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Synthesis and Antimicrobial activity of various Quinazolinone derivatives containing Thiazole and Thiazolidinone Moiety

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Abstract: 2-(substituted phenyl)-3-(5-(2-methyl-4-(substituted oxoquinazolin-3(4H)-ylamino)thiazol-2-yl) thiazolidinones (6a-6h) were prepared by the reaction with 3-(2-substituted benzylideneamino)thiazol-5-ylamino)-2-methylsubstituted quinazolinones (5a-5h) with thioglycolic acid in presence of anhydrous zinc chloride. All the synthesized compounds were screened for their antibacterial and antifungal activity and compared with reference drugs streptomycin for antibacterial and fusidic acid for antifungal activity. Structure of all the synthesized compounds have been characterized by elemental (C, H, N) and spectral (IR, ^{1}H-NMR and mass) analysis.
Key words: Quinazolinone, thiazole, thiazolidinone, antibacterial activity, antifungal activity.

Introduction

Resistance to number of antimicrobial agents among a variety of clinically significant bacteria is becoming increasingly important. There are various problems arising with the use of antimicrobials such as local tissue irretation, interference with wound healing process, hypersensitivity reaction, system toxicity and narrow antimicrobial spectrum. So, the increasing clinical importance of drug resistant microbial pathogens has addetional urgency in microbiological and antifungal research. A wide variety of heterocyclic systems have been explored for developing pharmaceutically important molicules. Quinazolinone derivatives have been found to exhibit diverse biological activities such as antimicrobial[1-3], antifungal[4], antibacterial[5], anti inflammatory[6], insecticidal[7], CNS depressants[8]etc. Similarly, thiazole[9-13] and thiazolidinone[14-16] derivatives have also been found to exhibit antibacterial and antifungal activity. In light of above observations it was thought worthwhile to synthesized some new substituted quinazolinone derivatives by in corporation of thiazole and thiazolidinone moieties with the hope to get better antimicrobial agents.

Material and Methods

All reagents and solvents were of analytical grade and used directly. Reactions were routinely performed in oven-dried borosil glassware. The melting points of compounds were determined in open capillaries with the help of thermonic melting point apparatus and were uncorrected. The homogeneity of all newly synthesized compounds was routinely checked by thin layer chromatography (TLC) on silica gel G plates and spots were located by using iodine chamber. Elemental analysis (C, H, N) of all the synthesized compounds

were determined by perkin-Elmer 2400 elemental analyzer, and results were found within the ± 0.4% of theoretical values. The IR spectra were recorded on a Beckman Acculab-10 spectrometer (ν max in cm^{-1}) and the ^1H NMR spectra were recorded by Brucker DPX-300 MHz using $CDCl_3$ as solvent. Mass spectra were determiend on VG-70-S instrument.

General procedure for synthesis of 2-methyl-6-substitutedbenzo(1,3)oxazin-4-ones (1a-1b)

These compounds were prepared according to the method of Bogert and Soil[17]. A mixture of substituted anthranilic acids (0.01 mol) in acetic anhydride (100 ml), acetic acid (50 ml) was added dropwise with stirring separately. The reaction mixtures were poured on to crushed ice then left overnight at room temperature. The precipitate thus obtained were filtered, dried and recrystallized with appropriate solvents to obtained compounds 1a-1b. Physical, analytical and spectral data given in table 1 and 2 respectively.

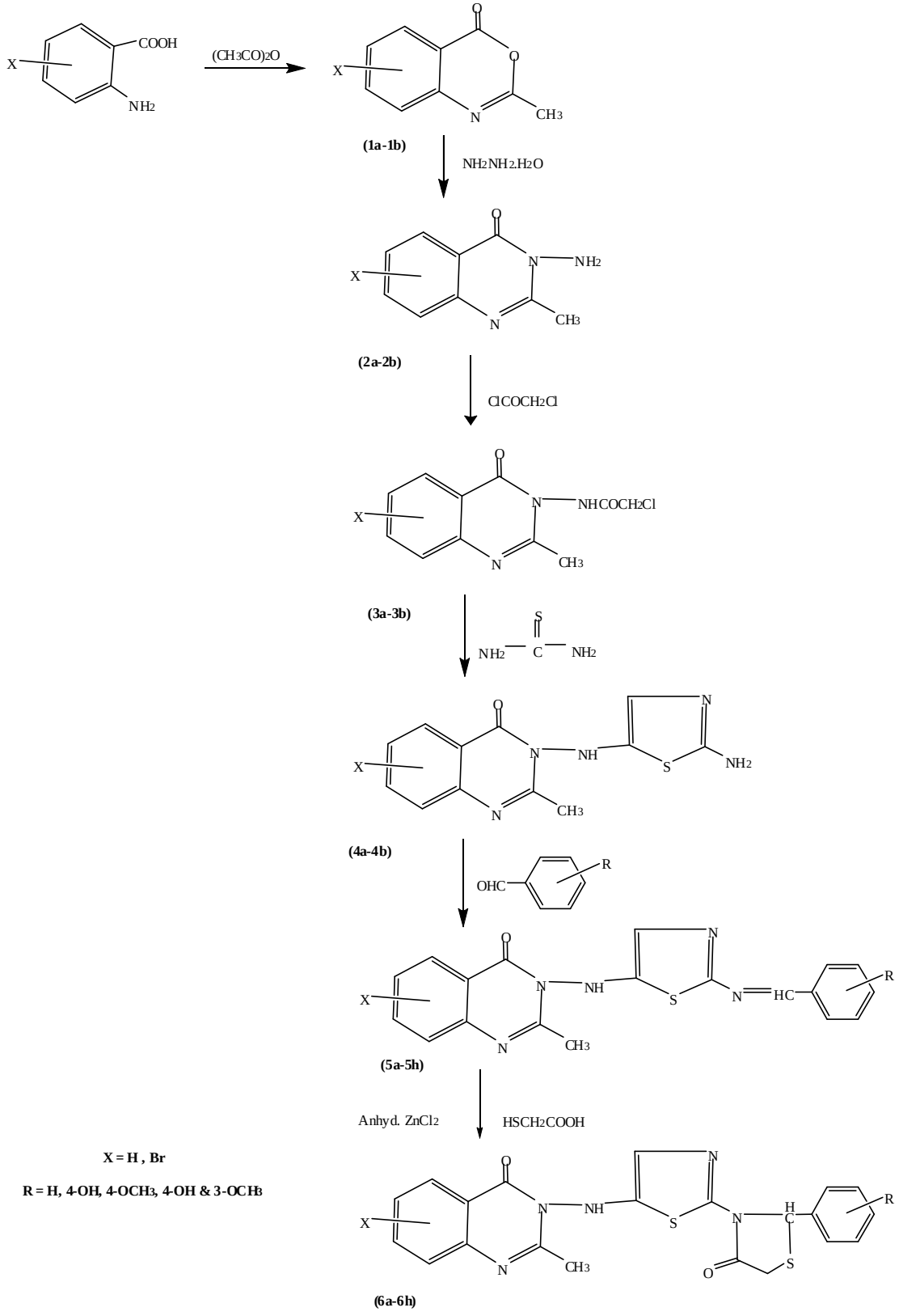
Table 1 physical and analytical data of the compounds 1a-1b, 2a-2b, 3a-3b, 4a-4b, 5a-5h and 6a-6h

Compounds	X	R	Yield%	m.p (^0c)	Mol. Formula	Analysis % found (calculated)		
						C	H	N
1a	H	-	75	156	$C_9H_7NO_2$	67.09 (67.07	4.35 4.38	8.67 8.69)
1b	Br	-	74	197	$C_9H_6BrNO_2$	45.05 (45.03	2.50 2.52	5.86 5.83)
2a	H	-	75	163	$C_9H_9N_3O$	61.72 (61.70	5.19 5.18	23.97 23.99)
2b	Br	-	73	214	$C_9H_8BrN_3O$	42.57 (42.54	3.19 3.17	16.55 16.54)
3a	H	-	71	160	$C_{11}H_{10}ClN_3O_2$	52.48 (52.50	4.03 4.01	16.74 16.70)
3b	Br	-	73	195	$C_{11}H_9BrClN_3O_2$	39.96 (39.97	2.73 2.74	12.70 12.71)
4a	H	-	69	173	$C_{12}H_{11}N_5OS$	52.75 (52.73	4.04 4.06	25.60 25.62)
4b	Br	-	65	218	$C_{12}H_{10}BrN_5OS$	40.93 (40.92	2.84 2.86	19.89 19.88)
5a	H	H	67	195	$C_{19}H_{15}N_5OS$	63.12 (63.14	4.16 4.18	19.36 19.38)
5b	Br	H	64	202	$C_{19}H_{14}BrN_5OS$	51.86 (51.83	3.23 3.20	15.90 15.91)
5c	H	4-OH	62	197	$C_{19}H_{15}N_5O_2S$	60.48 (60.46	4.04 4.01	18.55 18.56)
5d	Br	4-OH	65	228	$C_{19}H_{14}BrN_5O_2S$	50.03 (50.01	3.10 3.09	19.33 15.35)
5e	H	4-OCH_3	60	186	$C_{20}H_{17}N_5O_2S$	61.38 (61.37	4.35 4.38	17.86 17.89)
5f	Br	4-OCH_3	57	242	$C_{20}H_{16}BrN_5O_2S$	51.04 (51.07	3.46 3.43	14.86 14.89)
5g	H	4-OH & 3-OCH_3	49	235	$C_{20}H_{17}N_5O_3S$	58.99 (58.96	4.23 4.21	17.16 17.19)
5h	Br	4-OH & 3-OCH_3	46	286	$C_{20}H_{16}BrN_5O_3S$	49.37 (49.39	3.36 3.32	14.42 14.40)
6a	H	H	50	211	$C_{21}H_{17}N_5O_2S_2$	57.94 (57.91	3.97 3.93	16.06 16.08)
6b	Br	H	45	269	$C_{21}H_{16}BrN_5O_2S_2$	49.05 (49.03	3.17 3.14	13.60 13.61)
6c	H	4-OH	42	239	$C_{21}H_{17}N_5O_3S_2$	55.84 (55.86	3.77 3.79	15.50 15.51)
6d	Br	4-OH	40	293	$C_{21}H_{16}BrN_5O_3S_2$	47.58 (47.55	3.02 3.04	13.23 13.20)
6e	H	4-OCH_3	38	247	$C_{22}H_{19}N_5O_3S_2$	56.79 (56.76	4.13 4.11	15.05 15.04)
6f	Br	4-OCH_3	35	302	$C_{22}H_{18}BrN_5O_3S_2$	48.50 (48.53	3.35 3.33	12.83 12.86)
6g	OCH_3	4-OH & 3-OCH_3	37	282	$C_{22}H_{19}N_5O_4S_2$	54.85 (54.87	3.99 3.98	14.56 14.54)
6h	OC_2H_5	4-OH & 3-OCH_3	31	314	$C_{22}H_{18}BrN_5O_4S_2$	47.17 (47.15	3.27 3.24	12.52 12.50)

Table 2 spectral data of compounds 1a-1b, 2a-2b, 3a-3b, 4a-4b, 5a-5h and 6a-6g

Compd. No.	$[M]^+$ m/z	IR (KBr) ν max in Cm^{-1}	^{1}H-NMR ($CDCl_3$+$DMSOd_6$)δ in ppm
1a	161	3032 (C-H aromatic), 2910 (C-H aliphatic), 1670 (C=O), 1612 (C=N), 1531 (C-C of aromatic ring), 1180 (C-N)	7.75-8.75 (m, 4H, Ar-H), 2.27 (s, 3H, CH_3)
1b	240	3035 (C-H aromatic), 2913 (C-H aliphatic), 1672 (C=O), 1615 (C=N), 1534 (C-C of aromatic ring), 1182 (C-N), 612 (Br)	7.73-8.78 (m, 3H, Ar-H), 2.29 (s, 3H, CH_3)
2a	175	3261 (NH_2), 3032 (C-H aromatic), 2911 (C-H aliphatic), 1673 (C=O), 1613 (C=N), 1530 (C-C of aromatic ring), 1185 (C-N)	8.91 (s, 2H, NH_2), 7.72-8.77 (m, 4H, Ar-H), 2.28 (s, 3H, CH_3)
2b	254	3257 (NH_2), 3037 (C-H aromatic), 2915 (C-H aliphatic), 1672 (C=O), 1617 (C=N), 1533 (C-C of Ar), 1184 (C-N), 615 (Br)	8.95 (s, 2H, NH_2), 7.74-8.75 (m, 3H, Ar-H), 2.25 (s, 3H, CH_3)
3a	252	3036 (C-H Ar), 2916 (C-H aliphatic), 1677 (C=O), 1615 (C=N), 1531 (C-C of Ar), 1186 (C-N), 1025 (N-N), 761 (Cl)	7.70-8.80 (m, 4H, Ar-H), 7.12 (s, 1H, NH), 3.14 (s, 2H, CH_2), 2.27 (s, 3H, CH_3)
3b	331	3032 (C-H Ar), 2917 (C-H aliphatic), 1670 (C=O), 1616 (C=N), 1535 (C-C of Ar), 1180 (C-N), 1020 (N-N), 615 (C-Cl), 617 (C-Br)	7.72-8.75 (m, 3H, Ar-H), 7.12 (s, 1H, NH), 3.17 (s, 2H, CH_2), 2.29 (s, 3H, CH_3)
4a	273	3038 (C-H Ar), 2910 (C-H aliphatic), 1675 (C=O), 1612 (C=N), 1536 (C-C of Ar), 1188 (C-N), 1027 (N-N), 676 (C-S-C)	8.90 (s, 2H, NH_2), 7.73-8.74 (m, 4H, Ar-H), 7.35 (s, 1H, NH), 7.10 (s, 1H, CH of thiazole), 2.27 (s, 3H, CH_3)
4b	352	3270 (NH_2), 3039 (C-H Ar), 2919 (C-H aliphatic), 1674 (C=O), 1615 (C=N), 1530 (C-C Ar), 1185 (C-N), 1025 (N-N), 678 (C-S-C), 613 (C-Br)	8.96 (s, 2H, NH_2), 7.70-8.75 (m, 3H, Ar-H), 7.32 (s, 1H, NH), 7.05 (s, 1H, CH of thiazole), 2.24 (s, 3H, CH_3)
5a	361	3034 (C-H Ar), 2915 (C-H aliphatic), 1670 (C=O), 1618 (C=N), 1531 (C-C of Ar),1187 (C-N), 1020 (N-N), 679 (C-S-C)	8.61 (s, 1H, N=CH-Ar), 7.72-8.80 (m, 9H, Ar-H), 7.35 (s, 1H, NH), 7.14 (s, 1H, CH of thiazole), 2.28 (s, 3H, CH_3)
5b	440	3030 (C-H Ar), 2918 (C-H aliphatic), 1674 (C=O), 1615 (C=N), 1533 (C-C of Ar), 1188 (C-N), 1023 (N-N), 659 (C-S-C), 618 (C-Br)	8.65 (s, 1H, N=CH-Ar), 7.70-8.78 (m, 8H, Ar-H), 7.33 (s, 1H, NH), 7.10 (s, 1H, CH of thiazole), 2.27 (s, 3H, CH_3)
5c	377	3452 (OH), 3039 (C-H Ar), 2913 (C-H aliphatic), 1670 (C=O), 1616 (C=N), 1531 (C-C of Ar), 1180 (C-N), 1026 (N-N), 654 (C-S-C)	12.10 (s, 1H, OH), 8.63 (s, 1H, N=CH-Ar), 7.75-8.75 (m, 8H, Ar-H), 7.37 (s, 1H, NH), 7.12 (s, 1H, CH of thiazole), 2.30 (s, 3H, CH_3)
5d	456	3453 (OH), 3032 (C-H Ar), 2910 (C-H aliphatic), 1670 (C=O), 1612 (C=N), 1531 (C-C of Ar), 1180 (C-N), 1020 (N-N), 659 (C-S-C), 613 (C-Br)	12.14 (s, 1H, OH), 8.60 (s, 1H, N=CH-Ar), 7.73-8.71 (m, 7H, Ar-H), 7.36 (s, 1H, NH), 7.14 (s, 1H, CH of thiazole), 2.31 (s, 3H, CH_3)
5e	391	3035 (C-H Ar), 2912 (C-H aliphatic), 1677 (C=O), 1610 (C=N), 1535 (C-C of Ar), 1187 (C-N), 1024 (N-N), 655 (C-S-C)	8.65 (s, 1H, N=CH-Ar), 7.75-8.75 (m, 8H, Ar-H), 7.34 (s, 1H, NH), 7.13 (s, 1H, CH of thiazole), 3.46 (s, 3H, OCH_3), 2.35 (s, 3H, CH_3)
5f	470	3032 (C-H aromatic), 2910 (C-H aliphatic), 1670 (C=O), 1612 (C=N), 1531 (C-C of aromatic ring), 1180 (C-N), 1020 (N-N), 659 (C-S-C), 610 (C-Br)	8.63 (s, 1H, N=CH-Ar), 7.76-8.78 (m, 7H, Ar-H), 7.37 (s, 1H, NH), 7.11 (s, 1H, CH of thiazole), 3.47 (s, 3H, OCH_3), 2.38 (s, 3H, CH_3)
5g	407	3458 (OH), 3037 (C-H Ar), 2917 (C-H aliphatic), 1675 (C=O), 1613 (C=N), 1530 (C-C of Ar), 1186 (C-N), 1027 (N-N), 650 (C-S-C)	12.14 (s, 1H, OH), 8.68 (s, 1H, N=CH-Ar), 7.78-8.79 (m, 7H, Ar-H), 7.39 (s, 1H, NH), 7.10 (s, 1H, CH of thiazole), 3.49 (s, 3H, OCH_3), 2.35 (s, 3H, CH_3)
5h	486	3450 (OH), 3039 (C-H Ar), 2919 (C-H aliphatic), 1670 (C=O), 1610 (C=N), 1534 (C-C of Ar), 1513 (C-N-C), 1183 (C-N), 1025 (N-N), 657 (C-S-C), 614 (C-Br)	12.13 (s, 1H, OH), 8.66 (s, 1H, N=CH-Ar), 7.75-8.80 (m, 6H, Ar-H), 7.35 (s, 1H, NH), 7.13 (s, 1H, CH of thiazole), 3.47 (s, 3H, OCH_3), 2.32 (s, 3H, CH_3)
6a	436	3032 (C-H Ar), 2919 (C-H aliphatic), 1672 (C=O), 1615 (C=N), 1537 (C-C of Ar), 1186 (C-N), 1022 (N-N), 654 (C-S-C)	8.10 (s, 1H, N-CH-Ar), 7.70-8.75 (m, 9H, Ar-H), 7.40 (s, 1H, NH), 7.10 (s, 1H, CH thiazole), 3.14 (s, 2H, CH_2-S), 2.27 (s, 3H, CH_3)
6b	514	3034 (C-H Ar), 2921 (C-H aliphatic), 1675 (C=O), 1613 (C=N), 1538 (C-C of Ar), 1187 (C-N), 1029 (N-N), 660 (C-S-C), 614 (C-Br)	8.08 (s, 1H, N-CH-Ar), 7.72-8.80 (m, 8H, Ar-H), 7.32 (s, 1H, NH), 7.12 (s, 1H, CH thiazole), 3.17 (s, 2H, CH_2-S), 2.27 (s, 3H, CH_3)
6c	452	3450 (OH), 3039 (C-H Ar), 2919 (C-H aliphatic), 1670 (C=O), 1610 (C=N), 1534 (C-C of Ar), 1183 (C-N), 1025 (N-N), 657 (C-S-C)	12.15 (s, 1H, OH), 8.11 (s, 1H, N-CH-Ar), 7.76-8.79 (m, 8H, Ar-H), 7.30 (s, 1H, NH), 7.11 (s, 1H, CH thiazole), 3.19 (s, 2H, CH_2-S), 2.25 (s, 3H, CH_3)
6d	530	3455 (OH), 3031 (C-H Ar), 2914 (C-H aliphatic), 1673 (C=O), 1613 (C=N), 1538 (C-C of Ar), 1186 (C-N), 1027 (N-N), 652(C-S-C), 617 (C-Br)	12.10 (s, 1H, OH), 8.09 (s, 1H, N-CH-Ar), 7.70-8.76 (m, 7H, Ar-H), 7.13 (s, 1H, NH), 7.13 (s, 1H, CH thiazole), 3.15 (s, 2H, CH_2-S), 2.28 (s, 3H, CH_3)
6e	466	3030 (C-H Ar), 2920 (C-H aliphatic), 1670 (C=O), 1610 (C=N), 1530 (C-C of Ar), 1180 (C-N), 1028 (N-N), 654 (C-S-C)	8.11 (s, 1H, N-CH-Ar),7.75-8.79 (m, 8H, Ar-H), 7.34 (s, 1H, NH), 7.08 (s, 1H, CH thiazole), 3.47 (s, 3H, OCH_3), 3.14 (s, 2H, CH_2-S), 2.26 (s, 3H, CH_3)
6f	544	3033 (C-H Ar), 2915 (C-H aliphatic), 1676 (C=O), 1613 (C=N), 1539 (C-C of Ar), 1187 (C-N), 1022 (N-N), 653	8.09 (s, 1H, N-CH-Ar), 7.72-8.80 (m, 7H, Ar-H), 7.37 (s, 1H, NH), 7.12 (s, 1H, CH thiazole), 3.49 (s, 3H,

		(C-S-C), 617 (C-Br)	OCH_3), 3.17 (s, 2H, CH_2-S), 2.29 (s, 3H, CH_3)
6g	482	3460 (OH), 3032 (C-H Ar), 2912 (C-H aliphatic), 1674 (C=O), 1619 (C=N), 1538 (C-C of Ar), 1180 (C-N), 1020 (N-N), 652 (C-S-C)	12.14 (s, 1H, OH), 8.10 (s, 1H, N-CH-Ar), 7.70-7.75 (m, 7H, Ar-H), 7.38 (s, 1H, NH), 7.12 (s, 1H, CH thiazole), 3.49 (s, 3H, OCH_3), 3.16 (s, 2H, CH_2-S), 2.26 (s, 3H, CH_3)
6h	560	3454 (OH), 3035 (C-H Ar), 2916 (C-H aliphatic), 1670 (C=O), 1610 (C=N), 1534 (C-C of Ar), 1183 (C-N), 1025 (N-N), 657 (C-S-C), 610 (C-Br)	12.16 (s, 1H, OH), 8.12 (s, 1H, N-CH-Ar), 7.74-7.78 (m, 6H, Ar-H), 7.32 (s, 1H, NH), 7.11 (s, 1H, CH thiazole), 3.47 (s, 3H, OCH_3), 3.14 (s, 2H, CH_2-S), 2.27 (s, 3H, CH_3)



X = H , Br

R = H, 4-OH, 4-OCH_3, 4-OH & 3-OCH_3

Scheme 1

General procedure for synthesis of 3-amino-2-methyl-6-substitutedquinazolin-4(3H)-ones (2a-2b)

To the mixtures of compounds 1a-1b (0.01 mol) in ethanol (50 ml), hydrazine hydrate (0.02 mol) was added and refluxed for 8 h. The excess of ethanol was distilled off in vacou. The residue on cooling gave crystalline solids, which were recrystallized from appropriate solvents to obtained compounds 2a-2b. Physical, analytical and spectral data given in table 1 and 2 respectively.

General procedure for synthesis of 2-chloro-(2-methyl-6-substituted-4-oxoquinazolin-3(4H)-yl)acetamide (3a-3b)

To the mixture of compounds 2a-2b (0.01 mol), chloroacetyl chloride (0.01 mol) and anhydrous K_2CO_3 (5.00 gm) in acetone (dry, 80ml) were added and refluxed for 18-20 h on a waterbath. The excess of acetone was distilled off and the reaction mixtures were poured into water, filtered, dried and recrystallized from appropriate solvents to give compounds 3a-3b. Physical, analytical and spectral data given in table 1 and 2 respectively.

General procedure for synthesis of 3-(2-aminothiazol-5-ylamino)-2-methyl-6-substitutedquinazolin-4(3H) -ones (4a-4b)

To the mixture of compounds 3a-3b (0.01 mol) in absolute ethanol (200 ml), a solution of thiourea (0.02 mol) was added dropwise with stirring separately. The reaction mixtures were refluxed for 10-20 h. The separated solids were filtered, washed with 2% $NaHCO_3$ solution, then with water, dried and recrystallized from appropriate solvents to yielded compounds 4a-4b. Physical, analytical and spectral data given in table 1 and 2 respectively.

General procedure for synthesis of 3-(2-(substitutedbenzylideneamino)thiazol-5-ylamino)-2-methyl-6-substituted quinazolin-4(3H)-ones (5a-5h)

To a solution of compounds 4a-4b (0.01 mol) in ethanol, substitutedbezaldehydes were added separately in presence of 2-3 drops of glacial acetic acid. The reaction mixtures were refluxed for 16-18 h. The solvents were distilled off at reduced pressure and the solids thus obtained were recrystallized from appropriate solvents to yieded compounds 5a-5h. Physical, analytical and spectral data given in table 1 and 2 respectively.

General procedure for synthesis of 2-(substitutedphenyl)-3-(5-(2-methyl-4-oxoquinazolin-3(4H)-ylamino) thiazol-2-yl)thiazolidin-4-ones (6a-6h)

A mixture of compounds 5a-5h (0.01 mol) in DMF (80 ml), thioglycolic acid (0.02 mol) was added in presence of anhydrous $ZnCl_2$. The reaction mixtures were refluxed for 18 h then cooled and poured into ice cold water. The solids thus obtained were filtered, dried and recrystallized from appropriate solvents to obtained compounds 6a-6h. Physical, analytical and spectral data given in table 1 and 2 respectively.

Pharmacological Evaluation

Antibacterial Activity

The compounds 5a-5h and 6a-6h were tested for their in vitro growth inhibitory activity against different bacteria like E. coli, B. subtillis and S. aureus and compared with standard drug Streptomycin. The inhabitation zones of synthesized compounds were determines using cup plate methods[18]. In this methods Nutrient agar was poured onto the sterilized Petri dishes (20-25 ml each Petri dish). The poured material was allowed to set (1-1.5 h) and thereafter the "CUPS" (10 mm diameter) were made by punching into the agar surface with a sterile cork borer and scooping out the punched part of the agar. Into these cups the test compound solution was added with the help of sterile syringe. The plates were incubated at 37^0C for 48 hr and the results were noted. A solvent control (10% DMSO in methanol) was also run to note the activity of the blank (solvent). The inhibition zones produced by the various synthesized compounds on the microbial growth were measured (diameter in mm).

Antifungal Activity

The newly synthesized compounds and the standard drug, Fusidic acid were tested for their antifungal activity by employing the standard agar disc diffusion method[19]. The following strains of fungi have been used

in this study: Aspergillus niger and Candida albicans. All cultures were maintained on [Sabouraud-dextrose agar] SDA and incubated at 30^0C. To prepare homogeneous suspensions of the above mentioned fungi for the disc assays, they were grown in Sabouraud broth, centrifuged to collect the pellet, and buffered with saline. The fungal pellet was homogenized in a sterile hand-held homogenizer. This suspension was then plated onto SDA using a fungal spreader to obtain an even growth field. Sterile 6 mm Whatmann filter paper was impregnated with 250 µg/mL concentration of the various test compounds and standard drug fluconazole. These disc were then placed in the center of each quadrant of an SDA plate. Each plate had one control disc impregnated with DMSO. The plates were incubated at 30^0C. After 48 h, the plates were removed.

Results and Discussion

The antibacterial activity of compounds 5a-5h and 6a-6h was evaluated and compared with streptomycin as standard drug (table-3). All the tested compounds showed antibacterial activity against three pathogenic bacterial strains. Among the series 5a-5h and 6a-6h, compounds 6f and 6h exhibited an elevated antibacterial activity against tested bacterial strains. Compounds, 6e and 6g showed good antibacterial activity against all the tested organism. The other compounds of this series showed a moderate activity as compared to standard drug. The in vitro antifungal activity of synthesized compounds 5a-5h and 6a-6h, was studied against A. niger and C. albicans. The results were compared with standard drug fusidic acid as in table-3. The results of the antifungal screening revealed that all the tested compounds 5a-5h and 6a-6h showed moderate to good antifungal activity. Out of these compounds tested, compound 6h was found to be more potent antifungal agents against A. Niger and C. albicans than the reference drug. The other compounds of this series were less active compared to the standard drug. In the present study, different electron withdrawing and electron donating groups are attached to quinazolinone ring as substituent. The close survey of antimicrobial efficacy indicated that the inhibition values of all the compounds exhibited a varied range of antibacterial and antifungal activities against all the tested microbial strains. The nature of linkage (substituent on aromatic ring) influences the antimicrobial activity. Cyclization of compounds 5a-5h into their correspoding thiazolidinone congener's 6a-6h markedly enhanced the antibacterial and antifungal activities.

Table-3 antibacterial and antifungal activity of synthesized compounds 5a-5h and 6a-6h

Comp. No.	X	R	Bacterial growth Inhibition (diameter in mm)			Fungal growth inhibition (diameter in mm)	
			S. aureus	E. coli	B. subtillis	A. niger	C. albicans
5a	H	H	13	12	10	-	11
5b	Br	H	15	-	13	15	13
5c	H	4-OH	17	16	-	19	17
5d	Br	4-OH	20	-	18	-	-
5e	H	4-OCH_3	-	23	20	24	23
5f	Br	4-OCH_3	25	21	22	23	-
5g	H	4-OH & 3-OCH_3	24	-	25	27	25
5h	Br	4-OH & 3-OCH_3	-	26	-	-	28
6a	H	H	-	24	26	30	30
6b	Br	H	29	-	28	-	-
6c	H	4-OH	30	28	-	33	31
6d	Br	4-OH	36	33	34	36	-
6e	H	4-OCH_3	35	31	33	-	34
6f	Br	4-OCH_3	40	37	39	35	35
6g	H	4-OH & 3-OCH_3	38	33	34	36	-
6h	Br	4-OH & 3-OCH_3	42	36	37	40	39
Streptomycin			39	35	37		
Fusidic acid						37	38

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