Available online at www.joac.info

ISSN: 2278-1862

Journal of Applicable Chemistry

2013, 2 (6):1516-1522

(International Peer Reviewed Journal)

Synthesis and Antibacterial Activity of 2,3-dihydro-1H-benzo[f]chromen-1-one and 2,3-dihydro-1H-benzo[f]chromen-1-ol Derivatives

N. Rambabu *[1,2,3], P. K. Dubey [1], B. Ram [3] and B. Balram [3]

1. Department of Chenistry, Jawaharlal Nehru Technological University, Hyderabad-500 072, **INDIA**
2. Syngene International Ltd, Biocon Park, Plot No. 2 & 3, Bommasandra IV Phase, Banglore-560099, **INDIA**
3. Green Evolution Laboratories, Wangapally Village, Nalgonda, 500085, AP, **INDIA**

Email: rambabun2013@gmail.com

Received on 31st October and finalized on 04th November 2013

ABSTRACT

*New 2,3-dihydro-1H-benzo[f]chromen-1-one and 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives (**7-14**) were prepared from commercially available 2-Hydroxy-acetonaphthone. These compounds were screened for their antibacterial activity against Escherichia coli (MTCC-443), Staphylococcus aureus (MTCC-96), Pseudomonas aeruginosa (MTCC-424) and Streptococcus pyogenes (MTCC-442) bacterial strains by agar well disc diffusion method. It is observed that among the 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives, compounds **13** and **14** (bearing R_3 = pyrrolidine and morpholine) exhibited excellent activity (zone of inhibition: >20 mm) while the compounds **11** and **12** (bearing R_3 = ethyl and propyl) displayed good activity (zone of inhibition: 16-18 mm).*

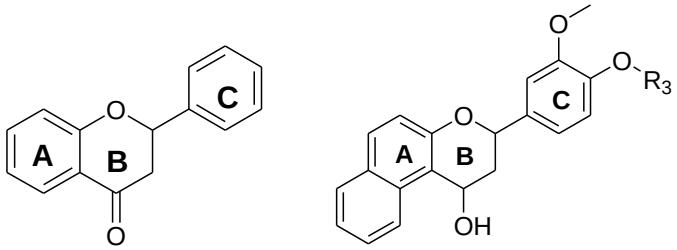
Keywords: 2,3-dihydro-1H-benzo[f]chromen-1-ol, Aldehydes, Antibacterial activity, Synthesis, *E.coli*, Ampicillin.

INTRODUCTION

The increased use of antimicrobial agents available in the market has resulted in the development of resistance to the commonly used drugs with important implications for morbidity, mortality [1-2] and health care costs. Among the resistant strains, an infection caused by Methicillin resistance Staphylococcus aureus (MRSA) and drug resistant enterococci is difficult to treat and as of now vancomycin is the last defense against these infections [3-6]. In spite of a large number of antibiotics and chemotherapeutics available for medical use, the antimicrobial resistance has created a substantial need for design of new class of antimicrobials.

Flavonoids are polyphenolic compounds that occur ubiquitously in foods of plant origin. Most of the flavonoids are very potent antioxidants because they can chelate metal ions, scavenge oxygen free radicals and prevent the oxidation of low density lipoprotein (LDL) [7]. Flavonoids are phenolic secondary metabolites that are widely distributed throughout the plant kingdom. The average Western diet includes up to 2 g of flavonoids per day, and they have been identified as antitumor agents, antioxidants, and free radical scavengers [8]. Flavonoids, are recognized class of compounds known to exhibit diverse

pharmacological properties, such as anticancer, antioxidant, anti-aging and antibacterial effect [9-11], vasorelaxant agents [12], antifungal activity [13] and aromatase inhibitor [14]. In the present paper, structural modifications on the **A, B** and **C** ring of flavanone **1**, leading to compounds **7-14**, respectively, were undertaken (**Fig. 1**). We report here in the synthesis, spectroscopic identification and antibacterial activity of 2,3-dihydro-1H-benzo[f]chromen-1-one and 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives (**7-14, Scheme 2**) derived from commercially available 2-Hydroxy-acetonaphthone. The synthesized compounds were screened for their antibacterial activity against *Escherichia coli* (MTCC443), *Pseudomonas aeruginosa* (MTCC424), *Staphylococcus aureus* (MTCC96) and *Streptococcus pyogenes* (MTCC442), using Ampicillin, as the standard drug.

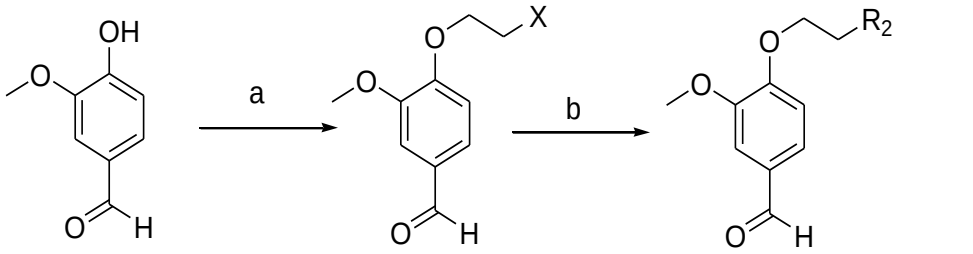


1 **7 - 14**

Fig 1 Structure of 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives

MATERIALS AND METHODS

Chemical and solvents used were purchased either from Fluka or Merck. All the reagents were of analytical grade. Thin-layer chromatography (TLC) was performed on E.Merck AL silica gel 60 F254 plates and visualized under UV light. The IR spectra were recorded on a Perkin Elmer FT-IR spectrometer. The ^{1}H NMR spectra were recorded in $CDCl_3$ on a Varian EM-360 spectrometer (400MHz). The ^{13}C NMR spectra recorded in $CDCl_3$ on a Varian EM-360 spectrometer operating at 100MHz. All the chemical shifts were reported in δ (ppm) using TMS as an internal standard. The mass spectra were recorded on Agilent ion trap MS. All the reactions were carried out under argon atmosphere.

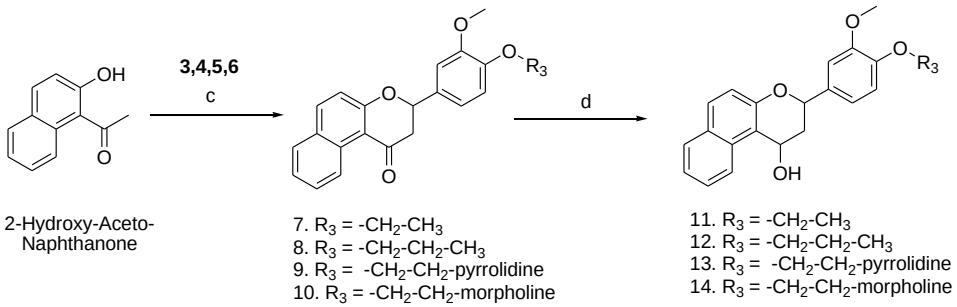


1

2. X = Br
3. X = H
4. X = CH_3

5. R_2 = -pyrrolidine
6. R_2 = -morphorline

Scheme-1: Reagents and Conditions**:** a) alkyl bromides [Br-$(CH_2)_2$-Br, C_2H_5-Br, C_3H_7-Br], K_2CO_3, DMF, 80 ^{o}C, 2h; b) Compound **2**, 2^{o} amines (pyrrolidine and morpholine), K_2CO_3, acetonitrile, 85 ^{o}C, 2.5h



2-Hydroxy-Aceto-Naphthanone

7. R_3 = -CH_2-CH_3
8. R_3 = -CH_2-CH_2-CH_3
9. R_3 = -CH_2-CH_2-pyrrolidine
10. R_3 = -CH_2-CH_2-morpholine

11. R_3 = -CH_2-CH_3
12. R_3 = -CH_2-CH_2-CH_3
13. R_3 = -CH_2-CH_2-pyrrolidine
14. R_3 = -CH_2-CH_2-morpholine

Scheme 2: Reagents and Conditions**:** c) 60% KOH (w/v), Ethanol, rt, 24h; d) $NaBH_4$, Methanol, 6 ^oC, 2 h.

General Procedure For The Preparation of 2,3-dihydro-1H-benzo[f]chromen-1-one derivatives (7-10) : To a ethanol solution containing 2-Hydroxy-acetonaphthone (200 mg, 0.538 mmol) was added appropriate aldehydes (**3-6**, 0.538 mmol) followed by aqueous; 60% KOH (w/v) (0.5 mL). The contents were stirred at room temperature for 24h under nitrogen atmosphere. The reaction mixture was poured into water, cooled to 10-15 ^oC and acidified to pH = 1-2 and extracted with ethyl acetate. The organic layer was washed with brine solution, dried over anhydrous sodium sulphate, filtered and concentrated under reduced pressure, to obtain the crude compounds. The crude compounds were purified by column chromatography using silica gel (100-200 mesh). Yields of the products varied between 50 and 83%.

3-(4-ethoxy-3-methoxyphenyl)-2,3-dihydro-1H-benzo[f]chromen-1-one (7): Yellow oily liquid; Yield: 140 mg, 75%; ^1H NMR (400 MHz, $CDCl_3$): ð 1.35 (t, 3H, *J* = 6.8 Hz), 2.85 (dd, 1H, *J* = 2.0, 16.0 Hz), 3.45 (t, 1H, *J* = 16 Hz), 3.80 (s, 3H), 4.05 (q, 2H, *J* = 6.6 Hz), 5.70 (dd, 1H, *J* = 2.0, 16.0 Hz), 6.95 (d, 1H, *J* = 16.0 Hz), 7.05 (d, 1H, *J* = 8.0 Hz), 7.20 (s, 1H), 7.25 (d, 1H, *J* = 16.0 Hz), 7.45 (t, 1H, *J* = 20.0 Hz), 7.65 (t, 1H, *J* = 20.0 Hz), 7.90 (d, 1H, *J* = 8.0 Hz), 8.15 (d, 1H, *J* = 16.0 Hz), 9.38 (d, 1H, *J* = 8.0 Hz); ^{13}C NMR (100 MHz, $CDCl_3$): δ 14.61, 56.21, 42.18, 64.86, 82.77, 109.03, 111.38, 112.66, 117.74, 118.84, 124.48, 125.03, 128.26, 128.73, 129.53, 129.74, 131.18, 134.62, 149.53, 150.13, 155.71, 196.73; EI MS: m/z (rel.abund.%) 349.0 (M^+, 100).

2,3-dihydro-3-(3-methoxy-4-propoxyphenyl)benzo[f]chromen-1-one (8): Yellow viscous liquid; Yield: 151 mg, 78%; ^1H NMR (400 MHz, $CDCl_3$): ð 1.00 (t, 3H, *J* = 6.8 Hz), 1.75 (q, 2H, *J* = 6.8 Hz), 2.85 (dd, 1H, *J* = 2.0, 16.0 Hz), 3.45 (t, 1H, *J* = 16 Hz), 3.80 (s, 3H), 3.95 (t, 2H, *J* = 6.6 Hz), 5.70 (dd, 1H, *J* = 2.0, 16.0 Hz), 6.95 (d, 1H, *J* = 16.0 Hz), 7.05 (d, 1H, *J* = 8.0 Hz), 7.20 (s, 1H), 7.25 (d, 1H, *J* = 16.0 Hz), 7.45 (t, 1H, *J* = 20.0 Hz), 7.65 (t, 1H, *J* = 20.0 Hz), 7.90 (d, 1H, *J* = 8.0 Hz), 8.15 (d, 1H, *J* = 16.0 Hz), 9.38 (d, 1H, *J* = 8.0 Hz); ^{13}C NMR (100 MHz, $CDCl_3$): δ10.37, 22.06, 42.18, 56.03, 70.54, 82.86, 109.03, 112.68, 114.32, 117.76, 118.83, 124.47, 125.06, 128.33, 128.73, 129.58, 129.68, 131.16, 134.74, 149.53, 150.08, 155.86, 196.69. EI MS: m/z (rel.abund.%) 363.0 (M^+, 100).

3-(4-(2-(pyrrolidin-1-yl)ethoxy)-3-methoxyphenyl)-2,3-dihydrobenzo[f]chromen-1-one (9): Brown liquid; Yield: 165 mg, 74%; ^1H NMR (400 MHz, $CDCl_3$): ð 1.98-2.02 (m, 4H), 2.78 (dd, 1H, *J* = 2.0, 8.6 Hz), 3.25 (t, 2H, *J* = 6.8 Hz), 3.48 (dd, 1H, *J* = 2.0, 8.6 Hz), 3.64-3.68 (m, 4H), 3.84 (s,3H), 4.66 (t, 2H, *J* = 6.8 Hz), 5.75 (dd, 1H, *J* = 2.0, 8.6 Hz), 7.15 (d, 2H, *J* = 7.8 Hz), 7.30 (d, 2H, *J* = 7.8 Hz), 7.50 (t, 1H, *J* = 12.0 Hz), 7.72 (t, 1H, *J* = 12.0 Hz), 7.95 (d, 1H, *J* = 8.0 Hz), 8.20 (d, 1H, *J* = 8.0 Hz), 9.38 (d, 1H, *J* = 8.0 Hz); ^{13}C NMR (100 MHz, $CDCl_3$): δ 23.58 (2C), 42.16, 56.08, 56.46 (2C),56.83, 66.84, 82.46, 108.88, 111.33, 112.66, 117.76, 118.88, 124.48, 125.09, 128.28, 128.77, 129.53, 129,78, 131.22,134.68, 149.53, 150.18, 155.73, 196.24; EI MS: m/z (rel.abund.%) 418.0 (M^+, 100).

3-(4-(2-morpholinoethoxy)-3-methoxyphenyl)-2,3-dihydrobenzo[f]chromen-1-one (10): Yellow liquid; Yield: 134 mg, 58%; ^1H NMR (400 MHz, $CDCl_3$): ð 2.60-2.64 (m, 4H), 2.85 (t, 2H, *J* = 7.2 Hz), 3.05 (dd,

1H, *J* = 2.0, 8.8 Hz), 3.32 (dd, 1H, *J* = 2.0, 8.8 Hz), 3.78-3.82 (m, 4H), 3.98 (s,3H), 4.20 (t, 2H, *J* = 7.2 Hz), 5.58 (dd, 1H, *J* = 2.0, 8.6 Hz), 6.95 (d, 1H, *J* = 16.0 Hz), 7.05 (d, 1H, *J* = 8.0 Hz), 7.10 (s, 1H), 7.20 (d, 1H, *J* = 16.0 Hz), 7.45 (t, 1H, *J* = 20.0 Hz), 7.65 (t, 1H, *J* = 20.0 Hz), 7.76 (d, 1H, *J* = 8.0 Hz), 7.98 (d, 1H, *J* = 16.0 Hz), 9.50 (d, 1H, *J* = 8.0 Hz); ^{13}C NMR (100 MHz, $CDCl_3$): δ 42.18, 56.13, 56.23 (2C), 57.13, 66.69 (2C), 67.08, 82.78, 109.04, 111.36, 112.66, 117.78, 118.86, 124.53, 125.06, 128.32, 128.77, 129.58, 129.66, 131.22, 134.73, 149.55, 150.11, 155.84, 196.76. EI MS: m/z (rel.abund.%) 434.26 (M^+, 100).

General Procedure For The Preparation of 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives (11-14) : To a solution of compounds **11-14** (200mg, 0.55mmol) in methanol was added sodium borohydride (0.72 mmol) at 6 ^oC and stirred for 1h. After completion of the reaction, the reaction mixture was poured into water and extracted with ethyl acetate. The organic layer was washed with water followed by brine solution, dried over anhydrous sodium sulphate, filtered and concentrated under reduced pressure, to obtain the crude compounds. The crude compounds were purified by column chromatography using silica gel (100-200 mesh). Yields of the products varied between 76 and 88%.

3-(4-ethoxy-3-methoxyphenyl)-2,3-dihydro-1H-benzo[f]chromen-1-ol (11): Pale Yellow liquid; Yield: 88%; ^{1}H NMR (400 MHz, $CDCl_3$): ð 1.33 (t, 3H, *J* = 7.6 Hz), 2.25 (ddd, 1H, *J* = 9.6, 12.2, 13.2 Hz), 2.62 (ddd, 1H, *J* = 1.6, 6.0, 13.2 Hz), 3.79 (s, 3H), 4.02 (q, 2H, *J* = 7.6 Hz), 5.05 (d, 1H, *J* = 11.2 Hz), 5.27 (d, 1H, *J* = 8.0 Hz), 5.45 (q, 1H, *J* = 8.0 Hz), 6.98-7.12 (m, 4H), 7.35 (t, 1H, *J* = 7.2 Hz), 7.47 (t, 1H, *J* = 7.2 Hz), 7.74 (d, 1H, *J* = 8.8 Hz), 7.80 (d, 1H, *J* = 8.2 Hz), 8.32 (d, 1H, *J* = 8.4 Hz); ^{13}C NMR (100 MHz, $CDCl_3$): 14.76, 38.38, 56.13, 62.07, 64.91, 77.42, 110.00, 112.57, 112.89, 117.18, 119.84, 123.72, 123.96, 126.98, 128.55,129.39, 129.87, 130.81, 131.18, 147.93, 150.03, 151.81; EI MS: m/z (rel.abund.%) 333.0 ($(M-18)^+$, 100).

2,3-dihydro-3-(3-methoxy-4-propoxyphenyl)-1H-benzo[f]chromen-1-ol (12): Yellow liquid; Yield: 85%; ^{1}H NMR (400 MHz, $CDCl_3$): ð 1.00 (t, 3H, *J* = 7.6 Hz), 1.74 (q, 2H, *J* = 7.2 Hz), 2.25 (ddd, 1H, *J* = 9.6, 12.2, 13.2 Hz), 2.62 (ddd, 1H, *J* = 1.6, 6.0, 13.2 Hz), 3.80 (s, 3H), 3.94 (t, 2H, *J* = 7.6 Hz), 5.05 (d, 1H, *J* = 11.2 Hz), 5.28 (d, 1H, *J* = 8.0 Hz), 5.45 (q, 1H, *J* = 8.0 Hz), 6.98-7.08 (m, 4H), 7.33 (t, 1H, *J* = 7.2 Hz), 7.45 (t, 1H, *J* = 7.2 Hz), 7.75 (d, 1H, *J* = 8.8 Hz), 7.80 (d, 1H, *J* = 8.2 Hz), 8.32 (d, 1H, *J* = 8.4 Hz); ^{13}C NMR (100 MHz, $CDCl_3$): 10.41, 22.63, 38.46, 56.22, 62.08, 70.63, 77.41, 110.10, 112.47, 112.88, 117.18, 119.93, 123.88, 123.93, 126.91, 128.57, 129.41, 129.96, 130.91, 131.18, 147.94, 150.12, 151.92; EI MS: m/z (rel.abund.%) 347.1 $(M-18)^+$, 100).

3-(4-(2-(pyrrolidin-1-yl)ethoxy)-3-methoxyphenyl)-2,3-dihydro-1H-benzo[f]chromen-1-ol (13): Brown viscous liquid; ^{1}H NMR (400 MHz, $CDCl_3$): ð 1.80 (m, 4H), 2.68-2.52 (m, 5 H), 2.72 (m, 1H), 2.85 (t, 2H, *J* = 7.2 Hz), 3.84 (s, 3H), 4.15 (t, 2H, *J* = 7.2 Hz), 5.28 (d, 1H, *J* = 11.2 Hz), 5.48 (d, 2H, *J* = 8.0 Hz), 6.88 (d, *J* = 16.0 Hz, 1H), 7.01-6.94 (m, 2H), 7.16 (d, *J* = 16.0 Hz, 1H), 7.38 (t, *J* = 8.0 Hz, 1H), 7.52 (t, *J* = 8.0 Hz, 1H), 7.78-7.58 (m, 2H), 8.20 (d, *J* = 10.2 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$): 25.9 (2C), 38.5, 54.4, 56.2, 58.2 (2C), 63.2, 67.2, 73.3, 112.8, 113.0, 115.5, 118.9, 121.1, 122.6, 123.8, 126.9, 128.5, 129.9, 129.4, 131.2, 132.1, 143.9, 150.0, 151.2; EI MS: m/z (rel.abund.%) 420.27 (M^+, 100)$^+$, 100).

3-(4-(2-morpholinoethoxy)-3-methoxyphenyl)-2,3-dihydro-1H-benzo[f]chromen-1-ol (14): Yellow viscous liquid; ^{1}H-NMR (400 MHz, $CDCl_3$): ð 2.37 (m, 4H), 2.38-2.63 (m, 2 H), 2.85 (t, 2H, *J* = 7.2 Hz), 3.84 (s, 3H), 4.15 (t, 2H, *J* = 7.2 Hz), 5.28 (d, 1H, *J* = 11.2 Hz), 5.48 (d, 1H, *J* = 8.0 Hz); 6.88 (d, *J* = 16.0 Hz, 1H), 7.01-6.94 (m, 2H), 7.16 (d, *J* = 16.0 Hz, 1H), 7.38 (t, *J* = 8.0 Hz, 1H), 7.52 (t, *J* = 8.0 Hz, 1H), 7.78-7.58 (m, 2H), 8.20 (d, *J* = 10.2 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$): 25.9 (2C), 38.5, 54.4, 56.2, 58.2 (2C), 63.2, 67.2, 73.3, 112.8, 113.0, 115.5, 118.9, 121.1, 122.6, 123.8, 126.9, 128.5, 129.9, 129.4, 131.2, 132.1, 143.9, 150.0, 151.2; EI MS: m/z (rel.abund.%) 420.27 (M^+, 100)$^+$, 100).

Antibacterial Bioassay: 2,3-dihydro-1H-benzo[f]chromen-1-one and 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives (**7 – 14**) were dissolved in dimethyl sulphoxide at 250 µg/mL concentration. The composition of nutrient agar medium was Bactotryptone (10 g), yeast extract (5 g), NaCl (10 g), final pH 7.4. After 18 h the exponentially growing cultures of the six bacteria in nutrient broth at 37 ^{o}C were diluted in sterile broth. From each of these diluted cultures, 1mL was added to 100 mL sterilized and cooled nutrient agar media to give a final bacterial count of 1 x 10^6 cell/ml. The plates were set at room temperature and later dried at 37 ^{o}C for 20h. Paper discs (6mm, punched from whatmann no 41 paper) were ultraviolet sterilized and used for the assays. Discs were soaked in different concentration of the test solution and placed on the inoculated agar media at regular intervals of 6-7 cm, care was taken to ensure that excess solution was not on the discs. All the samples were taken in triplicates. The plates were incubated at 37 ^{o}C in an inverted fashion. Activity was determined by zones showing complete inhibition (mm). Growth inhibition was calculated with reference to positive control.

RESULTS AND DISCUSSION

Substituted-aldehydes **2-4** were prepared by treating vanillin with the requisite alkyl bromide such as 1,2-bromo ethane, ethyl bromide, propyl bromide following the literature procedure [15-17] in dimethyl formamide in the presence of anhydrous potassium carbonate at 80 ^{o}C for 2 h. Aldehydes **2** was further reacted with secondary amines such as pyrrolidine and morpholine respectively in refluxing acetonitrile in the presence of anhydrous potassium carbonate at 85 ^{o}C for 2.5 h afforded aldehydes **5** and **6** [16]. The synthetic scheme for the preparation of aldehydes **2-6** is depicted in **Scheme 1**. The completion of the reaction was monitored by thin layer chromatography. The oily residues obtained after processing the reaction mixture were used as such for further reaction. Treatment of these substituted aldehydes **3- 6** with commercially available 2-Hydroxy-acetonaphthone in the presence of 60% KOH (w/v) in ethanol at room temperature for 24 h resulted in the formation of corresponding 2,3-dihydro-1H-benzo[f]chromen-1-one derivatives **7-10**. Subsequent reduction of these chromene-1-ones **7-10**, was carried out at low temperature (6 ^{o}C) using $NaBH_4$ in methanol, resulted in 1,3-cis-2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives **11-14.** This reaction, was stereoselective since it led only to 1,3-cis-2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives, the assignment of stereochemistry is in agreement with the previously reported literature precedent [18-20]. The synthetic scheme for the preparation of 2,3-dihydro-1H-benzo[f]chromen-1-one and 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives **7-14** is depicted in **Scheme 2**.

The newly prepared 2,3-dihydro-1H-benzo[f]chromen-1-one and 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives **7-14** were screened for their antibacterial activity against the following bacterial strains viz., *Escherichia coli* (MTCC-443), *Staphylococcus aureus* (MTCC-96), *Pseudomonas aeruginosa* (MTCC-424) and *Streptococcus pyogenes* (MTCC-442) by agar well disc diffusion method [21]. The anti-bacterial activity of the analogues (250 µg/mL concentration) was compared with standard drug Ampicillin and the zones of inhibition values are given in **table 1**. Inhibition zones were measured and compared with the controls. The antimicrobial screening data revealed that compounds 7-**14** showed good to excellent inhibitions towards all the tested bacterial strains. It is observed that among the 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives, compounds **13** and **14** (bearing R_3 = pyrrolidine and morpholine) exhibited excellent activity (zone of inhibition: >20 mm) while the compounds **11** and **12** (bearing R_3 = ethyl and propyl) displayed good activity (zone of inhibition: 16-18 mm). Moreover, among the 2,3-dihydro-1H-benzo[f]chromen-1-one derivatives, compounds **9** and **10** showed equipotent activity (zone of inhibition: 18 – 20 mm) where as compounds **7** and **8** displayed good activity (zone of inhibition: 17-18 mm) when compared to the standard drug Ampicillin.

These data indicate that the antibacterial activity is enhanced with the presence of the pyrrolidine and morpholine in the structure (2,3-dihydro-1H-benzo[f]chromen-1-one and 2,3-dihydro-1H-benzo[f]chromen-1-ol scaffold). Therefore it can be concluded that the basic moiety can be a potential scaffold for antibacterial drugs. Thus further SAR studied is required to get wide spectrum of activity

Table-1 Results of Antibacterial Bioassay of Compounds **7-14** (Concentration Used 250 µg/mL of DMSO). *Zones of Inhibition of Compounds* **7-14** *in mm*

Compound No.	*Gram negative*		*Gram positive*	
	E.Coli MTCC 443	***P.aeruginosa MTCC 424***	***S.Aureus MTCC 96***	***S.Pyogenes MTCC 442***
7	18	18	17	18
8	17	18	17	18
9	20	20	18	19
10	20	20	18	19
11	18	17	16	17
12	17	17	16	17
13	22	21	20	21
14	23	22	21	21
Standard Drug Ampicillin (Conc. 250 µg mL^{-1})	20	20	18	19

APPLICATIONS

In the present study, the synthesized eight n*ew* 2,3-dihydro-1H-benzo[f]chromen-1-one and 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives (**7-14**) were screened for their antibacterial activity and it was observed that some of the compounds showed potent antibacterial activity. Thus, it may be considered as a promising lead for further design and development of new antimicrobial agents.

CONCLUSIONS

The newly prepared 2,3-dihydro-1H-benzo[f]chromen-1-one and 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives **7-14** were screened for their antibacterial activity against Gram positive and Gram negative bacterial strains with standard drug ampicillin. It is observed that among the 2,3-dihydro-1H-benzo[f]chromen-1-ol derivatives, compounds **13** and **14** (bearing R_3 = pyrrolidine and morpholine) exhibited excellent activity (zone of inhibition: >20 mm) while the compounds **11** and **12** (bearing R_3 = ethyl and propyl) displayed good activity (zone of inhibition: 16-18 mm). Based on the test results, it indicates that the antibacterial activity is enhanced with the introduction of morpholine and pyrrolidine moiety in the structure. Therefore it can be concluded that the basic moiety can be a potential scaffold for antibacterial drugs. Thus further SAR studied is required to get wide spectrum of activity.

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