Design and Synthesis of Novel Triazolyl Benzoxazine Derivatives and Evaluation of Their Antiproliferative and Antibacterial Activity

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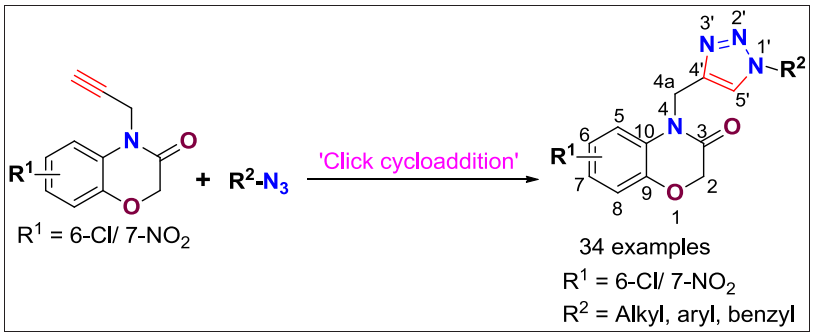

A series of novel triazolyl benzoxazine derivatives have been synthesized via Cu(I)-catalyzed 'Click' cycloaddition. All of the compounds were fully characterized from their spectral data, and their antiproliferative activity was evaluated against three selected human cancer cell lines: cervical cancer cells (HeLa), colorectal adenocarcinoma (HT-29), and ovarian adenocarcinoma (SKOV-3). A few representative compounds have also been evaluated for their antibacterial potential against two bacterial strains *Pseudomonas aeruginosa* and *Bacillus subtilis*.

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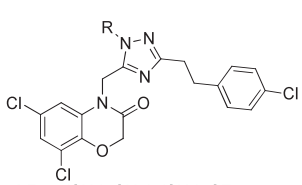
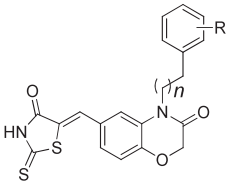
INTRODUCTION

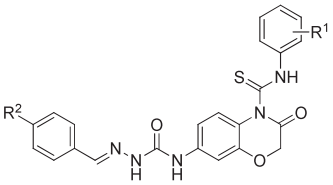
Heterocycles form by far the largest of classical divisions of organic chemistry and are of immense importance biologically and industrially. The majority of pharmaceuticals and biologically active agrochemicals are heterocyclic as well the countless additives and modifiers used in industrial applications ranging from cosmetics to information storage and plastics [1]. One striking structural feature inherent to heterocycles, which continue to be exploited to great advantage by the pharmaceutical industry, lies in their ability to manifest substituents around a core scaffold in defining three-dimensional representations. Nitrogen-containing heterocyclic compounds have maintained the interest of researchers through decades of historical development of organic synthesis. Among the nitrogen heterocycles, 1,4-benzoxazine is the important scaffold present in various agrochemicals and primarily used by plants as natural defense chemicals [2, 3]. In particular, the utility of the 2*H*-1,4-benzoxazin-3-(4*H*)-one scaffold as a privileged structure for the generation of drug-like libraries in drug-discovery programs has been amply demonstrated. 1,4-Benzoxazin-3(4*H*)-one derivatives have shown various biological activities; for example, both the derivatives of compound **1** are potential non-nucleoside SGLT2 inhibitors for the treatment of type 2 diabetes [4].



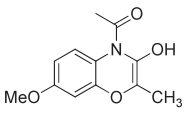
1 R = -$(CH_2)_2CH_3$/ -$(CH_2)_2CF_3$



2 R = H/ 4-CH_3/ 4-Cl/ 4-CN/ 4-*t*-butyl/ 4-CF_3/ 3,4-$(CH_3)_2$/ 4-OCH_3
n = 1-2



3 R^1 = H/ Me/ OMe
R^2 = H/ 2-Cl/ 4-Cl/ 4-OH/ 2-NO_2/ 3-NO_2



4 Cappamensin A

Similarly, investigation of a series of 4,6-disubstituted-4*H*-benzo[1,4]oxazin-3-ones (**2**) has led to the identification of inhibitors of PI3 kinases [5]. The compound **3** displayed significant anticonvulsant activity [6]. Recently, a compound cappamensin A (**4**) isolated from the roots of *Capparis sikkimensis* displayed significant *in vitro* antitumor activity in various human cell lines [7]. Moreover, benzoxazine derivatives are also known to exhibit other activities such as anti-inflammatory [8], antiulcer [9], antipyretic [10], antihypertensive [11], antifungal [12], potassium channel modulators [13], antirheumatic agents [14], and plant resistance factors against microbial diseases and insects [15].

Diverse biological activities of 2*H*-1,4-benzoxazin-3-(4*H*)-one scaffold have encouraged us to develop newer analogs that may follow novel mechanisms of action to combat diseases; this is indeed required as most drugs become ineffective because of the acquired drug resistance. Molecular hybridization, which covalently combines two or more drug pharmacophores into a single molecule, is an effective tool to design highly active novel entities. The clubbed pharmacophores may act on multiple therapeutic targets and offer the advantage of overcoming inevitable drug resistance [16]. In addition, the hybrids may also minimize unwanted side effects and allow for synergistic action [17]. The molecular hybrid approach has already been applied in developing novel antimalarial agents to overcome drug resistance [18]. In recent years, 1,2,3-triazole has emerged as an interesting scaffold for medicinal chemists owing to its numerous biological activities and synthetic accessibility by 'Click chemistry' [19]. 1,2,3-Triazole's pharmacological profile has made it much more appealing and promising for finding potential anticancer and antibacterial lead agents. 1,2,3-Triazoles conjugated with a wide range of moieties are reported to exhibit potent anticancer and antibacterial activities [20]. Encouraged by the recent research in this area by our group and the newest literature reports on benzo[*b*][1,4]oxazine scaffold, we envision observing the potential synergistic effect by clubbing together the 1,2,3-triazole and 2*H*-1,4-benzoxazin-3-(4*H*)-one moieties on the antiproliferative activity against cancerous human cell lines. Because such scaffolds are also known to possess antimicrobial activity, we thus planned to study the antibacterial activity of the compounds synthesized by combining two pharmacophores. This is the first such study where the triazolyl benzoxazine moieties have been clubbed together and the resulting compounds evaluated for antiproliferative and antibacterial activities.

RESULTS AND DISCUSSION

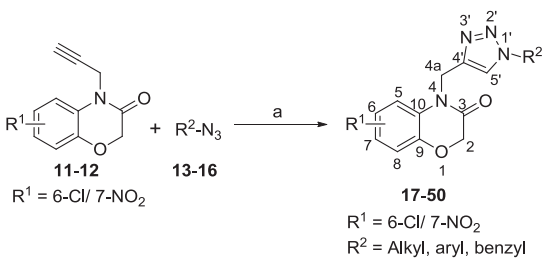
Chemistry. A series of triazolyl benzoxazine derivatives (**17–50**) were synthesized by reacting 6-chloro-4-(prop-2-yn-1-yl)-2*H*-benzo[b][1,4]oxazin-3(4*H*)-one (**11**) and 7-nitro-4-(prop-2-yn-1-yl)-2*H*-benzo[b][1,4]oxazin-3(4*H*)-one (**12**) with various aromatic and aliphatic azides (**13–16**) via copper(I)-catalyzed 1,3-dipolar cycloaddition (Scheme 1). The key propargyl benzoxazine intermediate was prepared from 2-amino-4-chlorophenol (**5**) and 2-amino-5-nitrophenol (**6**). In the first step, amidation of phenol (**5/6**) with 2-chloroacetyl chloride leads to the formation of the corresponding amide (**7/8**). The amide (**7/8**) was then dissolved in DMF and K_2CO_3 added to it. The reaction mixture was stirred at the 90°C for 5 h to yield the cyclized product, that is, benzoxazine (**9/10**). Benzoxazine was then reacted separately with propargyl bromide in anhydrous acetone and K_2CO_3 under reflux conditions to yield the desired 6-chloro-4-(prop-2-yn-1-yl)-2*H*-benzo[b][1,4]oxazin-3(4*H*)-one (**11**) and 7-nitro-4-(prop-2-yn-1-yl)-2*H*-benzo[b][1,4]oxazin-3(4*H*)-one (**12**), which was purified by column chromatography using ethyl acetate : petroleum ether (1:10) as eluting solvent (Scheme 2). Additionally, the azides **13–16** were in turn prepared following Schemes 3–5.

Synthesis of 2-azidopropane-1,3-diyl diacetate (13)/2-azidopropane-1,3-diol (14). The chemo-enzymatic methodology was utilized (Scheme 3) to synthesize the target 2-azidopropane-1,3-diol by following the literature report [21]. Glycerol was used as the starting material to form the azide (**13** and **14**) using immobilized *Candida antarctica* lipase B (CAL B) marketed by Novo Nordisk (Denmark) as Novozym 435. The first step involved the selective acetylation of the primary hydroxyl groups of glycerol using vinyl acetate and Novozym 435 to form 1,3-diacetoxy glycerol. It was then subjected to mesylation of the available secondary hydroxyl group followed by azidation in DMF to yield the diacetoxy azido derivative **13**, which on deacylation gives 2-azidopropane-1,3-diol **14**.

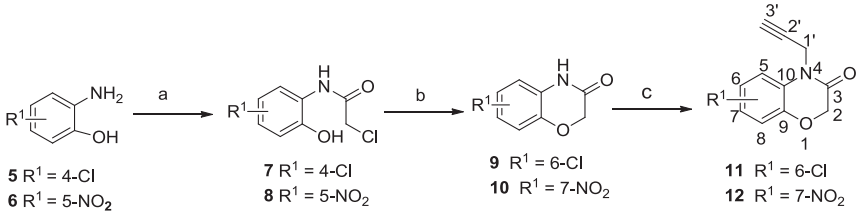
Synthesis of aliphatic azides (15). These azides were synthesized by following the method of Wilkening *et al.* [22]. Various *para*-substituted benzyl azide, hexyl azide, and 2-azido ethyl acetate were obtained from the corresponding bromo precursor by treatment with sodium azide (Scheme 4).

Synthesis of aromatic azides (16). The aromatic azides (**16**) were synthesized by following the literature procedure (Scheme 5) [22].

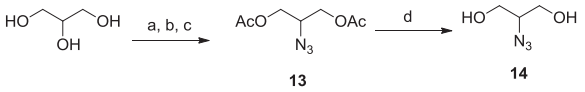
Scheme 1. The synthetic route of compounds 17–50. Reagents: (a) $CuSO_4 \cdot 5H_2O$, sodium ascorbate, THF : H_2O (1:1), 35–40°C.



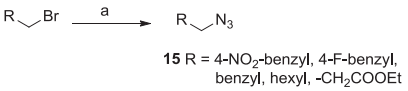
Scheme 2. The synthetic route of compounds **11** and **12**. Reagents: (a) Chloroacetyl chloride, K_2CO_3, CH_3CN, 25°C; (b) K_2CO_3, DMF, 90°C; (c) propargyl bromide, K_2CO_3, anhydrous acetone, reflux.



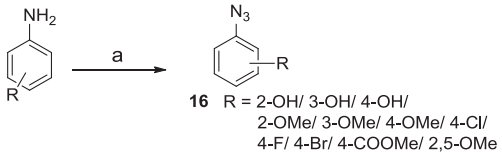
Scheme 3. Synthesis of 2-azidopropane-1,3-diol. Reagents: (a) Novozym 435, vinyl acetate, THF, 25°C; (b) MsCl, TEA, $CHCl_3$, 25°C; (c) NaN_3, DMF, 80-120°C; (d) K_2CO_3, abs. EtOH.



Scheme 4. The synthetic route of compound **15**. Reagents: (a) NaN_3, DMSO, 25°C.



Scheme 5. The synthetic route of compound **16**. Reagents: (a) $NaNO_2$, HCl, NaN_3, 0–25°C.



Antiproliferative activity evaluation of the triazolyl benzoxazine derivatives. ***Cell culture.*** The cells were grown on 75-cm^2 cell culture flasks with Eagle's minimum essential medium, supplemented with 10% fetal bovine serum and 1% penicillin/streptomycin solution (10,000 units of penicillin and 10 mg of streptomycin in 0.9% NaCl) in a humidified atmosphere of 5% CO_2, 95% air at 35°C.

Cell proliferation assay. Cell proliferation assay was carried out using CellTiter 96 aqueous one solution cell proliferation assay kit (Promega Corporation, Madison, WI, USA). Briefly, upon reaching about 75–80% confluence, 5000 cells per well were plated in a 96-well microplate in 100 µL media. After seeding for 72 h, the cells were treated with 50 µ*M* compound in triplicate. Doxorubicin (10 µ*M*) was used as the positive control. At the end of the sample exposure period (72 h), 20 µL CellTiter 96 aqueous solutions were added. The plate was returned to the incubator for 1 h in a humidified atmosphere at 37°C. The absorbance of the formazan product was measured at 490 nm using a microplate reader. The blank control was recorded by measuring at the same wavelength with wells containing a medium mixed with Cell Titer 96 aqueous solution but no cells. Results were expressed as the percentage of the control (without a compound set at 100%).

Out of 34 triazolyl benzoxazine derivatives synthesized (Table 1), 32 derivatives were evaluated against three human carcinoma cell lines, namely cervical cancer cells, HeLa, colorectal adenocarcinoma, HT-29, and ovarian adenocarcinoma SKOV-3 at a concentration of 50 DM. All the compounds tested for their antiproliferative activity displayed almost negligible activity against the three cell lines studied (Figs. 1–3).

Table 1

List of triazolyl benzoxazine derivatives synthesized.

Compound	R^2
17	$-CH(CH_2OH)_2$
18	4-NO_2-benzyl
19	4-C_6H_4OMe
20	4-C_6H_4Cl
21	4-C_6H_4F
22	3-C_6H_4OMe
23	4-C_6H_4COOMe
24	2-C_6H_4OH
25	2-C_6H_4OMe
26	2,5-$C_6H_4(OMe)_2$
27	Benzyl
28	4-F-benzyl
29	4-C_6H_4Br
30	$-C_6H_5$
31	$-CH_2COOEt$
32	$-CH(CH_2OAc)_2$
33	4-C_6H_4 NO_2
34	Hexyl
35	4-C_6H_4OH
36	3-C_6H_4OH
37	$-CH_2COOEt$
38	3-C_6H_4OMe
39	2-C_6H_4OMe
40	4-C_6H_4OMe
41	Benzyl
42	4-F-benzyl
43	4-NO_2-benzyl
44	4-C_6H_4Cl
45	4-C_6H_4Br
46	3-C_6H_4OH
47	4-$C_6H_4NO_2$
48	2,5-$C_6H_4(OMe)_2$
49	4-C_6H_4F
50	$-C_6H_5$

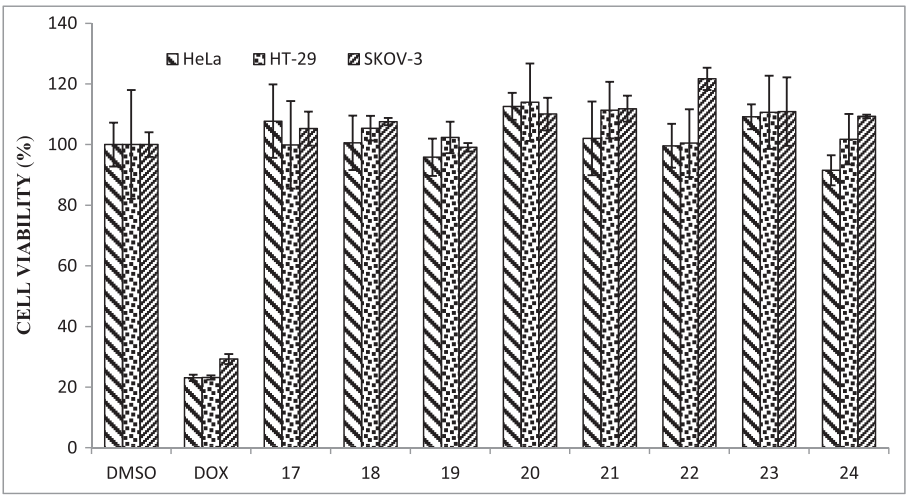


Figure 1. Cell viability results of compounds **17–24** against three cell lines HeLa, HT-29, and SKOV-3.

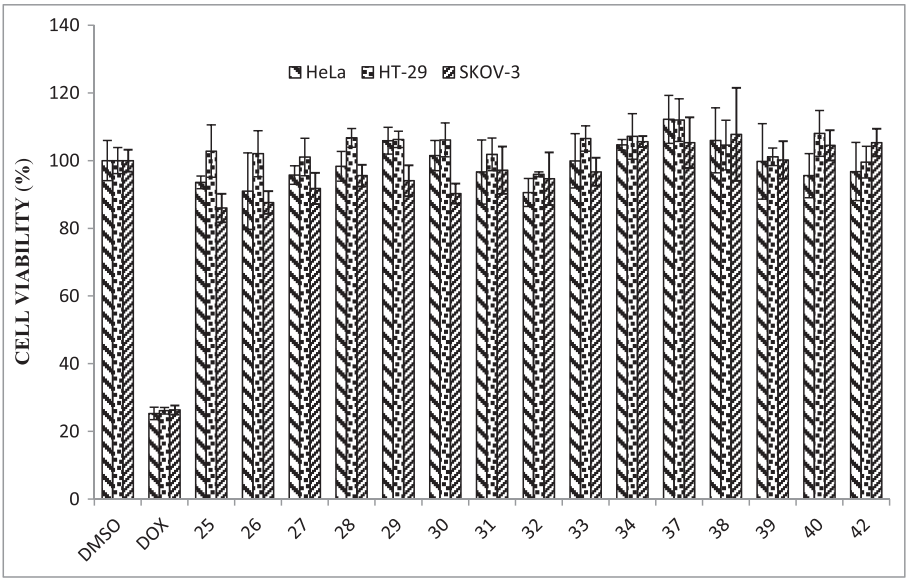


Figure 2. Cell viability results of compounds **25–34, 37–39, 40 & 42** against three cell lines HeLa, HT-29, and SKOV-3.

Antibacterial activity evaluation of the triazolyl benzoxazine derivatives. The antibacterial activity screening of few representative compounds was carried out against pathogenic bacteria by a disk diffusion method as described by the Kirby–Bauer method [23]. Briefly, the inoculums were prepared by growing bacteria at 37°C for 14–16 h. The OD of overnight culture was adjusted to 0.4–0.6 at a transmission wavelength of 600 nm. Sterilized disks (6 mm in diameter) were impregnated with the solution of compounds and incubated at 37°C for 16–17 h. The zone of inhibition developed by compounds was examined at a concentration of 250 µg/d, and gentamicin was used in the assay as the standard control drug. An equivalent amount of solvent was employed as the negative control in the assay.

Sample preparation for antimicrobial activity. ***Preparation of test organism.*** The antimicrobial activity test was performed by disk diffusion using two strains, that is, the Gram-positive bacterial strain of *Bacillus subtilis* and Gram-negative bacterial strain of *Pseudomonas aeruginosa*. The test organisms were inoculated in nutrient broth and kept at an orbital shaker (ISF1-X (Climo-Shaker), Kuhner, Dinkelbergstrasse 1, CH-4127 Birsfelden (Basel), Switzerland) at 200 rpm/min at 37°C for 14–16 h.

Kirby–Bauer disk diffusion assay. Antimicrobial activity was performed by using the Kirby–Bauer disk susceptibility test with some minor modifications.

Different antibiotic disks were placed on the respective grid of each Mueller Hinton Agar plates seeded with the test organism and then kept for overnight incubation at

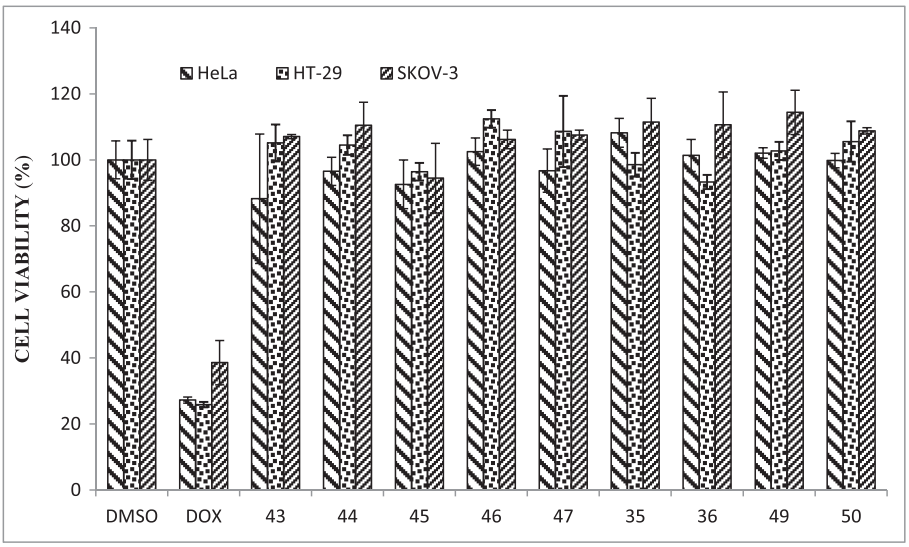


Figure 3. Cell viability results of compounds **35, 36, 43–47, 49 & 50** against three cell lines HeLa, HT-29, and SKOV-3.

Table 2

Antibacterial activity results.

Sample no.	Sample code	Solubility	Zone of inhibition (mm)[a]	
			Pseudomonas aeruginosa	*Bacillus subtilis*
1	**17**	DMSO	NA	NA
2	**21**	DMSO	NA	NA
3	**24**	DMSO	NA	NA
4	**28**	DMSO	NA	NA
5	**34**	DMSO	NA	NA
6	**35**	DMSO	NA	NA
7	**36**	DMSO	NA	NA
8	**50**	DMSO	NA	NA
9	Gentamicin (+ve)	—	28	35

Concentration of gentamicin: 100 μg/d.
[a]Concentration of the compound: 250 μg/d.

37°C. In antibiotics that inhibited the growth of organisms, a "zone of inhibition" was observed, which was a clear, distinct zone, and some antibiotics were not effective in inhibiting the growth of the organisms; hence, no zone of inhibition was found.

A few representative compounds were evaluated for their antibacterial activity against two bacterial strains *P. aeruginosa* and *B. subtilis*. The zone of inhibition was evaluated by the disk diffusion method. All the compounds evaluated did not show any noticeable antibacterial activity at the concentrations screened (Table 2).

CONCLUSIONS

A series of 34 novel triazolyl benzoxazine derivatives were synthesized. All the compounds were characterized on the basis of their ^{1}H NMR, ^{13}C NMR, HRMS, UV, and FT-IR spectral data. Out of 34 compounds, 32 have been evaluated for their antiproliferative activity against a panel of three human cancer cell lines, that is, HeLa, HT-29, and SKOV-3. Eight representative compounds were also evaluated for their antibacterial activity against two bacterial strains *P. aeruginosa* and *B. subtilis*. However, these compounds do not exhibit a noticeable antiproliferative or antibacterial activity. This information may be useful for researchers working in a related area for the further design and development of antiproliferative and antibacterial compounds.

EXPERIMENTAL

All the chemicals and reagents were procured from Spectrochem Pvt. Ltd. (Mumbai, India) and Sigma-Aldrich Chemicals Pvt. Ltd. (St. Louis, MO, USA). The organic

solvents were dried and distilled prior to their use. Reactions were monitored by precoated TLC plates (Merck silica gel 60F254); the spots were visualized with UV light. Silica gel (100–200 mesh) was used for column chromatography. Melting points were measured on a Buchi M-560 apparatus (BUCHI, Switzerland) and are uncorrected. Infrared spectra were recorded on a Perkin-Elmer FT-IR model 9 spectrophotometer (PerkinElmer, Waltham, MA, USA). The ^{1}H and ^{13}C NMR spectra were recorded on a Jeol-400 (400 MHz, 100.5 MHz) NMR spectrometer (JEOL USA Inc., Peabody, MA, USA) using TMS as internal standard. The chemical shift values are on the δ scale, and the coupling constant values (J) are in hertz. The HRMS data were obtained using a JEOL JMS-SX-102A spectrometer at the Institute fur Chemie und Biochemie, Freie Universitat Berlin, Germany.

General procedure for the synthesis of 6-chloro/7-nitro 4-(prop-2-yn-1-yl)-2*H*-benzo[b][1,4]oxazin-3(4*H*)-one (11/12). The target compound was synthesized by following the method of Vara *et al*. [24]. In a 500-mL RB flask, benzoxazine-3(4*H*)-one derivative (**9** and **10**) (1 equiv.) was dissolved in anhydrous acetone (200 mL) at 25°C followed by the addition of anhydrous K_2CO_3 (1.5 equiv.) along with stirring. The solution was stirred for 10 min, and then propargyl bromide (1.2 equiv.) was added dropwise. The reaction mixture was stirred at 65°C, and then the progress of the reaction was followed by TLC (ethyl acetate : petroleum ether, 1:4). On completion of the reaction, the reaction mixture was allowed to cool to room temperature followed by evaporation of the solvent under reduced pressure. The crude solid so obtained was cooled in an ice bath, and then distilled water (100 mL) was added. The resulting solution was extracted with chloroform (3 × 100 mL), and the combined organic layer was washed with water (2 × 100 mL) and brine (100 mL). After drying the solution over anhydrous sodium sulfate, the solvent was evaporated under reduced pressure, and the crude product so obtained was subjected to column chromatography (MeOH : $CHCl_3$, 1:20). The desired compound (**11–12**) was obtained in 90–95% isolated yield as a light brown solid.

6-Chloro-4-(prop-2-yn-1-yl)-2H-benzo[b][1,4]oxazin-3(4H)-one (11). Light brown solid; Yield: 95%; Melting point: 98–99°C (100–101°C) [25]; UV (MeOH) λ_{max}: 297 nm; IR (KBr) ν_{max} (cm^{-1}): 3229, 2854, 2115, 1684, 1384, 1272; ^{1}H NMR (400 MHz, $CDCl_3$): δ2.30 (t, 1H, H-3′), 4.63 (s, 2H, H-2), 4.66 (d, J = 2.2 Hz, 2H, H-1′), 6.93 (d, J = 8.8 Hz, 1H, H-8), 7.00 (dd, J = 8.8 and 2.2 Hz, 1H, H-7), 7.18 (d, J = 2.2 Hz, H-5).

7-Nitro-4-(prop-2-yn-1-yl)-2H-benzo[b][1,4]oxazin-3(4H)-one (12). Light brown solid; Yield: 90%; Melting point: 149–150°C; UV (MeOH) λ_{max}: 337 nm; IR (KBr) ν_{max} (cm^{-1}): 3301, 2915, 1700, 1501, 1339, 1320; ^{1}H NMR (400 MHz, $CDCl_3$): δ 2.31 (t, J = 2.5 Hz, 1H, H-3′), 4.73 (s, 2H, H-2), 4.75 (d, J = 2.2 Hz, 2H, H-1′), 7.29 (d, J = 8.4 Hz, 1H, H-5), 7.85 (d, J = 2.9 Hz, 1H, H-8), 7.97 (dd, J = 7.6 and 2.2 Hz, 1H, H-6).

General procedure for the synthesis of triazolyl benzoxazine (17-50). To a solution THF/H_2O (2:1 v/v) was added a propargyl derivative (**11–12**) (1 equiv.) and respective azide (**13–16**) (1 equiv.) followed by the addition of sodium ascorbate (0.1 equiv.) and $CuSO_4{\cdot}5H_2O$ (0.2 equiv.) with stirring at 35–40°C for 6–12 h. After completion of the reaction, observed through TLC (MeOH : $CHCl_3$, 1:20), the solvent was evaporated under reduced pressure. The crude solid obtained was then dissolved in distilled water and extracted with ethyl acetate (3 × 100 mL). The combined organic layer was washed with saturated sodium bicarbonate solution (3 × 50 mL) and with brine (50 mL). After drying the solution over anhydrous sodium sulfate, the solvent was removed under reduced pressure, and the desired compound (**17–50**) was obtained as crude solid. The crude product was purified by column chromatography over silica gel 100–200 mesh in 5–10% methanol/chloroform to yield the desired compound in 85–95% isolated yield.

6-Chloro-4-[(1-(1,3-dihydroxypropan-2-yl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b] [1,4]oxazin-3(4H)-one (17). White solid; Yield: 85%; Melting point: 177–179°C; UV (MeOH) λ_{max}: 258 and 297 nm; IR (KBr) ν_{max} (cm^{-1}): 3350, 2922, 1685, 1382, 1275; ^{1}H NMR (400 MHz, DMSO-d_6): δ 3.76 (d, J = 4.3 Hz, 4H, H-1″ and H-3″), 4.53–4.59 (m, 1H, H-2″), 4.72 (s, 2H, –OH), 5.02 (d, J = 5.1 Hz, 2H, H-4a), 5.13 (s, 2H, H-2), 7.01–7.06 (m, 2H, H-7 and H-8), 7.50 (d, J = 1.4 Hz, 1H, H-5), 8.02 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, DMSO-d_6): δ 36.38 (C-4a), 60.60 (C-1″ and C-3″), 64.97 (C-2), 67.05 (C-2″), 115.86 (C-8), 117.91 (C-5), 123.16 (C-7), 123.26 (C-5′), 126.34 (C-6), 129.95 (C-9), 141.37 (C-4′), 143.77 (C-10), 163.94 (C-3); HRMS (*m*/*z*): Calculated for $C_{14}H_{15}ClN_4O_4$ [M + Na]$^+$ 361.0680, found 361.0650 [M + Na]$^+$.

6-Chloro-4-[(1-(4-nitrobenzyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (18). Yellow solid; Yield: 95%; Melting point: 184–186°C; UV (MeOH) λ_{max}: 263 and 302 nm; IR (KBr) ν_{max} (cm^{-1}): 3072, 1691, 1370, 1265; ^{1}H NMR (400 MHz, DMSO-d_6): δ 4.70 (s, 2H, H-4a), 5.16 (s, 2H, H-2), 5.74 (s, 2H, H-1′a), 7.02–7.03 (m, 2H, H-8 and H-7), 7.39 (d, J = 1.4 Hz, 1H, H-5), 7.48 (d, J = 8.7 Hz, 2H, H-2″ and H-6″), 8.18 (s, 1H, H-5′), 8.20 (d, J = 8.7 Hz, 2H, H-3″ and H-5″); ^{13}C NMR (100.5 MHz, DMSO-d_6): δ 36.04 (C-4a), 51.65 (C-1′a), 66.69 (C-2), 115.75 (C-8), 117.63 (C-5), 123.15 (C-7), 124.01(C-5′), 124.54 (C-5″ and C-3″), 126.40 (C-6), 129.12 (C-2″ and C-6″), 129.76 (C-9), 142.56 (C-4′), 143.45 (C-1″), 143.84 (C-10), 147.26 (C-4″), 164.02 (C-3); HRMS (*m*/*z*): Calculated for $C_{18}H_{14}ClN_5O_4$ [M + Na]$^+$ 422.0632, found 422.0644 [M + Na]$^+$.

6-Chloro-4-[(1-(4-methoxyphenyl)-1H-1,2,3-triazol-4-yl) methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (19). Light yellow solid; Yield: 93%; Melting point: 164–166°C; UV (MeOH) λ_{max}: 263 nm; IR (KBr) ν_{max} (cm^{-1}): 3126, 1685, 1387, 1263; ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.85 (s, 3H, –OMe), 4.61 (s, 2H, H-4a), 5.20 (s, 2H, H-2), 6.90

(d,J = 8.7 Hz, 1H, H-8), 6.96 (dd, J = 8.7 and 2.2 Hz, H-7), 6.99 (d, J = 8.7 Hz, 2H, H-3″ and H-5″), 7.60 (d, J = 8.7 Hz, 2H, H-2″ and H-6″), 7.62 (d, J = 2.2 Hz, 1H, H-5), 7.95 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.55 (C-4a), 55.54 (–OCH_3), 67.61 (C-2), 114.69 (C-3″ and C-5″), 116.12 (C-5), 117.76 (C-7 and C-8), 121.64 (C-5′), 122.04 (C-2″ and C-6″), 123.91 (C-6), 128.17 (C-1″), 129.67 (C-9), 143.09 (C-4′), 143.66 (C-10), 159.83 (C-4″), 164.53 (C-3); HRMS (*m/z*): Calculated for $C_{18}H_{15}ClN_4O_3$ $[M+Na]^+$ 393.0730, found 393.0707 $[M+Na]^+$.

6-Chloro-4-[(1-(4-chlorophenyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (20). Light yellow solid; Yield: 92%; Melting point: 192–194°C; UV (MeOH) λ_{max}: 256 and 300 nm; IR (KBr) ν_{max} (cm^{-1}): 3147, 1677, 1377, 1264; ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.61 (s, 2H, H-4a), 5.20 (s, 2H, H-2), 6.90 (d, J = 8.7 Hz, 1H, H-8), 6.97 (dd, J = 8.7 and 2.20 Hz, 1H, H-7), 7.48 (d, J = 8.7 Hz, 2H, H-2″ and H-6″), 7.59 (d, J = 2.2 Hz, 1H, H-5), 7.66 (d, J = 8.7 Hz, 2H, H-3″ and H-5″), 8.02 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.46 (C-4a), 67.60 (C-2), 116.03 (C-5 and C-8), 117.84 (C-5′), 121.57 (C-2″ and C-6″), 124.00 (C-6 and C-7), 128.19 (C-3″ and C-5″), 129.60 (C-9), 129.89 (C-4′), 134.66 (C-4″), 135.22 (C-1″), 143.65 (C-10), 164.59 (C-3); HRMS (*m/z*): Calculated for $C_{17}H_{12}Cl_2N_4O_2$ $[M+Na]^+$ 397.0235, found 397.0231 $[M+Na]^+$.

6-Chloro-4-[(1-(4-fluorophenyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (21). Light yellow solid; Yield: 89%;Melting point: 148–149°C; UV (MeOH) λ_{max}: 252 and 299 nm; IR (KBr) ν_{max} (cm^{-1}): 1686, 1387, 1269; ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.61 (s, 2H, H-4a), 5.20 (s, 2H, H-2), 6.90 (d, J = 8.7 Hz, 1H, H-8), 6.97 (dd, J = 8.7 and 2.2 Hz, 1H, H-7), 7.20 (t, $^3J_{HF}$ = 8.7 Hz, 2H, H-2″ and H-6″), 7.60 (d, J = 2.2 Hz, 1H, H-5), 7.67–7.70 (m, 2H, H-3″ and H-5″), 8.00 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.52 (C-4a), 67.64 (C-2), 116.09 (C-8), 116.73 (d, J_{CF} = 23.0 Hz C-3″ and C-5″), 117.87 (C-7), 121.77 (C-5), 122.46 (d, J_{CF} = 8.6 Hz, C-2″ and C-6″), 124.03 (C-5′), 128.24 (C-6), 129.64 (C-4′), 133.07 (d, J_{CF} = 2.8 Hz, C-1″), 143.48 (C-10), 143.69 (C-9), 162.47 (d, J_{CF} = 250.16 Hz, H-4″), 164.63 (C-3); HRMS (*m/z*): Calculated for $C_{17}H_{12}ClFN_4O_2$ $[M+Na]^+$ 381.0531, found 381.0519 $[M+Na]^+$.

6-Chloro-4-[(1-(3-methoxyphenyl)-1H-1,2,3-triazol-4-yl) methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (22). Light yellow solid; Yield: 91%; Melting point: 194–195°C; UV (MeOH) λ_{max}: 255 and 295 nm; IR (KBr) ν_{max} (cm^{-1}): 2974, 1689, 1375, 1273; ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.87 (s, 3H, OCH_3), 4.62 (s, 2H, H-4a), 5.21 (s, 2H, H-2), 6.91 (d, J = 8.7 Hz, 1H, H-8), 6.95–6.98 (m, 2H, H-4″ and H-5″), 7.23 (dd, J = 8.0 and 2.2 Hz, 1H, H-7), 7.32 (t, J = 2.2 Hz, 1H, H-2″), 7.39 (t, J = 8.0 Hz, 1H, H-6″), 7.62 (d, J = 2.2 Hz, 1H, H-5), 8.03 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 36.40 (C-4a), 55.40 (–OCH_3), 67.16 (C-2), 115.80 (C-8), 115.88 (C-7), 118.09 (C-5), 121.88 (C-5′), 123.34 (C-6″), 126.44 (C-6), 129.90 (C-1″ and C-3″), 130.96 (C-10), 137.55 (C-4′), 143.31 (C-5″ and C-4″), 143.92 (C-9), 158.55 (C-3″), 164.20 (C-3); HRMS (*m/z*): Calculated for $C_{18}H_{15}ClN_4O_3$ $[M+Na]^+$ 393.0730, found 393.0735 $[M+Na]^+$.

Methyl 4-(4-[(6-chloro-3-oxo-2H-benzo[b][1,4]oxazin-4(3H)-yl) methyl]-1H-1,2,3-triazol-1-yl)benzoate (23). Light yellow solid; Yield: 95%; Melting point: 209–210°C; UV (MeOH) λ_{max}: 265 nm; IR (KBr) ν_{max} (cm^{-1}): 2952, 1719, 1689, 1364, 1274; ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.94 (s, 3H, H-1‴), 4.62 (s, 2H, H-4a), 5.22 (s, 2H, H-2″), 6.91 (d, J = 8.7 Hz, 1H, H-8″), 6.97 (dd, J = 8.0 and 2.2 Hz, 1H, H-7″), 7.59 (d, J = 2.2 Hz, 1H, H-5″), 7.82 (d, J = 8.7 Hz, 2H, H-3 and H-5), 8.11 (s, 1H, H-5′), 8.19 (d, J = 8.7 Hz, 2H, H-2 and H-6); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.46 (C-4a), 52.41 (C-1‴), 67.62 (C-2″), 116.03 (C-8″), 117.88 (C-4′), 119.85 (C-3 and C-5), 121.48 (C-7″), 124.04 (C-5″), 128.22 (C-6″), 129.60 (C-1), 130.36 (C-10″), 131.29 (C-2 and C-6), 139.79 (C-4), 143.68 (C-9″), 164.63 (C-3″), 165.77 (C-1‴); HRMS (*m/z*): Calculated for $C_{19}H_{15}ClN_4O_4$ $[M+Na]^+$ 421.0680, found 421.0616 $[M+Na]^+$.

6-Chloro-4-[(1-(2-hydroxyphenyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (24). Light yellow solid; Yield: 70%; Melting point: 214–215°C; UV (MeOH) λ_{max}: 249 and 294 nm; IR (KBr) ν_{max} (cm^{-1}): 3299, 1663, 1431, 1361, 1272; ^{1}H NMR (400 MHz, DMSO-d_6): δ 4.73 (s, 2H, H-4a), 5.25 (s, 2H, H-2), 6.94–6.98 (m, 1H, H-4″), 7.01–7.06 (m, 2H, H-5″ and H-6″), 7.09 (d, J = 8.2 Hz, 1H, H-8), 7.30–7.34 (m, 1H, H-3″), 7.52 (d, J = 1.8 Hz, 1H, H-5), 7.58 (dd, J = 7.7, 1.37 Hz, 1H, H-7), 8.42 (s, 1H, H-5′), 10.57 (s, 1H, OH); ^{13}C NMR (100.5 MHz, DMSO-d_6): δ 36.08 (C-4a), 67.05 (C-2), 115.82 (C-8), 117.05 (C-1″), 117.90 (C-3″), 119.55 (C-5), 123.12 (C-5′), 124.34 (C-5″), 124.94 (C-6), 125.28 (C-6), 126.33 (C-6″), 129.84 (C-10), 130.13 (C-4″), 141.75 (C-4′), 143.81 (C-9), 149.41 (C-2″), 164.03 (C-3); HRMS (*m/z*): Calculated for $C_{17}H_{13}ClN_4O_3$ $[M+Na]^+$ 379.0574, found 379.0550 $[M+Na]^+$.

6-Chloro-4-[(1-(2-methoxyphenyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (25). White solid; Yield: 85%; Melting point: 170–171°C; UV (MeOH) λ_{max}: 250 and 251 nm; IR (KBr) ν_{max} (cm^{-1}): 2901, 1685, 1386, 1288; ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.87 (s, 3H, OCH_3), 4.61 (s, 2H, H-4a), 5.23 (s, 2H, H-2), 6.90 (d, J = 8.7 Hz, 1H, H-8), 6.96 (dd, J = 8.7 and 2.2 Hz, 1H, H-5″), 7.05–7.10 (m, 2H, H-4″ and H-6″), 7.39–7.43 (m, 1H, H-3″), 7.65 (d, J = 2.2 Hz, 1H, H-5), 7.75 (dd, J = 8.0 and 1.4 Hz, 1H, H-7), 8.15 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.51 (C-4a), 55.91 (OCH_3), 67.63 (C-2), 112.15 (C-8), 116.27 (C-3″), 117.72 (C-7), 121.12 (C-5), 123.81 (C-5′), 125.34 (C-5″), 125.50 (C-6), 126.06 (C-6″), 128.11(C-1″), 129.78 (C-4″), 130.15 (C-10), 141.92 (C-4′), 143.72 (C-9), 150.97 (C-2″), 164.38 (C-3); HRMS (*m/z*): Calculated for $C_{18}H_{15}ClN_4O_3$ $[M+Na]^+$ 393.0730, found 393.0730 $[M+Na]^+$.

6-Chloro-4-[(1-(2,5-dimethoxyphenyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4] oxazin-3(4H)-one (26). Light yellow solid; Yield: 87%; Melting point: 145–146°C; UV (MeOH) λ_{max}: 251 and 301 nm; IR (KBr) ν_{max} (cm^{-1}): 2933, 1695, 1508, 1365, 1228; ^1H NMR (400 MHz, $CDCl_3$): δ 3.80 (s, 3H, OCH_3), 3.82 (s, 3H, OCH_3), 4.61 (s, 2H, H-4a), 5.23 (s, 2H, H-2), 6.90 (d, J = 8.7 Hz, 1H, H-3″), 6.92-7.00 (m, 3H, H-7, H-8 and H-4″), 7.39 (d, J = 2.9 Hz, 1H, H-6″), 7.65 (d, J = 1.8 Hz, 1H, H-5), 8.21 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.46 (C-4a), 55.90 (OMe), 56.41 (OMe), 67.61 (C-2), 110.08 (C-8), 113.48 (C-6″), 115.79 (C-4″), 116.24 (C-3″), 117.73 (C-1″), 123.81 (C-5′), 125.48 (C-5), 126.19 (C-7), 128.08 (C-6), 129.74 (C-10), 141.98 (C-4′), 143.70 (C-9), 144.72 (C-2″), 153.75 (C-5″),164.38 (C-3); HRMS (*m*/*z*): Calculated for $C_{19}H_{17}ClN_4O_4$ $[M+Na]^+$ 423.0836, found 423.0820 $[M+Na]^+$.

4-[(1-Benzyl-1H-1,2,3-triazol-4-yl)methyl]-6-chloro-2H-benzo[b][1,4]oxazin-3(4H)-one (27). Light yellow solid; Yield: 92%; Melting point: 152–153°C; UV (MeOH) λ_{max}: 256 and 295 nm; IR (KBr) ν_{max} (cm^{-1}): 3089, 1680, 1385, 1272; ^1H NMR (400 MHz, $CDCl_3$): δ 4.56 (s, 2H, H-4a), 5.10 (s, 2H, H-2), 5.48 (s, 2H, H-1′a), 6.88 (d, J = 8.0 Hz, 1H, H-8), 6.95 (dd, J = 8.7 and 2.2 Hz, 1H, H-7), 7.24–7.26 (m, 2H, H-2″ and H-6″), 7.35–7.36 (m, 3H, H-3″, H-4″ and H-5″), 7.49 (s, 1H, H-5′), 7.53 (d, J = 2.2 Hz, 1H, H-5); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.60(C-4a), 54.27 (C-1′a), 67.59 (C-2), 116.17 (C-8), 117.73 (C-7), 123.12 (C-5), 123.88 (C-4″), 128.15 (C-6), 128.83 (C-2″ and C-6″), 129.12 (C-3″ and C-5″), 129.68 (C-10), 134.21 (C-4′), 143.02 (C-1″), 143.66 (C-9), 164.43 (C-3); HRMS (*m*/*z*): Calculated for $C_{18}H_{15}ClN_4O_2$ $[M+Na]^+$ 377.0781, found 377.0750 $[M+Na]^+$.

6-Chloro-4-[(1-(4-fluorobenzyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (28). White solid; Yield: 93%; Melting point: 157–158°C; UV (MeOH) λ_{max}: 255 and 294 nm; IR (KBr) ν_{max} (cm^{-1}): 3035, 1677, 1500, 1386; ^1H NMR (400 MHz, $CDCl_3$): δ 4.57 (s, 2H, H-4a), 5.10 (s, 2H, H-2), 5.45 (s, 2H, H-1′a), 6.88 (d, J = 8.0 Hz, 1H, H-8), 6.95 (dd, J = 8.0 and 2.2 Hz, 1H, H-7), 7.03-7.07 (t, $^3J_{HF}$ = 8.7 Hz, 2H, H-3″ and H-5″), 7.23-7.26 (m, 2H, H-2″ and H-6″), 7.50 (s, 1H, H-5′), 7.53 (d, J = 2.2 Hz, 1H, H-5); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.51(C-4a), 53.44 (C-1′a), 67.55 (C-2), 115.98 (C-8), 116.09 (C-5), 116.20 (d, J_{CF} = 22.04 Hz, C-3″ and C-5″), 117.73 (C-7), 123.04 (C-5′), 123.85 (C-6), 128.06 (C-4′), 129.63 (C-1″), 130.01 (d, J_{CF} = 8.63 Hz, C-2″ and C-6″), 143.09 (C-10), 143.62 (C-9), 162.80 (d, J_{CF} = 248.24 Hz, C-4″), 164.40 (C-3); HRMS (*m*/*z*): Calculated for $C_{18}H_{14}ClFN_4O_2$ $[M+Na]^+$ 395.0687, found 395.0660 $[M+Na]^+$.

4-[(1-(4-Bromophenyl)-1H-1,2,3-triazol-4-yl)methyl]-6-chloro-2H-benzo[b][1,4]oxazin-3(4H)-one (29). Light yellow solid; Yield: 97%; Melting point: 208–210°C; UV (MeOH) λ_{max}: 256 and 298 nm; IR (KBr) ν_{max} (cm^{-1}): 3135, 1672, 1498, 1383; ^1H NMR (400 MHz, $CDCl_3$): δ 4.61 (s, 1H, H-4a), 5.20 (s, 1H, H-2), 6.90 (d, J = 8.7 Hz, 1H, H-8), 6.96 (dd, J = 8.7 and 2.2 Hz, 1H, H-7), 7.59–7.65 (m, 5H, H-5, H-2″, H-3″, H-5″ and H-6″), 8.03 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.49 (C-4a), 67.63 (C-2), 116.06 (C-8), 117.86 (C-5′), 121.44 (C-7), 121.82 (C-5), 122.57 (C-4″), 124.02 (C-6), 128.22 (C-2″ and C-6″), 129.63 (C-10), 132.89 (C-3″ and C-5″), 135.74 (C-4′), 143.62 (C-1″), 143.68 (C-9),164.60 (C-3); HRMS (*m*/*z*): Calculated for $C_{17}H_{12}BrClN_4O_2$ $[M+Na]^+$ 440.9730, found 440.9731 $[M+Na]^+$.

6-Chloro-4-[(1-phenyl-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (30). White solid; Yield: 82%; Melting point: 171–172°C; UV (MeOH) λ_{max}: 250 and 297 nm; IR (KBr) ν_{max} (cm^{-1}): 3081, 1693, 1498, 1381, 1267; ^1H NMR (400 MHz, $CDCl_3$): δ 4.62 (s, 2H, H-4a), 5.22 (s, 2H, H-2), 6.91 (d, J = 8.0 Hz, 1H, H-8), 6.97 (dd, J = 8.0 and 2.2 Hz, 1H, H-7), 7.41–7.45 (m, 1H, H-4″), 7.49–7.53 (m, 2H, H-3″ and H-5″), 7.62 (d, J = 2.2 Hz, 1H, H-5), 7.70–7.72 (m, 2H, H-2″ and H-6″), 8.04 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.52 (C-4a), 67.61 (C-2), 116.10 (C-8), 117.79 (C-7), 120.42 (C-2″ and C-6″), 121.53 (C-5), 123.93 (C-5′), 128.18 (C-6), 128.85 (C-4′), 129.69 (C-3″, C-4″, and C-5″), 136.78 (C-10), 143.33 (C-1″), 143.67 (C-9),164.53 (C-3); HRMS (*m*/*z*): Calculated for $C_{17}H_{13}ClN_4O_2$ $[M+Na]^+$ 363.0625, found 363.0629 $[M+Na]^+$.

Ethyl 2-(4-[(6-chloro-3-oxo-2H-benzo[b][1,4]oxazin-4(3H)-yl)methyl]-1H-1,2,3-triazol-1-yl)acetate (31). Light yellow solid; Yield: 88%; Melting point: 125–126°C; UV (MeOH) λ_{max}: 256 and 297 nm; IR (KBr) ν_{max} (cm^{-1}): 3149, 2983, 1758, 1685, 1381, 1205; ^1H NMR (400 MHz, $CDCl_3$): δ 1.28 (t, J = 7.32 Hz, 3H, H-2″′), 4.25 (q, J = 7.32 Hz, 2H, H-1″′), 4.59 (s, 2H, H-4a), 5.12 (s, 2H, H-2), 5.16 (s, 2H, H-2″), 6.89 (d, J = 8.79 Hz, 1H, H-8″), 6.95 (dd, J = 8.0 and 2.2 Hz, 1H, H-7″), 7.53 (d, J = 2.2 Hz, 1H, H-5″), 7.74 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 13.90 (C-2″′), 37.37 (C-4a), 50.77 (C-2), 62.31 (C-1″′), 67.49 (C-2″), 115.95 (C-8″), 117.66 (C-5″), 123.72 (C-7″), 124.71 (C-5′), 127.96 (C-6″), 129.61 (C-10″), 142.93 (C-4′), 143.59 (C-9″), 164.32 (C-3″), 165.64 (C-1); HRMS (*m*/*z*): Calculated for $C_{15}H_{15}ClN_4O_4$ $[M+Na]^+$ 373.0680, found 373.0676 $[M+Na]^+$.

2-(4-[(6-Chloro-3-oxo-2H-benzo[b][1,4]oxazin-4(3H)-yl] methyl)-1H-1,2,3-triazol-1-yl) propane-1,3-di-yl-diacetate (32). White solid; Yield: 91%; Melting point: 111–112°C; UV (MeOH) λ_{max}: 257 and 297 nm; IR (KBr) ν_{max} (cm^{-1}): 3148, 2967, 1735, 1690, 1500, 1376, 1240; ^1H NMR (400 MHz, $CDCl_3$): δ 2.01 (s, 6H, H-2″′), 4.48–4.50 (m, 4H, H-1 and H-3), 4.60 (s, 2H, H-4a), 5.03 (m, 1H, H-2), 5.14 (s, 2H, H-2″), 6.90 (d, J = 8.0 Hz, 1H, H-8″), 6.95 (dd, J = 8.7 and 2.2 Hz, 1H, H-7″), 7.52 (d, J = 2.2 Hz, 1H, H-5″), 7.68 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 20.47 (C-2″′), 37.45 (C-4a), 58.54 (C-2), 62.29 (C-1 and C-3), 67.57 (C-2″), 116.04 (C-8″), 117.78 (C-5″), 123.09 (C-7″), 123.87 (C-5′), 128.06 (C-6″), 129.64 (C-10″),

142.72 (C-4′), 143.67 (C-9″), 164.46 (C-3″),170.05 (C-1‴); HRMS (*m/z*): Calculated for $C_{18}H_{19}ClN_4O_6$ $[M+Na]^+$ 445.0891, found 445.0879 $[M+Na]^+$.

6-Chloro-4-[(1-(4-nitrophenyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (33). Light yellow solid; Yield: 81%; Melting point: 214–215°C; UV (MeOH) λ_{max}: 292 nm; IR (KBr) ν_{max} (cm^{-1}): 3073, 2927, 1683, 1500, 1388, 1271; ^1H NMR (400 MHz, $CDCl_3$): δ 4.62 (s, 2H, H-4a), 5.23 (s, 2H, H-2), 6.92 (d, *J* = 8.0 Hz, 1H, H-8), 6.98 (dd, *J* = 8.0 and 2.2 Hz, 1H, H-7), 7.58 (d, *J* = 2.2 Hz, 1H, H-5), 7.96 (d, *J* = 9.5 Hz, 2H, H-2″ and H-6″), 8.17 (s, 1H, H-5′), 8.41 (d, *J* = 8.7 Hz, 2H, H-3″ and H-5″), ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.44 (C-4a), 67.65 (C-2), 115.98 (C-8), 117.99 (C-7), 120.51 (C-5), 121.61 (C-2″ and C-6″), 124.17 (C-5′), 125.54 (C-6), 128.29 (C-3″ and C-5″), 129.55 (C-10), 140.78 (C-4′), 143.74 (C-1″), 144.31 (C-9), 147.30 (C-4″), 164.72 (C-3); HRMS (*m/z*): Calculated for $C_{17}H_{12}ClN_5O_4$ $[M+Na]^+$ 408.0476, found 408.0464 $[M+Na]^+$.

6-Chloro-4-[(1-hexyl-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (34). White solid; Yield: 98%; Melting point: 86–87°C; UV (MeOH) λ_{max}: 256 and 297 nm; IR (KBr) ν_{max} (cm^{-1}): 3073, 2935, 1680, 1498, 1362, 1265; ^1H NMR (400 MHz, $CDCl_3$): δ 0.84 (t, *J* = 7.3 Hz, 3H, H-6″),1.27 (s, 6H, H-2″, H-3″ and H-4″), 1.85 (m, 2H, H-5″), 4.28 (t, *J* = 7.32 Hz, 2H, H-1″), 4.57 (s, 2H, H-4a), 5.11 (s, 2H, H-2), 6.86 (d, *J* = 8.7 Hz, 1H, H-8), 6.92 (d, *J* = 2.2 Hz, 1H, H-5), 7.55 (s, 2H, H-5′ and H-7); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 13.87 (C-6″), 22.32 (C-5″), 26.08 (C-3″), 30.08 (C-2″), 31.04 (C-4″), 37.65 (C-4a), 50.43 (C-1″), 67.62 (C-2), 116.18 (C-8), 117.72 (C-5), 123.00 (C-7), 123.86 (C-5′), 128.17 (C-6), 129.71 (C-10), 142.55 (C-4′), 143.67 (C-9), 164.47 (C-3); HRMS (*m/z*): Calculated for $C_{17}H_{21}ClN_4O_2$ $[M+Na]^+$ 371.1251, found 371.1233 $[M+Na]^+$.

6-Chloro-4-[(1-(4-hydroxyphenyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (35). White solid; Yield: 81%; Melting point: 280–282°C; UV (MeOH) λ_{max}: 257 and 296 nm; IR (KBr) ν_{max} (cm^{-1}): 3320, 3050, 1663, 1390, 1270; ^1H NMR (400 MHz, DMSO-d_6): δ 4.73 (s, 2H, H-4a), 5.21 (s, 2H, H-2), 6.90 (d, *J* = 8.7 Hz, 2H, H-2″ and H-6″), 7.01–7.06 (m, 2H, H-7 and H-8), 7.43 (d, *J* = 1.4 Hz, 1H, H-5), 7.62 (d, *J* = 8.7 Hz, 2H, H-3″ and H-5″), 8.52 (s, 1H, H-5′), 10.02 (s, 1H, OH); ^{13}C NMR (100.5 MHz, DMSO-d_6): δ 36.40 (C-4a), 67.15 (C-2), 115.83 (C-8), 116.16 (C-3″ and C-5″), 117.95 (C-7), 121.75 (C-5′), 122.02 (C-2″ and C-6″), 123.20 (C-5), 126.37 (C-6), 128.66 (C-1″), 129.91 (C-10), 142.92 (C-4′), 143.91 (C-9), 157.89 (C-4″), 164.17 (C-3); HRMS (*m/z*): Calculated for $C_{17}H_{13}ClN_4O_3$ $[M+Na]^+$ 379.0574, found 379.0560 $[M+Na]^+$.

6-Chloro-4-[(1-(3-hydroxyphenyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (36). Light brown solid; Yield: 79%; Melting point: 242–243°C; UV (MeOH) λ_{max}: 254 and 293 nm; IR (KBr) ν_{max} (cm^{-1}): 3321, 2372, 1693, 1488, 1363, 1245; ^1H NMR (400 MHz, DMSO-d_6): δ 4.73 (s, 2H, H-4a), 5.22 (s, 2H, H-2), 6.85 (dd, *J* = 7.3 and 2.2 Hz, 1H, H-7), 7.01–7.06 (m, 2H, H-5 and H-8), 7.24–7.26 (m, 2H, H-5″ and H-6″), 7.32–7.37 (m, 1H, H-4″), 7.40 (s, 1H, H-2″), 8.64 (s, 1H, H-5′), 10.11 (s, 1H, OH); ^{13}C NMR (100.5 MHz, DMSO-d_6): δ 36.40 (C-4a), 67.16 (C-2), 107.02 (C-8), 110.53 (C-2″), 115.80 (C-4″), 115.87 (C-5), 118.09 (C-7), 121.88 (C-6″), 123.34 (C-5′), 126.36 (C-6), 129.90 (C-1″), 130.96 (C-10), 137.54 (C-4′), 143.30 (C-5″), 143.98 (C-9), 158.56 (C-3″), 164.25 (C-3); HRMS (*m/z*): Calculated for $C_{17}H_{13}ClN_4O_3$ $[M+Na]^+$ 379.0574, found 379.0524 $[M+Na]^+$.

Ethyl 2-(4-[(7-nitro-3-oxo-2H-benzo[b][1,4]oxazin-4(3H)-yl)methyl]-1H-1,2,3-triazol-1-yl) acetate (37). Light yellow solid; Yield: 89%; Melting point: 116–117°C; UV (MeOH) λ_{max}: 243, 303 and 338 nm; IR (KBr) ν_{max} (cm^{-1}): 3082, 2971, 1748, 1683, 1534, 1389, 1247; ^1H NMR (400 MHz, $CDCl_3$): δ 1.29 (t, *J* = 7.3 Hz, 3H, (H-2‴), 4.26 (q, *J* = 7.3 Hz, 2H, H-1‴), 4.70 (s, 2H, H-4a), 5.13 (s, 2H, H-2), 5.23 (s, 2H, H-2″), 7.76 (d, *J* = 8.0 Hz, 1H, H-5″), 7.84 (s, 1H, H-5′), 7.97 (d, *J* = 7.3 Hz, 2H, H-6″ and H-8″); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 13.90 (C-2‴), 37.43 (C-4a), 50.80 (C-2), 62.42 (C-1‴), 67.31 (C-2″), 115.83 (C-8″ and C-6″), 118.83 (C-4′ and C-5″), 134.16 (C-10″), 143.48 (C-7″), 144.68 (C-9″), 164.03 (C-3″), 165.93 (C-1); HRMS (*m/z*): Calculated for $C_{15}H_{15}N_5O_6$ $[M+Na]^+$ 384.0920, found 384.0887 $[M+Na]^+$.

4-[(1-(3-Methoxyphenyl)-1H-1,2,3-triazol-4-yl)methyl]-7-nitro-2H-benzo[b][1,4]oxazin-3(4H)-one (38). Light yellow solid; Yield: 85%; Melting point: 199–201°C; UV (MeOH) λ_{max}: 249 and 279 nm; IR (KBr) ν_{max} (cm^{-1}): 3085, 2926, 1690, 1500, 1388, 1241; ^1H NMR (400 MHz, $CDCl_3$): δ 3.87 (s, 3H, OCH_3), 4.72 (s, 2H, H-4a), 5.28 (s, 2H, H-2), 6.97 (dd, *J* = 8.0 and 2.0 Hz, 1H, H-6″), 7.23 (dd, *J* = 8.0 and 1.4 Hz, 1H, H-4″), 7.30 (d, *J* = 2.9 Hz, 1H, H-2″), 7.40 (t, *J* = 8.0 Hz, 1H, H-5″), 7.82–7.85 (m, 2H, H-5 and H-8), 8.00 (dd, *J* = 8.7 and 2.2 Hz, 1H, H-6), 8.06 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.34 (C-4a), 55.64 (OCH_3), 67.48 (C-2), 106.32 (C-8), 112.35 (C-2″), 112.64 (C-4″), 114.92 (C-6), 116.03 (C-5′), 119.07 (C-6″), 121.95 (C-5), 130.59 (C-1′), 134.15 (C-4′), 137.70 (C-10), 142.84 (C-5″), 143.89 (C-7), 144.73 (C-9), 160.75 (C-3″), 164.52 (C-3); HRMS (*m/z*): Calculated for $C_{18}H_{15}N_5O_5$ $[M+Na]^+$ 404.0971, found 404.0967 $[M+Na]^+$.

4-[(1-(2-Methoxyphenyl)-1H-1,2,3-triazol-4-yl)methyl]-7-nitro-2H-benzo[b][1,4]oxazin-3(4H)-one (39). Light yellow solid; Yield: 82%; Melting point: 218–220°C; UV (MeOH) λ_{max}: 242, 291, and 340 nm; IR (KBr) ν_{max} (cm^{-1}): 2983, 1690, 1507, 1389, 1250; ^1H NMR (400 MHz, $CDCl_3$): δ 3.87 (s, 3H, OCH_3), 4.72 (s, 2H, H-4a), 5.32 (s, 2H, H-2), 7.07–7.12 (m, 2H, H-4″ and H-5″), 7.42 (t, *J* = 8. Hz, 1H, H-8), 7.77–8.01 (m, 4H, H-5, H-6, H-3″ and H-6″), 8.58 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.63 (C-4a), 55.96 (OCH_3), 67.46 (C-2), 112.19

(C-6), 112.53 (C-4′), 116.20 (C-8), 119.03 (C-5), 121.22 (C-5″), 125.34 (C-6″), 125.95 (C-4″), 130.34 (C-4′), 134.18 (C-10), 143.69 (C-9), 144.83 (C-7), 150.96 (C-2″), 164.05 (C-3); HRMS (*m/z*): Calculated for $C_{18}H_{15}N_5O_5$ $[M+Na]^+$ 404.0971, found 404.0974 $[M+Na]^+$.

4-[(1-(4-Methoxyphenyl)-1H-1,2,3-triazol-4-yl)methyl]-7-nitro-2H-benzo[b][1,4]oxazin-3(4H)-one (40). Light yellow solid; Yield: 88%; Melting point: 201–203°C; UV (MeOH) λ_{max}: 251 and 338 nm; IR (KBr) ν_{max} (cm^{-1}): 3090, 2936, 1686, 1519, 1341, 1258; ^1H NMR (400 MHz, $CDCl_3$): δ 3.85 (s, 3H, OCH_3), 4.71 (s, 2H, H-4a), 5.28 (s, 2H, H-2), 7.00 (d, $J=8.7$ Hz, 2H, H-2″ and H-6″), 7.59 (d, $J=8.7$ Hz, 2H, H-3″ and H-5″), 7.83–7.85 (m, 2H, H-5 and H-6), 7.98 (d, $J=2.2$ Hz, 1H, H-8), 7.99 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.65 (C-4a), 55.62 (OCH_3), 67.47 (C-2), 112.60 (C-6), 114.80 (C-3″ and C-5″), 116.06 (C-5′), 119.07 (C-8), 121.99 (C-2″ and C-6″), 122.12 (C-5), 130.11 (C-1″), 134.12 (C-4′), 142.62 (C-10), 143.68 (C-7), 144.74 (C-9), 160.01 (C-4″), 164.39 (C-3); HRMS (*m/z*): Calculated for $C_{18}H_{15}N_5O_5$ $[M+Na]^+$ 404.0971, found 404.0954 $[M+Na]^+$.

4-[(1-Benzyl-1H-1,2,3-triazol-4-yl)methyl]-7-nitro-2H-benzo[b][1,4]oxazin-3(4H)-one (41). Light yellow solid; Yield: 95%; Melting point: 199–201°C; UV (MeOH) λ_{max}: 238, 304 and 338 nm; IR (KBr) ν_{max} (cm^{-1}): 3083, 1701, 1521, 1342, 1240; ^1H NMR (400 MHz, $CDCl_3$): δ 4.67 (s, 2H, H-4a), 5.18 (s, 2H, H-2), 5.49 (s, 2H, H-1′a), 7.27–7.28 (m, 2H, H-2″ and H-6″), 7.36–7.37 (m, 3H, H-3″, H-4″ and H-5″), 7.54 (s, 1H, H-5′), 7.77 (d, $J=9.5$ Hz, 1H, H-5), 7.82 (d, $J=2.2$ Hz, 1H, H-8), 7.96 (dd, $J=9.5$ and 2.2 Hz, 1H, H-6); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.53 (C-4a), 54.28 (C-1′a), 67.33 (C-2), 112.41 (C-6), 115.95 (C-8), 118.89 (C-5), 123.38 (C-5′), 128.16 (C-2″ and C-6″), 128.86 (C-4″), 129.09 (C-3″ and C-5″), 134.03 (C-4′), 134.17 (C-1″), 142.41 (C-10), 143.54 (C-7), 144.68 (C-9), 164.03 (C-3); HRMS (*m/z*): Calculated for $C_{18}H_{15}N_5O_4$ $[M+Na]^+$ 388.1122, found 388.1116 $[M+Na]^+$.

4-[(1-(4-Fluorobenzyl)-1H-1,2,3-triazol-4-yl)methyl]-7-nitro-2H-benzo[b][1,4]oxazin-3(4H)-one (42). Light yellow solid; Yield: 92%; Melting point: 150–152°C; UV (MeOH) λ_{max}: 246, 301, and 337 nm; IR (KBr) ν_{max} (cm^{-1}): 3088, 2957, 1689, 1508, 1344, 1221; ^1H NMR (400 MHz, $CDCl_3$): δ 4.65 (s, 2H, H-4a), 5.15 (s, 2H, H-2), 5.43 (s, 2H, H-1′a), 7.03 (t, $^3J_{HF}=8.7$ Hz, 2H, H-2″ and H-6″), 7.22–7.26 (m, 2H, H-3″ and H-5″), 7.52 (s, 1H, H-5′), 7.73 (d, $J=8.7$ Hz, 1H, H-5), 7.79 (d, $J=2.2$ Hz, 1H, H-8), 7.93 (dd, $J=8.7$ and 2.2 Hz, 1H, H-6); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.55 (C-4a), 53.56 (C-2), 67.36 (C-1′a), 112.47 (C-6), 115.95 (C-8), 116.15 (d, $J_{CF}=21.09$ Hz, C-3″ and C-5″), 118.94 (C-5), 123.32 (C-5′), 129.92 (d, $J_{CF}=2.88$ Hz, C-1″), 130.11 (d, $J_{CF}=7.67$ Hz, H-2″ and H-6″), 134.16 (C-4′), 142.55 (C-10), 143.60 (C-9), 144.71 (C-7), 161.62 (C-4″), 164.09 (C-3); HRMS (*m/z*): Calculated for $C_{18}H_{14}FN_5O_4$ $[M+Na]^+$ 406.0928, found 406.0928 $[M+Na]^+$.

7-Nitro-4-[(1-(4-nitrobenzyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (43). Light yellow solid; Yield: 95%; Melting point: 193–194°C; UV (MeOH) λ_{max}: 251, 295 and 337 nm; IR (KBr) ν_{max} (cm^{-1}): 3083, 1701, 1521, 1342, 1240; ^1H NMR (400 MHz, DMSO-d_6): δ 4.84 (s, 2H, H-4a), 5.23 (s, 2H, H-2), 5.72 (s, 2H, H-1′a), 7.47 (d, $J=8.7$ Hz, 2H, H-3″ and H-5″), 7.52 (d, $J=9.5$ Hz, 1H, H-5), 7.77 (d, $J=2.9$ Hz, 1H, H-8), 7.93 (dd, $J=8.7$ and 2.2 Hz, 1H, H-6), 8.18 (s, 1H, H-5′), 8.20 (d, $J=3.6$ Hz, 2H, H-2″ and H-6″); ^{13}C NMR (100.5 MHz, DMSO-d_6): δ 36.64 (C-4a),52.07(C-2), 67.05 (C-1′a), 11.79 (C-6), 116.18 (C-8), 118.62 (C-5′), 124.00 (C-3″, C-5″ and C-5), 124.57 (C-5′), 129.14 (C-2″ and C-6″), 134.55 (C-4′), 142.22 (C-10), 142.78 (C-1″), 143.36 (C-7), 144.77 (C-4″), 147.34 (C-9), 164.10 (C-3); HRMS (*m/z*): Calculated for $C_{18}H_{14}N_6O_6$ $[M+Na]^+$ 433.0873, found 433.0866 $[M+Na]^+$.

4-[(1-(4-Chlorophenyl)-1H-1,2,3-triazol-4-yl)methyl]-7-nitro-2H-benzo[b][1,4]oxazin-3(4H)-one (44). Light yellow solid; Yield: 95%; Melting point: 233–235°C; UV (MeOH) λ_{max}: 248 and 339 nm; IR (KBr) ν_{max} (cm^{-1}): 3101, 1691, 1501, 1340, 1246; ^1H NMR (400 MHz, $CDCl_3$): δ 4.71 (s, 2H, H-4a), 5.28 (s, 2H, H-2), 7.49 (d, $J=8.7$ Hz, 2H, H-2″ and H-6″), 7.66 (d, $J=8.7$ Hz, 2H, H-3″ and H-5″), 7.81 (d, $J=8.7$ Hz, 1H, H-5), 7.85 (d, $J=2.9$ Hz, 1H, H-8), 7.99 (dd, $J=8.7$ and 2.2 Hz, 1H, H-6), 8.06 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.55 (C-4a), 67.44 (C-2), 112.65 (C-6), 115.93 (C-8), 119.08 (C-5), 121.63 (C-2″ and C-6″), 121.84 (C-5′), 130.01 (C-3″ and C-5″), 134.04 (C-4′), 134.92 (C-4″), 135.13 (C-1″), 143.04 (C-10), 143.76 (C-9), 144.78 (C-7), 164.33 (C-3); HRMS (*m/z*): Calculated for $C_{17}H_{12}ClN_5O_4$ $[M+Na]^+$ 408.0476, found 408.0458 $[M+Na]^+$.

4-[(1-(4-Bromophenyl)-1H-1,2,3-triazol-4-yl)methyl]-7-nitro-2H-benzo[b][1,4]oxazin-3(4H)-one (45). Light yellow solid; Yield: 93%; Melting point: 233–234°C; UV (MeOH) λ_{max}: 251 and 339 nm; IR (KBr) ν_{max} (cm^{-1}): 3101, 2928, 1690, 1510, 1340, 1244; ^1H NMR (400 MHz, $CDCl_3$): δ 4.71 (s, 2H, H-4a), 5.28 (s, 2H, H-2), 7.60 (d, $J=9.5$ Hz, 2H, H-2″ and H-6″), 7.65 (d, $J=9.5$ Hz, 2H, H-3″ and H-5″), 7.81 (d, $J=9.5$ Hz, 1H, H-5), 7.84 (d, $J=2.2$ Hz, 1H, H-8), 7.99 (dd, $J=8.7$ and 2.2 Hz, 1H, H-6), 8.06 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.55 (C-4a), 67.44 (C-2), 112.65 (C-6), 115.93 (C-8), 119.08 (C-4″), 121.77 (C-5), 121.85 (C-2″ and C-6″), 122.80 (C-5′), 132.97 (C-3″ and C-5″), 134.13 (C-4′), 135.60 (C-10), 143.08 (C-1″), 143.77 (C-9), 144.80 (C-7), 164.33 (C-3); HRMS (*m/z*): Calculated for $C_{17}H_{12}BrN_5O_4$ $[M+Na]^+$ 451.9970, found 451.9970 $[M+Na]^+$.

4-[(1-(3-Hydroxyphenyl)-1H-1,2,3-triazol-4-yl)methyl]-7-nitro-2H-benzo[b][1,4]oxazin-3(4H)-one (46). Light yellow solid; Yield: 77%; Melting point: 268–270°C; UV (MeOH) λ_{max}: 247, 296, and 337 nm; IR (KBr) ν_{max} (cm^{-1}): 3377, 3096, 1673, 1500, 1342, 1212; ^1H NMR

(400 MHz, DMSO-d_6): δ 4.89 (s, 2H, H-4a), 5.31 (s, 2H, H-2), 6.85 (d, J = 7.3 Hz, 1H, H-6″), 7.25 (s, 2H, H-6 and H-8), 7.34 (t, J = 8.2 Hz, 1H, H-5″), 7.52 (d, J = 9.1 Hz, 1H, H-5), 7.81 (s, 1H, H-2″), 7.94 (d, J = 8.2 Hz, 1H, H-4″), 8.69 (s, 1H, H-5′),10.02 (s, 1H, –OH); ^{13}C NMR (100.5 MHz, DMSO-d_6): δ 36.58 (C-4a), 66.94 (C-2), 106.89 (C-6), 110.33 (C-8), 111.61 (C-5), 115.67 (C-4″), 116.01 (C-6″), 118.53 (C-1″), 121.77 (C-5′), 130.72 (C-4′), 134.37 (C-10), 137.40 (C-5″), 142.66 (C-7), 142.79 (C-9), 144.62 (C-7), 158.43 (C-3″), 163.96 (C-3); HRMS (*m*/*z*): Calculated for $C_{17}H_{13}N_5O_5$ $[M+Na]^+$ 390.0814, found 390.0816 $[M+Na]^+$.

7-Nitro-4-[(1-(4-nitrophenyl)-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (47). Light yellow solid; Yield: 91%; Melting point: 229–231°C; UV (MeOH) λ_{max}: 294 and 339 nm; IR (KBr) ν_{max} (cm^{-1}): 3153, 1695, 1521, 1342, 1257; ^{1}H NMR (400 MHz, DMSO-d_6): δ 4.89 (s, 2H, H-4a), 5.35 (s, 2H, H-2), 7.53 (d, J = 9.5 Hz, 1H, H-5), 7.82 (d, J = 2.9 Hz, 1H, H-8), 7.94 (dd, J = 8.7 and 2.2 Hz, 1H, H-6), 8.16 (d, J = 8.7 Hz, 2H, H-2″ and H-6″), 8.42 (d, J = 9.5 Hz, 2H, H-3″ and H-5″), 8.94 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, DMSO-d_6): δ 36.38 (C-4a), 66.94 (C-2), 111.84 (C-6), 116.15 (C-8), 118.73 (C-5), 120.76 (C-2″ and C-6″), 122.57 (C-5′), 125.71 (C-3″ and C-5″), 134.49 (C-4′), 140.75 (C-10), 142.85 (C-1″), 143.73 (C-9), 144.86 (C-7), 146.88 (C-4″), 164.17 (C-3); HRMS (*m*/*z*): Calculated for $C_{17}H_{12}N_6O_6$ $[M+Na]^+$ 419.0716, found 419.0706 $[M+Na]^+$.

4-[(1-(2,5-Dimethoxyphenyl)-1H-1,2,3-triazol-4-yl)methyl]-7-nitro-2H-benzo[b][1,4]oxazin-3(4H)-one (48). Light yellow solid; Yield: 95%; Melting point: 229–231°C; UV (MeOH) λ_{max}: 304 and 340 nm; IR (KBr) ν_{max} (cm^{-1}): 3080, 2964, 1690, 1508, 1344, 1285; ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.80 (s, 3H, OCH_3), 3.83 (s, 3H, OCH_3), 4.71 (s, 2H, H-4a), 5.30 (s, 2H, H-2), 6.65 (dd, J = 8.7 and 2.9 Hz, 1H, H-4″), 7.00 (d, J = 9.5 Hz, 1H, H-3″), 7.36 (d, J = 2.9 Hz, 1H, H-6″), 7.84 (d, J = 2.9 Hz, 1H, H-8), 7.87 (d, J = 8.7 Hz, 1H, H-5), 8.00 (dd, J = 9.5 and 2.2 Hz, 1H, H-6), 8.25 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.49 (C-4a), 55.86 (OCH_3), 56.39 (OCH_3), 67.38 (C-2), 110.17 (C-6″), 112.43 (C-1″), 113.44 (C-4″), 115.72 (C-3″), 116.08 (C-6), 118.90 (C-8), 125.71 (C-5′), 126.02 (C-5), 134.27 (C-4′), 141.47 (C-10), 143.57 (C-7), 144.67 (C-9), 144.76 (C-2″), 153.73 (C-5″), 164.05 (C-3); HRMS (*m*/*z*): Calculated for $C_{19}H_{17}N_5O_6$ $[M+H]^+$ 412.1257, found 412.1251 $[M+H]^+$.

4-[(1-(4-Fluorophenyl)-1H-1,2,3-triazol-4-yl)methyl]-7-nitro-2H-benzo[b][1,4]oxazin-3(4H)-one (49). Light yellow solid; Yield: 94%; Melting point: 216–217°C; UV (MeOH) λ_{max}: 246, 306 and 340 nm; IR (KBr) ν_{max} (cm^{-1}): 3095, 1691, 1517, 1340, 1241; ^{1}H NMR (400 MHz, DMSO-d_6): δ 4.89 (s, 2H, H-4a), 5.32 (s, 2H, H-2), 7.42-7.90 (m, 7H, H-5, H-6, H-8, H-2″, H-3″, H-5″ and H-6″), 8.74 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, DMSO-d_6): δ 36.53 (C-4a), 66.95 (C-2), 111.65 (C-6), 116.05 (C-8), 116.72 (d, J_{CF} = 23.00 Hz, C-3″ and C-5″), 118.57 (C-5′), 122.16 (C-5), 122.39 (d, J_{CF} = 8.63 Hz, C-2″ and C-6″), 132.98 (C-4′), 134.42 (C-1″), 142.69 (C-9), 142.96 (C-10), 144.64 (C-7), 161.66 (d, J_{CF} = 244.41 Hz, C-4″), 163.98 (C-3); HRMS (*m*/*z*): Calculated for $C_{17}H_{12}FN_5O_4$ $[M+Na]^+$ 392.0771, found 392.0726 $[M+Na]^+$.

7-Nitro-4-[(1-phenyl-1H-1,2,3-triazol-4-yl)methyl]-2H-benzo[b][1,4]oxazin-3(4H)-one (50). Light yellow solid; Yield: 88%; Melting point: 210–211°C; UV (MeOH) λ_{max}: 245, 309, 339 nm; IR (KBr) ν_{max} (cm^{-1}): 3091, 1689, 1502, 1341, 1257; ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.72 (s, 2H, H-4a), 5.29 (s, 2H, H-2), 7.45–7. 54 (m, 3H, H-3″, H-4″ and H-5″), 7.70 (d, J = 8.05 Hz, 2H, H-2″ and H-6″), 7.83 (s, 1H, H-5), 7.85 (d, J = 2.20 Hz, 1H, H-8), 8.00 (dd, J = 8.79 and 2.93 Hz, 1H, H-6), 8.08 (s, 1H, H-5′); ^{13}C NMR (100.5 MHz, $CDCl_3$): δ 37.55 (C-4a), 67.44 (C-2), 112.65 (C-6), 115.93 (C-8), 119.09 (C-5), 121.85 (C-5′), 122.80 (C-2″ and C-6″), 132.97 (C-3″, C-4″ and C-5″), 134.13 (C-4′), 135.66 (C-10), 143.08 (C-1″), 143.77 (C-9), 144.80 (C-7), 164.33 (C-3); HRMS (*m*/*z*): Calculated for $C_{17}H_{13}N_5O_4$ $[M+Na]^+$ 374.0865, found 374.0862 $[M+Na]^+$.

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