PLANT REGENERATION OF BANANA (*MUSA SPP.*) VIA TISSUE CULTURE TECHNIQUE

By

SARA MOHAMED ABDEL-MOTAGALY

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This Thesis for M.Sc. Degree has been approved by:

Dr. Amal Fathy Zein El Din
Senior researcher of plant physiology, Central laboratory for Date Palm researches and development, Agricultural Research Center

Dr. Amira Mahmoud Hegazi
Prof. of plant physiology, Faculty of Agriculture, Ain Shams University

Dr. Hossam Hassan Ahmed Manaf
Prof. of plant physiology, Faculty of Agriculture, Ain Shams University

Dr. Ibrahim Seif Eldin Ibrahim Aly
Prof. of plant physiology, Faculty of Agriculture, Ain Shams University, (Principal Supervisor)

Date of Examination: 11 / 8 / 2018

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Under the supervision of:

Dr. Ibrahim Seif Eldin Ibrahim Aly
Prof. of plant physiology, Department of Agricultural Botany, Faculty of Agriculture, Ain Shams University, (Principal Supervisor)

Dr. Hossam Hassan Ahmed Manaf
Prof. of plant physiology, Department of Agricultural Botany, Faculty of Agriculture, Ain Shams University

Dr. Yasmin Marzouk Ragab
Lecturer of plant physiology, Department of Agricultural Botany, Faculty of Agriculture, Ain Shams University

ABSTRACT

Sara Mohamed Abdel-Motagaly: Plant Regeneration of Banana (*Musa Spp.*) Via Tissue Culture Technique. Unpublished M.Sc. Thesis, Department of Agricultural Botany, Faculty of Agriculture, Ain-Shams University, 2018

The present investigation aimed to study the effect of some plant growth regulators on micropropagation of two explants (shoot tips of rhizomes and immature male flower buds) in *Musa acuminata* cv. Grand Nain AAA-group. Two laboratory experiments were conducted in 2014-2016 in plant tissue culture lab. Agricultural Botany Department, Faculty of Agriculture, Ain-Shams University, Shoubra El-Kheima Cairo, Egypt. Samples were taken for morphological, histological and biochemical at the rooting stage.

BA treatment at 6 mg l^{-1} led to a significantly increase in some morphological parameters compared to the rest treatments. Accumulation of total soluble sugars and free amino acids was enhanced by 6 mg l^{-1} of BA while the reverse was true with the rest biochemical compositions (total soluble phenols).

The immature male flower buds which were cultured on MS media supplemented with 6, 10 mg l^{-1} BA and 8 mg l^{-1} BA + 0.4 mg l^{-1} TDZ begin to bulge at the base and induction of white bud like structures (WBLS) was noticed after 30 days. Adding both BAP at 6 mg l^{-1} with GA_3 1.5 mg l^{-1} in the medium increased fresh and dry weights and induced a high number of shoots as well as promote shoot elongation as compared to the rest treatments. Biochemical status and treatment with benzyl adenine at 6 mg / l^{-1} during the precise propagation of shoot tips and immature male flower buds of banana may be important for its development and the optimal propagation strategy. The histological observations indicated that the shoot initiation was recorded through 16 weeks of culturing on BA media. Through this time, the shoots (adventitious buds) may be originated directly from the inflorescence axis or from a developing cushion. Each one has a meristematic dome surrounded by leaf primordia.

Key Words: Banana, *Musa accuminata* L., Micropropagation, Shoot tip, Immature male flower buds, Benzyladenine (BA=BAP).

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LIST OF ABREVIATIONS

2,4-D : 2,4-Dichlorophenoxy acetic acid
AC : Active charcoal
ADV : Adventitious buds
ANTH : Anther
BA : Benzyl adenine
BAP : Benzyl amino purine
Br : Bracts
Car. : Carotenoids
Chl. : Chlorophylls
Cu : Cushion
D.F : Dilution Factor
D.Wt : Dry weight
F.Wt : Fresh weight
FAA : Formalin-acetic acid-alcohol solution
Fil : Filament
GA_3 : Gibberellic acid
IAA : Indole acetic acid
IBA : Indole butyric acid
Kin : Kinetin
Lp : Leaf primordia
M.sh : Main shoot
MF : Male flowers
MS : Murashige & Skoog medium
NAA : Naphthalin acetic acid
Per : Perianth
PS : Procambium Strands
ROS : Reactive Oxygen Species
rpm : Round per minute
St : Stamens
TDZ : Thidiazuron

TS : Total sugars
UV : Ultra Violet
V : Volume
WBLS : White bud like structures
Zt : Zeatin

INTRODUCTION

Banana, *Musa spp.* (Musaceae) is a monocotyledon plant and the most popular commercial fruit crop grown in more than 132 countries throughout the world. It is a nutritious organic product rich in starches, potassium and a decent wellspring of vitamins. Banana contains low protein level and can be utilized to deliver huge measure of recombinant proteins (i.e. immunizations) **(Arvanitoyannis *et al.*, 2008)**. Banana is utilized as a decent wellspring of drinks, fermentable sugars, aroma, rope, cordage, festoons, protect, smoking material, and various formal and religious uses **(Nelson *et al.*, 2006)**. Generally, bananas are affected by numerous pest fungal and viral diseases. 'Grand Naine' is susceptible viral diseases.

Micropropagation has become an integral part of the banana production worldwide now as propagation by tissue culture from disease free mother plants. The planting material do not carry systemic diseases, vigorous and are more uniform in their growth, development and maturity. Thus, making the production practices easier leading to high productivity. Banana plants are generally engendered vegetatively by suckers which develop from parallel buds beginning from corms, and suckers are isolated for creation of individual plants. In a few cases, finish or splitted corms with one or a few buds are utilized **(Vuylsteke *et al.*, 1993)**.

Meristem culture offers a proficient technique for fast clonal proliferation, creation of infection free materials and germplasm safeguarding in plants **(Helloit *et al.*, 2002)**. While shoot tips have been used as explants in general for micropropagation of banana, the use of floral meristems for micropropagation has been also reported by earlier

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workers **(Ganapathi *et al.*, 1999)**. Active meristems of the inflorescence apices could also directly be induced to form multiple shoots **(Krikorian *et al.*, 1993)**. Male flowers of the banana inflorescence can become a potential regenerable explant, which shows contamination reduction during micropropagation compared to soil grown suckers and offers opportunities to regenerate plants having desirable agronomic and yield characteristics **(Darvari *et al.*, 2010).**

Micropropagation using banana male floral meristems showed no detectable somaclonal variation and found to show less risk for possible virus contamination as compared to soil grown suckers **(Resmi and Nair, 2007).** Thus the demand for a large number of suckers of elite cultivars can be met using inflorescence tip cultures **(Hrahsel *et al.*, 2014)**.

Plant multiplication from meristems, shoot tips, and other tissues without intermediate callus formations is therefore more desirable, enabling higher frequencies of plants which are genetically stable and homogenous. Specifically, male inflorescence reduces contamination rate during micropropagation as compared to soil grown suckers. Moreover, *in vitro* culture of inflorescence apices offers an opportunity to select a male bud with desirable characteristics such as a greater number of hands and fruits per bunch in situ **(Resmi and Nair, 2007**).

Therefore, the male inflorescence culture can help in increasing the efficiency of micropropagation, as well as produce plantlets from the parts which could be lost during harvesting. Micropropagation using banana male floral meristems is found to show no detectable somaclonal variation and low risk for latent virus contamination **(Harirah and Khalid, 2006)**. The early detection of the presence of somaclonal variants