

**STEMS' DIAMETER VARIATIONS TO DETECT SYMPODIAL  
ORCHIDS' WATER STRESS**



**RESEARCH MANAGEMENT INSTITUTE (RMI)  
UNIVERSITI TEKNOLOGI MARA  
40450 SHAH ALAM, SELANGOR  
MALAYSIA**

**BY :**

**NAIMAH BINTI MAT ISA  
SHAH RIZAM BINTI MOHD SHAH BAKI  
NOORITAWATI BINTI MD. TAHIR  
HUSNA BINTI ZAINOL ABIDIN  
MOHD. KHAIRI BIN NORDIN**

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## Letter of Offer (Research Grant)

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Tarikh : 30 Disember 2010



**Pn Naimah Mat Isa**  
Fakulti Kejuruteraan Elektrik  
Universiti Teknologi MARA  
40450 Shah Alam

Y. Brs. Prof/Tuan/Puan

### KELULUSAN SKIM GERAN PENYELIDIKAN FRGS FASA 2/2010

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Dengan hormatnya perkara di atas adalah dirujuk.

2. Sukacita dimaklumkan pihak Kementerian Pengajian Tinggi melalui surat JPT.S(BPKI) 2000/011/010 Jilid. 5 (54) telah meluluskan cadangan penyelidikan Y. Brs. Prof./tuan/puan untuk di biayai di bawah Skim Geran Penyelidikan Fundamental (FRGS) Fasa 2/2010.

3. Bagi pihak Universiti kami mengucapkan tahniah kepada Y. Brs. Prof./tuan/puan kerana kejayaan ini dan seterusnya diharapkan berjaya menyiapkan projek ini dengan cemerlang.

4. Peruntukan kewangan akan disalurkan melalui tiga (3) peringkat berdasarkan kepada laporan kemajuan serta kewangan yang mencapai perbelanjaan lebih kurang 50% dari peruntukan yang diterima.

Peringkat Pertama	20%
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5. Untuk tujuan mengemaskini, pihak Prof./tuan/puan adalah diminta untuk melengkapkan semula kertas cadangan penyelidikan sekiranya perlu, mengisi borang setuju terima projek penyelidikan dan menyusun perancangan semula bajet yang baru seperti yang diluluskan. Sila lihat lampiran bagi tatacara tambahan untuk pengurusan projek.

Sekian, harap maklum.

**“SELAMAT MENJALANKAN PENYELIDIKAN DENGAN JAYANYA”**

Yang benar

**MUSTAFAR KAMAL HAMZAH**  
Ketua Penyelidikan (Sains dan Teknologi)

Penolong Naib Canselor (Penyelidikan) : 03-5548 2094, 2095  
Bahagian Penyelidikan : 03-5548 2091, 2092, 2093, 2094, 2095  
Bahagian Perundingan : 03-5548 2096, 2097, 2098, 2099  
Bahagian Inovasi : 03-5548 2092, 2093, 2094

Bahagian Penerbitan : 03-5548 2035, 2036  
Bahagian Sokongan ICT : 03-5548 2092, 2094, 5521, 1461  
Bahagian Sains : 03-5548 2040, 5521, 1463  
Pejabat Am : 03-5548 2092, 2093, 2094, 2095, 2096

Penolong Pentadbiran : 03-5548 2090  
Fax : 03-5548 2096, 2097  
Unit Kewangan Zon 17 : 03-5548 3404  
03-5521 1586



Research Management Institute (RMI) Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia  
<http://www.rmi.uitm.edu.my>



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## **1.2 Enhanced Executive Summary**

The measurements of stems' has played an important indicator for plant's water status. Many researches have been carried out in terrestrial plants to investigate the stems' variations of responses that had inspired to develop a precise irrigation system. Hence, the work presented in this thesis investigates the stems' variations in epiphyte plants that are sympodial orchids. A strain gauge was used as a sensor to measure the orchid's stem variation for 48 days at two stages of measurements. The Dendrobium orchid that grew from tissue culture was chosen as a sampling plant due to its popularity as a cut flower in the world's demand. The experiment was done within 30 days involving 10 samples of orchid plants growing indoor and outdoor. The measurements were recorded every 15 minutes continuously along the experiment executed. The 2 mm aluminium strain gauge and its signal conditions that integrated with PIC produced a correlation at 0.96 between its output and the changes in displacement. The results showed that the stems' diameter variations in Dendrobium orchids could be manipulated for further analysis and it had played a significant role for triggering further researches in the developments of a precise watering system in the orchid farms.

### 1.3 Introduction

In farming activities, the cost of irrigation or watering the crops contributes a huge amount of financial usage from the whole farm's operational costs. Nowadays, due to freshwater supply has become an important issue around the world, an alternative method for precise irrigation or watering system is a must in agriculture farms. The system will highly give a good impact by increasing the farm's profit through the reduction of irrigation or watering costs. The parameters that can be manipulated to develop the system is through the identification of the plant's water status. The plant's water status can be used to monitor the need of water in plant by measuring several parts of the plant's anatomy.

The plant's water status can be evaluated through measurement of the physical information from roots, leaves and stems. The other indirect measurements that can be related to the plant's water status also has been investigated by using spectral reflectance, canopy temperature, ultrasound, soil moisture, microwave sensor, infrared and remote sensing techniques.

The stem's diameter variations (SDV) measurement is one of the techniques to get the information of plant's water status and to measure the plant's growth rate. The use of SDV for scientific study was started in year 1759 by Marsham, with using a tapes and calliper. The SDV was driven by the water changes in plant cell called xylem.

The investigation of plant's water status using the above mentioned techniques including the SDV by previous researchers used a terrestrial plant for their sampling. The grape, cotton, apple, citrus, almond, plum, sunflower tree, cherry tree, olive, cypress trees, peach and lemon, walnut are the examples of terrestrial plant that used for the purpose. There are no researches so far that investigate the SDV in the epiphyte plant to relate it to the plant's water status through stem. The orchid in epiphyte group was used in this study to investigate the relationship between its SDV and its water status.