

Synthesis, spectral characterization & biological screening of some novel synthesized imidazoles

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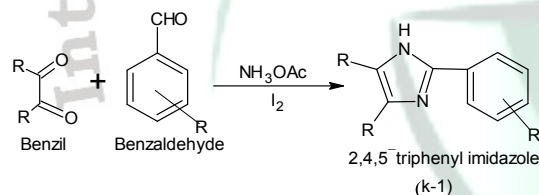
Abstract

The thesis entitled "synthesis and biological screening of some newly synthesized imidazole" is divided into different categories. The structure of synthesized compounds was confirmed by their IR, NMR and MASS spectral activity. All the compounds were tested for antifungal activity against *C. Albicans*, *M. audouinii*, *A. Niger* and *T. mentagrophytes*. Among the synthesized compounds the compounds KD-4 and KD-6 were found to be active against *A. Niger* and *C. albicans* and the compound KD-7 was found to be active against *A. Niger* and *M. audouinii* with compared to standard compound i.e. Fluconazole.

Keywords: Antifungal activity, biological screening, standard compound, fluconazole.

Introduction

Imidazole is an organic aromatic heterocyclic compound with the formula C₃H₄N₂. Imidazole ring system has many pharmacological properties and play important roles in biochemical processes. Many of the substituted imidazoles are known as inhibitors of fungicides and herbicides, plant growth regulators and therapeutic agents. Recent advances in green chemistry and organometallic chemistry have extended the boundary of imidazoles to the synthesis and application of a large class of imidazoles. Derivatives of imidazole were reported for anti-inflammatory, analgesic, tuberculostatic, anticancer and antidepressant, antimicrobial, antifungal activities¹⁻⁴.



Experimental work⁵⁻¹⁵

Synthesis of 2,4,5-triphenyl-1H-imidazole :- (KD-1)

Synthesis of 1-benzoyl 2,4,5-triphenyl-1H-imidazole :- (KD-2)

Synthesis of 1-benzyl 2,4,5-triphenyl-1H-imidazole :- (KD-3)

Synthesis of 1-para amino benzoyl 2,4,5-Triphenyl-1H-imidazole :- (KD-4)

Synthesis of 1-para toluene sulphonyl 2,4,5-Triphenyl-1H-imidazole :- (KD-5)

Synthesis of 1-phenyl sulphonyl 2,4,5-Triphenyl-1H-imidazole :- (KD-6)

Synthesis of 1-dichloro benzene 2,4,5-Triphenyl-1H-imidazole :- (KD-7)

Spectroscopy Characterization

IR Spectroscopy

¹HNMR Spectroscopy

IR spectrum of KD-1

S.N.	Frequency cm ⁻¹	Indications
01	3035.0	NH
02	2850.3	Aromatic CH
03	2700	C=N
04	1202.6	C-N
05	694.9	CH Bending

IR spectrum of KD-2

S.N.	Frequency cm ⁻¹	Indication
01	3382.9	N-H Vibration
02	3066.9	Aromatic C-H
03	2676.1	Secondary amine (imidazole 3 N)
04	1915.2	CO
05	1685.3	C=O
06	1603.2	Aromatic Skeletal vibration
07	1210.8	Aliphatic
08	932.9	Aromatic CH

IR spectrum of KD-3

Frequency cm ⁻¹	Indication
3034.8	Aromatic C-h
2924.2	Aliphatic CH Starching
2852.3	Aliphatic CH starching
1652.6	C=H
1593.0	Aromatic Skeletal Vibration
1200.8	C-N
913.4	Aromatic CH Bending
696.1	Aromatic CH Bending

IR spectrum of KD-5

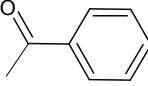
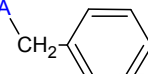
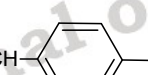

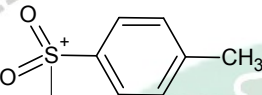
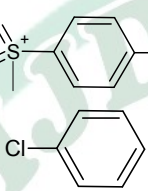
Frequency cm ⁻¹	Indication
3100.7	Aromatic CH
1670.9	C=N
1655.1	Aromatic Skeletal Vibration
1210.7	C-N
1400.3	SO
756.1	Aromatic CH Bending
2852.3	CH ₃

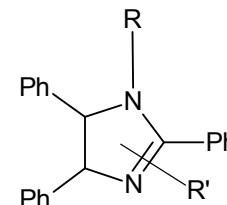
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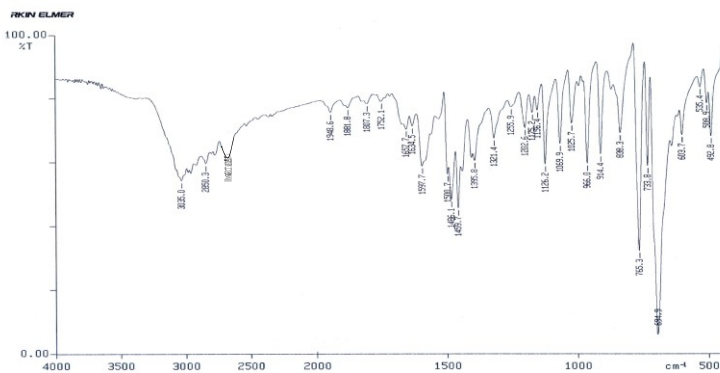
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Physical data of compounds:

IR spectrum of KD-5 S.N.	Product code	R	Mol Wt	Melting point	% yield
01.	KD-2		C ₂₈ H ₂₀ N ₂ O	110	56
02.	KD3		C ₂₈ H ₂₂ N ₂	92	44
03.	KD4		C ₂₈ H ₂₁ ON ₃	106	46
04.	KD5		C ₂₇ H ₂₂ O ₂ N ₂ S	82	43
05.	KD6		C ₂₇ H ₂₀ O ₃ N ₂ S	94	45
06.	KD7		C ₂₈ H ₂₀ N ₂ Cl	144	51

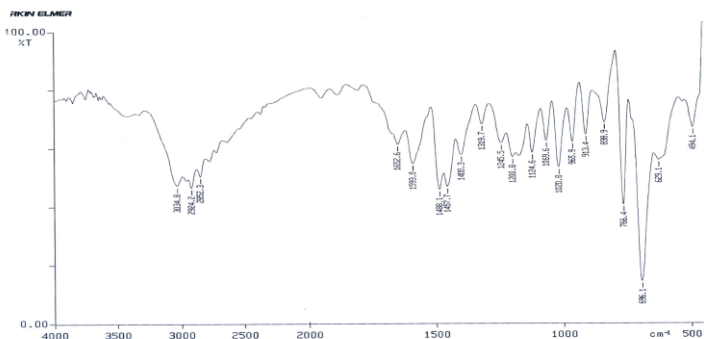


IR spectrum of KD-1



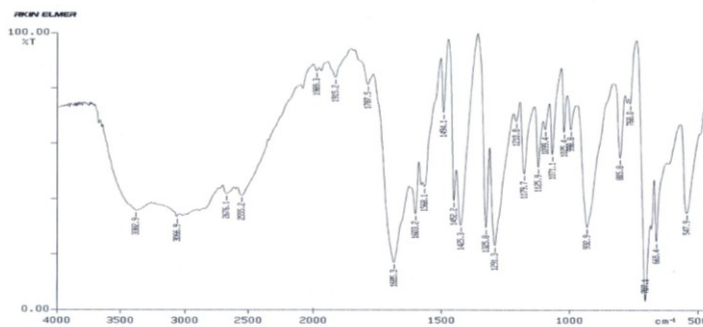
10/10/11 16:14 R.C./SAIF.P.U.CHD.
X: 4 scans, 2.0cm⁻¹, flat, smooth, abex

IR spectrum of KD-3



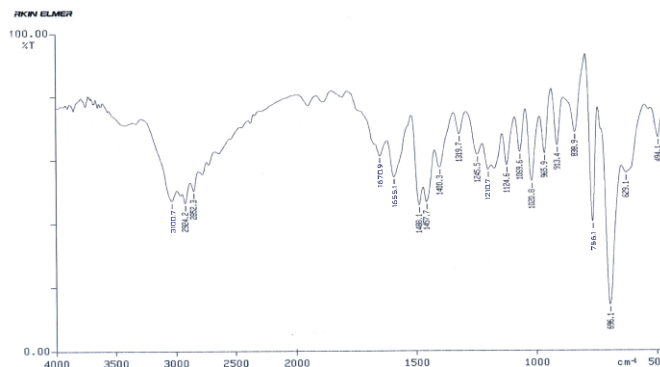
10/10/11 16:39 R.C./SAIF.P.U.CHD.
Z: 4 scans, 2.0cm⁻¹, flat, smooth, abex

IR spectrum of KD-2



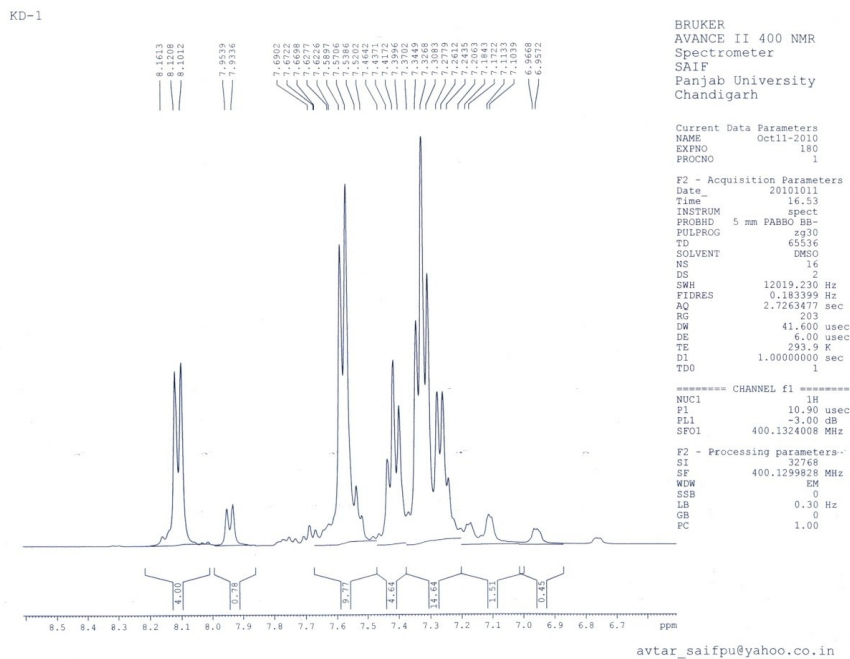
10/10/11 16:18 R.C./SAIF.P.U.CHD.
Y: 4 scans, 2.0cm⁻¹, flat, smooth, abex

IR spectrum of KD-5



10/10/11 16:39 R.C./SAIF.P.U.CHD.
Z: 4 scans, 2.0cm⁻¹, flat, smooth, abex

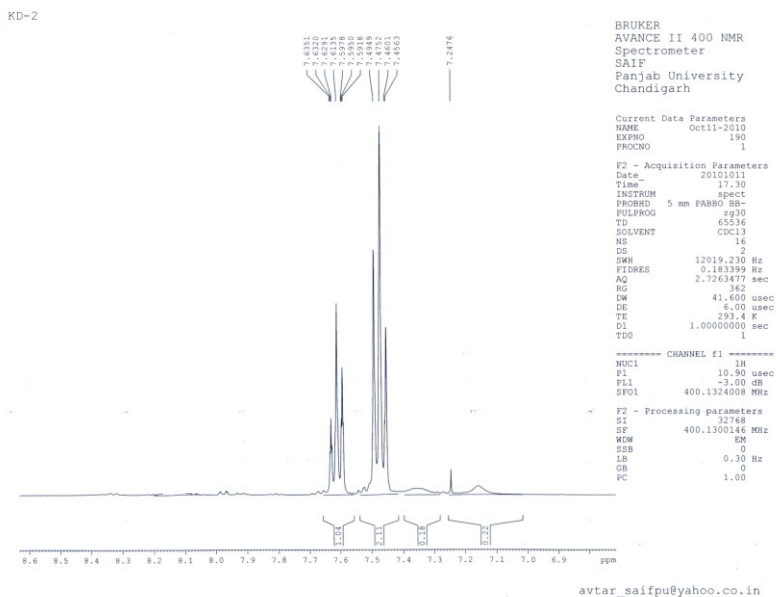
¹H NMR spectrum of KD 1



Interpretation of ¹H NMR Spectrum of KD 1

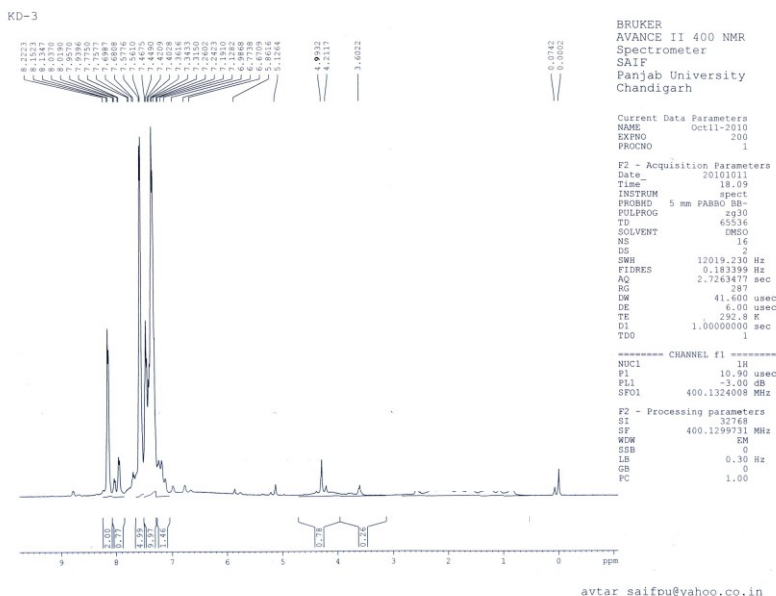
1H-NMR δ ppm	Interpretation
13.40	NH Imidazole
7.4642	CH Benzene
7.3268	CH Benzene
7.2063	CH Benzene

¹H NMR spectrum of KD 2



Interpretation of ¹H NMR Spectrum of KD 2

1H-NMR δ ppm	Interpretation
7.6351	CH Benzene, C=O
7.4563	CH Benzene, C=O
7.590	CH Benzene, C=O
7.4752	CH Benzene
7.2476	CH Benzene

¹H NMR spectrum of KD3Interpretation of ¹H NMR Spectrum of KD 3

¹ H-NMR δ ppm	Interpretation
4.9932	CH ₂ Methyl
7.1282	CH Benzene,-C
7.2423	CH Benzene,-C
7.3150	CH Benzene
7.4675	CH Benzene

Biological Evaluation

The compounds synthesised during the present investigation were screened for their antifungal activity. The anti fungal test was conducted on four common microorganisms such as: *C. albicans*, *M. audouinii*, *A. niger* and *T. mentagrophytes*. The antifungal activity of the compounds was assessed by disc plate method.

Results and Discussion

Synthesis of designed compounds has been performed as showed in Scheme. After completion of synthesis, physicochemical characterization of synthesized compounds has been performed. All synthesized compounds shows maximum solubility in ethanol and in water which confers the lipophilicity of synthesized compounds. The IR spectra of synthesized compounds were obtained from SAIF, Punjab University using KBr pellets. The ¹H NMR & ¹³C spectrums of synthesized compounds were obtained from SAIF, Punjab University. ¹H NMR (Bruker Advances II 400 NMR) showed chemical shifts is in good agreement with the structure of the synthesized compounds.

Conclusion

The method is described is the preparation of unique substituted imidazole fro, commercial and available chemicals and easy to prepare. The importance aspects of this protocol are high yielding, mild reaction conditions availability of the precursor and purity of the obtained product with no further crystallization. In conclusion molecular iodine was found to be a mild and effective catalyst for the formation of 2,4,5 tri phenyl substituted imidazole in excellent yields. The uses of this in expensive easily available catalyst under solvent free conditions make this protocol practical and economically attractive.

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Antifungal activity of Imidazole derivatives

Sample code	*Inhibition Zone diameter in mm			
	<i>C.albicans</i>	<i>M.audouinii</i>	<i>A.niger</i>	<i>T.mentagro phytes</i>
	100μ	100μ	100μ	100μ
KD 1	15	13	17	13
KD 2	14	15	13	14
KD 3	12	13	12	11
KD 4	19	15	18	13
KD 5	13	13	14	17
KD 6	21	14	20	13
KD 7	16	18	21	15
Flucanazole	26	18	28	22

*Each value is an average of three independent determination ± standard deviation.

Note: - denotes no activity, 8-12mm poor activity =, 13-17 mm moderate activity, 18-20 and above good activity.

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