



**UNIVERSITI PUTRA MALAYSIA**

***GENETIC DIVERSITY AND STABILITY ANALYSIS  
OF SWEETPOTATO (*IPOMOEA BATATAS* Lam. L.)  
GERMPLASM FOR LEAFY VEGETABLE QUALITY***

**THIYAGU DEVARAJAN**

**FP 2012 37**

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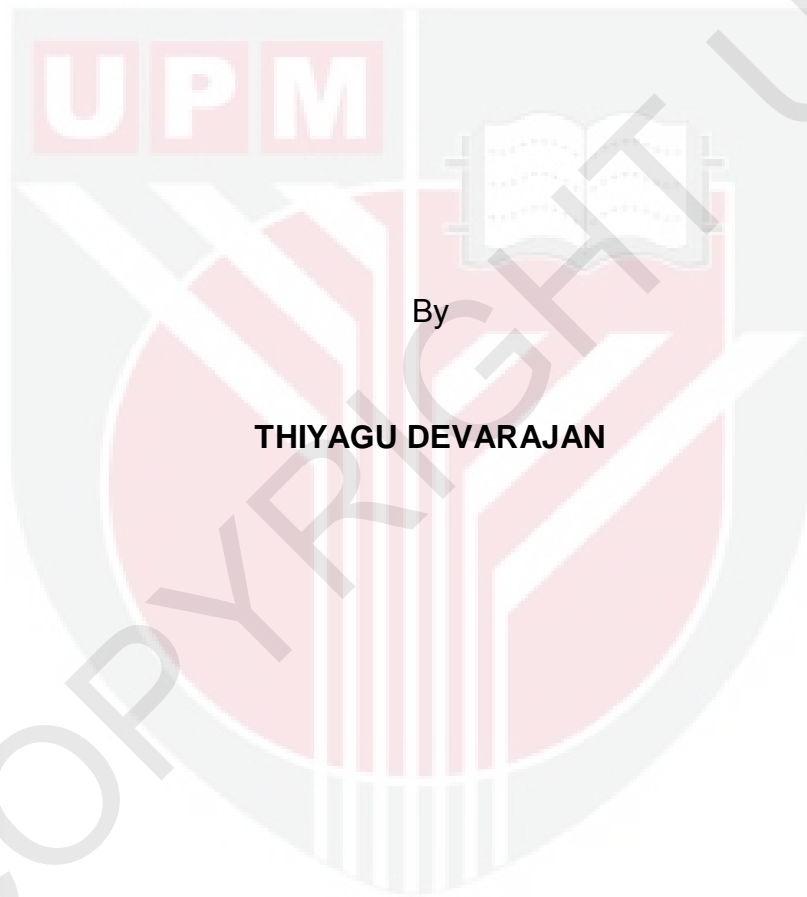


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MASTER OF SCIENCE  
UNIVERSITI PUTRA MALAYSIA

2012

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(*IPOMOEA BATATAS* Lam. L.) GERMPLASM FOR LEAFY VEGETABLE  
QUALITY**



By

**THIYAGU DEVARAJAN**

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
in Fulfilment of the Requirements for the Degree of Master of Science

April 2012

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

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**Chairman :** Assoc. Prof. Mohd Rafii Yusop, PhD

**Faculty:** Faculty of Agriculture

In Malaysia, sweetpotato has a good potential to be an important crop but currently it is not fully utilized. The leafy tops are sold in the market as vegetable, but the varieties sold are varied especially in eating quality. The objectives of this study were to evaluate the genetic diversity of leaf characters and yield components of selected twenty-two out of hundred fifty sweetpotato genotypes available in Malaysian Agriculture Research Development Institute (MARDI)'s sweetpotato germplasm collected from throughout Malaysia and other countries, subsequently to identify potential genotypes grown across different types of agro-ecology for vegetable use. In the first experiment, twenty sweetpotato genotypes were selected from MARDI's germplasm collection and another 2 genotypes obtained from wet market, Serdang, Selangor, and were evaluated in MARDI Research Station, Serdang. The genotypes were planted with three replications on three-bed plots using randomized complete block design. The planting distance was 50

cm between bed and 25 cm within planting rows, and 20 of 30 cm shoot cuttings were used as planting materials. Results showed, morphological, yield and yield component traits were highly variable. Heritability estimates accounted for more than 80% in all traits except latex, hairiness, mature leaf size (cm) and leaf number per 10 cm shoot. In most traits a large portion of the phenotypic variance was accounted for by the genetic component. MIB12 recorded high total shoot yield (kg bed<sup>-1</sup>) followed by MIB05. Meanwhile, MIB17 had the largest leaf area (cm<sup>2</sup>), while MIB09 with the smallest. For the overall consumer acceptability score in organoleptic test, MIB05 was chosen as highly preferred genotype followed by MIB14, MIB13 and MIB15.

In the second experiment, six selected genotypes from the first experiment namely, MIB05, MIB12, MIB13, MIB14, MIB15 and MIB20 were evaluated in four locations over two planting seasons. The six genotypes were selected based on shoot yield, low latex exudation, root yield and organoleptic characters. The trials were conducted at four locations, namely Serdang, Selangor (mineral soils), Telong, Kelantan (bris soils), Kundang, Selangor (tin-tailing soils) and Pontian, Johor (peat soils) with four replications using randomized complete block design in each agro-ecology. MIB05 had high total shoot yield in all agro-ecologies except in Pontian. Although MIB05 produced high shoot yield it had low or no root yields. The genotype stability analysis indicates that MIB15 was either stable or highly stable in all agro-ecologies in most characters using genotype-grouping techniques, non-parametric ( $S^3_i$ ) and superiority measure ( $P_i$ ) statistics. In this study, leaf area (cm<sup>2</sup>), petiole length (cm) and 30-shoots weight (kg) exhibited genotypic

coefficient variation (GCV) and phenotypic coefficient variation (PCV) more than 20% and heritability more than 40% at all agro-ecologies suggesting that these characters would be very useful as a base for selection in sweetpotato breeding programs. Finally this study suggests that MIB15 is highly recommended for leafy vegetable and root production across agro-ecologies. Meanwhile MIB05 is recommended for shoot yield production especially for planting on bris soils.



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

**KEPELBAGAIAN GENETIK DAN ANALISIS KESTABILAN JANAPLASMA KELEDEK (*IPOMOEA BATATAS* Lam. L.) UNTUK KUALITI SAYURAN DAUN**

Oleh

**THIYAGU DEVARAJAN**

**April 2012**

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Di Malaysia, keledak berpotensi menjadi tanaman penting tetapi pada masamkini belum dimanfaatkan sepenuhnya. Pucuk keledak ada dijual di pasar tempatan tetapi dari varieti yang berbeza-beza terutamanya dari segi kualiti pemakanan. Objektif kajian ini adalah menilai kepelbagaian genetik ciri pucuk dan komponen hasil genotip keledak yang terdapat di janaplasma keledak MARDI dan seterusnya, untuk mengenalpasti genotip berpotensi untuk kegunaan pucuk sebagai sayuran yang sesuai ditanam di pelbagai persekitaran ekologi. Di dalam percubaan pertama, dua puluh daripada seratus lima puluh genotip keledak telah dipilih dari koleksi janaplasma MARDI (dalam dan luar negara) dan dua genotip didapati daripada pasar basah Serdang, Selangor, dan telah dibuat penilaian di Stesen MARDI Serdang. Genotip tersebut ditanam dengan tiga replikasi di atas tiga batas per plot dengan menggunakan rekabentuk blok penuh rawak. Jarak tanaman adalah 50 cm di antara batas dan 25 cm di dalam baris, dan menggunakan 20 keratan pucuk sepanjang 30 cm sebagai bahan tanaman.

Keputusan menunjukkan, ciri morfologi, hasil dan komponen hasil adalah sangat bervariasi. Anggaran keterwarisan adalah melebihi 80% bagi semua ciri kecuali latek, kepadatan rambut, saiz daun matang (cm) dan bilangan daun dalam setiap 10 cm pucuk. Dalam kebanyakan ciri, kadar yang tinggi dari variasi fenotip adalah dari sumbangan komponen genetik. MIB12 menunjukkan jumlah hasil pucuk yang tinggi dan diikuti oleh MIB05. Sementara itu, MIB17 mempunyai luas daun yang terbesar, manakala MIB09 adalah yang terkecil. Skor penerimaan pengguna keseluruhan di dalam ujian organoleptik, MIB05 telah dipilih sebagai genotip yang paling digemari dan diikuti oleh MIB14, MIB13 dan MIB15.

Di dalam eksperimen kedua, enam genotip terpilih dari percubaan pertama, iaitu MIB05, MIB12, MIB13, MIB14, MIB15 dan MIB20 telah dinilai di empat lokasi dengan dua musim penanaman. Enam genotip tersebut telah dipilih berdasarkan ciri hasil pucuk, rembesan latek yang rendah, hasil ubi dan organoleptik. Percubaan ini, telah dijalankan di empat lokasi, iaitu Serdang, Selangor (tanah mineral), Telong, Kelantan (tanah bris), Kundang, Selangor (tanah bekas lombong) dan Pontian Johor (tanah gambut), dengan empat replikasi menggunakan rekabentuk penuh blok terawak bagi setiap agro-ekologi. MIB05 memberikan jumlah hasil pucuk yang tinggi di semua agro-ekologi kecuali di Pontian. Walaupun, MIB05 memberikan hasil pucuk yang tinggi tetapi mempunyai hasil ubi yang rendah atau tiada. Analisa kestabilan genotip menunjukkan MIB15 adalah samada sangat stabil atau stabil di semua agro-ekologi bagi kebanyakan ciri dengan menggunakan teknik pengumpulan-genotip, non-parametrik ( $S^3_i$ ) dan statistik ukuran keunggulan ( $P_i$ ). Dalam kajian ini, luas daun ( $\text{cm}^2$ ), panjang tangkai (cm) dan berat 30-



pucuk (kg) menunjukkan pekali variasi genetik (GCV) dan pekali variasi fenotip (PCV) adalah lebih daripada 20% dan keterwarisan adalah lebih daripada 40% di semua agro-ekologi menunjukkan ciri tersebut adalah sangat berguna sebagai asas pemilihan di dalam program pembaikbakaan keledak. Akhirnya, kajian ini mencadangkan MIB15 adalah sangat disyorkan untuk pengeluaran sayur berdaun dan ubi di pelbagai agro-ekologi. Sementara itu, MIB05 adalah disyorkan untuk pengeluaran hasil pucuk terutama bagi penanaman di tanah bris.



## ACKNOWLEDGEMENTS

First my humble salutation to Lord Almighty, by His Grace and blessing able to complete this thesis. Second, my sincere appreciation to MARDI for sponsoring my master degree. This research was partly supported by Science Fund grant (05-03-08SF0126).

I would also like to express my deep appreciation to the chairman of my supervisory committee, Assoc. Prof. Dr. Mohd Rafii Yusop, for his patience, invaluable advice and guidance and endless encouragement throughout my graduate study. I would like to also thank my other committee member, Assoc. Prof. Dr. Mahmud Tengku Muda Mohamed, Department of Crop Science for his creditable suggestions and comments, close support on my thesis. Also my sincere thanks and gratitude to the following:

Dr. Indu Bala Jaganath from MARDI for constant motivation, encouragement and support.

Special thanks to the supporting staffs from MARDI for their invaluable help which enabled me to carry out the agro-ecology trials, they are: En. Badrul Hisham bin Abu Bakar (Serdang), En. Abdul Hamid bin Idris (Pontian), En. Mohd Rosli bin Ismail (Telong) and En. Mustafar bin Yaakob (Kundang).

Special thanks are conveyed to Dr. Habibuddin, Dr. Tan Swee Lian and Tn. Hj. Mansor bin Puteh for their encouragement and valuable comments on this project.

Special thanks to Ms. Gan Huang Huang from Applied Agricultural Research Sdn. Bhd. for assisting me on the use of GenStat software for AMMI analysis. Not forgetting Dr. Ahmad bin Selamat who have taught me on use of statistical analysis technique.

Finally, I would like to extend my greatest appreciation to my beloved late father, (Devarajan Dewudoo) and mother Saratha Devi Shanmugam for their love, inspiration, care and support.



## APPROVAL

I certify that an Examination Committee has met on **27 APRIL 2012** to conduct the final examination of Thiyagu Devarajan on his M.Sc. thesis entitled "GENETIC DIVERSITY AND STABILITY ANALYSIS OF SWEETPOTATO GERMPLOASM FOR LEAFY VEGETABLE" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the student be awarded the M. Sc.

Members of the Examination Committee were as follows:

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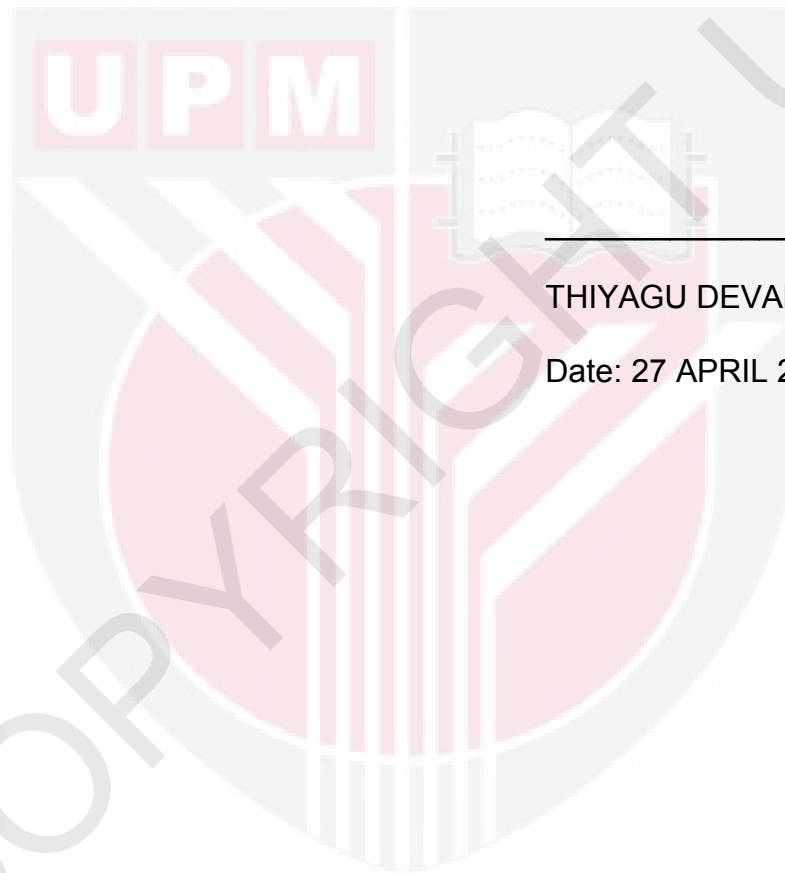
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Date :

## DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or any other institution.



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THIYAGU DEVARAJAN

Date: 27 APRIL 2012

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