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Research Article

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Microwave assisted synthesis and antibacterial studies of (E)-3-(2-Morpholinoquinolin-3-yl)-1-aryl prop-2-en-1-ones

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ABSTRACT

*Interest in the chemistry of quinolines and morpholines is unabated. Quinoline, morpholine and chalcone derivatives exhibit extensive biological and pharmacological activities. Therefore some novel morpholine ring containing quinolinolyl chalcones were synthesized from 2-morpholinoquinoline-3-carbaldehyde **(2)** and aryl methyl ketones **(3a-j)** to produce (E)-3-(2-morpholinoquinolin-3-yl)-1-aryl prop-2-en-1-ones **(4a-j)** by conventional and non-conventional methods. The newly synthesized compounds were characterized using Mass Spectrometry, IR, ^{1}H-NMR, ^{13}C-NMR, and Elemental analysis. These compounds were evaluated for their antibacterial activity against gram positive and gram negative strains using a micro dilution procedure. Synthesized compounds showed activity against a panel of microorganisms.*

Keywords: Quinoline, Morpholine, Chalcone, Antibacterial activity, Microwave irradiation.

INTRODUCTION

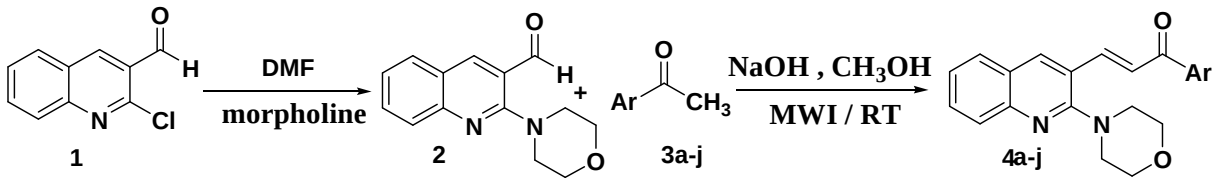
In continuation of our work on synthesis, characterization and activity of heterocyclic compounds [1-3] the present work reports that Quinoline derivatives exhibit extensively biological and pharmacological activities [4]. Plant source Quinoline derivatives have been shown to exhibit a variety of biological properties including antibacterial [5], antifungal [6], antiviral [7], anti-protozoal [8] and anti-platelet aggregation [9] activities. Also these compounds are found to be key intermediates in the synthesis of several furo quinoline and pyranoquinoline type heterocycles [10,11,12]. Morpholine derivatives have been reported to possess antimicrobial [13], potent caspase-3 inhibitory [14] activities. Moreover morpholine is a substitution in many heterocyclic moieties has been reported to possess anti-inflammatory [15]. Quinoline-2-one based chalcones privileged structures that have a wide range of biological properties such as anti-tumor activity [16] and antiprotozoal [17]. Thus considerable efforts have been devoted to synthesize some quinolinyl chalcones with morpholine ring system.

In recent years, there is an increasing interest in the use of microwave-induced rate acceleration technology [18,19,20] in organic synthesis in view of the mild, clean, convenient, greater selectivity, easier workup, spontaneity of the reaction process in comparison to the conventional solution phase reactions and the associated ease of manipulation. It is of note that this technique offers an environmentally friendly process of organic synthesis [21, 22].

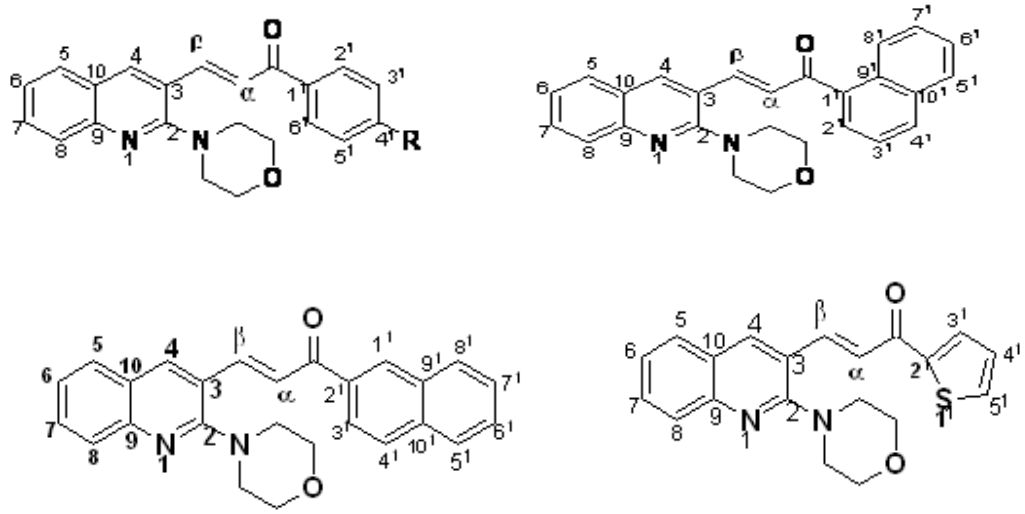
EXPERIMENTAL SECTION

Melting points (mp) were determined using Boetieus micro heating table and are uncorrected. IR (KBr, cm^{-1}) spectra were obtained on Perkin- Elmer FT-IR spectrum BX. ^{1}H NMR spectra were recorded on Bruker AMX-400 (400 MHz) spectrometer using TMS as an internal reference (Chemical shifts in δ, ppm). Elemental analyses were performed on Perkin Elmer CHN-analyzer. Mass spectra were recorded on Quatro Lc micromas (Waters Manchester.UK). (70 eV) mass spectrometer. For microwave irradiation a L.G. (M-2349E, 2450 MHz) domestic microwave oven was used. We performed disc diffusion method to identify the antimicrobial activity on gram positive bacteria *viz. staphylococcus aureus* and gram negative bacteria *viz. Escherichia coli* for which disc whatmann filter paper discs were used.

SCHEME



Ar = a) Phenyl, b) 4-Methyl phenyl, c) 4-Methoxy phenyl, d) 4-Nitro phenyl,
e) 4-Chloro phenyl, f) 4-Bromo phenyl, g) 4-Hydroxy phenyl, h) 1-Naphthyl,
i) 2-naphthyl, j) Thiophenyl.



R = -H, -CH3, -OCH3, -NO2, -Cl, -Br, -OH

The starting material compound 2-chloroquinoline-3-carbaldehyde **(1)** was synthesized by using the Vilsmeier-Haack reagent. Condensation of (**1)** with morpholine in DMF yielded a pure compound (**2**) in high yield. In the ^{1}H-NMR spectra of the compound **(2)** showed the protons of aliphatic system absorbed as two triplets around δ 3.4 ppm for -N-CH_2- and δ 3.8 ppm for -O-CH_2- confirming the structure to be 2-morpholinoquinoline-3-carbaldehyde (**2**). The condensation of 2-morpholinoquinoline-3-carbaldehyde **(2)** with Acetophenone (**3a**) in the presence of alkali yielded a pure compound (**4a**) (TLC single spot). The mass spectrum (fig-1) of the compound **(4a)** showed molecular ion peak at *m/z* 345. The IR (KBr) spectrum (fig-2) of compound **(4a)** showed a significant band at 1659.10 cm^{-1} (carbonyl group). The ^{1}H NMR ($CDCl_3$) (fig-3) of compound **(4a)** represented two triplets at δ 3.41 and δ 3.92 for N-CH_2 and O-CH_2 of morpholine ring protons respectively. One triplet is observed at δ 7.39-7.43 (6-H) and another triplet is appeared at δ 7.52-7.57 of 3^1,5^1 protons of the phenyl ring, two doublets at δ 7.75-7.77 for Hα proton and 7.86-7.88 for H_β proton. One doublet appeared at δ 8.01-8.05 (5-H), and another doublet appeared at δ 8.06-8.08 for 2^1,6^1 protons of phenyl ring. A single peak at δ 8.29 (4-H) of quinoline ring proton. On the basis of

^{13}C NMR ($CDCl_3$) (fig-4) spectra the following signal were assigned to the compound **(4a).** Two aliphatic signals and δ 51.93(N-CH_2), δ 66.93(O-CH_2) indicates two morpholine ring carbons and 122.74(C-3), 123.07(C-10), 124.83(C-6), 127.85(C-α), 128.69(C-8), 128.77(C-5), 129.11(C-3^1,5^1), 130.63(C-2^1,6^1), 133.26(C-7), 137.25(C-4^1), 137.90(C-4), 139.10(C-1^1), 141.93(C-β), 147.70(C-9), 159.64(C-2), and a peak appeared at δ 190.20 for carbonyl carbon. The elemental analysis calculated for the compound **(4a)** is found to be C, (77.04%); H,(6.14%); N,(7.83%). These analytical values confirm the structure of the compound (**4a)** as (E)-3-(2-morpholinoquinolin-3-yl)-1-phenyl prop-2-en-1-one.

The series of (E)-3-(2-morpholinoquinolin-3-yl)-1-aryl prop-2-en-1-ones **(4a-j)** were obtained by condensation of **(2)** with different Aryl methyl ketones **(3a-j)** and characterized by spectral data.

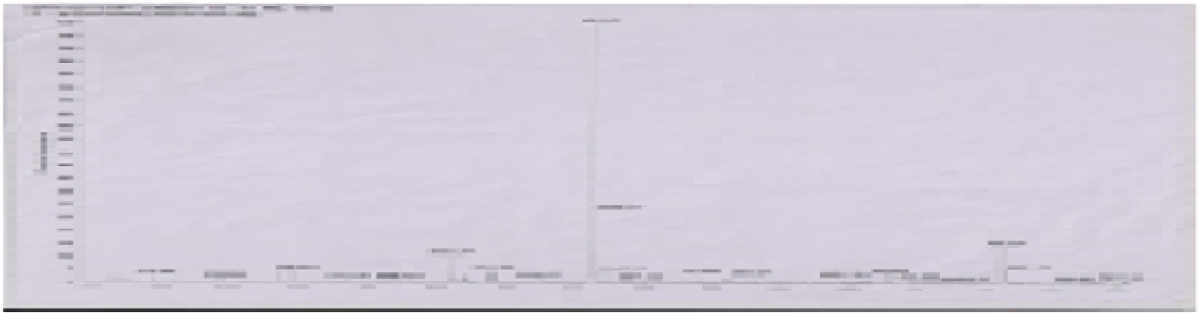


Fig-1

Fig-2

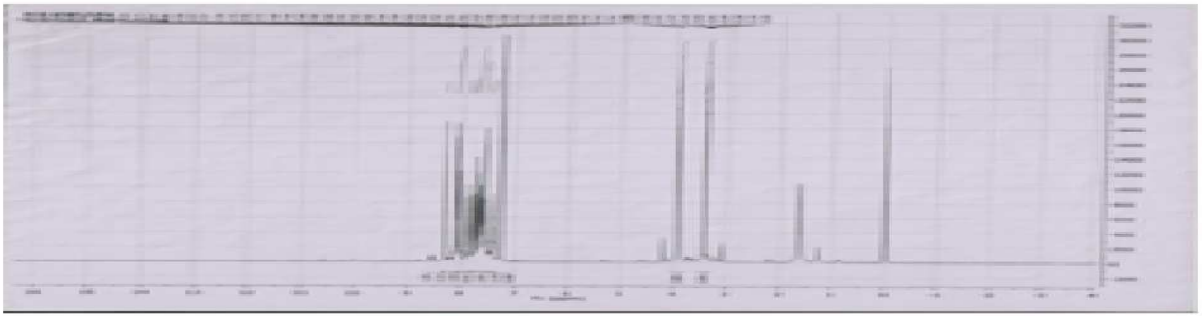


Fig-3

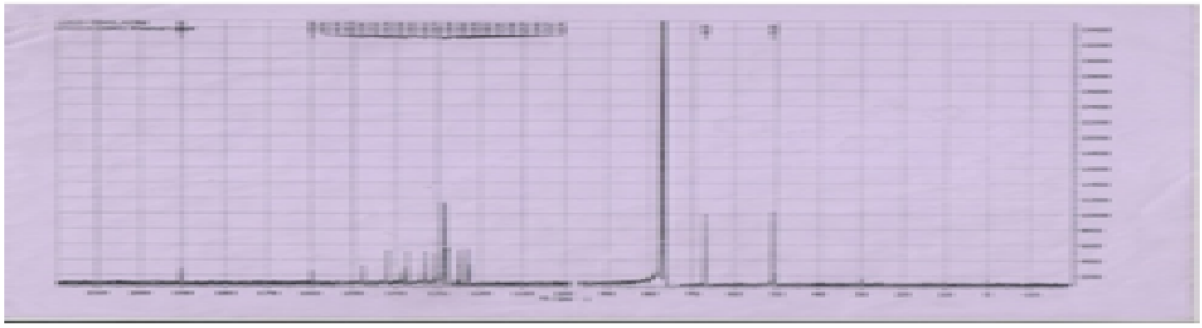


Fig-4

Preparation of 3-formyl-2-morpholinoquinoline (2):
To a solution of morpholine (4.35 g, 0.05 mol,) and 2-chloro-3-formyl-quinoline (9.55 g, 0.05 mol) in DMF(20ml) were stirred at 35^{o}C for 4 hrs. The reaction progress was checked by TLC. After completion of the reaction the reaction mixture poured into ice cold water and neutralized with dil. HCl, the resulting solid was filtered, dried and recrystallized from ethanol to obtain compound **2** yield 70%, as yellowish white solid M.P. 178^{o}C.

General procedure for the preparation of compounds (4a-j):
a)Conventional method:
To a solution of 3-formyl-2-morpholinoquinoline (**2**) (0.01mol), aryl methyl ketone (**3a-j**) (0.01mol), 20% sodium hydroxide in methanol were stirred for 3-4 hr at room temperature. The reaction progress was monitored by TLC. After completion of the reaction the reaction mixture was poured into ice cold water and neutralized with dil. HCl, the resulting solid was filtered, dried and recrystallized from ethanol to obtain the compounds **4a-j.** The yields and M.P.s of the compounds were shown in Table-1.

b)Microwave irradiation method:
To a mixture of 3-formyl-2-morpholinoquinoline (**2**) (0.01mol), aryl methyl ketone (**3a-j**) (0.01 mol), 20% sodium hydroxide in methanol were irradiated under microwave at 180 watt for 2-3 min. with 30 sec intervals. The reaction progress was checked by TLC. After completion of the reaction the reaction mixture poured into ice cold water and neutralized with dil.HCl, the resulting solid was filtered, dried and recrystallized from ethanol to obtain the compounds **4a-j.** Details of the melting points and yields of the compounds were presented in the Table-1.

Table 1: Physical data for Chalcones (4a-j)

No.	Aryl group	m.p. in ^{o}C.	Reaction Time		Yield (%)	
			R. T. In hours	MWI in minutes	R. T.	MWI
4a	phenyl	128	4.0	3.0	68	85
4b	4-methyl phenyl	130	3.0	2.0	72	90
4c	4-methoxy phenyl	132	3.0	2.0	75	90
4d	4-nitro phenyl	148	4.0	4.0	64	86
4e	4-chloro phenyl	134	4.0	3.0	72	88
4f	4-bromo phenyl	126	3.5	3.0	78	89
4g	4-hydroxy phenyl	128	3.5	2.5	64	91
4h	1-naphthyl	144	4.0	3.0	70	90
4i	2-naphthyl	145	4.0	3.0	68	88
4j	2-thienyl	138	4.0	3.0	72	90

RESULTS AND DISCUSSION

All the compounds **(4a-j)** were in solid state, yellowish in colour, stable to moisture and temperature. The structures were established by Mass spectrometry, IR, ^{1}H-NMR & ^{13}C NMR, and Elemental analysis.

IR, ^{1}H & ^{13}C-NMR, Mass spectral and Elemental analysis data of 4a-j:

1. (E)-3-(2-morpholinoquinolin-3-yl)-1-phenylprop-2-en-1-one (4a):

IR (KBr):1659.10 (C=O); 1587.38 (C=C); ^{1}H-NMR ($CDCl_3$): 3.41 (t, 4H, N-CH_2), 3.92 (t, 4H, O-CH_2), 7.39-7.43 (t,1H,6-H), 7.52-7.57 (t,2H, 3^1,5^1-H), 7.60-7.69(d, 3H, 4^1,7,8-H), 7.75-7.77 (d, 8Hz, 1H, H_α), 7.86-7.88 (d, 8Hz, 1H, H_β), 8.01-8.02(d, 1H,5-H), 8.06-8.08(d,2H, 2^1,6^1-H), 8.29 (s, 1H, 4-H); ^{13}C-NMR ($CDCl_3$): 51.02(N-CH_2), 66.93(O-CH_2), 122.74(C-3), 123.07(C-10), 124.83(C-6), 127.85(C-α), 128.69(C-8), 128.77(C-5), 129.11(C-3^1,5^1), 130.63(C-2^1,6^1), 133.26(C-7), 137.25(C-4^1), 137.90(C-4), 139.10(C-1^1), 141.93(C-β), 147.70(C-9), 159.64(C-2), 190.20(C=O); MS: *m/z* = 345$[M+H]^+$. Elemental Analysis Calculated for $C_{22}H_{20}N_2O_2$: C, 76.72; H,5.85;N,8.13.Found:C,76.69;H,5.81;N,8.09.

2. (E)-3-(2-morpholinoquinolin-3-yl)-1-p-tolylprop-2-en-1-one (4b):

IR (KBr): 1658.25 (C=O); 1587.12 (C=C); ^{1}H-NMR ($CDCl_3$): 2.46(s, 3H), 3.38 (t, 4H, N-CH_2), 3.92(t, 4H, O-CH_2), 7.33-7.36 (d,2H, 3^1,5^1-H), 7.38-7.42(t,1H,6-H), 7.63-7.66(t,1H, 7-H), 7.67-7.69(d,1H,8-H), 7.75-7.77(d, 8Hz, 1H, H_α), 7.84-7.88(d, 8Hz, 1H, H_β), 7.97-7.99 (d, 1H, 5-H), 8.01-8.04(d,2H, 2^1,6^1-H), 8.28 (s, 1H, 4-H); ^{13}C-NMR ($CDCl_3$): 21.74(CH_3); 50.99(N-CH_2), 66.93(O-CH_2), 122.87(C-3^1,5^1), 124.25(C-3), 124.98(C-10), 127.66(C-6), 127.82(C-α), 128.67(C-8), 129.86(C-5), 130.55(C-1^1), 135.32(C-7), 137.19(C-2^1,6^1), 138.44(C-4), 139.04(C-4^1), 141.46(C-β), 143.99(C-9), 159.63(C-2), 189.63(C=O); MS: *m/z* =359 $[M+H]^+$; Elemental Analysis Calculated for $C_{23}H_{22}N_2O_2$: C, 77.07; H, 6.19; N, 7.82. Found: C, 77.04; H, 6.14; N, 7.83.

3.(*E*)-1-(4-Methoxyphenyl)-3-(2-morpholinoquinolin-3-yl)prop-2-en-1-one (4c):

IR (KBr): 1659.28 (C=O); 1587.31 (C=C); ^{1}H-NMR ($CDCl_3$): 3.42(t, 4H, N-CH_2), 3.85(t, 4H, O-CH_2), 3.91 (s, 3H, O-CH_3), 7.00-7.02 (d,2H, 3^1,5^1-H), 7.38-7.41 (t, 1H, 6-H), 7.62-7.66 (t, 1H, 7-H), 7.69-7.73(d,8Hz,1H,H_α), 7.74-7.76(d,1H,8-H), 7.85-7.87(d,1H,5-H), 7.99-8.03(d,8Hz, 1H,H_β), 8.08-8.10 (d,2H,2^1,6^1-H), 8.26 (s,1H,4-H); ^{13}CNMR($CDCl_3$): 50.97 (N-CH_2), 55.56(O-CH_3), 66.95(O-CH_2), 113.90(C-3^1,5^1), 113.99(C-3), 122.86(C-10), 122.97(C-6), 124.76(-C-α), 124.99(C-8), 127.65(C-5), 127.79(C-1^1), 130.77(C-7), 130.94(C-2^1,6^1), 137.13(C- 4), 141.05(C- β), 147.60(C-9), 159.64(C-4^1), 163.65(C-2); 188.26(C=O); MS: *m/z* = 375$[M+H]^+$; Elemental Analysis Calculated for $C_{23}H_{22}N_2O_3$: C, 73.78; H, 5.92; N, 7.48. Found: C, 73.65; H, 5.98; N, 7.39.

4.(E)-3-(2-morpholinoquinolin-3-yl)-1-(4-nitrophenyl)prop-2-en-1-one (4d):

IR (KBr): 1658.36 (C=O); 1592.75 (C=C); ^{1}H-NMR (DMSO): 3.43 (t,4H, N-CH_2), 3.91(t,4H, O-CH_2), 7.41-7.44 (t,1H,6-H), 7.66-7.69 (t, 1H, 7-H), 7.70-7.72(d, 1H, 8-H),7.75-7.79(d, 8Hz, 1H,H_α), 7.87-7.89(d,1H, 5-H), 8.09-8.13(d, 8Hz,1H, H_β), 8.20-8.23(d,2H,2^1,6^1-H), 8.32 (s,1H, 4-H), 8.38-8.42 (d,2H,3^1,5^1-H); ^{13}C-NMR (DMSO): 50.89(N-CH_2), 66.02(O-CH_2), 119.02(C-3), 121.90(C-10), 123.91(C-6), 124.90C-3^1,5^1), 127.11(C-α), 128.25(C-8), 129.86(C-5), 130.95(C-7), 133.57(C-2^1,6^1), 136.84(C-4), 138.03 (C-1^1), 138.03(C-β), 141.49(C-9), 159.38(C-4^1), 170.67 (C-2), 187.96 (C=O); *m/z* =390 $[M+H]^+$ Elemental Analysis Calculated for $C_{22}H_{19}N_3O_4$: C, 67.86; H, 4.92; N,10.79 . Found: C, 67.84; H, 4.90; N, 10.77

5.(E)-1-(4-chlorophenyl)-3-(2-morpholinoquinolin-3-yl)prop-2-en-1-one (4e):

IR (KBr): 1659.72 (C=O); 1591.32 (C=C); ^{1}H-NMR ($CDCl_3$): 3.40 (t, 4H, N-CH_2), 3.92(t, 4H, O-CH_2), 7.39-7.42 (t,1H,6-H), 7.50-7.52 (d, 2H, 3^1,5^1-H); 7.64-7.66 (t, 1H,7-H); 7.68 (d, 1H,8-H); 7.75-7.77 (d, 8Hz, 1H, H_α); 7.86-7.88(d, 8Hz, 1H, H_β); 8.01-8.03 (d,2H,2^1,6^1-H); 8.06 (d, 1H, 5-H); 8.28 (s, 1H, 4-H); ^{13}C-NMR ($CDCl_3$): 51.05(N-CH_2), 66.90(O-CH_2),122.30(C-3), 124.92(C-10), 127.70(C-6), 127.86(C- α), 129.00(C-8), 129.04(C-5), 129.14(C-3^1,5^1), 129.99(C-7), 130.75(C-2^1,6^1), 136.18(C-4), 137.35(C-1^1), 139.54(C-4^1), 142.37(C- β), 147.75(C-9), 159.60(C-2), 188.68(C=O); *m/z* =379 $[M+H]^+$ .Elemental Analysis Calculated for $C_{22}H_{19}ClN_2O_2$: C, 69.75; H, 5.05; Cl, 9.36;N, 7.39. Found: C,69.71; H, 5.02; Cl, 9.33;N, 7.37.

6.(E)-1-(4-bromophenyl)-3-(2-morpholinoquinolin-3-yl)prop-2-en-1-one (4f):

IR (KBr): 1657.15 (C=O); 1591.98 (C=C); ^{1}H-NMR ($CDCl_3$): 3.41 (t, 4H, N-CH_2), 3.92(t, 4H, O-CH_2), 7.39-7.43 (t,1H,6-H), 7.64-7.67 (t, 1H, 7-H), 7.68-7.69 (d, 1H, 8-H), 7.70 (d, 1H, 3^1,5^1-H), 7.75-7.78 (d, 8Hz, 1H, H_α), 7.87-7.89(d, 8Hz, 1H, H_β), 7.93-7.96 (d,2H,2^1,6^1-H), 8.03-8.07(d,1H,5-H), 8.29(s, 1H, 4-H); ^{13}C-NMR ($CDCl_3$): 51.06(N-CH_2), 66.90(O-CH_2), 122.31(C-3), 122.53(C-10), 124.89(C-6), 124.92(C-α), 127.63(C-8), 127.86(C-3^1,5^1), 128.26(C-5), 130.02(C-4^1), 130.81(C-7), 132.02(C-2^1,6^1), 132.08(C-4), 136.60(C-1^1), 142.41(C-9), 159.56(C-2), 188.80(C=O); *m/z* =423 $[M+H]^+$ Elemental Analysis Calculated for $C_{22}H_{19}BrN_2O_2$: C, 62.42; H, 4.52; Br, 18.88; N, 6.62. Found: C, 62.38; H, 4.49; Br, 18.85; N, 6.59.

7.(E)-1-(4-hydroxyphenyl)-3-(2-morpholinoquinolin-3-yl)prop-2-en-1-one (4g):
IR (KBr): 1649.74 (C=O); 1592.47 (C=C); ^{1}H-NMR (DMSO): 3.41 (t, 4H, N-CH_2), 3.85 (t, 4H, O-CH_2), 7.00-7.03 (d,2H, 3^1,5^1-H), 7.39-7.42 (t, 1H, 6-H), 7.62-7.66 (t, 1H, 7-H), 7.68-7.72(d, 8Hz,1H,H_α), 7.74-7.76(d,1H,8-H), 7.84-7.86(d,1H,5-H), 7.98-8.02(d,8Hz,1H,H_β), 8.06-8.08 (d,2H,2^1,6^1-H), 8.26 (s,1H,4-H); ^{13}C-NMR (DMSO): 51.05(N-CH_2), 66.90(O-CH_2), 122.30(C-8^1), 122.52(C-3), 124.87(C-10), 124.92(C-6), 127.70(C-6^1), 127.86(3^1,8), 129.00(C-2^1), 129.04(C-5), 129.09(C-9^1), 129.14(C-7), 129.91(C-5^1), 129.99(C-10^1), 130.75(C-4^1), 136.18(C-7^1), 137.35(C-4), 139.54(C-1^1), 142.37(C- β), 147.75(C-9), 159.60 (C-2), 188.68(C=O); *m/z* =361 $[M+H]^+$ Elemental Analysis Calculated for $C_{22}H_{20}N_2O_3$: C, 73.32; H, 5.59; N, 7.77. Found: C, 73.28; H,5.57;N,7.75.

8.(E)-3-(2-morpholinoquinolin-3-yl)-1-(naphthalen-1-yl)prop-2-en-1-one (4h):
IR (KBr): 1653.70(C=O); 1589.81 (C=C); ^{1}H-NMR (DMSO): 3.42 (t, 4H, N-CH_2), 3.92(t, 4H, O-CH_2), 7.24(t,1H,6-H), 7.33 (d, 8Hz, 1H, H_α), 7.56-7.73(m,6H,2^1,3^1,6^1,7^1,7,8-H), 7.91(d, 8Hz, 1H, H_β), 8.03-8.08 (d,2H,4^1,5^1-H), 8.16(d,1H,5-H), 8.26(d,1H,8^1-H), 8.58(s,1H,4-H); ^{13}C-NMR (DMSO): 51.04(N-CH_2), 66.95(O-CH_2), 122.51(C-8^1), 122.86(C-10), 115.58(C-3), 119.03(C-6), 119.52(C-6^1), 122.86(C-5^1), 125.63(C-3^1,8), 126.05(C-5), 127.01(C-2^1), 128.01(C-9^1), 128.16(C-7), 129.30(C-5^1), 132.11(C-10^1), 132.43(C-7^1), 133.87(C-4^1), 139.50(C-4), 140.81(C-1^1), 140.82(C-β), 142.28(C-9), 161.25 (C-2), 195.42(C=O); *m/z* =395 $[M+H]^+$; Elemental Analysis Calculated for $C_{26}H_{22}N_2O_2$: C, 79.16; H, 5.62; N, 7.10. Found: C,79.10; H, 5.59; N, 7.07.

9.(E)-3-(2-morpholinoquinolin-3-yl)-1-(naphthalen-2-yl)prop-2-en-1-one (4i):
IR (KBr): 1658.45 (C=O); 1591.45 (C=C); ^{1}H-NMR (DMSO): 3.44 (t,4H,N-CH_2), 3.93(t,4H,O-CH_2), 7.40-7.44(t,1H,6-H), 7.60-7.67(m,3H,7,8,8^1-H), 7.78-7.80(d,8Hz,1H,H_α), 7.86-7.94 (m,3H,3^1,4^1,5^1-H), 7.97-7.99(d,8Hz,1H,H_β), 8.02-8.04(d,1H,5-H), 8.12-8.16(dd,2H,6^1,7^1-H), 8.35(s,1H,4-H), 8.60(s,1H,1^1-H); ^{13}C-NMR (DMSO): 51.04(N-CH_2), 66.95(O-CH_2), 122.81(C-8^1),122.97(C-3),124.38(C-10), 124.83(C-6), 124.99(C-6^1), 126.94(C-3^1), 127.69(C-8), 127.90(C-5), 128.60(C-2^1), 128.77(C-9^1), 129.55(C-7), 130.06(C-5^1), 130.63(C-10^1), 132.71(C-4^1), 134.56(C-7^1), 135.12(C-4), 137.08(C-1^1), 141.63(C-β), 148.03(C-9),159.46(C-2), 189.75(C=O); *m/z* =395 $[M+H]^+$. Elemental Analysis Calculated for $C_{26}H_{22}N_2O_2$: C, 79.16; H, 5.62;N, 7.10. Found:C,79.10;H,5.59;N,7.07.

10.(E)-3-(2-morpholinoquinolin-3-yl)-1-(thiophen-2-yl)prop-2-en-1-one (4j):
IR (KBr): 1656.27 (C=O); 1592.83 (C=C); ^{1}H-NMR ($CDCl_3$): 3.42 (t,4H,N-CH_2), 3.92(t,4H,O-CH_2), 7.22-7.26(d,2H,3^1,5^1-H), 7.39-7.43 (t,1H,4^1-H), 7.58-7.63(t,1H,6-H), 7.66-7.68(t,1H,7-H), 7.76-7.78(d,1H,8-H), 7.86-7,88(d, 8Hz,1H, H_α), 7.92-7.96(d, 8Hz,1H, H_β), 8.05-8.08(d,1H,5-H), 8.27 (s, 1H, 4-H); ^{13}C-NMR ($CDCl_3$): 51.00(N-CH_2), 66.95(O-CH_2), 122.54(C-10), 124.83(C-6), 127.68(C-α), 127.84(C-8), 128.40(C-4^1), 130.67(C-7), 131.97(C-4), 134.25(C-5^1), 137.50(C-3^1), 141.21(C-2^1), 145.32(C-β), 147.69(C-9), 159.62 (C-2),180.74(C=O); *m/z*=351$[M+H]^+$ Elemental Analysis Calculated for $C_{20}H_{18}N_2O_2S$: C, 68.55; H, 5.18;N, 7.99; S,9.15. Found: C, 68.53; H, 5.17; N, 7.95; S, 9.14.

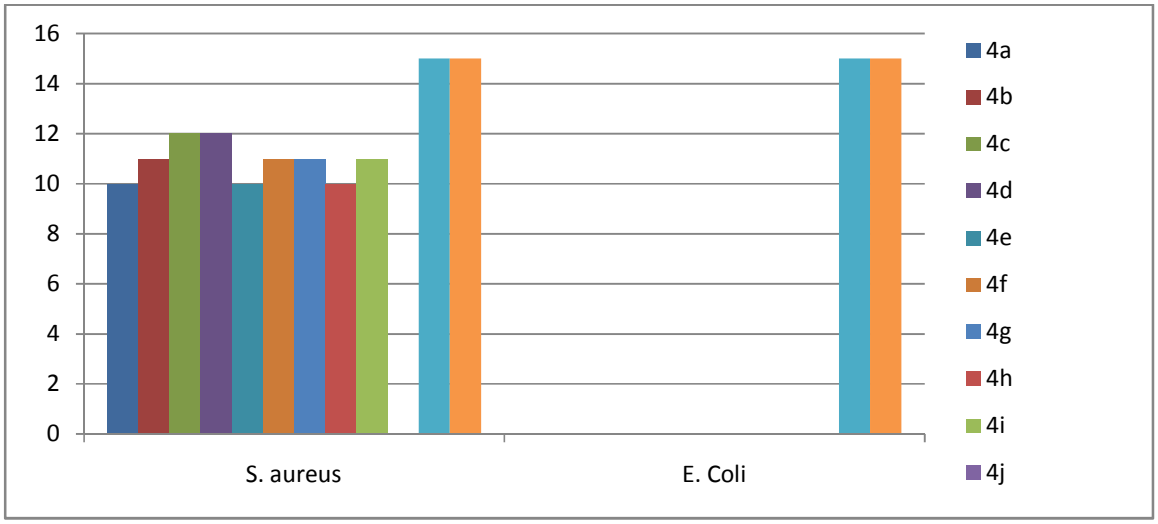
Biological Activity:

The newly synthesized compounds **(4a-j)** were screened for their antibacterial activity against gram negative bacteria *viz. Escherichia coli* and gram-positive bacteria *viz. Staphylococcus aureus* at three concentrations *i.e.* 1000, 500 and 250 µg using ditch dilution methods. The test organism was a two hour culture of *Escherichia coli* and *Staphylococcus aureus*, incubated and grown in peptone-water medium (temp-37^{o}C). DMF was used as solvent control which did not show any zone of inhibition. Muller-Hilton agar medium was used as culture medium. The culture plates were incubated at 37^{o}C for 24 hrs. The newly synthesized compounds were screened for their antibacterial activity against gram negative bacteria *viz. Escherichia coli* and gram-positive bacteria viz. *Staphylococcus aureus* with three concentrations *i.e.* 1000, 500 and 250 µg. Out of these concentrations chosen the best result was obtained 250 µg and hence this was optimum concentration. All the compounds were found to show strong activity against gram-positive bacteria *viz. Staphylococcus aureus*. In case of gram negative bacteria *viz. Escherichia coli* all the compounds were found to be inactive.

These results are given in table-2.

Table 2: Activity of the Synthesized compounds: Antimicrobial studies

Compounds	Antibacterial activity zone of inhibition(mm)	
	S.aureus	*E.coli*
Gentamycine	**15**	**15**
Ampicilline	**15**	**15**
4a	**10**	-
4b	**11**	-
4c	**12**	-
4d	**12**	-
4e	**11**	-
4f	**11**	-
4g	**11**	-
4h	**10**	-
4i	**11**	-
4j	-	-



CONCLUSION

In this synthetic work the compounds **(4a-j)** were synthesized by conventional method and microwave irradiation method. Among these microwave irradiation method is an easy, high yielding, convenient and green method. The process proved to be a simple, environmentally friendly technique with high yields and high rate of acceleration was achieved in performing the reaction in microwave irradiation technique. These compounds were characterized on the basis of Mass Spectrometry, IR, ^{1}H-NMR, ^{13}C-NMR, and Elemental analysis.

Synthesized compounds were checked for their anti-microbial activity. The inhibition of micro-organism (against gram positive bacteria *S.aureus* and against gram negative bacteria *E.coli*) were evaluated under standardized conditions using ampicillin and gentamycin as standards.

Synthesized compounds were showed moderate activity and it is observed that compound (*E*)-1-(4-Methoxyphenyl)-3-(2-morpholinoquinolin-3-yl)prop-2-en-1-one **(4c)**,(E)-3-(2-morpholinoquinolin-3-yl)-1-(4-nitrophenyl)prop-2-en-1-one **(4d)** show better activity against gram positive bacteria *S.aureus* and shows no activity against gram negative bacteria *E.coli*.

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