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A convenient and eco-friendly one-pot synthesis of 3-triazolyl-2-iminochromenes and investigation of their antioxidant properties

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A simple, green and efficient procedure for the synthesis of highly functionalized 3-triazolyl-2-iminochromenes by using a one-pot three component reaction of 2-azido acetonitrile, phenylacetylene and salicylaldehyde in water using CuI/K_2CO_3 is described. The present protocol offers advantages like high atom economy, simple methodology, shorter reaction time, easy product isolation, no chromatographic purification and avoidance of environmentally hazardous solvents. Compounds **4a-d**, **4g-h** and **6a-b** have been investigated for antioxidant activity. Compound **4c** is found to be the most active among the series showing high reducing power and free radical scavenging activity.

Keywords: Multicomponent reaction, 2-azido acetonitrile, salicylaldehyde, phenylacetylene, CuI/K_2CO_3, chromenes

Design of novel heterocycles with potent antioxidant properties have been a key area of research in recent years. Generation of free radicals in any bioorganic redox processes is highly responsible for inducing oxidative degradation of cells leading to diseases like arthritis, haemorrhagic shock, cancer, AIDS, hypertension, cardiac infarction, arteriosclerosis, cataracts, *etc*.[1] The production of free radicals can be effectively quenched by antioxidants. Among many methods available for determination of free radical scavenging activity, assay using stable 2,2-diphenyl-1-picryl-hydrazyl radical (DPPH) was found to be the best one owing to its convenience and rapidness[2].

Triazoles are present as basic heterocyclic moiety in various pharmaceutical compounds. Examples of pharmaceuticals containing 1,2,3-triazole ring include the anticancer compound CAI, the non-nucleoside reverse transcriptase inhibitor TSAO, β-lactum antibiotic Tazobactum, Cephalosporines, Cefatrizine, *etc*.[3] and their structures are shown in Figure 1. They are also employed as agrochemicals[4], corrosion inhibitors[5], hMetAP2 inhibitor[6] and for antiphotoaging agents[7]. In addition, Chromenes represent an important class of chemical entities being the main constituents of many products like natural alkaloids, flavonoids, tocopherols and anthocyanins[8]. They exhibit a variety of biological activities such as anti-microbial[9], anti-viral[10], anti-inflammatory[11], antimalarial[12], sex-hormonal[13], anti-proliferative[14], anti-tumor[15], anti-cancer[16], anti-Alzheimer's[17], anti-Parkinson[18], TNFα-inhibitor[19], estrogenic[20], anticonvulsant[21], *etc*.

A structure with chromene as well as a triazole ring in a single molecule may enhance biocidal profile remarkably. To the best of our knowledge, only a few compounds possessing such a triazolylchromenes molecular skeleton has been reported in the literature[22,23]. Earlier researches reports have their own merits; however, they have at least one drawback such as poor yield, harsh reaction condition, longer reaction time, tedious work-up procedures and use of organic solvents. Hence, we planned to develop an improved, ready to adopt and eco-friendly protocol to synthesize 3-triazolyl-chromen-2-ylideneamine and the results are discussed herein.

Result and Discussion

In continuation of our work involving three component reaction of salicylaldehydes, malononitrile and various other nucleophile[24], we herein report for the first time a CuI/K_2CO_3catalyzed efficient and clean synthesis of highly functionalized 3-triazolyl-2-iminochromenes in water at ambient temperature and also its antioxidant activity (Scheme I).

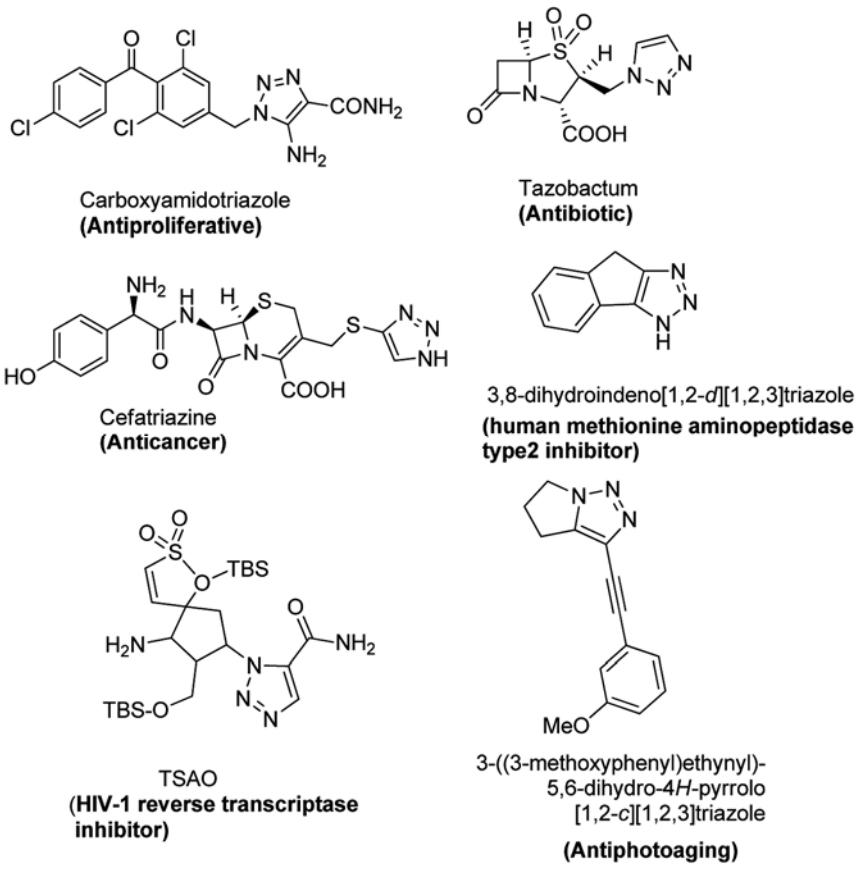
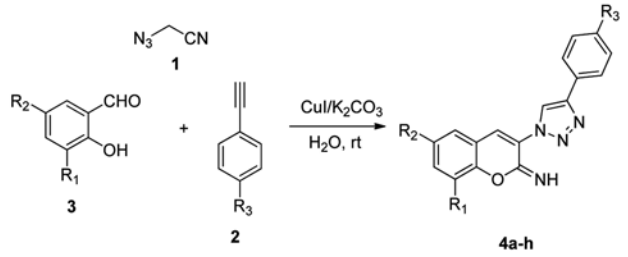


Figure 1 — Structure of 1,2,3-triazole based biologically active compounds



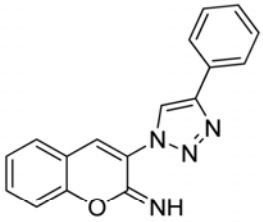
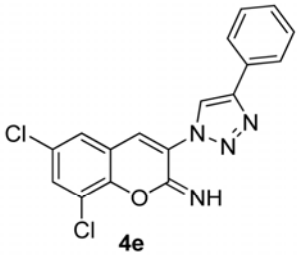
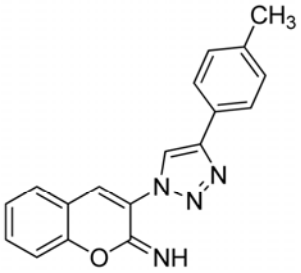
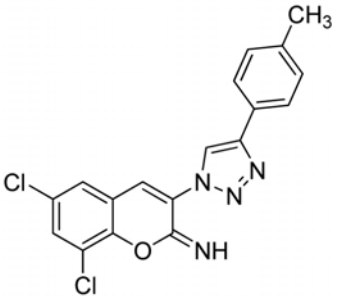
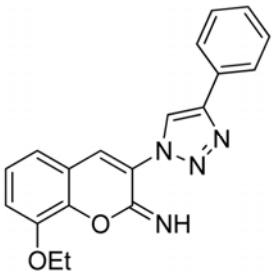
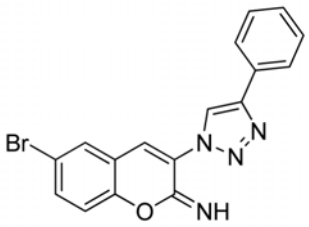
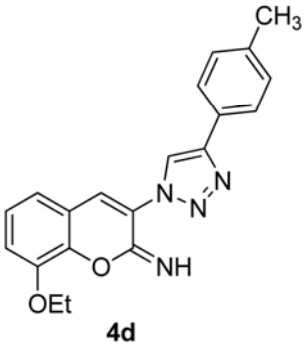
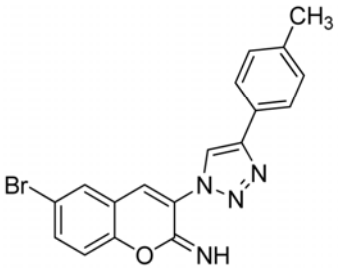
Scheme I — One-pot three-component synthesis of 3-triazolyl-chromen-2-ylideneamine **4a-h**

We began our study by gently stirring the azido acetonitrile (formed *in situ* by the reaction of chloroacetonitrile and sodium azide), phenylacetylene and salicylaldehyde in water containing a catalytic amount of K_2CO_3 (20 mol%) and copper(I) iodide (0.05 mmol). The progress of the reaction was monitored by TLC. The crude product was isolated from the reaction mixture by filtration and washed several times with water and finally with ethanol to afford the product in pure form. Conventional chromatographic purification or recrystallization was not required. Next, with these optimized reaction conditions, we further explored the scope of the reaction by reacting several salicylaldehydes with azido acetonitrile and phenylacetylene. As shown in Table I, various salicylaldehydes participated very well in the reaction to give the desired product in moderate to high yields. 4-Methyl phenyl acetylene also reacted quite well in the reaction (Table I).

Encouraged by these results, we extended the protocol by replacing salicylaldehyde with 2-hydroxynapthalene-1-carboxaldehyde in order to synthesize fused chromenes **6a,b** under the same optimized condition. The reaction is illustrated in Scheme II.

The structures of compounds **4a-h** were confirmed by IR, ^{1}H and ^{13}C NMR spectroscopy and mass spectrometry. The IR spectrum of **4a** showed absorptions at 3223 (-NH), 1664 (C=NH) and 1461 (-N=N-N) cm^{-1}. In the ^{1}H NMR spectrum, aromatic signals were observed at δ 7.18 to 8.13 and a broad singlet at δ 9.11 showed the presence of NH group (D_2O exchangeable). The imine carbon (C=NH) resonated at δ 152.55 in the ^{13}C NMR spectrum.

Table I — One-pot three-component synthesis of 3-triazolyl-chromen-2-ylideneamine in water

Entry	Product (**4**)	Time (h)	Yield [a] (%)	Entry	Product (**4**)	Time (h)	Yield [a] (%)
1	 **4a**	7	72	5	 **4e**	6	90
2	 **4b**	7	86	6	 **4f**	8	80
3	 **4c**	6	75	7	 **4g**	9	78
4	 **4d**	6	88	8	 **4h**	9	65

[a] Isolated pure product

It is believed that the reaction involves two reactions namely CuI catalyzed azide-alkyne cycloaddition (CuAAC) click reaction and Knoevenagel condensation followed by cyclization. 2-Azidoacetonitrile **1** and phenyl acetylene **2** undergo CuI/K_2CO_3 catalyzed click reaction to form the activated triazole methylene derivative. The formed intermediate then condenses with salicylaldehyde **3** followed by 6-exo-dig cyclization of the hydroxyl group with the cyano group to produce the 3-triazolyl-chromen-2-ylideneamine. The schematic mechanism is shown in Scheme III.

Biological Evaluation

Antioxidant activity

For the first time, the reducing power and free radical scavenging activity of 3-triazolyl-chromen-2-ylideneamine and their evaluation as *in vitro* antioxidants is reported.

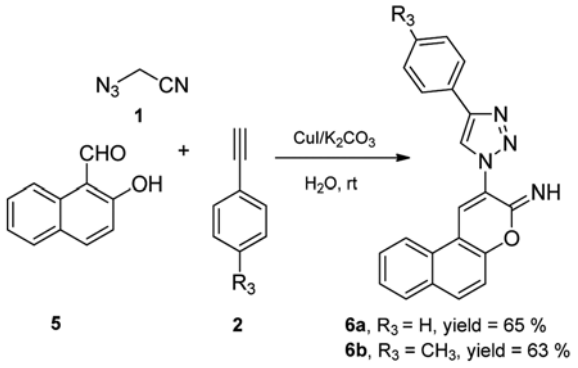
Radical scavenging activity assay (RSA)

The antioxidant ability of synthesized 3-triazolyl-chromen-2-ylideneamine derivatives **4a-d, 4g-h, 6a,b** was evaluated by DPPH assay using 2-tert-butyl-4-methoxyphenol (butylated hydroxyanisole, BHA) and ascorbic acid (AA). Figure 2 illustrates the radical scavenging ability of synthesized compounds in various concentrations. Radical scavenging activity is portrayed in percent and it increases with increase in the concentration of compounds. From Table II, it is inferred that compounds **4c** and **4d** exhibit good scavenging ability against DPPH free radical.

Table II — Free radical scavenging activity of 3-triazolyl-chromen-2-ylideneamine **4a-d**, **4g-h**, **6a**,**b** at 1 mg/mL concentration

S. No.	Compd	RSA [a] (1 mg/mL)	
		%	IC_{50} value (µg)
1.	**4a**	44.39 ± 0.71	>1000
2	**4b**	45.91 ± 0.91	>1000
3	**4c**	84.60 ± 0.51	186.26 ±1.57
4	**4d**	65.67 ± 0.62	393.29 ± 1.64
5	**4g**	27.92 ± 0.62	>1000
6	**4h**	21.58 ± 0.57	>1000
7	**6a**	26.93 ± 0.54	>1000
8	**6b**	25.40 ± 0.47	>1000
9	**AA**	97.06 ± 0.57	111.60 ± 1.58
10	**BHA**	95.65 ± 0.62	33.57 ± 1.39

[a] Antioxidant activities were expressed in percentage compared with standards, Ascorbic acid and BHA. The data represent mean value (SEM) of three duplicates.



Scheme II — One-pot synthesis of 2-phenyl-[1,2,3]triazol-1-yl-benzo[*f*]chromen-3-ylideneamine **6a-b**

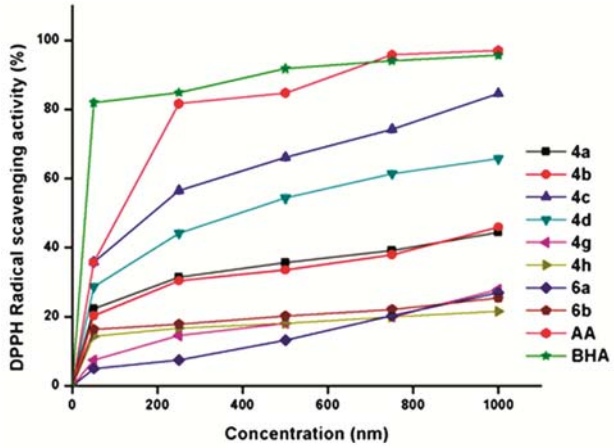
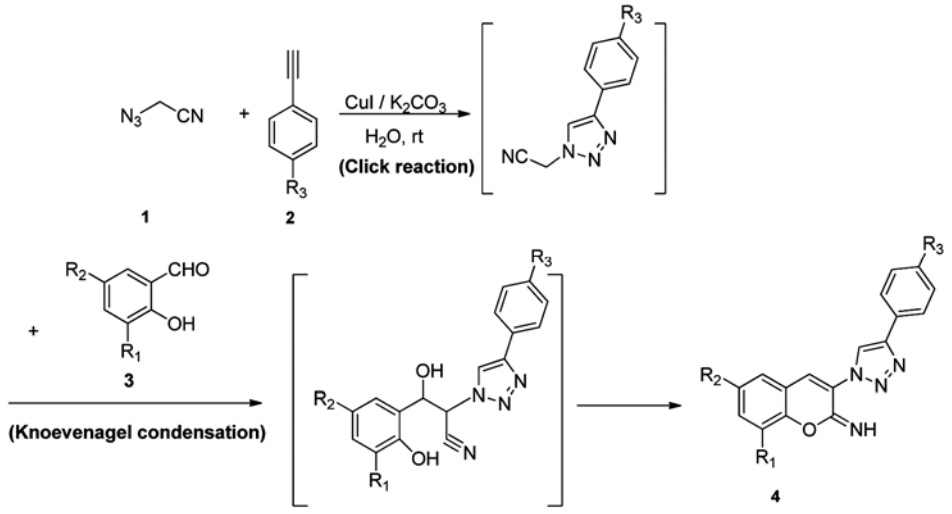


Figure 2 — DPPH radical scavenging activity of 3-triazolyl-chromen-2-ylideneamine **4a-d**, **4g-h**, **6a,b**



Scheme III — Proposed reaction pathway

IC_{50} (required concentration for 50% free radical inhibition) value also highlights that compounds **4c** and **4d** show significant antioxidant activity. Particularly, **4c** has lower IC_{50} value (186.26 ±1.57), closely resembling synthetic antioxidant AA.

Reducing power assay

The antioxidant ability of 3-triazolyl-chromen-2-ylideneamine was examined through its electron donating ability by reducing power method. In the study, it was observed that probe compounds reduced the Fe^{3+} ion into Fe^{2+} ion to form a Prussian blue coloured product. The absorbance was measured at 700 nm and the intensity of colour was proportional to the reducing power of test compounds. Figure 3 depicts the trend of reducing power of 3-triazolyl-chromen-2-ylideneamine and it increases with increase in the concentration of compounds. Ethoxy derivative of 3-triazolyl-chromen-2-ylideneamine **4c** brings out much more effective reducing power activity when compared with other derivatives. Reducing power activity of test compounds was scored on the basis of EC_{50} (Efficient concentration to reach 0.5 absorption at 700 nm) and the results are presented in Table III. Compounds **4c** and **4d** have shown lower EC_{50} values 22.52 ± 0.84 and 32.21 ± 1.09 µg respectively indicating their potent antioxidant activity. Notably, ethoxy derivative **4c** is more effective showing strong antioxidant activity with the standards BHA and AA. Thus, from the above results we find that ethoxy derivative of 3-triazolyl-chromen-2-ylideneamine **4c** may serve as an effective antioxidant.

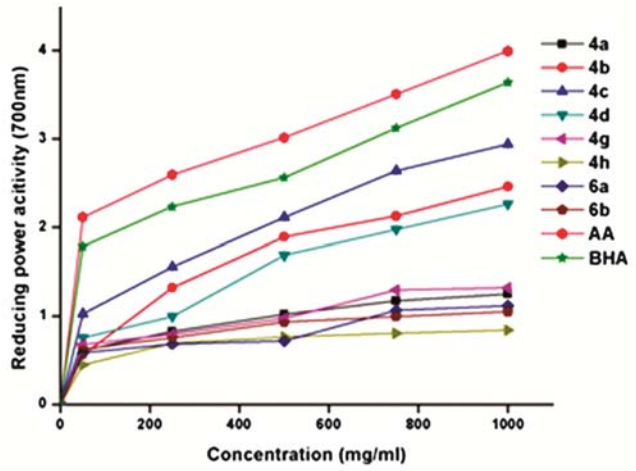


Figure 3 — Reducing power activity of 3-triazolyl-chromen-2-ylideneamine **4a-d**, **4g-h**, **6a,b** at various concentrations

Experimental Section

General

Salicylaldehyde, 5-bromo salicylaldehyde, 3,5-dichloro salicylaldehyde, 3-ethoxy salicylaldehyde, 2-hydroxynaphthalene-1-carboxaldehyde, phenylacetylene, chloroacetonitrile, sodium azide and CuI were purchased from Sigma-Aldrich. K_2CO_3 was purchased from S.D. Fine-Chem Limited. Melting points were determined in capillary tubes and the values were taken without corrections. FT-IR spectra were recorded using Thermo Electron Scientific spectrophotometer on KBr discs. The ^1H and ^{13}C NMR spectra were recorded in $CDCl_3$ and DMSO-d_6 with Bruker 400 MHz and Bruker 100 MHz high resolution NMR spectrometer. $CDCl_3$ and DMSO-d_6 were used as solvents for NMR spectral measurements and spectra were recorded in ppm with TMS as internal standard. Multiplicities are abbreviated as follows: singlet (s), doublet (d), triplet (t), multiplet (m) and broad (br). The mass spectra were analyzed through an electrospray ionization method using ThermoFinnigan Mass spectrometer. Analytical TLC was performed on precoated plastic sheets of silica gel G/UV-254 of 0.2 mm thickness (Macherey-Nagel).

General procedure for the synthesis of 3-triazolyl-chromen-2-ylideneamine 4a-h and 6a,b

Representative Procedure for 3-triazolyl-chromen-2-ylideneamine **4a** (Table I, entry 1): To a stirred mixture of azido acetonitrile (0.082g, 1 mmol) [formed *in-situ* by the reaction of chloroacetonitrile (0.0765g, 1 mmol) and sodium azide (0.065g, 1 mmol)], phenylacetylene (0.102g, 1 mmol) and salicylaldehyde (0.120g, 1 mmol) in water (10 mL), an adequate amount of catalyst-K_2CO_3 (0.0276g, 20 mol%) and CuI (0.0095g, 0.05 mmol) in water (10 mL) was added and the reaction mixture was

Table III — Reducing power activity of 3-triazolyl-chromen-2-ylideneamine **4a-d**, **4g-h**, **6a**,**b** at 1 mg/mL concentration

S. No.	Compd	Absorbance at 700 nm	EC_{50} value (µg)
1.	**4a**	1.250 ± 0.004	37.70± 0.89
2.	**4b**	2.461 ± 0.005	42.67± 1.55
3.	**4c**	2.938 ± 0.007	22.52± 0.84
4.	**4d**	2.262 ± 0.006	32.21± 1.09
5.	**4g**	1.322 ± 0.003	38.60± 0.50
6.	**4h**	0.840 ± 0.005	94.35± 1.22
7.	**6a**	1.116 ± 0.003	40.42± 1.02
8.	**6b**	1.050 ± 0.006	41.37± 1.00
9.	**AA**	3.994 ± 0.004	11.93± 0.68
10.	**BHA**	3.641 ± 0.007	14.94± 0.72

The data represent mean value (SEM) of three duplicates.

stirred at RT for the sufficient reaction time (Table I). After complete conversion as indicated by TLC, the precipitated solid so obtained was filtered, washed successively with 2% NH_4OH, water and finally with 10 mL of ethanol to obtain analytically pure product.

Procedure for the determination of radical scavenging activity

Methanolic solutions (50, 250, 500, 750 and 1000 µg/mL) of compounds **4a-d, 4g-h** and **6a,b** (Table II) in various concentrations were prepared. The compound solution (0.2 mL) of different concentration was added to 1.8 mL of methanolic DPPH solution (6×10^{-5}mol/L) and the mixture was kept in dark for 60 min. DPPH radical scavenging activity was measured by recording the absorbance of mixtures at 517 nm in UV-Visible spectrophotometer[25]. The RSA was calculated as a percent of DPPH decolouration using the equation: % RSA = $100\times(1 - A_C/A_D)$ where A_C is the absorbance of sample solution and A_D is the absorbance of the DPPH solution.

Procedure for the determination of reducing power

Reducing power of synthesized compounds was determined by following reported method[26] with slight modification. Several concentrations of methanolic solutions (50, 250, 500, 750 and 1000 µg/mL) of compounds **4a-d, 4g-h** and **6a,b** (Table III) were prepared. The compound solution (1 mL) of various concentrations was mixed with 1 mL of 200 mmol/L sodium phosphate buffer (*p*H 6.6) and 1 mL of potassium ferricyanide (10 mg/mL). The mixture was incubated at 50°C for 20 min. Then, 1 mL of trichloroacetic acid (100 mg/mL) was added and the mixture was centrifuged at 650 rpm for 5 min. Afterwards, 1 mL supernatant solution of the mixture was mixed with 1 mL distilled water and 0.1 mL of ferric chloride (1 mg/mL) and the absorbance was measured at 700 nm.

3-(4-Phenyl-[1,2,3]triazol-1-yl)-chromen-2-ylideneamine, 4a[22]: Tan solid. Yield 72%. m.p. 140-142°C. FT-IR (KBr): 3299, 3037, 1664, 1608, 1461, 1219, 1065, 1020, 913, 862, 760 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.18 (d, 1H, *J* = 8.4 Hz), 7.22 (d, 1H, *J* = 7.6 Hz), 7.36 (d, 1H, *J* = 7.2 Hz), 7.44 (m, 4H), 7.78 (s, 1H), 7.92 (d, 2H, *J* = 7.2 Hz), 8.13 (s, 1H), 9.11 (s, 1H, NH, D_2O exchangeable); ^{13}C NMR (100 MHz, $CDCl_3$): δ 115.4, 118.5, 121.8, 124.4, 125.1, 125.9, 127.3, 128.2, 128.7, 128.8, 130.4, 131.5, 147.4, 152.6, 152.8; MS: *m/z* 289 (M^++1).

3-(4-*p*-Tolyl-[1,2,3]triazol-1-yl)-chromen-2-ylideneamine, 4b: Tan solid. Yield 86%. m.p. 143-145°C. FT-IR (KBr): 3296, 3168, 1655, 1600, 1460, 1205, 1017, 814, 756 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$): δ 2.34 (s, 3H), 7.19 (d, 1H, *J* = 8.4 Hz), 7.24 (d, 1H, *J* = 7.6 Hz), 7.40 (d, 1H, *J* = 7.2 Hz), 7.48 (m, 3H), 7.85 (s, 1H), 7.95 (d, 2H, *J* = 7.2 Hz), 8.17 (s, 1H), 9.07 (s, 1H, NH, D_2O exchangeable); ^{13}C NMR (100 MHz, $CDCl_3$): δ 21.5, 115.4, 118.5,121.8, 124.4, 125.1, 125.9, 127.3, 128.2, 128.7, 128.8, 130.4, 131.5, 147.4, 152.6, 152.8; MS: *m/z* 303 (M^++1).

8-Ethoxy-3-(4-phenyl-[1,2,3]triazol-1-yl)-chromen-2-ylideneamine, 4c[22]: Tan solid. Yield 75%. m.p. 150-152°C. FT-IR (KBr): 3294, 3169, 2974, 1666, 1608, 1579, 1473, 1421, 1273, 1223, 1203, 1167, 1018, 840, 779 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$): δ 1.51 (t, 3H, *J* = 6.8 Hz), 4.17 (q, 2H, *J* = 6.8 Hz), 7.02 (m, 3H), 7.33 (t, 1H, *J* = 6.8 Hz), 7.43 (t, 2H, *J* = 7.6 Hz), 7.92 (d, 3H, *J* = 6.8 Hz), 8.10 (s, 1H), 9.13 (br s, 1H, NH, D_2O exchangeable); ^{13}C NMR (100 MHz, $CDCl_3$): δ 14.8, 64.9, 115.0, 119.3, 120.3, 121.8, 124.2, 125.2, 125.9, 127.4, 128.2, 128.8, 130.4, 142.2, 145.8, 147.3, 152.5; MS: *m/z* 333 (M^++1).

8-Ethoxy-3-(4-*p*-tolyl-[1,2,3]triazol-1-yl)-chromen-2-ylideneamine, 4d: Yellow solid. Yield 88%. m.p. 148-150°C. FT-IR (KBr): 3309, 3169, 2981, 1608, 1480, 1220, 1018, 812 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$): δ 1.41(s, 3H), 2.35 (s, 3H), 4.22 (s, 2H), 7.21 (m, 5H), 7.83 (s, 3H), 8.15 (s, 1H), 9.15 (br s, 1H, NH, D_2O exchangeable); ^{13}C NMR (100 MHz, DMSO-d_6): δ 15.1, 21.3, 64.9, 116.5, 119.3, 120.9, 121.9, 124.9, 125.9, 127.6, 129.2, 130.0, 130.2, 137.4, 138.2, 142.8, 145.7, 152.9; MS: *m/z* 347 (M^++1).

6,8-Dichloro-3-(4-phenyl-[1,2,3]triazol-1-yl)-chromen-2-ylideneamine, 4e: Brown solid. Yield 90%. m.p. 192-193°C. ^{1}H NMR (400 MHz, DMSO-d_6): δ 7.39 (d, 2H, *J* = 6.8 Hz), 7.49 (m, 3H), 7.85 (s, 1H), 7.94 (d, 2H, *J* = 5.6 Hz), 8.19 (s, 1H), 9.21 (br s, 1H, NH, D_2O exchangeable); MS: *m/z* 358 (M^++1).

6,8-Dichloro-3-(4-*p*-tolyl-[1,2,3]triazol-1-yl)-chromen-2-ylideneamine, 4f: Brown solid. Yield 80%. m.p. 196-198°C. FT-IR (KBr): 3264, 3171, 1654, 1560, 1454, 1217, 998, 816, 691 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$): δ 2.42 (s, 3H), 7.27 (m, 3H), 7.40

(s, 1H), 7.51 (s, 1H), 7.81 (d, 2H, J = 6.8 Hz), 8.09 (s, 1H), 9.12 (br s, 1H, NH, D_2O exchangeable); ^{13}C NMR (100 MHz, DMSO-d_6): δ 21.3, 120.3, 121.6, 122.8, 124.8, 125.8, 125.9, 126.9, 127.7, 128.2, 130.0, 131.1, 138.2, 140.5, 147.6, 151.5; MS: *m/z* 372 (M^++1).

6-Bromo-3-(4-phenyl-[1,2,3]triazol-1-yl)-chromen-2-ylideneamine, 4g: Yellow solid. Yield 78%. m.p. 176-178°C. FT-IR (KBr): 3302, 3155, 1660, 1597, 1438, 1205, 1014, 904, 804, 758, 686 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6): δ 7.23 (d, 1H, J = 7.6 Hz), 7.39 (d, 2H, J = 6.0 Hz), 7.48 (d, 2H, J = 6.4 Hz), 7.68 (d, 1H, J = 8.4 Hz), 7.94 (d, 2H, J = 6.4Hz), 8.0 (s, 1H), 8.16 (s, 1H), 9.18 (br s, 1H, NH, D_2O exchangeable); ^{13}C NMR (100 MHz, DMSO-d_6): δ 115.5, 117.2, 120.4, 121.7, 125.4, 125.9, 128.2, 129.0, 130.0, 131.1, 134.1, 141.1, 147.5, 151.4, 152; MS: *m/z* 368 (M^++1).

6-Bromo-3-(4-*p*-tolyl-[1,2,3]triazol-1-yl)-chromen-2-ylideneamine, 4h: Yellow solid. Yield 65%. m.p. 179-182°C. ^{1}H NMR (400 MHz, DMSO-d_6): δ 2.35 (s, 3H), 7.29 (m, 2H), 7.67 (m, 3H), 7.82 (d, 2H, J = 8 Hz), 7.98 (m, 1H), 8.15 (s, 1H), 9.10 (br s, 1H, NH, D_2O exchangeable); ^{13}C NMR (100 MHz, DMSO-d_6): δ 21.3, 115.9, 117.7, 120.9, 122.9, 123.0, 125.8, 126.4, 127.7, 127.8, 130.0, 131.5, 134.5, 138.1, 147, 152.1; MS: *m/z* 382 (M^++1).

2-(4-Phenyl-[1,2,3]triazol-1-yl)-benzo[f] chromen-3-ylideneamine, 6a: Rust solid. Yield 65%. m.p. 154-156°C. FT-IR (KBr): 3292, 3030, 1604, 1460, 1438 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6): δ 7.44 (s, 1H), 7.55 (s, 2H), 7.68 (s, 2H), 7.97 (m, 2H), 8.03 (m, 3H), 8.14 (d, 1H, J = 6 Hz), 8.46 (s, 2H), 9.33 (br s, 1H, NH, D_2O exchangeable); ^{13}C NMR (100 MHz, DMSO-d_6): δ 113.8, 114.2, 120.6, 121.7, 122.4, 123.4, 124.1, 124.3, 124.7, 127.1, 127.2, 127.5, 128.0, 128.3, 134.5, 147.0, 149.2, 152.9, 159.7; MS: *m/z* 339 (M^++1).

2-[4-(4-Methylphenyl)-1*H*-1,2,3-triazol-1-yl]-3*H*-benzo[f]chromen-3-ylideneamine, 6b: Tan black solid. Yield 63%. m.p. 153-155°C. ^{1}H NMR (400 MHz, DMSO-d_6): δ 2.37 (s, 3H), 7.33 (d, 2H, J = 8 Hz), 7.63 (m, 2H), 7.84 (d, 2H, J = 8 Hz), 8.02 (m, 3H), 8.13 (d, 1H, J = 8.8 Hz), 8.45 (s, 2H), 9.27 (br s, 1H, NH, D_2O exchangeable); MS: *m/z* 353 (M^++1).

Conclusions

We have demonstrated a highly efficient procedure for the synthesis of 3-triazolyl-chromen-2-ylideneamine by three-component reaction of 2-azido acetonitrile, phenylacetylene and salicylaldehyde in the presence of CuI/K_2CO_3 catalyst in water under mild reaction conditions. One of the notable merits of the herein reported protocol are the use of readily available K_2CO_3 as mild base catalyst and water as the reaction medium, which make it cost-effective and environmentally benign. Wider substrate scope, higher yields, operational simplicity and simple purification process make the protocol highly applicable in the synthesis of 3-triazolyl-chromen-2-ylideneamine. In addition, for the first time, *in vitro* antioxidant activity of 3-triazolyl-chromen-2-ylideneamine has been examined and reported. Compound **4c** was found to be the most active among the series showing high reducing power and free radical scavenging activity.

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Supplementary Information

Supplementary information is available in the website http://nopr.niscpr.res.in/handle/123456789/58776.

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