

Affectivity evaluation of *Bacillus subtilis* in controlling eggplant root rot caused by *Rhizoctonia solani* and *Fusarium solani*

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Abstract

This study included an evaluation of the efficacy of bacteria *Bacillus subtilis* obtained from Biohealth fertilizer to control the disease of eggplant root rot, caused by *Rhizoctonia solani* and *Fusarium solani*. The survey results showed that the disease was observed in all the subjected sites, which were Btera, Maymouna, Saad River and Greta in Misan province. The disease incidence ranged in the four sites between (15-44%). Several pathogenic fungi were isolated and diagnosed, with the most notable and most frequent appearance (*R. solani* and *F. solani*) with (35.29 and 29.41%) and (16.91 and 14.18%), respectively. Four isolates were obtained from the fungus *R. solani* and three isolates from *F. solani*. All tested fungal isolates caused significant decrease in the percentage of germination seeds in varying proportions, as well as the infection of eggplant root rot with varying proportions. The use of the bacteria (*B. subtilis*) led to a decrease in the percent severity of disease, and an increase in the soft and dry weight of the vegetative and root groups, as well as a clear increase in the height of plant, leaf number and leaf area of the eggplant. The use of *B. subtilis* increased the total phenol content (18.4 and 17.8 mg/ml) compared to the control treatment (16.4mg/ml).

1. Introduction

Solanum melongena, known as eggplant, brinjal and aubergine, is an important vegetable crop throughout Asia and the Mediterranean where its fruits are a major ingredient in national and regional cuisine. Meanwhile, Asia is the main center of eggplant production. Iraq's production in 2009 is 396,000 tons, 21,000 hectares [1]

Eggplant crops are affected in the fields by many diseases and pests that cause severe damages during the growing season. One of these diseases is the root rot disease, which is one of the most common diseases in nurseries and greenhouses, caused by *Rhizoctonia solani*, *Fusarium solani* and *Macrophomina phaseolina* [2, 3].

The use of biological agents in controlling pathogens is due to their ability to stimulate self-resistance in plants. Some bacterial species, such as *Bacillus*, *Rhizobium*, *Pseudomonas*, *Azospirillum* and *Azotobacter* are known agents that stimulate the growth of plants [4]. *Bacillus subtilis* has been reported as a growth promoter and antagonistic to a variety of pathogens in vitro and vivo in numerous studies [5]. The disease resistance by *B. subtilis* is due to the fact that these bacteria possess multiple mechanisms such as promoting plant growth, contrast, site and nutrient competition, pathogen degradation and stimulating systemic induced resistance (ISR). The aim of research was to conduct a survey of pathogens that cause eggplant root rot and to evaluate the efficiency of bacteria *B. subtilis* in controlling eggplant root disease.

2. Materials and Methods

2.1 Field survey and sample collection

Symptomatic Plants that showed root rot infection were collected from four areas of Misan province in the 2017-2018 agricultural season, which were Btera, Maymouna, Saad River and Greta. Disease incidence was calculated according to, the following formula:

$$\text{Disease incidence} = \text{Number of infected plants} / \text{Total number of plants tested} \times 100$$

