DEVELOPMENT OF AN INOCULUM AND IDENTIFICATION OF COMPONENT OF VESICULAR-ARBUSCULAR MYCORRHIZA FOR IMPROVED SURVIVAL AND GROWTH OF MICROPROPAGATED SAGO PALM (*Metroxylon sagu* ROTTBOLL) AT NURSERY STAGE

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Dear Professor,

FINAL RESEARCH REPORT - "DEVELOPMENT OF AN INOCULUM AND IDENTIFICATION OF COMPONENT OF VESICULAR-ARBUSCULAR MYCORRHIZA FOR IMPROVED SURVIVAL AND GROWTH OF MICROPROPAGATED SAGO PALM (*Metroxylon sagu* ROTTBOLL) AT NURSERY STAGE"

With reference to the above, I am pleased to submit three copies of the final research report entitled: Development of an inoculum and identification of component of Vesicular-arbuscular mycorrhiza for improved surivival and growth of micropropagated sago plam (*Metroxylon sagu* Rottboll) at nursery stage.

Thank you.

Yours truly,

MARGARET CHAN KIT YOK
Leader
Research Project

TABLE OF CONTENTS

ABSTRACT

The ability and compatibility of the vesicular-arbuscular mycorrhizal (VAM) fungi, taxonomically found in the order of the Glomales of Zygomycetes indigenous to field sago palm (*Metroxylon sagu* Rottboll) on the root colonization of micropropagated sago plantlets was investigated. There were clear evidences of root colonization of the sago plantlets by the VAM with the presence of the characteristic structures: the appresoria, arbuscular and vesicles involving a sequence of steps that were documented over duration of 20 weeks. There was also a clear evidence of host control of the colonization process. Phosphate application had been shown to inhibit the colonization as indicated by the delayed presence of the characteristic structures of the VAM in the root samples of the VAM inoculated plantlets applied with phosphate by one month. The VAM inoculated plantlets without phosphate application showed better growth in shoot length which showed significance at Month Six compared to plantlets from the Control Treatment (non inoculated without phosphate) and treatments of VAM non-inoculated plantlets and VAM inoculated plantlets both applied with phosphate. Although the VAM non-inoculated plantlets with phosphate showed longer root length throughout the five months of growth, the VAM inoculated plantlets without phosphate application showed better growth in root length which could be attributed to the ability of the VAM to convert unavailable minerals in the growth depleted of nutrients. The relative growth rate (RGR cm day $^{-1}$) of shoots and roots calculated between monthly intervals over the six months' period showed comparatively faster growth rate with VAM inoculation without the application of phosphate. The beneficial effect of VAM was also expressed in the shoot and root dry and fresh weight of the plantlets. The root:shoot fresh weight ratio did not

CHAPTER 1

1.0 INTRODUCTION

Sarawak has a long history of good quality clean, odourless and uncorroded sago starch production ranking highly among the agricultural export commodities within the state. Originally, sago palm (*Metroxylon sagu* Rottboll) was purely a subsistence crop mainly on peat, especially for the population of coastal areas. The expansion is tremendous with about 1.69 million ha of peat soil that can be cultivated with this palm. The Sarawak government has developed it as a plantation crop, utilizing part of the 1 500 000 ha of peat swamps through the Land Custody Development Agency with the world's first large-scale commercial plantations near Mukah, Oya, Dalat and Sebakong. Although the palm propagates itself, both vegetatively by means of suckers and sexually at the end of its life cycle, there are major limitations due to the long gestation of the sago palm (Flach, 1997).

The future of sufficient sago planting materials will depend on the clonal propagation of sago palm through micropropagation i.e. *in vitro* techniques and genetic engineering to convert sago palm from its present semi-wild status to a modern clone with high yields, shortening gestation period of the present 10 – 15 years and responsiveness to fertilizers. Micropropagation of clonal sago planting materials has been successful since its initiation in 1985 and is being tested in the field (Zaliha, 2006). However, the extensive use of the micropropagated planting materials at the field has yet