CHARACTERIZATION OF SOME BACTERIAL VIRUSES ISOLATED FROM DRAIN WATER AND THEIR APPLICATIONS

By

YASMER SAYED HUSSEIN MUHAMMAD

B.Sc. Agric. Sc. **(**Agric. Microbiology), Ain Shams Univ., 2003

M.Sc. Agric. Sc. (Agricultural Viruses), Ain Shams Univ., 2010

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This thesis for Ph.D. degree has been approved by:

Dr. Gamal El-Didamony Mohamed ……...…
Prof. of Virology, Fac. of Science, Zagazig University.

Dr. Atef Shoukry Sadik .....…….…….…....
Prof. Emeritus of Agric. Viruses, Fac. of Agric., Ain Shams University.

Dr. Badawi Abd El-Salam Othman ….……...
Prof. Emeritus of Agric. Viruses, Fac. of Agric., Ain Shams University.

Dr. Khalid Abdel-Fattah El-Dougdoug ….……
Prof. Emeritus of Agric. Viruses, Fac. of Agric., Ain Shams University.

Date of Examination: 19/12 /2017

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Under the Supervision of:

Dr. Khalid Abdel-Fattah El-Dougdoug

Prof. Emeritus of Agricultural Viruses, Dept. of Agric. Microbiology, Fac. of Agriculture, Ain Shams University (Principle Supervisor)

Dr. Badawi Abd El-Salam Othman

Prof. Emeritus of Agricultural Viruses, Dept. of Agric. Microbiology, Fac. of Agriculture, Ain Shams University

ABSTRACT

Yasmer Sayed Hussein Muhammad: Characterization of some Bacterial Viruses Isolated from Drain Water and Their Applications. Unpublished Ph.D. Thesis, Department of Agricultural Microbiology, Faculty of Agriculture, Ain Shams University, 2018.

We are here focusing on isolation of some bacterial viruses from sewage water, irrigation water contaminated with sewage and characterization of these viruses biologically and chemically using some modern technologies. Their use as biological control agents against the contaminated bacteria was also aimed. A number of water samples, including water from irrigation and other systems contaminated with sewage, were collected from four different canals in El-Kalubiah and El-Giza Governorates. On microbiological analysis, some pathogenic bacteria, including *Listeria* sp. and *Salmonella* sp., were isolated and then the presence of phages specific to these bacteria was detected by spot test. Six phages for each bacterial host were propagated, and partially purified. The phages were characterized by determining their stability under different factors, and determination of their morphology by electron microscopy. The molecular weight of their proteins was estimated using SDS-PAGE, and finally, RAPD-PCR technique was used to determine the genetic variability between the isolated phages. Samples of green salad, which is not exposed to any thermal transactions, and could be contaminated with undesirable microbes, were tested as previously mentioned. Determination the safety of using phages as a food additive was done by testing the cytotoxicity of phages on liver carcinoma cell line *in vitro*. The results indicated that all phages didn`t show any cytotoxic effect on liver carcinoma cell line. Phage cocktails were applied as biological control agents against the pathogenic bacteria of this study (*L. monocytogenes* and *S.* Typhimurium). Promising results were recorded, therefore, the results can be considered as a milestone for the formation of

a bank of bacterial viruses which can be widely used in biological control as well as gene therapy.

Keywords: Phages, Microbiological analysis, Stability, SDS-PAGE, RAPD-PCR, Cytotoxicity on cell line, *Listeria monocytogenes*, *Salmonella* Typhimurium, Biocontrol.

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LIST OF ABBREVIATIONS

A

Agric.	Agriculture
APHA	American Public Health Association
APS	Ammonium persulfate

B

BCM	Billion Cubic Meter
BHI	Brain Heart Infusion
bp	Base pair
BPB	Bromophenol blue
BPW	Buffer peptone water
BGLBB	Brilliant green lactose bile broth
BSA	Bovine serum albumin
BiSA	Bismuth sulphite agar

C

^{o}C	Centigrade
$CaCl_2$	Calcium chloride
CBB	Coomassie brilliant blue
cfu	Colony forming unit
Cm	Centimeter
Cm^2	Square centimeter
CR agar	Congo red agar
CsCl	Cesium chloride

D

Dept.	Department
DLA	Double layer agar
DMSO	Dimethyl sulfoxide
DNA	Deoxy ribonucleic acid
ds-DNA	Double strand deoxy ribonucleic acid

E

e.g.	Exempli gratia (For example)
EDTA	Ethylene diamine tetra acetic acid
EHEC	Enterohemorrhagic *E. coli*
EM	Electron microscope
EMB	Eosin methylene blue
EPA	Environmental protection agency
et al.	And others (*et alii*)

F

^{o}F	Fahrenheit
Fac.	Faculty
FC	Fecal coliform
FDA	Food and drug agency
FS	Fecal streptococci

G

g	Gram
g	Gravity
GRAS	Generally recognized as safe