

UNIVERSITI TEKNOLOGI MARA

**MICROPROPAGATION OF SUGAR
PALM (*Arenga pinnata* Wurm. Merr.)**

NAZATUL ASIKIN BINTI MUDA

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ABSTRACT

A micropropagation protocol of sugar palm (*Arenga pinnata* Wurmb Merr.) through seed culture, embryo culture, organ culture (direct organogenesis), callus culture and somatic embryogenesis using different type of explants (i.e. immature embryos, tender leaf of palm heart and different parts of aseptic seedlings such as leaf, upper stem, basal stem and roots) has been developed. Cultures responded differently to the different type and concentrations of plant growth regulators (PGRs) used in the artificial nutrient medium (MS). Seed culture and embryo culture through *in vitro* germination method were carried out to facilitate rapid and uniform growth of aseptic seedlings; which were later used as source of explants. Optimal establishment of aseptic seedlings (100%) was obtained through embryo culture on MS basal medium (MS0) within 7-8 weeks following inoculation. Dormancy of mature seeds used could not be broken under *in vitro* condition. The direct organogenesis culture in sugar palm on different type of explants revealed the optimum organogenic capability of basal stem explant treated with MS + 2.0 mg/L BAP + 1.0 mg/L GA₃ to regenerate into complete plantlet. Multiplication of bud-like shoots (0.04%) was determined later from the immature embryo explant treated on MS + 2.0 mg/L BAP + 1.0 mg/L GA₃ + 1.0 mg/L AgNO₃. Maximized rooting of plantlets and shoot regenerants was obtained upon transfer to MS + 3.0 mg/L IBA. Through callus culture, the significant roles of auxins particularly 2,4-D and cytokinins (BAP and Kinetin) to proliferate callus on different type of explants was proven. Immature embryo explant inoculated on MS + 0.4 mg/L 2,4-D + 0.5 mg/L BAP promoted 100% frequency of fragile, beige callus within 8 weeks of culture. Increased sucrose concentration (6.0%) and the addition of 3.0 g/L casein hydrolysate (CH) to MS + 0.4 mg/L 2,4-D + 0.5 mg/L BAP maximized the embryogenic potency of callus. Somatic embryogenesis pathway began with the development of globular and heart-shaped somatic embryos on the very same medium, which later matured into torpedo and cotyledonary developmental stages on MS + 0.4 mg/L 2,4-D + 0.5 mg/L BAP + 1.0 mg/L AgNO₃. Improved germination of cotyledonary embryos into primordial shoots and roots was achieved on MS + 1.0 mg/L BAP + 1.0 mg/l NAA. Separate regeneration of shoots and roots of normal morphology was established on ½ MS medium + 0.1 mg/L activated charcoal. Well-developed synthetic seeds production in sugar palm was obtained by the encapsulation of somatic embryos in 3.0% Na- alginate and 100 mM CaCl₂. Maximum rate (50%) of synthetic seeds germination was observed on MS + 1.0 mg/L BAP + 1.0 mg/l NAA within 8 weeks of culture. Temperature at 25°C was relevant for synthetic seed storage. Well-rooted *in vitro* plantlets survived the acclimatization phase at 80% following transfer to soil: peat moss: perlite (2:2:1) mixture. Exposure of *in vitro* plantlets for acclimatization under 50-100 μmol m⁻²s⁻¹ light intensity resulted in 60% survival rate after 12 weeks. Established plantlets were successfully maintained under greenhouse condition with 40% rate of survival after a year.

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TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	xiv
LIST OF FIGURES	xxi
LIST OF PLATES	xxiv
LIST OF SYMBOLS	xxxii
LIST OF ABBREVIATIONS	xxxiii
LIST OF NOMENCLATURES	xxxiv
CHAPTER ONE: INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	2
1.3 Objectives	3
1.4 Significance of Research	3
1.5 Scope of Research	4
CHAPTER TWO: LITERATURE REVIEW	5
2.1 Description of Palm (Arecacea / Palmae) Family	5
2.2 Genus <i>Arenga</i>	6
2.2.1 Taxonomic Description, Habitat and Economic Importance of Genus <i>Arenga</i>	6
2.3 Sugar Palm (<i>Arenga Pinnata</i> Wurmbr Merr.)	13
2.3.1 Botanical Description and Habitat of Sugar Palm	13
2.3.2 Economic Importance of Sugar Palm	17

2.3.3	Limitations of Sugar Palm's Development	20
2.3.4	Economic Distribution of Sugar Palm in Peninsular Malaysia	23
2.4	Micropropagation Studies of Palmae	25
2.4.1	Seed Culture of Palmae	26
2.4.2	Embryo Culture of Palmae	26
2.4.3	Organ Culture (Organogenesis) of Palmae	28
2.4.4	Callus Culture (Callogenesis) of Palmae	30
2.4.5	Somatic Embryogenesis of Palmae	32
2.4.6	Synthetic Seeds Technology of Palmae	33
2.4.7	Acclimatization of Plantlets (<i>In Vitro</i>) of Palmae	37
CHAPTER THREE: SEED CULTURE AND EMBRYO		41
CULTURE OF SUGAR PALM (<i>Arenga pinnata</i> Wurmb Merr.)		
3.1	Introduction	41
3.2	Materials and Methods	42
3.2.1	Plant Materials	42
3.2.2	Surface Sterilization Method	42
3.2.3	Explants Preparation	42
3.2.4	Culture Medium Preparation	44
3.3	Initiation and Establishment of Culture	44
3.3.1	Mature Seed Germination	44
3.3.2	Seed Culture and Embryo Culture under <i>In Vitro</i> Condition	44
3.4	Data Analysis	45
3.4.1	Experimental Design	45
3.4.2	Data Recorded	45
3.4.3	Statistical Analysis	46
3.5	Results	46
3.5.1	Seed Germination for Seedlings Establishment of Sugar Palm (Mature Seed Culture)	46
3.5.2	Young Seed Culture for Aseptic Plantlets Establishment of Sugar Palm	46