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RETRO SYNTHESIS AND BIOLOGICAL ACTIVITY STUDIES OF THIAZOLE-5-CARBOXYLIC ACID AMIDE DERIVATIVES

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Abstract:-During the course of our investigation in the field of carboxylic acid antithrombotic agents, we have indentified and synthesized 2-[4'-(6,7-dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl-thiazole-5-carboxylic acid derivatives **(9a-k),** a carboxylic acid derivatives with good in vivo activity. These findings prompted us to prepare new 2-[4'-(6,7-dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl-thiazole-5-carboxylic acid derivatives **(9a-k),** in the hope of increasing activity and better understanding the influence of ester and amides.

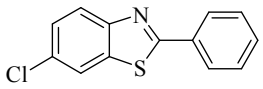
Keywords: Anti- bacterial activity, ethyl-2-chloro acetoacetate, thienopyridine, retro synthesis.

Introduction

Thiazole is a five membered unsaturated heterocyclic moiety containing sulfur and nitrogen atoms as the main heterocyclic constituents. Thiazoles are the members of azole heterocycles. Thiazole and related compounds are named as 1,3-azoles. They are isomeric with 1,2-azoles, nitrogen and sulfur compound being called as isothiazoles. Thiazoles are structurally similar to imidazoles where the sulphur is replaced by nitrogen in imidazoles.

Significance of thiazole derivatives in the field of science particularly in pharmaceutical industry, agrochemicals, and dyes is rapidly increasing from day to day. We started our journey towards the synthesis of new heterocyclic moieties having biphenyl system along with tetra hydro thienopyridine nucleus. In continuation of our work towards the synthesis of new heterocyclic moieties on the biphenyl system along with tetrahydro thienopyridine nucleus in its structure we explored to introduce the thiazole ring system on the second position of biphenyl system. For this strategy, we are keen to use the one of the known intermediates for the functionalization of the thiazole mother skeleton. During our journey towards the synthesis of new molecules containing biphenyl system along with tetrahydro thienopyridine nucleus we found 4'-(6,7-dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-carbonitrile **(1)** as an important intermediate for the preparation of thiazole moiety. Thus we had targeted the synthesis of 2-[4'-(6,7-dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl-thiazole-5-carboxy-lic acid **2** and acid amide derivatives with an objective to study their biological activity. With this aim, we started to prepared the required pharmacophore using the known intermediates, 4-(6,7-dihydro-4H-thieno[3,2-

c]pyridine-5-ylmethyl)-biphenyl-2-carbo-nitirle **5** are the synthesis for the preparation of compounds (**9a-k).**



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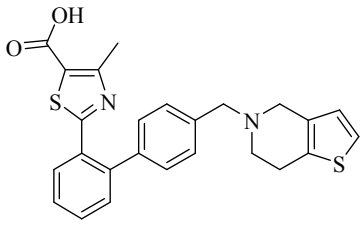

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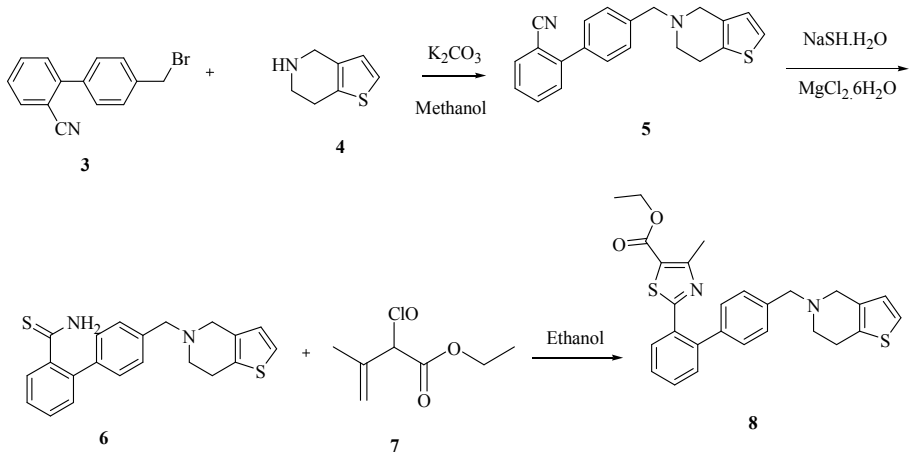
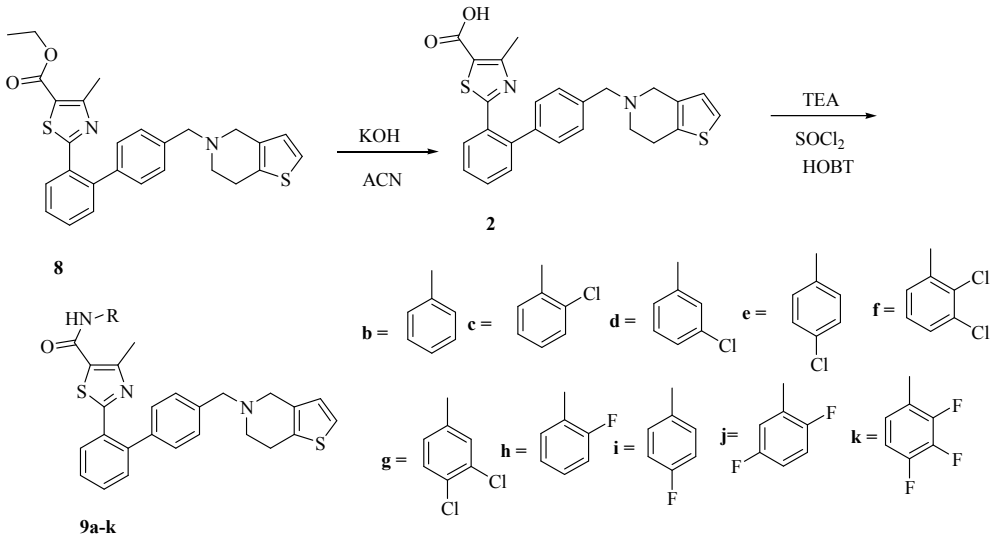
Results and discussions

The reaction sequence employed for the synthesis of title compounds is shown in (**Scheme-2**). The nitrile function of compound 5 was transformed into thioamide **(6)** followed by ring construction using commercially available ethyl-2-chloro acetoacetate **7** under reagent free conditions affords the thiazole skeleton 2-[4'-(6,7-dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl-thiazole-5-carboxylic acid ethyl ester **(8).** The compound **8** appeared in the ^{1}H NMR spectrum (400 MHz, CDC1$_3$), the signals observed at ð 1.27 as triplet which is due to CH_3 of ester moiety of thiazole ring (t, *J*=7.2 Hz, 3H, CH_3), a singlet appeared at ð 2.69 is due to the CH_3 of thiazole ring (s, 3H, CH_3), adjacent methylene protons displayed between ð 2.84-2.90 (m, 4H, 2 x CH_2). Another singlet protons appeared at ð 3.59 is allylic CH_2 of thienopyridine ring and another singlet appeared at ð 3.76 is due to benzylic CH_2. A quartet appeared at ð 4.23 (q, J=7.2 Hz, 2H, OCH_2) is due to the ester CH_2 protons. In the ^{13}C NMR (100 MHz, CDC1$_3$) spectrum the signals observed at ð 14.30 are signals of CH_3 of thiazole ring, 17.41 (CH_3 ester), 25.46 (CH_2 pyridine ring), 50.51 (CH_2, allylic), 53.05 (CH_2 pyridine ring), 61.04 (benzylic CH_2), 61.86 (CH_2 ester), the compound **(6)** which is upon saponification gives 2-[4'-(6,7-dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl-thiazole-5-carboxylic acid **(2)**.The compound **(2)** In the ^{1}H NMR (400 MHz, $CDCl_3$) spectrum the signals observed at ð 2.61 (s, 3H, CH_3) is due to the methyl protons of the thiazole ring system. Two adjacent methylene protons displayed between ð 2.78-2.91 (m, 4H, 2 x CH_2). Two singlet protons appeared at ð 3.60 (s, 2H, CH_2) and ð 3.72 (s, 2H, CH_2). In the ^{13}C NMR (100 MHz, $CDCl_3$) spectrum the signals observed at ð 14.42 are signals of CH_3 of thiazole ring, 25.36 (CH_2 pyridine ring), 50.85 (CH_2, allylic), 53.12 (CH_2 pyridine ring), 61.22 (benzylic CH_2).

Finally the acid function further converted into amide **(9a–k)** as per the retro synthetic path way the synthesis of target molecules using the commercially available, economically cheap starting materials to give different 2-[4'-(6,7-dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl-thiazole-5-carboxylic acid derivatives **(9a-k).** The compound **9a** in the ^{1}H NMR (400 MHz, $CDCl_3$) spectrum, the signals observed at ð 2.15 (s, 3H, CH_3) is due to the methyl protons of the thiazole ring system. Two adjacent methylene protons displayed between ð 2.78-2.83 (m, 4H, 2 x CH_2). Two singlet protons appeared at ð 3.50 (s, 2H, CH_2) and ð 3.73 (s, 2H, CH_2) are due to the methylene protons of the pyridine ring and benzylic protons respectively. Aromatic protons resonated between ð 6.79–7.69 (10H, ArH). In the ^{13}C NMR (100 MHz, $CDCl_3$) spectrum, the signals observed at ð 14.62 are signals of CH_3 of thiazole ring, 25.63 (CH_2 pyridine ring), 50.58 (CH_2, allylic), 53.14 (CH_2 pyridine ring).



Scheme-i: Synthesis of 4-methyl-thiazole-5-carboxylic acid ethyl ester (8)



Scheme-ii: Synthesis of title compounds thiazole-5-carboxylic acid amides (9a–k)

Antibacterial activity

All the newly prepared compounds **(9a–k)** were screened for the antibacterial activity is done by the paper disc method. Organisms used: Escherichia coli (gram-negative), Staphylococcus aureus (gram-positive).

After solidification of media, petriplates inoculated with actively growing culture of Escherichia coli and Staphylococcus aureusseparately as follows. Filter paper discs of 5 mm diameter were dipped in the test solution of different concentrations. After drying the disc, it was kept on Antibiotic med-3 agar in petriplates seeded with 1 ml bacterial culture of Escherichia coli and Staphylococcus aureusand incubated for 24 h at 37 °C.

The antibacterial screening data showed that almost all the compounds **9a–k** is active and showing moderate to good antibacterial activity. Among the screened **9c**, **9f, 9i** and **9k** in which respectively showed high activity against all the micro-organism employed. The activities of these compounds are almost equal to the standards the remaining compounds showed moderate to good antibacterial activity.

Table-1: Antibacterial activity

Escherichia coli (gram-negative) (Conc. µg ml^{-1})				**Staphylococcus aureus** (gram-positive) (Conc. µg ml^{-1})		
comp.	200	100	50	200	100	50
9a	11	13	14	24	18	26
9b	24	27	21	14	2	11
9c	14	21	12	8	11	12
9d	8	6	18	11	6	18
9e	9	-	-	25	-	-
9f	25	22	32	15	22	32
9g	15	12	12	23	14	12
9h	23	22	21	19	22	21
9i	20	20	32	17	20	30
9j	13	12	12	20	12	12
9k	20	20	21	16	20	20

Experimental Section

General experimental conditions

All the reactants, reagents and solvents were obtained from commercial sources and were of analytical grade. Melting points were determined by open capillary method. The IR spectra (in KBr pellets) were recorded on a Perkin-Elmer FTIR spectrophotometer. ^{1}H NMR ($CDCl_3$, 400 MHz) and ^{13}C NMR ($CDCl_3$, 100 MHz) were recorded on spectrometer TMS as internal standard (chemical shifts and ppm). Mass spectra were recorded on a VG micromass70–70H instrument. The purity of the compounds was checked by TLC on silica gel plates using a mixture of n-hexane and ethyl acetate.

Synthesis

Synthesis of synthesis of 2-[4'-(6,7-dihydro-4H-thieno[3,2-c] pyridine-5-ylmethyl) biphenyl-2-yl]-4-methyl-thiazole-5-carboxylic acid (2)

Charged ACN (50.0 mL), compound **8** (5.0 g, 0.01 moles) and KOH powder (0.84 g, 0.015 moles) into the RBF. Stirred and heated the reaction to reflux and maintained for 3–4 h. The progress of the reaction mixture monitored using TLC. After completion of the reaction the mass was cooled to 25–30 °C. The product was filtered off and washed the solid with ACN (5.0 mL) to remove the impurities. The obtained product is in the form of potassium salt of compound **2**. The potassium salt is dissolved in water (50.0 mL) and the pH of the reaction mixture adjusted to 4–5 using 5% acetic acid to afford the title product **2** as crude material. The crude material is further suspended in ACN (25.0 mL) affords compound **2** as off white solid material.

Off white solid, yield 80%, mp: 205–210 °C, IR (KBr) (cm'1): 1698 (C=O), 3600 (OH), ^{1}H NMR (400 MHz, DMSO-d_6) : ð 2.61 (s, 3H, CH_3), 2.78–2.91 (m, 4H, 2 x CH), 3.60 (s, 2H, CH_2), 3.72 (s, 2H, CH_2), 6.78–8.12 (10H, ArH).^{13}C NMR (100 MHz, DMSO-d_6): ð 14.42, 25.36, 50.85, 53.12, 61.22, 122.44, 123.16, 125.22, 127.82, 129.16, 129.88, 129.98, 130.01, 130.82, 132.11, 133.32, 133.91, 138.05, 139.05, 141.16, 159.42, 162.14, 169.16. MS (m/z):447.1(M+1).

Synthesis of title compounds (9a–k)

2-[4'-(6,7-dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl-thiazole-5-carboxylic acid amide (9a)

Added DCM (10.0 mL), compound **2** (1.0 g, 0.002 moles) and HOBT (0.31 g, 0.002 moles) into the RBF under nitrogen atmosphere. Cooled the reaction mixture to -5 °C to 0 °C and added TEA (0.42 g, 0.004 moles) slowly into the reaction mixture at below -5 °C. Then $SOCl_2$ was added into the reaction mixture over a period of 30–40 minutes under nitrogen atmosphere at below -5 °C. After completion of addition, the temperature was raised slowly to 10–15 °C and maintained the reaction mixture at the same temperature for 2 h. Then water (5.0 mL) was added into the reaction mixture and stirred for 5 minutes and separated the organic layer (active ester layer). Charged the active ester layer into the RBF and aniline (0.23 g, 0.002 moles) was taken into DCM (10.0 mL) and added the solution slowly over a period of 30–40 minutes at 10–15 °C. After completion of the addition the temperature of the reaction mixture was raised to 25–30 °C and maintained for 10–12 h at the same temperature. Progress of the reaction was monitored by using TLC, after completion of the reaction water (10.0 mL) was added into the reaction mixture, stirred for 10–15 minutes. Separated the organic layer and the organic layer was washed with 10% K_2CO_3 solution (5 mL) followed by water (5 mL) washing. Organic layer was dried over anhydrous sodium sulfate and solvent was removed completely under reduced pressure. Co-distillation of the solvent with diisopropyl ether (2 x 10 mL) followed by isolation in diisopropyl ether (5 mL) affords the title compound **9a** quantitatively. Pale yellow solid, yield 60%. mp: 176–179 °C, IR (KBr) (cm^{-1}): 1718 (C=O), 3400 (NH_2), ^{1}H NMR (400 MHz, $CDCl_3$): ð 2.15 (s, 3H, CH_3), 2.78–2.83 (m, 4H, 2 x CH_2), 3.50 (s, 2H, CH_2), 3.73 (s, 2H, CH_2), 6.79–7.69 (10H, ArH). ^{13}C NMR (100 MHz, $CDCl_3$): ð 14.62, 25.63, 50.58, 53.14, 61.44, 122.33,122.95, 124.82, 127.28, 129.10, 129.38, 129.65, 130.00, 130.28, 132.01, 133.23, 133.19, 137.52, 138.75, 141.04, 159.24, 161.91, 168.76. MS (m/z): 446.9 (M+l).

All compounds were synthesized by using same experimental procedure described above and obtained in good yield. Therefore, all the following experiments were conducted in same conditions.

2-[4'-(6,7-dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl thiazole-5-carboxylic acid phenyl amide (9b)

Pale yellow solid, yield 75%, mp: 130–133 °C, IR (KBr) (cm^{-1}): 1680 (C=O), 3350 (NH) ^{1}H NMR (400 MHz, $CDC1_3$): ð 2.71 (s, 3H, CH_3), 2.83–2.91 (m, 4H, 2 x CH_2), 3.61 (s, 2H, CH_2), 3.74 (s, 2H, CH_2), 6.61–8.11 (16H, ArH). ^{13}C NMR (100 MHz, $CDC1_3$): ð 17.33, 25.42, 50.70, 53.09, 61.96, 120.31, 122.69, 124.85, 125.31, 127.40, 127.84, 129.11, 129.42, 129.79, 129.88, 130.02, 130.85, 131.75, 133.33, 133.70, 137.41, 138.28, 139.02, 141.26, 155.39, 160.04, 166.66. MS (m/z): 522.1 (M+l).

2-[4'-(6,7-dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl thiazole-5-carboxylic acid (2-chloro-phenyl)-amide (9c)

Pale yellow solid, yield 75%, mp: 259–261 °C, IR (KBr) (cm^{-1}): 1667 (C=O), 3453 (NH) ^{1}H NMR (400 MHz, $CDCl_3$): ð 2.72 (s, 3H, CH_3), 2.86–2.90 (m, 4H, 2 x CH_2), 3.59 (s, 2H, CH_2), 3.76 (s, 2H, CH_2), 6.60–8.05 (15H, ArH). ^{13}C NMR (100 MHz, $CHCl_3$): ð 17.25, 21.43, 49.18, 49.93, 58.40, 111.02, 111.17, 119.59, 122.92, 124.65, 124.99, 126.64, 126.79, 128.13, 128.58, 129.59, 129.93, 130.24, 130.34, 131.16, 131.59, 131.70, 140.05, 141.74, 155.89, 160.53, 166.20. MS (m/z): 555.9 (M+l).

2-[4'-(6,7-Dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl thiazole-5-carboxylic acid (3-chloro-phenyl)-amide (9d)

Off white solid ,yield 65%, mp: 220–223 °C, IR (KBr) (cm^{-1}): 1667 (C=O), 3453 (NH),^{1}H NMR (400 MHz, $CDC1_3$): ð 2.73 (s, 3H, CH_3), 2.85–2.91 (m, 2H, 2 x CH_2), 3.58 (s, 2H, CH_2), 3.75 (s, 2H, CH_2), 6.59–8.05 (15H, ArH).^{13}C NMR (100 MHz, $CDC1_3$): ð 17.83, 25.04, 50.57, 53.70, 62.11, 121.35, 122.77, 125.32, 126.19, 127.78, 129.11, 129.25, 129.81, 129.87, 130.01, 130.58, 131.56, 133.03, 133.06, 135.99, 138.91, 139.20, 141.42, 155.58, 160.20, 166.08. MS (m/z):555.9(M+l).

2-[4'-(6,7-Dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl thiazole-5-carboxylic acid (4-chloro-phenyl)-amide (9e)

Pale yellow solid, yield 62%, mp: 140–143 °C, IR (KBr) (cm^{-1}): 1638 (C=O), 3423 (NH),^{1}H NMR (400 MHz, $CDCl_3$): ð 2.72 (s, 3H, CH_3), 2.85–2.90 (m, 4H, 2 x CH_2), 3.58 (s, 2H, CH_2), 3.75 (s, 2H, CH_2), 6.59–8.05 (15H, ArH).^{13}C NMR (100 MHz, $CDC1_3$): ð 17.38, 25.40, 50.75, 53.07, 62.11, 121.53, 122.77, 125.23, 126.91, 127.87, 129.11, 129.52, 129.18, 129.78, 130.10, 130.85, 131.65, 133.30, 133.60, 135.99, 138.19, 139.02, 141.24, 155.85, 160.02,166.80. MS (m/z): 555.9 (M+l).

2-[4'-(6,7-Dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl thiazole-5-carboxylic acid (2,3-dichloro-phenyl)-amide (9f)

Cream colored solid, yield 50%, mp: 156–160 °C, IR (KBr) (cm^{-1}): 1643 (C=O), 3304 (NH),^{1}H NMR (400 MHz, $CDCl_3$): ð 2.78 (s, 3H, CH_3), 2.84–2.90 (s, 4H, 2 x CH_2), 3.58 (s, 2H, CH_2), 3.77 (s, 2H, CH_2), 6.67–8.37 (14H, ArH).^{13}C NMR (100 MHz, $CDCl_3$): ð 17.58, 25.53, 50.74, 53.12, 61.97, 119.20, 121.26, 122.58, 125.32, 125.43, 127.55, 127.87, 127.95, 129.34, 129.59, 129.93, 130.16, 130.84, 131.58, 132.81, 133.42, 133.88, 136.15, 138.68, 138.82, 141.45, 155.66, 159.75, 167.39. MS (m/z): 590 (M+l).

2-[4'-(6,7-Dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl thiazole-5-carboxylic acid (3,4-dichloro-phenyl)-amide (9g)

Cream colored solid, yield 60%, mp: 161–164 °C, IR (KBr) (cm^{-1}): 1643 (C=O), 3304 (NH), ^{1}H NMR (400 MHz, $CDC1_3$): ð 2.71 (s, 3H, CH_3) 2.84–2.90 (m, 4H, 2 x CH_2), 3.56 (s, 2H, CH_2), 3.74 (s, 2H, CH_2), 6.62–8.04 (14H, ArH).^{13}C NMR (400 MHz, $CDC1_3$): 17.43, 25.47, 50.79, 53.09, 62.03, 119.40, 121.90, 122.76, 125.20, 126.53, 127.88, 128.01, 129.49, 129.79, 129.85, 130.17, 130.55, 130.89, 131.56, 132.91, 133.31, 133.67, 136.89, 138.37, 138.92, 141.28, 156.22, 160.00, 167.01. MS (m/z): 590.0 (M+l).

2-[4'-(6,7-Dihydro-4H-thieno[3,2-c]pyridin-5-yImethyl)-biphenyI-2-yl]-4-methyl thiazole-5-carboxylic acid (2-fluoro-phenyl)-amide (9h)

Off white colored solid, yield 65% , mp: 118–121 °C, IR (KBr) (cm^{-1}): 1656 (C=O), 3451 (NH), ^{1}H NMR (400 MHz, $CDC1_3$): ð 2.78 (s, 3H, CH_3), 2.87–2.90 (m, 4H, 2 x CH_2), 3.61 (s, 2H, CH_2), 3.80 (s, 2H, CH_2), 6.70–8.34 (15H, ArH).^{13}C NMR (400 MHz, $CDC1_3$): ð 17.39, 25.47, 50.66, 53.10, 62.92, 114.75, 114.94, 121.69, 122.57, 124.70, 124.74, 125.35, 126.09, 126.19, 127.63, 127.84, 129.35, 129.68, 129.88, 130.07, 130.82, 131.69, 133.41, 133.86, 138.55, 138.87, 141.38, 151.24, 153.66, 155.25, 159.77, 167.19. MS (m/z): 540.0 (M+l).

2-[4'-(6,7-Dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl thiazole-5-carboxylic acid (4-fluoro-phenyl)-amide (9i)

Off white solid, yield 70%, mp: 146–149 °C, IR (KBr) (cm^{-1}): 1653 (C=O), 3423 (NH),^{1}H NMR (400 MHz, $CDCl_3$): ð 2.72 (s, 3H, CH_3), 2.85–2.91 (m, 4H, 2 x CH_2), 3.58 (s, 2H, CH),

3.75 (s, 2H, CH_2), 6.64–8.05 (15H, ArH).^{13}C NMR (100 MHz, $CDC1_3$): ð 17.35, 25.47, 50.73, 53.12, 62.02, 115.68, 115.90, 122.22, 122.30, 122.69, 125.25, 126.95, 127.85, 129.44, 129.80, 129.86, 130.06, 130.87, 131.69, 133.34, 133.73, 138.34, 138.98, 141.25, 155.69, 158.47, 160.06, 160.90, 166.70. MS (m/z): 540.1 (M+l).

2-[4'-(6,7-Dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl)-4-methyl thiazole-5-carboxylic acid (2,5-difluoro-phenyl)-amide (9j)

Off white colored solid, yield 72%, mp :163–166 °C, IR (KBr) (cm^{-1}): 1659 (C=O), 3449 (NH), ^{1}H NMR (400 MHz, $CDC1_3$): ð 2.75 (s, 3H, CH_3), 3.05–3.21 (m, 4H, 2 x CH_2), 3.82 (s, 2H, CH_2), 4.00 (s, 2H, CH_2), 6.73–8.07 (14H, ArH).^{13}C NMR (100 MHz, $CDC1_3$): ð 17.48, 29.69, 50.07, 53.12, 62.02, 108.84, 109.14, 110.45, 110.53, 110.70, 110.78, 115.12, 115.22, 115.34, 115.44, 125.20, 126.95, 128.08, 129.70, 130.21, 130.29, 130.66, 131.63, 140.94, 155.08, 159.69, 167.38. MS (m/z): 558.0 (M+l).

2-[4'-(6,7-Dihydro-4H-thieno[3,2-c]pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl-thiazole-5-carboxyIic acid (2,3,4-trifluoro-phenyl)-amide (9k)

Off white colored solid, yield 80% , mp: 128–131 ° C, IR (KBr) (cm^{-1}): 1654 (C=O), 3421 (NH),^{1}H NMR (400 MHz, $CDC1_3$): ð 2.77 (s, 3H, CH_3), 2.83–2.90 (m, 4H, CH_2), 3.56 (s, 2H, CH_2), 3.75 (s, 2H, CH_2), 6.66–8.08 (13H, ArH).^{13}C NMR(100 MHz, $CDC1_3$): ð 17.55, 25.53, 50.72, 53.14, 62.01, 121.30, 122.55, 122.64, 124.84, 125.36, 127.84, 127.88, 127.93, 129.04, 129.33, 129.59, 129.91, 130.07, 130.82, 131.69, 133.43, 133.92, 134.51, 138.65, 138.85, 141.43, 155.22, 159.73, 167.24. MS (m/z): 575.9 (M+l).

Conclusion

We have successfully synthesized of eleven new thiazole-5-carboxylic acid amide derivatives **(9a–k)** via 2-[4'-(6, 7-dihydro-4H-thieno [3, 2-c] pyridin-5-ylmethyl)-biphenyl-2-yl]-4-methyl-thiazole-5-carboxylic acid (**2**) in good yields. The structures of all the compounds were confirmed by their spectral data. All the newly synthesized compounds were screened for their MIC and zone of inhibition against two strains of bacteria. Amongst the compounds screened, most of the compounds have shown moderate to good antibacterial and antifungal properties whereas some compounds have shown promising antifungal properties, which were further used to determine MBC and MFC against some selected strains of bacteria and fungi.

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