MOLECULAR MARKERS ASSOCIATED WITH THE EXPRESSION OF PATHOGENICITY GENES OF *RHIZOCTONIA SOLANI* CAUSING FABA BEAN ROOT ROT

By

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B.Sc. Agric. Sc. (Plant Pathology), Ain Shams University, 2004
M.Sc. Agric. Sc. (Plant Pathology), Ain Shams University, 2009

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ABSTRACT

Maha Helmy Mohamed Hassan: Molecular Markers Associated with the Expression of Pathogenicity Genes of *Rhizoctonia solani* Causing Faba Bean Root Rot. Unpublished Ph.D. Thesis, Department of Plant Pathology, Faculty of Agriculture, Ain Shams University, 2015.

The present study was carried out to identify the most important genes that up regulate in *Rhizoctonia solani* during pathogenesis in order to find a new approach to control *Rhizoctonia* disease on faba bean.

One hundred and thirty one isolates of *Rhizoctonia* spp. were isolated of faba bean plants infected with root-rot and stem canker collected from different plant ages from different locations.

According to morphological features of *Rhizoctonia* isolates, all isolates were divided into twelve groups. Twenty one isolates from the different groups were randomly chosen for pathogenicity test procedure. The most aggressive isolate belong to polynucleate *Rhizoctonia* was identified as *Rhizoctonia solani* AG4-HGI by using specific primers of ITS regions of rDNA.

Anastomosis test was carried out between accurately identified isolate and eleven isolates belong to polynucleate groups. All aforementioned isolates were perfectly fused with each other. This result indicated that the eleven chosen isolates are belonging to the same anastomosis group *i.e.* AG4-HGI.

The obtained results clarified that the fungus feels the presence of the host by entity the moisture around the fungus or by heat emitted from the host, evaporate substances of the host plant or by all of these factors. The most noticed morphological deviations from the normal state by scanning electron microscope (SEM) are swelling the hyphae beneath the host which was observed twenty four hour after exposing the fungus to the peeled seeds, followed by formation of mycelial threads which grow toward the host forming infection cushions.

Peeled faba bean germinated seeds were coated by gum Arabic and subjected to the pathogen in a distance 6 mm in Petri dishes or by sown in plastic pots contained infested sand with the pathogen. The result obtained indicated that coated seeds with gum Arabic significantly reduced of disease index and positively reflected on all plant growth characters compared with non-coated seeds.

Starvation of *R. solani* leads to significantly increase of its aggressiveness *in vitro* test. Disease index was significantly reduced when amended soil with three different organic fertilizers in presence of fungal inoculum and positively reflected on all plant growth characters than those plants produced in non-amended soil.

Canker symptom -in fact- is a type of resistance response, due to increase the activity of PPO and the positive test of NBT in infected tissues. Isozymes pattern of SOD showed clear variability of visible bands between treatments.

Increase of nitrogen levels lead to significantly increasing the disease index as well as increasing the activity of both SOD and CAT. Potassium phosphate and calcium chloride significantly reduced of the disease index, reduced activity of both SOD and CAT, and positively reflected on all plant growth characters. The highest correlation coefficient between the disease index and the activity of both SOD and CAT emphases that these enzymes are important factors in *R. solani* pathogenicity.

Keywords:

Faba bean, Root rot, *Rhizoctonia solani*, Molecular markers, Pathogenicity genes, Superoxide dismutase (SOD), Catalase (CAT), Organic fertilizers, Sodium nitrate, Phosphate potassium, Calcium chloride, gum Arabic.

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