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Synthesis of Novel 4-Thiazolidinone Derivatives Incorporated with Benzothiazole and its Antimicrobial Activity

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ABSTRACT

A series of novel tetrazoloquinoline schiff's bases ***3a-g,4a-g,5a-g,6a-g,7a-g*** *were prepared from 6/7/8-trisubstituted quinoline carbaldehyde . All tetrazolo quinoline Schiff bases were refluxed with thioacetic acid in presence of anhydrous zinc chloride and solvent N,N-dimethyl formamide to afforded novel series of 4-thiazolidinone* ***8a-g,9a-g,10a-g,11a-g,12a-g****.All synthesized 4-thiazolidinone were screened for their antimicrobial activity.*

Keywords: Schiff bases, 4-Thiazolidinones, tetrazoloquinoline, antimicrobial activity, acetic acid.

INTRODUCTION

Quinoline and its derivative is an interesting class of heterocyclic compounds with a wide range of applications as a drug. Most of the Quinoline derivatives act as analgesics [1], antiamoebic [2-5], tryphocidal [6], antiseptic [7] and antiserotonin [8]. In addition to these, derivatives also exhibit good antimalerial [9-10] antitubercular [11], antibacterial [12], antihistaminic [13], antineurodegerative [14], anticonvulsant [15], antitumor [16], anticancers [17-18] and antiallergics [19] activities. And also moreover fusion of tetrazole, which is considered as planar acidic heterocyclic analogue of carboxylic function [20-21] have ability to increase potency [22-23] and improve bioavailability[24] Similarly schiff's bases have been reported to possess antimicrobial [25-26]apart from other biological activities. These observations led to the conception that Schiff's bases of synthesis of schiff's bases of 8-methyl- tetrazolo[1,5-*a*] quinoline as potential anti- inflammatory and antimicrobial agents [27].After successful literature survey it stimulate us to synthesize 2-(7/8/9-tri substituted tetrazolo[1,5-a]quinolin-4-yl)-3-(substituted benzothiazol-2-yl) thiazolidin-4-ones and purity of the compound was checked by TLC and structure of the compound was deduced on the basis of their IR, ^{1}H NMR and mass spectroscopy. The synthesis of compounds **8a-g,9a-g,10a-g,11a-g,12a-g.** is mentioned in scheme-2 and their antimicrobial data in Table1.

MATERIALS AND METHODS

Melting point was determined by open capillary tubes and were uncorrected. All the reactions monitored by thin layer chromatography, carried out on 0.2 mm silica gel-C plates using iodine vapors for detection. Infrared spectra . were recorded in Nujol or as potassium bromide pallets on infrared spectrophotometer, nuclear magnetic resonance spectra were obtained on brukner advance spectrophotometer 400 MHz mass spectra were recorded on FT-VC-7070 H Mass spectrometer using the EI technique at 70 eV. All the reaction were carried out under ambient atmosphere. Elemental analysis was performed on a Heraeus CHN-O rapid analyzer.

4–Formyl-7/8/9-trisubstituted tetrazolo [1,5-a] quinoline schiff's bases (3a-g,4a-g,5a-g,6a-g,7a-g)

A mixture of 7-chloro-3-formyl tetrazoloquinoline (1), 7-methoxy-3-formyl tetrazoloquinoline (2), 7-methyl-3-formyl tetrazoloquinoline (3), 7/9-dimethyl-3-formyl tetrazoloquinoline (4) (0.005mol) and 2-amino benzothiazole /2-amino-6-methyl benzothiazole /2-amino-6-methoxy benzothiazole/2-amino-6-chloro benzothiazole /2-amino-6-nitro benzothiazole /2-amino-4,6-dimethyl benzothiazole (0.005mol) in 10 ml methanol & acetic acid was refluxed independently on water bath for 2 hrs. The reaction mixture was allowed to cool and separated solid was filtered, washed with water dried and recrystallized from ethanol to give respective products .

7/8/9-Trisubstituted tetrazolo[1,5-a] quinoline 4-thiazolidinones (8a-g,9a-g,10a-g,11a-g,12a-g)

0.01mol of 4a-e, 5a-e and 6a-e was refluxed with thioacetic acid (0.01mol) in 10 ml of N,N-dimethyl formamide in presence of anhydrous zinc chloride were refluxed for 3-5 hrs. After complete heating reaction mixture was cooled, which was then poured in ice cold water, the solid obtained, filtered, dried and recrystallized from ethanol-DMF.

3-Benzothiazol-2-yl-2-(7-chloro-1,2,3,9b-tetraaza-cyclopenta[a]naphthalen-4-yl)-thiazolidin-4-one (8a)

Orange powder, yield 70 %, mp 187 °C (dec.). IR (KBr / cm^{-1}) 1642 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.45 (s, 2H,CH_2), 6.12 (s, 1H), 7.43-8.93 (m, 8H, Ar-H). EI-MS (m/z: RA %): 439 (M+I), 13C NMR (300 MHz, CDCl3) δ:36.5, 53,122.2, 122.6, 122.7, 125.1, 125.6, 125.8, 128.6, 128.9, 130.4, 131.2, 131.6, 133.5, 144.2, 148.61, 52.5, 166, 174 Anal. Calcd. For: $C_{19}H_{11}ClN_6OS_2$; C, 51.99; H, 2.53; N, 19.15. Found: C, 51.12; H, 2.01; N, 18.76.

2-(7-Chloro-1,2,3,9b-tetraaza-cyclopenta[a]naphthalen-4-yl)-3-(6-methyl-benzothiazol-2-yl)-thiazolidin-4-one (8b)

Orange powder, yield 64 %, mp 190 °C (dec.). IR (KBr / cm^{-1}) 1648 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.45 (s, 2H,CH_2), 2.54 (s, 3H,CH_3), 6.12 (s, 1H), 7.43-8.93 (m, 8H, Ar-H). EI-MS (m/z: RA %): 453 (M+I), Anal. Calcd. For: $C_{20}H_{13}ClN_6OS_2$; C, 53.03; H, 2.89; N, 18.55; Found: C, 52.62; H, 2.32; N, 18.01.

2-(7-Chloro-1,2,3,9b-tetraaza-cyclopenta[a]naphthalen-4-yl)-3-(6-methoxy-benzothiazol-2-yl)-thia zolidin-4-one (8c)

Orange powder, yield 68 %, mp 182 °C (dec.). IR (KBr / cm^{-1}) 1642 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.51 (s, 2H,CH_2), 3.68 (s, 3H,OCH_3),6.12 (s, 1H), 7.41-8.83 (m, 7H, Ar-H). EI-MS (m/z: RA %): 453 (M+I), Anal. Calcd. For: $C_{20}H_{13}ClN_6O_2S_2$; C, 51.22; H, 2.79; N, 17.92; Found: C, 50.66; H, 2.19; N, 17.21.

3-(6-chlorobenzo [d] thiazol-2-yl)-2-(7-chlorotetrazolo [1, 5-a] quinolin-4-yl) thiazolidin-4-one (8d)
Orange powder , yield 72 %, mp 181°C (dec.). IR (KBr / cm^{-1}) 1645 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.42 (s, 2H,CH_2), 5.86 (s, 1H), 7.46-8.89 (m, 7H, Ar-H). EI-MS (m/z: RA %): 472 (M+I), Anal. Calcd. For: $C_{19}H_{10}Cl_2N_6OS_2$; C, 48.21; H, 2.13; N, 17.75; Found: C, 47.54; H, 1.76; N, 17.13.

2-(7-chlorotetrazolo [1, 5-a] quinolin-4-yl)-3-(6-nitrobenzo[d]thiazol-2-yl) thiazolidin-4-one (8e)
Brown powder , yield 72 %, mp 208°C (dec.). IR (KBr / cm^{-1}) 1645 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.34 (s, 2H,CH_2), 5.96 (s, 1H), 7.34-8.92 (m, 7H, Ar-H). EI-MS (m/z: RA %): 484 (M+I), Anal. Calcd. For: $C_{19}H_{10}ClN_7O_3S_2$; C, 47.16; H, 2.08; N, 20.26; Found: C, 46.45; H, 1.42; N, 19.54.

2-(7-chlorotetrazolo[1,5-a]quinolin-4-yl)-3-(4,6-dimethylbenzo[d]thiazol-2-yl)thiazolidin-4-one (8f)
Orange powder, yield 61 %, mp 188 °C (dec.). IR (KBr / cm^{-1}) 1644 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.38 (s, 2H,CH_2), 2.38 (s, 6H,CH_3), 5.84 (s, 1H), 7.32-8.86 (m, 8H, Ar-H). EI-MS (m/z: RA %): 467 (M+I), Anal. Calcd. For: $C_{21}H_{15}ClN_6OS_2$; C, 54.01; H, 3.24; N, 18.00; Found: C, 53.46; H, 2.62; N, 17.49.

3-(6-chloro-7-fluorobenzo[d]thiazol-2-yl)-2-(7-chlorotetrazolo[1,5-a]quinolin-4-yl) thiazolidin-4-one (8g)
Orange powder, yield 76 %, mp 184 °C (dec.). IR (KBr / cm^{-1}) 1644 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.38 (s, 2H,CH_2), 5.76 (s, 1H), 7.02-8.75 (m, 6H, Ar-H). EI-MS (m/z: RA %): 490 (M+I), Anal. Calcd. For: $C_{19}H_9Cl_2FN_6OS_2$; C, 46.44; H, 1.85; N, 17.10; Found: C, 45.72; H, 1.31; N, 16.43.

3-(Benzo [d]thiazol-2-yl)-2-(7-methoxy tetrazolo [1,5-a]quinolin-4-yl)thiazolidin-4-one (9a)
Orange powder, yield 82 %, mp 160 °C (dec.). IR (KBr / cm^{-1}) 1646 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.29 (s, 2H,CH_2), 3.59 (s, 3H,OCH_3), 5.19 (s, 1H), 6.24-8.35 (m, 8H, Ar-H). EI-MS (m/z: RA %): 434, Anal. Calcd. For: $C_{20}H_{14}N_6O_2S_2$; C, 55.29; H, 3.25; N, 19.34; Found: C, 54.64; H, 2.48; N, 18.65.

2-(7-methoxytetrazolo[1,5-a]quinolin-4-yl)-3-(6-methylbenzo[d]thiazol-2-yl)thiazolidin-4-one (9b)
Orange powder, yield 86 %, mp 174 °C (dec.). IR (KBr / cm^{-1}) 1639 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.34 (s, 2H,CH_2), 2.58 (s, 3H,CH_3), 3.54 (s, 3H,OCH_3), 5.99 (s, 1H), 7.43-8.93 (m, 7H, Ar-H). EI-MS (m/z: RA %): 448 , Anal. Calcd. For: $C_{21}H_{16}N_6O_2S_2$; C, 56.23; H, 3.60; N, 18.74; Found: C, 55.72; H, 2.76; N, 18.03.

3-(6-methoxybenzo[d]thiazol-2-yl)-2-(7-methoxy tetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (9c)
Orange powder, yield 78 %, mp 168 °C (dec.). IR (KBr / cm^{-1}) 1642 (CO); 1H NMR (400 MHz,DMSO-d_6)3.38 (s, 2H,CH_2), 3.54 (s, 6H,OCH_3), 5.86 (s, 1H), 6.29-8.49 (m, 7H, Ar-H). EI-MS (m/z: RA %): 464 , Anal. Calcd. For: $C_{21}H_{16}N_6O_3S_2$; C, 54.30; H, 3.47; N, 18.09; Found: C, 53.75; H, 2.88; N, 17.46.

2-(7-methoxytetrazolo[1,5-a]quinolin-4-yl)-3-(6-nitrobenzo[d]thiazol-2-yl)thiazolidin-4-one (9d)
Orange powder, yield 72 %, mp 184 °C (dec.). IR (KBr / cm^{-1}) 1635 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.31 (s, 2H,CH_2), 3.64 (s, 3H,OCH_3), 5.76 (s, 1H), 6.34-8.74 (m, 7H, Ar-H).

EI-MS (m/z: RA %): 468 , Anal. Calcd. For: $C_{20}H_{13}ClN_6O_2S_2$; C, 50.10; H, 2.73; N, 20.45; Found: C, 49.64; H, 2.24; N, 19.84.

3-(6-chlorobenzo[d]thiazol-2-yl)-2-(7-methoxytetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (9e)
Orange powder, yield 75 %, mp 216 °C (dec.). IR (KBr / cm^{-1}) 1639 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.29 (s, 2H,CH_2), 3.66 (s, 3H,OCH_3), 5.64 (s, 1H), 6.27-8.87 (m, 7H, Ar-H). EI-MS (m/z: RA %): 479, Anal. Calcd. For: $C_{20}H_{13}N_7O_4S_2$; C, 51.22; H, 2.79; N, 17.92; Found: C, 50.64; H, 2.14; N, 17.28.

2-(7-methoxytetrazolo[1,5-a]quinolin-4-yl)-3-(4,6-dimethylbenzo[d]thiazol-2-yl)thiazolidin-4-one (9f)
Orange powder, yield 88 %, mp 179 °C (dec.). IR (KBr / cm^{-1}) 1644 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.38 (s, 2H,CH_2), 3.59 (s, 3H,OCH_3), 5.58 (s, 1H), 6.25-8.77 (m, 7H, Ar-H). EI-MS (m/z: RA %): 462, Anal. Calcd. For: $C_{22}H_{18}N_6O_2S_2$; C, 57.13; H, 3.92; N, 18.17; Found: C, 56.48; H, 3.27; N, 17.52.

3-(6-chloro-7-fluorobenzo[d]thiazol-2-yl)-2-(7-methoxytetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (9g)
Orange powder, yield 84 %, mp 182 °C (dec.). IR (KBr / cm^{-1}) 1644 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.46 (s, 2H,CH_2), 3.64 (s, 3H,OCH_3), 5.92 (s, 1H), 6.94-7.98 (m, 6H, Ar-H). EI-MS (m/z: RA %): 486, Anal. Calcd. For: $C_{20}H_{12}ClFN_6O_2S_2$; C, 49.33; H, 2.48; N, 17.26; Found : C, 48.74; H, 1.83; N, 17.68.

3-(benzo[d]thiazol-2-yl)-2-(7-methyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (10a)
Orange powder, yield 80 %, mp 157 °C (dec.). IR (KBr / cm^{-1}) 1647 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.32 (s, 2H,CH_2), 2.36 (s, 3H, CH_3), 5.88 (s, 1H), 7.24-8.57(m, 8H, Ar-H). EI-MS (m/z: RA %): 418, Anal. Calcd. For: $C_{20}H_{14}N_6OS_2$; C, 57.40; H, 3.37; N, 20.08;Found : C, 56.75; H, 2.84; N, 19.42.

3-(6-methylbenzo[d]thiazol-2-yl)-2-(7-methyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one(10b)
Orange powder, yield 74 %, mp 208 °C (dec.). IR (KBr / cm^{-1}) 1638 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.46 (s, 2H,CH_2), 2.36 (s, 3H,CH_3), 5.92 (s, 1H), 6.75-7.98 (m, 7H, Ar-H). EI-MS (m/z: RA %): 432, Anal. Calcd. For: $C_{21}H_{16}N_6OS_2$; C, 58.31; H, 3.73; N, 19.43; N, 18.17 ; Found : C, 57.86; H, 3.15; N, 17.62.

3-(6-methoxybenzo[d]thiazol-2-yl)-2-(7-methyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (10c)
Orange powder, yield 76 %, mp 174 °C (dec.). IR (KBr / cm^{-1}) 1639 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.35 (s, 2H,CH_2), 2.68 (s, 3H,CH_3), 3.69 (s, 3H,OCH_3), 5.84 (s, 1H), 6.35-7.84 (m, 7H, Ar-H). EI-MS (m/z: RA %): 448, Anal. Calcd. For: $C_{21}H_{16}N_6O_2S_2$; C, 56.23; H, 3.60; N, 18.74; Found : C, 55.71; H, 3.17; N, 17.54.

3-(6-chlorobenzo[d]thiazol-2-yl)-2-(7-methyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (10d)
Orange powder, yield 76 %, mp 187 °C (dec.). IR (KBr / cm^{-1}) 1632 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.44 (s, 2H,CH_2), 2.64 (s, 3H,CH_3), 5.82 (s, 1H), 6.84-8.48 (m, 7H, Ar-H). EI-MS (m/z: RA %): 452, Anal. Calcd. For: $C_{20}H_{13}ClN_6OS_2$; C, 53.03; H, 2.89; N, 18.55; Found : C, 52.47; H, 2.41; N, 17.88.

2-(7-methyltetrazolo[1,5-a]quinolin-4-yl)-3-(6-nitrobenzo[d]thiazol-2-yl)thiazolidin-4-one(10e)
Orange powder, yield 78 %, mp 228 °C (dec.). IR (KBr / cm^{-1}) 1635 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.36 (s, 2H,CH_2), 2.65 (s, 3H,CH_3), 5.82 (s, 1H), 6.74-7.98 (m, 7H, Ar-H). EI-MS (m/z: RA %): 486, Anal. Calcd. For: $C_{20}H_{12}ClFN_6O_2S_2$; C, 49.33; H, 2.48; N, 17.26; N, 18.17 ; Found : C, 48.74; H, 1.83; N, 17.68.

3-(4,6-dimethylbenzo[d]thiazol-2-yl)-2-(7-methyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one(10f)
Orange powder, yield 72 %, mp 158 °C (dec.). IR (KBr / cm^{-1}) 1636 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.26 (s, 2H,CH_2), 2.56 (s, 9H,CH_3), 5.82 (s, 1H), 6.44-7.99 (m, 6H, Ar-H). EI-MS (m/z: RA %): 446, Anal. Calcd. For: $C_{22}H_{18}N_6OS_2$; C, 59.17; H, 4.06; N, 18.82; Found : C, 58.64; H, 3.68; N, 18.28.

3-(6-chloro-7-fluorobenzo[d]thiazol-2-yl)-2-(7-methyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (10g)
Orange powder, yield 74 %, mp 174 °C (dec.). IR (KBr / cm^{-1}) 1644 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.36 (s, 2H,CH_2), 2.67 (s, 3H, CH_3), 5.82 (s, 1H), 6.46-8.86 (m, 6H, Ar-H). EI-MS (m/z: RA %): 470, Anal. Calcd. For: $C_{20}H_{12}ClFN_6OS_2$; C, 51.01; H, 2.57; N, 17.85; Found : C, 50.48; H, 2.03; N, 17.27.

3-(benzo[d]thiazol-2-yl)-2-(7,9-dimethyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (11a)
Orange powder, yield 88 %, mp 163 °C (dec.). IR (KBr / cm^{-1}) 1647 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.32 (s, 2H,CH_2), 2.36 (s, 6H, CH_3), 5.88 (s, 1H), 7.24-8.57(m, 8H, Ar-H). EI-MS (m/z: RA %): 432, Anal. Calcd. For: $C_{21}H_{16}N_6OS_2$; C, 57.54; H, 3.14; N, 20.13;Found : C, 56.95; H, 2.64; N, 19.62.

3-(6-methylbenzo[d]thiazol-2-yl)-2-(7,9-dimethyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (11b)
Orange powder, yield 85 %, mp 188 °C (dec.). IR (KBr / cm^{-1}) 1636 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.36 (s, 2H,CH_2), 2.38 (s, 9H,CH_3), 5.94 (s, 1H), 6.65-7.88 (m, 7H, Ar-H). EI-MS (m/z: RA %): 446, Anal. Calcd. For: $C_{22}H_{18}N_6OS_2$; C, 58.45; H, 3.50; N, 19.48; Found : C, 57.76; H, 2.85; N, 18.72.

3-(6-methoxybenzo[d]thiazol-2-yl)-2-(7,9-dimethyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (11c)
Orange powder, yield 82 %, mp 172 °C (dec.). IR (KBr / cm^{-1}) 1634 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.29 (s, 2H,CH_2), 2.68 (s, 6H,CH_3), 3.62 (s, 3H,OCH_3), 5.74 (s, 1H), 6.45-7.96 (m, 7H, Ar-H). EI-MS (m/z: RA %): 462, Anal. Calcd. For: $C_{22}H_{18}N_6O_2S_2$; C, 57.13; H, 3.92; N, 18.17; Found : C, 56.48; H, 3.37; N, 17.44.

3-(6-chlorobenzo[d]thiazol-2-yl)-2-(7,9-dimethyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (11d)
Orange powder, yield 86 %, mp 194 °C (dec.). IR (KBr / cm^{-1}) 1632 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.34 (s, 2H,CH_2), 2.74 (s, 6H,CH_3), 5.72 (s, 1H), 6.74-8.38 (m, 7H, Ar-H). EI-MS (m/z: RA %): 466, Anal. Calcd. For: $C_{21}H_{15}ClN_6OS_2$; C, 54. 01; H, 3.24; N, 18.00; Found : C, 53.66; H, 2.61; N, 17.48.

2-(7,9-dimethyltetrazolo[1,5-a]quinolin-4-yl)-3-(6-nitrobenzo[d]thiazol-2-yl)thiazolidin-4-one (11e)
Orange powder, yield 88 %, mp 232 °C (dec.). IR (KBr / cm^{-1}) 1636 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.35 (s, 2H,CH_2), 2.64 (s, 3H,CH_3), 5.86 (s, 1H), 6.54-8.34 (m, 7H, Ar-H).

EI-MS (m/z: RA %): 477, Anal. Calcd. For: $C_{21}H_{15}N_7O_3S_2$; C, 52.82; H, 3.17; N, 20.53; Found : C, 52.15; H, 2.54; N, 20.01

3-(4,6-dimethylbenzo[d]thiazol-2-yl)-2-(7,9-dimethyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (11f)
Orange powder, yield 86 %, mp 154 °C (dec.). IR (KBr / cm^{-1}) 1636 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.36 (s, 2H,CH_2), 2.66 (s, 9H,CH_3), 5.75 (s, 1H), 6.34-7.98 (m, 6H, Ar-H). EI-MS (m/z: RA %): 460, Anal. Calcd. For: $C_{23}H_{20}N_6OS_2$; C, 59.98; H, 4.38; N, 18.25; Found : C, 59.24; H, 3.78; N, 17.58.

3-(6-chloro-7-fluorobenzo[d]thiazol-2-yl)-2-(7,9-dimethyltetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (11g)
Orange powder, yield 84 %, mp 174 °C (dec.). IR (KBr / cm^{-1}) 1644 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.32 (s, 2H,CH_2), 2.61 (s, 3H, CH_3), 5.86 (s, 1H), 6.26-8.93 (m, 6H, Ar-H). EI-MS (m/z: RA %): 484, Anal. Calcd. For: $C_{21}H_{14}ClFN_6OS_2$; C, 52.01; H, 2.91; N, 17.33;Found : C, 51.47; H, 2.15; N, 16.68.

3-(benzo[d]thiazol-2-yl)-2-(8-methoxytetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (12a)
Orange powder, yield 74 %, mp 168 °C (dec.). IR (KBr / cm^{-1}) 1638 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.37 (s, 2H,CH_2), 2.32 (s, 6H, CH_3), 5.84 (s, 1H), 7.25-8.45(m, 8H, Ar-H). EI-MS (m/z: RA %): 434, Anal. Calcd. For: $C_{20}H_{14}N_6O_2S_2$; C, 55.29; H, 3.25; N, 19.34; Found : C, 54.68; H, 2.44; N, 18.38.

3-(6-methoxybenzo[d]thiazol-2-yl)-2-(8-methoxytetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (12b)
Orange powder, yield 74 %, mp 185 °C (dec.). IR (KBr / cm^{-1}) 1634 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.36 (s, 2H,CH_2), 2.38 (s, 9H,CH_3), 5.94 (s, 1H), 6.65-7.88 (m, 7H, Ar-H). EI-MS (m/z: RA %): 448, Anal. Calcd. For: $C_{21}H_{16}N_6O_2S_2$; C, 56.23; H, 3.60; N, 18.74; Found: C, 55.72; H, 2.76; N, 18.03.

2-(8-methoxytetrazolo[1,5-a]quinolin-4-yl)-3-(6-methylbenzo[d]thiazol-2-yl)thiazolidin-4-one (12c)
Orange powder, yield 73 %, mp 173 °C (dec.). IR (KBr / cm^{-1}) 1634 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.29 (s, 2H,CH_2), 2.68 (s, 6H,CH_3), 3.62 (s, 3H,OCH_3), 5.74 (s, 1H), 6.45-7.96 (m, 7H, Ar-H). EI-MS (m/z: RA %): 464, Anal. Calcd. For: $C_{21}H_{16}N_6O_3S_2$; C, 54.30; H, 3.47; N, 18.09; Found: C, 53.75; H, 2.88; N, 17.46.

2-(8-methoxytetrazolo[1,5-a]quinolin-4-yl)-3-(6-nitrobenzo[d]thiazol-2-yl)thiazolidin-4-one (12d)
Orange powder, yield 77 %, mp 178 °C (dec.). IR (KBr / cm^{-1}) 1636 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.38 (s, 2H,CH_2), 2.75 (s, 6H,CH_3), 5.75 (s, 1H), 6.46-8.28 (m, 7H, Ar-H). EI-MS (m/z: RA %): 468, Anal. Calcd. For: $C_{20}H_{13}ClN_6O_2S_2$; C, 50.10; H, 2.73; N, 20.45; Found: C, 49.64; H, 2.24; N, 19.84.

3-(6-chlorobenzo[d]thiazol-2-yl)-2-(8-methoxytetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (12e)
Orange powder, yield 70 %, mp 218 °C (dec.). IR (KBr / cm^{-1}) 1636 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.34 (s, 2H,CH_2), 2.66 (s, 3H,CH_3), 5.84 (s, 1H), 6.58-8.36 (m, 7H, Ar-H). EI-MS (m/z: RA %): 479, Anal. Calcd. For: $C_{20}H_{13}N_7O_4S_2$; C, 51.22; H, 2.79; N, 17.92; Found: C, 50.64; H, 2.14; N, 17.28.

2-(8-methoxytetrazolo[1,5-a]quinolin-4-yl)-3-(4,6-dimethylbenzo[d]thiazol-2-yl)thiazolidin-4-one (12f)

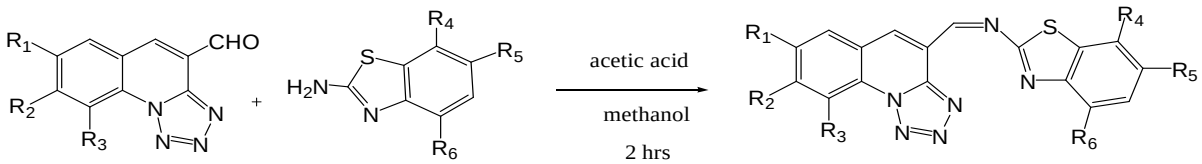
Orange powder, yield 86 %, mp 154 °C (dec.). IR (KBr / cm^{-1}) 1636 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.36 (s, 2H,CH_2), 2.66 (s, 9H,CH_3), 5.75 (s, 1H), 6.34-7.98 (m, 6H, Ar-H). EI-MS (m/z: RA %): 462, Anal. Calcd. For: $C_{22}H_{18}N_6O_2S_2$; C, 57.13; H, 3.92; N, 18.17; Found: C, 56.48; H, 3.27; N, 17.52.

3-(6-chloro-7-fluorobenzo[d]thiazol-2-yl)-2-(8-methoxytetrazolo[1,5-a]quinolin-4-yl)thiazolidin-4-one (12g)

Orange powder, yield 84 %, mp 174 °C (dec.). IR (KBr / cm^{-1}) 1644 (CO); 1H NMR (400 MHz,DMSO-d_6) 3.32 (s, 2H,CH_2), 2.61 (s, 3H, CH_3), 5.86 (s, 1H), 6.26-8.93 (m, 6H, Ar-H). EI-MS (m/z: RA %): 486, Anal. Calcd. For: $C_{20}H_{12}ClFN_6O_2S_2$; C, 49.33; H, 2.48; N, 17.26; Found : C, 48.74; H, 1.83; N, 17.68.

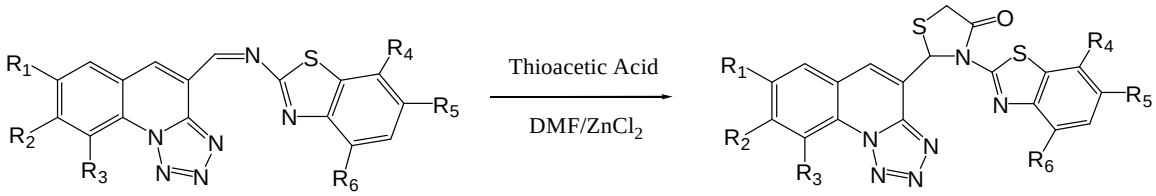
RESULTS AND DISCUSSION

The starting 7-chloro-3-formyl tetrazoloquinoline , 7-methoxy-3-formyl tetrazoloquinoline , 7-methyl-3-formyl tetrazoloquinoline, 7/9-dimethyl-3-formyl tetrazoloquinoline (**1**) were condensed independently with 2-amino benzothiazole (a) / 2-amino-6-methyl benzothiazole (b) / 2-amino-6-methoxy benzothiazole (c) / 2-amino-6-chloro benzothiazole (d) /2-amino-4,6-dimethyl benzothiazole (e) 2-amino-6-chloro,7-floro benzothiazole in presence of methanol and acetic acid to afford respective Schiff's bases mentioned in scheme -1 **3a-g,4a-g,5a-g,6a-g,7a-g** . The structure of 1-3, **8a-g,9a-g,10a-g,11a-g,12a-g** were supported by their spectral data. IR spectra in KBr showed the absence of absorption bond in the region 2830-2700 cm^{-1} due to C-H and 1725-1680 cm^{-1}due to C=O of –CHO groups respectively and the presence of absorption band in the region 1500-1525 cm^{-1} due to –CH=N- stretch. Mass spectra of these products exhibit molecular ion peaks at M+1 and M+ which corresponds to their molecular weight.^{1}H NMR (DMSO-d6) spectra of these compounds revealed signals in the region δ 7.1-8.3 (m, due to Ar-H), δ 8.2-8.5 ppm (s,1H due to C-CH in quinoline). These 7/8/9–substituted tetrazolo quinoline Schiff bases **3a-g,4a-g,5a-g,6a-g,7a-g** were heating with thioacetic acid in the presence of anhydrous zinc chloride which act as a catalyst and solvent N,N-dimethyl formamide (DMF) under go cyclisation to afford 2-chloro-7/8/9- substituted tetrazoloquinoline-4-thiazolidinones **8a-g,9a-g,10a-g,11a-g,12a-g scheme -2.** All the newly synthesized compounds gave satisfactory C, H and N analysis and spectral data. The IR in KBr showed absence of absorption in the region 1500-1525 cm-1 due to –CH=N- and presence of absorption band in the range 1730-1740cm-1 due to C=O of thiazolidinones. ^{1}H NMR (DMSO-d6) signals appeared at δ 3.6-4.14 ppm due to methylene group and at δ 5.7-6.4 ppm assigned for >CH– (methylinic proton) of 4-thiazolidinone . In ^{1}H-NMR spectra methylene proton of the 4-thiazolidinone ring displayed two signals appearing as doublet at δ 3.7-3.8 and δ 3.6-4.9 ppm due to non equivalent germinal methylene protons.



1 **2** **3a-g,4a-g,5a-g,6a-g,7a-g**

Scheme 1. Formation of Schiff's bases



3a-g,4a-g,5a-g,6a-g,7a-g **8a-g,9a-g,10a-g,11a-g,12a-g**

Scheme 2. Formation of 4-thiazolidinones

Sr.No	R_1	R_2	R_3	R_4	R_5	R_6
8a	-Cl	H	H	H	H	H
8b	-Cl	H	H	H	$-CH_3$	H
8c	-Cl	H	H	H	$-OCH_3$	H
8d	-Cl	H	H	H	-Cl	-CH3
8e	-Cl	H	H	H	$-NO_2$	H
8f	-Cl	H	H	H	$-CH_3$	$-CH_3$
8g	-Cl	H	H	F	-Cl	H
9a	$-OCH_3$	H	H	H	H	H
9b	$-OCH_3$	H	H	H	$-CH_3$	H
9c	$-OCH_3$	H	H	H	$-OCH_3$	H
9d	$-OCH_3$	H	H	H	-Cl	H
9e	$-OCH_3$	H	H	H	$-NO_2$	H
9f	$-OCH_3$	H	H	H	$-CH_3$	$-CH_3$
9g	$-OCH_3$	H	H	F	-Cl	H
10a	$-CH_3$	H	H	H	H	H
10b	$-CH_3$	H	H	H	$-CH_3$	H
10c	$-CH_3$	H	H	H	$-OCH_3$	H
10d	$-CH_3$	H	H	H	-Cl	H
10e	$-CH_3$	H	H	H	$-NO_2$	H
10f	$-CH_3$	H	H	H	$-CH_3$	$-CH_3$
10g	$-CH_3$	H	H	F	-Cl	H
11a	$-CH_3$	H	$-CH_3$	H	H	H
11b	$-CH_3$	H	$-CH_3$	H	$-CH_3$	H
11c	$-CH_3$	H	$-CH_3$	H	$-OCH_3$	H
11d	$-CH_3$	H	$-CH_3$	H	-Cl	H
11e	$-CH_3$	H	$-CH_3$	H	$-NO_2$	H
11f	$-CH_3$	H	$-CH_3$	H	$-CH_3$	$-CH_3$
11g	$-CH_3$	H	$-CH_3$	F	-Cl	H
12a	H	$-OCH_3$	H	H	H	H
12b	H	$-OCH_3$	H	H	$-CH_3$	H
12c	H	$-OCH_3$	H	H	$-OCH_3$	H
12d	H	$-OCH_3$	H	H	-Cl	H
12e	H	$-OCH_3$	H	H	$-NO_2$	H
12f	H	$-OCH_3$	H	H	$-CH_3$	$-CH_3$
12g	H	$-OCH_3$	H	F	-Cl	H

Antibacterial Studies

The synthesized compounds were evaluated for their antibacterial activity against gram-positive

species *S. aureus* and *B. substilis* and gram-negative species *E. coli* and *S. typhi* by paper disc diffusion method[28] . All the synthesized compounds were dissolved in dimethyl sulphoxide. The synthesized compounds exhibited zone of inhibition of 09-15 mm in diameter whereas standard Streptomycin exhibited zone of inhibition of 18 and 22 mm in diameter against *S. aureus* and *B. substilis* and Penicillin exhibited zone of inhibition of 15 and 16 mm in diameter against *E. coli* and *S. typhi* respectively. Amongst the synthesized compounds compound **8d,8e,8f,8g**,**9a,9d,9e,9f,9g,10d,10e,10f,10g,11d,11e,11f,11g,12d,12e,12f,** and **12g,** showed higher zone of inhibition against *S. aureus, B. substilis*, *E. coli* and *S. typhi* respectively. It seems that the presence of -F, $-NO_2$ & $-OCH_3$ -Cl group increases antibacterial activity .

Table - 1 : Antibacterial Studies of Newly Synthesized Compound (8a-12g)

Diameter in zone of inhibition in mm				
Comp. No	***S. aureus***	***B. substilis***	***E. coli***	***S. typhi***
8a	06	08	10	09
8b	09	07	11	10
8c	07	08	09	11
8d	06	08	12	10
8e	08	07	12	09
8f	07	08	10	09
8g	10	11	14	09
9a	12	12	08	04
9b	10	09	05	06
9c	06	11	--	05
9d	14	15	--	07
9e	15	16	--	08
9f	11	11	--	06
9g	16	18	11	12
10a	05	10	--	--
10b	08	08	--	09
10c	05	08	04	09
10d	11	15	06	08
10e	13	14	05	08
10f	09	11	05	07
10g	14	12	06	09
11a	07	12	03	08
11b	09	15	08	--
11c	08	05	06	05
11d	12	06	07	04
11e	14	08	08	05
11f	12	--	08	05
11g	14	13	05	06
12a	10	--	--	03
12b	08	04	08	02
12c	09	09	09	02
12d	12	11	08	11
12e	11	12	05	05
12f	10	--	03	03
12g	14	11	11	12
Streptomycin	**18**	**22**	-----	----
Penicillin	-----	-----	**15**	**16**

CONCLUSION

In conclusion, we have described a convenient and practical procedure for the preparation of some novel tetrazoloquinoline Schiff's bases derivatives by the condensation of 2-amino-4, 6, 7-substuited benzothiazole catalyzed by thioacetic acid and DMF/ $ZnCl_2$. The milder reaction conditions, simple workup, and good yields are the most significant advantages of this new procedure in synthesis of these potential biologically active compounds.

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