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2ND INTERNATIONAL SCIENCE,
ENGINEERING AND TECHNOLOGY
COLLOQUIUM



THE POWER OF SCIENTIFIC INNOVATION

INTELLIGENT SOLUTIONS FOR A
SUSTAINABLE WORLD

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(ISETC 2025)**

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PREFACE

Welcome to the 2nd International Science, Engineering and Technology Colloquium 2025 (ISETC 2025)!

It is with great pleasure that we present this year's colloquium, a distinguished gathering of scholars, researchers, and professionals dedicated to the advancement of applied sciences. Held virtually on 9th July 2025, ISETC 2025 serves as a platform to highlight cutting-edge research, foster meaningful networking, encourage collaborations, and explore innovative solutions to global challenges.

This year's theme, "The Power of Scientific Innovation: Intelligent Solutions for a Sustainable World" highlights our shared goal to solve global challenges through applied science. It celebrates innovation as a key to building a more sustainable and resilient future. We're proud to feature keynote speakers and presenters who bring fresh insights, bold ideas, and breakthroughs shaping tomorrow's world.

We would like to extend our heartfelt appreciation to the Faculty of Applied Sciences, Universiti Teknologi MARA, Perak Branch, Tapah Campus, for their outstanding support and assistance throughout the planning and execution of the event. Their dedication has been instrumental to the success of this colloquium. We would like to sincerely thank all participants and researchers for their valuable contributions. We also appreciate the reviewers for their careful evaluations and helpful feedback. Your hard work and support mean a lot to us.

As editors, we are proud to present this collection of proceedings. It is an honour to bring together the interesting and meaningful work of our speakers and authors. We hope the ideas shared will lead to new discoveries, encourage more research, and help solve global challenges through science and innovation.

Warm regards,

Dr. Emi Norzehan Mohamad Mahbob

Dr. Saiyidah Nafisah Hashim

Ms. Lili Widarti Zainuddin

Ms. Nurul Nazwa Mohammad

Ms. Rozaina Saleh

ISETC 2025 Proceedings Editors

MORPHOLOGICAL AND PHENOTYPIC VARIATIONS IN BOUGAINVILLEA BRACTS ACROSS DIFFERENT COLORS USING IMAGEJ

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Abstract: This study examines the morphology of bougainvillea flower varieties based on their bracts. The research used ImageJ software to analyze bract areas and plantlet lengths under abiotic stress conditions, providing precise data for ornamental plant breeding. The study found that white-flowered bougainvillea plants showed the most vigorous growth, especially in good sunlight and soil drainage, while the pink variety was more sensitive to environmental factors and had poorer growth. The findings could be used for plant growth simulations or yield forecasting. Future research should consider plant variety and site conditions.

Keywords: *Bougainvillea, flower, morphology, bract, ImageJ*

INTRODUCTION

Bougainvillea, a flowering plant from the Nyctaginaceae family, is widely used in tropical and subtropical landscaping due to its vibrant bracts—modified leaves that attract pollinators and come in colors like magenta, pink, orange, and white (Chang et al., 2021; Cornelissen et al., 2003). Though not true flowers, these bracts play key ecological roles. This study explores the relationship between bract color and morphology using ImageJ software and digital imaging to analyze bract area. Findings may aid floral horticulture by identifying desirable traits and improving stress-resistant cultivars. In Malaysia, popular hybrids like *Bougainvillea* × *buttiana* dominate, and the plant itself is named after French explorer Admiral Louis-Antoine de Bougainville (Datta, 2021).

MATERIALS AND METHODS

The study was conducted at Universiti Teknologi MARA Cawangan Perak, Kampus Tapah, where various *Bougainvillea glabra* varieties (purple, white, and pink) were selected based on differences in bract size, shape, and arrangement. Flower samples were randomly collected from three locations: near the zebra-crossing by the Non-Resident (NR) parking, the foyer in front of the Plaza Pentadbiran building, and above the drain near Perpustakaan Tun Abdul Razak (PTAR). Image analysis was performed using ImageJ software. Images were opened and calibrated with a known scale (4 cm), followed by color threshold adjustment to highlight the bracts in red while keeping the background white. Bracts were selected using the wand tool and added to the ROI Manager for measurement. A summary of total bract area was then generated for further analysis.

RESULTS AND DISCUSSION

The study on *B. glabra* at three distinct locations: a zebra-crossing, a foyer, and above a drainage area revealed consistent growth patterns across its pink, purple, and white varieties. The white-flowered variety consistently exhibited superior growth across all measured parameters, including bracts area, bud diameter, and flower size. In contrast, the pink variety consistently showed the smallest values for each trait, with the purple variety generally falling in between. Significantly larger bracts have been observed in the white bougainvillea at all three locations, suggesting robust vegetative development and potential adaptability to urban conditions. The flowerbeds at the zebra-crossing (6.28) and foyer (6.86) provided more favorable environments, where larger flowers and bracts were noted, particularly in the white variety. Conversely, the pink and purple varieties showed reduced growth in the flowerbed

above the drain, possibly due to inconsistent moisture, poor drainage, or limited nutrients (Sharma & Sharma, 2020). These findings highlight the crucial role of environmental factors like sunlight exposure, soil drainage, and air quality in flower development (Singh & Sharma, 2018). White bougainvillea also led in bud diameter measurements, implying a potential advantage in reproductive development, and consistently produced the largest flowers across all locations. The standard error values for bracts area (0.86 cm²), bud diameter (0.23 mm), and flower size (0.67 mm) indicate moderate to high variation in the measurements.

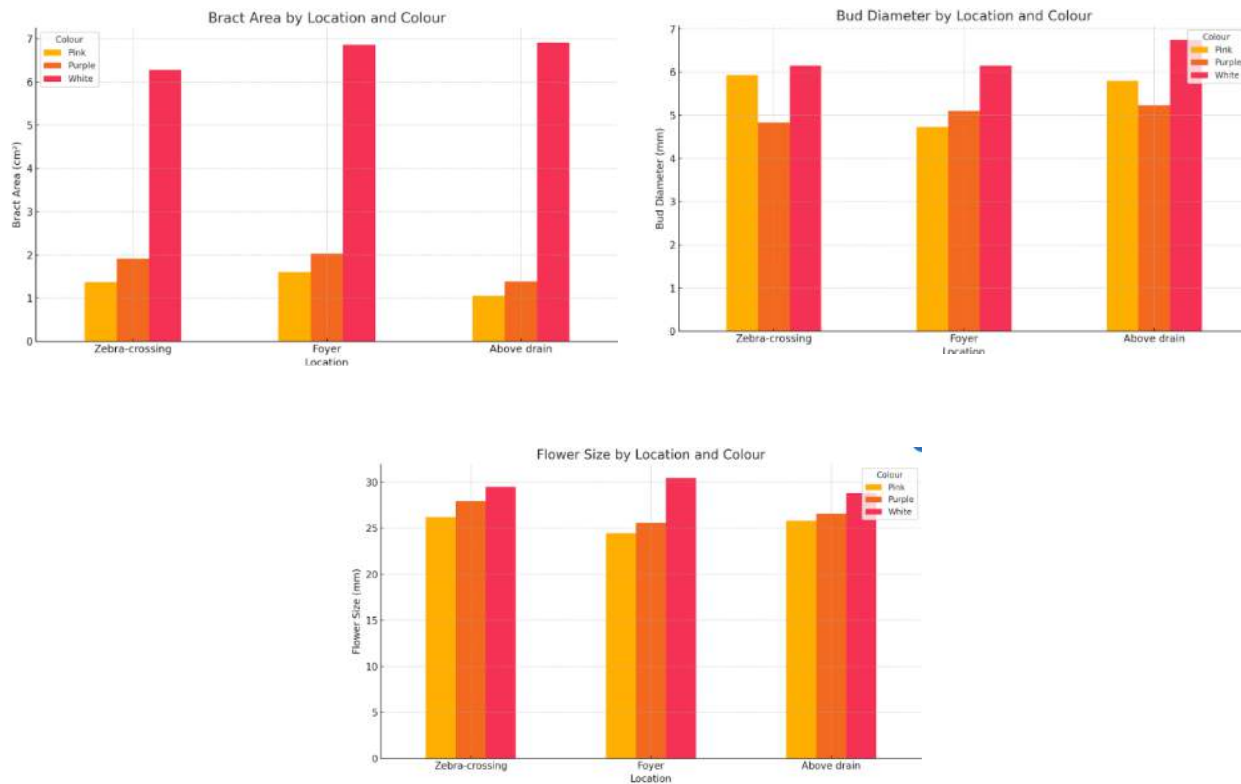


Figure 1. Bract area (cm²), bud diameter (mm), and flower size (mm) in bougainvillea specimens

CONCLUSIONS

This study examined the growth of *B. glabra* in urban flower-bed settings, revealing that white-flowered plants showed the most vigorous growth, especially in good sunlight and soil drainage. The pink variety was more sensitive to environmental factors and had poorer growth. The ImageJ software was used to measure bract area, which could be used for plant growth simulations or yield forecasting. Future research should consider plant variety and site conditions.

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Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

Setuju.

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