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ANTIFUNGAL ACTIVITY OF SOME PLANT EXTRACTS AND THEIR EFFECT ON HYDROLYTIC ENZYMES FROM *RHIZOCTONIA SOLANI*

By

SEHAM MOHAMED SAMY ABD EL AZIZ

B.Sc.Agric.Sc (Agric. Biotechnology), Fac., Agric., Ain Shams University, 2012

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النشاط المضاد للفطريات لبعض المستخلصات النباتية وتأثيرها على إنزيمات التحليل المائي من فِطْر *Rhizoctonia solani*

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ABSTRACT

Seham Mohamed Samy Abd El Aziz: Antifungal activity of some plant extracts and their effect on hydrolytic enzymes from *Rhizoctonia solani*. Unpublished M.Sc. Thesis, Department of Biochemistry, Faculty of Agriculture, Ain Shams University, 2022.

Rhizoctonia solani is a widespread pathogen is responsible for damping-off and root rot diseases in many crops. The high pathogenicity of *R. solani* is correlated with its ability to produce extracellular cell wall degrading hydrolytic enzymes including pectinases, cellulases and proteases. The present study was conducted to evaluate the ability of different extracts (hexane, methylene chloride and methanol 70%) of cinnamon and black cumin seeds to inhibit *R. solani* growth and its extracellular cell wall degrading enzymes. The results clearly demonstrated that the concentrations of 300 or 450 ppm of methylene chloride or hexane extracts of cinnamon completely inhibit the growth of *R. solani* after 72 hours of incubation at 25±1°C. Moreover, methylene chloride and hexane extracts of black cumin seeds with concentration of 4000 ppm inhibited *R. solani* growth by only 37% and 39%, after 72 hours of incubation, respectively. Meanwhile methanol extracts of cinnamon and black cumin seeds at 1000, 2000 and 4000 ppm did not exhibit any effect on the growth of *R. solani*. Extracellular enzymes activities including pectin lyase (PL), polygalacturonase (PG), and protease were inhibited by hexane and methylene chloride extracts of cinnamon and black cumin seeds at 2000 ppm. Black cumin seed hexane extract at 2000 ppm inhibited pectin lyase (PL) and polygalacturonase (PG) by 55% and 38% respectively. Although the methanolic extract of black cumin seeds at 2000 ppm didn't affect *R. solani* growth, it caused a significant reduction of *exo*-protease activity by 74.8%. GC- MS results of black cumin seed hexane extract and cinnamon hexane and methylene chloride extracts showed that linoleic acid is the main component of black cumin seed hexane extract while (E)-cinnamaldehyde isomer is the main

component in hexane and methylene chloride extracts of cinnamon. HPLC-MS analysis of the methanolic extract of black cumin seeds showed that amentoflavone, quercetin3-O-sophoroside-7-O-rhamnoside, procyanidin C2 and 5,7-dihydroxy-3,4-dimechoxyflavone were the main components. To understand the molecular interaction between the major compounds of the antifungal active extracts of both cinnamon bark and black cumin seeds and cell wall degrading enzymes, molecular docking between these compounds and the active site of pectin lyase and *exo*-protease have been carried out. The results of molecular docking indicated that the major compounds of these extracts competitively inhibit *R. solani* pectin lyase. Also, the molecular docking of *exo*-protease with amentoflavone and cinnamaldhyde clearly proved binding of both compounds in the active side.

Key words: *Rhizoctonia solani*, *Cinnamomum cassia, Nigella sativa, Pectinases acti*vity, Carboxymethyl cellulase activity and Protease activity

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