

ENVIRONMENTAL CONSIDERATIONS FOR MICROBIAL CONTAMINATION IN SOME FOOD FACTORIES

By

EMAN HASSANIN AWAD HASSANIN

B.Sc. Agriculture (Food Science),
Ain Shams University (1987)

A thesis submitted in partial fulfillment

Of

The requirements for the Master Degree

In

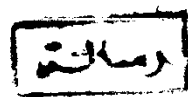
ENVIRONMENTAL SCIENCE

Department of Agricultural Sciences

Institute of Environmental Studies and Research
Ain Shams University



56286



664.024

E. H

1999



APPROVAL SHEET

ENVIRONMENTAL CONSIDERATIONS FOR MICROBIAL CONTAMINATION IN SOME FOOD FACTORIES

By

EMAN HASSANIN AWAD HASSANIN

B.Sc. Agriculture (Food Science),
Ain Shams University (1987)

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

Prof. Dr. S.H. Abou-Raia

S.H. Abou-Raia

Prof. of Food Sci., Fac. Agric., Cairo Univ.

Prof. Dr. W.A. Mashhoor

W.A. Mashhoor

**Prof. and Head of Agric. Microbiol. Dept., Fac.
Agric., Ain-Shams Univ.**

Prof. Dr. M.A. El-Borollosy

M.A. El-Borollosy

**Prof. of Agric. Microbiol., Fac. Agric.,
Ain-Shams Univ. (Supervisor)**

Committee in Charge : 30/7/1999

ENVIRONMENTAL CONSIDERATIONS FOR MICROBIAL CONTAMINATION IN SOME FOOD FACTORIES

By

EMAN HASSANIN AWAD HASSANIN

B.Sc. Agriculture (Food Science),
Ain Shams University (1987)

Under the Supervision of :

Prof. Dr. M.A. El-Borollosy

Prof. of Agric. Microbiol., Fa. Agric., Ain Shams
Univ.

Dr. M. Heweihy

Lecturer of Biology, Instit. of Environ. Studies and
Res., Ain Shams Univ.

Dr. M.A. El-Azab

Researcher in Food Tech. Res. Instit., ARC, Giza.

ACKNOWLEDGMENT

Praise and thanks be to ALLAH, the most merciful for assisting and directing me to the right way.

This work has been carried out under the supervision and direction of **Prof. Dr. M.A. El-Borollosy**, Prof. of Agric. Microbiology, Fac. Agric., Ain-Shams Univ., **Dr. M. Heweihy**, Lecturer of Biology, Instit. of Environ, Studies and Res., Ain-Shams Univ. and **Dr. M.A. El-Azab**, Researcher in Food Tech. Res. Instit., ARC, Giza, Egypt. I wish to express my deepest gratitude to them for suggesting the problem, helpful guidance, progressive criticism and valuable advises.

Sincere thanks are due to **Dr. A.M. Shamloul**, Lecturer of Botany, Fac. Sci., South Valley Univ., Souhag, Egypt for his help in detecting aflatoxins.

Thanks and gratitude are also extended to all my colleagues in Food Tech. Res. Instit., ARC, for providing facilities and encouragement.

CONTENTS

1. INTRODUCTION	Page 1
2. REVIEW OF LITERATURE	2
2.1. Microbial content of bakery products	2
2.2. Microbial content of bakery raw materials	4
2.2.1. Flour	4
2.2.1.1. Microbial content of flours	4
2.2.1.2. Microbial types in flours	5
2.2.2. Dried milk	7
2.2.2.1. Microbial content of dried milk	7
2.2.2.2. Microbial types in dried milk	8
2.2.3. Microbial content of fats and oils	10
2.2.4. Microbial content of sugars	11
2.3. Factors affecting survival and growth of microorganisms in bakery products	12
2.3.1. Temperature	12
2.3.2. pH - value	14
2.3.3. Water activity (a_w)	15
2.3. Microbial content of juices and jams	16
2.5. Microbial contamination by hands	19
2.6. Microbial contamination from air	20
2.7. Microbial contamination from water	23
2.8. Contamination with mycotoxins	24
3. MATERIALS AND METHODS	34
3.1. Sampling	34
3.1.1. Raw materials	34
3.1.2. Bakery products	34
3.1.3. Jams	34
3.1.4. Juices	34
3.1.5. Low calory foods	34

	Page
3.2. Microbiological analysis	34
3.2.1. Total microbial count	34
3.2.2. Coliform count	35
3.2.3. Staphylococci count	35
3.2.4. Yeast and moulds	36
3.3. Chemical analysis	37
3.3.1. pH	37
3.3.2. Moisture	37
3.4. Evaluating the role of workers in microbial contamination of foods	37
3.5. Evaluating the role of air in microbial contamination of foods	37
3.6. Evaluating the role of production lines and walls in microbial contamination of foods	37
3.7. Assay of aflatoxins	38
4. RESULTS AND DISCUSSION	41
4.1. Microbial content of raw materials	41
4.1.1. Microbial content of wheat flour	41
4.1.2. Microbial content of wheat bran	43
4.1.3. Microbial content of sugar	44
4.1.4. Microbial content of milk powder	46
4.1.5. Microbial content of palm oil	48
4.2. Microbial content of food products	51
4.2.1. Microbial content of low calorie foods .	51
4.2.1.1. Microbial content of diet toast bread	52
4.2.1.2. Microbial content of diet biscuits	54
4.2.1.3. Microbial content of diet jam	56
4.2.2. Microbial content of normal foods	56
4.2.2.1. Microbial content of juices and jams	56

	Page
4.2.2.2. Microbial content of bakery products	58
4.2.2.2.1. Microbial content of toast bread	58
4.2.2.2.2. Microbial content of cup cake	65
4.2.2.2.3. Microbial content of biscuits and wafers	67
4.3. Microbial contamination through some environmental factors	77
4.3.1. Factory walls and floor	77
4.3.2. Production line	77
4.3.3. Water	81
4.3.4. Air	81
4.3.5. Personnel	83
4.4. Presence of aflatoxins in food products	85
5. SUMMARY	89
6. REFERENCES	96
7. ARABIC SUMMARY	

LIST OF TABLES

Table	Page
1. Microbial densities in wheat flour	42
2. Most dominating microorganisms in wheat flour .	42
3. Microbial densities in wheat bran	45
4. Most dominating microorganisms in wheat bran ..	45
5. Microbial densities in sugar	47
6. Most dominating microorganisms in sugar	47
7. Microbial densities in whole milk powder	49
8. Most dominating microorganisms in dried milk ...	49
9. Microbial densities in palm oil	50
10. Most dominating microorganisms in palm oil	50
11. Microbial densities in diet toast bread after manufacturing and during 5 days of storage at room temperature ($25 \pm 2^{\circ}\text{C}$)	53
12. Most dominating microorganisms in low calory (diet) toast bread	53
13. Microbial densities in diet biscuits after manu- facturing and during 4 months of storage at room temperature ($25 \pm 2^{\circ}\text{C}$)	55
14. Most dominating microorganisms in low calory (diet) biscuits	55
15. Microbial densities in diet strawberry jam after manufacturing and during 9 months of storage, at room temperature ($25 \pm 2^{\circ}\text{C}$)	57

Table	Page
16. Most dominating microorganisms in low calory (diet) strawberry jam	57
17. Microbial densities of mango juice stored at room temperature ($25-30 \pm 2^{\circ}\text{C}$)	59
18. Microbial densities of orange juice stored at room temperature ($25-30 \pm 2^{\circ}\text{C}$)	60
19. Microbial densities of apple juice stored at room temperature ($25-30 \pm 2^{\circ}\text{C}$)	61
20. Microbial densities of apricot jam stored at room temperature ($25-30 \pm 2^{\circ}\text{C}$)	62
21. Microbial densities of strawberry jam stored at room temperature ($25-30 \pm 2^{\circ}$)	63
22. Microbial densities of figs jam stored at room temperature ($25-30 \pm 2^{\circ}\text{C}$)	64
23. Microbial densities of toast bread after manufacturing and during 5 days of storage at room temperature ($25 \pm 2^{\circ}\text{C}$)	66
24. Most dominating microorganisms in toast bread...	66
25. Microbial densities in cup cake after manufacturing and during 16 days of storage at room temperature ($15 \pm 2^{\circ}\text{C}$)	68
26. Most dominating microorganisms in cup cake	68
27. Microbial densities in manually wrapped biscuit covered with chocolate after manufacturing and during 6 months of storage at room temperature ($20-35 \pm 2^{\circ}\text{C}$)	69