

**EFFECTIVENESS OF VESICULAR  
ARBUSCULAR MYCORRHIZA ON  
ROOT DEVELOPMENT OF SAGO  
PALM PLANTLETS**

**SITI SAHMSIAH BINTI SAHMAT**

Thesis submitted in fulfillment  
of the requirements for the degree of  
**Master of Science**

**Faculty of Applied Sciences**

**April 2014**

## **AUTHOR'S DECLARATION**

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

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulation for Post Graduate, UniversitiTeknologi MARA, regulating the conduct of my study and research.

Name of Student : Siti Sahmsiah binti Sahmat  
Student I.D No. : 2008757871  
Programme : Master of Science  
Faculty : Faculty of Applied Sciences  
Title : Effectiveness of Vesicular Arbuscular Mycorrhiza on  
Root Development of Sago Palm Plantlets

Signature of Student :  
Date : April 2014

## ABSTRACT

The state of Sarawak in Malaysia started the world's first plantation of sago palm (*Metroxylon sagu* Rottboll) in Mukah Division in the 1990s to cope with the growing demands of sago flour. Sago palm planting material using tissue culture propagation has been hindered by the slow nursery growth of the plantlets. Earlier studies have shown that the introduction of indigenous mycorrhiza belonging to the *Glomus* species isolated from wild sago palm have accelerated growth of tissue cultured plantlets in the nursery stage. *Arum* type with intercellular hyphae of arbuscles was discovered in the study. The successful isolation and bulking of the vesicular arbuscular mycorrhiza (VAM) inoculum using the alternate host, *Allium* sp. enabled study on the growth response of sago plantlets to VAM which indicated that the symbiosis relationship overcoming transplanting shock and accelerating nursery establishment. The introduction of VAM to *in-vitro* sago palm plantlet has not been investigated. Therefore, the main objective is to study the effectiveness of VAM on root development of sago palm plantlets. Inoculums obtained from the wild sago palms, confirmed as VAM were produced in a cultured media. A range of pH 3.8 to pH 6 was prepared to observe the highest number of spore production. The infectivity of cultured spores was determined by the colonization of VAM on alternate host and confirmed by the presence of VAM characteristic. The cultured spore was inoculated to the plantlets aged from stage three aged from zero to eight month. The result showed the highest production of spores occurred at pH 4.2 after 21 days of inoculation to the host plant of *Allium* sp. The cultured spores colonized the roots of the *Allium* sp. indicating its infectivity and therefore were used as a source of inoculum to infect the tissue plantlets of sago palm. An experiment based on complete randomized block design (CRDB) technique was carried out in the biotechnology laboratory of CRAUN Research Sdn. Bhd. to determine the plantlet infections after being surface sterilized with Teepol detergent. The spore number that resulted in the most successful infection of sago palm plantlets was 15 spores with 10.6% infection on plantlets aging between zero to two months old. The beneficial effect of VAM spores inoculated micropropagated plantlets at the *in-vitro* stage was reflected by the early initiation of lateral root growth. Thus, with accelerated root establishment in the *in-vitro* stage will overcome the problem of using micropropagated plantlets as planting materials.

# TABLE OF CONTENTS

	<b>Page</b>
<b>AUTHOR'S DECLARATION</b>	ii
<b>ABSTRACT</b>	iii
<b>ACKNOWLEDGEMENT</b>	iv
<b>TABLE OF CONTENTS</b>	v
<b>LIST OF TABLES</b>	viii
<b>LIST OF FIGURES</b>	ix
<b>LIST OF PLATES</b>	x
<b>LIST OF ABBREVIATIONS</b>	xii
<b>CHAPTER ONE: INTRODUCTION</b>	
1.1 Background of The Study	1
1.2 Problem Statement	2
1.3 Objectives	2
<b>CHAPTER TWO: LITERATURE REVIEW</b>	
2.1 Botanical Characteristics	3
2.1.1 Characteristic of Sago Palm	3
2.2 Economic Importance of Sago Palm	4
2.2.1 Starch	5
2.2.2 Food Delicacies	5
2.2.3 Production of Ethanol	6
2.3 Economic Importance of Sago Industry in Sarawak	7
2.4 Mycorrhiza	8

2.5	Abiotic Factors	10
2.6	Development of Spores as VAM Inoculum	11
2.7	Introduction of VAM to Micropropagated Plantlets	12

### **CHAPTER THREE: MATERIALS AND METHODS**

3.1	Determination of Suitable Formulation for the Production of Spores of VAM of Sago Palm	14
3.1.1	Collection of VAM Inoculum of Sago Palm	14
3.1.2	Confirmation of Presence of VAM in Sago Root Source	15
3.1.3	Infectivity of Root Fragments and Harvested Spores on <i>Allium</i> sp.	16
3.1.4	Formulation of Culture Medium for Production of Sago VAM Spores	18
3.1.5	Culturing of VAM Spores	20
3.1.6	Harvesting VAM Spores From Stock Solution	21
3.2	Investigation of Infectivity of Cultured Spores on The <i>Allium</i> sp. as Alternate Host	23
3.3	Determination of Growth of <i>In-Vitro</i> Tissue Culture Plants Colonized by Sago VAM	23
3.3.1	Sterilization of Cultured Spores	24
3.3.2	Inoculation of <i>In-Vitro</i> Tissue Culture Sago Palm Plantlets with Sterilized Cultured Spores	24

### **CHAPTER FOUR: RESULTS**

4.1	Confirmation of Presence of VAM in Sago Root Source	27
-----	---	----