

Future Studies

It has been shown in this study that the addition of carbenicillin to the culture media has increased the production and vigour of the papaya somatic embryos. However, the mechanisms of actions of carbenicillin in its dual function are unknown. Further studies on the range of carbenicillin concentrations should have generated a better prediction for the efficient production of embryogenic suspension culture. Besides, further studies on the understanding of these mechanisms will be investigated to enable future application of this antibiotic to other crops.

Rooting formation is a crucial process for the success of acclimatization and field transplantation of the tissue culture plantlets of *Carica papaya* L. In this study, 58.3 % plantlets were successfully rooted compared to Drew, 1987 and to date no other publications have shown a 100 % success. For future investigations, other methods of inducing roots such as the addition of either vermiculite or activated charcoal to the culture media, the use of liquid culture and the application of *in vivo* methods such as the use of either cushion mosses or other relevant materials, should be tested.

Although the technique of somatic embryogenesis was significantly succeeded for plantlet regeneration from suspension cultures in this study, however, the deoxyribonucleic acid (DNA) profile of the tissue culture plantlets should be verified using random amplification polymorphism DNA (RAPD) analysis compared to field grown plant to ascertain true-to-type plantlets generated from the original source explants.

Further studies on the enhancement of the production of carpaine from the suspension cultures using physical factors, elicitors, precursors and various combinations should be investigated. Current study has shown extracellular carpaine production in the cell suspension cultures using normal extraction method (acid/base extraction). Super critical fluid extraction (SFE) method will be adopted in the future to obtain high yield of pure compounds.

In the previous study, the extraction and analysis of alkaloid metabolites from papaya plants was carried out on various plant parts namely; seed (Farias *et al.*, 2007; Chend and Tsai, 2004; and Wilson *et al.*, 2002); fruit (Nitsawang *et al.*, 2006; Azarkan *et al.*, 2003; Knez *et al.*, 2003; Guillermo *et al.*, 2003; and); root (Tang and Takenaka, 1983); leaves (Khuzhaev and Aripova, 2000; Tang, 1978; Burdick, 1971; Ogan, 1970; Coke and Rice, 1965; Bevan and Ogan, 1964 and Govindachari and Narasimhan, 1953) and this was restricted to *Carica papaya* L. Further studies on this work could include chemical taxonomy and profiling of other *Caricaceaea* families and compare it with the results obtained in this study. This could help build a data base that could be used in setting up a chemical profile for valuable medicinal compound in the *Caricaceaea* families.