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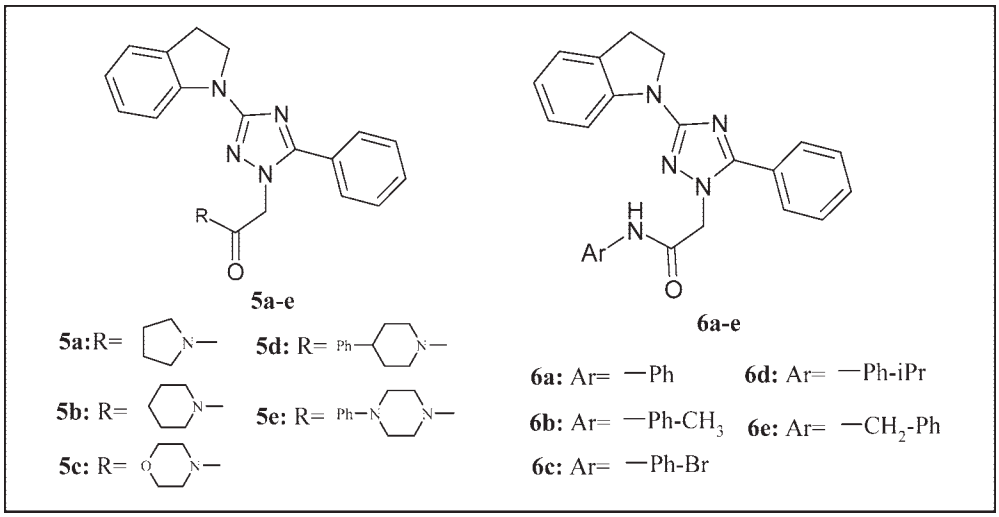

Triazole skeleton is ubiquitous in pharmaceutically important compounds. A novel series of indoline-containing triazole with different amides are described, which exhibit antibacterial and antifungal activities. The chemical synthesis strategies used, the complete characterization of the compounds, their *in vitro* screening, and the promising activity as reflected in the MIC values are reported.

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INTRODUCTION

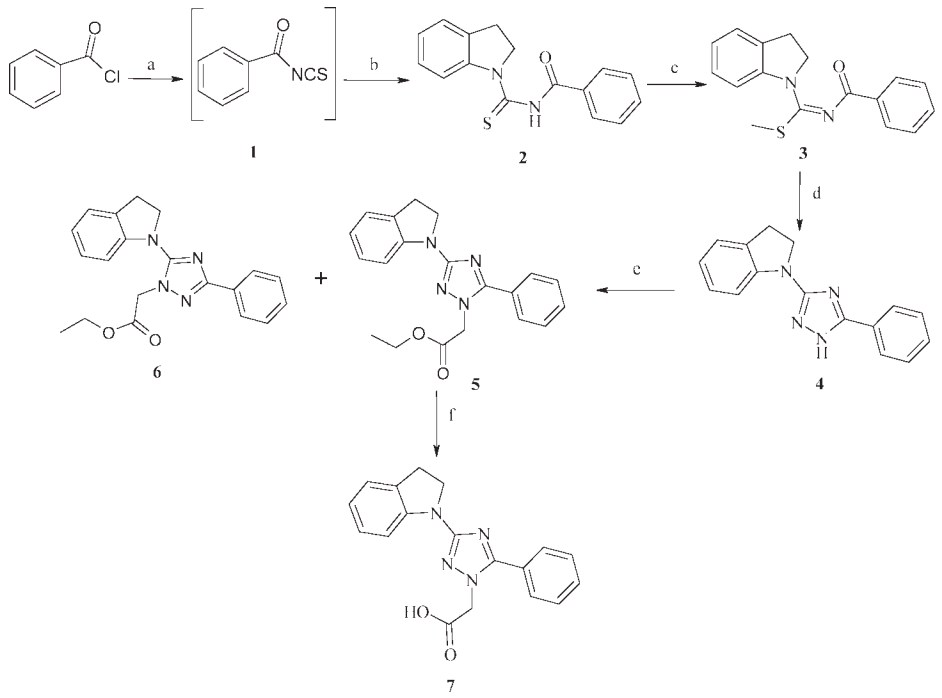
Developing new antimicrobial agents (antibacterial and antifungal) continues to attract attention and is an area of rigorous research. Although a large number of antibiotics and chemotherapeutics are available for medical use, the antimicrobial resistance created a substantial need of new class of antimicrobial agents in the last decades [1–3].

Triazole and its derivatives have distinct status as pharmaceutical agents. They have been found to have high therapeutic value as antifungal [4–6], anti-inflammatory [7], antimalarial [8], antiviral [9], antihypertensive [10], analgesic [11], antihyperuricemic [12], and anticancer agents [13,14]. Recently, synthesis of trisubstituted 1,2,4-triazole derivatives reported as a modulator of nicotinic receptor agonist [15] and antitumor and antiviral agents [16], in addition triazole derivatives revealing promising antimicrobial activities [17–23]. In continued quest of new antimicrobial agents, we designed and synthesized novel 1,2,4-triazole derivatives containing indoline ring. Structures of the products were characterized by IR, ^{1}H-NMR, mass spectrometry, and elemental analysis. Results of biological activities indicate that some compounds possess potential antimicrobial activity.

RESULTS AND DISCUSSION

Chemistry. The synthetic strategy involved in the synthesis of intermediate and target compounds is outlined in Schemes 1 and 2. The key intermediate [3-(2,3-dihydroindol-1-yl)-5-phenyl[1,2,4] triazol-1-yl]acetic acid **7** was prepared as outlined in Scheme 1 [24,25]. Benzoyl chloride reacted with ammonium thiocyanate to obtain benzoyl thiocyanate **1**, which was treated *in situ* with indoline to provide the addition product *N*-benzoyl thiourea **2** [26]. The addition product **2** was methylated by methyl iodide to produce *N*-benzoyl-S-methylisothiourea **3**, which was further cyclized with hydrazine hydrated in refluxing ethanol to give the triazole **4**. The triazole **4** was alkylated by ethyl bromoacetate in the presence of sodium hydride in dry THF to afford two regioisomers **5** and **6**. The isomer **5** was hydrolyzed in the presence of aqueous LiOH to give the corresponding

Scheme 1. Reagents and conditions: (a) ammonium thiocyanate, acetone, 56°C, 30 min; (b) indoline, acetone, 56°C, 1 h; (c) methyl iodide, K_2CO_3, DMF, rt, 1 h; (d) hydrazine hydrate, ethanol, reflux, 5 h; (e) ethyl bromoacetate, NaH, THF, rt, 4 h; (f) aq. $LiOH.H_2O$, THF-methanol, rt, 5 h.



acid derivative **7**, which was used as a key intermediate for the synthesis of target compounds.

The two regioisomers **5** and **6** were separated by chromatography on silica gel, and the resulting regioisomer ethyl [3-(2,3-dihydroindol-1-yl)-5-phenyl[1,2,4] triazol-1-yl]acetate **5** was the major product. The structures of these two regioisomers **5** and **6** were assigned based on NMR analysis and confirmed by NOE NMR experiments [24,27] (Fig. 1).

The synthesis of target compounds **8a–e** and **9a–e** is outlined in Scheme 2. The amide coupling of [3-(2,3-dihydroindol-1-yl)-5-phenyl[1,2,4] triazol-1-yl]acetic acid **7** was carried out with different amines, in the presence of EDCI in THF at room temperature, with excellent yield.

The structures of all the intermediates and final compounds **8a–e** and **9a–e** were found on the basis of elemental analysis and spectrographic (IR, ^{1}H-NMR, and Mass) data. The physical characterization data are listed in Table 1.

Biological activities. The newly synthesized derivatives were evaluated for their *in vitro* antibacterial activity against gram-negative *E. coli*, *P. aeruginosa*, gram-positive *S. aureus*, *S. pyogenes*, and antifungal activity against *C. albicans* and *A. niger* by microbroth dilution methods [28–30]. The standard strains used for screening of antibacterial and antifungal activities were procured from the Institute of Microbial Technology (IMTECH), Chandigarh, India. The MIC values are given in Table 2. The standard drug used for antibacterial activity was ciprofloxacin and nystatin for antifungal activity. Mueller Hinton broth was used as nutrient medium for bacteria and Sabouraud dextrose broth for fungal to grow. Inoculum size for test strain was adjusted to 108 CFU/mL by comparing the turbidity. Serial dilutions were prepared for primary and secondary screening. The target compounds and standard drugs were dissolved in DMSO water at a concentration of 2.0 mg/mL. In primary screening, 500, 250, and 125 μg/mL

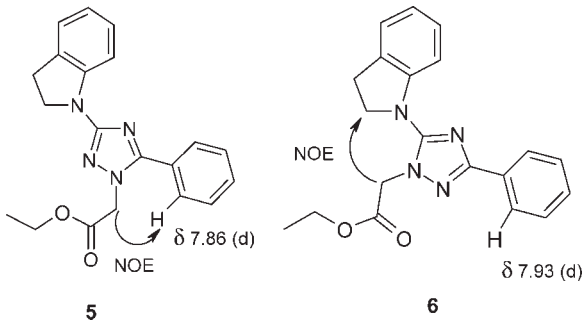
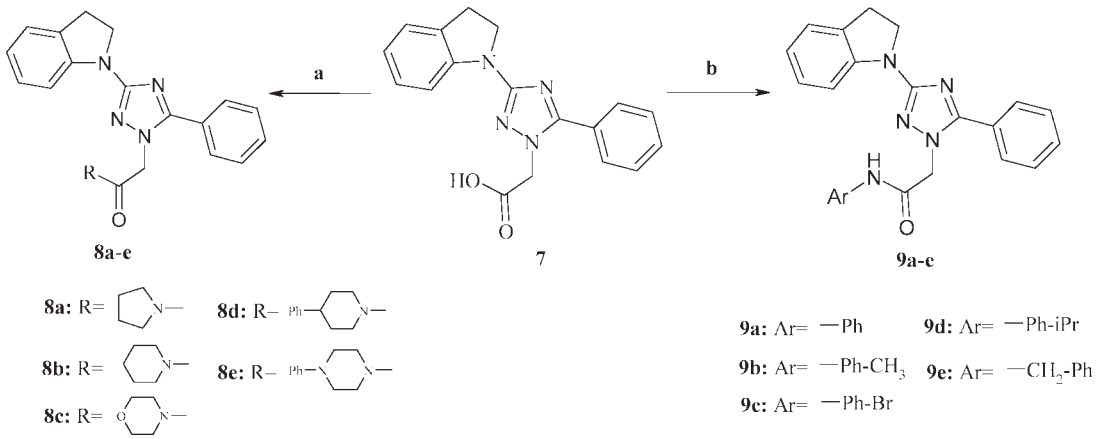


Figure 1. NOE was observed between 1-methylene and ortho-proton of phenyl group of compound **5** and between 1-methylene and *N*-methylene group of compound **6**. Chemical shift of ortho-hydrogen of phenyl in compound **6** was more downfield because of extra deshielding effect from the triazole ring.

Scheme 2. Reagents and conditions: (a) corresponding secondary cyclic amine, EDCI, DIPEA, THF, rt, 5–10 h and (b) corresponding aromatic amine, EDCI, DIPEA, THF, rt, 5–8 h.



concentrations of the synthesized drugs were taken. Data were not taken for the initial solution, because of the high DMSO concentration (10%). The active synthesized drugs found in this primary screening were further tested in a second set of dilution against all microorganisms. In secondary screening, the drugs found active in primary screening were similarly diluted to obtain 100, 50, 25, 12.5, and 6.250 μg/mL concentrations. The inoculated wells were incubated overnight at 37°C in a humid atmosphere. The highest dilution showing at least 99% inhibition zone is taken as MIC.

Results of antibacterial and antifungal activities of screened compounds indicate that some compounds possess comparable antibacterial activity with respect to reference drug ciprofloxacin. Compounds **8a–e** with secondary amide functionality exhibited moderate to excellent activity against all the tested bacterial strains, but not showed satisfactory activity against fungal strains. Compound **8a** exhibited excellent activity against *E. coli*, whereas moderate activity against *P. aeruginosa* and *S. aureus*. Compound **8b** showed very good active against *P. aeruginosa* only, whereas compound **8c** exhibited moderate activity against all the tested bacteria except *S. pyogenes*. Compound **8e** showed excellent activity against *S. aureus* and moderate activity against all the other tested bacteria. While the other series with aromatic amide functionality, compounds **9a–e**, did not show comparable inhibition with any tested bacterial and fungal organisms.

EXPERIMENTAL

Melting points were determined with a Buchi B-545 melting point apparatus and are uncorrected. IR spectra were recorded on a Perkin-Elmer PE-1600 FTIR spectrometer in KBr disc. ^{1}H-NMR spectra were recorded on a Varian 400 spectrometer in DMSO-d_6 as a solvent and TMS as an internal standard. Peak values are shown in δ ppm. EI-MS spectra were measured on a Waters mass spectrometer. Progress of the reaction was checked by thin layer chromatography (TLC) on silica gel-coated aluminum sheets (silica gel 60 F254) using a mixture of ethyl acetate and hexane (5:5 v/v). All of the solvents and materials were reagent grade and purified as required.

***N*-(2,3-Dihydroindole-1-carbothioyl)benzamide (2).** Benzoyl chloride was added to a stirred solution of NH_4SCN (3.51 g, 0.046 mol) in acetone (30 mL), and the resultant suspension was refluxed for 30 min and then cooled to room temperature. A solution of indoline (5.0 g, 0.042 mol) in acetone (30 mL)

Table 1

Physical characterization data of compounds **8a–e** and **9a–e**.

Compound	Physical state	Time (h)	Mp (°C)	Yield (%)	Molecular formula	M_W
8a	Off-white crystal	5	180–181	77	$C_{22}H_{23}N_5O$	373
8b	Off-white crystal	5	178–180	73	$C_{22}H_{23}N_5O_2$	389
8c	White crystal	4	129–131	69	$C_{23}H_{25}N_5O$	387
8d	Off-white crystal	5	187–189	81	$C_{29}H_{29}N_5O$	463
8e	White crystal	4	172–174	69	$C_{28}H_{28}N_6O$	464
9a	White crystal	4	183–185	83	$C_{24}H_{21}N_5O$	395
9b	White crystal	5	181–183	71	$C_{25}H_{23}N_5O$	409
9c	White crystal	6	197–200	79	$C_{24}H_{20}BrN_5O$	474
9d	Off-white crystal	5	179–181	73	$C_{27}H_{27}N_5O$	437
9e	White crystal	4	199–201	81	$C_{25}H_{23}N_5O$	409

Table 2

Antimicrobial activity data of newly synthesized compounds **8a–e** and **9a–e**.

	Antibacterial MIC (μg/mL)				Antifungal MIC (μg/mL)	
Compounds	*E.coli* MTCC 443	*P. aeruginosa* MTCC 1688	*S. aureus* MTCC 96	*S. pyogenes* MTCC 442	*C. albicans* MTCC 227	*A. niger* MTCC 82
8a	50	100	125	500	1000	500
8b	125	62.5	125	250	1000	1000
8c	62.5	100	62.5	500	500	1000
8d	100	125	200	500	1000	500
8e	100	125	50	100	1000	1000
9a	250	500	500	500	500	1000
9b	500	500	250	500	1000	1000
9c	250	250	250	250	500	1000
9d	500	500	500	125	200	200
9e	500	500	500	500	200	200
Ciprofloxacin	25	25	50	50	–	–
Nystatin	–	–	–	–	100	100

was added and the mixture was refluxed for 1 h. Reaction mixture was cooled to room temperature and poured in to water, and the resulting white solid was filtered and washed with water. Solid was recrystallized in ethanol giving pure compound **3** as off-white solid. Yield 9.79 g (83.0%), m.p. 140–142°C; ^{1}H-NMR (DMSO-d_6): δ 3.17–3.25 (t, 2H, CH_2, J = 8.5 Hz), 4.10–4.21 (t, 2H, CH_2, J = 8.6 Hz), 6.95–7.19 (m, 2H, ArH), 7.23–7.31 (d, 1H, ArH), 7.41–7.56 (m, 3H, ArH), 7.86–8.01 (m, 3H, ArH), 12.3 (bs, 1H, NH); ms: *m/z* 281 (M-1). Anal. Calcd. for $C_{16}H_{14}N_2OS$: C, 68.06; H, 5.00; N, 9.92; Found: C, 68.21; H, 4.89; N, 9.78.

***N*-[1-(2,3-Dihydroindol-1-yl)-1-methylsulfanyl-methylidene] benzamide (3).** Methyl iodide (2.38 mL, 0.038 mol) was added to a stirred suspension of compound **2** (9.0 g, 0.031 mol) and anhydrous K_2CO_3 (6.4 g, 0.046 mol) in DMF (50 mL) and stirred for 1 h at room temperature. Reaction mixture was poured in water (200 mL) and stirred for 15 min. The resulting off-white solid was filtered, washed with water, and dried *in vacuo*. Solid was crystallized from rectified spirit to give compound **3** as off-white solid. Yield 7.33 g (78.0%), m.p. 87–89°C; ^{1}H-NMR (DMSO-d_6): δ 2.234 (s, 3H, CH_3); 3.17–3.25 (t, 2H, CH_2, J = 8.5 Hz), 4.17–4.25 (t, 2H, CH_2, J = 8.5 Hz), 7.02–7.20 (m, 2H, ArH), 7.28–7.32 (d, 1H, ArH), 7.43–7.58 (m, 3H, ArH), 8.02–8.09 (m, 3H, ArH); ms: *m/z* 297 (M+1). Anal. Calcd. for $C_{17}H_{16}N_2OS$: C, 68.89; H, 5.44; N, 9.45; Found: C, 68.77; H, 5.58; N, 9.33.

1-(5-Phenyl-1*H*-[1,2,4]triazol-3-yl)-2,3-dihydro-1*H*-indole (4). A solution of compound **3** (7.0 g, 0.023 mol) and hydrazine hydrate (1.78 mL, 0.035 mol) in ethanol (50 mL) was refluxed for 5 h, cooled, and poured into water (100 mL), and the mixture was stirred at room temperature. The resulting white solid was collected by filtration and washed with water to give a crude compound **3**. The solid was recrystallized in ethanol to give a pure compound **4** as white solid. Yield 4.64 g (75%), m.p. 131–133°C; ^{1}H-NMR (DMSO-d_6): δ 3.16–3.25 (t, 2H, CH_2, J = 8.2 Hz), 3.92–4.01 (t, 2H, CH_2, J = 8.2 Hz), 6.72–6.81 (t, 1H, ArH), 7.13–7.21 (m, 2H, ArH), 7.49–7.53 (m, 3H, ArH), 7.69–7.73 (m, 2H, ArH), 7.81–7.86 (m, 1H, ArH), 12.9 (s, 1H, NH); ms: *m/z* 263 (M+1). Anal. Calcd. for $C_{16}H_{14}N_4$: C, 73.26; H, 5.38; N, 21.36; Found: C, 73.12; H, 5.51; N, 21.48.

Ethyl[3-(2,3-dihydroindol-1-yl)-5-phenyl[1,2,4]triazol-1-yl] acetate (5) and ethyl[5-(2,3-dihydroindol-1-yl)-3-phenyl[1, 2,4]triazol-1-yl]acetate (6). A solution of compound **4** (4.5 g, 0.017 mol) in dry THF was treated with NaH (1.0 g, 0.025 mol) at room temperature for 20 min, followed by ethyl bromoacetate (2.0 mL, 0.018 mol). The reaction mixture was stirred for 4 h at room temperature, and TLC indicated two products. The mixture was evaporated and the product was separated by chromatography on silica gel (20% EtOAc/hexane) to afford **5** and **6**.

***5*.** The major product, white solid. Yield 3.76 g (63%), m.p. 160–162°C; ^{1}H-NMR (DMSO-d_6): δ 1.28–1.30 (t, 3H, CH_3, J = 7.10 Hz), 3.17–3.20 (t, 2H, CH_2, J = 8.30 Hz), 4.02–4.06 (t, 2H, CH_2, J = 8.30 Hz), 4.11–4.13 (q, 2H, CH_2, J = 7.11 Hz), 4.99 (s, 2H, CH_2), 6.77–6.81 (t, 1H, ArH), 7.11–7.15 (t, 1H, ArH), 7.17–7.19 (d, 1H, ArH), 7.55–7.57 (m, 3H, ArH), 7.70–7.73 (m, 2H, ArH), 7.84–7.86 (d, 1H, ArH); ms: *m/z* 349 (M+1). Anal. Calcd. for $C_{20}H_{20}N_4O_2$: C, 68.95; H, 5.79; N, 16.08; Found: C, 68.73; H, 5.93; N, 15.90.

***6*.** The minor product, white solid. Yield 0.59 g (10%), m.p. 171–163°C; ^{1}H-NMR (DMSO-d_6): δ 1.27–1.29 (t, 3H, CH_3, J = 7.10 Hz), 3.14–3.16 (t, 2H, CH_2, J = 8.25 Hz), 3.28–3.34 (m, 2H, CH_2), 4.10–4.12 (q, 2H, CH_2, J = 7.10 Hz), 5.05 (s, 2H, CH_2), 6.85–6.89 (t, 1H, ArH), 7.17–7.19 (t, 1H, ArH), 7.22–7.24 (t, 1H, ArH), 7.57–7.60 (m, 3H, ArH), 7.77–7.79 (m, 2H, ArH), 7.91–7.93 (dd, 1H, ArH); ms: *m/z* 349 (M+1). Anal. Calcd. for $C_{20}H_{20}N_4O_2$: C, 68.95; H, 5.79; N, 16.08; Found: C, 68.76; H, 5.87; N, 15.88.

[3-(2,3-Dihydro-indol-1-yl)-5-phenyl[1,2,4]triazol-1-yl]acetic acid (7). A solution of compound **6** (3.70 g, 0.010 mol) in THF-MeOH (20:20 mL) was treated with LiOH.$H_2$0 (0.89 g, 0.021 mol) at room temperature for 5 h, and the mixture was evaporated *in vacuo*. Water (50 mL) was added to the residue and washed with ethyl acetate (20 mL). Aqueous layer was acidified to pH 4 by adding dil. HCl, and the resulting precipitate was filtered, washed with water, and dried *in vacuo* to give compound **7** as white solid. Yield 2.75 g (81%), m.p. 200–202°C; ^{1}H-NMR (DMSO-d_6): δ 3.13–3.21 (t, 2H, CH_2, J = 8.31 Hz), 4.00–4.08 (t, 2H, CH_2, J = 8.31 Hz), 4.99 (s, 2H, CH_2), 6.75–6.83 (t, 1H, ArH), 7.10–7.20 (m, 2H, ArH), 7.54–7.57 (m, 3H, ArH), 7.70–7.74 (m, 2H, ArH), 7.84–7.88 (d, 1H,

ArH), 13.51 (s, 1H, COOH); ms: *m/z* 319 (M-1). Anal. Calcd. for $C_{18}H_{16}N_4O_2$: C, 67.49; H, 5.03; N, 17.49; Found: C, 67.57; H, 5.16; N, 17.31.

General procedure for the synthesis of compounds 8a–e and 9a–e. A stirred solution of compound **6** (0.625 mmol), corresponding amino derivative (0.687 mmol), and diisopropylethylamine (1.25 mmol) in anhydrous THF (10 mL) was cooled to 0°C. EDCI (0.750 mmol) was added to the above mixture, and the resulting solution was stirred at room temperature for 5–7 h. The reaction mixture was evaporated *in vacuo*, and water (50 mL) was added to the residue and acidified to pH 4 by adding dil. HCl. The solid separated was collected by filtration, washed with water, and dried. Compound was recrystallized from 95% ethanol to give pure compounds **8a–e** and **9a–e**. The yield, the reaction time, and the physical properties are reported in Table 1.

2-[3-(2,3-Dihydro-indol-1-yl)-5-phenyl-[1,2,4]triazol-1-yl]-1-pyrrolidin-1-yl-ethanone (8a). IR υ (cm^{-1}): 1675 (C=O); ^{1}H-NMR (DMSO-d_6): δ 2.12–2.20 (m, 4H, $2CH_2$), 3.12–3.23 (t, 2H, CH_2, J = 8.25 Hz), 3.41–3.63 (m, 4H, $2CH_2$), 3.91–4.00 (t, 2H, CH_2, J = 8.25 Hz), 5.21 (s, 2H, CH_2), 6.78–6.80 (t, 1H, ArH), 7.13–7.19 (m, 2H, ArH), 7.52–7.55 (t, 3H, ArH), 7.66–7.80 (m, 2H, ArH), 7.85–7.90 (dd, 1H, ArH); ms: *m/z* 374 (M+1). Anal. Calcd. for $C_{22}H_{23}N_5O$: C, 70.76; H, 6.21; N, 18.75; Found: C, 70.89; H, 6.09; N, 18.84.

2-[3-(2,3-Dihydro-indol-1-yl)-5-phenyl-[1,2,4]triazol-1-yl]-1-morpholin-4-yl-ethanone (8b). IR υ (cm^{-1}): 1678 (C=O); ^{1}H-NMR (DMSO-d_6): δ 3.11–3.25 (t, 2H, CH_2, J = 8.20 Hz), 3.45–3.68 (m, 8H, $4CH_2$), 3.99–4.05 (t, 2H, CH_2, J = 8.20 Hz), 5.22 (s, 2H, CH_2), 6.77–6.80 (t, 1H, ArH), 7.11–7.19 (m, 2H, ArH), 7.54–7.57 (t, 3H, ArH), 7.68–7.85 (m, 2H, ArH), 7.87–7.94 (dd, 1H, ArH); ms: *m/z* 390 (M+1). Anal. Calcd. for $C_{22}H_{23}N_5O_2$: C, 67.85; H, 5.95; N, 17.98; Found: C, 67.91; H, 5.81; N, 17.81.

2-[3-(2,3-Dihydro-indol-1-yl)-5-phenyl-[1,2,4]triazol-1-yl]-1-piperidin-1-yl-ethanone (8c). IR υ (cm^{-1}): 1664 (C=O); ^{1}H-NMR (DMSO-d_6): δ 1.62–1.71 (m, 6H, $3CH_2$), 3.13–3.24 (t, 2H, CH_2, J = 8.20 Hz), 3.38–3.43 (m, 4H, $2CH_2$), 3.91–3.99 (t, 2H, CH_2, J = 8.20 Hz), 5.20 (s, 2H, CH_2), 6.80–7.19 (m, 3H, ArH), 7.54–7.57 (t, 3H, ArH), 7.69–7.81 (m, 2H, ArH), 7.85–7.90 (m, 1H, ArH); ms: *m/z* 388 (M+1). Anal. Calcd. for $C_{23}H_{25}N_5O$: C, 71.29; H, 6.50; N, 18.07; Found: C, 71.42; H, 6.37; N, 18.23.

2[3-(2,3-Dihydro-indol-1-yl)-5-phenyl[1,2,4]triazol-1-yl]-1-(4-phenyl-piperidin-1-yl) ethanone (8d). IR υ (cm^{-1}): 1679 (C=O); ^{1}H-NMR (DMSO-d_6): δ 1.80–1.86 (m, 4H, $2CH_2$), 2.78–2.81 (m, 1H, CH), 3.13–3.24 (t, 2H, CH_2, J = 8.25 Hz), 3.40–3.44 (m, 4H, $2CH_2$), 3.96–4.07 (t, 2H, CH_2, J = 8.25 Hz), 5.21 (s, 2H, CH_2), 6.80–7.19 (m, 3H, ArH), 7.54–7.57 (t, 5H, ArH), 7.69–7.81 (m, 5H, ArH), 7.85–7.90 (m, 1H, ArH); ms: *m/z* 464 (M+1). Anal. Calcd. for $C_{29}H_{29}N_5O$: C, 75.14; H, 6.31; N, 15.11; Found: C, 75.29; H, 6.19; N, 15.23.

2[3-(2,3-Dihydro-indol-1-yl)-5-phenyl[1,2,4]triazol-1-yl]-1-(4-phenyl-piperazin-1-yl) ethanone (8e). IR υ (cm^{-1}): 1668 (C=O); ^{1}H-NMR (DMSO-d_6): δ 3.13–3.24 (t, 2H, CH_2, J = 8.22 Hz), 3.40–3.44 (m, 4H, $2CH_2$), 3.61–3.64 (m, 4H, $2CH_2$), 3.96–4.07 (t, 2H, CH_2, J = 8.20 Hz), 5.23 (s, 2H, CH_2), 6.83–7.21 (m, 3H, ArH), 7.58–7.62 (t, 5H, ArH), 7.71–7.83 (m, 5H, ArH), 7.85–7.90 (m, 1H, ArH); ms: *m/z* 465 (M+1). Anal. Calcd. for $C_{28}H_{28}N_6O$: C, 72.39; H, 6.08; N, 18.09; Found: C, 72.21; H, 6.22; N, 18.21.

2[3-(2,3-Dihydro-indol-1-yl)-5-phenyl[1,2,4]triazol-1-yl]-N-phenyl-acetamide (9a). IR υ (cm^{-1}): 3415 (N—H), 1674 (C=O); ^{1}H-NMR (DMSO-d_6): δ 3.16–3.18 (t, 2H, CH_2, J = 8.24 Hz), 3.97–4.12 (t, 2H, CH_2, J = 8.22 Hz), 5.13 (s, 2H, CH_2), 6.78–6.86 (t, 1H, ArH), 7.08–7.18 (m, 3H, ArH), 7.32–7.41 (t, 2H, ArH), 7.55–7.60 (m, 5H, ArH), 7.81–7.97 (m, 3H, ArH), 10.56 (bs, 1H, NH); ms: *m/z* 396 (M+1). Anal. Calcd. for $C_{24}H_{21}N_5O$: C, 72.89; H, 5.35; N, 17.71; Found: C, 72.77; H, 5.43; N, 17.83.

2[3-(2,3-Dihydro-indol-1-yl)-5-phenyl[1,2,4]triazol-1-yl]-N-p-tolyl-acetamide (9b). IR υ (cm^{-1}): 3450 (N—H), 1679 (C=O); ^{1}H-NMR (DMSO-d_6): δ 2.41 (s, 3H, CH_3), 3.20–3.21 (t, 2H, CH_2, J = 8.21 Hz), 3.89–3.93 (t, 2H, CH_2, J = 8.20 Hz), 5.10 (s, 2H, CH_2), 6.80–6.82 (m, 1H, ArH), 7.10–7.16 (m, 3H, ArH), 7.30–7.37 (m, 2H, ArH), 7.60–7.65 (m, 4H, ArH), 7.91–7.97 (m, 3H, ArH), 10.66 (bs, 1H, NH); ms: *m/z* 410 (M+1). Anal. Calcd. for $C_{25}H_{23}N_5O$: C, 73.33; H, 5.66; N, 17.10; Found: C, 73.47; H, 5.51; N, 16.91.

N-(4-Bromo-phenyl)-2-[3-(2,3-dihydro-indol-1-yl)-5-phenyl[1,2,4]triazol-1-yl]acetamide (9c). IR υ (cm^{-1}): 3446 (N—H), 1683 (C=O); ^{1}H-NMR (DMSO-d_6): δ 3.18–3.21 (t, 2H, CH_2, J = 8.22 Hz), 3.96–4.10 (t, 2H, CH_2, J = 8.21 Hz), 5.31 (s, 2H, CH_2), 6.78–6.86 (t, 1H, ArH), 7.12–7.16 (m, 3H, ArH), 7.55–7.60 (m, 5H, ArH), 7.81–7.97 (m, 4H, ArH), 10.86 (bs, 1H, NH); ms: *m/z* 475 (M+1). Anal. Calcd. for $C_{24}H_{20}BrN_5O$: C, 60.77; H, 4.25; N, 14.76; Found: C, 60.81; H, 4.38; N, 14.59.

2[3-(2,3-Dihydro-indol-1-yl)-5-phenyl[1,2,4]triazol-1-yl]-N-(4-isopropyl-phenyl)acetamide (9d). IR υ (cm^{-1}): 3433 (N—H), 1678 (C=O); ^{1}H-NMR (DMSO-d_6): δ 1.32–1.41 (d, 6H, $2CH_3$), 3.16–3.23 (m, 3H, CH_2 and CH), 3.93–4.02 (t, 2H, CH_2, J = 8.22 Hz), 5.23 (s, 2H, CH_2), 6.86–7.16 (m, 4H, ArH), 7.55–7.60 (m, 5H, ArH), 7.81–7.97 (m, 4H, ArH), 10.71 (bs, 1H, NH); ms: *m/z* 438 (M+1). Anal. Calcd. for $C_{27}H_{27}N_5O$: C, 74.12; H, 6.22; N, 16.01; Found: C, 74.01; H, 6.37; N, 16.17.

N-Benzyl-2-[3-(2,3-dihydro-indol-1-yl)-5-phenyl[1,2,4]triazol-1-yl]acetamide (9e). IR υ (cm^{-1}): 3411 (N—H), 1683 (C=O); ^{1}H-NMR (DMSO-d_6): δ 3.26–3.31 (t, 2H,CH_2, J = 8.20 Hz), 3.93–4.17 (t, 2H, CH_2, J = 8.20 Hz), 4.56–4.61 (d, 2H, CH_2), 5.23 (s, 2H, CH_2), 6.89–7.14 (m, 4H, ArH), 7.32–7.41 (m, 5H, ArH), 7.55–7.60 (m, 3H, ArH), 7.73–7.80 (m, 2H, ArH), 9.81 (bs, 1H, NH); ms: *m/z* 410 (M+1). Anal. Calcd. for $C_{25}H_{23}N_5O$: C, 73.33; H, 5.66; N, 17.10; Found: C, 73.12; H, 5.79; N, 17.22.

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