Cryopreservation of plumule explants of coconut (*Cocos nucifera* L.) by encapsulation/dehydration method

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Coconut plumule appears to be a suitable explant for cryopreservation. In the present study, cryopreservation of coconut plumules through encapsulation/dehydration method was tested. The plumules were excised from mature zygotic embryos of Sri Lanka Tall coconut and encapsulated in sodium alginate. The beads were subjected to different pretreatments comprising of 0.75 M sucrose alone and in combination with 3 different concentrations of ABA (10, 20 and 40 μM) to test the cryoprotectant ability. Prior to freezing in liquid nitrogen, the plumules were subjected to further desiccation by exposure to silica gel for 16 h. Histological analysis was also undertaken to measure the degree of cell damage caused by different treatments. The water loss from plumules during pretreatment and desiccation was monitored and survival and recovery of plumules after each treatment was studied.

The results clearly indicated the positive effect of ABA on survival and recovery of both unfrozen and frozen plumules. A very high survival rate (92 and 91%) was observed in unfrozen plumules pretreated with 20 and 40 μM ABA respectively. Similarly, pretreatment with ABA increased the survival rate of frozen plumules and the highest survival (88%) was observed in the plumules pretreated with 40 μM ABA. The recovery of plumules (frozen and unfrozen) pretreated only with sucrose was found to be very low whereas a remarkable improvement in recovery was observed with ABA. In frozen plumules, the highest rate of recovery (35%) was achieved when pretreated with 20 μM ABA. The lowest percentage of water loss (61.5%) was recorded in the plumules pretreated with 0.75M sucrose alone whereas the water loss was highest (69%) for plumules pretreated in 0.75M sucrose in combination with 40 μM ABA.

Histological analysis revealed that extensive cell damage has taken place in frozen plumules that did not undergo any pretreatment or desiccation. In ABA-treated, cryopreserved plumules, the extent of cell damage was minimal and most of the cells in the apical region were intact. Thus the higher rate of post-thaw recovery in plumules pretreated with ABA was confirmed by histological studies, indicating that ABA in combination with sucrose is an effective cryoprotectant agent for cryopreservation of coconut plumules.