EMPLOYMENT OF SOME BACTERIAL VIRUSES FOR IMPROVEMENT OF QUALITY AND SAFETY OF SOME FOOD PRODUCTS

By

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B.Sc. Agric. Sc. **(**Food Science), Cairo University, 2002

M.Sc. Agric. Sc. (Agricultural Virology), Ain Shams Univ., 2008

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ABSTRACT

Abeer Abd El-Wahab Feisal Gad El-Hak: Employment of Some Bacterial Viruses for Improvement of Quality and Safety of Some Food Products. Unpublished Ph.D. Thesis, Department of Agricultural Microbiology, Faculty of Agriculture, Ain Shams University, 2013.

Samples of sewage water were assayed qualitatively by the spot test for the presence of phages specific for *Salmonella typhimurium*. The *Salmonella* bacteriophage was isolated by the single plaque isolation technique; propagated by the liquid enrichment method and purified by the two phase separation system using polyethylene glycol 6,000 and dextran sulfate 500. The morphology of purified particles of the isolated *Salmonella* bacteriophage was determined and it was curled long non contractile tail type with 243.5 nm in length and 17.4 nm in width and the head is isometric in shape with diameter of about 69.6 nm. The phage isolate infected two bacterial strains out of 8 bacterial isolates belonging to family Enterobacteriaceae including *Salmonella typhimrium* ATCC25566 and *S.typhimurium* MM11.The isolated *Salmonella* phage has ds DNA size of 18 kbp. Thermal inactivation point of the isolated phage was found to be 78 ºC for 10 min. Phage survived for 7 days at 4, 25, 37, 42 and -20 ºC., the virus lost ability its to lyses *salmonella* cells at pH 4, 5, 6, 10, 11 and 12. The virus lost its activity after 50 min exposure to UV at distance of 53 and 70 cm UV source. The preservation of *Salmonella* bacteriophage particles with different concentrations of sodium chloride (NaCl), sodium benzoate, potassium sorbate and citric acid for 24 hr resulted in inhibiting viral infectivity completely above0.05,0.1, 0.5 and 1.0 % for sodium benzoate, potassium sorbate and citric acid, respectively. The effect of sodium hypochlorite and SDS on *Salmonella* bacteriophage suspension was studied. The virus

infectivity was completely inhibited at concentration of 5 % for both detergents.

In this study, numbers of experiments have been performed to evaluate the potential of the isolated phage for the reduction of *S. typhimurium* contamination in fresh green salads, apple, some meat products and fresh chicken cuts.

Data revealed that, the virulent *Salmonella* phage reduced the total counts of *S. typhimurium* in fresh green salads through 24hr from incubation at 4°C at rate of 3.26 $\log_{10}$ units. The virulent phage reduced the total viable number of *Salmonella* cells in the green apple, red apple and apple slices at rat of 2.36 $\log_{10}$, 3.07 $\log_{10}$ and 3.1 $\log_{10}$ respectively after incubation for 7 days . at room temperature (22-25°C).Application of virulent *Salmonella* phage to manufactured chicken Berger caused a reduction of indigenous *Salmonella* density after 15 days from the incubation at 4°C at rate of 2.26 $\log_{10}$ cfu/g , and with rate of 3.39 $\log_{10}$ cfu/g in case of treatment the manufactured chicken Berger with both phage and *Salmonella*.

Treatment of the fresh chicken cuts with mixture of *Salmonella* and its phage by flipping, spraying and soaking followed by incubation for 7 days at 4°C caused reduction of *Salmonella* cells with rate of 2.75 $\log_{10}$, 2.84 $\log_{10}$ and 2.11 $\log_{10}$ respectively.

Keywords: *Salmonella typhimurium*, bacteriophage, physical properties, biology, morphology, stability, restriction enzymes, phage therapy, food preservation, phage application.

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