

UNIVERSITI TEKNOLOGI MARA

**MICROPROPAGATION OF SUGAR
PALM (*Arenga pinnata* Wurmbe 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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