EVALUATION OF SOME GENETICALLY MODIFIED BACTERIA ON ROOT-KNOT NEMATODE INFECTION IN TOMATO PLANT

By

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B.Sc. Agric. Sci. (Plant ProtectionCairo University, 2002
M.Sc. Agric. Sci. (Nematology), Cairo University, 2008

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ABSTRACT

Gaziea M. Soliman, Ph.D., 2014.

Gaziea Mohamed Soliman Mohamed: Evaluation of some Genetically Modified Bacteria on Root-Knot Nematode in Tomato Plant. Unpublished PhD. Thesis, Department of Plant Protection, Faculty of Agriculture, Ain Shams University, 2014.

The nematicidal activity of the wild types of the lytic bacteria, *Serratia marcescens*, *Pseudomonas fluoresences* and *Bacillus licheniformis* and their ten mutants (overproducing chitinase and alkaline protease *via* using mutation), namely: mutant SM 190, mutant SM 167, mutant SM 36 and. mutant. SM 21 from *S. marcescens*, mutant BL 3, mutant BL 132, mutant BL21, mutant BL 37 and, mutant BL 40 from *B. licheniformis* and mutant PF 63 from *P. fluoresences* which were produced by using mutagenic chemicals (MMS, EMS) and three fusants (overproducing chitinase and alkaline protease *via* recombinant strains on protoplast fusion technique) and the parents of two strains of *S. marcescens* (isolate No. 18) and *B. licheniformis* (isolate No. 10), were evaluated against juvenile survival and egg hatching of the root – knot nematode, *Meloidogyne incognita*, as a safer and an environmental friendly control alternative to chemical nematicides. They were evaluated as lytic bacteria (chitinase and alkaline protease) on juvenile survival, egg hatching and on gelatinous matrix forming the eggmasses of *M. incognita* under laboratory conditions by using standard (S) or (S /10), and exposure periods (24, 48 and 72 hrs).

The results indicated that, the three fusants achieved the best effect on juveniles compared to the mutants and their parents. This effect may be due to increase production of lytic enzymes under this study and compilation of the best qualities by protoplast fusion. The numbers of either viable juveniles (VJ) or non viable juveniles (NVJ) were reduced at two dilutions (S and S/10) at different exposure periods (24, 48 and 72 hr) compared to untreated control and consequently decreasing the numbers of both (VJ) and (NVJ). Most of the dead nematode bodies were degraded and destroyed by these fusants. In this respect, fusant F103 achieved the

most effective mortality and had the least numbers of juveniles as compared to the bacterial parents and untreated control. The results were the same in case of using eggmasses.

Effect of wild types and different mutants and the parents of two strains *S. marcescens* (mutant No. 18) and *B. licheniformis* (mutant No. 10) were tested against nematode development in case of using juveniles as a source of tomato plant infection. Four application methods of adding bacteria in soil were applied as follows:

1- Adding nematodes, *M. incognita* and after one week adding bacteria.
2- Adding nematodes, *M. incognita* and bacteria in the same time.
3- Adding bacteria to soil and after one week adding nematodes.
4- Adding nematodes, *M. incognita* and bacteria together and after one week another dose of bacteria was added.

The best application of bacteria on the infected soil of tomato plant with nematodes, *M. incognita* was last treatment. In this application the mutant BL 21 sustained the best effect on controlling the juveniles, the galls and the eggmasses formation compared to the untreated control. These reductions reached 92.15 % of juveniles mortality in soil and 77.08 % of gall formation and 88.43 % of eggmass numbers. The mutant SM 36 recorded 90.72 % number of juveniles mortality in soil, 70.63 % of gall formation and 86.50 of eggmasses compared to the wild type of SM which attained the lowest reduction in either of gall formation or eggmasses number (26.49 % and 30.85%; respectively). These reductions were corresponding to improvements of tomato growth.

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I. INTRODUCTION

One of the main challenges of the first half of this millennium will be the production of food and feed in quantities, large enough to feed the ever-increasing world population. To feed the entire world population and improve their health in the future there is a clear need to improve productivity and nutritional quality of food crops. The equilibrium between human beings and their food supply is felt unsound. This encouraged scholarly thought to solve the problem. One traditional