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SYNTHESIS AND CHARACTERIZATION OF SOME NEW AZETIDINONE, THIAZOLIDINONE and IMIDAZOLODINONE DERIVATIVES FROM 2-AMINOPYRIDINE

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ABSTRACT

This research involves the synthesis of some new azetidinone, thiazolidinone and imidazolidinone derivatives. Firstly 2-aminpyridine was converted to thiazolo[4,5-b]pyridin-2-amine **(A)** by reacting it with ammonium thiocyanate in presence of glacial acetic acid. Then, compound **(B)** was prepared from the reaction of **(A)** with p-acetamido benzenesulphonyl chloride in basic medium. Hydrolysis of compound **(B)** in glacial acetic acid gives compound **(C)**. Schiff bases **(1-5)** were prepared by reaction of **(C)** with aromatic aldehydes. Azetidinone derivatives **(6-10)** were synthesized from reaction Schiff bases with chloroacetic acid in presence of TEA. Thiazolidinone derivatives **(11-15)** and **(16-20)** were prepared from reaction of Schiff bases with thioglycollic acid and thiomalic acid, respectively. Finally, imidazolidinone derivatives **(21-25)** and **(26-30)** were synthesized from reaction glycine and alanine with Schiff bases. The synthesized compounds have been confirmed by their melting points, and characterized by C.H.N. analysis, FT-IR and ^{1}H-MNR spectroscopy.

Key words: 2-Aminopyridine, Azetidinone, Thiazolidinone, Imidazolidinone, Sulfonamide derivatives.

INTRODUCTION

Sulfonamide derivatives have been the subject of intensive studies, where a wide variety of those derivatives have been prepared and used in various physical, biological and pharmacological fields[1]. Schiff bases derived from aromatic amines and aromatic aldehydes have a wide variety of applications in many fields as sulfonamide's, Schiff bases have been reported to posses antimicrobal activity[2], anti-inflammatory activity[3], antikinetoplastid antimitotic activity[4], antitumor activity[5] and anticonvulsant activity[6]. Small ring heterocycles containing nitrogen, sulfur and oxygen have been under investigation for a long time because of their important medicinal properties[7]. Also, 2-azetidinone have been reported to possess a variety of significant and diverse pharmacological activities such as antibacterial, anticonvulsant, antihyperglycemic, antitumour, anti-HIV, anti-inflammatory and enzyme inhibitory activities[8-10].

Thiazolidinones and their derivatives are an important class of heterocyclic compounds because of their broad biological activities, such as COX-1 inhibition[11], anti-inflammatory[12], antiproliferative[13,14], antihistaminic[15], and anti-HIV activities[16,17]. Imidazolidin-4-ones represent an interesting class of compounds with respect to biological activity. Through manipulation of the substituent's around the imidazolidin-4-one core molecules with a variety of biological properties have been discovered. Examples include compounds

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that exhibit antibacterial activity. Imidazolidin-4-one have also been reported to inhibit binding of vascular cell adhesion molecule 1 (VCAM-1) to very late antigen 4 (VLA-4), which are useful in treating inflammation associated with chronic inflammatory diseases such as rheumatoid arthritis, multiple sclerosis, asthma, and inflammatory bowel disease[18,19]. This research involves the synthesis of some new azetidinone, thiazolidinone and imidazolidinone derivatives starting with convertsign of 2-aminopyridine to sulfonamide derivatives.

EXPERIMENTAL

Chemicals

All chemicals used were supplied from Merck, BDH and Fluke Chemicals Company. The melting points were recorded using thermometer melting point apparatus, UK. The elemental analyses were recorded using E.A.G.E.R.-100, Carlo Erba, Italy. FT.IR spectra were recorded using Fourier transform infrared Shimadzu FT.IR-8400S infrared spectrophotometer by KBr disc. ^{1}H-NMR were recorded on Fourier transform Bruker spectrometer, operating at 400 MH_Z.

Methods

Synthesis of thiazolo[4,5-b]pyridin-2-amine (A)[20]

In a 250 mL round bottomed flask equipped with a magnetic bar stirrer and a dropping funnel, solution of bromine (1.2 mL) in glacial acetic acid (75 mL) was allowed to run through the dropping funnel drop wise during 30 min. to a mixture of 2-aminopyridine (0.03 mol) and ammonium thiocyanate (0.1 mol) in 150 mL glacial acetic acid with stirring. The mixture was stirred for 1 hr, diluted with water and then neutralized with solid sodium hydroxide. The precipitated substance was collected and recrystallized from a suitable solvent to obtain compound **(A)**.

Synthesis of N-(4-(N-thiazolo[4,5-b]pyridin-2-ylsulfamoyl)phenyl)acetamide (B)[21]

Compound **(A)** (0.01 mol) was added in a mixture of 20 mL of dry pyridine and 80 mL of acetic anhydride. To this mixture, p-acetamido benzene sulphonyl chloride (0.02 mol) was added and the mixture was heated for 2 hrs on a water bath. The reaction mixture was poured into crushed ice, and the precipitate obtained was filtered and recrystallized from ethanol to give white crystalline solid compound **(B)**.

Synthesis of 4-amino-N-(thiazolo[4,5-b]pyridin-2-yl)benzenesulfonamide (C)[22]

The compound **(B)** (0.03 mol) was hydrolyzed by boiling with 100 mL of glacial acetic acid for 6 hrs and then the reaction mixture was poured into crushed ice. The precipitate obtained was filtered and recrystallized from ethanol to give white crystalline solid compound **(C)**.

General procedure for the synthesis of Schiff bases (1-5)[23]

A mixture of equimolar quantities (0.01 mol) of aromatic benzaldehyde and compound **(C)** was refluxed for 24 hrs in (30 mL) of absolute ethanol and glacial acetic acid. The reaction mixture was cooled and the crystals found were filtered, dried and recrystallized from ethanol to give compounds **(1-5)**.

General procedure for the synthesis of azetidinone derivatives (6-10)[24]

To a mixture of Schiff bases **(1-5)** (0.01 mol) in dioxane (10 mL) and triethylamine (3.49 mL, 0.025 mol), chloroacetyl chloride (1.99 mL, 0.025 mol) was added drop-wise at 0-5^{o}C. The reaction mixture was stirred for 6 hrs and kept for two days at room temperature. Then reaction mixture was poured into crushed ice. The solid separated was dried and recrystallized from ethanol.

General procedure for the synthesis of thiazolidinone derivatives (11-15)[25]

To mixture of Schiff bases **(1-5)** (0.001 mol) and thioglycollic acid (0.002 mol) dissolved in 1,4 dioxane (20 mL), anhydrous zinc chloride (0.7 mg) was added and refluxed for 8 hrs. The reaction was then cooled and the resulting solid was washed with sodium bicarbonate solution. The precipitated compounds were recrystallized from absolute ethanol.

General procedure for the synthesis of thiazolidinone acetic acid derivatives (16-20)[26]

A mixture of Schiff bases **(1-5)** (0.01 mol) and thiomalic acid (0.01 mol) was heated on an oil-bath at 120-125°C for 12 hrs. The reaction mixture was cooled and treated with 10% sodium bicarbonate solution. The product was isolated and recrystallised from methanol-dioxane (4:1).

General procedure for the synthesis of imidazolidin-4-one derivatives (21-25)[27]

A mixture of Schiff bases **(1-5)** (0.001 mol) dissolved in THF (15 mL) and glycine (0.002 mol) was dissolved in THF (15 mL) and refluxed for 24 hrs. The reaction was then cooled and the resulting solid compounds were recrystallized from absolute ethanol.

General procedure for the synthesis of 5-methyl imidazolidin-4-one derivatives (26-30)[28]

A mixture of Schiff bases **(1-5)** (0.001 mol) and alanine (0.002 mol) was prepared in THF (15 mL) and refluxed for 24 hrs. The reaction was then cooled and the resulting solid compounds were recrystallized from absolute ethanol.

RESULTS AND DISCUSSION

Synthesis of thiazolo[4,5-b]pyridin-2-amine (A)

This compound **(A)** was prepared first by the condensation of 2-aminopyridine with ammonium thiocyanate in the presence of bromine in glacial acetic acid.

(A)

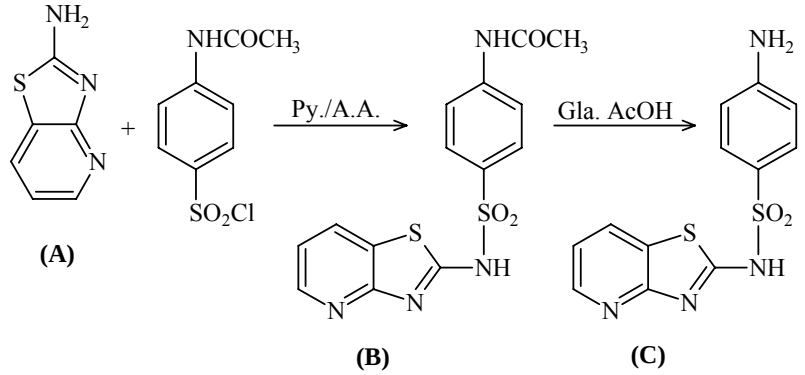
The synthesized compound **(A)** was characterized by C, H, N and S analysis, and the result of experimental percentages was in good agreement with the calculated percentages of elements shown in Table 1. This is a good evidence for formatting these compounds. The FT-IR spectra of this compound showed appearance of two absorption bands at 3420 cm^{-1} and 3350 cm^{-1} of the asymmetric and symmetric stretching vibrations of (-NH_2) group and absorption band at 1555 cm^{-1} of the stretching vibration of (C=N) group of hetero aromatic ring of pyrimidine[29] as well as the stretching vibration of (C-S) at 840 cm^{-1}. All these absorption bands are good evidences for the formation of compound **(A)**. ^{1}H-NMR spectrum (δ ppm), (DMSO-d_6) showed (Ar-H) (7.34-8.43) and (2H) (NH_2) (6.93).

Table 1: Elemental analysis data and some physical properties of synthesized compound (A)

Compd. No.	Chemical formula	C.H.N.S. data calculated found				M.P. (^{0}C)	Yield %	R_f
		C%	H%	N%	S%			
A	$C_6H_5N_3S$	47.66 47.52	3.33 3.28	27.79 27.56	21.21 20.95	155-156	77	0.75

Compound **(B)** N-(4-(N-thiazolo[4,5-b]pyridin-2-ylsulfamoyl)phenyl)acetamide was prepared from the reaction of **(A)** with p-acetamidobenzene sulphonyl chloride in basic medium. The FT-IR spectra of compound **(B)** showed disappearance of two absorption bands of the asymmetric and symmetric stretching vibrations of (-NH_2) group of compound **(A)** and appearance of the band at 1665 cm^{-1} of stretching vibration of (C=O) carbonyl group and absorption band at 3310 cm^{-1} due to a stretching vibration of (N-H) secondary sulfonamide, and the asymmetric 1336 cm^{-1} and symmetric 1155 cm^{-1} stretching vibrations of (-SO_2) group. C, H, N and S. analysis gives good agreement result between experimental and calculated percentages of elements. ^{1}H-NMR spectrum (δ ppm), (DMSO-d_6) showed ((3H) (N-$COCH_3$) 2.04), (Ar-H) (7.46-8.42), (1H) $(N\text{-}H)_{sulfonamide}$ (11.21) (1H) $(N\text{-}H)_{amide}$ (10.28).

Then hydrolysis compound **(B)** with glacial acetic acid forms compound **(C)** 4-amino-N-(thiazolo[4,5-b]pyridin-2-yl)benzenesulfonamide. The FT-IR spectra of compound **(C)** showed appearance of two absorption bands at 3425 cm^{-1} and 3353 cm^{-1} of the asymmetric and symmetric stretching vibrations of (-NH_2) group and disappearance of (C=O) carbonyl group and absorption band at 3310 cm^{-1} due to a stretching vibration of (N-H) secondary sulfonamide as well as the asymmetric 1335 cm^{-1} and symmetric 1150 cm^{-1} stretching vibrations of (-SO_2) group. C, H, N, S analysis gives good agreement result between experimental and calculated percentages of elements. ^{1}H-NMR spectrum (δ ppm), (DMSO- d_6) showed ((3H) (N-$COCH_3$) 2.12), (Ar-H) (7.35-8.34), (1H) $(N\text{-}H)_{sulfonamide}$ (11.16) and (1H) $(N\text{-}H)_{amide}$ (10.14).

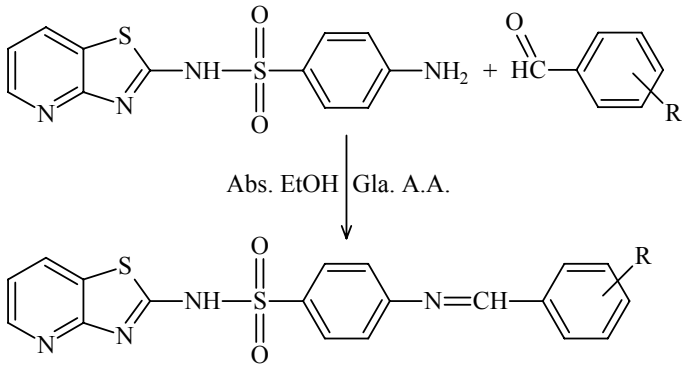


(A) **(B)** **(C)**

Table 2: C, H, N, S analysis data and some physical properties of synthesized compound (B) and (C)

Compd. No.	Chemical formula	C.H.N.S. data calculated/found				M.P. (^{o}C)	Yield (%)	R_f
		C%	H%	N%	S%			
B	$C_{14}H_{12}N_4O_3S_2$	48.26	3.47	16.08	18.41	182-183	84	0.72
		48.17	3.25	15.86	18.31			
C	$C_{12}H_{10}N_4O_2S_2$	47.04	3.29	18.29	20.93	174-175	82	0.68
		46.96	3.26	18.17	20.87			

Schiff bases **(1-5)** were prepared by reaction of compound **(C)** with aromatic aldehydes in the presence of glacial acetic acid to form 4-(4-(dimethylamino)benzylideneamino)-N-(thiazolo[4,5-b]pyridin-2-yl) benzenesulfonamide **(1)**, 4-(4-bromobenzylideneamino)-N-(thiazolo[4,5-b]pyridin-2-yl) benzenesulfonamide **(2)**, 4-(2-bromobenzylideneamino)-N-(thiazolo[4,5-b]pyridin-2-yl)benzenesulfonamide **(3)**, 4-(2,4-dibromo-benzylideneamino)-N-(thiazolo[4, 5-b]pyridin-2-yl) benzenesulfonamide **(4)** and 4-(4-chlorobenzylidene-amino)-N-(thiazolo[4,5-b]pyridin-2-yl)benzenesulfonamide **(5)**.



(1-5)

R = 4-$N(CH_3)_2$, 4-Br, 2,4-di Br, 4-Cl

The FT-IR spectra of Schiff bases showed disappearance of two absorption bands of the asymmetric and symmetric stretching vibrations of (-NH_2) group and appearance of the band between 1600-1645 cm^{-1} of stretching vibration of (C=N) group and absorption band at 3315 cm^{-1} due to a stretching vibration of (N-H) secondary sulfonamide, and the asymmetric 1330 cm^{-1} and symmetric 1150 cm^{-1} stretching vibrations of (-SO_2) group. C, H, N, S analysis, gives good agreement result between experimental and calculated percentages of elements (Table 3). ^{1}H-NMR spectrum (δ ppm), (DMSO-d_6) showed ((3H) (N-$COCH_3$) 2.04), (Ar-H) (7.25-8.35), (1H) $(N\text{-}H)_{sulfonamide}$ (11.28), (1H) $(N{=}CH)_{Imine}$ (8.75) and ((6H) (N-$(CH_3)_2$ 3.32) for compound **(1)**.

Table 3: C, H, N and S analysis data and some physical properties of synthesized compound (1-5)

Compd. No.	Chemical formula	C.H.N.S. data calculated/found				M.P. (^{o}C)	Yield (%)	R_f
		C%	H%	N%	S%			
1	$C_{21}H_{19}N_5O_2S_2$	57.65 57.58	4.38 4.34	16.01 15.94	14.66 14.57	232-233	87	0.72
2	$C_{19}H_{13}BrN_4O_2S_2$	48.21 48.15	2.77 2.64	11.84 11.75	13.55 13.52	248-249	88	0.65
3	$C_{19}H_{13}BrN_4O_2S_2$	48.21 48.15	2.77 2.64	11.84 11.75	13.55 13.52	256-257	87	0.7
4	$C_{19}H_{12}Br_2N_4O_2S_2$	41.32 41.27	2.19 2.12	10.14 10.11	11.61 11.57	266-267	85	0.62
5	$C_{19}H_{13}ClN_4O_2S_2$	53.20 53.16	3.05 2.94	13.06 13.01	14.95 14.88	271-272	88	0.67

Azetidinone derivatives **(6-10)** were synthesized from reaction of Schiff bases with chloroacetic acid in presence of TEA to form: 4-(3-chloro-2-(4-(dimethylamino)phenyl)-4-oxoazetidin-1-yl)-N-(thiazolo[4,5-b]pyridin-2-yl)benzenesulfonamide **(6)**, 4-(2-(4-bromophenyl)-3-chloro-4-oxoazetidin-1-yl)-N-(thiazolo[4, 5-b]pyridin-2-yl) benzenesulfonamide **(7)**, 4-(2-(2-bromophenyl)-3-chloro-4-oxoazetidin-1-yl)-N-(thiazolo[4,5-b]pyridin-2-yl)benzenesulfonamide **(8)**, 4-(3-chloro-2-(2,4-dibromophenyl)-4-oxoazetidin-1-yl)-N-(thiazolo [4, 5-b] pyridin-2-yl) benzenesulfonamide **(9)** and 4-(3-chloro-2-(4-chlorophenyl)-4-oxoazetidin-1-yl)-N-(thiazolo[4,5-b]pyridin-2-yl) benzene sulfonamide **(10)**.

The FT-IR spectra of azetidinone derivatives showed disappearance of the band of stretching vibration of (C=N) group and appearance absorption band of (C=O) β-lactam at 1695-1799 cm^{-1} and

appearance of the vibration between 702-784 cm^{-1} was due to the (C-Cl) β-lactam and stretching vibration of (N-H) secondary sulfonamide at 3317 cm^{-1}, and the asymmetric 1335 cm^{-1} and symmetric 1157 cm^{-1} stretching vibrations of (-SO_2) group. The result of experimental percentages was in good agreement with the calculated percentages of elements (Table 4). ^{1}H-NMR spectrum (δ ppm), (DMSO-d_6) showed (Ar-H) (6.79-8.83), (1H) $(N\text{-}H)_{sulfonamide}$ (11.30), (1H) $(N\text{-}CH)_{lactam}$ (5.16), (1H) $(Cl\text{-}CH)_{lactam}$ (5.44) and ((6H) $(N\text{-}(CH_3)_2$ 3.24) for compound **(6)**.

Table 4: C, H, N, S analysis data and some physical properties of synthesized compound (6-10)

Compd. No.	Chemical formula	C.H.N.S. data calculated/found				M.P. (°C)	Yield (%)	R_f
		C%	H%	N%	S%			
6	$C_{21}H_{19}N_5O_2S_2$	57.65	4.38	16.01	14.66	232-233	87	0.72
		57.58	4.34	15.94	14.57			
7	$C_{19}H_{13}BrN_4O_2S_2$	48.21	2.77	11.84	13.55	248-249	88	0.65
		48.15	2.64	11.75	13.52			
8	$C_{19}H_{13}BrN_4O_2S_2$	48.21	2.77	11.84	13.55	256-257	87	0.7
		48.15	2.64	11.75	13.52			
9	$C_{19}H_{12}Br_2N_4O_2S_2$	41.32	2.19	10.14	11.61	266-267	85	0.62
		41.27	2.12	10.11	11.57			
10	$C_{19}H_{13}ClN_4O_2S_2$	53.20	3.05	13.06	14.95	271-272	88	0.67
		53.16	2.94	13.01	14.88			

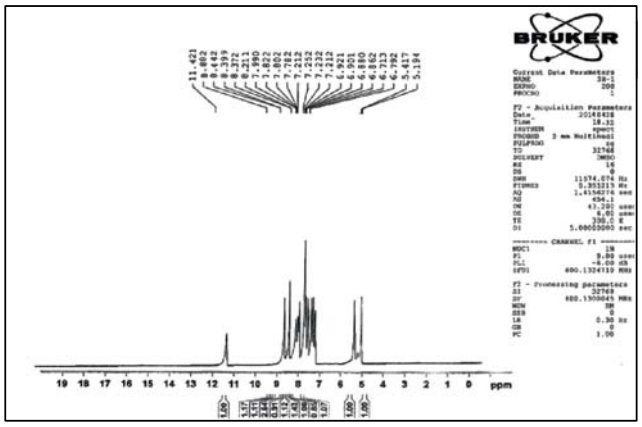


Fig. 1: ^{1}H-NMR spectrum of compound (10)

Thiazolidinone derivatives **(11-15)** and **(16-20)** were prepared from reaction of Schiff bases with thioglycollic acid and thiomalic acid, respectively to form : 4-(2-(4-(dimethylamino)phenyl)-4-oxothiazolidin-3-yl)-N-(thiazolo[4,5-b]pyridin-2-yl) benzenesulfon-amide **(11)**, 4-(2-(4-bromophenyl)-4-oxothiazolidin-3-yl)-N-(thiazolo [4, 5-b] pyridin-2-yl) benzenesulfonamide **(12)**, 4-(2-(2-bromophenyl)-4-oxothiazolidin-3-yl)-N-(thiazolo [4, 5-b] pyridin-2-yl) benzenesulfonamide **(13)**, 4-(2-(2, 4-dibromophenyl)-4-oxothiazolidin-3-yl)-N-(thiazolo [4, 5-b] pyridin-2-yl) benzenesulfonamide **(14)**, 4-(2-(4-Chlorophenyl)-4-oxothiazolidin-3-yl)-N-(thiazolo [4, 5-b] pyridin-2-yl) benzenesulfonamide **(15)**, 2-(2-(4-(dimethylamino)phenyl)-4-oxo-3-(4-(N-

thiazolo [4, 5-b] pyridin-2-ylsulfamoyl)phenyl)thiazolidin-5-yl) acetic acid **(16)**, 2-(2-(4-bromophenyl)-4-oxo-3-(4-(N-thiazolo [4,5-b] pyridin-2-ylsulfamoyl)phenyl) thiazolidin-5-yl) acetic acid **(17)**, 2-(2-(2-bromophenyl)-4-oxo-3-(4-(N-thiazolo[4,5-b]pyridin-2-ylsulfamoyl)phenyl) thiazolidin-5-yl)acetic acid **(18)**, 2-(2-(2, 4-dibromophenyl)-4-oxo-3-(4-(N-thiazolo[4, 5-b] pyridin-2-ylsulfamoyl) phenyl)thiazolidin-5-yl) acetic acid **(19)** and 2-(2-(4-Chlorophenyl)-4-oxo-3-(4-(N-thiazolo[4, 5-b]pyridin-2-ylsulfamoyl)phenyl) thiazolidin-5-yl)acetic acid **(20)**.

The FT-IR spectra of thiazolidinone derivatives showed disappearance of the band of stretching vibration of (C=N) group and appearance of absorption band of (C=O) thiazolidinone at 1700-1725 cm^{-1} and appearance of the vibration between 702-784 cm^{-1} was due to the (C-Cl) β-lactam and stretching vibration of (N-H) secondary sulfonamide at 3315 cm^{-1}, the asymmetric 1332 cm^{-1} and symmetric 1153 cm^{-1} stretching vibrations of (-SO_2) group. The result of experimental percentages was in good agreement with the calculated percentages of elements (Table 5). ^{1}H-NMR spectrum (δ ppm), (DMSO-d_6) showed (Ar-H) (6.72-8.45), (1H) $(N-H)_{sulfonamide}$ (11.26), (2H) (S-CH_2) (4.13), (1H) (S-CH) (6.44) and ((6H) (N-$(CH_3)_2$ 3.15) for compounds **(11)** and **(16)** and (1H) (COOH) (13.41), (2H) (CH_2) (3.1) and (1H) (S-CH) (3.8) (for compounds **(16-20)**.

Table 5: C, H, N, S analysis data and some physical properties of synthesized compound (11-20)

Compd. No.	Chemical formula	C.H.N.S. data calculated/found				M.P. (^{0}C)	Yield (%)	R_f
		C%	H%	N%	S%			
11	$C_{23}H_{21}N_5O_3S_3$	53.99 53.87	4.14 4.12	13.69 13.61	18.80 18.74	211-212	82	0.76
12	$C_{21}H_{15}BrN_4O_3S_3$	46.07 46.01	2.76 2.74	10.23 10.17	17.57 17.48	215-216	83	0.73
13	$C_{21}H_{15}BrN_4O_3S_3$	46.07 46.01	2.76 2.74	10.23 10.17	17.57 17.48	212-213	86	0.74
14	$C_{21}H_{14}Br_2N_4O_3S_3$	40.27 40.22	2.25 2.21	8.94 8.88	15.36 15.33	220-221	83	0.72
15	$C_{21}H_{15}ClN_4O_3S_3$	50.14 50.08	3.01 2.95	11.14 11.11	19.12 18.97	217-218	84	0.75
16	$C_{25}H_{23}N_5O_5S_3$	52.71 52.66	4.07 4.02	12.29 12.23	16.89 16.82	223-224	88	0.62
17	$C_{23}H_{17}BrN_4O_5S_3$	45.62 45.57	2.83 2.75	9.25 9.22	15.89 15.83	238-239	87	0.64
18	$C_{23}H_{17}BrN_4O_5S_3$	45.62 45.57	2.83 2.75	9.25 9.22	15.89 15.83	246-247	88	0.63
19	$C_{23}H_{16}Br_2N_4O_5S_3$	40.36 40.33	2.36 2.32	8.19 8.14	14.06 14.02	255-256	89	0.60
20	$C_{23}H_{17}ClN_4O_5S_3$	49.24 49.21	3.05 3.02	9.99 9.93	17.15 17.12	251-252	87	0.66

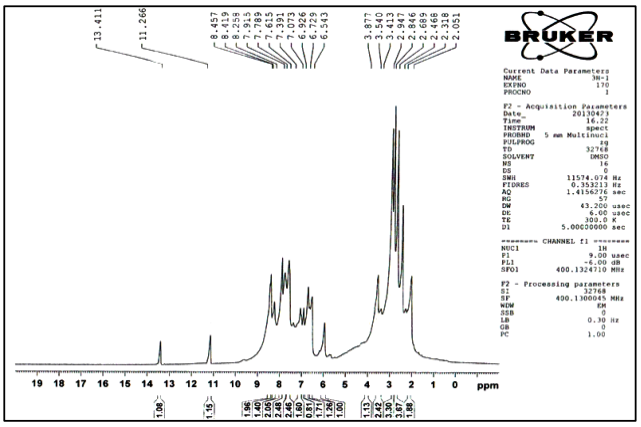
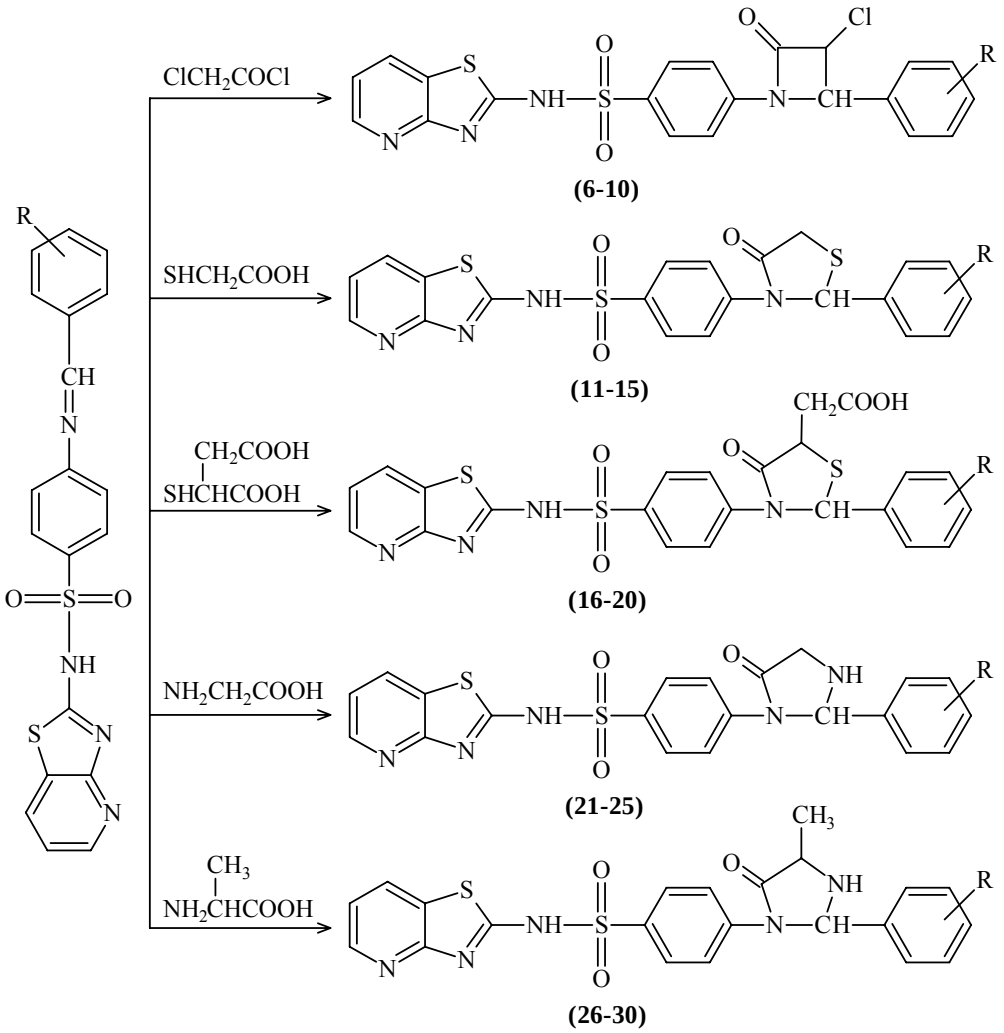


Fig. 2: ^{1}H-NMR spectrum of compound [16]



R = 4-N(CH$_3$)$_2$, 4-Br, 2-Br, 2,4-diBr, 4-Cl

Imidazolidinone derivatives **(21-25)** and **(26-30)** were synthesized from reaction of glycine and alanine with Schiff bases to form: 4-(2-(4-(dimethylamino)phenyl)-5-oxoimidazolidin-1-yl)-N-(thiazolo[4,5-b] pyridin-2-yl)benzenesulfonamide **(21)**, 4-(2-(4-bromophenyl)-5-oxoimidazolidin-1-yl)-N-(thiazolo[4,5-b] pyridin-2-yl)benzenesulfonamide **(22)**, 4-(2-(2-bromophenyl)-5-oxoimidazolidin-1-yl)-N-(thiazolo[4,5-b]

pyridin-2-yl)benzenesulfonamide **(23)**, 4-(2-(2,4-dibromophenyl)-5-oxoimidazolidin-1-yl)-N-(thiazolo[4,5-b] pyridin-2-yl)benzenesulfonamide **(24)**, 4-(2-(4-Chlorophenyl)-5-oxoimidazolidin-1-yl)-N-(thiazolo[4,5-b] pyridin-2-yl)benzenesulfonamide **(25)** and 4-(2-(4-(dimethylamino)phenyl)-4-methyl-5-oxoimidazolidin-1-yl)-N-(thiazolo[4,5-b] pyridin-2-yl) benzenesulfonamide **(26)**, 4-(2-(4-bromophenyl)-4-methyl-5-oxoimidazolidin-1-yl)-N-(thiazolo [4,5-b] pyridin-2-yl) benzenesulfonamide **(27)**, 4-(2-(2-bromophenyl)-4-methyl-5-oxoimidazolidin-1-yl)-N-(thiazolo [4,5-b]pyridin-2-yl)benzenesulfonamide **(28)**, 4-(2-(2, 4-dibromophenyl)-4-methyl-5-oxoimidazolidin-1-yl)-N-(thiazolo [4,5-b] pyridin-2-yl) benzenesulfonamide **(29)**, 4-(2-(4-Chlorophenyl)-4-methyl-5-oxoimidazolidin-1-yl)-N-(thiazolo[4,5-b]pyridin-2-yl)benzenesulfonamide **(30)**.

The FT-IR spectra of imidazolidinone derivatives showed disappearance of the band of stretching vibration of (C=N) group and appearance of absorption band of (C=O) imidazolidinone at 1681-1712 cm^{-1} and stretching vibration of (N-H) secondary sulfonamide at 3317 cm^{-1}, the asymmetric 1333 cm^{-1} and symmetric 1155 cm^{-1} stretching vibrations of ($-SO_2$) group. The result of experimental percentages was in good agreement with the calculated percentages of elements (Table 6). ^{1}H-NMR spectrum (δ ppm), (DMSO-d_6) showed (Ar-H) (7.12-8.43), (1H) $(N\text{-}H)_{sulfonamide}$ (11.32), (1H) $(N\text{-}H)_{Imidazolidinone}$ (9.32), ($C\text{-}CH_3$) (1.28), (1H) $(CH)_{Imidazolidinone}$ (3.74) and ((6H) $(N\text{-}(CH_3)_2$ 3.15) for compound **(26)**.

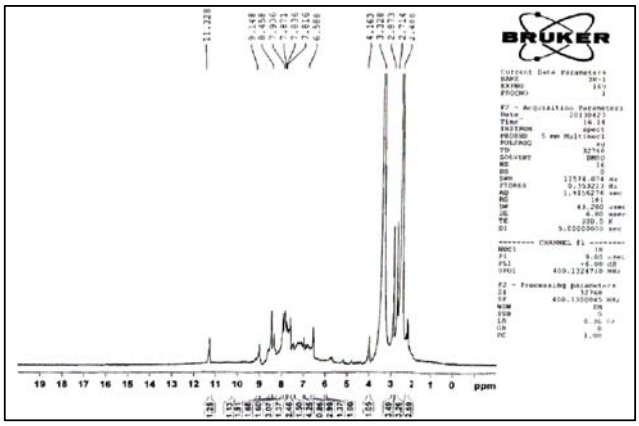


Fig. 3: ^{1}H-NMR spectrum of compound (26)

Table 6: C, H, N, S analysis data and some physical properties of synthesized compound (11-20)

Compd. No.	Chemical formula	C, H, N and S data calculated/found				M.P. (^{0}C)	Yield (%)	R_f
		C%	H%	N%	S%			
21	$C_{23}H_{22}N_6O_3S_2$	55.85 55.80	4.48 4.42	16.99 16.93	12.97 12.92	230-231	87	0.65
22	$C_{21}H_{16}BrN_5O_3S_2$	47.55 47.50	3.04 3.01	13.20 13.17	12.09 12.01	235-236	86	0.66
23	$C_{21}H_{16}BrN_5O_3S_2$	47.55 47.50	3.04 3.01	13.20 13.17	12.09 12.01	232-233	87	0.67
24	$C_{21}H_{15}Br_2N_5O_3S_2$	41.39 41.32	2.48 2.44	11.49 11.42	10.52 10.48	240-241	88	0.62
25	$C_{21}H_{16}ClN_5O_3S_2$	51.90 51.83	3.32 3.26	14.41 14.36	13.20 13.17	237-238	89	0.68

Cont…

Compd. No.	Chemical formula	C, H, N and S data calculated/found				M.P. (^{0}C)	Yield (%)	R_f
		C%	H%	N%	S%			
26	$C_{24}H_{24}N_6O_3S_2$	56.67 56.61	4.76 4.72	16.52 16.46	12.61 12.57	232-233	87	0.64
27	$C_{22}H_{18}BrN_5O_3S_2$	48.53 48.51	3.33 3.30	12.86 12.82	11.78 11.71	236-237	87	0.60
28	$C_{22}H_{18}BrN_5O_3S_2$	48.53 48.51	3.33 3.30	12.86 12.82	11.78 11.71	233-234	88	0.62
29	$C_{22}H_{17}Br_2N_5O_3S_2$	42.39 42.33	2.75 2.72	11.24 11.21	10.29 10.23	239-240	86	0.61
30	$C_{22}H_{18}ClN_5O_3S_2$	52.85 52.82	3.63 3.58	14.01 13.97	12.83 12.81	238-239	87	0.69

CONCLUSION

Here, some new azetidinone, thiazolidinone and imidazolidinone derivatives were synthesized from 2-aminpyridine and following conclusion could be drawn:

(i) Effect of electron-donating and electron-withdrawing group in the determination of the time of the reaction. The electron-donating group increased the rate of the reaction and therefore, the time of the reaction was decreased while the electron-withdrawing group decreased the rate of reaction and therefore, the time of reaction was increased.

(ii) All the synthesized compounds were stable by resonance and having high melting points relatively. This is another evidence on the extent of stability.

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