamma ray irradiation. This research was conducted in two places, the implementation of gamma ray irradiation at the PATIR-BATAN Laboratory (Pusat Aplikasi Teknologi Isotop dan Radiasi-Badan Tenaga Nuklir Nasional), Pasar Jumat, South Jakarta and subculture in Plant Physiology and Biotechnology Laboratory of Agriculture Faculty, University of Sebelas Maret Surakarta. The research was conducted start from March 2019 – January 2020. The research used a simple design of one factor, the dose of gamma ray irradiation with 5 levels, 0 Gy (control), 10 Gy, 15 Gy, 20 Gy, and 25 Gy. Each level of treatment was planted and observed 50 plantlets. Observational data were analyzed descriptively by comparing observational data from *Dendrobium odoardi* orchids irradiated with control plants. The results showed that the induction of gamma ray irradiation at doses of 10 Gy, 15 Gy, 20 Gy, and 25 Gy resulted changes in morphological characters in *Dendrobium odoardi* orchid plant. Changes occur in plant height, number of leaves, leaf length, leaf width, number of roots, leaf shape, and leaf color. Changes in the morphological character of *Dendrobium odoardi* orchids produce plant diversity.

**Keywords :** *Dendrobium odoardi*, Mutation, Phenotypic Variation, PLBs

## Introduction

Orchid is a popular ornamental plant. Orchid has a variety of flower shapes, floral patterns, and scent which has potential to be developed. Orchid is one of the commodities recognized as a commodity that has economic value in the international flower industry, in addition to being used as an ornamental plant, several types of orchids can also be used as food or medicine. One of the *dendrobium* orchid species is *Dendrobium odoardi*. Novelty factors can make the ornamental plant industry more developed and can compete in the market. New varieties of orchids will increase diversity, so as to enrich the source of genetic diversity (germplasm). Efforts that can be done to obtain new varieties with desired characteristics are by conducting breeding through mutation techniques. This study aims is to determine the effects of gamma ray irradiation to the the diversity by their morphological characters.

## Methods

- This research was conducted in two places, the implementation of gamma ray irradiation conducted in the PATIR-BATAN Laboratory (Pusat Aplikasi Teknologi Isotop dan Radiasi-Badan Tenaga Nuklir Nasional), Pasar Jumat, South Jakarta and subcultured in Plant Physiology and Biotechnology Laboratory of Agriculture Faculty, University of
- The study was conducted from March 2019 - Januari 2020
- The study design uses a simple one-factor design with 5 levels. The factor used is gamma ray irradiation dose with a level of 0 Gy (control), 10 Gy, 15 Gy, 20 Gy, and 25 Gy. Each level of treatment was planted and observed 50 plantlets. Planting is done by planting 2 plantlets in each culture bottle.
- The data obtained were analyzed descriptively by comparing the observational data of the *Dendrobium odoardi* orchid irradiated by 10 Gy, 15 Gy, 20 Gy, 25 Gy with control plants (without irradiation).

## Result

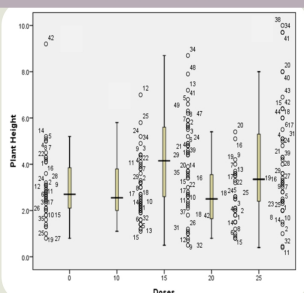


Figure 1. *Dendrobium odoardi* orchid plant height treatment without gamma ray irradiation (control) and gamma ray irradiation treatment.

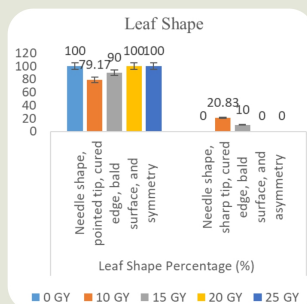


Figure 2. *Dendrobium odoardi* orchid leaf shape treatment without gamma ray irradiation (control) and gamma ray irradiation treatment.

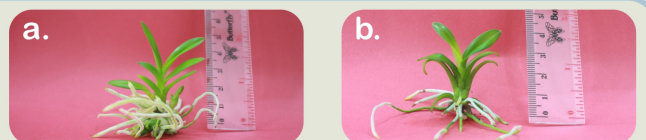


Figure 3. (a) Needle shape pointed tip, cured edge, bald surface and symmetry (b) Needle shape, sharp tip, cured edge, bald surface, and asymmetry

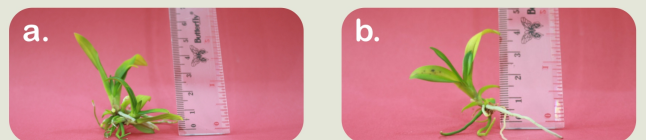


Figure 4. (a) Mutants with chimera, (b) Mutants with leaf spot

## Conclusion

1. Plant breeding through gamma ray irradiation at doses of 10 Gy, 15 Gy, 20 Gy, and 25 Gy resulting in changes in morphological characters in the *Dendrobium odoardi* orchid plant generation M1. Changes that occur include plant height, leaf number, leaf length, leaf width, number of roots, leaf shape, and leaf color.
2. Changes in plant morphology by treating gamma ray irradiation at doses of 10 Gy, 15 Gy, 20 Gy, and 25 Gy produce diversity in the M1 generation of *Dendrobium odoardi* orchids.