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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 فطر
Rhizoctonia solani

رسالة مقدمة من

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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 Unpublished M.Sc.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 $25\pm 1^{\circ}\text{C}$. 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, quercetin-3-O-sophoroside-7-O-rhamnoside, procyanidin C2 and 5,7-dihydroxy-3,4-dimethoxyflavone 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 cinnamaldehyde clearly proved binding of both compounds in the active site.

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

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CONTENTS

LIST OF TABLES.....	V
LIST OF FIGURES.....	VII
INTRODUCTION	1
REVIEW OF LITERATURE	5
2.1. <i>Rhizoctonia solani</i> pathogenicity.	5
2.2. Extracellular cell wall degrading enzymes of <i>R. solani</i>	8
2.3. Chemical control of <i>R. solani</i>	10
2.4. Antifungal activity of some plants extracts and active compounds against <i>R. solani</i>	12
2.4.1 Antifungal activity of cinnamon (<i>Cinnamomum cassia</i>) different extracts.	12
2.4.2 Antifungal activity of black cumin seed (<i>Nigella sativa</i>) different extracts.	16
2.4.3 Antifungal activity of other plant extracts and some active compounds.	18
2.5. Effect of plants extracts and active compounds on cell wall degrading enzymes.	20
2.6. Chemical composition and phytochemical screening of cinnamon (<i>Cinnamomum cassia</i>) and black cumin seeds (<i>Nigella sativa</i>).	22
2.6.1. Cinnamon (<i>Cinnamomum cassia</i>).	22
2.6.2. Black cumin seeds (<i>Nigella sativa</i>).	25
MATERIALS AND METHODS.....	29
3.1. Preparation of plant extracts.	29
3.2. Fungal isolate.	29
3.3. Determination of antifungal activity of plant extracts.	29
3.4. Production of <i>R. solani</i> extracellular enzymes in liquid medium.	31

3.5. Determination of <i>R. solani</i> hydrolytic extracellular enzymes activity.	31
3.5.1. Determination of pectin lyase (PL) activity.	31
3.5.2. Determination of polygalacturonase (PG) and carboxymethyl cellulase (CMCase) activity.	32
3.5.3. Determination of <i>exo</i> -protease activity.	32
3.6. Phytochemical screening of cinnamon and black cumin seed extracts.	33
3.6.1. Qualitative determination of tannins and phenols.	34
3.6.2. Qualitative determination of saponins.	34
3.6.3. Qualitative determination of flavonoids.	34
3.6.4. Qualitative determination of protein.	34
3.6.5. Qualitative determination of quinones.	35
3.6.6. Qualitative determination of reduced sugars.	35
3.7. Quantitative analysis of cinnamon and black cumin seed extracts.	35
3.7.1. GC-MS analysis.	35
3.7.2. HPLC-MS analysis.	36
3.8. Molecular docking.	37
3.9. Statistical analysis.	38
RESULTS AND DISCUSSION.	39
4.1. Effect of cinnamon bark and black cumin seed extracts on <i>Rhizoctonia solani</i> growth.	39
4.2. Effect of black cumin seeds and cinnamon bark extracts on extracellular hydrolytic enzymes of <i>Rhizoctonia solani</i>	45
4.2.1 Effect of black cumin seeds and cinnamon bark extracts on pectin lyase (PL) activity.	45
4.2.2 Effect of black cumin seeds and cinnamon bark extracts on polygalacturonase (PG) activity.	45
4.2.3 Effect of black cumin seeds and cinnamon bark extracts on carboxymethyl cellulase (CMCase) activity.	46

4.2.4 Effect of black cumin seeds and cinnamon bark extracts on <i>exo</i> -protease activity.	46
4.3. Qualitative analysis of cinnamon bark and black cumin seed extracts.	52
4. 4. Quantitative analysis of cinnamon bark and black cumin seed extracts.	55
4. 5. The relationship between chemical composition of cinnamon and black cumin seed different extracts and their biological activities.	73
SUMMARY.....	81
5.1. Effect of cinnamon and black cumin seed extracts on <i>Rhizoctonia solani</i> growth.	81
5.2. Effect of cinnamon and black cumin seed extracts on extracellular hydrolytic enzymes of <i>Rhizoctonia solani</i>	82
5.2.1. Effect of black cumin seed and cinnamon bark extracts on pectin lyase (PL) activity.	82
5.2.2. Effect of black cumin seed and cinnamon bark extracts on polygalacturonase (PG) activity.	82
5.2.3. Effect of black cumin seed and cinnamon bark extracts on carboxymethyl cellulase (CMCase) activity.	82
5.2.4. Effect of black cumin seed and cinnamon bark extracts on <i>exo</i> -protease activity.	83
5.3. Qualitative analysis of cinnamon bark and black cumin seed extracts.	83
5.4. Quantitative analysis of cinnamon bark and black cumin seed extracts.	83
5.5. The relationship between chemical composition of cinnamon and black cumin seed different extracts and their biological activities.	84
REFERENCES	87
الملخص العربي.....	1