بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / مني مغربي أحمد

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THE PRODUCTION, IMMOBILIZATION AND APPLICATION OF LACTIC ACID BACTERIA AS A PROBIOTIC

By

MONA ABD-ALLAH ASHOUR MOHAMED
B.Sc. Agric. Sc. (Biotechnology), Fac. of Agric., Ain Shams University, 2012
M.Sc. Agric. Sc. (Agric. Microbiology), Fac. of Agric., Ain Shams University, 2017

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Approval Sheet

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ABSTRACT

Mona Abd-Allah Ashour Mohammed: The Production, Immobilization and Application of Lactic Acid Bacteria as a Probiotic. Unpublished Ph. D. Thesis, Department of Agricultural Microbiology, Faculty of Agriculture, Ain Shams University, 2022.

Lactic acid bacteria (LAB) are important microorganisms for the food industry due to their functional activity as starters and potential probiotic strains. Probiotic consumption had several health benefits, including improving intestinal health through microbiota regulation, stimulating and developing the immune system, synthesizing and enhancing the bioavailability of nutrients, reducing lactose intolerance symptoms. Therefore, this investigation was designed to obtain lactic acid bacterial strains that had ideal characteristics as a probiotic and exert beneficial effects.

In the present study, thirty nine isolates (from milk, yogurt, chesses, cream, and pickled) and collected bacterial strains were tested for their ability to hemolytic activity, antimicrobial activity and antibiotic resistance. Only five isolates (WC_1, CM_1, P_3, KC and GM_4) were selected as probiotic culture according to their safety assessment. These isolates were identified as the genera of LAB, based on morphological and biochemical traits, and characterized at the species level by using MALDI-TOF and VITEK techniques. The identified cocci shape strains were *Streptococcus equinus* WC_1, *Streptococcus bovis* CM_1, *Streptococcus gallolyticus* P_3, and rod shape strains were *Lapidilactobacillus concavus* KC and *Limosilactobacillus reuteri* GM_4. These strains were studied evaluating technological and safety characteristics, including the ability to grow in bile salt, Aesculine hydrolysis, starch hydrolysis, gelatin hydrolysis, arginine hydrolysis, suger utilization, gas production, proteolytic activity, salt tolerance, catalase activity, grow at 30-37°C & low pH, and antimicrobial activity against pathogen. Using Arnold arish cheese whey as whole medium led to increase the cell dry weight of LAB about 42% comparing to MRS medium. The immobilized LAB cells were

survived with ˜ 10^8 cfu/g during 90 days storage period. A total of 14 compounds were identified as major metabolites between *Streptococcus equinus* WC_1 & *Limosilactobacillus reuteri* GM_4 strains. Chromatid deletion and changes in chromosome structure and number were observed in bone marrow of mice given different doses of LAB as probiotic for two weeks MMC exposure increased significantly the chromosomal aberration and decreased significantly the mitotic activity of mice bone marrow cells comparing to control, whereas the vise versa was true for all subacute treatments of tested LAB. These treatment also recorded good adhesion ability to intestinal wall of mice with reduction the number of microflora. Moreover, no change in the normal structure of hepatic lobules of liver and the anatomy of the renal corpuscle & tubule structure of kidney was noticed at all treatments of LAB given to mice. These treatments were also reduced EST size and inducing apoptosis through the up-regulation of pro-apoptotic factors (*p53* and *Bax*) and down- regulation of anti-apoptotic factor (*Bcl*$_2$).

Keywords: Probiotics; lactic acid bacteria; identification, characterization, antimicrobial activity, safety assessment, immobilization, GC-MS analysis, Chromosomal aberrations, Histopathological sections, apoptosis-regulatory genes, Ehrlich solid tumor mice, Antitumor and Antimutagenic.

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