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Research Article

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Antimicrobial activities of substituted 2-aminobenzothiazoles

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ABSTRACT

In the present work all the synthesized compounds were screened for their antimicrobial activities. These compounds were found to have antimicrobial activities comparable to and in some cases greater than those of equimolar quantities of standard drug.

Key words: Antimicrobial activity, phenylthiourea, aminobenzothiazole, Thiazoles, antibacterial activities and antifungal activities

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INTRODUCTION

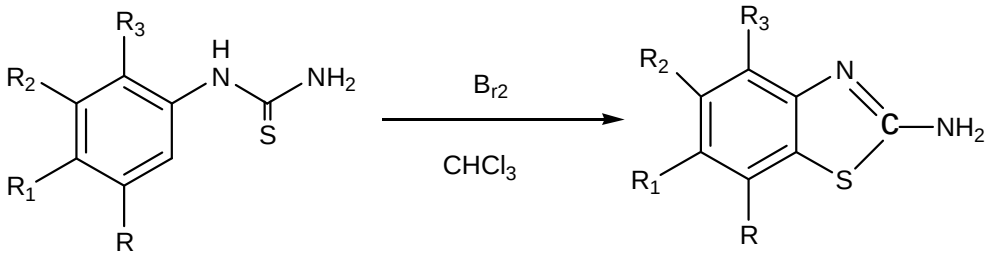
Heterocyclic compounds are the cyclic compounds which contains at least two different atoms in their ring. The most common are those which contain five- or six-memberd rings and containing of nitrogen, oxygen or sulfur. These heterocyclic compounds form the number of pharmaceutical drugs, agrochemicals [1]. A review of the literature reveals that number of references is available for the synthesis and antimicrobial activity of substituted 2-aminobenzothiazole. N-bridged and S- bridged heterocyclic resulting in the formation of heterocyclic compounds which has a very high potential towards biological activity. Benzothiazols has been found to be important pharmaceutical drug which can be used for antiviral, antitumor, analgesic, anti-inflammatory, muscle relaxant etc [2-8]. Substituted 2-aminobenzothiazol hetrosystems are considered to be most active in case of antimicrobial activity [9-12]. Due to high importance of thiazoles and their derivatives they have been quantitatively synthesized by using different catalyst, conditions, strategies [13-22]. The sulphur–nitrogen heterocycles constitute an interesting class of heterocycles and attracting the attention of the synthetic and medicinal chemists due to their structural diversity and biological activities.

In view of the structural changes with the presence of heteroatoms and the relationship of structures with the biological/pharmacological activities, we have synthesized nitrogen-sulfur heterocycles of biological and pharmacological importance incorporating diverse structural feature due to diversity in substituent, heterocyclic systems and appended pharmacologically active functional groups for making them available for biological evaluation and SAR studies.

EXPERIMENTAL SECTION

Preparation of substituted 2-aminobenzothiazole: - Take 0.05 mole phenylthiourea dissolve it in 50 ml of chloroform cool it to 5 ^{0}C. And add 0.05 mole of bromine to 50ml of chloroform. Add slowly the bromine solution

to the phenylthiourea solution for about 90-120 minutes by controlling the temperature of 0-5 ^{0}C. Now elute the solution. Dry the sample at about 40 ^{0}C then add sulfur dioxide liquid, its colour changes to greenish. Further addition of sulfur dioxide liquid (100 ml) to the green coloured residue, now heat it on water bath the mixture gets soluble and elute the solution. The elute is cooled down and add slowly ammonium hydroxide to it by continuous stirring a precipitate is formed. Add ammonium hydroxide till the solution becomes basic. Filtrate the solution and wash it with water so that base comes out. Dry it and the powered 2-aminobenzothiazole is formed. Structural characterization of the compounds was carried out by the use of literature [23-34].



Scheme-1: Synthesis of 2-aminobenzothiazole

Antimicrobial activities

All the synthesized compound was screened for their antimicrobial activities. In the present work I have used the Agar disc method [35-37]. This may yield in zone of inhibition in mm results for the amount of antimicrobial chemicals that is needed to inhibit the growth of microorganism. It is carried out in Petri-plates. Medium for microorganisms consists of

1. Agar agar 13 g
2. LB agar 5 g
3. Distilled water 300 g

The above constituents are dissolved and sterilized in an autoclave at 15 lbs and 121^{0}C for 15 minutes. The sterilized medium was poured into different sterilized Petra-plates in laminar, allowing them to solidify.

Following common standard strains used for screening of antibacterial and anti fungal activities:

1. *Samonella typhimurium*,
2. *E. coli*
3. *Nitrobecter*
4. *Aspergillus fumigatus*,
5. *Penicillium chrysogenum*
6. *Fusarium graminearium*

RESULTS AND DISCUSSION

All the synthesized compounds (Sample 1-6) were screened for their antibacterial activity against bacteria, *Samonella typhimurium*, *E. coli* and *Nitrobecter* as well as for their antifungal activities against *Aspergillus fumigatus*, *Penicillium chrysogenum* and *Fusarium graminearium* by Agar disc method. The results obtained were given below. Chloroamphinacol is used as standard drug **(Table-1).**

Table-1 Antimicrobial activities of substituted aminobenzothiazoles

SAMPLE-1:- 2-amino-6-methyl-benzothiazole (Solvent system: 1ml methanol and 9ml water)				
Name of Bacteria/Fungi	*Zone of inhibition in (mm)at different concentration (in ppm)*			
	0ppm	100 ppm	200 ppm	300 ppm
E. coli	0 mm	0.75mm	0.125mm	0.5mm
Salmonella typhemurium	0mm	0mm	0mm	0mm
Nitrobecter	0mm	0mm	0mm	0 mm
Aspergillus fumigatus	0mm	0mm	0mm	0mm
Pencillium chrysogenum	0mm	0mm	0mm	0mm
Fusariumgr graminearium	0mm	1.75mm	3mm	3.6mm
SAMPLE -2:- 2-amino-4,7-dichloro-benzothiazole (7ml methanol and 3 ml water)				
Name of Bacteria/Fungi	*Zone of inhibition in (mm)at different concentration (in ppm)*			
	0 ppm	100 ppm	200 ppm	300 ppm
E. coli	0mm	1.75mm	2.5mm	4.5mm
Salmonella typhemurium	0mm	1.3mm	2.8mm	1.25mm
Nitrobecter	0mm	0mm	0mm	0mm
Aspergillus fumigatus	0mm	0.13mm	2mm	2.6mm
Pencillium chrysogenum	0mm	0mm	0mm	0mm
Fusariumgr graminearium	0mm	0mm	0mm	0mm
SAMPLE-3:- 2-amino-6-bromo-benzothiazole (Solvent system: 3ml methanol 7ml water).				
Name of Bacteria/Fungi	*Zone of inhibition in (mm)at different concentration (in ppm)*			
	0 ppm	100 ppm	200 ppm	300 ppm
E. coli	2mm	2.5mm	3mm	0mm
Salmonella typhemurium	0mm	0.3mm	0.4mm	0.6mm
Nitrobecter	0mm	0.5mm	0.7mm	1.2mm
Aspergillus fumigatus	0mm	7.5mm	6.2mm	11mm
Pencillium chrysogenum	0mm	2.5mm	3.3mm	1mm
Fusariumgr graminearium	0.5mm	0.6mm	0.6mm	0.6mm
SAMPLE-4:- **2-amino-6-chloro-benzothiazole** (Solvent system: 1ml methanol 9ml water)				
BECTERIA	*Zone of inhibition in (mm)at different concentration (in ppm)*			
	0 ppm	100 ppm	200 ppm	300 ppm
E. coli	0.5mm	0.5mm	0.5mm	1mm
Salmonella typhemurium	0mm	2.5mm	1.5mm	1mm
Nitrobecter	2mm	1.5mm	6.2mm	3.8mm
Aspergillus fumigatus	0.25mm	2.5mm	3.7mm	4.5mm
Pencillium chrysogenum	0.25mm	1mm	12mm	5mm
SAMPLE- 5:- 2-amino-6-methoxy-benzothiazole(Solvent system:1ml DMSO and 9ml water)				
Name of Bacteria/Fungi	*Zone of inhibition in (mm)at different concentration (in ppm)*			
	0 ppm	100 ppm	200 ppm	300 ppm
E. coli	0mm	0mm	0mm	0mm
Salmonella typhemurium	0.2mm	0.3mm	0.3mm	0.4mm
Nitrobecter	0mm	0mm	0mm	0mm
Aspergillus fumigatus	2mm	2mm	1.5mm	2mm
Pencillium chrysogenum	0mm	0mm	0mm	0.2mm
Fusariumgr graminearium	0.5m	0.5mm	0.7mm	0.5mm
SAMPLE-6:-2-Aminobenzothiazole				
Name of Bacteria/Fungi	*Zone of inhibition in (mm)at different concentration (in ppm)*			
	0ppm	100ppm	200ppm	300ppm
E. coli	0mm	0mm	0.5mm	3mm
Salmonella typhemurium	0mm	0mm	0mm	0mm
Nitrobecter	0mm	0mm	0mm	0mm
Aspergillus fumigatus	0mm	0mm	0mm	0mm
Pencillium chrysogenum	0mm	2mm	2mm	3.2mm
Fusariumgr graminearium	0mm	0mm	0mm	0mm

CONCLUSION

It has been observed that all the compounds (Sample 1-6) show activity against microbes. Thus from the results, it has been found that substituted 2-aminobenzothiazols shows wide variety of antimicrobial activity in comparison to unsubstituted 2-aminobenzothiazole.

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