Studies on Utilization of Probiotic as Functional Starter Culture for the Food Fermentation

By

Hebat Allah Ibrahim Abdelazeem Youssef

B.Sc. Microbiology ٢٠٠٤

Thesis

Submitted in partial fulfillment for the requirements of the degree of Master of Science in Microbiology

Department of Microbiology

Faculty of Science

Ain Shams University

٢٠١٢

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B.Sc. Microbiology ٢٠٠٤

Under the supervision of

Dr: Hala Mohamed Abu Shady

Assistant Prof. of Microbiology

Department of Microbiology

Faculty of Science

Ain shams university

Prof. Dr. Zeinab Ibrahim Mohamed Sadek

Prof. of Microbiology

Dairy Department

National research center

٢٠١٢

Approval Sheet

Title of Thesis:- Studies on Utilization of Probiotic as Functional Starter Cultures for the Food Fermentation

Degree:- M.Sc. in Microbiology

Name of Student:- Hebat Allah Ibrahim Abdelazeem Youssef

This thesis of M. Sc. Degree has been approved by:-

١.

٢.

٣.

Date of Examination:

بِسْمِ اللهِ الرَّحْمنِ الرَّحِيم

"رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ الَّتِي أَنْعَمْتَ عَلَيَّ وَعَلَى وَالِدَيَّ وَأَنْ أَعْمَلَ صَالِحاً تَرْضَاهُ وَأَدْخِلْنِي بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ"

صدق الله العظيم

"سورة النمل:الآية ١٩"

List of Abbreviations

B: *Bifidobacteria*

BHI: brain heart infusion

cfu: colony forming unit

CD: Crohn's disease

E: *Escherichia coli*

EPS: exopolysaccharide

GI: gastrointestinal

H: *Helicobacter*

HNCMB: Hungarian national collection of medical bacteria

h: hour

HS: horse serum

IBD: Inflammatory bowel disease

IgA: Immunoglobulin A antibody

IgE: Immunoglobulin E antibody

L: *Listeria*

LAB: lactic acid bacteria

Lb: *Lactobacillus*

LDL: low density lipoproteins

MRS: Man Rogosa Sharpe

MRSC: Man Rogosa Sharpe Cystiene

NRRL: Northern regional research laboratory

S: *Staphylococcus*

UBT: urease breath test

UC: Ulcerative colitis

VLDL: very low density lipoproteins

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ABSTRACT

ABSTRACT

Probiotic characteristics of four *Lactobacillus* species (*Lb. acidophilus, Lb. gasseri* B-١٤١٦٨, *Lb. johnsonii* B-٢١٧٨ and *Lb. bulgaricus* Lb-١٢) and one *Bifidobacterium bifidum* Ch١ including bile tolerance, acid tolerance, antibiotic susceptibility, antimicrobial activity of culture supernatant against some pathogenic bacteria, antagonistic activity toward some pathogenic bacteria and assimilation of cholesterol from culture media were tested *Invitro*.

Results could be helpful in selecting the strains with the best probiotic characteristics for further examination to be applied in functional dairy product suitable for *Helicobacter pylori* infection treatment and in the production of a cream with low cholesterol content.

Results revealed that all of the tested strains proved to be probiotic as all the tested strains proved to be quiet resistant in the presence of ٢ % of the bile salt. All strains survived well at pH ٢,٥ after ٢h, *Lb. acidophilus* was the most tolerant strain. Antibiotic resistance test showed that , *B. bifidum* Ch١, *Lb. acidophilus* , *Lb. bulgaricus* Lb-١٢ and *Lb. gasseri* B-١٤١٦٨ were resistant to ٦ of the ١٠ antibiotics tested while *Lb. johnsonii* B-٢١٧٨ was resistant to ٥ of the ١٠ antibiotics tested.

The un-neutralized cell free spent broth of the tested strains were inhibitory to most of the tested pathogens in variable degrees ,while neutralizing the cell free spent broth leads to decrease in the inhibitory effect. Additionally, probiotic strains were antagonistic towards *H. pylori* to varying degrees, *B. bifidum* Ch١, *Lb. acidophilus, Lb. johnsonii* B-٢١٧٨ proved highly suppressive effect followed by *Lb. gasseri* B-١٤١٦٨.

Lb. acidophilus achieved the highest activity by removing ٦٥,١٪ of cholesterol from broth media, while *B. bifidum* Ch١ showed the lowest activity ١٦,٩ %.

According to the previous results three of the tested probiotic strains which display more efficient antagonistic activity against *H. pylori* were chosen for supplementation of yogurt to detect the survival of *H. pylori* in yogurt during cold storage. The yogurt supplemented with the probiotic *B. bifidum* Ch١ was the most suppressive followed by yogurt supplemented with *Lb. acidophilus* and then yogurt with *Lb. gasseri* B-١٤١٦٨.

Also, results of cholesterol assimilation in culture media proved that all of the five probiotic strains were able to reduce the cholesterol content, but two strains (*Lb. acidophilus* and *Lb. gasseri* B-١٤١٦٨) showed the highest cholesterol reducing effect so, they have been chosen for the production of cream with low cholesterol content.

Key words: probiotic, *Bifidobacteria*, *lactobacillus*, *H. pylori*, yogurt, cream and cholesterol.

Acknowledgment

First of all, everlasting thanks to ***Allah*** *to whom I relate any success in my life.*

This thesis would not have been possible without the support of many people.

I wish to express my gratitude to my supervisor, ***Dr. Hala Mohamed Abu Shady -*** *Assistant Prof. of Microbiology Department of Microbiology- Faculty of Science- Ain shams university, who was abundantly helpful and offered invaluable assistance, support and guidance.*

I owe my deepest gratitude also to my supervisor ***Prof. Dr. Zeinab Ibrahim Mohamed Sadek -*** *Prof. of Microbiology Dairy department- National Research Center* ***,****without her knowledge and assistance this study would not have been successful.*

Special thanks also to all my friends, in the National research center, especially ***Dr. Azzat Bauomy-*** *Assistant Prof. of Microbiology, Dairy department- National Research Center* ***and Dr. Wafaa Kamel-*** *Researcher, Dairy department- National Research Center, who always have been there and for her invaluable assistance.*

My gratitude also goes to the Department of Microbiology at faculty of Science – Ain Shams University.

I would also like to convey thanks to the Ministry of Scientific Research for providing a part of the financial means of my study

I wish to express my love and gratitude to my beloved family; for their understanding and endless love, through the duration of my study.

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