

EFFECT OF GAMMA RADIATION ON THE MICROBIAL

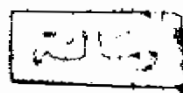
FLORA OF SOME MEDICINAL PLANTS IN EGYPT

A THESIS

Submitted to the Department of Botany

Women's College, Ain-Shams University

FOR



The Degree of Master of Science in

Microbiology

BY

51233

581134

58

Seham Yousef Mohamed El-Tablawy

FROM

NATIONAL CENTRE FOR RADIATION RESEARCH

AND TECHNOLOGY

(1 9 9 3)



TO MY MOTHER,

MY HUSBAND AND

TO THE SOUL OF MY FATHER.



EFFECT OF GAMMA RADIATION ON THE MICROBIAL
FLORA OF SOME MEDICINAL PLANTS IN EGYPT

BY

Seham Yousef Mohamed El-Tablawy

B.Sc. (Sciences), Ain
Shams University, 1982

Under the supervision of:

Prof. Dr. Mohamed I. Mahmoud.

Prof. of Microbiology, Botany Department, Women's
College, Ain Shams University.

Prof. Dr. Hamid R. El-Kady.

Emeritus Professor of Radiation Biology, National
Center for Radiation Research and Technology, Cairo.

Associate Professor Dr. Zeinab E. El-Bazza.

Associate Prof. of Pharmaceutical Microbiology,
National Center for Radiation Research and
Technology, Cairo.

Abstract

This investigation was carried out to study the effect of gamma radiation on the mold counts on some common medicinal herbs before and after storage. The mycotoxin production by the isolated fungal organism on liquid medium at different water activities and on the herb samples at two relative humidities was also studied.

The Thesis of
Seham Yousef Mohamed El-Tablawy
is approved

Advisors:

1- Professor Dr. Mohamed I. Mahmoud.

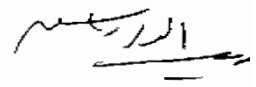
2- Professor Dr. Hamid R. El-Kady.

3- Associate Professor Dr. Zeinab E. El-Bazza.

Approved:



H. R. El Kady



N O T E

The candidate passed successfully the examination in the following courses:

- 1- Special Courses:
 - a- Soil Microbiology.
 - b- Microbial biochemistry.
 - c- Enzymology.
 - d- Applied Microbiology.
- 2- Methodology.
- 3- Statistics.
- 4- English Language.

A C K N O W L E D G E M E N T

The author is greatly indebted to thank with deep appreciation Dr. Mohamed I. Mahmoud, Professor of Microbiology, Botany Department, Women's College, Heliopolis, Ain Shams University, for suggesting the subject and valuable critical reading and revising the manuscript.

The author is greatly indebted to thank with deep appreciation Dr. Hamid R. El-Kady, emeritus Professor of radiation biology and former chairman of Atomic Energy Authority, for his guidance, advice and supervision throughout the work.

The author is greatly indebted to Dr. Zeinab E. El-Bazza, Associate Professor of Pharmaceutical Microbiology, National Center for Radiation Research and Technology, for suggesting the subject and for her continuous valuable guidance and constructive criticism.

My sincere thanks are to all members of the Department of Drug Radiation Research and Department of Radiation Microbiology, National Center for Radiation Research and Technology, for providing me with all the facilities that led to the completion of this work and for their help.

CONTENTS

	Page
I- Introduction.	1
2- Literature Review.	5
a- Microbial Flora of Spices.	5
b- Mycotoxins.	8
c- Screening and detection of aflatoxins.	13
d- Production of aflatoxin on non synthetic medium.	18
e- Production of aflatoxins on natural substrates.	21
f- Water activity.	21
g- Relative humidity.	22
h- Gamma-Irradiation study.	25
i- Types of ionizing radiation.	25
j- Radiation dose units.	27
k- Biological Effects of radiation.	28
l- Mode of action of ionizing energy on microorganisms.	29
m- The decimal reduction dose.	30
n- Effect of gamma-radiation on fungi and aflatoxins production.	30
3- Material and Methods.	37
A- Material:	37
a- Medicinal herbs samples.	37

b- Test organisms.	38
c- Chemicals.	38
d- Growth media.	39
e- Irradiation source.	40
B- Methods.	40
a- Effect of gamma-irradiation on the total mold count in herb samples.	40
b- Isolation and purification of fungi.	41
c- Microscopical examination of the fungal isolates.	41
d- Production of mycotoxins.	42
e- Extraction of mycotoxins.	42
f- Purification of mycotoxins.	42
g- Estimation of mycotoxins.	43
h- Confirmation of aflatoxins and ochratoxin A.	45
i- Regulation of water activity.	45
j- Determination of decimal reduction dose.	47
k- Effect of gamma-radiation on aflatoxin production.	47
l- Production of aflatoxins on the herb samples.	48
m- Extraction of aflatoxins from herb samples.	49
4- Results.	52
5- Discussion.	124

6- Summary	143
7- References	146
8- Arabic summary	

(d)

LIST OF TABLES

<u>Table No.</u>	<u>Page</u>
1- Medicinal herbs used.	37
2- Molalities of glycerol for various values of water activities at 25° C.	46
3- Effect of different doses of gamma radiation on the total mold counts in caraway.	59
4- Effect of different doses of gamma radiation on the total mold counts in khella.	61
5- Effect of different doses of gamma radiation on the total mold counts in shih balady.	63
6- Effect of different doses of gamma radiation on the total mold counts in wild chamomile.	65
7- Counts and percent reduction of the total mold counts in caraway at the different doses of gamma radiation. .	67
8- Counts and percent reduction of the total mold counts in khella at the different doses of gamma radiation. .	69
9- Counts and percent reduction of the total mold counts in shih balady at the different doses of gamma radiation.	71
10- Counts and percent reduction of the total mold counts in wild chamomile at the different doses of gamma radiation.	73

11- Screening for mycotoxins production by fungi isolated from irradiated and non-irradiated samples of caraway.	75
12- Screening for mycotoxins production by fungi isolated from irradiated and non-irradiated samples of khella.	77
13- Screening for mycotoxins production by fungi isolated from irradiated and non-irradiated samples of shih balady.	79
14- Screening for mycotoxins production by fungi isolated from irradiated and non-irradiated samples of wild chamomile.	81
15- Mycotoxins production by fungi isolated from non-irradiated medicinal herb samples.	83
16- Total number of resistant fungi isolated at their sublethal dose levels (kGy) from irra- diated herb samples collected from different localities in Egypt.	84
17- Identification of mycotoxins producer fungi isolated from irradiated herb samples.	85
18- Effect of different doses of gamma-radiation on the total mold counts in caraway after storage for two years at 5+1° C.	86

19-	Effect of different doses of gamma-radiation on the total mold counts in khella after storage for two years at $5+1^{\circ}\text{C}$	88
20-	Effect of different doses of gamma-radiation on the total mold counts in shih balady after storage for two years at $5+1^{\circ}\text{C}$	90
21-	Effect of different doses of gamma-radiation on the total mold counts in wild chamomile after storage for two years at $5+1^{\circ}\text{C}$	92
22-	Counts and percent reduction of the total mold counts in caraway at the different doses of gamma-radiation after storage for two years at $5+1^{\circ}\text{C}$	94
23-	Counts and percent reduction of the total mold counts in khella at the different doses of gamma-radiation after storage for two years at $5+1^{\circ}\text{C}$	96
24-	Counts and percent reduction of the total mold counts in shih balady at the different doses of gamma-radiation after storage for two years at $5+1^{\circ}\text{C}$	98
25-	Counts and percent reduction of the total mold counts in wild chamomile at the different doses of gamma-radiation after storage for two years at $5+1^{\circ}\text{C}$	100

26- Screening for mycotoxins production by fungi isolated from irradiated and non-irradiated samples of caraway after storage for two years at $5 \pm 1^{\circ}\text{C}$	102
27- Screening for mycotoxins production by fungi isolated from irradiated and non-irradiated samples of khella after storage for two years at $5 \pm 1^{\circ}\text{C}$	104
28- Screening for mycotoxins production by fungi isolated from irradiated and non-irradiated samples of shih balady after storage for two years at $5 \pm 1^{\circ}\text{C}$	106
29- Screening for mycotoxins production by fungi isolated from irradiated and non-irradiated samples of wild chamomile after storage for two years at $5 \pm 1^{\circ}\text{C}$	107
30- Screening for mycotoxins in fungi isolated from medicinal herbs stored for two years at $5 \pm 1^{\circ}\text{C}$	108
31- Total number of resistant fungi isolated at their sublethal dose levels (kGy) from herb samples collected from different localities in Egypt and stored for two years at $5 \pm 1^{\circ}\text{C}$	109

(h)

32- Coloures of fluorescence and R_f values of standard aflatoxins and ochratoxins	110
33- Effect of gamma radiation on the aqueous spores of <u>Aspergillus flavus</u>	113
34- Effect of gamma radiation on aflatoxins production by <u>Aspergillus flavus</u> in Sabouraud's yeast medium. .	116
35- Effect of water activity of the growth medium on the production of aflatoxins B_1 and B_2 by <u>Asp. flavus</u>	118
36- Aflatoxins production by <u>Asp. flavus</u> in khella at two different relative humidities and different incubation periods.	119
37- Aflatoxins production by <u>Asp. flavus</u> in caraway at two different relative humidities and different incubation periods.	120
38- Aflatoxins production by <u>Asp. flavus</u> in shih balady at two different relative humidities and different incubation periods.	121