



بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / مني مغربي أحمد

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى

مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد



EFFECT OF PHAGES ON SOME PHOSPHATE SOLUBLE BACTERIA IN THE SOIL

By

ALAA MOHAMED FATHI EL-SAYED BARAKAT

B.Sc. of Agriculture (Biothenology), Fac. of Agric., Ain Shams Univ., 2011

M.Sc. of Microbiology (Virology), Fac. of Agric., Ain Shams Univ., 2017

**A Thesis Submitted in Partial Fulfillment
Of
The Requirements for The Degree of**

**DOCTOR OF PHILOSOPHY
in
Agricultural Sciences
(Agricultural Virology)**

**Department of Agric. Microbiology
Faculty of Agriculture
Ain Shams University**

2022

Approval Sheet

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

Dr. Gamal El-Didamony Mohamed

Prof. Virology, Fac. of Science, Zagazig University.

Dr. Atef Shoukry Sadik

Prof. Emeritus of Agric. Viruses, Fac. of Agric., Ain Shams
University

Dr. Badowi Abd El-Salam Othman

Prof. Emeritus of Agric. Viruses, Fac. of Agric., Ain Shams
University

Dr. Abd Allah Mohamed Eid El-Ahdal

Prof. Emeritus of Agric. Viruses, Fac. of Agric., Ain Shams
University

Date of Examination: 25 /5 /2022

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Under the supervision of:

Dr. Abd Allah Mohamed Eid

Prof. Emeritus of Agriculture Viruses, Department of Agric.
Microbiology, Faculty of Agriculture, Ain Shams University
(Principal Supervisor)

Dr. Badawi Abd El-Salam Othman

Prof. Emeritus of Agriculture Viruses, Department of Agric.
Microbiology, Faculty of Agriculture, Ain Shams University.

Dr. Samar Said Ahamed El-Masry

Associate Professor of Agricultural Viruses, Department of Agric.
Microbiology, Faculty of Agriculture, Ain Shams University.

ABSTRACT

Alaa Mohamed Fathi El-Sayed Barakat: Effect of phages on some phosphate soluble bacteria in the soil. Unpublished Ph.D Thesis, Department of Agricultural Microbiology, Faculty of Agriculture, Ain Shams University, 2022.

Phosphate-solubilizing microorganisms play an important role in supplementing phosphorus to the plants, allowing a sustainable use of phosphate fertilizers. Microorganisms are involved in a range of process that affect the transformation of soil phosphorus (P) and thus are integral component of the soil 'P' cycle. Several mechanisms like lowering of soil pH by acid production, ion chelation, and exchange reactions in the growth environment have been reported to play a role in phosphate solubilization by Phosphate- solubilizing bacteria (PSB). It is slowly emerging as important organisms for the soil improvement.

In this study four bacterial viruses (phages) specific for *Bacillus velezensis* were isolated on the basis of the differences between the plaque morphology. The phages were signed as Bv₁- Bv₂- Bv₃ and Bv₄ . The isolated phages were propagated by the enrichment liquid method which gave particles with concentration of 10¹¹ PFU/ml. Phages were purified and concentrated by differential centrifugation. Electron microscopy of the 2% uranyl acetate negatively stained showed that phages were belonging to family Siphoviridae.

Bacillus velezensis phages infect many strains belong to its species, which means that they have a broad host range. Physical properties of *B. velezensis* phages revealed that, they different in their stability to TIP, DEP and LIV, pH degrees, Osmotic shock and effect of different solvents.

Sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) technique was performed to determine the properties of viral proteins. The purity and quantity of isolated DNAs were determined spectrophotometrically. Data showed that concentration of Bv₁ DNA was 0.75 µg/µL , Bv₂ DNA and Bv₃ DNA were 0.60 µg/µL and finally Bv₄ DNA 0.55 µg/µL. The analysis of genetic material of *B. velezensis* phages was determined based on both Inter Simple Sequence Repeat (ISSR) PCR technique and restriction enzymes. Data showed different amplifications patterns with all phages .

Finally, study the effect of *B. velezensis* phages on *B. velezensis* as solubilized phosphate bacteria and it's reflectance on sunflower was investigated in the pot experiment. The results revealed that : adding the rock phosphate to the soil led to increase plant height, stem diameter, number of leaves, chlorophyll A&B, caroteins, prolein, head diameter, seed weight and the oil percentage .Inoculation of the sandy soil with the bacteria increased solubilized phosphate .The virus deceased the total count of bacteria .Inoculation of the sandy soil with the bacteria increased plant height, steam diameter, number of leaves, chlorophyll A&B, caroteins, prolein, head diameter, seed weight and the oil percentage .The infection of bacteria with the virus reduced the parameters mentioned before .

Keywords: Bacteriophages, Solubilizing phosphorus, Phage stability, Electron microscopy, SDS-PAGE, Restriction enzymes and ISSR – PCR.

ACKNOWLEDGEMENT

I would to think **Prof. Dr. Abdullah Mohamed Eid**, the main supervisor, Emeritus Professor of Agricultural Viruses, Department of Agricultural Microbiology, Faculty of Agriculture, Ain Shams University for his supervision , his valuable time and advices during this work and may God protect him and take care of him and prolong his life.

I express my deep gratitude to **Prof. Dr. Badawi Abd El-Salam Othman**, Emeritus Professor of Agricultural Viruses, Faculty of Agriculture, Ain Shams University. Since the idea of the subject of the study was developed, and his constant encouragement and sensitivity to my first steps in the field of bacterial viruses, as well as constructive criticism and keen interest, providing all means to implement experiments and reach satisfactory results.

Special thanks are due to **Dr. Samar Said El-Masry**, Associate Prof. of Agric. Microbiology, Dept. of Agric. Microbiology, Fac. of Agriculture, Ain Shams University for her valuable assistance, precious, advices and helpful comments which necessary to the accomplishment of this study.

I would like to thank my honorable professors and colleagues in the Department of Agricultural Microbiology, especially my professors and colleagues in the branch of virus, for the assistance and advice they provided me throughout the study period and all the workers in the virus branch for helping me in experiments, especially the applied experiment.

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