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Antifungal Assay of some Novel Chalcone Derivatives

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Abstract

Numerous heterocyclic compounds demonstrated a wide range of biological activities, including pesticidal, fungicidal, insecticidal, antioxidant, and analgesic properties. The majority of heterocycles have outstanding antitubercular, anticancer, and antimicrobial properties. These actions were documented by the researchers in both *in-vitro* and *in-vivo* settings. So we undertake the antifungal assay of synthesized compounds against some pathogens viz *Candida albicans*, *Trichophyton rubrum*, *Aspergillus niger*, and *Trichophyton mentagoforum* which are mainly responsible for the diseases in ornamental plants.

Article History

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Keywords

Antifungal agents; *Chalcone derivatives*; *Plant pathogens*.

Introduction

Heterocyclic[1,2] nuclei are crucial building blocks for the development of numerous therapeutic medicines and play a significant role in medicinal chemistry. The central core of numerous significant biological *molecules* known as chalcones is an aromatic ketone. The α,β-unsaturated carbonyl system of chalcones and its analogues is recognized as a crucial framework and has been used as a precursor for *molecules* with physiological activity. The parent compound in the chalcone series is benzylidene acetophenone. Chalcones[3,4,5,6,7,8] are the biogenetic precursors of flavonoids and isoflavonoids ,the natural and synthetic products that have been reviewed for their wide range of pharmacological activity[9,10] medicinal[11,12] and agricultural activities. Literature survey also reveals various biological activities[13,14,15,16] like antibacterial[17,18,19] antioxidant,[20] antifungal,[21,22,23,24,25,26] tubulin polymerisation inhibitors,[27] potent antitumor activity,[28] antimalarial agent,[29] antimicrobial,[30,31,32] anticancer,[33,34,35] antitubercular,[36] anti-infective properties[37] *in-vivo*,[38] as well as *in-vitro* conditions.[39]

Plant pathology is the study of the causes, progression, and management of plant diseases. Plant diseases can be brought on by environmental factors or pathogenic organisms like fungi, bacteria, viruses, etc. Plants suffering from these diseases may grow more slowly or even die. Fungi were the first class of agents identified as causing plant diseases.

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Materials and Methods

In our previous work, a series of novel substituted chalcones[40] (listed in Table 1) were prepared by treating different aromatic aldehydes with different substituted acetophenones in presence of ethyl alcohol and aqueous potassium hydroxide (KOH) solution. These synthesized compounds were characterized by IR and ^{1}H NMR spectra and assayed for their antibacterial activities. In continuation with our previous work, we undertake the antifungal activities these compounds.

Table 1: List of Synthesized Chalcones

Sr No	Code	Synthesized Chalcones
1	AM1	3-(2,3-Dichlorophenyl)-1-(4-methylphenyl)prop-2-en-1-one
2	AM2	3-(4-Fluorophenyl)-1-phenylprop-2-en-1-one
3	AM3	1-(2,4-Dihydroxyphenyl)-3-(3-nitrophenyl)prop-2-en-1-one
4	AM4	1-(4-Methylphenyl)-3-(3-nitrophenyl)prop-2-en-1-one
5	AM5	3-(4-Methoxyphenyl)-1-phenylprop-2-en-1-one
6	AM6	1-(4-Bromophenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one
7	AM7	3-(4-Methoxyphenyl)-1-(4-methylphenyl)prop-2-en-1-one
8	AM8	1-(4-Bromophenyl)-3-phenylprop-2-en-1-one
9	B4	1-(3-Aminophenyl)-3-(4-chlorophenyl)prop-2-en-1-one
10	G	3-(4-Hydroxyphenyl)-1-(4-methylphenyl)prop-2-en-1-one
11	H	3-(2,3-Dichlorophenyl)-1-(2,4-dihydroxyphenyl)prop-2-en-1-one
12	I	3-(4-Chlorophenyl)-1-(4-methylphenyl)prop-2-en-1-one
13	J	1-(3-Aminophenyl)-3-(2,3-dichlorophenyl)prop-2-en-1-one
14	K	3-(2,3-Dichlorophenyl)-1-(4-methylphenyl)prop-2-en-1-one
15	L	3-(3-Nitrophenyl)-1-phenylprop-2-en-1-one
16	M	1-(3-Methylphenyl)-3-phenylprop-2-en-1-one
17	N	3-(4-Nitrophenyl)-1-phenylprop-2-en-1-one
18	O	1-(4-Bromophenyl)-3-(4-methoxyphenyl)prop-2-en-1-one
19	P	3-(4-Chlorophenyl)-1-(2,4-dihydroxyphenyl)prop-2-en-1-one

Results

The synthesized chalcone derivatives were screened for their antifungal assay against some ornamental plant pathogens viz. *Candida albicans, Trichophyton rubrum*, *Aspergillus niger*, and *Trichophyton mentagoforum*.

Table 2: Impact of test compounds against plant pathogens (Fungi)

Test Compound	*Candida albicans*	*Trichophyton rubrum*	*Aspergillus Niger*	*Trichophyton mentagoforum*
Compound 1	20mm	16 mm	19 mm	20 mm
Compound 2	19 mm	--	20 mm	22 mm
Compound 3	15 mm	20 mm	23 mm	24 mm
Compound 4	21 mm	19 mm	21 mm	23 mm
Compound 5	14 mm	18 mm	16 mm	25 mm
Compound 6	19 mm	18 mm	--	26 mm
Compound 7	--	15 mm	--	28 mm
Compound 8	15 mm	--	--	--
Compound 9	14 mm	20 mm	20 mm	13 mm
Compound 10	16 mm	22 mm	--	22 mm

Compound 11	--	18 mm	20 mm	17 mm
Compound 12	20 mm	--	18 mm	22 mm
Compound 13	18 mm	20 mm	--	21 mm
Compound 14	18 mm	22 mm	--	18 mm
Compound 15	21 mm	18 mm	17 mm	24 mm
Compound 16	19 mm	17 mm	20 mm	17 mm
Compound 17	20 mm	19 mm	18 mm	16 mm
Compound 18	13 mm	18 mm	--	18 mm
Compound 19	--	20 mm	21 mm	21 mm
Reference Antibiotic	38 mm (Fluconazole)	39 mm (Fluconazole)	16 mm (Fluconazole)	18 mm (Fluconazole)
Control Disc (Chloroform)	--	--	--	--

Diameter of inhibition zone (mm)

Discussion

The synthesized compounds listed in Table 1, when assayed against the ornamental plant pathogens (fungi) viz. *C.albicans*, *T.rubrum, A.niger*, and *T.mentagoforum* showed moderate to excellent activities.

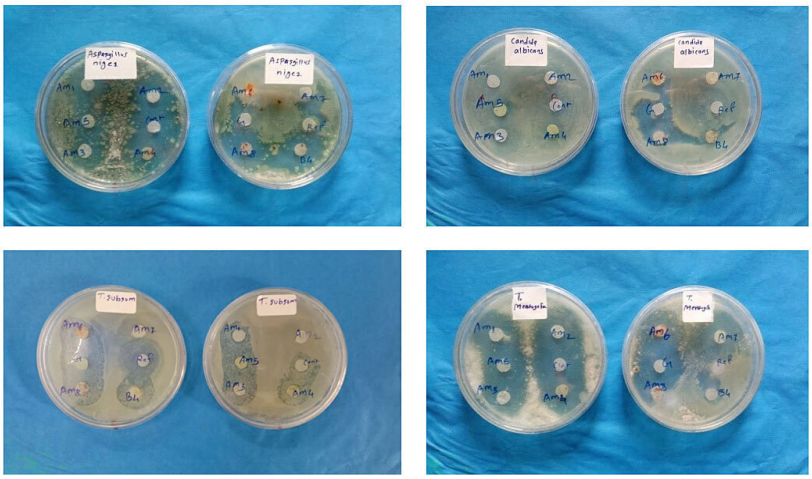

Fig.1: Pictorial presentation of the Impact of test compounds against experimented

organisms

In general, compounds in Table 2 showed good antifungal actions against all the test organisms viz. *C.albicans, T.rubrum*, *A.niger,* and *T.mentagoforum*. In general, test compounds 4, 15 and 16 showed very good activities against all the experimented organisms *viz C.albicans*, *T. rubrum*, A. niger, and *T. mentagoforum*. All the test compounds had shown comparatively excellent inhibitory activities against *T. mentagoforum*. The test compound 4 showed excellent antifungal activity against *C.albicans*. The test compounds10 and 14 were very active against *T. rubrum*. The test compound 3 showed very good activity against *A. niger*. The test compounds 6 and 7 showed excellent activity against *T. mentagoforum*. In case of *A.niger*, and *T.mentagoforum,* some test compounds showed higher antifungal actions than reference antibiotic Fluconazole.

Conclusion

Most of the test compounds were found to be highly active against the experimented fungi viz. *C.albicans*, *T.rubrum, A.niger*, and *T.mentagoforum*.

Hence, all of these test compounds can be employed to treat diseases in ornamental plants brought on by these pathogens. Yet, it is advisable to do a more in-depth investigation in light of agricultural sciences.

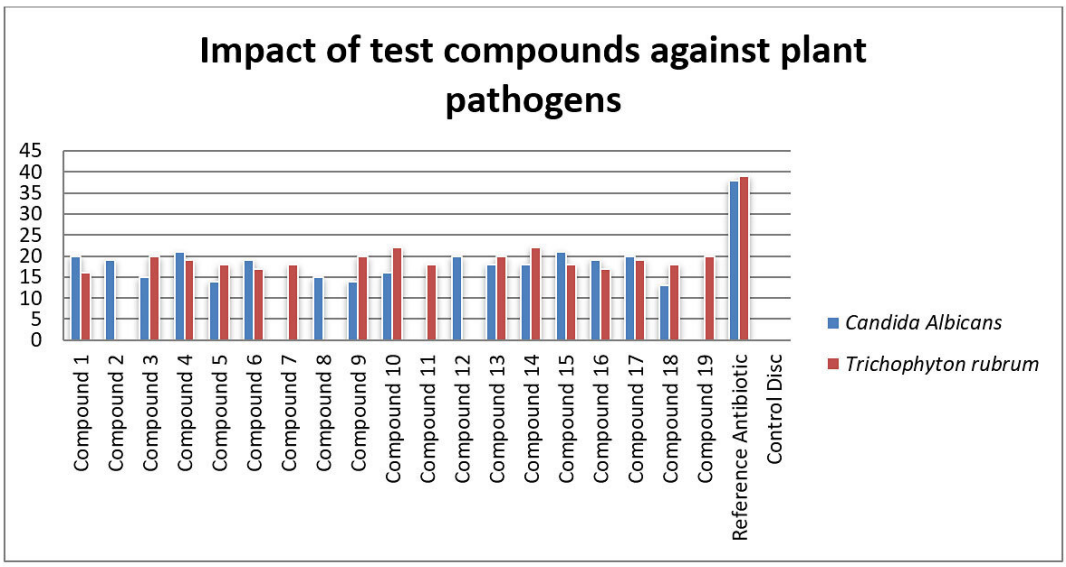

Fig. 2: Graphical representation of the Impact of test compounds against plant pathogens viz *Candida albicans* and *Trichophyton rubrum*

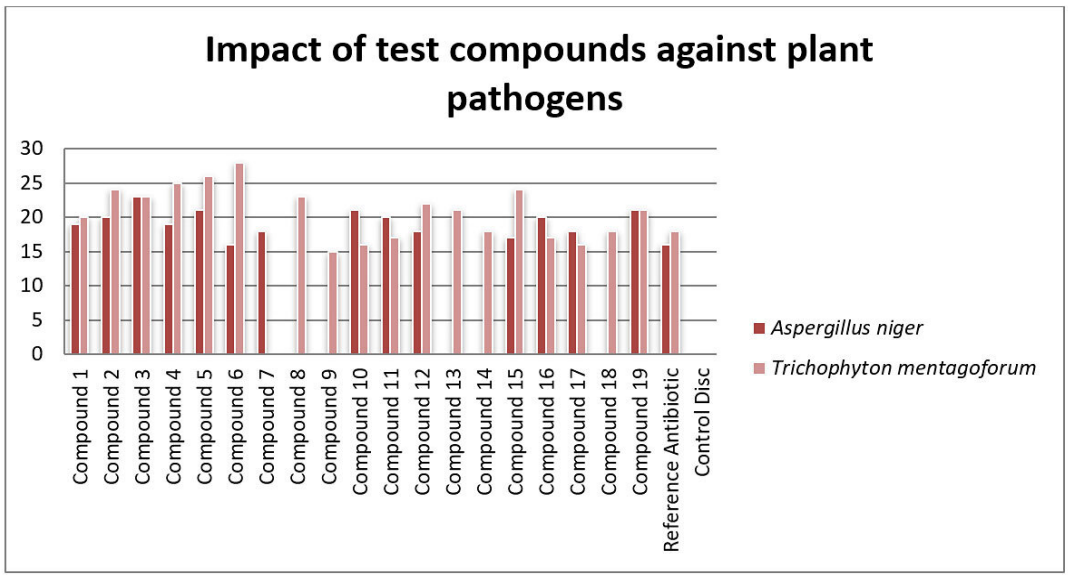

Fig. 3: Graphical representation of the Impact of test compounds against plant pathogens viz Aspergillus niger and Trichophyton mentagoforum

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Conflict of Interest
The authors do not have any conflict of interest.

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