Proposal, Synthesis and Antimicrobial activity of 1-((1-phenyl-1H-1,2,3-triazol-5-yl)methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d]imidazole

Raghuramarao Irigineni[1,3*], Krishnakanth Reddy L.[2] and Kishore Babu B.[3]
1. Aragen Life Sciences (Formerly known as GVK Biosciences), Medicinal Chemistry Division, 28/A, IDA, Nacharam, Hyderabad-500076, Telangana state, INDIA
2. Sai Life Sciences Limited, Medicinal Chemistry Division, ICICI Knowledge Park, Turkapelly, Hyderabad, Telangana State-500078, INDIA
3. Department of Engineering Chemistry, Andhra University College of Engineering (A), Visakhapatnam, A.P., 530003, INDIA
*raguramaraoirigineni@gmail.com

Abstract

A new series of 1-((1-phenyl-1H-1,2,3-triazol-5-yl) methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo [d] imidazole (12a-n) and a library of novel imidazole-1,2,3-triazole hybrids were designed and synthesized based on the fusion pharmacophore approach. Therefore, copper (I) catalyzed click reaction of propargylated imidazole with numerous organo arylazides yielded imidazole-1,2,3-triazole hybrids 12a–n. The products were purified over column chromatography and structures of these compounds are recognized by IR, ^{1}H-NMR, ^{13}C-NMR and mass spectral data.

All the final compounds were screened for their anti-microbial activity and the effects were matched with ciprofloxacin. Compound (12d, l, i) was the most effective compound of this series and with activities improved than ciprofloxacin under the experienced situations. Chroman-4-one scaffold is a stable structure in heterocyclic chemistry and drug conclusion.

Keywords: Chromanones, Suzuki-coupling, Benzimidazoles, Triazoles and antimicrobial activity.

Introduction

In the last few decades, microscopic organisms have developed a strong battle against antimicrobial drugs[8,31]. Advance of this resistance has recently accelerated substantially, important to a rise in the quantity of poisons. As a result, there is a persistent necessity to ripen antimicrobial drugs[17]. One major objective of organic and medicinal chemistry is to design and synthesize new molecules with high therapeutic indices which can overcome resistant microorganisms. Despite significant progress in antimicrobial therapy, there is still much demand for novel antimicrobial drugs[4,30]. Because infectious disease[17] is a major global health problem[28], the resistance acquired by microbes may be because of increasing use and misuse of antimicrobial drugs[7,13]. In this study, we synthesized 1-((1-phenyl-1H-1,2,3-triazol-5-yl) methyl) -2- (4 – phenyl - 2H-chromen-3-yl)-1H-benzo[d]imidazole derivatives because these structures are known to have a wide range of pharmacological activity[1,2,6,11,15,29].

Incorporation of an imidazole nucleus, a biologically well-established pharmacophore[6,14], in 1-((1-phenyl-1H-1,2,3-triazol -5-yl) methyl) -2- (4-phenyl-2H-chromen-3-yl) -1H-benzo[d]imidazole derivatives has resulted in versatile heterocyclic systems with a wide range of biological activity[6,9,19,27]. Benzmidazole and triazole groups readily interact with the biopolymers of living organisms[10]. Because this type of structure is known to have a wide range of biological activity, for example, antibacterial[11], antiviral[26], antimicrobial[5], antiulcer proton-pump inhibiting[24,25] and anticancer[16] activity, new drugs are usually discovered on the basis of molecular modification of lead compounds or already established pharmacophores.

We synthesized fifteen novel derivatives of 1-((1-phenyl-1H-1,2,3-triazol-5-yl) methyl) -2- (4-phenyl-2H-chromen-3-yl)-1H-benzo[d]imidazole. Recent investigation of a variety of triazoles has revealed the importance of this pharmacophore to antibacterial activity[1,13,21]. Interestingly, the 1,2,3-triazole ring had been reported to mimic peptide bonds (amide bond surrogate)[3,12]. 1,2,3-Triazoles can be regarded as antibacterial agents because they can inhibit synthesis of the cell membrane, cell wall and nucleic acids of bacteria[7]. The concept of privileged structures has appeared as a rewarding approach in the field of drug discovery and development.

Azole is one such showcased important class of privileged heterocyclic scaffolds in consequence of its drug like and versatile binding properties[18]. Usually, the synthesis of imidazole derivatives is performed by the construction of the imidazole scaffold through condensation reactions[22,23]. We therefore synthesized derivatives characterized by spectral and CHN analysis. The compounds were screened for antimicrobial activity.

Material and Methods

The ^{1}H NMR spectra were using an Advance Bruker NMR spectrometer (Bruker, Switzerland) at 400–600 MHz, while δ ^{13}C NMR spectra were known on the same instrument at 100–150 MHz using tetramethylsilane (TMS) (δ, ppm) as the internal standard. The ESI mass spectra were sedated with a Finnigan MAT 95 XL spectrometer (Finnigan, Germany). All the cleaners and reagents cast-off in this exertion were of the highest superiority of analytical reagent ranking and were procured from Sigma-Aldrich, USA and were castoff without added purification. The responses were

observed through thin layer chromatography (TLC), exhausting UV fluorescent Silica gel type Merck 60 F254 plates. The spots were envisaged using a UV lamp (254 nm).

The melting points of the made products were measured using a Stuart Scientific SMP1 (Stuart, UK). The functional groups were recognized by a SHIMADZU FTIR-Affinity-1S spectrometer in the array of 400–4000 cm^{-1} using a PerkinElmer 1430 series FT-IR spectrometer (Perkin-Elmer, USA) as potassium bromide pellets. Elemental investigation was passed out on a Perkin Elmer Series-II C, H, N, S and O Analyzer 2400.

General procedure

Synthesis of 1-((1-phenyl-1H-1,2,3-triazol-5-yl)methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d]imidazoles: In this study, we analyzed the synthesis of 1-((1-phenyl-1H-1,2,3-triazol-5-yl)methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d]imidazole through a solution of copper sulfate (0.10 g) and sodium ascorbate (0.15 g) in water (10 mL), added drop wise to a reagent of alkyne 2 (1 mmol) in DMF (10 mL) under stirring. Formerly, the appropriate arylazide 11a–e (1 mmol) was added. The retort was examined by TLC (hexane-ethyl acetate 2:1). After the end of the reaction, the blend was dispensed onto iced-water. The precipitous form was tranquiled by filtration, splashed with a saturated solution of ammonium chloride, besides being recrystallized after ethanol/DMF to give the targeted 1,2,3-triazoles 12a-n.

(12a) ((1-phenyl-1H-1,2,3-triazol-5-yl)methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d]imidazole: Chemical formula: $C_{31}H_{23}N_5O$: Mol. Wt.: 481.56. White solid. Yield: 85%; M.P**.** 159-161˚C. Elemental analysis: C, 77.42; H, 3.96; N, 14.65; O, 3.31. Found: C, 77.11; H, 3.77; N, 14.64; O, 3.93%. **IR (KBr):** 2978 (C-H str), 1448 (C=C), 1503 (N=N) cm^{-1}. **^{1}H-NMR** (400 MHz, $CDCl_3$): δ 5.20 (s, 2H), 5.57 (s, 2H), 6.64 (d, *J* = 2.3 Hz, 2H), 6.92 (dd, *J* = 8.6 Hz, 2H), 7.03 (dd, *J* = 7.6 Hz, 2H), 7.18 (ddd, *J* = 15.1, 10.9, 8.8 Hz, 4H), 7.43 – 7.32 (m, 2H), 7.66– 7.60 (m, 4H), 7.72 (dd, *J* = 10.0 Hz, 2H), 7.82 (s, 1H), **^{13}C-NMR** (101 MHz, $CDCl_3$): δ 52.36, 66.27, 110.39, 114.23, 116.24, 118.86, 119.65, 121.54, 122.52, 123.72, 124.63, 127.00, 128.32, 129.26, 129.62, 130.11, 130.46, 134.14, 136.27, 136.65, 133.63, 142.54, 144.23, 148.49, 154.63. **ESI-MS** (*m/z*): 481.56. $[M+H]^+$.

(12b) 5,6-dimethyl-1-((1-phenyl-1H-1,2,3-triazol-5-yl) methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d] imidazole: Chemical formula: $C_{33}H_{27}N_5O$: Mol. Wt.: 509.21. White solid. Yield: 79%; M.P**.** 162-164˚C. Elemental analysis: C, 81.73; H, 5.76; N, 7.85; O, 4.73. Found: C, 77.79; H, 5.32; N, 13.75; O, 3.54%. **IR (KBr):** 2978 (C-H str), 1592 (C=N), 1503 (N=N) and 1448 (C=C) cm^{-1}. **^{1}H-NMR** (400 MHz, $CDCl_3$): δ 2.37 (s, 3H), 2.48 (s, 3H), 5.20. (s, 2H), 5.57 (s, 2H), 6.64 (m, 2H), 7.03 (d, *J* = 7.6 Hz, 1H), 7.18 (ddd, *J* = 15.1, 10.9, 8.8 Hz, 2H), 7.41–7.32 (m, 2H), 7.46 (s, 1H), 7.58 – 7.52 (m, 4H), 7.69 (s, 2H), 7.61 (m, 2H), **^{13}C-NMR** (101 MHz, $CDCl_3$): δ 18.81, 52.36, 66.27, 110.39, 116.24, 118.86, 119.65, 121.54, 122.52, 123.72, 124.63, 127.00, 129.26, 129.62, 130.11, 130.46, 131.72, 133.26, 136.27, 136.65, 142.54, 148.49, 154.63. **ESI-MS** (*m/z*): 509.22. $[M+H]^+$.

(12c)5-chloro-1-((1-phenyl-1H-1,2,3-triazol-5-yl)methyl) -2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d]imidazole: Chemical formula: $C_{31}H_{22}ClN_5O$: Mol. Wt.: 516.15. White solid. Yield: 83%; M.P**:** 156-154˚C. Elemental analysis: C, 72.68; H, 4.24; Cl, 6.86; N, 13.79; O, 3.48. Found: C, 72.14; H, 4.31; Cl, 6.88; N, 13.81; O, 3.10%. **IR (KBr):** 2978 (C-H str), 1592 (C=N), 1503 (N=N) and 1448 (C=C) cm^{-1}. **^{1}H-NMR** (400 MHz, $CDCl_3$): δ 5.20 (s, 2H), 5.57 (s, 2H), 6.64 (m, 2H), 6.92 (dd, *J* = 8.6, 5.2 Hz, 2H), 7.03 (dd, *J* = 7.6, 4.3 Hz, 2H), 7.18 (ddd, *J* = 15.1, 10.9, 8.8 Hz, 3H), 7.46 (s, 1H), 7.59 – 7.52 (m, 3H), 7.61 (dd, *J* = 12.5, 8.5 Hz, 2H), 8.36 (s, 1H), 7.69 (m, 2H). **^{13}C-NMR** (101 MHz, $CDCl_3$): δ 52.36, 66.05, 110.21, 116.24, 118.86, 119.65, 121.54, 122.52, 123.72, 124.63, 127.00, 129.26, 129.62, 130.11, 130.46, 133.26, 135.32, 136.27, 136.65, 142.54, 143.92, 148.49, 154.68. **ESI-MS** (*m/z*): 515.15. $[M+H]^+$.

(12d)5,6-dichloro-1-((1-phenyl-1H-1,2,3-triazol-5-yl) methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d] imidazole: Chemical formula: $C_{31}H_{21}Cl_2N_5O$: Mol. Wt.: 550.14. White solid. Yield: 83%; M.P**.** 152-154˚C. Elemental analysis: C, 67.66; H, 3.3; Cl, 12.86; N, 12.82; O, 2.92. Found: C, 67.64; H, 3.85; Cl, 12.88; N, 12.81; O, 2.46%. **IR (KBr):** 2976 (C-H str), 1591 (C=N), 1505 (N=N) and 1444 (C=C) cm^{-1}. 1592 (C=N) 1562 and 1437 (C=C). **^{1}H-NMR** (400 MHz, $CDCl_3$): δ 5.20 (s, 2H), 5.58(s, 2H), 6.64 (m, 2H), 6.92 (m, 2H), 7.03 (d, *J* = 7.6 Hz, 1H), 7.18 (ddd, *J* = 15.1, 10.9, 8.8 Hz, 3H), 7.47 – 7.32 (m, 2H), 7.68 – 7.59 (m, 3H), 7.71 (t, *J* = 12.3 Hz, 1H), 7.79 (dd, *J* = 12.2, 6.2 Hz, 2H), 8.30 (s, 2H). **^{13}C-NMR** (101 MHz, $CDCl_3$): δ 52.42, 66.27, 110.39, 116.24, 118.86, 119.65, 121.54, 122.52, 123.72, 124.63, 127.00, 129.26, 129.62, 130.11, 130.46, 133.26, 136.27, 136.65, 142.54, 148.49, 154.63. **ESI-MS** (*m/z*): 550.41 $[M+H]^+$.

(12e)6-nitro-1-((1-phenyl-1H-1,2,3-triazol-5-yl)methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d]imidazole: Chemical formula: $C_{31}H_{22}N_6O_3$: Mol. Wt.: 526.56. White solid. Yield: 81%; M.P**.** 142-144˚C. Elemental analysis: C, 70.17; H, 4.48; N, 15.14; O, 9.15. Found: C, 69.99; H, 4.21; N, 15.12; O, 9.07%. **IR (KBr):** 2976 (C-H str), 1591 (C=N), 1505 (N=N) and 1444 (C=C) cm^{-1}. **^{1}H-NMR** (400 MHz, $CDCl_3$): δ 5.20 (s, 2H), 5.57 (s, 2H), 6.64 (d, *J* = 2.3 Hz, 1H), 6.92 (m, 3H), 7.08 (d, *J* = 6.4, Hz, 1H), 7.12 (m, 2H), 7.34 (dd, *J* = 7.6, 4.2, Hz, 2H), 7.37 (dd, *J* = 8.4, 6.1 Hz, 2H), 7.57 (dd, *J* = 6.4, 2.9 Hz, 2H), 7.67 (m, 3H), 8.08 (d, *J* = 7.6 Hz, 1H), 8.21 (s, 1H), **^{13}C-NMR (**101 MHz, $CDCl_3$): δ 52.42, 66.56, 110.21, 116.42, 118.97, 119.65, 121.26, 122.52, 123.56, 124.75, 129.02, 129.62, 129.86, 130.46, 133.17, 135.02, 136.65, 141.20, 142.38, 146.27, 154.85. **ESI-MS** (*m/z*): 526.18 $[M+H]^+$.

(12f) 2-(6-chloro-4-phenyl-2H-chromen-3-yl)-1-((1-phenyl-1H-1,2,3-triazol-4-yl)methyl)-1H-benzo[d] imidazole: Chemical formula: $C_{31}H_{22}ClN_5O$: Mol. Wt.: 516.00. White solid. Yield: 86%; M.P**.** 159-161˚C. Elemental analysis: C, 72.16; H, 4.30; Cl, 6.87; N, 13.57; O, 3.10. Found: C, 72.51; H, 4.65; Cl, 6.16; N, 13.24; O, 4.14%. **IR (KBr):**1502 (N=N), 2975 (C-H str) cm^{-1}. **^{1}H-NMR** (500 MHz, $CDCl_3$)**:** δ 5.20 (s, 2H), 5.53 (s, 2H), 6.66 (dd, *J* = 7.7, 1.5 Hz, 2H), 6.77 – 6.71 (m, 1H), 6.84 (dd, *J* = 12.4, 5.0 Hz, 1H), 7.15 – 7.06 (m, 3H), 7.39 – 7.31 (m, 4H), 7.52 – 7.41 (m, 3H), 7.57(m, 2H), 7.66 -7.64 (dd, *J* = 15.3, 7.8 Hz, 2H), 8.03 (d, *J* = 7.1 Hz, 1H), **^{13}C-NMR** (126 MHz, $CDCl_3$)**:** δ 52.33, 66.61, 116.11, 120.71, 121.43, 124.07, 124.12, 127.17, 128.31, 128.59, 128.89, 130.00, 130.31, 134.63, 137.01, 139.63, 144.81, 147.46, 147.51, 154.81, 156.77. **ESI-MS** (*m/z*): 516 $[M+H]^+$.

(12g) 2-(6-chloro-4-phenyl-2H-chromen-3-yl)-5,6-dimethyl-1-((1-phenyl-1H-1,2,3-triazol-4-yl)methyl)-1H-benzo[d]imidazole: Chemical formula: $C_{33}H_{26}ClN_5O$: Mol. Wt.:543.18. White solid. Yield: 80%; M.P**.** 159-161˚C. Elemental analysis: C, 72.55; H, 4.83; Cl, 6.50; N, 12.80; O, 2.92. Found: C, 72.85; H, 4.82; Cl, 6.52; N, 12.87; O, 2.94%. **IR (KBr):** 1503 (N=N), 2978 (C-H str) cm^{-1}. **^{1}H-NMR** (500 MHz, $CDCl_3$)**:** δ 2.38 (s, 3H), 2.47 (s, 3H), 5.20 (s, 2H), 5.52 (s, 2H), 6.64 (dd, *J* = 7.7, 1.5 Hz, 2H), 6.78 – 6.70 (m, 1H), 6.84 (dd, *J* = 12.4, 5.0 Hz, 1H), 7.16 – 7.08 (m, 2H), 7.40 – 7.31 (m, 4H), 7.52 – 7.41 (m, 2H), 7.56(m, 2H), 8.01 (d, *J* = 7.1 Hz, 1H), 124.07, 124.12, **^{13}C-NMR** (126 MHz, $CDCl_3$)**:** δ 18.8, 52.23, 66.58, 116.11, 120.71, 121.33, 121.43, 122.00, 127.17, 128.31, 128.59, 128.89, 129.80, 130.00, 130.31, 134.63, 137.01, 139.63, 144.81, 147.46, 147.51, 156.77, 154.81. **ESI-MS** (*m/z*) 544.06 $[M+H]^+$.

(12h)5,6-dichloro-2-(6-chloro-4-phenyl-2H-chromen-3-yl)-1-((1-phenyl-1H-1,2,3-triazol-4-yl)methyl)-1H-benzo [d]imidazole: Chemical formula: $C_{31}H_{20}Cl_3N_5O$: Mol. Wt.:583.18. White solid. Yield: 84%; M.P**.** 159-161˚C. Elemental analysis: C, 63.64; H, 3.55; Cl, 18.18; N, 11.99; O, 2.78. Found: C, 63.66; H, 3.55; Cl, 18.28; N, 11.97; O, 2.76%. **IR (KBr):** 1502 (N=N), 2975 (C-H str) cm^{-1}. **^{1}H-NMR** (500 MHz, $CDCl_3$)**:** δ 5.20 (s, 2H), 5.53 (s, 2H), 6.66 (dd, *J* = 7.7, 1.5 Hz, 1H), 6.77 – 6.71 (m, 1H), 6.84 (dd, *J* = 12.4, 5.0 Hz, 1H), 7.15 – 7.06 (m, 3H), 7.39 – 7.31 (m, 4H), 7.48 – 7.41 (m, 2H), 7.61(s, 1H), 7.65 (dd, *J* = 15.3, 7.8 Hz, 2H), 7.90 (d, *J* = 7.1 Hz, 1H), **^{13}C-NMR** (126 MHz, $CDCl_3$)**:** δ 64.33, 67.61, 116.11, 120.71, 121.33, 121.43, 122.00, 124.07, 124.12, 127.17, 128.31, 128.59, 128.89, 129.80, 130.00, 134.63, 137.01, 139.63, 144.81, 147.46, 147.51, 154.81, 156.77. **ESI-MS** (m/z) 584.52 $[M+H]^+$.

(12i)2-(6-chloro-4-phenyl-2H-chromen-3-yl)-6-nitro-1-((1-phenyl-1H-1,2,3-triazol-4-yl)methyl)-1H-benzo[d] imidazole: Chemical formula: $C_{31}H_{21}ClN_6O_3$: Mol. Wt.:561.18. White solid. Yield: 82%; M.P: 147-148˚C. Elemental analysis: C, 66.27; H, 3.67; Cl, 6.52; N, 14.96; O, 8.52. Found: C, 66.37; H, 3.77; Cl, 6.32; N, 14.98; O, 8.56%. **IR (KBr):** 1502 (N=N), 2975 (C-H str) cm^{-1}. **^{1}H-NMR** (500 MHz, $CDCl_3$)**:** δ 5.18 (s, 2H), 5.50 (s, 2H), 6.87 – 6.63 (m, 4H), 7.23 – 7.06 (m, 2H), 7.32 (d, *J* = 17.5 Hz, 2H), 7.54 – 7.38 (m, 1H), 7.82 – 7.57 (m, 5H), 8.08 (m, 2H), 8.20 (s, 1H), **^{13}C-NMR** (101 MHz, $CDCl_3$+DMSO)**:** δ 64.09, 67.31, 88.39, 115.92, 116.33, 116.44, 116.64, 116.75, 117.16, 121.26, 121.31, 121.71, 121.78, 122.41, 122.59, 123.89, 126.98, 128.22, 128.46, 129.63, 129.79, 130.19, 134.40, 146.85, 147.39, 156.32. **ESI-MS** (*m/z*): 561 $[M+H]^+$.

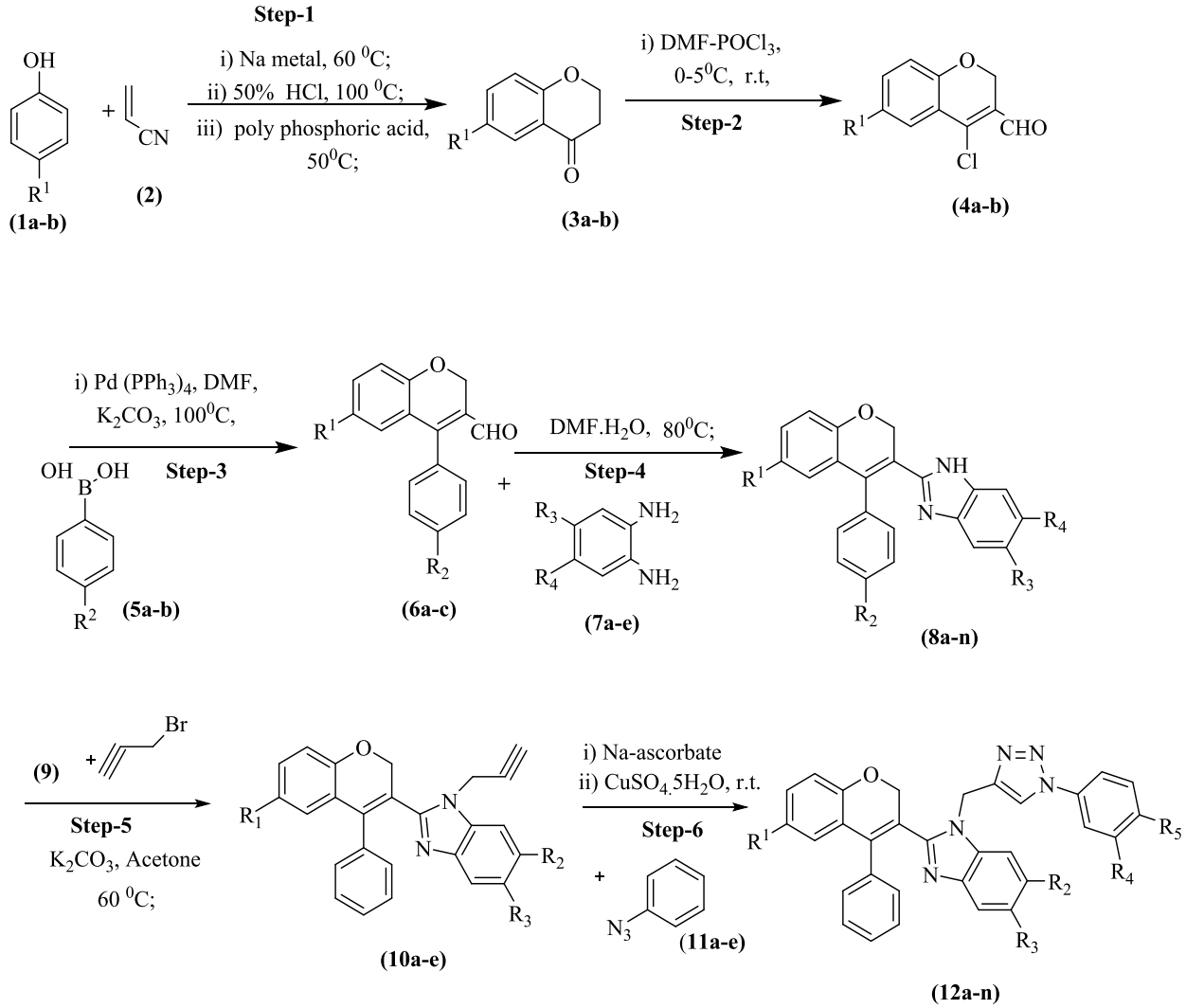
(12j) 1-((1-(3-chlorophenyl)-1H-1,2,3-triazol-4-yl) methyl)-6-nitro-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d]imidazole: Chemical formula: $C_{31}H_{21}ClN_6O_3$: Mol. Wt.:561.18. White solid. Yield: 84%; M.P. 159-161˚C. Elemental analysis: C, 72.16; H, 4.30; Cl, 6.87; N, 13.57; O, 3.10. Found: C, 72.51; H, 4.65; Cl, 6.16; N, 13.24; O, 4.14%. IR (KBr): 1502 (N=N), 2975 (C-H str) cm^{-1}. ^{1}H-NMR (500 MHz, $CDCl_3$): δ 5.20 (s, 2H), 5.53 (s, 2H), 6.66 (dd, *J* = 7.7, 1.5 Hz, 2H), 6.84 (dd, *J* = 12.4, 5.0 Hz, 1H), 6.77 – 6.71 (m, 1H), 7.15 – 7.06 (m, 3H), 7.39 – 7.31 (m, 4H), 7.52 – 7.41 (m, 3H), 7.57(m, 2H), 7.66-7.64 (dd, *J* = 15.3, 7.8 Hz, 2H), 8.03 (d, *J* = 7.1 Hz, 1H). ^{13}C-NMR (126 MHz, $CDCl_3$): δ 52.33, 66.61, 116.11, 120.71, 121.33, 121.43, 122.00, 124.07, 124.12, 127.17, 128.31, 128.59, 129.80, 128.89, 130.00, 130.31, 134.63, 137.01, 139.63, 144.81, 147.46, 147.51, 154.81, 156.77. ESI-MS (*m/z*): 516 $[M+H]^+$.

(12k) 1-((1-(4-fluorophenyl)-1H-1,2,3-triazol-4-yl) methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d] imidazole: Chemical formula: $C_{31}H_{22}FN_5O$: Mol. Wt.:499.18. White solid. Yield: 79%; M.P. 147-148˚C. Elemental analysis: C, 74.52; H, 4.42; F, 3.60; N, 14.12; O, 3.28. Found: C, 74.54; H, 4.44; F, 3.80; N, 14.02; O, 3.20%. **IR (KBr):** 1502 (N=N), 2975 (C-H str) cm^{-1}. **^{1}H-NMR** (500 MHz, $CDCl_3$)**:** 5.18 (s, 2H), 5.52 (s, 2H), 6.87 – 6.63 (m, 4H), 7.23 – 7.06 (m, 4H), 7.32 (d, *J* = 17.5 Hz, 2H), 7.54 – 7.38 (m, 1H), 7.82 – 7.57 (m, 4H), 7.95 (s, 2H), 8.20 (s, 1H). **^{13}C-NMR** (101 MHz, $CDCl_3$+DMSO)**:** δ 52.09, 67.31, 88.39, 115.92, 116.44, 116.33, 117.16, 116.75, 121.31, 121.71, 121.26, 121.78, 122.41, 122.59, 123.89, 126.98, 128.46, 128.22, 129.63, 129.79, 130.19, 134.40, 146.85, 147.39, 154.81. **ESI-MS** (m/z): 499.54 $[M+H]^+$.

(12l) 1-((1-(3-methoxyphenyl)-1H-1,2,3-triazol-4-yl) methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d] imidazole: Chemical formula: $C_{32}H_{25}N_5O_2$: Mol. Wt.:511.59. Light yellow solid. Yield: 80%, M.P. 125-127˚C. Elemental analysis: C, 75.11; H, 4.93; N, 13.59; O, 6.25. Found: C, 75.13; H, 4.93; N, 13.69; O, 6.25%. **IR (KBr):** 1501 (N=N), 2974 (C-H str) cm^{-1}. **^{1}H-NMR** (400 MHz, $CDCl_3$)**:** δ 3.87 (s, 3H), 5.20 (s, 2H), 5.52 (s, 2H), 6.73 (dd, J = 7.7, 1.6 Hz, 1H), 6.80 (td, J = 7.6, 1.1 Hz, 1H), 6.91 (dd, *J* = 8.1, 0.9 Hz, 1H), 6.98 – 6.95 (m, 1H), 7.26 – 7.15 (m, 5H), 7.33 (t, *J* = 2.2 Hz, 1H), 7.43 – 7.37 (m, 4H), 7.68 (s, 1H), 7.95 (s, 1H), **^{13}C-NMR** (101 MHz, $CDCl_3$)**:** δ 52.68, 56.33, 66.61, 106.51, 112.53, 14.76, 116.11, 121.41, 124.12, 127.17, 128.31, 128.59, 130.00, 130.55, 130.31, 134.65, 138.03, 139.63, 144.76, 147.50, 154.82, 160.64, **ESI-MS** (*m/z*): 511.59 $[M+H]^+$.

(12m) 1-((1-benzyl-1H-1,2,3-triazol-4-yl)methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d]imidazole: Chemical formula: $C_{32}H_{25}N_5O$: Mol. Wt.:495.23. Light yellow solid. Yield: 82%, M.P. 160-162˚C. Elemental analysis: C, 77.58; H, 5.09; N, 14.23; O, 3.13. Found: C, 77.46; H, 5.12; N, 14.23; O, 3.20%. **IR (KBr):** 1502 (N=N), 2975 (C-H str) cm^{-1}. **^{1}H-NMR** (400 MHz, $CDCl_3$)**:** δ 5.07 (s, 3H), 5.18 (s, 3H), 5.51 (s, 3H), 6.72 (dd, J = 7.7, 1.4 Hz, 1H), 6.82 – 6.77 (m, 1H), 6.92 – 6.89 (m, 1H), 7.17 (dt, J = 3.9, 2.9 Hz, 4H), 7.27 – 7.25 (m, 2H), 7.38 (dd, *J* = 12.8, 7.0 Hz, 7H), 7.44 (s, 1H), 7.62 (s, 1H). **^{13}C-NMR** (101 MHz, $CDCl_3$)**:** δ 52.47, 54.30, 66.67, 116.10, 121.40, 122.06, 122.97, 124.14, 127.13, 128.13, 128.28, 128.83, 128.57, 129.17, 129.99, 130.26, 134.53, 139.44, 144.43, 147.31, 154.81. ESI-MS (*m/z*): 495 $[M+H]^+$.

(12n) 1-((1-(4-bromobenzyl)-1H-1,2,3-triazol-4-yl) methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d] imidazole: Chemical formula: $C_{32}H_{24}BrN_5O$: Mol. Wt.:574.48. White solid. Yield: 85%, M.P. 152-154˚C. Elemental analysis: C, 77.58; H, 5.09; N, 14.23; Br, 13.60; O, 3.13. Found: C, 77.22; H, 5.22; N, 14.22; Br, 13.91; O, 3.50%. **IR (KBr):** 1502 (N=N), 2975 (C-H str) cm^{-1}. **^{1}H-NMR** (400 MHz, $CDCl_3$)**:** δ 5.20 (s, 2H), 5.42 (s, 2H), 5.57 (s, 2H), 6.72 (dd, *J* = 7.8, 1.6 Hz, 1H), 6.82 – 6.78 (m, 1H), 6.92 (dd, J = 8.1, 1.1 Hz, 1H), 7.41 – 7.39 (m, 3H), 7.45 (s, 1H), 7.49 (d, *J* = 1.9 Hz, 1H), 7.51 (d, J = 1.9 Hz, 1H), 7.62 (s, 1H), **^{13}C-NMR** (101 MHz, $CDCl_3$)**:** δ 156.81, 147.36, 144.68, 139.54, 134.64, 133.57, 132.34,132.34, 130.30,130.30, 129.99, 129.69,128.60, 128.58, 128.30, 127.15, 124.12, 122.94, 121.99, 121.43, 116.12, 67.61, 64.29 and 53.48. **ESI-MS (m/z):** Molecular ion peaks at m/z 575.0 $[M+H]^+$, 573.0 $[M+H-2]^+$.



12a=R_1=R_2=R_3=R_4=R_5=H;**12b**=R_1=R_4=R_5=H,R_2=R_3=CH_3;**12c**=R_1=R_3=R_4=R_5=H, R_2=-Cl;
12d=R_1=R_4=R_5=H,R_2=R_3=Cl; **12e**=R_1=R_3= R_4=H,R_2=NO_2; **12f**=R_1=Cl,R_2=R_3=R_4=R_5=H;
12g=R_1=Cl, R_2=R_3=CH_3,R_4= R_5=H;**12h**=R_1=R_2=R_3=Cl,R_4=R_5=H;**12i**=R_1=Cl,R_2=NO_2, R_3=R_4=R_5=H;
12j=R_1=R_2=R_5=H; R_3=NO_2, R_4=-Cl;**12k**=R_1=R_2=R_3=R_4=H,R5=Cl;**12l**=R_1=R_2=R_3=R_5=H, R_4=OCH_3;
12m=R_1=R_2=R_3=R_4=R_5=H; **12n**=R_1=R_2=R_3=R_4=H, R_5=Br

Scheme 1: Synthesis of 1-((1-phenyl-1H-1,2,3-triazol-4-yl)methyl)-2-(4-phenyl-2H-chromen-3-yl) -1H-benzo[d]imidazoles.

Table 1
Antibacterial activity of newly synthesized compounds (12a-n).

Compounds	Conc. (µg/ml)	Zone of inhibition in (mm)			
		Staphylococcus aureus	***Bacillus subtilis***	***Escherichia coli***	***Pseudomonas aeruginosa***
12a	100	16	18	23	29
	200	18	15	24	21
12b	100	**22**	**20**	**25.5**	**32.0**
	200	**23.5**	**21.5**	**26**	**33.0**
12c	100	18.5	15	25	28
	200	20	19	26	27
12d	**100**	**22**	**20**	**25**	**31**
	200	**23**	**21**	**26**	**32**
12e	100	16	16	19	20
	200	17	17	20	21
12f	100	17	16.5	19	20
	200	16	17.5	15	24
12g	100	19.5	17.01	12	21
	200	20	19.0	13	25
12h	100	16	16.2	14	28
	200	18	17.3	15	19
12i	**100**	**23**	**20**	**26**	**30**
	200	**23**	**21**	**27**	**31**
12j	100	14	18	26	27
	200	16	15	16.25	29
12k	100	17	16	17.2	21.5
	200	19	18	16.25	22
12l	**100**	**22**	**20**	**25**	**31**
	200	**23**	**21**	**26**	**32**
12m	100	16	12	15	24
	200	17	14	16	29
12n	100	16.8	15	19	26
	200	17.2	16	20	29
	200	**23.5**	**21**	**26.5**	**32**
Ciprofloxacin	100	23	21	26	32
	200	24	22	27	33

Results and Discussion

Synthesis of 1-((1-phenyl-1H-1,2,3-triazol-4-yl)methyl)-2-(4- phenyl-2H- chromen-3-yl)- 1H-benzo[d] imidazole scrutinized the synthesis of 1-((1-phenyl-1H-1,2,3-triazol-4-yl)methyl)-2- (4-phenyl-2H- chromen-3-yl)- 1H-benzo[d] imidazole via a blend of 2-(4-phenyl-2H-chromen-3-yl)-1-(prop-2-yn-1-yl)-1H-benzo[d]imidazole (10a-e). Propargyl bound chromene products convoluted in Cu(I) catalyzed 1,4 regioselective 1,3 dipolar cyclo tallying with different aromatic azides (11a-e), under Click reaction environments consuming copper sulphate and sodium ascorbate in tertiary butanol and water as solvent standard to crop chosen products chromene 1,2,3 triazole conjugates 1-((1-phenyl-1H-1,2,3-triazol-4-yl)methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d]imidazole(12a-n). These were categorized by their IR, ^{1}H NMR and ^{13}C NMR and ESI-MS spectral data.

Reaction blend was stimulated 10-15 hours for completion of reaction at 25-30°C. After the reaction mixture was poured, completion of the reaction (monitored by TLC (70:30), hexane: ethyl acetate) on crinkled ice provided solid product, splashed through water and withered. The unsophisticated yields was filtered by way of column chromatographic manner and the solid composite of afforded unalloyed 1-((1-phenyl-1H-1,2,3-triazol-4-yl)methyl) -2-(4-phenyl- 2H-chromen-3-yl)- 1H- benzo[d] imidazole in upright yield up to 90%. Comparable method implemented for 12(b-n). The produced compounds 12(a-n) show noble anti-microbial activity, out of them 5 (12b, 12d, 12i, 12l) composites show top action surrounded by them.

Antibacterial activity: All the newly fused compounds (12a-n) were divided for their antibacterial activity against *E.coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Bacillus subtilis* at various 20, 30, 40,100 and 200g/mL meditation**.** The ciprofloxacin is used as a regular reference drug; the activity was resoluted by agar well diffusion technique affording to the collected works procedure.

Table 2
Antifungal activity of synthesized compounds (12a-n).

Compounds	Conc.(µg/mL)	Zone of inhibition in (mm)	
		Aspergillus niger	***Candida albicans***
12a	100	20	22.3
	200	21	23
12b	**100**	**26.5**	**24**
	200	**28**	**25.3**
12c	100	26	22
	200	26	24
12d	**100**	**27.5**	**24**
	200	**29**	**25.6**
12e	100	26	21
	200	27	21.1
12f	100	26	21.6
	200	22	22
12g	100	21	23
	200	23	23
12h	100	24.5	20
	200	26.3	17
12i	**100**	**27**	**23.5**
	200	**29**	**25.3**
12j	100	16	14
	200	19	20
12k	100	20	23
	200	21	20
12l	**100**	**27**	**23.03**
	200	**29**	**25.2**
12m	100	23	21
	200	22	23.8
12n	100	26	20
	200	21	19
Voriconazole	100	28	24
	200	30	26

All these 14 chemical products **(**12a-n) showed good activity, out of these 5 compounds (12b, 12d, 12i, 12l) showed very high activity against all four bacterial strains. The activity information results are summarized in the table 1.

Antifungal Activity: The antifungal activity compounds (12a-n) against *Aspergillus Niger* and *Candida Albicans* is tested at 100, 200µg/mL concentrations utilizing standard reference drug *Voriconazole*. The activity was resolved using the disc diffusion technique. The result revealed that the compounds (12b,12d,12i,12l) showed highest activity and are summarized in the table 2.

Conclusion

A new series of novel 1-((1-phenyl-1H-1,2,3-triazol-4-yl) methyl) -2- (4-phenyl-2H-chromen-3-yl)- 1H-benzo[d] imidazole (12a-n) was produced by the condensation of 2,4-phenyl-2*H*-chromene-3- carbaldehyde and *o*-phenylenediamines, benzimidazole was formed, then propergylated under cyclo addition reaction with phenyl azides. The newly synthesized substituted 1-((1-phenyl-1H-1,2,3-triazol-4-yl)methyl)-2-(4-phenyl-2H-chromen-3-yl)-1H-benzo[d]imidazole shows good anti-bacterial and anti-fungal activities. Among them, 5 compounds (12b, 12d, 12i, 12l) showed first-rate activity.

Acknowledgement

One of the Authors (Irigineni Raghurama Rao) is thankful to the GVK Biosciences Pvt. Ltd., Hyderabad and Department of Engineering Chemistry, Andhra University, Andhra Pradesh, India, for support in the research for providing laboratory facilities and spectral data.

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(Received 20th October 2023, accepted 21st November 2023)