Cryopreservation of oil palm (Elaeis guineensis Jacq.) polyembryoids via encapsulation–desiccation

ABSTRACT

The current report assesses the efficiency of encapsulation–desiccation protocol to cryopreserve oil palm (Elaeis guineensis Jacq.) polyembryoids. Specifically identified polyembryoids, comprising of haustorium and torpedo-shaped structures, were encapsulated [comprising 3% (w/v) sodium alginate and 100 mM CaCl2]. Calcium alginate-encapsulated and sucrose-precultured polyembryoids were subjected to different spans of desiccation in a laminar air-flow cabinet, followed by freezing in liquid nitrogen. The effect of sucrose preculture (with gradual exposure to 0.3, 0.5, 0.75 and 1 M for 7 days) and dehydration periods (0–10 h) under sterile air-flow on post-freezing survival and regrowth of encapsulated polyembryoids were studied. Cryopreserved and thawed polyembryoids (initially precultured in sucrose, followed by 9 h air-desiccated to 23.3% moisture content) displayed the highest survival percentage (73.3%) and regeneration (of shoot, root and secondary somatic embryo) on Murashige and Skoog regrowth medium containing sucrose (0.3–1 M) and 0.2 mg/l 2,4-dichlorophenoxy acetic acid. In addition, ultrastructural study using scanning electron microscopy exhibited successful revival of cryopreserved polyembryoids, owing to retention of cellular membrane stability through optimized and protected (encapsulated) desiccation. The present study thus substantiates the potential of this encapsulation–desiccation procedure in cryopreservation of oil palm polyembryoids for long-term conservation programs.

Keyword: Developmental stage; Dehydration; Preculture; Regrowth; Scanning electron microscopy