UNIVERSITI TEKNOLOGI MARA

AGROBACTERIUM RHIZOGENES – MEDIATED HAIRY ROOTS CULTURES OF *CAPSICUM ANNUUM* AND *CAPSICUM FRUTESCENS*

NURSURIA MD SETAMAM

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of University Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification

I, hereby acknowledge that I have been supplied with the academic rules and regulation for Post Graduates, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Nursuria Md Setamam
Student I.D. No.	:	2011980079
Programme	:	AS 780 (Plant Tissue Cultures)
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Signature of Student	:	.....
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ABSTRACT

Capsicum annuum and *Capsicum frutescens* also known as "chilies" have tremendous economic values as crops and medicinal plants. In recent years, the establishment of hairy roots cultures via *Agrobacterium rhizogenes* had provided numerous advantages to many plant studies including *Capsicum* species. Therefore, in this research, *A. rhizogenes*–mediated hairy roots cultures were studied with the expectation to provide a better understanding and alternative solutions regarding these species. The objectives were to induce and proliferate the putative hairy roots, callus, and regenerated plantlets of *C. annuum* and *C. frutescens* with variables factors such as hormones, media and explants. The volatile compounds present in cultures samples were also identified. Initially, the cotyledon, radical and hypocotyl explants were obtained from seedlings and co-cultured with isolated strains of *A. rhizogenes* (ATCC 15834, ATCC 43056, ATCC 13333 and ATCC 43057). The highest induction putative hairy roots were transferred as explants into liquid MS with 0.2, 0.4, 0.6, 0.8, 1.0 mg/L of IAA for proliferation. The explants were also cultured in 0.5, 1.0, 1.5, 2.0 mg/L of each IAA, NAA, and 2,4-D for callus induction. In plant regeneration, the explants were cultured in solid MS containing 0.25, 0.5, 1.0, 1.5, 2.0 mg/L of BAP. Each treatment consisted of 20 replications and sub-cultured every two weeks. Proliferated hairy roots, callus, leaves, and stem from putative hairy roots explants were dried and extracted by using three types of solvents for GC-MS analysis. Findings showed that, the highest induction efficiency was achieved by using cotyledon explants which were ATCC 43056 for *C. annuum* and ATCC 15834 for *C. frutescens*. The presence of 1.0 mg/L IAA was suitable for putative hairy roots proliferation in both species. Meanwhile, 1.0 mg/ L and 1.5 mg/L of NAA for *C. annuum* and *C. frutescens* respectively, improved the callus induction. Through direct morphogenesis, the optimum concentration of BAP for plant regeneration were achieved in 1.5 mg/L for *C. annuum* and 1.0 mg/L for *C. frutescens*. Various beneficial compounds had been identified via GC-MS analysis for both *C. annuum* (33 compounds) and *C. frutescens* (37 compounds). More compounds were found in hexane extract compared to other solvents and proliferated putative hairy roots consisted more of compounds than other cultures. As a conclusion, *A. rhizogenes*–mediated hairy roots cultures can be used as an alternative tool to overcome recalcitrant. However, more further studies on additional factors were recommended in the future.

TABLE OF CONTENTS