



UNIVERSITI PUTRA MALAYSIA

**EFFECTIVENESS OF SHADE LEVELS ON THE PERFORMANCE OF
PSEUDERANTHEMUM GRACILIFLORUM AND MELASTOMA
MALABATHRICUM FOR URBAN LANDSCAPE USE**

ZULHAZMI BIN SAYUTI.

FRSB 2005 4



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**MASTER OF SCIENCE
UNIVERSITI PUTRA MALAYSIA**

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By

ZULHAZMI BIN SAYUTI

**Thesis Submitted to the School of Graduate Studies, Universiti Putra
Malaysia, in Fulfillment of the Requirement for the Degree of Master of
Science**

April 2005



DEDICATED TO

My parents

Sayuti Bin Hj. Said and Sapura Binti Ihsan

My lovely Wife

Rafeah Binti Mat @ Anuar

My Cute daughters

Nur Farzana and Nur Fatini

And

For All My Family

This Victory is for All of You

Grateful to Allah, Amin.....



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for degree of Master of Science

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By

ZULHAZMI SAYUTI

April 2005

Chairman: Associate Professor Mustafa Kamal Bin Mohd. Shariff, PhD

Faculty: Design and Architecture

A study of different shade levels on two selected native flowering shrubs namely *Pseuderanthemum graciliflorum* and *Melastoma malabathricum* was carried out at the Horticulture Research Centre, MARDI, Serdang, Selangor from February 2003 until May 2004.

Both plants were propagated and established within one month before transferred under shading treatment. The plants were put under 4 levels of shade treatments i.e. 0%, 25%, 50% and 80%. The plots were arranged in Split-plot design with four replications. The main plots were 4 different shade levels while the sub-plots were both species. The parameters measured were the leaf area, total leaf area, chlorophyll content (SPAD), specific leaf area, leaf area ratio, leaf weight ratio, relative growth rate, root-shoot ratio, A/Ci curve, light response



curve, A_{max} , J_{max} , apparent quantum yield, RuBP capacity, net photosynthesis, flower production and also consumer preferences.

The results from this study showed that the growth performance of *Pseuderanthemum graciliflorum* under 25% shade and *Melastoma malabathricum* under 0% shade had the best growth in terms of their chlorophyll contents and specific leaf areas. Shading was also found to influence the gas exchange of both species in this study. The results showed that J_{max} values were not significantly different on shoot for both species but have significant difference on mature leaf. J_{max} values were highest on mature leaf of *P. graciliflorum* and *M. malabathricum* when grown under full sunlight. However, the plants decreased the rate of potential electron when exposed to shading condition. The two species tested had the lowest mean for J_{max} under 80% shade. There were no significant difference in RuBP capacity at all levels of shading. However there were significant differences in A_{max} on mature leaf and apparent quantum yield on shoot and mature leaf for all shading treatments.

Plant characterization through flower production indicated that *P. graciliflorum* was flowering at all shade levels compared to *M. malabathricum* which only flowered under 0% and 25% shade. *M. malabathricum* had a decreased number of flowers of more than 50% when shading was increased and had a one week delay to first flowering. A survey of consumer preferences that were carried out using 30 respondents consisting of landscape contractors and horticulturists



indicated that they preferred *P. graciliflorum* grown under 25% and 50% shade. On the other hand *M. malabathricum* grown under 25% shade was preferred. *Pseuderanthemum graciliflorum* was also chosen to be suitable as potted plants and grown as hedges. Meanwhile, *M. malabathricum* was preferred only as a potted plant for outdoor landscape planting. The results also indicated that *P. graciliflorum* was a shade loving plant while *M. malabathricum* was a sun loving plant. These results can determine the suitability and functional properties of both species for planting in urban areas.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**KAJIAN KEBERKESANAN ARAS LINDUNGAN TERHADAP PERTUMBUHAN
PSEUDERANTHEMUM GRACILIFLORUM DAN *MELASTOMA
MALABATHRICUM* UNTUK
KEGUNAAN LANDSKAP BANDAR**

Oleh

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April 2005

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Kajian mengenai aras lindungan terhadap pertumbuhan pokok renek berbunga asli terpilih, iaitu *Pseuderanthemum graciliflorum* dan *Melastoma malabathricum* telah dijalankan di Pusat Penyelidikan Hortikultur, MARDI, Serdang Selangor.

Tanaman disemai selama sebulan sebelum dipindahkan ke bawah naungan. Pokok-pokok diletakkan di bawah 4 aras lindungan berbeza iaitu 0%, 25%, 50% dan 80%. Reka bentuk kajian adalah secara reka bentuk plot berbelah dengan 4 replikasi. Plot utama ialah 4 aras teduhan berbeza manakala sub-plot ialah kedua-dua spesies iaitu *Pseuderanthemum graciliflorum* dan *Melastoma malabathricum*. Parameter kajian yang diukur ialah luas daun, kandungan klorofil (SPAD), luas daun spesifik, nisbah berat daun, nisbah luas daun, kadar tumbesaran bandingan, nisbah akar ke pucuk, keluk A/Ci, keluk tindakbalas



cahaya, A_{max} , J_{max} , hasil kuantum ketara, kapasiti RuBP, kadar fotosintesis, Pengeluaran Pembungaan pokok dan juga soal selidik terhadap penerimaan pengguna.

Keputusan kajian mendapati bahawa pada naungan 25% bagi tanaman *Pseuderanthemum graciliflorum* dan 0% naungan bagi *Melastoma malabathricum* mempunyai prestasi pertumbuhan yang baik berdasarkan kandungan klorofil daun dan luas daun spesifik. Terdapat juga pengaruh teduhan terhadap pertukaran gas ke atas kedua-dua spesies dalam kajian ini. Keputusan kajian ACi mendapati nilai J_{max} tiada perbezaan bererti pada pucuk untuk kedua-dua spesies tetapi terdapat perbezaan bererti pada daun matang. Daun matang untuk kedua-dua spesies memberikan bacaan yang tinggi untuk J_{max} apabila pokok diletakkan di bawah cahaya penuh. Walau bagaimanapun, pokok mengurangkan kadar elektron berpotensi apabila terdedah kepada teduhan. Kedua-dua species menunjukkan purata J_{max} yang rendah di bawah teduhan 80%. Tiada juga perbezaan bererti ke atas RuBP untuk kesemua rawatan. Terdapat perbezaan bererti ke atas A_{max} pada daun matang dan juga Hasil Kuantum Ketara di kedua-dua jenis daun pucuk dan matang untuk kesemua rawatan teduhan.

Pencirian pokok melalui pembungaan dan penerimaan pelanggan juga mendapati pokok *Pseuderanthemum graciliflorum* berbunga pada semua aras teduhan berbanding dengan *Melastoma malabathricum* yang hanya berbunga

pada aras 0% dan 25% sahaja. *M. malabathricum* mengurangkan bilangan bunga lebih 50% apabila aras teduhan meningkat dan menangguhkan pengeluaran bunga selama 1 minggu. Melalui soal selidik yang dijalankan ke atas 30 orang responden yang terdiri dariada kontraktor landskap dan juga ahli hortikultur mendapati yang mereka lebih mengemari kepada kualiti *P. graciliflorum* di bawah teduhan 25% dan 50% manakala *M. malabathricum* di bawah 25% teduhan sangat digemari. *P. graciliflorum* juga dipilih sesuai sebagai tanaman pasuan dan pagaran manakala bagi *M. malabathricum* dipilih sesuai sebagai tanaman pasuan untuk kegunaan luaran sahaja. Kajian ini juga menunjukkan bahawa *P. graciliflorum* ialah pokok renek berbunga yang gemar kepada teduhan manakala *M. malabathricum* pula gemar kepada cahaya. Keseluruhan keputusan kajian boleh menentukan kesesuaian dan fungsi sebenar kedua-dua spesies untuk penanaman dalam bandar.

ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude and appreciation to my project supervisor, Asso. Prof. Dr. Mustafa Kamal Bin Mohd. Shariff, for undertaking the position and giving his sincere support towards the completion of this thesis. Special acknowledgement are due to Asso. Prof. Dr. Mohd. Fauzi Bin Ramlan and Dr. Hj. Zainuddin Bin Meon for their advice, guidance and encouragement throughout the study.

I am also indebted to the Malaysian Agriculture and Research Development Institute (MARDI) for providing financial support during my study. Special thanks to Mr. Ahmad Shokri Othman (MARDI, Senior Statistician) for his guidance on all data analysis and also to Mrs. Rosiah Hamzah (Editor) for editing this thesis. Appreciation to Mr. Hanim Ahmad, Mr. Harun Rais, Mr. Zainal Ali, Mrs. Norlaila Basirun, Mr. Mazlan Bangi, Mr. Azhar Othman, Mr. Fadhilnoor Abdullah, Miss Tasnim, Miss Intan Rozainita and Miss Ida for their kind assistance.

Finally, I wish to thank my wife, Rafeah Binti Mat @ Anuar and my two daughters, Nur Farzana and Nur Fatini for their endless support, love and a source of my inspiration.



TABLE OF CONTENTS

	Pages
DEDICATION	ii
ABSTRACT	iii
ABSTRAK	vi
ACKNOWLEDGEMENT	ix
APPROVAL	x
DECLARATION	xii
LIST OF TABLES	xvi
LIST OF FIGURES	xvii
LIST OF PLATES	xviii
CHAPTER 1 INTRODUCTION	1
1.1 Native plants in urban areas	3
1.2 Justification for use of native plants	4
1.3 Objectives of study	5
CHAPTER 2 LITERATURE REVIEW	6
2.1 The advantages of using native plants	6
2.1.1 Increase plant biodiversity in urban landscape	6
2.1.2 Generate income for nation through domestic and export markets.	7
2.1.3 Decrease landscape cost maintenance	8
2.1.4 Create Malaysian landscape identity by using native species	9
2.1.5 Revive the old Nusantara concept of Garden Nation	10
2.1.6 Preserve important medical, herbal and culinary plants	11
2.2 Potential of using native shrubs in urban areas	11
2.3 Selected native shrub species	13
2.3.1 <i>Pseuderanthemum graciliflorum</i>	14
2.3.2 <i>Melastoma malabathricum</i>	16
2.4 Development of adaptive procedure of native plant collection	18
2.4.1 Collection and identification of species	19
2.4.2 Evaluation and characterization	19
2.4.3 Propagation	19
2.4.4 Nursery requirement	19
2.4.5 Functional usage	20
2.4.6 Market acceptance	20
2.5 Adaptability studies of selected species	21
2.5.1 The importance of light for plants	21
2.5.2 Acclimatization of ornamental plants.	23
2.5.3 Effect of shading on plant physiology.	24
2.5.4 Physiological factor	25
2.5.4 Characterization of the species	29



CHAPTER 3 METHODOLOGY	31
a) Effect of different shade levels on growth and flowering of selected native shrubs species (<i>Pseuderanthemum graciliflorum</i> and <i>Melastoma malabathricum</i>)	
3.1 Materials and Methods	31
3.2 Experimental design	31
3.3 Plant maintenance	32
i) Irrigation	32
ii) Fertilization	32
3.4 Study parameters	33
a. Growth parameters	
i) Relative Growth Rate (RGR)	34
ii) Leaf Area (LA)	34
iii) Specific Leaf Area (SLA)	35
iv) Leaf Area Ratio (LAR)	36
v) Leaf Weight Ratio (LWR)	36
vi) Root Shoot Ratio (R:S)	36
vii) Chlorophyll Content	37
viii) Leaf Area Index	37
ix) Plant growth rate	38
b) Physiological parameters	39
i) Net Photosynthesis	39
ii) Light Response Curve	40
iii) A/Ci Curve	40
c) Physical characteristics of plants	41
i) Flowering	41
ii) Consumer preference	41
 CHAPTER 4 RESULTS	 43
4.1 Effect of shading on growth performance	43
4.1.1 Specific Leaf Area (SLA)	43
4.1.2 Leaf Area Ratio (LAR)	43
4.1.3 Leaf Area Index (LAI)	44
4.1.4 Correlation of growth parameters	46
4.1.5 Chlorophyll content	50
4.1.6 Leaf area development	54
4.1.7 Total Leaf Area (cm ²)	56
4.2 Effect of shading on gas exchange	
4.2.1 Net photosynthesis rate	57
4.2.2 RuBP capacity value	59
4.2.3 Jmax value	61
4.2.4 A/Ci curve	63
4.2.5 Apparent quantum yield	66
4.2.6 Maximum assimilation rate (Amax)	68
4.2.7 Light response curve	70
4.3 Characterization of the species	



4.3.1 Flower production and longevity	74
4.3.2 Consumer preference study	81
CHAPTER 5 DISCUSSION	85
5.1 Growth performance	85
5.2 Plant gaseous exchange	87
5.3 Plants characterization	91
5.3.1 Plant characteristics	91
5.3.2 Consumer preference	92
CHAPTER 6 GENERAL CONCLUSION AND SUGGESTION	94
6.1 Conclusion	94
6.2 Suggestion for future research	95
BIBLIOGRAPHY	97
APPENDICES	104
BIOGRAPHICAL SKETCH	132



LIST OF TABLES

Table		Page
1	Statistics on trade in ornamental plant in Malaysia for the period 1992 -2001 (Source: Department of Statistics, Malaysia)	8
2	Growth performance of the <i>Pseuderanthemum graciliflorum</i> and <i>Melastoma malabathricum</i> at different shade levels	44
3	Growth performance of the <i>Pseuderanthemum graciliflorum</i> and <i>Melastoma malabathricum</i> at different shade levels	45
4	Correlation of growth parameters for <i>Pseuderanthemum graciliflorum</i> at 40 days under shading treatment	47
5	Correlation of growth parameters for <i>Melastoma malabathricum</i> at 40 days under shading treatment.	48
6	Chlorophyll content of <i>Pseuderanthemum graciliflorum</i> & <i>Melastoma malabathricum</i> grown under different shade levels	49
7	Total leaf area of <i>P. graciliflorum</i> and <i>M. malabathricum</i>	56
8	Mean number of flowers at different shade levels	75
9	Flower development at different shade levels	76
10	Consumer preference for <i>P. graciliflorum</i> and <i>M. malabathricum</i> grown under different shade levels	83
11	Consumer rating on flower aesthetic and types of landscape uses	84



LIST OF FIGURES

Figure		Page
1	Development of Adaptive procedure of native plant collection	18
2	Chlorophyll content in different types of leaf for both species every 4 days (mgcm^{-2})	51
3	Leaf area development of <i>P. graciliflorum</i> & <i>M. malabathricum</i>	55
4	Net photosynthesis rate of shoot at different shade levels ($\mu\text{molem}^{-2}\text{s}^{-1}$). Vertical bars indicate LSD at $p \leq 0.05$	58
5	RuBP capacity values at different shade levels ($\text{mol CO}_2 \text{ mol m}^{-2} \text{ quanta}$) Vertical bars indicate LSD at $p \leq 0.05$	60
6	Jmax values at different shade levels ($\mu\text{mol m}^{-2}\text{s}^{-1}$). Vertical bars indicate LSD at $p \leq 0.05$	62
7	A/Ci curve of <i>P. graciliflorum</i> and <i>M. Malabathricum</i> at different shade levels	65
8	Apparent quantum yield ($\text{mol CO}_2 \text{ mol m}^{-2} \text{ quanta}$) Vertical bars indicate LSD at $p \leq 0.05$	67
9	Amax values at different shade levels ($\mu\text{mol m}^{-2}\text{s}^{-1}$) Vertical bars indicate LSD at $p \leq 0.05$	69
10	Light response curve of <i>P. graciliflorum</i> under 0%, 25%, 50% and 80% shade levels for shoot and mature leaves.	72
11	Light response curve of <i>M. malabathricum</i> under 0%, 25%, 50% and 80% shade levels for shoot and mature leaves.	73



LIST OF PLATES

Plate		Page
1.	Native shrub species – <i>Pseuderanthemum graciliflorum</i>	15
2.	<i>Melastoma malabathricum</i>	17
3.	Structure with different levels of shading	32
4.	Automatic Leaf Area Meter (ALAM) Model LI-3100	35
5.	Minolta SPAD-502 to measure chlorophyll content	37
6.	Plant Canopy Analyzer Model LAI-2000 LICOR	38
7.	Infrared Analysis Model LI-6200 LICOR	39
8.	Portable Photosynthesis System Model LI-6400 LICOR.	40
9.	<i>Pseuderanthemum graciliflorum</i> , 40 days after treatment	78
10.	<i>Melastoma malabathricum</i> , 40 days after treatment	80



CHAPTER 1

INTRODUCTION

Malaysia has placed a heavy emphasis on landscape development including urban beautification. This is clearly seen in her determination to retain 50% of its land area under forest growth and also a strong commitment to make Malaysia into a Garden Nation by 2005. Malaysia is currently active in planting trees in towns and cities and this campaign will continue until she reaches a goal of having planted 20 million trees by the year 2020 (Ismail, 1997).

At present, landscaping in Malaysia is more related to tree planting or softscape. Although this is actually only a part of the overall landscaping works, it is indeed a very important component. One of the challenges in implementing landscape projects is that plants have different environmental and cultural requirements that must be considered in selecting the species for landscape development. Current trend towards the beautification of homes and the environment has generated a keen interest among homeowners and professionals. The identification of new and suitable flowering plants for both indoor and outdoor landscaping will address the urgent needs of the landscape industry.

Many of the ornamental plants used in landscaping today are mainly exotic introductions from countries where there is an established ornamental industry such as South America, China and Europe. They were mainly introduced by the Portuguese, Dutch and English Colonialists. Over the years they have



become naturalized. However, as the landscape industry expanded and demand for trees and shrubs, especially flowering ones increased tremendously, there is an urgent need to introduce local or native species. This is also in line with the biodiversity conservation.

Malaysian jungles are rich in native species, which have not been fully exploited for their potential as ornamental plants. According to Soepadmo and Wong (1995) there is an estimated of 12,000 to 15,000 plant species in Malaysia compared to 5,000 in the whole of Europe, which has a landmass 20 times bigger than Malaysia. The Malaysian rainforest is the home of an estimated 8,500 species of flowering plants that can yield many ornamental and landscape plants. Nevertheless, very little is known of their performance when reveal of their natural habitats (Yong, 2002).

The use of native plant species as landscape plants will not only raise the value of the plants but also conserve them through proper propagation and breeding. The Government has given encouragement and support for research towards native plant species. The Ministry of Science and the Environment reported that only 3 percent of our forest plants are studied for use in medicine and health (The Star, 2002)

Thus, the potential of using local plants for the urban landscape is great. But research regarding their light requirements, growing media, nutrients and water



requirements as well as pests and diseases are essential before they can be introduced for landscape use. The acclimatization process is critical for plants to be successful in an environment that differ from their natural environment (Saharan, 2000).

1.1 Native plants in urban areas

The landscape industry in Malaysia has progressively developed since the 70's and supported by a number of local authorities. The focus however, is on important areas like highways and roads, buildings and parks. Until today, the government still gives serious effort in developing the industry by launching continuous campaign on tree planting.

A strategic vision set by the government of Malaysia is to transform Malaysia into Garden Nation by 2005. One of the efforts towards achieving this objective is to put more effort to plant trees in urban areas to offset the fast pace of physical development. Therefore, in March 1997 Prime Minister launched the Greening Nation program. This program was carried out extensively with the support of private sectors, city dwellers and other government agencies.

In Malaysia, landscaping is more related to tree planting. Although this is actually only one aspect of the overall landscape development of the nation, it is a very important component (Saharan, 2000). The City Hall of Kuala Lumpur itself has already planted more than 400,000 trees and 6,000,000 shrubs around the city (Nordin, 1997). To add beauty and enhancement to the city during SUKOM in



1998, many exotic shrubs species were chosen and planted in Kuala Lumpur and other venues. It was estimated that about 1 million plants (including shrubs) were planted. Many of new colourful flowering and foliage species were introduced to the urban landscape during that time. The species include *Turnera ulmifolia*, *Iresine herbstii*, *Arachis pintoii* and *Allamanda* sp. Although they were well adapted to the local Malaysian conditions, the plants still need high maintenance on pruning because of the plant vigorous growth characteristic. Lack of maintenance such as pruning and fertilization could cause the plants to become invasive impeding the local species and become a threat to agriculture.

1.2 Justification for use of native plants

The use of native plants in landscaping has a lesser threat compared to the exotic species that have been used by the public. *Pseuderanthemum graciliflorum* is among native shrub species that has the potential to be introduced as a landscape plant (Davidson and Bland, 1993).

There has not been any previous study done on *Pseuderanthemum graciliflorum* in terms of its adaptability and basic plant requirements. This study was carried out to understand the plant capability especially from the viewpoint of its physiological aspect on growth and survival in different environment conditions. If there is no interference in its habitat, the existing species will form a balanced population in the bioregion. Disturbance in the surrounding area will either cause vigorous vegetative growth or suppress the reproductive part. Acclimatization



process is critical for plants to be used in environments that differ from the environment in which they are raised. This is to ensure good quality remains after delivery and a quick establishment once they are transplanted onto landscape site.

Therefore, studies on characteristics of these species under different shade levels and growing media combinations will aid in their introduction as a quality landscape plant.

The goal of this study was to determine the performance of *Pseuderanthemum graciliflorum* and *Melastoma malabathricum* grown under different shade levels.

1.3 Objectives of study

The objectives of this study include:

1. To determine the optimum shade requirement of the selected plants.
2. To study the characteristics of the species as influenced by shade levels.
3. To determine the consumer preferences of the species.