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Synthesis, Characterizations and Antimicrobial Activities of 1, 2, 4-Triazoles

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ABSTRACT

A series of substituted 1, 2, 4-triazole derivatives have been synthesized, using chloroform mediated phenylimino dichloromethane. It was added to a chloroform suspension of N'-(arylidene) ethanehydrazonohydrazide and the mixture was refluxed over water bath for 3 hours. The evolution of hydrogen chloride gas was noticed. The structures of synthesized compounds are confirmed on spectral analysis like IR; ^{1}H NMR and ^{13}C NMR data. All newly synthesized compounds were screened for their antimicrobial activity towards *Gram-positive* and *Gram-negative* bacterial strains and antifungal activity including B. subtilis, E. coli, S. aureus, S. ablong, Candida and A. *niger*. Results showed that most of compounds have measurable antibacterial and antifungal activity.

Keywords: 1, 2, 4-triazoles, hydrazonohydrazide, Synthesis of 1, 2, 4-triazoles.

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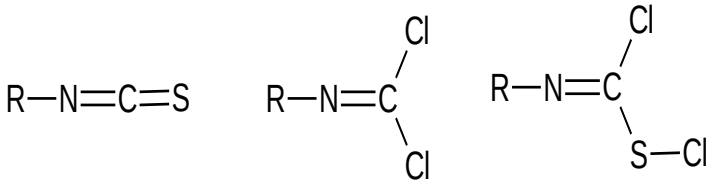
INTRODUCTION

In current years, another strategy employing a combination of two different active fragments in one molecule has emerged three. In this approach, each drug moiety is designed to attach independently to two different biological targets and synchronously build up at both target sites. Such hybrid drugs, offer the possibility to overcome the current resistance and reduce the appearance of new resistant strains[1-4]. 1,2,4-Triazole derivatives have yet again and again attracted scientific and realistic interest due to their broadly varying chemical properties, synthetic flexibility, and pharmacological actions, such as antibacterial,[5−11] antifungal, [8−12] antitubercular, [13−15] analgesic, [16,17] anti-inflammatory, [18−19] anticancer, [20,21] anticonvulsant, [22,23] antiviral, [24,25] insecticidal, [26] and antidepressant[27] properties. Moreover, the 1,2,4-triazole compounds carrying sulfone moiety or imine bond have been reported as antibacterial and antifungal, antihypertensive, analgesic, anti-inflammatory, or antitumoral agents[28−36]. Another important group is the morpholine nucleus included in a wide variety of therapeutically important drugs, one of which is linezolid, which belongs to the oxazolidinone class of antibiotics and is used for the treatment of infection caused by gram-positive bacteria[37−39]. In addition, 4-phenylmorpholine derivatives have been reported to have antimicrobial, anti-inflammatory and central nervous system activities[40]. Triazoles having different applications like Agricultural applications, Pharmacological applications, and Industrial applications like Chemical Industry, Textile industry and in Cotton industry.

Isothiocyanates, aryl/alkyl imino chloromethane sulphenyl chloride, aryl/alkyl imino dichloromethane



Isothiocyanates, aryl/alkyl imino chloromethane sulphenyl chloride, aryl/alkyl imino dichloromethane these are the useful intermediates in the synthesis of nitrogen, sulfur, oxygen and sulfur, nitrogen containing heterocyclic compounds. These reagents have been shown to posses enough potential in the synthesis of heterocyclic compounds.

On the above literature survey we found that the triazoles having much more space for synthesis work so we are trying to synthesize new triazoles with the help of dichlorocynodichloride. The present work describes the synthesis of new 1, 2, 4-triazoles heterocyclic compounds by unknown route.

MATERIALS AND METHOD

General Remark

Melting points were taken in open capillary tubes and are uncorrected. Unless otherwise indicated, ^{1}H (400 MHz) and ^{13}C NMR spectra were recorded on a Bruker DSX-300=AV-III 400L NMR spectrometer from dimethylsulfoxide (DMSO) solution with tetramethylsilane (TMS) as an internal reference. Chemical shifts are recorded as parts per million (ppm) on the scale and multiplicities are described as s (singlet), d (doublet), and m (multiplet). Infrared (IR) spectra were recorded on a Bruker and Shimadzu (4000–450 cm^{-1}) FTIR spectrophotometer. Thin-layer chromatography (TLC) was performed with E. Merck precoated TLC plates, aluminium silica gel60 F_{254}, and spots were located with ultraviolet (UV) light or iodine vapor. All other commercial reagents and solvents were used without further purification.

General Procedure:

General procedure for synthesis of N'-(arylidene)acetohydrazide (3):

Acetohydrazide (0.01mol) and arylaldehyde (0.01mol) mixture was refluxed using water as a solvent for 3 hours to give N'-(arylidene) acetohydrazide. The obtained solid product was filtered, washed several times with water to remove water soluble impurities and dried to afford compound (3).

General procedure for Synthesis of (1Z)-N'-[(Z)-((sub) aryl) methylidene] ethane hydrazonohydrazide (4a-f):

N'-(arylidene)acetohydrazide (0.01mol) and hydrazine hydrate (0.01 mol) in aqueous ethyl alcohol (15 ml) was stirred and refluxed on water bath for 3 hours. The completion of reaction was monitored by TLC. The product was poured into ice cold water. The solid product thus obtained was filtered, washed with water and recrystallized with ethanol.

General procedure for Synthesis of 1, 2, 4-Triazole (5a-f):

Chloroform mediated phenyl imino dichloromethane (0.01 mol) was added to a chloroform suspention of N'-[(aryl) methylidene] ethane hydrazonohydrazide (0.01 mol) and mixture was refluxed over water bath for 3 hrs. The evolution of hydrogen chloride gas was noticed.

After completion of reaction solvent was distilled off when solid compound was isolated. The product 1, 2, 4-Triazole was washed several times with petroleum ether and the compound was crystallize from ethanol.

Synthesis of phenyl imino dichloromethane:

Phenyl imino dichloromethane can be prepared by the chlorination of phenyl isothiocynate.

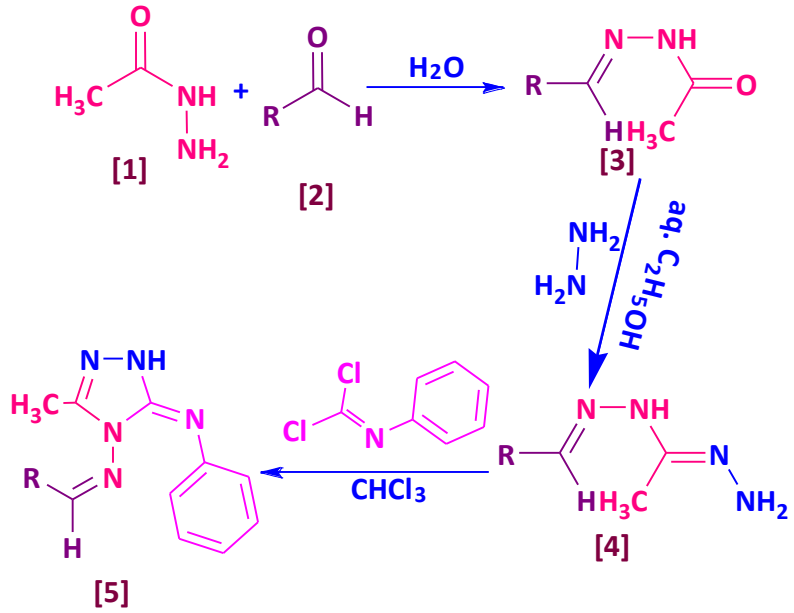
Chlorine gas (0.02 mol) was passed through suspension of phenyl isothiocynate (0.01 mol) in chloroform to give a yellow-orange colored Phenyl imino dichloromethane. Thus formed reagent is used directly for further reactions.

RESULTS AND DISCUSSION

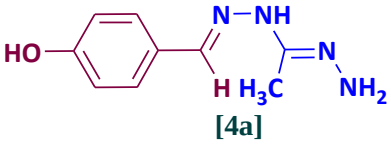
When acetohydrazide reacted with different aromatic aldehydes then a stable imine i.e benzylidene acetohydrazide is formed. This transformation proceeded with ease as NH_2 group in acetohydrazide easily donates its lone pair of electrons to the carbonyl carbon of aldehyde.

In the present work we achieved the synthesis of ethane hydrazonohydrazide derivatives by treating benzylidene acetohydrazide with hydrazine hydrate. Benzylidene acetohydrazide contains one carbonyl group. Though it is somewhat neutral in nature still possesses some electrophilic character. Being very reactive and nucleophilic, hydrazine attacked on carbonyl carbon of benzylidene acetohydrazide with ease under moderate reaction conditions. This methodology gave a new route to the synthesis of different ethane hydrazonohydrazide derivatives. The structures of newly synthesized ethane hydrazonohydrazide were established on the basis of IR, ^{1}H NMR, ^{13}C NMR and elemental analysis.

These ethane hydrazonohydrazide derivatives can act as a good precursor for the synthesis of different heterocyclic compounds. In order to achieve this, ethane hydrazonohydrazides were treated with phenylcarbonimidic dichroride to obtain different 1, 2, 4-triazole derivatives. The structural elucidations of new compounds were done on the basis of IR, ^{1}H NMR, ^{13}C NMR and elemental analysis.

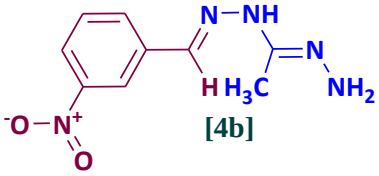


General Reaction Scheme



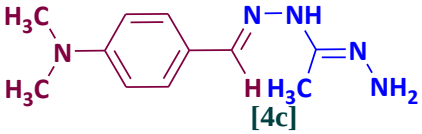
[4a]

(1*E*)-*N*'-[(*E*)-(4-hydroxyphenyl)methylidene] ethanehydrazonohydrazide



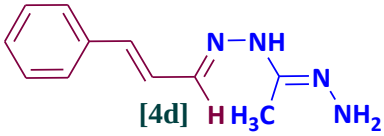
[4b]

(1*E*)-*N*'-[(*E*)-(3-nitrophenyl)methylidene] ethanehydrazonohydrazide



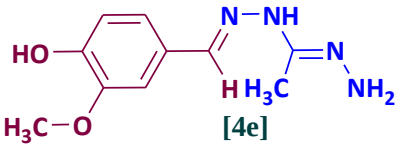
[4c]

(1*E*)-*N*'-{(*E*)-[4-(dimethylamino)phenyl]methylidene} ethanehydrazonohydrazide



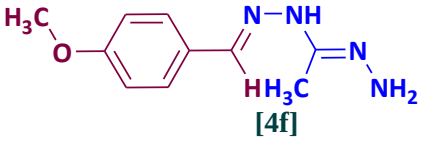
[4d]

(1*E*)-*N*'-[(1*E*,2*E*)-3-phenylprop-2-en-1-ylidene] ethanehydrazonohydrazide



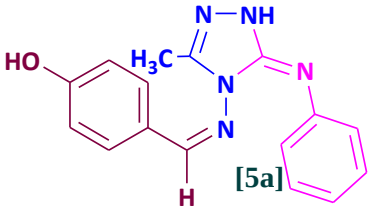
[4e]

(1*E*)-*N*'-[(*E*)-(4-hydroxy-3-methoxyphenyl)methylidene] ethanehydrazonohydrazide



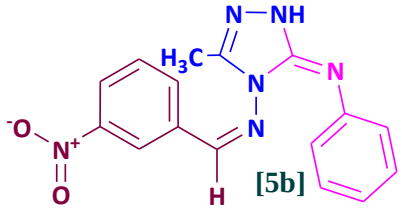
[4f]

(1*E*)-*N*'-[(*E*)-(4-methoxyphenyl)methylidene] ethanehydrazonohydrazide



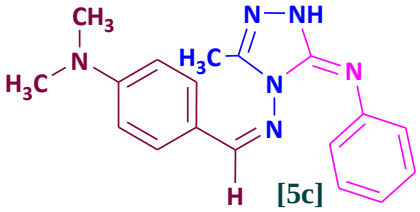
[5a]

4-[(*Z*)-{[(5*Z*)-3-methyl-5-(phenylimino)-1,5-dihydro-4*H*-1,2,4-triazol-4-yl]imino}methyl]phenol



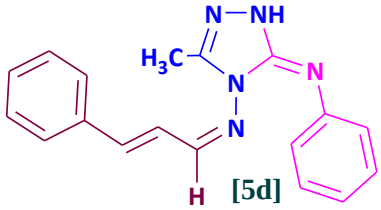
[5b]

(3*Z*)-5-methyl-4-{(*Z*)-[(3-nitrophenyl)methylidene] amino}-*N*-phenyl-2,4-dihydro-3*H*-1,2,4-triazol-3-imine



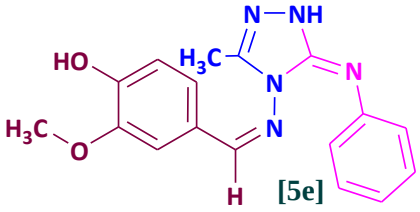
[5c]

N,*N*-dimethyl-4-[(*Z*)-{[(5*Z*)-3-methyl-5-(phenylimino)-1,5-dihydro-4*H*-1,2,4-triazol-4-yl]imino}methyl]aniline



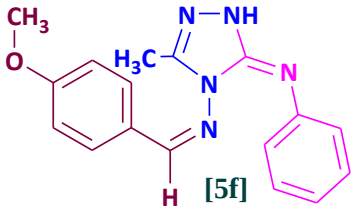
[5d]

(3*Z*)-5-methyl-*N*-phenyl-4-{(*Z*)-[(2*E*)-3-phenylprop-2-en-1-ylidene]amino}-2,4-dihydro-3*H*-1,2,4-triazol-3-imine



[5e]

2-methoxy-4-[(*Z*)-{[(5*Z*)-3-methyl-5-(phenylimino)-1,5-dihydro-4*H*-1,2,4-triazol-4-yl]imino}methyl]phenol



[5f]

(3*Z*)-4-{(*Z*)-[(4-methoxyphenyl)methylidene]amino}-5-methyl-*N*-phenyl-2,4-dihydro-3*H*-1,2,4-triazol-3-imine

Characterization data of (4a-f):

Spectral analysis of (1Z)-N'-[(Z)-(4-hydroxyphenyl)methylidene]ethane hydrazonohydrazide (4a):

MP. 250 ^{o}C. **Yield** 93.33%. **IR (KBr) (υmax, cm^{-1})**: 3792.05(OH), 3305.99(NH), 3169.04(ArCH), 2883.58(Ali CH), 1666.5(C=N), 1307.74(C-N). **^{1}HNMR** (DMSO-d6): δ 9.09(s, 1H, OH, exchangeable with D_2O), 7.47-6.72(m, 4H, ArH), 7.63(s, 1H, NH), 6.29(s, 2H, NH_2), 2.18(s, 1H, CH), 1.77(s, 3H, CH_3). **^{13}CNMR** (DMSO-d6): 157.24(C1), 126.65(C2=C6), 115.57(C3=C5), 139.8(C4), 39.47(C7), 79.03(C8), 20.42(C9). **Anal. Calcd**. For $C_9H_{12}N_4$: C 56.25%; H 6.25%; , N 29.16%. **Found:** C 56.20%; H 6.22%; N 29.12%.

Spectral analysis of (1Z)-N'-[(Z)-(3-nitrophenyl)methylidene] ethanehydrazonohydrazide (4b) :

MP = 213^{0}C. **Yield** 90.43%. **IR (KBr) (υmax, cm^{-1})**: 3400.5(NH), 3188.33(ArCH), 2924.09(Ali CH), 1597.06(C=N), 1552.7, 1319.31(NO_2), 1249.87(C-N). **^{1}HNMR** (DMSO-d6): δ 8.09 (dd, 1H, ArH), 8.02(s, 1H, CH), 7.84-7.36(m, 3H, ArH), 6.92(s, 2H, NH_2), 3.38(s, 1H, NH), 1.7(s, 3H, CH_3). **^{13}CNMR** (DMSO): 168.79(C6), 148.1(C2), 138.4(C3), 135.1(C4), 130.91(C9), 129.63(C8), 121.19(C7), 118.84(C5), 20.35(C1). **Anal. Calcd**. % for $C_9H_{11}N_6O$: C 49.31; H 5.41; N 38.35. **Found** %: C 49.33; H 5.39; N 38.33

Spectral analysis of (1Z) - N'-{(Z)-[4-(dimethylamino) phenyl] methylidene} ethanehydrazono hydrazide (4c):

MP. 202 ^{o}C. **Yield** 94.77%. **IR (KBr) (υmax, cm^{-1}):** 3523.95 (NH_2), 3292.49 (NH), 3080.32 (ArCH), 2910.58 (Ali CH), 1691.57 (C=N), 1228.66 (C-N). **^{1}HNMR** (DMSO-d6): δ 7.83 (s, 1H, NH), 7.64-7.43 (m, 4H, ArH), 6.72 (s, 2H, NH_2), 2.88 (s, 1H, CH), 1.79 (s, 3H, CH_3). **^{13}CNMR** (DMSO-d6): 167.82(C3), 151.78(C6), 129.35(C4=C8), 111.59(C5=C7), 78.91(C10), 40.01(C1=C2), 38.96(C9), 20.34(C11). **Anal. Calcd**. For $C_{11}H_{17}N_5$: C 60.27%; H 7.76%; N 31.96%. **Found**: C 60.20%; H 7.70%; N 31.92%.

Spectral analysis of (1Z)-N'-[(1Z, 2E)-3-phenylprop-2-en-1-ylidene] ethane hydrazonohydrazide (4d) :

MP = 201^{0}C. **Yield** 91.33%. **IR (KBr) (υmax, cm^{-1})**: 3400.5(NH), 3188.33(ArCH), 2926.01(Ali CH), 1743.65(C=N), 1597.06(C=C), 1267.23(C-N). **^{1}HNMR** (DMSO-d6): δ 8(d, 1H, CH), 7.98(d, 1H, CH), 7.84(m, 1H, CH), 7.79-7.52(m, 5H, ArH), 7.82(s, 1H, NH), 7.08(s, 2H, NH_2), 2.5(s, 3H, CH_3). **^{13}CNMR** DMSO): 148.12(C2), 138.44(C3), 135.24(C6), 134.37(C5), 130.89(C8=C10), 129.6(C7=C11), 125.5(C9), 122.48(C4). **Anal. Calcd**. % for $C_{11}H_{15}N_4$: C 65.02; H 7.38; N 27.58. **Found** %: C 65.07; H 7.33; N 27.61

Spectral analysis of (1Z)-N'-[(Z)-(4-hydroxy-3-methoxyphenyl) methylidene] ethane hydrazonohydrazide (4e):

MP. 239 ^{o}C. **Yield** 93.32%. **IR (KBr) (υmax, cm^{-1})**: 3745.76(OH), 3579.88, 3433.29(NH_2), 3332.99(NH), 3008.95(ArCH), 2889.37(Ali CH), 1693.50(C=N), 1286.25(C-N), 1244.09 & 1033.85(Ar ether C-O). **^{1}HNMR** (DMSO-d6): δ 8.19(s, 1H, OH, exchangeable with D_2O), 7.63(s, 1H, NH), 7.12-6.75(m, 3H, ArH), 6.28(s, 2H, NH_2), 3.78(s, 3H, OCH_3), 2.2(s, 1H, CH), 1.79(s, 3H, CH_3). **^{13}C NMR** (DMSO-d6): 147.69(C7), 146.64(C2), 140.04(C4), 127.8(C3), 119.25(C6), 115.4(C5), 78.96(C9), 55.3(C1), 39.48(C8), 20.38(C10). **Anal. Calcd**. For $C_{10}H_{14}O_2N_4$: C, 54.05%; H, 6.30%; N, 25.22%. **Found:** C, 54.00%; H, 6.30%; N, 25.20%.

Spectral analysis of (1Z)-N'-[(Z)-(4-methoxyphenyl) methylidene] ethane hydrazonohydrazide (4f):

MP = 210^{0}C. **Yield** 92.33%. **IR (KBr) (υmax, cm^{-1})**: 3018.6(ArCH), 2889.37(Ali CH), 1602.85(C=N), 1255.66(C-N), 1234.44, 1089.78(Ar ether C-O). **^{1}HNMR** (DMSO-d6): δ 8.6 (s, 1H, CH), 7.25-7.91 (m, 4H, ArH), 7.01 (s, 2H, NH_2), 3.83 (s, 3H, OCH_3), 2.51(NH), 2.18(s, 3H, CH_3). **^{13}CNMR** (DMSO): 165.31(C2), 158.86(C9), 158.17(C8), 131.07(C4=C6), 114.45(C3=C7), 55.26(C1), 20.38(C10). **Anal. Calcd**. % for $C_{10}H_{14}N_4O$: C 58.25; H 6.79; N 27.18. **Found** %: C 58.20; H 6.84; N 27.15.

Characterization data of (5a-f):

Spectral analysis of 4-[(*Z*)-{[(5*Z*)-3-methyl-5-(phenylimino)-1,5-dihydro-4*H*-1,2,4-triazol-4-yl]imino} methyl] phenol (5a):

MP =155, **Yield** 91%. **IR (KBr) (υmax, cm^{-1}):** 3186.40(N-H), 3059.10(Ar C-H), 2924.09(Ali C-H) 1691.57(C=N), 1309.67(C-N). **^{1}HNMR** (DMSO-d6): δ 9.99(s, 1H, O-H), 7.6-6.8(m, 9H, ArH), 2.17(s, 1H, CH), 7.89(s, 1H, NH), 1.95(s, 3H, CH_3). **^{13}CNMR** (DMSO-d6): 127.15(C1=C5), 129.90(C2=C4), 160.27(C3), 39.48(C7), 38.85(C8), 78.48(C9), 79.14(C10), 157.36(C11), 125.23(C12=C16), 123.28(C13=C15), 115.55(C14). **Anal. Calcd**. % for $C_{16}H_{15}N_5O$: C-65.45; H-4.77; N- 23.48. **Found** %: C-65.48; H-4.73; N-23.52.

Spectral analysis of (3*Z*)-5-methyl-4-{(*Z*)-[(3-nitrophenyl) methylidene] amino}-*N*-phenyl-2, 4-dihydro-3*H*-1, 2, 4-triazol-3-imine (5b):

MP =155, **Yield** 92%. **IR (KBr) (υmax, cm^{-1})**: 3641.60 (NH), 3093.82(ArCH), 2910.85(Ali CH), 1693.5 (N=C), 1531.48 & 1408.04(NO_2), 1311.59(C-N). **^{1}HNMR** (DMSO-d6): δ 10.14 (s, 1H, NH), 8.88-7.66 (m, 9H, ArH), 2.5 (s, 1H, CH), 1.98 (s, 3H, CH_3). **^{13}CNMR** (DMSO-d6): 148.16(C1), 143.16(C11), 140.06(C5), 136.28(C6), 135.25(C3), 134.84(C2), 134.39(C4), 133.01(C12=C16), 130.77(C13=C15), 128.34(C14), 79.16(C10), 78.51(C9), 39.56(C7),

20.16(C8). **Anal. Calcd**. % for $C_{16}H_{14}N_6O_2$: C-57.83; H-4.21; N- 25.30. **Found** %: C-57.78; H-4.28; N-25.26.

Spectral analysis of N, N-dimethyl-4-[(Z)-{[(5Z)-3-methyl-5-(phenylimino)-1,5-dihydro-4H-1,2,4-triazol-4-yl]imino} methyl] aniline (5c):

MP =152^{0}C, **Yield** 90%. **IR (KBr) (υmax, cm^{-1})**: 3134.33(N-H), 3082.25(Ar C-H) , 2800.64(Ali C-H), 1697.36(C=N), 1321.24(C-N). **^{1}HNMR** (DMSO-d6): δ 2.80(s, 6H, CH_3), 7.8-6.7(m, 9H, ArH), 2.51(s, 1H, C-H), 7.84(s, 1H, N-H), 2.49(s, 3H, CH_3). **^{13}CNMR** (DMSO-d6): 39.71(C1=C2), 159.81(C3), 152.22(C4=C8), 151.82(C5=C7), 157.88(C6), 38.91(C9), 42.82(C10), 78.56(C11), 79.22(C12), 161.65(C13), 129.24(C14=C18), 121.55(C15=C17). **Anal. Calcd**. % for $C_{18}H_{20}N_6$: C-67.41; H-6.24; N-26.21**. Found** %: C-67.46; H-6.20; N-26.19.

Spectral analysis of (3*Z*)-5-methyl-*N*-phenyl-4-{(*Z*)-[(2*E*)-3-phenylprop-2-en-1-ylidene] amino}-2, 4-dihydro-3*H*-1, 2, 4-triazol-3-imine (5d):

MP =155, **Yield** 92%. **^{1}HNMR** (DMSO-d6): δ 7.93 (s, 1H, NH), 7.78-6.78 (m, 10H, ArH), 6.47 (d, 1H, CH), 6.43 (d, 1H, CH), 2.14 (s, 3H, CH_3), 1.95 (s, 1H, CH). **^{13}CNMR** (DMSO-d6): 152.71(C13), 147.59(C4), 144.87(C7), 143.69(C8), 135.81(C14=C18), 134.15(C3=C5), 130.91(C15=C17), 128.94(C2=C6), 125.18(C1), 79.01(C12), 78.68(C11), 39.55(C9), 20.09(C10). **Anal. Calcd**. % for $C_{18}H_{17}N_5$: C-71.28; H-5.61; N- 23.10. **Found** %: C-71.20; H-5.66; N-22.96.

Spectral analysis of 2-methoxy-4-[(*Z*)-{[(5*Z*)-3-methyl-5-(phenylimino)-1,5-dihydro-4*H*-1,2,4-triazol-4-yl]imino}methyl]phenol (5e):

MP =150^0 C, **Yield** 91%. **IR (KBr) (υmax, cm^{-1}):** 3172.90(N-H), 3057.17(Ar C-H), 2850.79(Ali C-H) 1691.57(C=N), 1311.59(C-N), 1238.30(O-C). **^{1}HNMR** (DMSO-d6): δ 3.37(s, 3H, CH_3), 7.5-6.8(m, 8H, ArH), 2.50(s, 1H, CH), 8.54(s, 1H, NH), 9.63(s, 1H, OH), 3.85(s, 3H, OCH_3). **^{13}CNMR** (DMSO-d6): 55.46(C1), 149.86(C2), 160.44(C3), 125.66(C4), 124.19(C5), 128.78(C6), 127.92(C7), 38.91(C8), (C9), 78.56(C10), 79.19(C11), 147.89(C12), 122.86(C13=C17), 116.75(C14=C16), 115.39(C15). **Anal. Calcd.** % for $C_{17}H_{17}N_5O_2$: C-63.09; H-5.25; N-21.64. **Found** %: C-63.07; H-5.27; N-21.60.

Spectral analysis of (3*Z*)-4-{(*Z*)-[(4-methoxyphenyl) methylidene] amino}-5-methyl-*N*-phenyl-2, 4-dihydro-3*H*-1, 2, 4-triazol-3-imine (5f):

M.P =155, Yield 93%. **IR (KBr) (υmax, cm^{-1})**: 3118.90 (NH bridged), 3012.81(ArCH), 1693.5 (N=C), 1301.95(C-N), 1255.66 & 1026.13(C-O). **^{1}HNMR** (DMSO-d6): δ 7.95 (s, 1H, NH), 7.81-6.88 (m, 9H, ArH), 2.52 (s, 3H, OCH_3), 2.15 (s, 3H, CH_3), 1.96 (s, 1H, CH). **^{13}CNMR** (DMSO-d6): 147.57(C2), 144.88(C12), 143.67(C5), 138.32(C3=C7), 137.69(C4=C6), 128.68(C13=C17),

126.69(C14=C16), 125.22(C15), 79.09(C11), 78.43(C10), 40.19(C1), 39.57(C8), 20.11(C9). **Anal. Calcd**. % for $C_{17}H_{17}N_5O$: C-66.45; H-5.53; N- 22.81. **Found** %: C-66.40; H-5.49; N-22.52.

BIOLOGICAL ACTIVITIES

These ethane hydrazonohydrazide were tested against bacterium **B. subtilis, E. coli, S. aureus** and **S. ablong**. It was found that compound **(3a)** was highly active against **B. subtilis, E. coli** and compound **(3e)** is also highly active against **B. subtilis, E. coli** and **S. ablong** respectively.

All these compounds are also checked for their antifungal activity against **Candida** and **A.niger.** Out of these compounds **(3c)** highly active against **A. niger** and compound **(3d)** moderately active against **Candida**. Other compounds are inactive and some shows weak antifungal activity.

Table: Antibacterial Activities of hydrazonohydrazide

	B. subtilis	E. Coli	S. aureus	S. ablong
3a	+++	+++	-	NiI
3b	-	+	-	-
3c	-	+	NiI	NiI
3d	-	+	-	+
3e	+++	+++	-	+++
3f	Nil	Nil	-	Nil

Table: Antifungal Activities of hydrazonohydrazide

	Candida	A. niger
3a	-	-
3b	+	-
3c	-	+++
3d	++	-
3e	-	-
3f	-	+

Newly synthesized 1,2,4-triazoles were screened for their antibacterial activities against **B. subtilis, E. Coli, S. aureus** and **S. ablong** and antifungal activities against **Candida, A.niger**. It is observed that the following compounds gave bacterial activities. Compound **(5a)** highly active against **B. subtilis** and moderately against **E. coli.** Other compounds are inactive and weakly active against **B. subtilis, E. coli, S. aureus** and **S. ablong**

Synthesized 1, 2, 4-triazoles derivatives were tested for antifungal activities against **Candida, A.niger**

Compound **(5a)** and **(5e)** showed moderate activities against **Candida** and compound **(5e)** and **(5f)** are highly active against **A.niger.**

Table: Antibacterial activities of the 1, 2, 4-triazoles

	B. subtilis	E. Coli	S. aureus	S. ablong
5a	+++	++	+	-

5b	+	-	-	-
5c	-	-	-	-
5d	+	+	-	-
5e	+	-	+	-
5f	+	+	+	-

	Candida	**A.niger**
5a	++	+
5b	+	+
5c	-	-
5d	-	+++
5e	++	+++
5f	-	-

Table: Antifungal activities of the 1, 2, 4-triazoles

(-) = inactive (less than 12mm), (+) = weakly active (12-16mm)

(++) = moderately active (17-20mm), (+++) = highly active (21-30mm)

CONCLUSION

We have developed very simple and capable method for synthesis of substituted hydrazonohydrazide and1, 2, 4-triazoles. The intermediate hydrazonohydrazide can be effectively used for formation of different heterocyclic compounds. All the compounds were tested for their antifungal and antibacterial activity against various Gram-positive and Gram-negative bacteria and fungi. Results showed that some compounds have significant antibacterial and antifungal activity.

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