



Research Article

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Synthesis and antimicrobial evaluation of some novel 1,3,4-oxadiazole

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ABSTRACT

5-Nitro-1-benzofuran-2-carbohydrazide **2** was prepared by condensation of Ethyl-5-Nitro-1-benzofuran-2-carboxylate **1** and hydrazine hydrate in Ethanol. The reaction of the **2** with various aromatic aldehydes to give 5-Nitro-N'-[aryl methylidene]-1-benzofuran-2-carbohydrazide **3** which on cyclization with chloramine-T furnished 2-(5-Nitro-1-benzofuran-2-yl)-5-aryl-1,3,4-oxadiazole **4**. The newly synthesized compounds have been characterized by IR, ¹H NMR, MASS Spectra. The synthesized compounds were screened for antimicrobial activity. The purity of synthesized compound was confirmed by TLC.

Key words: 1,3,4-Oxadiazole, benzofuran, chloramine-T, Antimicrobial activity, Schiff's base.

INTRODUCTION

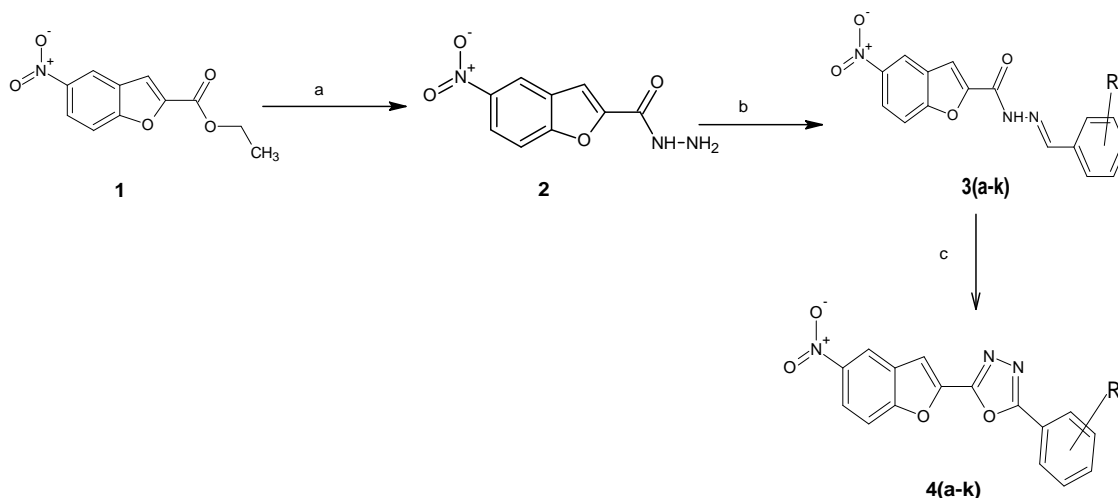
1,3,4-oxadiazole are a class of 5-membered heterocyclic compounds containing oxygen & two nitrogen atom. Derivatives of 1,3,4-oxadiazole constitute an important family of heterocyclic compounds [1]. Since many of them exhibit remarkable biological activity [2-3]. They have been found to possess anti viral [4], Anti-bacterial [5-6], Anti-malarial [7], Anti-inflammatory [8], Anti-microbial activity [9]. They also used as dyes, photosensitive electrical material.

Benzofuran [10] compounds are ubiquitous in nature. Often such natural product possessing benzofuran nucleus are endowed with useful pharmacological properties. This has generated enormous interest in synthetic products containing benzofuran nucleus and has resulted in development benzofuran chemistry during the last several years. Benzofuran are bicyclic ring system with multiple applications. The literatures indicate that compounds having the benzofuran [11] nucleus possess broad range of biological activities like griseofulvin as anti-fungal. Amiodarone as antiarrhythmic, Benzbromarone as uricosuric, Cloridarol as vasodilator; Oxetorone as antimigraine agent. The present communication reports the synthesis of novel 2-(5-nitro-1-benzofuran-2-yl)-5-aryl-1,3,4-oxadiazole (**4a-4k**) and their antimicrobial activity.

EXPERIMENTAL SECTION

Melting points were determined in open capillary tubes in a Thomas Hoover melting point apparatus and are uncorrected. The purity of the compounds was confirmed by thin layer chromatography. The spots were developed in iodine chamber and visualized under ultraviolet lamp. Infrared (IR) and ¹H nuclear magnetic resonance (¹H NMR) spectra were recorded for the compounds in SHIMADZU FTIR 8400

Spectrophotometer and BRUKER Spectrometer (400 MHz) respectively. Chemical shift are reported in parts per million (PPM) using tetramethylsilane (TMS) as an internal standard.



Scheme 1. Reagents and conditions: (a) Hydrazine hydrate, Ethanol, reflux, 10-12 hrs. (b) substituted aromatic aldehyde, acetonitrile, cat. amount of gal. acetic acid reflux 10-15 hrs. (c) chloramine T, ethanol, reflux 6-8 hrs.

Procedure for Synthesis of 5-nitro-1-benzofuran-2-carbohydrazide(2):

A mixture of ethyl 5-nitro-1-benzofuran-2-carboxylate(0.01mole) (1) and Hydrazine hydrate(0.02) in 30 ml ethanol was refluxed for 10-12 hrs. completion of reaction was checked by TLC using mobile phase ethylene dichloride/ethyl acetate(8/2).The reaction mixture was then kept in deep-freezer overnight. The precipitated product was filtered off, washed with hexane(10 ml) and crystallized from methanol-DMF to give light brown solid.

Characterization of 5-nitro-1-benzofuran-2-carbohydrazide(2):

Light brown crystals, mp 260-262 °C, ¹H NMR (DMSO-d₆) δ ppm: 4.66(s, 2H), 7.72(s, 1H), 7.91(d, 1H), 8.33(dd, 1H), 8.77(d, 1H), 10.26(s, 1H). IR: 3037 (Aromatic C-H str.), 1514 (Aromatic C=C), 1060 (C-H in plane deformation aromatic ring), 833 (C-H out of plane aromatic ring), 1655 (C=O stretching of amide), 1344 (C-N stretching), 3232 (N-H stretching of amide). MS: m/z 222.2 (M+1).

Process for synthesis of substitute 5-nitro-N'-(Arylmethylidene)-1-benzofuran-2 carbohydrazide (3a-3k):

A mixture of 5-nitro-1-benzofuran-2-carbohydrazide(2) (0.01mol) and different aromatic aldehyde (0.01mol) in 30 ml acetonitrile was refluxed for 10-15 hrs. completion of reaction was checked by TLC using mobile phase ethylene dichloride/ethyl acetate (8/2).The reaction mixture was then kept in deep-freezer overnight. The precipitated product was filtered off, washed with chilled acetonitrile(10 ml) and crystallized from methanol-DMF.

Characterization of synthesized substituted 5-nitro-N'-(Arylmethylidene)-1-benzofuran-2-carbohydrazide (3a-3k):

N'-[(4-chlorophenyl)methylidene]-5-nitro-1-benzofuran-2-carbohydrazide(3a).

Off white crystals, m.p. 181-183 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.56(d, 2H), 7.79(d, 2H), 7.98(d, 2H), 8.36(dd, 1H), 8.51(s, 1H), 8.85(s, 1H), 12.41(s, 1H.). IR (cm⁻¹): 3037 (Aromatic C-H str.), 1514 (Aromatic C=C), 1060 (C-H in plane deformation aromatic ring), 833 (C-H out of plane aromatic ring), 2960(C-H asymmetrical stretching of CH₃ group),2843 (C-H symmetric stretching of CH₃ group),1604 (N=C azomethine stretching), 1655 (C=O stretching of amide), 720(C-Cl stretching), 1344 (C-N stretching), 3232 (N-H stretching of amide). MS: 344.6 (M+1). Yield: 78%.

N'-[(4-methoxyphenyl)methylidene]-5-nitro-1-benzofuran-2-carbohydrazide(3b).

Off white crystals, m.p. 168-170 °C, ¹H NMR (DMSO-d₆) δ ppm: 3.82 (s, 3H), 7.05(d,2H), 7.71(d, 2H), 7.91(d, 2H), 8.34 (dd, 1H), 8.46(s, 1H), 8.85 (s, 1H), 12.22 (s 1H). IR (cm⁻¹): 3033(Aromatic C-H str.), 1520 (Aromatic C=C str.) 1055 (C-H in plane deformation of aromatic ring), 837 (C-H out of plane aromatic ring), 1609 (N=C azomethine stretching), 1659 (C=O stretching of amide), 1261 (C-O-C stretching), 1349 (C-N stretching), 3235 (N-H stretching of amide). MS: 340.3 (M+1). Yield: 74%

N'-[(4-bromophenyl)methylidene]-5-nitro-1-benzofuran-2-carbohydrazide(3c).

Light yellow crystals, m.p. 175-178 °C ¹H NMR (DMSO-d₆) δ ppm: 7.66(d,2H), 7.81(d, 2H), 7.89(d, 2H), 8.44 (dd, 1H), 8.51(s, 1H), 8.82 (s, 1H), 12.43 (s 1H). IR (cm⁻¹): 3037(Aromatic C-H str.), 1527 (Aromatic C=C str.) 1058 (C-H in plane deformation of aromatic ring), 842 (C-H out of plane aromatic ring), 1615 (N=C azomethine stretching), 1660 (C=O stretching of amide), 1349 (C-N stretching), 3235 (N-H stretching of amide). MS: 389.6 (M+1). Yield: 72 %

5-nitro-N'-[phenylmethylidene]-1-benzofuran-2-carbohydrazide(3d).

Off white crystals, m.p. 157-159 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.59(d,2H), 7.68(dd, 2H), 7.78(m, 1H) 7.86(d, 2H), 8.42 (dd, 1H), 8.49(s, 1H), 8.81 (s, 1H), 12.41 (s 1H). IR (cm⁻¹): 3034(Aromatic C-H str.), 1525 (Aromatic C=C str.) 1057 (C-H in plane deformation of aromatic ring), 844 (C-H out of plane aromatic ring), 1617 (N=C azomethine stretching), 1658 (C=O stretching of amide), 1350 (C-N stretching), 3234 (N-H stretching of amide). MS: 310.4 (M+1). Yield: 75 %

N'-[(4-hydroxyphenyl)methylidene]-5-nitro-1-benzofuran-2-carbohydrazide(3e).

Light brown crystals, m.p. 191-193 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.68(d,2H), 7.83(d, 2H), 7.90(d, 2H), 8.46 (dd, 1H), 8.53(s, 1H), 8.85 (s, 1H), 10.14(s 1H), 12.46 (s 1H). IR (cm⁻¹): 3035 (Aromatic C-H str.), 1529 (Aromatic C=C str.) 1055 (C-H in plane deformation of aromatic ring), 846 (C-H out of plane aromatic ring), 1616 (N=C azomethine stretching), 1658 (C=O stretching of amide), 1351 (C-N stretching), 3237 (N-H stretching of amide), 3599 (free -OH). MS: 326.3 (M+1). Yield: 60 %

N'-[(3-hydroxyphenyl)methylidene]-5-nitro-1-benzofuran-2-carbohydrazide(3f).

Light brown crystals, m.p. 185-187 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.72(s,1H), 7.84-7.86(m, 3H), 7.89(d, 2H), 8.50 (dd, 1H), 8.54(s, 1H), 8.83 (s, 1H), 10.16(s 1H), 12.44 (s 1H). IR (cm⁻¹): 3033 (Aromatic C-H str.), 1530 (Aromatic C=C str.) 1057 (C-H in plane deformation of aromatic ring), 844 (C-H out of plane aromatic ring), 1618 (N=C azomethine stretching), 1659 (C=O stretching of amide), 1355 (C-N stretching), 3234 (N-H stretching of amide), 3596 (free -OH). MS: 326.6 (M+1). Yield: 61 %

N'-[(3-methoxyphenyl)methylidene]-5-nitro-1-benzofuran-2-carbohydrazide(3g).

Off white crystals, m.p. 169-171 °C, ¹H NMR (DMSO-d₆) δ ppm: 3.86 (s, 3H), 7.56(s,1H), 7.71 -7.78(m, 3H), 7.90(d, 2H), 8.36 (dd, 1H), 8.448(s, 1H), 8.86 (s, 1H), 12.23 (s 1H). IR (cm⁻¹): 3034(Aromatic C-H str.), 1523 (Aromatic C=C str.) 1056 (C-H in plane deformation of aromatic ring), 836 (C-H out of plane aromatic ring), 1610 (N=C azomethine stretching), 1660 (C=O stretching of amide), 1262 (C-O-C stretching), 1348 (C-N stretching), 3236 (N-H stretching of amide). MS: 340.2 (M+1). Yield: 72%

N'-[(3-chlorophenyl)methylidene]-5-nitro-1-benzofuran-2-carbohydrazide(3h).

Off white crystals, m.p. 178-180 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.60(s, 1H), 7.79-7.82(m, 3H), 7.96(d, 2H), 8.37(dd, 1H), 8.52(s, 1H), 8.87(s, 1H), 12.44(s, 1H). IR (cm⁻¹): 3033 (Aromatic C-H str.), 1516 (Aromatic C=C), 1062 (C-H in plane deformation aromatic ring), 835 (C-H out of plane aromatic ring), 2962 (C-H asymmetrical stretching of CH₃ group), 2845 (C-H symmetric stretching of CH₃ group), 1606 (N=C azomethine stretching), 1656 (C=O stretching of amide), 722 (C-Cl stretching), 1346 (C-N stretching), 3233 (N-H stretching of amide). MS: 344.8 (M+1). Yield: 65%.

N'-[(4-hydroxy-3-methoxyphenyl)methylidene]-5-nitro-1-benzofuran-2-carbohydrazide(3i).

Off white crystals, m.p. 157-159 °C, NMR (DMSO-d₆) δ ppm: 3.76(s, 1H), 5.06(s, 1H), 7.68(s, 1H), 7.72(d, 1H), 7.75(d, 1H), 7.98(d, 2H), 8.39(dd, 1H), 8.55(s, 1H), 8.85(s, 1H), 12.46(s, 1H). IR (cm⁻¹): 3030 (Aromatic C-H str.), 1520 (Aromatic C=C), 1060 (C-H in plane deformation aromatic ring), 840 (C-H out of plane aromatic ring), 2975 (C-H asymmetrical stretching of CH₃ group), 2850 (C-H symmetric stretching of CH₃ group), 1610 (N=C azomethine stretching), 1660 (C=O stretching of amide), 1261 (C-O-C

stretching), 1341 (C-N stretching), 3240 (N-H stretching of amide), 3599 (free -OH) MS: 356.1 (M+1). Yield: 60%.

N'-[(3,4-dimethoxyphenyl)methylidene]-5-nitro-1-benzofuran-2-carbohydrazide(3j).

Off white crystals, m.p. 151-153 °C, ¹H NMR (DMSO-d₆) δ ppm: 3.82 (s, 6H), 7.71(s,1H), 7.78 (d, 1H),7.81(d, 1H), 7.94(d, 2H), 8.39 (dd, 1H), 8.46(s, 1H), 8.88 (s, 1H), 12.26 (s 1H). IR (cm⁻¹): 3036(Aromatic C-H str.), 1530 (Aromatic C=C str.), 1055 (C-H in plane deformation of aromatic ring), 840 (C-H out of plane aromatic ring), 1612 (N=C azomethine stretching), 1658 (C=O stretching of amide), 1265 (C-O-C stretching), 1350 (C-N stretching), 3240 (N-H stretching of amide). MS: 370.2 (M+1). Yield: 62%

5-nitro-N'-[(3-nitrophenyl)methylidene]-1-benzofuran-2-carbohydrazide(3k).

Light yellow crystals, m.p. 209-211 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.68(s, 1H), 7.79-7.82(m, 3H), 7.98(d, 2H), 8.39(dd, 1H), 8.53(s, 1H), 8.85(s, 1H), 12.46(s, 1H). IR (cm⁻¹): 3035 (Aromatic C-H str.), 1512 (Aromatic C=C), 1063 (C-H in plane deformation aromatic ring), 836 (C-H out of plane aromatic ring), 2965 (C-H asymmetrical stretching of CH₃ group),2847 (C-H symmetric stretching of CH₃ group),1605 (N=C azomethine stretching), 1654 (C=O stretching of amide), 1348 (C-N stretching), 3236 (N-H stretching of amide). MS: 355.2 (M+1). Yield: 60%.

Process for synthesis of substituted 2-(5-nitro-1-benzofuran-2-yl)-5-arylyl-1,3,4-oxadiazole (4a-4k):

A mixture of Schiff's base (3a-3k) 0.01 mol and chloramine T 0.02 in 20 ml ethanol was refluxed for 6-8 hrs. completion of reaction was checked by TLC using mobile phase ethylene dichloride/ethyl acetate(8/2).The reaction mixture was then cool to room temperature and kept overnight. The precipitated product was filtered off, digested with water and crystallized with methanol-DMF.

Characterization of synthesized substituted 2-(5-nitro-1-benzofuran-2-yl)-5-arylyl-1,3,4-oxadiazole (4a-4k):
2-(4-chlorophenyl)-5-(5-nitro-1-benzofuran-2-yl)-1,3,4-oxadiazole(4a):

Off white crystals, m.p. 215-217 °C, ¹H NMR (DMSO-d₆) δ ppm:7.68-7.75(m, 3H), 8.09(d, 1H) 8.12-8.15 (d, 2H), 8.39 (dd, 1H), 8.83(dd, 1H), IR (cm⁻¹): 3085 (Aromatic C-H str.), 1512 (Aromatic C=N),1450 (C=C), 1350(C-N str.), 1063 (C-H in plane deformation aromatic ring), 836 (C-H out of plane aromatic ring), 1260(C-O-C str.),720(C-Cl) MS: 342.5 (M+1).Yield: 70%.

2-(4-methoxyphenyl)-5-(5-nitro-1-benzofuran-2-yl)-1,3,4-oxadiazole(4b):

Off white crystals, m.p. 225-227 °C, ¹H NMR (DMSO-d₆) δ ppm: 3.84(s, 3H)7.69-7.77(m, 3H), 8.10(d, 1H) 8.15-8.17 (d, 2H), 8.40(dd, 1H), 8.84(s, 1H), IR (cm⁻¹): 3086 (Aromatic C-H str.), 1516 (Aromatic C=N),1455 (C=C), 1350(C-N str.), 1066 (C-H in plane deformation aromatic ring), 837 (C-H out of plane aromatic ring), 1265 (C-O-C str.), MS: 338.4 (M+1).Yield: 75%.

2-(4-bromophenyl)-5-(5-nitro-1-benzofuran-2-yl)-1,3,4-oxadiazole(4c):

Light yellow crystals, m.p. 250-251 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.66-7.74(m, 3H), 8.09(d, 1H) 8.12-8.15 (d, 2H), 8.39 (dd, 1H), 8.81(s, 1H), IR (cm⁻¹): 3082 (Aromatic C-H str.), 1513 (Aromatic C=N),1450 (C=C), 1355 (C-N str.), 1065 (C-H in plane deformation aromatic ring), 835 (C-H out of plane aromatic ring), 1260 (C-O-C str.), MS: 387.6 (M+1).Yield: 71 %.

2-(5-nitro-1-benzofuran-2-yl)-5-phenyl-1,3,4-oxadiazole(4d):

Off white crystals, m.p. 235-237 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.65-7.73(m, 3H), 8.10(d, 1H) 8.12-8.15 (m, 3H), 8.38 (dd, 1H), 8.82(s, 1H), IR (cm⁻¹): 3085 (Aromatic C-H str.), 1524 (Aromatic C=N),1445 (C=C), 1344 (C-N str.), 1066 (C-H in plane deformation aromatic ring), 837 (C-H out of plane aromatic ring), 1265 (C-O-C str.), MS: 308.2 (M+1).Yield: 80 %.

2-(4-hydroxyphenyl)-5-(5-nitro-1-benzofuran-2-yl)-1,3,4-oxadiazole(4e):

Off white crystals, m.p. 260-261 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.68-7.76(m, 3H), 8.13(d, 1H) 8.13-8.17 (d, 2H), 8.39 (dd, 1H), 8.83(s, 1H), 10.15(s, 1H). IR (cm⁻¹): 3087 (Aromatic C-H str.), 1524 (Aromatic C=N),1443 (C=C), 1341 (C-N str.), 1061 (C-H in plane deformation aromatic ring), 831 (C-H out of plane aromatic ring), 1262 (C-O-C str.), 3596 (free -OH) MS: 324.3 (M+1).Yield: 62 %.

2-(3-hydroxyphenyl)-5-(5-nitro-1-benzofuran-2-yl)-1,3,4-oxadiazole(4f):

Off white crystals, m.p. 248-250 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.68-7.76(m, 2H), 8.13(d, 1H) 8.13-8.17 (m, 3H), 8.39 (dd, 1H), 8.83(s, 1H), 10.12(s, 1H). IR (cm⁻¹): 3088 (Aromatic C-H str.), 1528 (Aromatic C=N), 1450 (C=C), 1338 (C-N str.), 1070 (C-H in plane deformation aromatic ring), 840 (C-H out of plane aromatic ring), 1268 (C-O-C str.), 3596(free -OH) MS: 324.1 (M+1). Yield: 61 %.

2-(3-methoxyphenyl)-5-(5-nitro-1-benzofuran-2-yl)-1,3,4-oxadiazole(4g):

Off white crystals, m.p. 241-243 °C, ¹H NMR (DMSO-d₆) δ ppm: 3.84(s, 3H) 7.70-7.79(m, 2H), 8.16(d, 1H) 8.17-8.21 (m, 3H), 8.41 (dd, 1H), 8.85(s, 1H). IR (cm⁻¹): 3080 (Aromatic C-H str.), 1530 (Aromatic C=N), 1460 (C=C), 1328 (C-N str.), 1050 (C-H in plane deformation aromatic ring), 810 (C-H out of plane aromatic ring), 1259 (C-O-C str.). MS: 338.2 (M+1). Yield: 68 %.

2-(3-chlorophenyl)-5-(5-nitro-1-benzofuran-2-yl)-1,3,4-oxadiazole(4h):

Off white crystals, m.p. 271-273 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.66-7.74(m, 2H), 8.14(d, 1H) 8.15-8.19 (m, 3H), 8.39 (dd, 1H), 8.81(s, 1H). IR (cm⁻¹): 3082 (Aromatic C-H str.), 1541 (Aromatic C=N), 1465 (C=C), 1324 (C-N str.), 1055 (C-H in plane deformation aromatic ring), 816 (C-H out of plane aromatic ring), 735(C-Cl), 1248 (C-O-C str.). MS: 341.8 (M+1). Yield: 75 %.

2-methoxy-4-[5-(5-nitro-1-benzofuran-2-yl)-1,3,4-oxadiazol-2-yl]phenol(4i):

Off white crystals, m.p. 268-270 °C, ¹H NMR (DMSO-d₆) δ ppm: 3.84(s, 3H) 7.70-7.79(m, 2H), 8.16(d, 1H) 8.17-8.21 (m, 2H), 8.41 (dd, 1H), 8.85(s, 1H), 10.21(s, 1H). IR (cm⁻¹): 3088 (Aromatic C-H str.), 1541 (Aromatic C=N), 1468 (C=C), 1335 (C-N str.), 1041 (C-H in plane deformation aromatic ring), 835 (C-H out of plane aromatic ring), 1245 (C-O-C str.), 3591(free -OH). MS: 354.1 (M+1). Yield: 60 %.

2-(3,4-dimethoxyphenyl)-5-(5-nitro-1-benzofuran-2-yl)-1,3,4-oxadiazole(4j):

Off white crystals, m.p. 268-270 °C, ¹H NMR (DMSO-d₆) δ ppm: 3.81(s, 6H) 7.65-7.74(m, 2H), 8.10(d, 1H) 8.12-8.16 (m, 2H), 8.36 (dd, 1H), 8.80(s, 1H). IR (cm⁻¹): 3085 (Aromatic C-H str.), 1555 (Aromatic C=N), 1445 (C=C), 1342 (C-N str.), 1038 (C-H in plane deformation aromatic ring), 825 (C-H out of plane aromatic ring), 1250 (C-O-C str.). MS: 368.3 (M+1). Yield: 62 %.

2-(5-nitro-1-benzofuran-2-yl)-5-(3-nitrophenyl)-1,3,4-oxadiazole(4k):

Light yellow crystals, m.p. 290-293 °C, ¹H NMR (DMSO-d₆) δ ppm: 7.71-7.80(m, 2H), 8.21(d, 1H) 8.23-8.29 (m, 3H), 8.45 (dd, 1H), 8.86(s, 1H). IR (cm⁻¹): 3085 (Aromatic C-H str.), 1544 (Aromatic C=N), 1470 (C=C), 1330 (C-N str.), 1048 (C-H in plane deformation aromatic ring), 836 (C-H out of plane aromatic ring), 1245 (C-O-C str.). MS: 353.1 (M+1). Yield: 60 %.

RESULTS AND DISCUSSION

Antibacterial activity

The minimum inhibitory concentrations (MICs) of the tested compounds are shown in table 1. From screening data, most of compounds possessed very good antibacterial activity (MBC, 50-250 µgm/ml) against gram positive *S. aureus*, some of them possessed excellent activity compared to ampicilline. Compound **4b**, **4g**, **4h**, **4i** showed MBC value in the range between 60-125 µg/ml against gram negative *E. coli* which indicate that this compounds have excellent activity, while other compounds possessed MBC valued in range of 150-250µgm/ml. compound **4b**, **4d**, **4g**, **4h**, **4i**, **4j** exhibit very good activity against *P. aeruginosa* compared with ampicilline. Compound **4d**, **4e**, **4h** possessed good activity against *S. pyogenus*. The remaining derivative possessed moderate to poor activity against all four bacterial species.

Antifungal activity

The minimal inhibitory concentration (MICs) of the synthesized compounds are shown in table 1. For *in vitro* anti fungal activity three fungal species *C. albicans*, *A. niger* and *A. clavatus* were used and compared with standard drug griseofulvin. Most of compounds possessed very good antifungal activity against *C. albicans*, their MFC values were in the range between 250-500 µgm/ml. compounds **4e**, **4h** showed excellent activity of 250 µgm/ml, **4b**, **4c** possessed very good activity of 500 µgm/ml which is similar to standard drug against *C. albicans* where as remaining compounds possessed moderate to poor activity against *A. niger* and *A. clavatus* compared with standard drugs.

Table 1 : Antimicrobial activity of Compounds 4(a-k)

Compound Code	Minimal bactericidal concentration µg/ml				Minimal fungicidal concentration µg/ml		
	Gram negative		Gram positive				
	<i>E. Coli</i>	<i>P. aeruginosa</i>	<i>S. aureus</i>	<i>S. pyogenus</i>	<i>C. albicans</i>	<i>A. niger</i>	<i>A. clavatus</i>
4a	200	250	200	200	100	250	250
4b	125	125	500	500	500	1000	1000
4c	200	250	250	250	500	1000	1000
4d	250	125	62.5	100	100	1000	1000
4e	250	250	100	100	250	1000	1000
4f	250	250	250	200	>1000	250	250
4g	62.5	100	200	200	>1000	500	500
4h	100	100	100	125	250	1000	1000
4i	100	125	200	200	1000	>1000	>1000
4j	200	100	125	200	1000	500	1000
4k	250	200	500	500	>1000	>1000	>1000
Ampicilline	100	100	250	100	-	-	-
Griseofulvin	-	-	-	-	500	100	100

CONCLUSION

A synthetic method has been developed for substituted 1,3,4-oxadiazole derivatives using chloramine T as reagent. It can be concluded that formation of oxadiazoles via oxidative cyclization depends on time period. So the variation found in required reaction time period to yield the concern product with great significance and it was due to steric hinderance substituent. The antimicrobial screening results for compounds (4a-4k) showed that the substituent pattern on 5-position of 1,3,4-oxadiazole derivatives. From above discussions we concluded that the some newly synthesized compounds displayed excellent antibacterial and antifungal activity.

These results put shows the novel oxadiazoles into the class of interesting lead molecule for further synthetic and biological evaluation. It can be concluded that this class of compounds certainly holds great promise towards the pursuit to discover novel class of antimicrobial agents

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