OPTIMIZATION OF AN EFFICIENT TISSUE CULTURE PROTOCOL FOR GRAY BANANA *(Musa paradisiaca)* USING EXISTING HORMONE COMPOSITION IN THE INITIATION MEDIUM

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ABSTRACT

The gray banana *(Musa paradisiaca)* is an agronomically important horticultural crop with high nutritional and economic value, widely cultivated in tropical and subtropical conditions. Conventional propagation through suckers often results in a low multiplication rate and facilitates the spread of pests and diseases. Therefore, tissue culture using shoot tips provides an alternative for disease free and genetically uniform plant materials. This study aimed to develop an efficient protocol for the initiation of banana shoot tip culture using Murashige and Skoog (MS) medium supplemented with varying concentrations of 6-benzylaminopurine (BAP) and indole-3-acetic acid (IAA). Four initiation media formulated for Rathambala (T_1), Nethrapalam (T_2), and General (T_3) varieties, along with a hormone-free control (T_4), were evaluated. The effects of these treatments on shoot initiation, height, leaf formation, colour variation, and contamination rate were assessed over five weeks. Among the treatments, MS medium supplemented with 3 mg L^{-1} BAP and 2 mg L^{-1} IAA (T3) produced the best results, showing a higher number of greenish shoots (4 shoots per explant), maximum shoot formation (1.20 ± 0.20), and greater shoot height (9.34 ± 1.91 cm). In contrast, the medium containing lower hormone concentrations (T1) resulted in reduced shoot and leaf formation. Treatment 2, produced the higher number of leaves throughout the five-week culture period, indicating its effectiveness in supporting leaf initiation and expansion. Results of this study confirm that the hormonal equilibrium within the culture medium plays a crucial role in stimulating cell division and elongation, which directly influences the morphogenesis of cultured shoots. Furthermore, the study emphasized the importance of maintaining stringent aseptic conditions and effective sterilization protocols to minimize microbial contamination, a common constraint in tissue culture. Overall, shoot tip culture was validated as a practical and valuable approach for producing uniform, vigorous, and high-quality banana plantlets. This technique holds significant potential for large-scale commercial propagation, thereby contributing to sustainable banana production and agricultural advancement.

Keywords: BAP-IAA Combination, Cell Division and Elongation, Hormonal Equilibrium, *Musa paradisiaca*, Shoot Tip Initiation, Tissue Culture.

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