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Research Article

Synthesis and Antibacterial Activity of Some 2- Substituted Amino Benzothiazole Derivatives

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ABSTRACT

A series of 2- amino substituted (3a-3g) were synthesized by treating with ammonium thiocynate in the presence of Conc. HCl with different substituted anilines.Structures of all the synthesized compounds were established on melting point, TLC, IR,^{1}H NMR spectral data. In the present study 2-aminobenzothiazole derivatives were prepared from the substituted anilines, in the presence of ammonium thiocyanate and the titled compounds were evaluated for Antibacterial Activity .

Key-words: Amino benzothiazole, Antibacterial Activity.

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Introduction:

Benzothiazoles are bicyclic ring system with multiple applications which have been the subject of great interest because of their biological activities. Literature review revealed the potent inhibition of human immunodeficiency virus type 1 (HIV-1) replication by HIV-1 protease inhibition, anti tumor, analgesic and anti-inflammatory, antimalerial, antifungal and various CNS activities of benzothiazoles. Long term therapy with nonselective NSAIDs may cause gastrointestinal complications ranging from stomach irritation to life-threatening GI ulceration and bleeding. Even with selective coxibs has revealed unexpected cardiovascular adverse effects. Thus there remains a compelling need for effective NSAIDs with an improved safety profile.

In the present study 2-aminobenzothiazole derivatives were prepared from the substituted anilines, in the presence of ammonium thiocyanate and the titled compounds were evaluated for Antibacterial Activity .

Experimental:

The melting points were determined in open capillary tube and are uncorrected.The completion of the reaction and purity of the compounds were checked by thin layer chromatography (TLC).IR spectra were recorded on Bruker optics Alpha ATR by using KBr pellets.

Synthesis: General method of synthesis

Equimolar quantities of substituted anilines and ammonium thiocynate were dissolved in ethanol containing Conc. HCl keep as it for 30 minutes , to this Conc. H_2SO_4 was added and the reaction mixture was refluxed for one and half hour. The precipitate was washed with cold water to make it acid free ,then it was dried and recrystallized from ethanol (Step-1). Substituted anilines (0.1 mole) were dissolved in glacial acetic acid and saturated solution of sodium acetate. To this chloroacetyl chloride (0.12 mole) was added drop wise with stirring .After half an hour white precipitate was obtained ,it was filtered , dried and recrystallised from ethanol (Step-2). Equimolar quantities of substituted 2-aminobenzothiazole and substituted chloroacetanilides were dissolved in dry 1,4-dioxane . To this triethyl amine was added , reaction mixture was refluxed for 2 hour .It was then cooled , poured onto crushed ice . Solid precipitate was filtered , dried and recrystallized from ethanol (Step-3).

Spectral Data:

1) **Compound (3a) :**Solid , M.P 150-152^0 C, **(IR) υ_{max} (KBr /cm^{-1}):** 3345.52 (N-H), 3085.26 (Ar-CH), 1594.31(C=N), 1508.80 (NO_2), 830.83 (C-Cl) , 673.56 (C-S)

2) **Compound (3b) :**Solid , M.P 155-157^0 C, **(IR) υ_{max} (KBr /cm^{-1}):** 3198.89 (N-H), 3087.49 (Ar-CH), 1596.29 (C=N) , 1510.81 (NO_2), 802.78 (C-Cl) , 670.47 (C-S)

3) **Compound (3c) :**Solid , M.P 150-152^0 C, **(IR) υ_{max} (KBr /cm^{-1}):** 3348.97 (N-H), 3089.81 (Ar-CH) , 1597.56 (C=N) , 1510.64 (NO_2) , 842.78 (C-Cl) , 675.82 (C-S)

4) **Compound (3d) :**Solid , M.P 150-152^0 C, **(IR) υ_{max} (KBr /cm^{-1}):** 3282.82 (N-H) , 3081.41 (Ar-CH) , 1592.54 (C=N) , 1515.61 (NO_2) , 873.35 (C-Cl), 670.31 (C-S), **: ^{1}H NMR (δ ppm) :** 10.5 (NH) , 7.754-8.604 (Phenyl) , 3.5 (Carbonyl CH).

5) **Compound (3e) :**Solid , M.P 112-115^0 C, **(IR) υ_{max} (KBr /cm^{-1}):** 3245.89 (N-H), 3085.82 (Ar-CH) , 1599.90 (C=N) , 1504.31 (NO_2), 854.70 (C-Cl) , 680.42 (C-S)

6) **Compound (3f) :**Solid , M.P 110-113^0 C, **(IR) υ_{max} (KBr /cm^{-1}):** 3344.17 (N-H), 3089.17 (Ar-CH) , 1613.50 (C=N) , 1511.48 (NO_2) , 870.17 (C-Cl), 662.52 (C-S)

7) **Compound (3g) :**Solid , M.P 099-101^0 C, **(IR) υ_{max} (KBr /cm^{-1}):** 3346.29 (N-H), 3079.90 (Ar-CH), 1586.69 (C=N) , 1495.25 (NO_2) , 843.97 (C-Cl) , 689.11 (C-S)

Antibacterial Activity:

Antibacterial activity was assayed using the cup-plate-agar-diffusion method using Mueller Hinton agar against *Staphylococcus aureus, Bacillus subtilis, Escherichia coli* and *Pseudomonas aeruginosa* . The results of antibacterial studies are given in Table 2.

Result and Discussion:

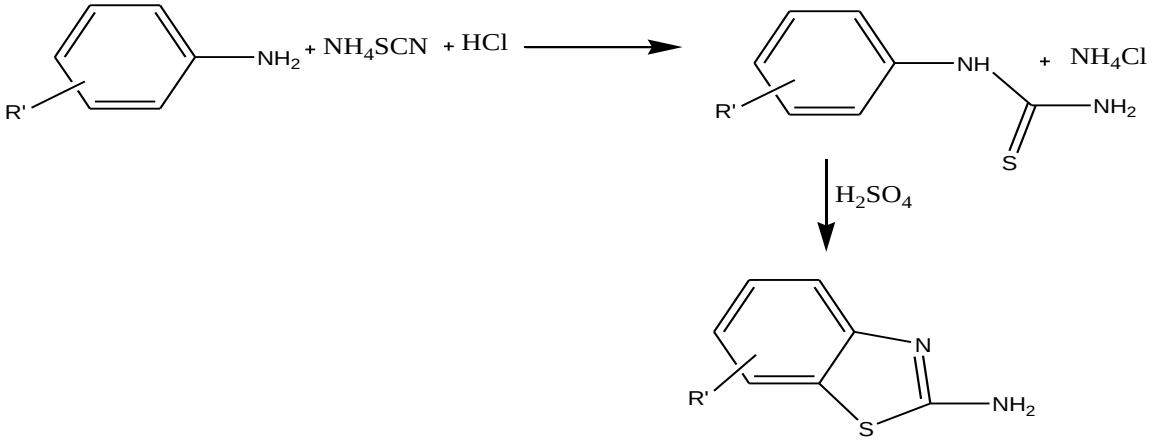
All the synthesized compounds (1-7) were characterized by , IR,^{1}H NMR spectral studies. All the compounds shows good antibacterial activity.

Table 1: Physicochemical characteristics of title compounds (3 a – 3 g)

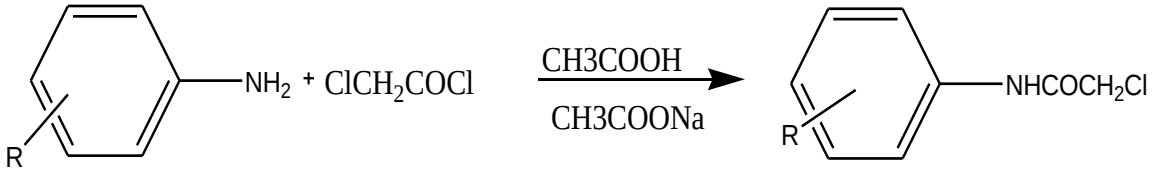
Comp No.	R	R'	Mol.Formula	Mol.Wt (gm)	Melting point (^{0} c)	R_f Value	% yield
3a	4 NO_2	3 Cl	$C_{16}H_{14}ClN_4O_3S$	377.83	150-152^0 C	0.65	62.00
3b	3 NO_2	2 Cl	$C_{16}H_{14}ClN_4O_3S$	377.83	155-157^0 C	0.66	65.00
3c	3 Cl	4 NO_2	$C_{16}H_{14}ClN_4O_3S$	377.83	150-152^0 C	0.67	66.12
3d	3 NO_2	3 Cl	$C_{16}H_{14}ClN_4O_3S$	377.83	150-152^0 C	0.62	61.00
3e	3 NO_2	4 NO_2	$C_{16}H_{14}N_5O_5S$	388.38	112-115^0 C	0.64	69.00
3f	3 NO_2	3 NO_2	$C_{16}H_{14}N_5O_5S$	388.38	110-113^0 C	0.62	67.12
3g	4 NO_2	4 NO_2	$C_{16}H_{14}N_5O_5S$	388.38	099-101^0 C	0.60	70.57

Scheme of synthesis

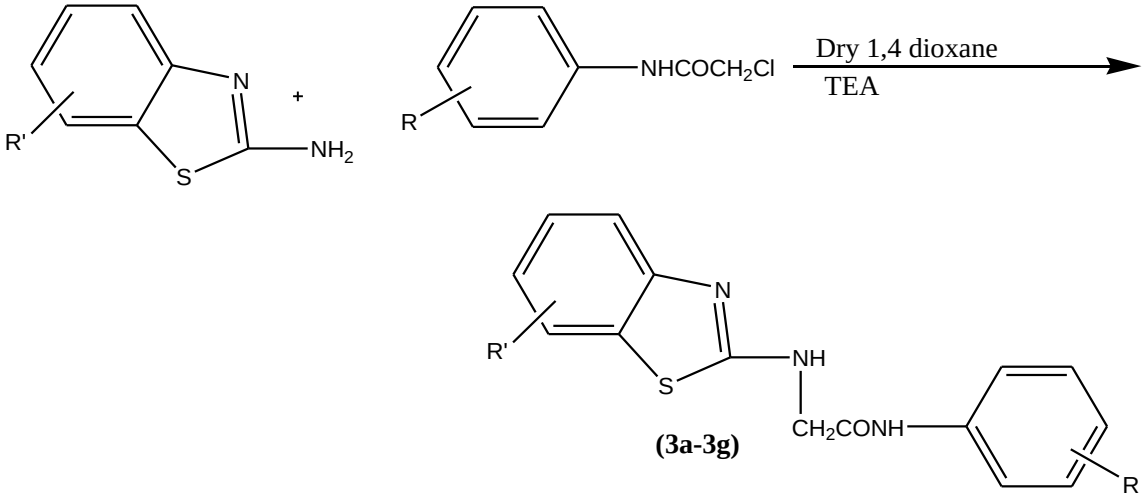
Step 1:



Step 2:



Step 3:



(3a-3g)

(Where R'=4-NO_2,3-NO_2,3-Cl and R=3-Cl,3-NO_2,4-NO_2,2-Cl)

Table 2: Antibacterial Activity of title compounds (3 a – 3 g)

Test microorganisms	Sample I Zone of inhibition in 'cm'		Sample II Zone of inhibition in 'cm'	
	50µg/ml	100µg/ml	50µg/ml	100µg/ml
Staphylococcus aureus	1.5	1.3	1.3	1.4
Bacillus subtilis	1.1	1.2	1.5	1.3
Escherichia coli	0.9	1.4	0.9	1.4
Pseudomonas aeruginosa	0.8	1.0	0.9	0.9
Aspergillus flavus	-	-	-	-
Aspergillus niger	-	-	-	-
Negative control	-	-	-	-

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