Zagazig University
Faculty of Vet. Medicine
Food Control Department

MONITORING OF BIOGENIC AMINES IN SOME LOCALLY PRODUCED DAIRY PRODUCTS

By

Yasmin Adel Abd El Salam Ahmed
(B.V.Sc., Benha University, 2008)
(M.Sc., Zagazig University, 2015)

Under Supervision of

Prof. Dr. Madeha Abdalah Ayoub
Professor of Milk Hygiene and Technology, Food Control Department, Faculty of Vet. Medicine, Zagazig University

Prof. Dr. Salah Fathy Ahmed Abd El-Aal
Professor of Milk Hygiene and Technology, Food Control Department, Faculty of Vet. Medicine, Zagazig University

Prof. Dr. Rania Mohamed Kamal Mohamed Kamal
Professor of Milk Hygiene and Technology, Food Control Department, Faculty of Vet. Medicine, Zagazig University

Prof. Dr. Marionette Zaghloul Nassif
Chief Researcher-Food Hygiene Department
Animal Health Research Institute-Benha Branch

A THESIS
Submitted to Zagazig University
For Ph.D. degree of Vet. Medical Science
(Milk Hygiene)
Food Control Department
(2021)

CONTENTS

GLOSSARY AND ABBREVIATIONS

AOs	Amine oxidases
BA	Biogenic amine
Cu AO	Copper- containing amine oxidases
DAO	Diamino oxidase
EFSA	European Food Safety Authority
ES	Egyptian standard
FDA	Food and Drug Administration
Flav AO	Flavin-containing monoamine oxidases
GMP	Good manufacturing practice
GIT	Gastrointestinal tract
GRAS	Generally regarded as safe
HPLC	High pressure liquid chromatography
LAB	Lactic acid bacteria
MAO	Monoamine oxidase
MAOI	Monoamine oxidase inhibitor
MCO	Multi-copper oxidase
MRS	Man, Rogosa, and Sharpe broth
NaCl	Sodium chloride
NSLAB	Non-starter lactic acid bacteria
PAO	Polyamine oxidase
PCR	Polymerase chain reaction
PEA	Phenylethylamine
QPS	Qualified Presumption of Safety
RASFF	Rapid Alert System for Food and Feed

LIST OF TABLE

LIST OF FIGURES

SUMMARY

A total of 100 random samples, 20 samples of each Cheddar; Ras Damietta; Kariesh; cheese and yoghurt collected in their retail packages from different markets and dairy shops in Zagazig City. Collected samples were transferred directly to the laboratory in an ice box at 4^{o}C under complete aseptic conditions without delay and then subjected to following examination:-

Chemical analysis of examined samples:-

The obtained results indicated that the mean values of pH in examined dairy products samples (Cheddar, Ras Damietta, Kariesh, cheese and yoghurt) were 5.50 ± 0.02; 4.79 ± 0.11; 4.97 ± 0.06; 4.92 ± 0.06 and 4.34 ± 0.03, respectively. Mean values of salt concentration in examined cheese samples were 1.53 ± 0.04; 4.42 ± 0.05%; 4.16 ± 0.11 and 1.72 ± 0.02, respectively. Mean values of moisture content in examined dairy products samples were 40.45 ± 0.24; 38.64 ± 0.34; 55.76 ± 0.38; 74.60 ± 0.22 and 84.23 ± 0.99 %, respectively.

Our results showed that that pH value was negatively correlated with tryptamine, putrescine and histamine ; moisture content was negatively correlated with tryptamine, PEA, putrescine and cadacerine, while salt concentration was positively correlated with (Histamine; putrescine and tryptamine) content.

Determination of biogenic amines:

The obtained results indicated that the mean values of histamine values were 3.34 ± 0.89; 8.28 ± 1.03; 6.21 ± 1.01; 11.20 ± 1.89 and 1.71 ± 0.22 mg/100g in Cheddar, Ras, Damietta, Kariesh cheese and yoghurt samples, respectively. Mean values of tyramine in examined samples were 5.29 ± 0.76; 4.32 ± 0.74; 5.75 ± 1.52; 15.27 ± 2.40 and 2.60 ± 0.60 mg/100g, respectively. Mean values of cadaverine in examined samples were 1.39 ± 0.66; 3.68 ± 1.46; 2.40 ± 0.60; 5.58 ± 0.83 and 0.57 ± 0.12 mg/100g, respectively. Mean values of putrescine in examined samples were 1.94 ± 0.30; 7.44 ± 0.96; 2.80 ± 0.44; 7.44 ± 1.68 and 0.74 ± 0.18 mg/100g, respectively. Mean values of treptamine in examined samples were 0.69 ± 0.11; 2.83 ± 0.28; 1.01 ± 0.18; 0.63 ± 0.13 mg/100g and not detected, respectively. Mean values of PEA in examined Ras and Damietta cheese samples were 2.40 ± 0.17 and 1.26 ± 0.26 mg/100g, respectively but not detected in Cheddar, Kariesh cheese and yoghurt samples.

Total mean values of different BAs (mg/ 100g) in the examined Cheddar; Ras; Damietta; Kariesh cheese and yoghurt samples were 12.65 ± 2.72; 28.95 ± 4.64; 19.43 ± 4.01; 40.12 ± 6.93 and 5.62 ± 1.12 mg/ 100g, respectively

Permissible level of histamine in examined dairy products samples:

Our results showed that 80; 40; 50; 50 and 100% of Cheddar; Ras; Damietta; Kariesh cheese and yoghurt samples were accepted, respectively according to **(FDA, 2020)** which stated that the permissible limit of histamine should not exceed than 5mg/100g.

Control of biogenic amines:-

Polymerase chain reaction (PCR) was used to select LAB strains that have (*sufI*) gene which involved in the degradation of BAs. Our results showed that *SufI* gene was found in 5 LAB strains (*L. acidophilus* MK 850930, *L. brevis* MK852397, *L. plantarum* MK806485, *P.acidilactici* MK871658 and *P. pentosaceus* MK852683) and gave an amplification product sizes of 329 bp. While *L. rhamnosus* LMG23522 was negative for amplification of *sufI* gene.