بسم الله الرحمن الرحيم

∞∞∞

تم رفع هذه الرسالة بواسطة / حسام الدين محمد مغربي

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات : لا يوجد

INDUCTION OF GENETIC VARIATION IN GARLIC

By

MOATAZ ABD EL-HAMID EL-SAYED

B.Sc. Agric. Sci. (Horticulture), Fac. Agric., Ain Shams Univ., 2006
M.Sc. Agric. Sci. (Vegetable Crops), Fac. Agric., Cairo Univ., 2016

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

In

Agricultural Sciences

(Vegetable Crops)

Department of Vegetable Crops
Faculty of Agriculture
Cairo University
EGYPT

2022

Format Reviewer **Vice Dear of Graduate Studies**

APPROVAL SHEET

INDUCTION OF GENETIC VARIATION IN GARLIC

Ph.D. Thesis
In
Agric. Sci. (Vegetable Crops)

By

MOATAZ ABD EL-HAMID EL-SAYED

B.Sc. Agric. Sci. (Horticulture), Fac. Agric., Ain Shams Univ., 2006
M.Sc. Agric. Sci. (Vegetable Crops), Fac. Agric., Cairo Univ., 2016

APPROVAL COMMITTEE

Dr. AFAF TAWFIK MAHMOUD KASIM……..
Head Researcher, Horticulture Research Institute, ARC

Dr. MOHAMED MOHAMED SHAHEIN……
Professor of Vegetable Crops, Fac. Agric., Cairo University

Dr. FARIDA FAROUK KABIL…….
Associate Professor of Vegetable Crops, Fac. Agric., Cairo University

Dr. MERGHANY MOHAMED MERGHANY…….....
Professor of Vegetable Crops, Fac. Agric., Cairo University

Date: 22 /6/2022

SUPERVISION SHEET

INDUCTION OF GENETIC VARIATION IN GARLIC

Ph.D. Thesis
In
Agric. Sci. (Vegetable Crops)

By

MOATAZ ABD EL-HAMID EL-SAYED

B.Sc. Agric. Sci. (Horticulture), Fac. Agric., Ain Shams Univ., 2006
M.Sc. Agric. Sci. (Vegetable Crops), Fac. Agric., Cairo Univ., 2016

SUPERVISION COMMITTEE

Dr. MERGHANY MOHAMED MERGHANY
Professor of Vegetable Crops, Fac. Agric., Cairo University

Dr. FARIDA FAROUK KABIL
Associate Professor of Vegetable Crops, Fac. Agric., Cairo University

Dr. Mahmoud Mohamed Samy
Senior Researcher, Horticulture Research Institute, ARC

Name of Candidate: Moataz Abd El-Hamid El-Sayed **Degree:** PhD
Title of Thesis: Induction of Genetic Variation in Garlic
Supervisors: Dr. Merghany Mohamed Merghany
Dr. Farida Farouk Kabil
Dr. Mahmoud Mohamed Samy
Department: Vegetable Crops **Approval:** 22/ 6/2022

ABSTRACT

This study was carried out during the period from 2017 to 2021 at Kaha vegetable research farm, Qalyubia, Egypt, for the open field experiment. While tissue culture experiment was carried out in tissue culture Laboratory, Vegetable Research Departments, Horticulture Research Institute, Giza, Egypt. The aim of this work was to induce genetic variations in garlic by using of chemical mutagens as well as somatic embryos grown *in vitro* then evaluate the result under Egyptian local conditions. The study was divided into two parts as (1) treat garlic cv. El Balady cloves with chemical mutagens [Ethyl methane sulfonate (EMS), Sodium azide (SA) and colchicine (Col)] for periods (6 and 12 h) at concentrations (0.01, 0.05 and 0.1%) in the open field and (2) induce genetic variation through indirect somatic embryogenesis of garlic cv. El Balady by using various concentrations of 2,4-Dichlorophenoxyacetic acid (2,4-D) (0, 1, 2, 3, and 4 mg/l) for callus formation. The formed callus were subcultured into MS medium supplemented with a combination of 2,4-D and 6-Benzyladenine (BA) at concentrations (0, 1 and 2 mg/l) for embryos induction. The results in field showed that SA at concentrations 0.05 and 0.1% led to not germinating any clove, which confirms that they are lethal doses, while the concentration 0.01 % achieved the lowest characteristics of vegetative growth and yield in the first season but it gave the highest characteristics of vegetative growth and yield in the third season. EMS and Col induced positive effects on vegetative growth and yield characteristics. Five new clones were obtained from the field treatments, and the clones were superior as compared with control for vegetative growth and yield characteristics as well as chemical characteristics of the cloves in the third season. For the *in vitro* experiment, 2,4- D at concentration 1 mg/l gave the highest callus formation traits and 1 mg/l BA was the best concentration for embryos induction traits. Four new clones were obtained from the embryogenesis in vitro and planted in the greenhouse for evaluation. The results of RAPD test showed that the obtained nine clones, from both experiments, were different from the control.

Key words: *Garlic, Chemical mutagens, Somatic embryogenesis, Vegetative growth, Yield, chemical characteristics, RAPD test.*

DEDICATION

I would like to dedicate this thesis to ***my family*** *that encouraged and supported me over the years to achieve this work.*

Very special thanks to ***Dr Mohamed Mostafa, Sayed Mansor*** *and all my colleagues in Tissue Culture Lab for sincere help. Also special thanks to my best friend and workmate* ***Dr Yasser Mohamed Mohamed*** *for his help during the work period.*

ACKNOWLEDGEMENT

First of all, Thanks to ***Allah*** *for offering me the strength to fulfill this hard mission.*

I wish to express my sincere appreciation and deep gratitude to ***Dr Merghany Mohamed Merghany,*** *Professor of Vegetables, Vegetable Crops Department, Cairo University for his valuable advices to me. I will always remember his generous help.*

Also, I wish to express my sincere appreciation and deep gratitude to ***Dr Farida Farouk Kabil,*** *Associate Professor of Vegetable Crops Department, Cairo University Cairo University for her kind supervision and the facilities offered to me during the preparation of this work.*

I feel deeply thanks to ***Dr Mahmoud Mohamed Samy,*** *Senior Researcher, Horticulture Research Institute, Agriculture Research Center for his kind supervision and the facilities offered to me during the preparation of this work and writing the manuscript.*

Also, I wish to express my deep thanks to ***Dr Sayed Mahmoud Ahmed,*** *Head Researcher, Horticulture Research Institute, Agriculture Research Center for his help during the preparation of this work and writing the manuscript.*

Also, I wish to express my deep thanks to ***Dr Engy Osman*** *Lecturer, Department of Genetics, Faculty of Agriculture, Cairo University for her help during the Genetics work.*

LIST OF ABREVIATIONS

µM	Micromolar
2.4-D	2,4-Dichlorophenoxyacetic acid
BAP	Benzyl amino purine
cm	Centimeter
Col	Colchicine
cv	Cultivar
EMS	Ethyl methane sulfonate
g	Gram
l	liter
m	Meter
M	Mutation generation
mg	Milligram
MS	Murashige and Skoog medium
SA	Sodium azide