Efficient Synthesis and Characterization of Thiazole Derivative.

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Abstract : As a part of systematic investigation of synthesis, we have prepared thiazole derivative by reacting alpha halo carbonyl compound. These compound have been characterized on the basis of their IR and NMR spectral results. A new synthetic way for the formation of thiazole derivative compounds containing 5-phenyl chlorosubtituted moiety and 2-substituted amino group has been developed that achieved in minimum number of steps with a good yield.

Keywords: Thiazoles, alpha halo carbonyl compound, TLC plate, IR and NMR data.

I. INTRODUCTION

Thiazole is a five membered ring system in which two heteroatoms (N and S) are placed in the ring at 1,3-positions. Small ring heterocycles containing nitrogen and sulphur atoms have been under investigation for a long time because of their important medicinal properties. Among the wide range of heterocycles explored to develop pharmaceutically important molecules, thiazoles have played an important role in medicinal chemistry. Thiazole and its derivatives display a wide range of biological activities such as sedative[1], anaesthetic[2], cardiotonic[3], anti-bacterial[4], antifungal[5] and anti-inflammatory[6].

Since, discovery and development of effective as well as safe drugs has brought a progressive era in human healthcare that is accompanied by the appearance of drug resistant bacterial strains, there is constant need of new antibacterial agents having novel mechanisms of action to act against the harmful pathogens.1,3-thiazole heterocycle is an interesting building block in a variety of natural and synthetic compounds found to possess good antibacterial [7-9] potential.

In the present study, we have designed and synthesized thiazole derivative.

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II. EXPERIMENTAL

All the chemicals used were of analytical grade. All the solvents used were purified by standard methods. All the glasswares used in the present work were of pyrex quality. Purity of compounds was monitored on silica gel coated TLC plate. Melting points were determined in glass capillary tubes and are uncorrected. PMR spectra were recorded on a Bruker Avance II 400 spectrophotometer in DMSO. IR spectra were recorded on a Perkin-Elmer FT IR 1600. Physical characterization data of all the compounds is given in table 1.

The synthetic routes which furnished the target compounds are shown below along with IR and NMR data (Scheme-1)

Preparation of 2-[4-{4'-chlorobenzoyl}-5-(3',5'-dichloro-2'-hydroxyphenyl) thiazol-2-ylamino]-1-(3',5'-dichloro-2'-hydroxyphenyl)ethanone (1).

5-(2'-Hydroxy-3',5'-dichlorophenyl)-4-(4'-chlorobenzoyl)-2-amino-1,3-thiazole (0.01M) and 2-bromo-1-(2'-hydroxy-3',5'-dichlorophenyl)ethanone (0.01 M) were taken in 20 ml of ethanol and refluxed for 3 hours. The solid thus separated was filtered and washed with cold ethanol to get the compound.

The spectral data of compound (1):

The IR spectrum of the compound (1) recorded in KBr showed following main absorption bands :

Compound	Frequency (cm^{-1})	Intensity	Correlation
1	3204	B	Strongly intermolecular hydrogen bonding O-H stretching
	3118	W	Aromatic C-H stretching
	3034	S	-N-H stretching
	3009	W	Stretching in aromatic system
	1656	S	Carbonyl stretching
	1552	S	-C=C stretching
	1343	S	O-H bending in phenol
	870	S	C-Cl stretching

1. NMR spectrum of compound (1) was recorded in DMSO with TMS as an internal standard. The observed chemical shifts can be correlated as follows

Chemical shifts	Nature of peak	No. of protons	Types of protons
11.46	s	1H	Ar-O**H**
8.09	d	1H	Ar-**H**
7.90	d	2H	Ar-**H**
7.75	d	2H	Ar-**H**
7.66	d	1H	Ar-**H**
7.40	d	1H	Ar-**H**
7.27	d	1H	Ar-**H**
3.42	B	1H	N-**H**
2.53	s	2H	-C**H**$_2$-CO

Preparation of (4'-chlorophenyl)(5-(3',5'-dichloro-2'-hydroxyphenyl)-2-(4-(3',5'-dichloro-2'-hydroxyphenyl)-2-mercapto-1H-imidazol-1-yl)thiazo-4-yl)methanone (2).

A mixture of 2-[4-{4'-chlorobenzoyl}-5-(3',5'-dichloro-2'-hydroxyphenyl) thiazol-2-ylamino]-1-(3',5'-dichloro-2'-hydroxyphenyl)ethanone(1) and KSCN (0.01M) was refluxed for 2 hours in glacial acetic acid (20 ml) and cooled. The solid thus separated was filtered and crystallized from ethanol to get the compound.

The spectral data of compound (2):

The IR spectrum of the compound (2) recorded in KBr showed following main absorption bands :

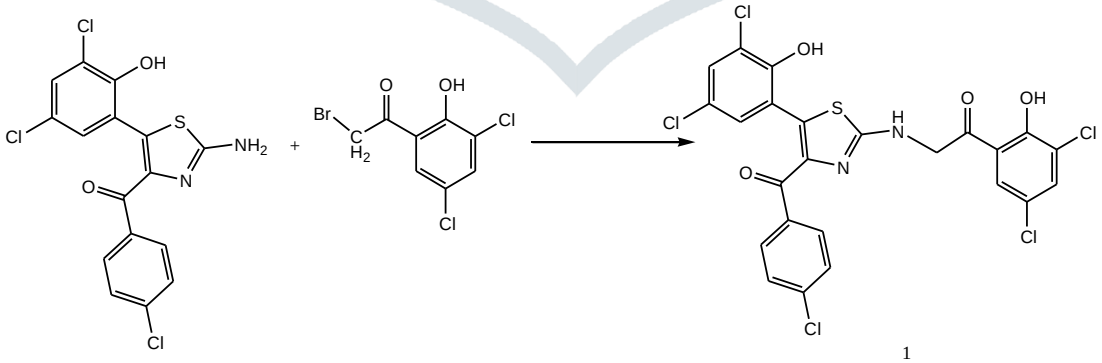
Compound	Frequency (cm-1)	Intensity	Correlation
2	3413	b	intermolecular hydrogen bonding O-H
	3206	w	Aromatic C-H stretching
	3035	w	Stretching in aromatic system
	3009	s	-S-H stretching
	1649	s	-CO- stretching
	1553	s	-C=N stretching
	1449	s	-C=C stretching
	1438	s	O-H bending in phenol
	746	s	C-Cl stretching

1. NMR spectrum of compound (2) was recorded in DMSO with TMS as an internal standard. The observed chemical shifts can be correlated as follows :

Chemical shifts	Nature of peak	No. of protons	Types of protons
12.50	s	2H	Ar-O**H**
7.94	d	1H	Ar-**H**
7.93	d	1H	Ar-**H**
7.88	d	2H	Ar-**H**
7.69	d	1H	Ar-**H**
7.62	d	1H	Ar-**H**
7.39	d	2H	Ar-**H**
7.28	s	1H	**H**-C=C
3.35	s	1H	S-**H**

Table 1: Characterization data of newly synthesized compounds

Compound	Molecular formula	M.P(ºC)	Yield (%)	Rf
1	$C_{25}H_{17}O_4Cl_5N_2S$	156-162	70	0.33
2	$C_{25}H_{12}Cl_5O_3N_3S_2$	175-180	65	0.24



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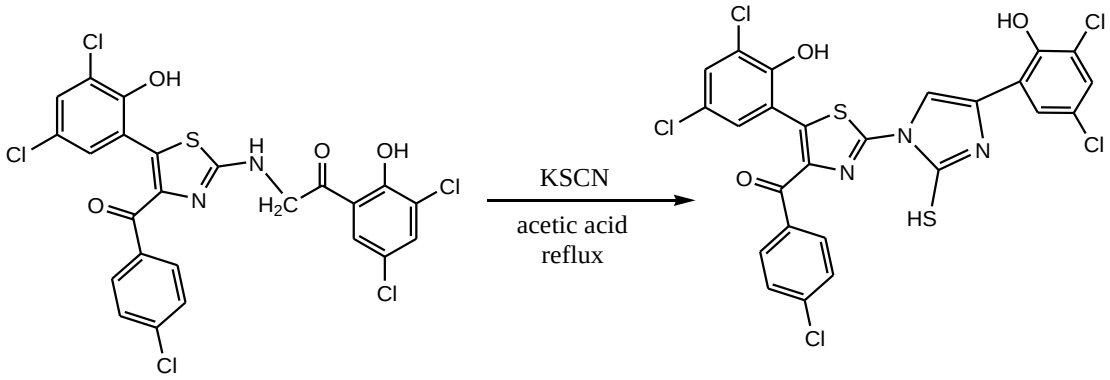

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Scheme-I

III. RESULTS AND DISCUSSION

A new synthetic procedure for the formation of thiazole derivative compounds containing 5-phenyl chlorosubtituted moiety and 2-substituted amino group has been developed that achieved in minimum number of steps with better yield. Thus, we believe that this novel procedure opens up a new door for the formation of important heteroaromatic compounds of this series in the interest of academics and pharmaceutical industries.

IV. ACKNOWLEDGEMENT

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