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Facile Multicomponent synthesis of Thiazolidinone based triazines derivatives as new potential anti-microbial agent

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Abstract

A frequent approach to synthesize a series of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2- phenylthiazolidin-4-one was developed by applying an efficient multi-component reaction. Also, the synthesized compounds were tested for their antimicrobial activity. The most admirable results were observed with the substituted phenyl thiazolidin-4-one triazine analogs and it could be a potential starting point to develop innovative lead compounds fight against a panel of some human disease-causing pathogens bacteria and fungi. All synthesized compounds were characterized by IR, ^{1}H NMR, mass and elemental analysis.

Key words: Synthesis, Characterization, Thiazolidinone, Antibacterial; s-Triazine.

1. Introduction

Treatment of infections caused by bacterial pathogens always creates a peril to healthcare. It becomes more acute due to the rapid development of resistance against conventional chemotherapy. In order to reduce the rapid multidrug-resistance in pathogenic microbes, we urgent require to find out and manufacture new drugs that acts through a new mechanism of action.[1] Such a demanding organisms were due for dramatic and shocking raise in microbial infections which result in severe problem in widespread. In visualization of the above trouble, existing situation highlights the vital need to develop fresh agents with precise activity with improved potency to maintain a pool of novel bioactive entities.

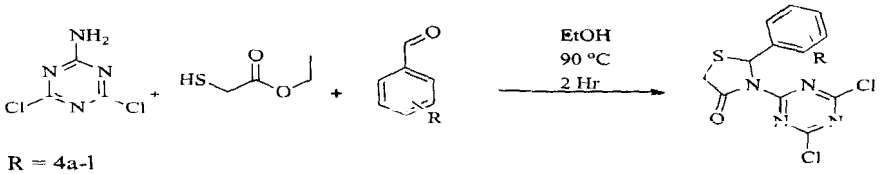
Recently, several heterocyclic compounds from the sequence of triazine and thiazolidin-4-one have been synthesized and their pharmacological activity has accordingly been investigated. It has been accomplished that, triazine ring frame hold a extensive spectrum of biological and pharmaceutical activities.[7-9] It has played a fundamental role in unique drug innovation for modulating physical and

biological properties of the molecule due to wide diversity of biological applications.[10] The triazine core has known and huge concentrationlinking chemists through victorious resource of pharmacological activities such as antibacterial,[11-12] antimalarial,[13] antifungal,[14] anticancer,[15] antimychobacterial[16] and antiviral.[17] Moreover, thiazolidin-4-one derivatives are also reported to have important biological activities such as anti-inflammatory,[18] antituberculosis,[19] anticancer,[20] antitumor,[21] anti-HIV activity[22] etc. The 1,3,5-triazine is a pharmacophore found as a core skeleton in molecules with diverse biological activities. In continuation of our research work, in order to ûnd the broad spectrum biologically active triazines frame work (Fig-1) of new heterocyclic bioactive agents. A series of thiazolidin-4-one fused triazines was synthesized by applying an efficient coupling using as a base in dry ethanol solvent. Here, we report the synthesis and biological activity of 3-(4, 6- dichloro-1, 3, 5-triazin-2-yl)-2-phenylthiazolidin-4-one as antimicrobial agents. In the structure activity relationship (SAR) studies, the biological activity of these molecules was compared with standard reference.

2. Experimental

2. 1. Material and methods:

The solvents and chemicals used for the synthesis purchased from commercial sources were of analytical grade. 2,4,6-Trichloro-1,3,5-triazine, substituted aromatic aldehyde, ethyl 2-mercaptoacetate was purchased from Sigma Aldrich, Merck and Fluka Chemicals Pvt. Ltd., Mumbai, India. Melting points were determined in open capillaries tubes and are uncorrected. The ^{1}H NMR and ^{13}C NMR spectra were recorded on a Bruker 400 MHz model spectrometer using DMSO-d6 as a solvent and TMS as internal standard (Chemical Shift in δ, ppm). The splitting patterns are designated as follows: m, multiplet; dd, doublet of doublets; d, doublet and s, singlet. The mass spectra were recorded on JOEL SX-102 (EI) model with 70 eV ionizing energy.



R = 4a-l

4a = Phenyl	4g = 3-methyl
4b = 4-Methoxy	4n = 4-Nitro
4c = 2-fluoro	4i = 2-Hydroxy
4d = 2-fluoro-4-bromo	4j = 3-Methoxy
4e = 4-bromo	4k = 2,5-difluoro
4f = 2-fluoro-5-chloro	4l = 3- CN

Scheme-1: Synthesis of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-substituted phenylthiazolidin-4-one:

2.2 General method for the preparation of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-phenyl thiazolidin-4-one (4a):

A mixture of 2-amino 4,6-dichloro-1,3,5-triazine (0.01 mol), substituted aromatic aldehydes (0.01 mol) and ethyl 2-mercaptoacetate (0.01 mol) was refluxed for 2 hrs in dry ethanol (100 ml). The progress of reaction was monitored by TLC [Toluene: Acetone (4:6)]. The excess alcohol was evaporated in vacuo. The resulting crude product was triturated with saturated $NaHCO_3$ solution until CO_2 evolution ceased. The solid was washed with water, dried and recrystallized from ethanol to afford final respective compounds.

Similarly remaining compound **4b-l** were prepared

2.3 Biological Evolution :

Antibacterial assay :

Newly synthesized compounds were screened for their antibacterial activity against selected Gram-positive organism's viz. *Staphylococcus aureus* (MTCC 96), *Bacillus subtilis* (MTCC 441) and Gram-negative organism's viz. *Escherichia coli* (MTCC 443), *Salmonella typhimurium* (MTCC 98) bacterial strains by ager well diffusion method with little modification.[2] Different concentrations (10-200 µg/ml) of test compounds were prepared in DMSO. The bacterial suspension was spread over nutrient agar plates and the well with of 6 mm diameter was punched with sterile cork borer. The sample (50 µL) was added to the well and the plates were incubated at 37 °C for 24 h. Respective solvent control (DMSO) was kept and ciprofloxacin was used as standard antibacterial agent. The lowest concentration of compound which completely inhibits the bacterial growth was taken as minimum inhibitory concentration (MIC). Minimum inhibitory concentrations (MIC) were noted.

Antifungal assay :

Newly synthesized compounds were screened for their antifungal activity against *Candida albicans* (MTCC 227), *Aspergillus niger* (MTCC 281), *Fusarium solani* (MTCC 350) and *Aspergillus flavus* (MTCC 277) by agar well diffusion method with little modification.46 Normal saline was used to make a suspension of spores of fungal strain. The fungal suspension was spread over potato dextrose agar plates and the wells of 6 mm diameter were punched with sterile cork borer. The sample (50 µL) was added to the well and the plates were incubated at 37°C for 2-3 days. Respective solvent control (DMSO) was kept and miconazole was used as standard antifungal agent. The lowest concentration of compound which completely inhibits the fungal growth was taken as minimum inhibitory concentration (MIC). Minimum inhibitory concentrations (MIC) were noted.

20 35 20 20

Table 1.2: Antibacterial activity of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-phenyl thiazolidin-4-one derivatives (4**a-l**).

(MIC [a] values µg/mL)

Compound (4a-l)	Gram-positive		Gram-negative	
	S. aureus	*B. subtilis*	*E. coli*	*S. typhimurium*
4a	60	70	60	65
4b	**15**	**15**	**10**	**20**
4c	70	75	70	65
4d	75	00	75	65
4e	60	65	70	70
4f	00	80	80	00
4g	65	60	70	70
4h	**20**	**20**	**15**	**10**
4i	**35**	**45**	**30**	**40**
4j	70	55	70	70
4k	75	00	00	70
4l	**15**	**25**	**15**	**20**
Ciprofloxacin (Ref.)	20	25	20	20

[a] – Values are the average of three readings.

Table 1.2: Antifungal activity of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-phenylthiazolidin 4-on derivatives (4**a-l**).

(MIC a values µg/mL)

Compound (4a-l)	*Candida* albicans	*Aspergillus niger*	*Fusarium – solani*	*Aspergillus flavus*
4a	70	70	65	70
4b	**15**	**15**	**10**	**20**
4c	00	75	70	75
4d	70	60	65	70
4e	60	70	65	70
4f	70	60	70	70
4g	00	00	75	70
4h	**20**	**20**	**15**	**10**
4i	**35**	**45**	**30**	**40**
4j	70	65	70	00
4k	70	70	75	75
4l	**45**	**35**	**55**	**40**
Miconazole Ref.)	20	25	25	15

[a] - Values are the average of three readings.

3. Results and Discussion

All newly synthesized compounds (4a-l) were subjected to anti-microbial activity against various gram-positive, gram-negative bacteria and fungal strains by using an agar well diffusion method. [2] The antimicrobial activity of these compounds to further assist for SAR study. The final compounds were screened against a panel of human disease-causing pathogens consisting of four gram-positive and four gram-negative strains as well as antifungal strain.

From antimicrobial activity data shown in **Table 1** and 2 it is revealed that some analogues of this series have more potency than the standard drug Ciprofloxacin and Miconazole while some of them have comparable potency. Interestingly none of the compound with high anti-inflammatory activity found to be potent antibacterial or antifungal agents. Thus, the compounds **4b, 4h and 4l** have higher potency against the tested antimicrobial strain. It is cleared from our results that the 4th position of substituent on terminal benzene ring is thefavorable site for high antimicrobial activity. The high potency of these compounds may be attributed to the presence of non halogenated electron donating group (EDG) or electron donating group (EDG) type group's placement at 4-positions. Mean while the presence **CN** (EDG) **at** C-5 and **OH** (EDG) at C-2 on terminal benzene ring (**4i and 4l**) shows moderately potent antimicrobial activity with respect to standard drug. It is noteworthy to mention that compound containing halogenated electron-withdrawing group **(-Br)** at 4th position have no activity against the pathogenic bacteria and fungal strain. Any activity has not been observed in case of remaining compounds up to concentration of 200 µg/mL against same bacterial and fungal strains. It is cleared from results i.e. **Table 1 and 2**, the SAR of antibacterial activity partially correlates with their SAR of antifungal activity as there is some divergence is observed. The same aryl 4th position as observed already is favorable site of high activity. The compounds **4b** and **4h** have been found to be 2 fold more potent than the standard drug Micanazole as similar to the antibacterial activity trend. While the compounds **(4a, 4c, 4d, 4e, 4f, 4g, 4j and 4k)** have no major effect on the antifungal activity also.

Characterization data for compounds (4a-l) are given as follows:

Synthesis of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-phenylthiazolidin-4-one (4a):

Nature : Pale yellow solid; M. F. $C_{12}H_8Cl_2N_4OS$; Yield:80% ; M.P. 138-140 °C; IR (KBr cm^{-1}) : ν = 2842 (C-H str. in aromatic ring), 1723 (C=O of thiazolidinone), 1660 (-C=C- str. in aromatic ring), 814(C-N- str. in s-triazine) cm^{-1}; ^{1}H NMR (400 MHz, chloroform-d_6) δ ppm : 7.41- 6.85 (m, 5H), 5.33 (s, 1H), 3.40 (d, *J = 7.1 Hz,* 2H); MS (70 eV) *m/z* : 325.96 [M^+, 100%], Anal. Calcd for $C_{12}H_8Cl_2N_4OS$: C, 44.05; H, 2.46; N, 17.12: S, 9.80; Found: C, 43.98; H, 2.35; N, 17.00: S, 9.60 %.

Synthesis of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-(4-methoxyphenyl)thiazolidin-4-one (4b):

Nature : Pale yellow solid; M. F. $C_{13}H_{10}Cl_2N_4O_2S$; Yield:82% ; M. p. 140-142 °C; IR (KBr cm^{-1}) : ν = 2838 (C-H str. in aromatic ring), 1720 (C=O of thiazolidinone), 1655 (-C=C- str. in aromatic ring), 813(C-N-str. in s-triazine) cm^{-1}; ^{1}H NMR (400 MHz, chloroform-d_6) δ ppm : 7.41(m, 2H), 6.89(m, 2H), 5.34 (d, 1H), 3.82 (s, 3H), 3.43 (d, *J = 7.2 Hz,* 2H) ; MS (70 eV) *m/z* : 355.98[M^+, 100%], Anal. Calcd for $C_{13}H_{10}Cl_2N_4O_2S$: C, 43.71; H, 2.82; N, 15.68: S, 8.98; Found: C, 43.30; H, 2.45; N, 15.48: S, 8.40 %.

Synthesis of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-(2-fluorophenyl)thiazolidin-4-one (4c):

Nature : Pale yellow solid; M. F. $C_{12}H_7Cl_2N_4OS$; Yield:78 %; M.P. 145-147 ºC; IR (KBr cm^{-1}) ν=2836 (C-H str. in aromatic ring), 1715 (C=O of thiazolidinone), 1629 (-C=C- str. in aromatic ring), 809 (C-N- str. in s-triazine) cm^{-1}; ^{1}H NMR (400 MHz, chloroform-d_6) δ ppm: 7.58 (td, *J =7.5,1.9 Hz,* 1H), 7.32 (td, *J = 6.6, 5.8, 3.7 Hz,* 1H), 7.18 (td, *J = 7.6, 1.2 Hz,* 1H), 7.06 (ddd, *J = 9.5, 8.3 .1.2 Hz,,* 1H, Ar-H), 5.94 (d, *J = 7.4 Hz,* 1H), 4.25 - 4.10 (m, 2H),; MS (70 eV) *m/z* : 343.90 [M^+, 100%], Anal. Calcd for $C_{12}H_7$ F Cl_2N_4OS : C, 41.75; H, 2.04; N, 16.23: S, 9.29; Found: C, 41.55; H, 2.00; N, 16.10: S, 9.10 %.

Synthesis of 2-(4-bromo-2-fluorophenyl)-3-(4,6-dichloro-1,3,5-triazin-2-yl) thiazolidin-4- one (4d):

Nature : Pale yellow solid; M. F. $C1_2H_6$ F Br Cl_2N_4OS; Yield:76% ; M. p. 145-147 °C; IR (KBr cm^{-1}) : ν = 2830 (C-H str. in aromatic ring), 1719 (C=O of thiazolidinone), 1650 (-C=C- str. in aromatic ring), 810 (C-N- str. in s-triazine) cm^{-1}; 1H NMR (400 MHz, chloroform-d_6) δ ppm: 7.48-7.42(m, 1H), 7.33 (dd, *J* = 8.4, 2.0 Hz, 1H), 7.25 (dd, *J* = 9.4, 1.9 Hz, 1H), 5.86 (s, 1H), 4.20 - 4.13 (m, 2H), ; MS (70 eV) *m/z* : 424.8 [M^+, 100%], Anal. Calcd for $C1_2H_6$ F Br Cl_2N_4OS : C, 33.99 ; H, 1.43 ; N, 13.21: S, 7.56; Found: C, 33.41; H, 1.35; N, 13.10: S, 7.20 %.

Synthesis of 2-(4-bromophenyl)-3-(4,6-dichloro-1,3,5-triazin-2-yl)thiazolidin-4-one (4e):

Nature : Pale yellow solid; M. F. $C_{12}H_7BrCl_2N_4OS$; Yield:80% ; M. p. 160-162 °C; IR (KBr cm^{-1}) : ν = 2830 (C-H str. in aromatic ring), 1721(C=O of thiazolidinone), 1656 (-C=C- str. in aromatic ring), 811(C-N- str. in s-triazine) cm^{-1}; ^{1}H NMR (400 MHz, chloroform-d_6) δ ppm: 7.53-7.47(m, 2H), 7.41-7.34 (m, 2H), 5.34 (s, 1H), 4.17 (q, *J = 7.2 Hz,* 2H), ; MS (70 eV) *m/z* : 403.86 [M^+, 100%], Anal. Calcd for $C_{12}H_7BrCl_2N_4OS$: C, 35.49; H, 1.74 ; N, 13.80: S, 7.90; Found: C, 35.30; H, 1.45; N, 13.48: S, 7.20 %.

Synthesis of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-(4-chloro-2-fluorophenyl) thiazolidin-4-one (4f):

Nature : Pale yellow solid; M. F. $C_{12}H_6FCl_3N_4OS$; Yield:81% ; M. p. 155-157 °C; IR (KBr cm^{-1}) : ν = 2820 (C-H str. in aromatic ring), 1720 (C=O of thiazolidinone), 1651 (-C=C- str. in aromatic ring), 812(C-N- str. in s-triazine) cm^{-1}; ^{1}H NMR (400 MHz, chloroform-d_6) δ ppm: 7.69(dd, *J =6.4, 2.6 Hz,* 1H), 7.41 (ddd, *J = 8.7, 4.6,2.6 Hz,* 1H), 6.95 (dd, *J = 9.6, 8.7 Hz,* 1H), 5.86 (s, 1H), 4.17 (m, 2H),; MS (70 eV) *m/z* : 377.93[M^+, 100%],

Anal. Calcd for $C_{12}H_6FCl_3N_4OS$: C, 37.97 ; H, 1.59 ; N, 14.76: S, 8.45; Found: C, 37.41; H, 1.35; N, 14.30: S, 8.20 %.

Synthesis of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-m-tolylthiazolidin-4-one (4g):

Nature : Pale yellow solid; M. F. $C_{13}H_{10}Cl_2N_4OS$; Yield:86% ; M. p. 140-142 °C; IR (KBr cm^{-1}) : ν = 2842 (C-H str. in aromatic ring), 1718 (C=O of thiazolidinone), 1660 (-C=C- str. in aromatic ring), 814(C-N- str. in s-triazine) cm^{-1}; 1H NMR (400 MHz, chloroform-d_6) δ ppm : 7.37-7.33(m, 2H), 7.32-7.27 (m, 2H), 5.88 (s, 1H), 2.21 (s, 3H), 4.22-4.27 (d, *J = 7.2 Hz,* 2H) ; MS (70 eV) *m/z* : 340.6 [M^+, 100%], Anal. Calcd for $C_{13}H_{10}Cl_2N_4OS$: C, 45.76; H, 2.95; N, 16.42: S, 9.40; Found: C, 45.56; H, 2.65; N, 16.10: S, 9.30 %.

Synthesis of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-(4-nitrophenyl)thiazolidin-4-one (4h):

Nature : Pale yellow solid; M. F. $C_{12}H_7Cl_2N_5O_3S$; Yield:78% ; M.P.170-172 °C; IR (KBr cm^{-1}) : ν = 2836 (C-H str. in aromatic ring), 1721 (C=O of thiazolidinone), 1641 (-C=C- str. in aromatic ring), 807(C-N- str. in s-triazine) cm^{-1}; ^{1}H NMR (400 MHz, chloroform-d_6) δ ppm: 7.66 (m, 2H), 6.85(m, 2H), 5.84 (s, 1H), 4.19-4.12 (m, 2H) ; MS (70 eV) *m/z* : 370.8 [M^+, 100%], Anal. Calcd for C12H7Cl2N5O3S : C, 38.72 ; H, 1.90 ; N, 18.82: S, 8.62; Found: C, 38.41; H, 1.65; N, 18.40: S, 8.40 %.

Synthesis of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-(2-hydroxyphenyl)thiazolidin-4-one (4i):

Nature : Pale yellow solid; M. F. $C_{12}H_8Cl_2N_4O_2S$; Yield:82% ; M. p. 160-162 °C; IR (KBr cm^{-1}) : ν = 2838 (C-H str. in aromatic ring), 1722 (C=O of thiazolidinone), 1630 (-C=C- str. in aromatic ring), 806 (C-N- str. in s-triazine) cm^{-1}; ^{1}H NMR (400 MHz, chloroform-d_6) δ ppm: 7.58 (d, *J = 11 Hz, 1.8 Hz,* 1H), 7.32 (d, *J = 6.5, 5.7, 3.6 Hz,* 1H), 7.18 (d, *J = 7.5, 1.3 Hz,* 1H), 7.06 (dd, *J = 9.4, 8.2 .1.2 Hz,,* 1H, Ar-H), 5.92 (d, *J = 7.5 Hz,* 1H), 4.21 - 4.12 (m, 2H), ; MS (70 eV) *m/z* : 341.7 [M^+, 100%], Anal. Calcd for $C_{12}H_8Cl_2N_4O_2S$: C, 42.00; H, 2.35; N, 16.33: S, 9.34; Found: C, 41.90; H, 2.10; N, 16.10: S, 9.20 %.

Synthesis of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-(3-methoxyphenyl)thiazolidin-4-one (4j):

Nature : Pale yellow solid; M. F. $C_{13}H_{10}Cl_2N_4O_2S$; Yield:80% ; M. p. 141-143 °C; IR (KBr cm^{-1}) : ν = 2834 (C-H str. in aromatic ring), 1717 (C=O of thiazolidinone), 1625 (-C=C- str. in aromatic ring), 806 (C-N- str. in s-triazine) cm^{-1}; ^{1}H NMR (400 MHz, chloroform-d_6) δ ppm: 8.15 (s, 1H, Ar-H), 7.93 (m, 1H, Ar-H), 7.60 (m, 1H, Ar-H), 7.46 (m, 1H, Ar-H), 5.37 (d, *J = 7.1 Hz,* 1H), 3.75(s, 3H), 3.38 (d, 2H); MS (70 eV) *m/z* : 355.7 [M^+, 100%], Anal. Calcd for $C_{13}H_{10}Cl_2N_4O_2S$: C, 43.71; H, 2.82; N, 15.68: S, 8.98; Found: C, 43.50; H, 2.75; N, 15.42: S, 8.60 %.

Synthesis of 3-(4,6-dichloro-1,3,5-triazin-2-yl)-2-(2,5-difluorophenyl)thiazolidin-4-one (4k):

Nature : Pale yellow solid; M.F. $C_{12}H_6Cl_2F_2N_4OS$; Yield: 75% ; M.p. 178-180 °C; IR (KBr cm^{-1}): v=2825 (C-H str. in aromatic ring), 1725 (C=O of thiazolidinone), 1650 (-C=C- str. in aromatic ring), 813(C-N- str. in s-triazine) cm^{-1}; ^{1}H NMR (400 MHz, chloroform-d_6) δ ppm: = 7.72 (dd, *J =6.3, 2.5 Hz,* 1H), 7.39 (dd, *J = 8.6, 4.5,2.5 Hz,* 1H), 6.85 (dd, *J = 9.5, 8.6 Hz,* 1H), 5.80 (s, 1H), 4.15 (m, 2H), ; MS (70 eV) *m/z* : 361.1 [M^+, 100%], Anal. Calcd for $C_{12}H_6Cl_2F_2N_4OS$: C, 39.69 ; H, 1.67 ; N, 15.43: S, 8.83; Found: C, 39.50; H, 1.44; N, 15.33; S, 8.32 %.

Synthesis of 3-(3-(4,6-dichloro-1,3,5-triazin-2-yl)-4-oxothiazolidin-2-yl)benzonitrile (4l):

Nature : Pale yellow solid; M. F. $C_{13}H_7Cl_2N_5OS$; Yield:78% ; M.P. 145-147 °C; IR (KBr cm^{-1}) : ν = 2835

(C-H str. in aromatic ring), 1724 (C=O of thiazolidinone), 1640 (-C=C- str. in aromatic ring), 806(C-N- str. in s-triazine) cm^{-1}; ^1H NMR (400 MHz, chloroform-d_6) δ ppm: δ = 7.94 (s, 1H, Ar-H), 7.59 (s, 1H, Ar-H), 7.34-7.21 (m, 1H, Ar-H), 7.04-7.02 (m, 1H, Ar-H), 5.78 (s, 1H), 3.40-3.36(m, 2H) ; MS (70 eV) *m/z* : 350.8 [M^+,100%], Anal. Calcd for $C_{13}H_7Cl_2N_5OS$: C, 44.33; H, 2.00 ; N, 19.88; S, 9.10; Found: C, 44.10; H, 1.90; N, 19.56: S, 8.89 %.

4. Conclusions

We successfully synthesized series of 3-(4, 6-dichloro-1, 3, 5-triazin-2-yl)-2- phenylthiazolidin-4-one derivatives (4**a-l**) by condensation cyclisation reaction between substituted aromatic aldehyde, 4, 6-dichloro-1,3,5-triazin-2-amine and ethyl 2-mercaptoacetate using dry ethanol. The good yield (67-72 %) were obtained when reaction were performed in dry ethanol at reflux temperature for short duration of time (less than 2 hr). Reaction leading to longer time often resulted in degradation of products with low yield. The synthesized compounds were exploited for antimicrobial activity.

The presence of electron-withdrawing substitution on aromatic ring on C-2 position of 4- thiazolinone presenting varied degrees of inhibition against gram-positive and gram-negative bacteria showing inhibition as good as to the standard drugs used. The activity of the compounds depends upon the position and nature of the substituent at the aryl ring attached with thiazolidinone ring. Hence further investigation in this direction may yield fruitful results. From these observations, the importance of the nucleus is highlighted. There are so much scope in this promising moiety as a number of different molecular targets is available for 4-thiazolidinone. Thus the presence of lipophilic -Cl and -F at 5^{th} position tolerates the procytokine activity. Alsothe presence of non halogenated electron donating group (EDG) or electron donating group (EDG) type of (4-OMe and 4-NO2) group's present at 4-positions of terminal benzene ring found to be effective potent antimicrobial agents.

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