UNIVERSITI PUTRA MALAYSIA

USE OF ORGANIC ENRICHMENT AS ADDITIVES IN COCONUT COIR DUST SOILLESS CULTURE FOR GROWTH AND YIELD OF TOMATOES (Lycopersicon esculentum Mill. cv. Beril)

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MASTER OF SCIENCE
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By

SOLMAZ MOKHTARI

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

September 2010

DEDICATION

To my beloved father and mother

To my dearest brother, sister and my sister in law

To dearly missed my grandparents.

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

USE OF ORGANIC ENRICHMENT AS ADDITIVES IN COCONUT COIR DUST SOILLESS CULTURE FOR GROWTH AND YIELD OF TOMATOES (*Lycopersicon esculentum* Mill. cv. Beril)

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September 2010

Chairman : Professor. Mohd Razi Ismail, PhD

Faculty : Agriculture

Soilless culture is an artificial means of providing support for plants as well as a reservoir for nutrients and water, and is becoming an important part of world agriculture. In Malaysia there is a rapid expansion on the use of locally produced coconut coir dust (CD) as a growth media. The main limitation in using this media its low cation exchange capacity (CEC) and poor water retention that can affect plant development. These limitations may be overcome with organic amendments. Hence, the main objective of this study was to determine the effect of different concentrations of empty fruit bunch (EFB) and vermicompost (VC) as additives on the growth and yield of tomato plants grown in coconut coir dust media.

Experiments were conducted on 100% CD (control) with nutrient solution (EC=2.5 $mScm^{-1}$), and 30% of EFB with 70% CD, 10% VC with 90% CD, 20% VC with 80% CD, 30% VC with 70% CD and 40% VC with 60% CD (on pot volume basis)

in which the nutrient concentrations was half of those supplied in the control. The results showed that plants grown in CD with 20% and 10% of VC had higher growth and yield compared to plants grown in 100% CD or CD mixed with EFB. Total yield and fruit quality of tomatoes were improved by vermicompost amendment as additive in the coconut coir based media. The investigation on tissue nutrient content showed high accumulation of N, P, K, Ca and Mg in organic enrichment (EFB and VC) media in comparison to the control (100% CD). The N uptake in shoots from enrichment with half of nutrient concentration (EC=1.25 $mScm^{-1}$) was more (EFB = 46.52 mg/plot and 20%VC= 30.96 mg/plot) than in shoots from the control with EC =2.5 $mScm^{-1}$ (29.48 mg/plot).

Results on tomato fruit analysis showed higher heavy metal concentrations in CD with high electrical conductivity of 2.5 mS cm^{-1}. Fruits obtained in the three amended media had Zn, Cu and Cd concentrations below UK Guidelines (1989). Pb concentration was also within safe limits according to international guidelines (UK Guidelines, 1989). Overall, these results suggest that with the use of organic amendments lower volume of chemical nutrients can be used to achieve good yield in soilless culture.

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

PENGGUNAAN ORGANIK YANG KAYA DENGAN NUTRIEN SEBAGAI BAHAN TAMBAH PADA PERTUMBUHAN, DAN HASIL POKOK TOMATO *(Lycopersicon esculentum Mill*) DALAM SABUT KELAPA TANPA TANAH

Oleh

SOLMAZ MOKHTARI

September 2010

Pengerusi : Professor. Mohd Razi Ismail, PhD

Fakulti : Pertanian

Kultur tanpa tanah adalah kaedah bukan semulajadi yang membantu dalam penyimpanan dan pembekalan nutrient dan air pada tumbuhan, dan kaedah ini menjadi semakin penting dalam dunia pertanian. Di Malaysia penggunaan sabut kelapa (CD) yang dihasilkan sebagai media pertumbuhan tempatan dari bahan buangan kelapa sedang berkembang pesat. Namun begitu, masalah utama yang dihadapi dalam penggunaan sabut kelapa- adalah pertukaran kapasiti kation (CEC) yang rendah, dan status pemegang air yang boleh memberi kesan pada- pertumbuhan pokok. Akan tetapi kelemahan sedemikian boleh di atasi dengan penambahan bahan organic tambahan dalam media. Oleh yang demikian, objektif utama experiment ini adalah untuk mengkaji kesan penambahan tandan sawit kosong (EFB) dan pelbagai kuantiti (10%, 20%, 30% and 40%) vemikompos (VC) pada pertumbuhan dan hasil pokok tomato di dalam media sabut kelapa. Di dalam ujikaji

ini, pokok tomato ditanam dalam pelbagai campuran CD: 100% CD (sebagai kawalan) dengan larutan nutrien (EC=2.5 $mScm^{-1}$), 70% EFB + 30% CD, 10% VC + 90% CD, 20% VC + 80% CD, 30% VC+ 70% CD dan 40% VC + 60% CD dengan larutan separuh nutrient (EC=1.25 $mScm^{-1}$). Dalam semua rawatan media yang merupakan campuran dengan bahan organik tambahan, nutrien yang diberi kepada media adalah pada separuh kekuatan sahaja.

Keputusan kajian menunjukkan bahawa pertumbuhan dan hasil pokok dalam media CD yang bercampur dengan 10% dan 20% vemikompos adalah lebih tinggi berbanding dengan media 100% CD atau CD bercampur dengan EFB.

Penambahan vermikompos sebagai bahan tambahan di dalam sabut kelapa telah meningkatkan kualiti pemasaran dan keseluruhan hasil buah tomato. Tambahan pula bekalan bahan kimia pada daun dan di dalam media N, P, K, Ca and Mg bertambah baik apabila media dicampurkan degan vermikompos dan tandan kelapa sawit kosong berbanding dengan sabut kelapa sahaja.

Keputusan analisis buah tomato menunjukkan peningkatan kepekatan logam dengani media sabut kelapa yang menerima nutrient pada kondultiviti elektrik yang tinggi (2.5 $mScm^{-1}$). Kepekatan logam berat seperti Zn, Cu dan Cd di dalam tiga jenis media yang bercampur dengan bahan tambahan organic adalah lebih rendah berbanding garispanduan antarabangsa (UK Guidelines,1989). Mengikut piawaian antarabangsa kepekatan Pb juga adalah didalam tahap selamat (UK Guidelines, 1989). Secara keseluruhan, keputusan kajian ini mencadangkan bahawa dengan

penambahan bahan organik ke dalam media pertumbuhan (tanpa tanah) seperti CD, pertumbuhan dan hasil yang baik boleh diperolehi dengan menggunakan isipadu baja kimia yang lebih rendah.

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Finally, most profound thanks go to the Malaysian government and people represented by University Putra Malaysia, for giving me this opportunity to study in their prestigious and reputable institute.

I certify that a Thesis Examination Committee has met on the September 2010 to conduct the final examination of Solmaz Mokhtari on her Master of Agriculture Science thesis entitled "Use of Organic Enrichment as Additives in Coconut Coir Dust Soilless Culture for Growth and Yield of Tomato (*Lycoperiscon esculentum* L.)" in accordance with Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the relevant degree.

Members of the Examination Committee were as follows:

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This thesis was submitted to the Senate of University Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Agriculture Science.
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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 other institution.

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SOLMAZ MOKHTARI

Date: 6 September 2010

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