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PHYSIOLOGICAL AND ANATOMICAL STUDIES ON *IN VITRO* ROOTING AND ACCLIMATIZATION OF GLOBE ARTICHOKE

By

ABD-ALSLAM ALI ALI SHOKR
B.Sc. Agric. Coop. Sci., Agric. Higher Institute for Agric. Coope., 2012

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Approval sheet

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ABSTRACT

Abdalslam Ali Ali Shokr. Physiological and Anatomical Studies on *In Vitro* Rooting and Acclimatization of Globe Artichoke. Unpublished M.Sc. Thesis, Department of Horticulture, Faculty of Agriculture, Ain Shams University, 2021.

In Egypt, the vegetative propagation of artichoke is still the only method to grow, due to keeping the original variety characteristics at the time of breeding. Adopting a tissue culture technique for vegetative propagation confers many advantages, like viral-free seedling and seedling bulk production. The goal of this study is to propagate artichokes using tissue culture techniques, as well as to improve the rooting percentage and the effectiveness of seedling acclimation in the greenhouse. In addition, anatomical study techniques were used to track the causes of weakening root development *in vitro* throughout the rooting stage. Explants were grown on a modified Murashige and Skoog (MS) medium, which had ammonium nitrate and potassium nitrate concentrations of 50, 75, and 100 percent of each, but no further changes were found. For multiplication, the developed cultures were moved to a modified MS medium containing 50 percent of both ammonium nitrate and potassium nitrate supplemented with BA at 0.5, 1.0, 1.5 mg/l and Kin at 1.0, 2.0, 4.0 mg/l or without any growth regulators. Micro shoots produced from the multiplication stage were transferred to the modified MS for roots. Both ammonium nitrate and potassium nitrate at 50% were added along with 0, 1.0, and 2.0 mg/l IBA or NAA mixed with β-cyclodextrin at 2.0 and 4.0 g/l. Exvitro acclimatization was achieved by plating rooted shoots from the *in vitro* rooting stage in plastic pots filled with a mixture of peat moss: vermiculite: Perlite (1: 1: 1, V) or peat moss: Perlite at (1: 1 by volume) or peat moss: Perlite at (1: 1, V) or Perlite: vermiculite (1: 1, V). Each group of the pots was divided into two halves,

the first was inoculated with mycorrhiza, but the other remained without inoculation. All pots were kept under a low tunnel established in a plastic greenhouse. According to the anatomical investigation, there was no structural difference between rooted and unrooted plants. By following the following technique, the artichoke may be effectively micro propagated through tissue culture: Initial explants have had a good survival rate due to sanitation with Clorox (5.25 percent) at 50% + 0.2 g/l HgCl2 for 20 minutes then planting on 50% ammonium nitrate and potassium nitrate in an MS modified medium. Kin at a concentration of 4.0 mg/l resulted in the greatest multiplication rate (number of shoots per cluster). NAA 2.0 mg/l + -cyclodextrin g/l was added to the in vitro rooting medium and was shown to be effective in obtaining the optimum root number/young shoot ratio. To obtain a high survival rate during ex vitro acclimation, a combination of Perlite: vermiculite (1:1) with mycrrhiza was used.

Key words: Globe artichoke, Micropropagation, Anatomical, Medium, Tissue culture, Cytokinins, Auxins, Acclimalization media.

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LIST OF ABBREVIATIONS

BAP	6-Benzylaminopurine
°C	Degree Celsius
Ca	Calcium
$Ca(Clo)_2$	Calcium hypochlorite
cm	Centimeter
g/l	Gram/liter
GC%	Percentage of Guanine and Cytosine
H_2SO_4	Sulfuric acid
$HgCl_2$	mercuric chloride
IBA	Indole butyric acid
K	Potassium
Kin	Kinetin
Mg	Magnesium
mg/l	Milligram/liter
MS	Murashige and Skoog
N	Nitrogen
NAA	Naphthalene acetic acid
µm	Micromilli
P	Phosphorous
pH	Power of Hydrogen
ppm	Part per million
QL	Quoirin and Lepoivre medium
SCoT	Start codon targeted
SLS	Sodium Lauryl Sulphate
SPAD	Soil Plant Analysis Development
TE buffer	A commonly used buffer solution in molecular biology
TH	Tree height
UPGMA	Unweighted pair group method with arithmetic mean
UV	Ultraviolet
v/v	Volume by volume
W	Watt
w/v	Weight by volume

INTRODUCTION

Globe artichoke (Cynara Scolymus L.) is one of the most important non-traditional vegetable crops in the composite family for export and the local marketing. The Mediterranean region and Southern Europe, considered as a habitat of the globe artichoke. It is grown for its flower heads, which are eaten raw or cooked, and the bases of the meatballs, which contain 56.5 g of water, 9.9 g of carbohydrates, 2.8 g of protein, 0.2 g of fat, 310 mg of phosphorus, 51 mg of calcium, 30 mg of sodium, and 11 mg of iron per 100 gm. It includes numerous antioxidants in addition to 150 mg vitamin A, 8 mg vitamin C, and 14 percent fibers. Globe Artichoke farming is concentrated in Egypt in northern areas, where the climate, soil, and skilled labor are ideal. The cultivated area exceeded 35081feddan, with an average yield of 8.63 tones per feddan (Ministry of Agriculture 2019). Following the entry of some promising international cultivars with greater and earlier output. Furthermore, employing proper growth methods as well as innovative crop harvesting and post-harvest processes and handling. These provide Egypt a major comparative advantage and a potential to boost exports to European markets like Italy, France, and Germany, as well as Arab nations like Lebanon and Saudi Arabia in the period between November and March.

One of the most important techniques of artichoke propagation is micropropagation technique using viral diseases, plants high number of seedlings in the short time, with less economical cost compared to the regular propagation methods.