IS/2018/BST/014

# EXPLORING ALTERNATIVE TECHNIQUES FOR CONTAMINATION REDUCTION IN BANANA (*MUSA SPP.*) TISSUE CULTURE INITIATION PHASE

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By

**R.A.M.A Rajapaksha**

FTC 144
Project Report
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**Department of Biosystems Technology**

**Faculty of Technology**

**Eastern University, Sri Lanka,**

**Chenkalady**

**2025**

# ABSTRACT

Banana (*Musa spp.*) is a globally significant crop, valued for nutritional and economic benefits. However, its production faces challenges such as pests, diseases, and climate change, necessitating efficient propagation methods like tissue culture. Despite its advantages, contamination during the initiation phase of banana tissue culture remains a major obstacle, leading to significant losses. This study aimed to explore alternative techniques for reducing contamination in the initiation phase of banana tissue culture, focusing on the effects of light and dark conditions, meristem size, and hormone levels in the culture media. The experiment was conducted at BOT Farm, Gampaha, Sri Lanka, using healthy Cavendish banana suckers. Two types of culture media were prepared: hormone-low media (containing BAP and IAA) and hormone-free media. Explants were sterilized and dissected into small (0.5 cm) and large (1 cm) meristem sizes. These were cultured under light and dark conditions in a factorial completely randomized design with six replicates per treatment. Contamination rates and successful plantlet establishment were monitored over two-week intervals. Contaminants were identified using Potato Dextrose Agar (PDA) and Nutrient Agar (NA) media, followed by microscopic analysis. Results revealed significant differences in contamination rates across treatments. Large meristems exhibited higher contamination of (0.458) compared to small meristems (0.042), likely due to their larger surface area and greater susceptibility to microbial colonization. Light conditions significantly increased contamination (0.375) compared to dark conditions (0.125), suggesting that light may promote microbial growth or stress explants, making them more vulnerable. Hormone levels did not significantly affect contamination, indicating that the addition of BAP and IAA at low concentrations does not inherently increase contamination risk. Microscopic analysis identified bacterial contaminants such as *Bacillus spp.*, *Streptococcus spp.*, and *Pseudomonas spp.*, as well as fungal contaminants like *Fusarium spp.* and *Rhizopus spp.* These findings underscore the importance of stringent sterilization protocols and the selection of optimal explant sizes and environmental conditions to minimize contamination. The study concludes that small meristem sizes and dark conditions are more effective in reducing contamination during the initiation phase of banana tissue culture. These findings provide practical insights for improving the efficiency of banana micropropagation, particularly in commercial and research settings. Future research could explore additional sterilization

techniques, the role of endophytic microbes, and the long-term effects of these alternative methods on plantlet development and genetic stability. By optimizing these factors, the success rate of banana tissue culture can be significantly enhanced, contributing to sustainable banana production worldwide.

**Keywords**: Banana tissue culture, Contamination reduction, Hormone levels, Light conditions, Meristem size, Microbial identification.

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