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# Use of 2-Ethoxy(4*H*)-3,1-benzoxazin-4-one as a Precursor for Synthesis of Quinazoline and Quinazolinone Starting Materials

Maher A El-Hashash, Sameh A Rizk, Fakhry A El-Bassiouny
Chemistry Department, Faculty of Science, Ain Shams University, Abbassia, Cairo, Egypt.

Khalid M Darwish
Chemistry Department, Science Faculty, University of Garyounis, Benghazi, Libya
Corresponding Author: khaliddarwish1962@yahoo.com, Tel. +201113049976

**Abstract:**

The interactions of 2-ethoxy(4*H*)-3,1-benzoxazin-4-one (**1**) with various nitrogen nucleophiles such as ammonium acetate, hydrazine hydrate, ethanolamine, *p*-phenylenediamine, *o*-phenylenediamine, *o*-tolidine, dapsone, 2-aminophenol, 4-aminophenol, 4-aminobenzoic acid and 2-aminonicotinic acid have been discussed. The reactions of 2-thoxy-(3*H*)-quinazolin-4-one with ethyl chloroformate, phosphorus pentasulfide, chloroacetyl chloride and phosphorus oxychloride have also been investigated. Similar reactions of 2-ethoxy-4-chloroquinazoline with hydrazine hydrate and thiosemicarbazide have been introduced. Aminolysis of the 2-ethoxy group in some of the thiadiazoloquinazolinone derivatives has been attempted. The interactions of these aminolized derivatives and the 3-aminoquinazolinone with chloroacetyl chloride have been studied. All of the synthesized derivatives have been used in a wide range as starting materials for the synthesis of novel quinazoline and/or quinazolinones which have biological activity. The structures of all these products, obtained by heterocyclic ring opening and ring closure, were inferred by the IR, MS, $^{1}$H NMR spectral as well as elemental analyses.

**Keywords:** Aminothiadiazole, Benzoxazin-4-one, *N*-nucleophile, quinazoline, quinazolin-4-one, thiosemicarbazide.

## 1. Introduction

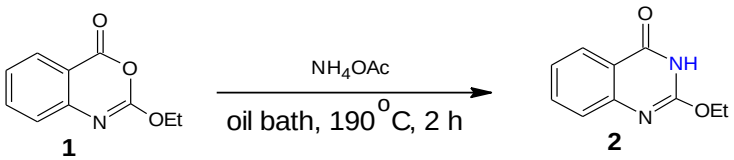
3,1-Benzoxazin-4-ones can be considered as semiacid anhydrides which undergo many of the reactions of true acid anhydrides, but at a slower rate. This special reactivity allows this class of compounds to be useful as antimicrobial (Mathew *et al* 2010), anti-platelet aggregation (Pritchard *et al* 2007), human leukocyte elastase inhibitors (Pei-Wen Hsieh *et al* 2005), receptor agonist active (Ward *et al* 2007), receptor antagonist active (Deswal *et al* 2006, ohno *et al* 2006, Kern *et al* 2007, Powell *et al* 2007, Bromidge *et al* 2009), pesticides (Shakil *et al* 2010), tissue culture protective and *in vivo* model of neurodegeneration (Wang *et al* 2010) and improve the umbilical vein endothelial cells (Dong *et al* 2010). On the other hand, in recent years, there has been an increasing interest in the chemistry of 4(3*H*)-quinazolinones because of their biological importance. Many of them show antifungal (Bartroli *et al* 1998), antibacterial (Shiba *et al* 1997), anticancer (Abdel-Hamid *et al* 1997), anti-inflammatory (Barker 1995), anticonvulsant (Bekhit *et al* 1998), immunotropic (Gursoy *et al* 1995), hypolipidemic (Nawrocka *et al* 1997), antitumor (Kurogi *et al* 1996), antiulcer (Hame *et al* 1996), analgesic (Terashima *et al* 1995),

antiproliferative activities (Raffa *et al* 1999) and inhibitory effects (Baek *et al* 1998) for thymidylate synthase and poly(ADP-ribose) polymerase (PARP) (Griffin *et al* 1998). The 4(3*H*)-quinazolinones can act as semicyclic amides or iminols, due to the tautomeric phenomenon they have. Their reactions in either form with alkyl or acyl halides are perhaps the most interesting due to the large number of heterocycles that are obtained either directly or through further transformations of the initially formed products. Also quinazolines are a big family of heterocyclic compounds, which have shown broad variety of biological activity profiles (Jhone 1982, Brown 1996), e. g. analgesic, narcotic, diuretic, antihypertensive, antimalarial, sedative, hypoglycaemic, antibiotic, antitumoral and many others. It has been found (Armarego 1967) that the biological activity strongly depends on the type and place of the substituents in their molecules. Out of the wide substitution patterns known, 4-aminoquinazolines are useful as fungicides (Nakagami *et al* 1982, Haley 1994) anti-inflammatory (Palanki *et al* 1999, Myers *et al* 1998) anticancer (Baker 1999) anti-microbial and anti-hypertensive agents (Nauta 1976, Mizogami *et al* 1986). Some 4-anilinoquinazolines have found to be potential and highly selective inhibitors of human immunoglobulin E (Berger *et al* 2001) and epidermal growth factor receptor tyrosine kinase (Bridges 2001) which regulates the cell growth and proliferation, so they work as potent antiallergic or anticancer agents, respectively. Among the broad synthetic pathways for aminoquinazoline preparation (Katritzky *et al* 1996 and 2000) the substitution of chlorine atom in 4-chloroquinazolines by amines is the shortest and cheapest one. On the other hand, it is well known that heterocycle-bearing N-glycosides play a significant role as inhibitors, e. g. the tetrazole-bearing *N*-glycosides used as SGLT2 inhibitors (Gao *et al* 2010) where their hypoglycemic activity is tested *in vivo* by mice oral glucose tolerance test (OGTT). In the current article we report the synthesis of 4-aminoquinazoline-bearing *N*-glycosides in a similar way with exception of the endocyclic 2 °nitrogen atom attached to the glucose moiety.

## 2. Results and Discussion

In this paper we used the 2-ethoxy(4*H*)-3,1-benzoxazin-4-one (**1**) to synthesize novel quinazoline and quinazolinone derivatives having active functional groups which make their parent compounds important to be used as starting materials for novel derivatives. This advantage will be revealed by the functional group (or groups) residing on position 2 of the benzoxazinone ring, on positions 2 and 3 of the quinazolin-4-one ring and positions 2 and 4 of the quinazoline ring. Thus, the fusion of compound **1** with ammonium acetate gave the quinazolin-4-one **4** (Scheme 1).



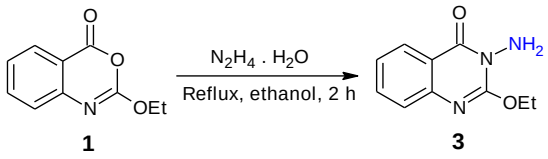

**1** **2**

**Scheme 1** : synthetic pathway for compound **2**

The structure of compound **2** was inferred by its $^{1}$H NMR spectrum that showed a singlet at δ 12.30 which is attributable for NH group.

Compound **1** reacted with hydrazine hydrate in boiling ethanol to give 3-aminoquinazolinone **3** (Scheme 2).

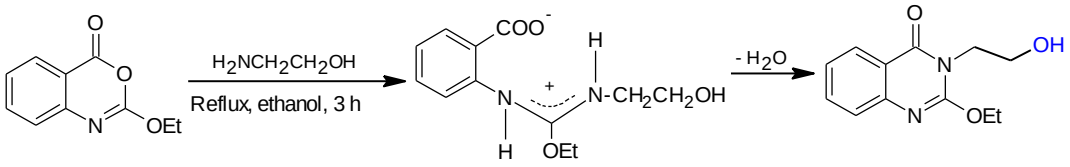



**1** **3**

**Scheme 2** : synthetic pathway for compound **3**

The structure of compound **3** was assigned by its $^1$H NMR spectrum that showed a singlet at δ 2.00 which is attributable for amino group.

Compound **1** was interacted with 2-aminoethanol in boiling ethanol to afford compound **4** which on heating above its melting point (120-121 ℃) yielded the desired product **4a** (Scheme 3).

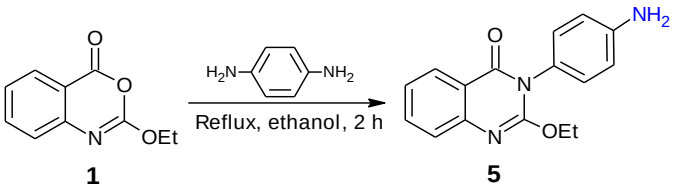



**1** **4**, amidine salt **4a**

**Scheme 3**: Synthetic pathway for compounds **4** and **4a**

The elemental analyses and spectroscopic data for **4** and **4a** were consistent with the assigned structures and isolation of **4** ruled out an abnormal nucleophilic addition to C-2 to form an amidine salt that subsequently dehydrates to give the desired product **4a** (Dong *et al* 2010).

Compound **1** was reacted with *p*-phenylenediamine in boiling ethanol affording compound **5** (Scheme 4).

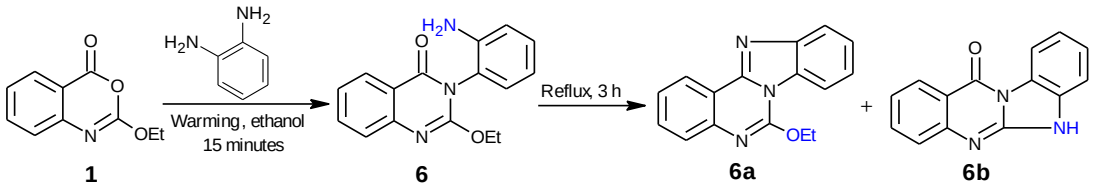



**1** **5**

**Scheme 4**: synthetic pathway for compound **5**

The structure of **5** was confirmed by microanalytical and spectral analysis.

Compound **1** was reacted with *o*-phenylenediamine in warming ethanol affording compound **6** (Scheme 5). Heating compound **6** above its melting point afforded compound **6a** with traces of compound **6b**.



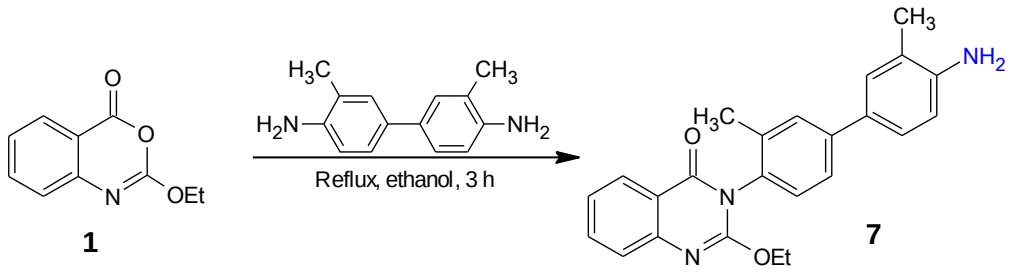

**1** **6** **6a** **6b**

**Scheme 5**: synthetic pathway for compounds **6, 6a** and **6b**

The $^1$H NMR spectrum of **6a** devoid any band for the carbonyl group whereas the $^1$H NMR of **6b** devoid any band for the ethoxy group.

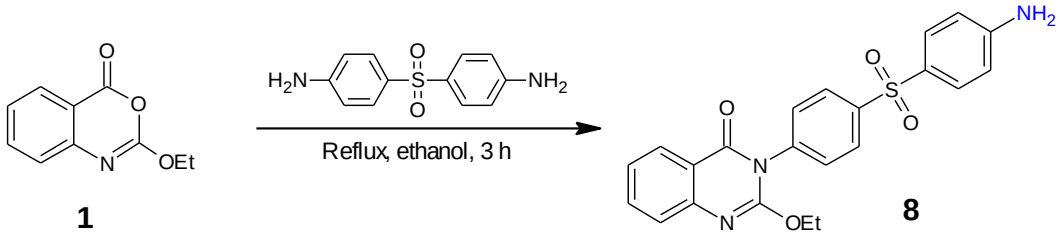
Compound **1** was reacted with *o*-tolidine in boiling ethanol to give compound **7** (Scheme 6).




**Scheme 6**: synthetic pathway for compound **7**

The structure of compound **7** was assigned by its mass spectrum and elemental analysis.

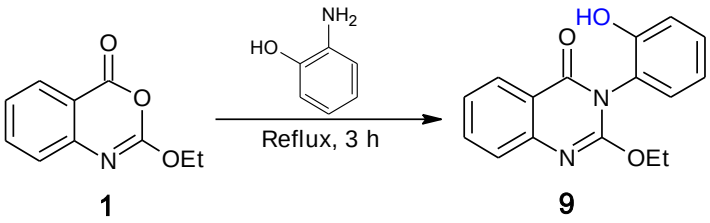
Compound **1** was reacted with dapsone in boiling ethanol to give compound **8** (Scheme 7).




**Scheme 7 :** synthetic pathway for compound **8**

The structure of compound **8** was assigned by its mass spectrum and elemental analysis.

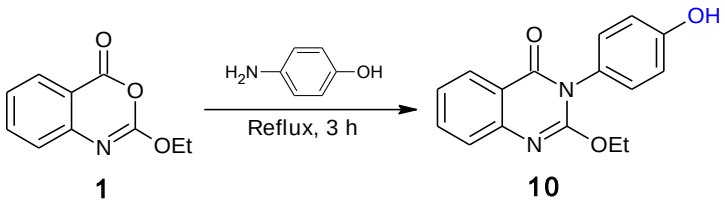
Compound **1** was reacted with 2-aminophenol in boiling ethanol to give compound **9** (Scheme 8).




**Scheme 8**: synthetic pathway for compounds**9**

Compound **1** was reacted with 4-aminophenol in boiling ethanol to give compound **10** (Scheme 9).

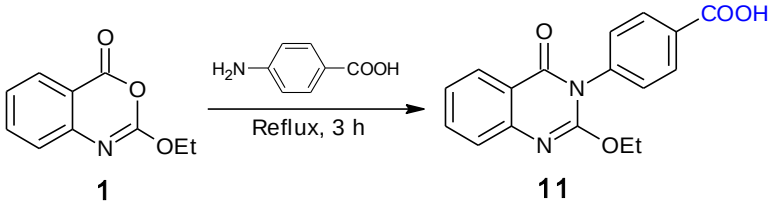
 




**Scheme 9**: synthetic pathway for compounds **10**

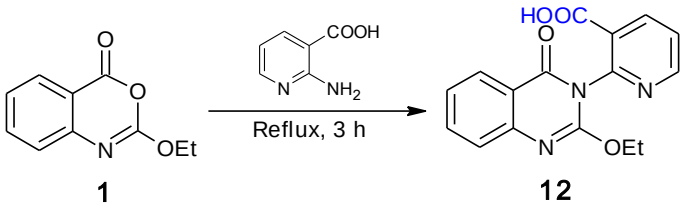
The structures of compounds **9** and **10** were confirmed by microanalytical and spectral analysis.

Compound **1** was reacted with 4-aminobenzoic acid in boiling ethanol to give compound **11** (Scheme 10).




**Scheme 10**: synthetic pathway for compounds **11**

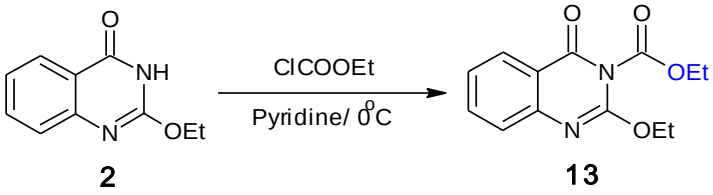
Compound **1** was reacted with 2-aminonicotinic acid in boiling ethanol to give compound **12** (Scheme 11).




**Scheme 11**: synthetic pathway for compounds **12**

The structures of products **11** and **12** were inferred by microanalytical and spectral analysis. The IR spectra for **11** and **12** showed absorption bands in the range 1704-1705 attributable to $\upsilon_{max}$ of C=O groups of acids.

Compound **2** was reacted with ethyl chloroformate in dry pyridine to give compound **13** (Scheme 12).

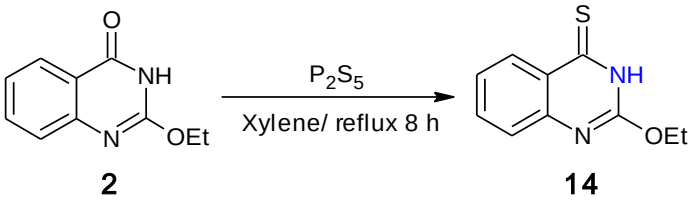



**Scheme 12** : synthetic pathway for compounds **13**

The IR spectrum devoid any band of NH but rather revealed an absorption band at 1762 attributable to $\upsilon_{max}$ of C=O group of ester.

Compound **2** was reacted with phosphorus pentasulfide in dry xylene to give compound **14** (Scheme 13).

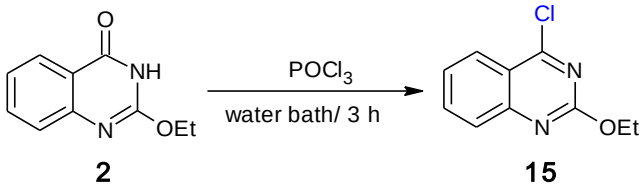



**2** **14**

**Scheme 13**: synthetic pathway for compounds **14**

The IR spectrum devoid any band of C=O in the carbonyl region but rather revealed an absorption band at 1319 attributable to $\upsilon_{max}$ of C=S group.

Compound **2** was reacted with phosphorus oxychloride in water bath to give compound **15** (Scheme 14).

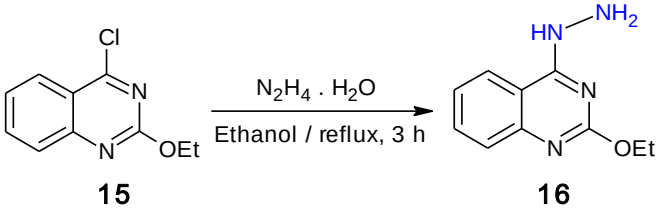



**2** **15**

**Scheme 14**: synthetic pathway for compounds **15**

The IR spectrum devoid any band of C=O in the carbonyl region.

Compound **15** was reacted with hydrazine hydrate in boiling ethanol to give compound **16** (Scheme 15).

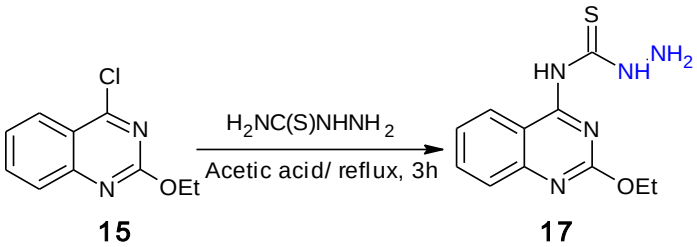



**15** **16**

**Scheme 15** : synthetic pathway for compounds **16**

The IR spectrum revealed an absorption band in the range 3250-3300 attributable to $\upsilon_{max}$ of $NH_2$ group.

Compound **15** was heated with thiosemicarbazide in AcOH / fused NaOAc to give product **17** (Scheme 16).



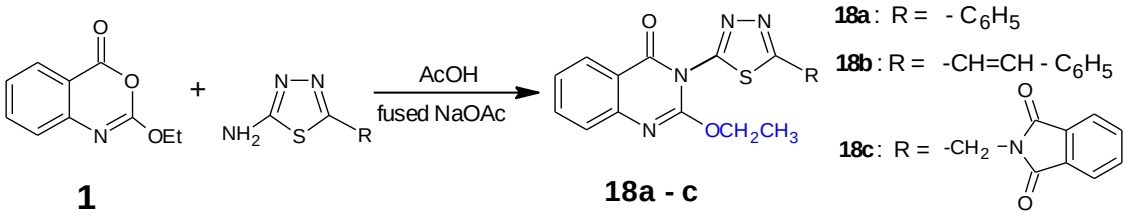

**15** **17**

**Scheme 16** : synthetic pathway for compounds **17**

The IR spectrum revealed an absorption band at 1381 attributable to $\upsilon_{max}$ of C=S group.

Compound **1** was heated with thiadiazole derivatives in boiling AcOH/fused NaOAc affording compounds **18a-c** (Scheme 17).

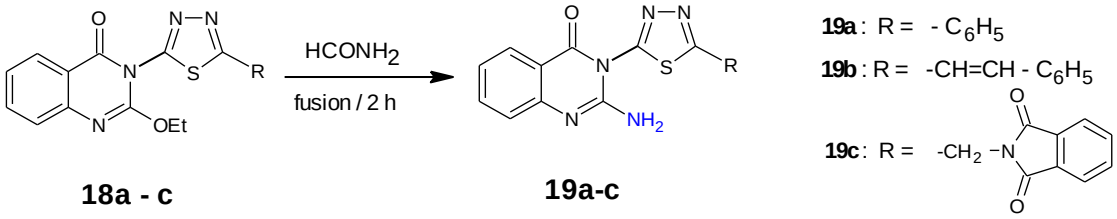



**1** **18a - c**

**Scheme 17** : synthetic pathway for compounds **18a-c**

The structures of **18a-c** were assigned by their mass spectra and elemental analysis.

Compounds **18a-c** were fused with ammonium acetate or formamide to give products **19a-c** (Scheme 18).

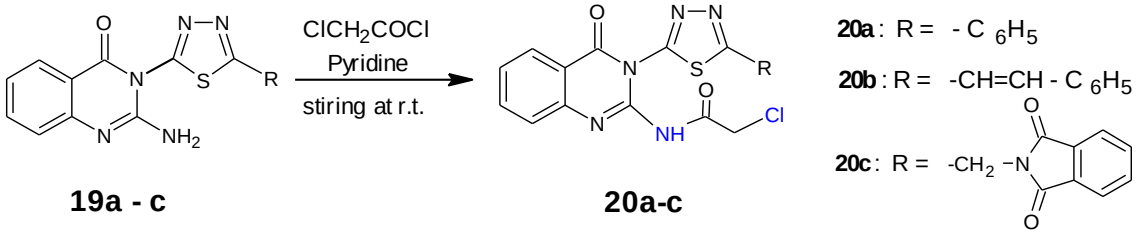



**18a - c** **19a-c**

**Scheme 18** : synthetic pathway for compounds **19a-c**

The $^{1}$H NMR spectrum devoid any band of ethoxy group.

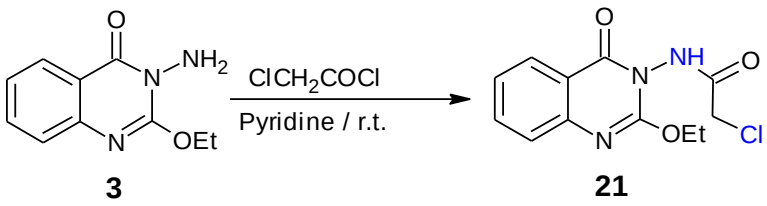
Compounds **19a-c** were reacted with chloroacetyl chloride in pyridine to give products **20a-c** (Scheme 19).




**19a - c** **20a-c**

**Scheme 19** : synthetic pathway for compounds **20a-c**

Compound **3** was reacted with chloroacetyl chloride in pyridine to give compound **21** (Scheme 20).




**3** **21**

**Scheme 20**: synthetic pathway for compound **21**

The $^{1}$H NMR spectra for **20** and **21** always revealed singlets at δ 8.00 and 8.11 for the amidicNH.

**Experimental**

All melting points recorded are uncorrected. The IR spectra were recorded on a Pye Unicam SP1200 spectrophotometer using KBr wafer technique. The $^1$H-NMR spectra were determined on a Varian FT-200, Brucker AC-200 MHz spectrophotometry experiment using TMS as an internal standard. Chemical shifts (δ) are expressed in ppm. The mass spectra were determined using MP model NS-5988 and Shimadzu single focusing mass spectrometer (70 eV).
The 2-ethoxy(4*H*) –3,1–benzoxazin–4–one **1** was prepared according to methods available in the literature (Krantz *et al* 1990) and was immediately used after preparation, prior to each synthesis to avoid moisture.

*2- Ethoxy-4(3H)quinazolinone* **2.** 2-ethoxy(4*H*)-3,1-benzoxazin-4-one (0.01 mol) and ammonium acetate (0.01 mol) were fused using an oil bath for 2 h. The mixture was poured into an ice / water mixture and stirred. The yellowish white precipitate that separated out was filtered, washed, dried, and then crystallized from ethanol to give off-white crystals of compound **2**. M.p. 155-156 ℃; yield 85 %; Anal. for $C_{10}H_{10}N_2O_2$ (m.wt. 190); Found: C, 63.16; H, 5.26; N, 14.74; Calcd: C, 63.22; H, 5.18; N, 14.72; IR υ (cm$^{-1}$) 1671 (C=O), 3229 (NH); MS: *m/z* (int. %) $[M+H]^+$ 190 (58%); $^1$H-NMR (DMSO-$d_6$) δ 1.19 (t, 3H; $OCH_2CH_3$, *J* = 7.4 Hz), 4.29 (q, 2H; $OCH_2CH_3$, *J* = 7.4 Hz), 7.31-8.17 (4d, 4H; ArH), 12.30 (br s, 1H, *NH*).

*3-Amino-2-ethoxyquinazolin-4(3H)-one* **3.** 2-ethoxy-4*H*-3,1- benzoxazin-4-one (0.01 mol) was heated under reflux with hydrazine hydrate (0.02 mol) in ethanol (20 mL) for 3 h. The mixture was cooled, filtered off and crystallized from ethanol as off-white needles; yield 68 %; m.p. 172-173 ℃. Anal. for $C_{10}H_{11}N_3O_2$ (m.w. 205); Found: C, 58.59; H, 5.42; N, 20.56; Calcd: C, 58.53; H, 5.37; N, 20.49; IR υ (cm$^{-1}$) 1671 (C=O), 1528 (C=N); 3389 (NH); 3443 (CH); MS: *m/z* (int. %) $[M+H]^+$ 205 (78.3); $^1$H-NMR (DMSO-$d_6$) δ 1.14 (t, 3H; $OCH_2CH_3$), 4.33 (q, 2H; $OCH_2CH_3$), 7.29-8.19 (m, 4H; ArH), 2.0 (s, NH, amine).

*Synthesis of Compounds **4** and **4a***

A mixture of compound **1** and ethanolamine (0.01mol each) in boiling ethanol (30 mL) was refluxed for 3h. Concentration of the solvent left a white precipitate of compound **4** which was crystallized from ethanol to affording off-white crystals. Heating of **4** above its melting point yielded the corresponding product **4a.**

*2-Ethoxycarbonylamino(β-hydroxyethyl)benzamide* **4.** Yellowish white crystals from ethanol; m.p. 120-121 ℃; yield 80 %; Anal. for $C_{12}H_{16}N_2O_4$ (m.w. 252); Found: C, 57.21; H, 6.29; N, 11.13; Calcd: C, 57.14; H, 6.35; N, 11.11; IR υ (cm$^{-1}$) 1636 (C=O), 1737 (C=O), 3069 (CH), 3130 (NH), 3342 (OH); MS: *m/z* (int. %) $[M+H]^+$ 252 (42.3).

*2-Ethoxy–3-(2-hydroxyethyl)quinazolin–4–one* **4a.**
Light brown crystals; m.p. 108-109 ℃; yield 75 %; Anal. for $C_{12}H_{14}N_2O_3$ (m.w. 234); Found: C, 61.05; H, 5.98; N, 12.03; Calcd: C, 61.54; H, 5.98; N, 11.97; IR υ (cm$^{-1}$) 1660 (C=O), 3340 (OH). MS: *m/z* (int. %) $[M+H]^+$ 234 (58.0), 236 (12.8), 190 (100), 192 (22.3); 174 (22.3), 176 (12.4); $^1$H-NMR (DMSO-$d_6$) δ 1.19 (t, 3H; $OCH_2CH_3$, *J* = 7.4 Hz), 3.52 (m, 2H, 2'-H), 4.32 (q, 2H; $OCH_2CH_3$, *J* = 7.4Hz), 4.13 (m, 1H, 1'-H), 5.72 (s, br., OH), 7.41- 8.16 (4 d, 4H; ArH).

*2-Ethoxy-3-(4-aminophenyl)quinazolin-4-one* **5.** A mixture of compound **1** (0.01 mol) and *p*-phenylene diamine (0.01 mol) in boiling ethanol (30 mL) was refluxed for 3 h. Concentration of the solution gave a solid which was filtered, washed, dried and then crystallized from ethanol to give blue crystals of product **5**; m.p. 105-106 ℃; yield 80 %. Anal. for $C_{16}H_{12}N_3O_2$ (m.w. 278); Found: C, 69.22; H, 4.16; N, 15.08; Calcd: C, 69.06; H, 4.32; N, 15.10; IR υ (cm$^{-1}$) 1635 (C=N), 1670 (C=O), 3225 (NH). MS: *m/z* (int. %) $[M+H]^+$ 278 (55.0), 280 (18.2), 191 (100), 193 (31.7), 175 (32.1), 177 (0.8), 157 (4.7), 159 (0.6), 130 (52.4), 132

(0.3), 93 (0.9), 95 (0.1), 78 (0.2), 80 (0.1); $^1$H-NMR (DMSO-$d_6$) δ 1.22 (t, 3H; $OCH_2CH_3$, $J$ = 6.9 Hz), 4.35 (q, 2H; $OCH_2CH_3$ $J$ = 6.9Hz), 5.12 (s, 2H, $NH_2$), 6.70-7.43 (m, 4H; Ph-H), 7.47-8.19 (m, 4H, quinazolone).

*Reactions of Compound **1** with o-phenylene diamine:*

A mixture of compound **1** and *o*-phenylenediamine (0.01 mol each) was slightly warmed in ethanol (30 mL) for 15 min. The precipitate that separated out was filtered, washed, dried and then crystallized from ethanol to give light blue crystals of product **6**. Heating product **6** above its melting point gave dark blue residue of unstable melting point. Crystallization of the residue, using different ratios of benzene/ethanol, enabled the products **6a** and **6b** to be isolated. The purity of products was checked by different melting points and TLC.

*3-(2-aminophenyl)-2-ethoxyquinazolin-4(3H)-one* **6.** M.p. 105-106 ℃; yield 80 %. Anal. for $C_{16}H_{12}N_3O_2$ (m.w. 278); Found: C, 69.22; H, 4.16; N, 15.08; Calcd: C, 69.06; H, 4.32; N, 15.10; IR υ ($cm^{-1}$) 1635 (C=N), 1670 (C=O), 3225 (NH). MS: *m/z* (int. %) $[M+H]^+$ 278 (55.0), 280 (18.2), 191 (100), 193 (31.7), 175 (32.1), 177 (0.8), 157 (4.7), 159 (0.6), 130 (52.4), 132 (0.3), 93 (0.9), 95 (0.1), 78 (0.2), 80 (0.1); $^1$H-NMR (DMSO-$d_6$) δ 1.22 (t, 3H; $OCH_2CH_3$, $J$ = 6.9 Hz), 4.36 (q, 2H; $OCH_2CH_3$ $J$ = 6.9 Hz), 5.24 (s, 2H, $NH_2$), 6.71-7.42 (m, 4H; Ph-H), 7.29-8.19 (m, 4H, quinazolinone).

*2-Ethoxy benzimidazolo-[1,2-c]quinazoline* **6a.** M.p. 191-192 ℃; yield 85 %. Anal. for $C_{16}H_{13}N_3O$ (m.w. 263); Found: C, 73.02; H, 4.94; N, 15.98; Calcd: C, 73.00; H, 4.94; N,15.97; IR υ ($cm^{-1}$) 1607 (C=N). MS: *m/z* (int. %) $[M+H]^+$ 263 (66.0), 265 (17.3), 187 (44.8), 189 (4.8), 175 (28.4), 177 (11.1), 157 (3.3), 159 (0.1), 130 (78.9), 132 (12.4), 78 (2.4), 80 (0.1); $^1$H-NMR (DMSO-$d_6$) δ 1.22 (t, 3H; -$OCH_2CH_3$, $J$ = 7.1 Hz), 4.31 (q, 2H; $OCH_2CH_3$ $J$ = 7.1), 7.52-7.92 (m, 4H, benzimidazole), 7.62-8.55 (2m, 4H; quinazoline).

*Benzimidazo[2,1-b]quinazolin-5(1H)-one* **6b.** M.p. 202-203 ℃; yield 23 %. Anal. for $C_{14}H_9N_3O$ (m.w. 235); Found: C, 71.56; H, 3.85; N, 17.91; Calcd: C, 71.49; H, 3.83; N, 17.87; IR υ ($cm^{-1}$) 1607 (C=N). MS: *m/z* (int. %) $[M+H]^+$ 235 (26.0), 237 (1.8); $^1$H-NMR (DMSO-$d_6$) δ 7.52-7.92 (m, 4H, PhH), 7.62-8.55 (2m, 4H; quinazoline), 6.88 (br s, 1 H, *NH*).

*2-Ethoxy-3-(3,3'-dimethyl-4-amino)biphenyl quinazolin-4-one* **7.** A mixture of benzoxazinone **1** and 3,3'-dimethyl-4,4'-biphenyldiamine (0.01 mol each) in boiling butanol (30 mL) was heated under reflux for 6 h. The solvent was concentrated leaving a solid gum which was washed, filtered, dried and then recrystallized from ethanol giving product **7** as dark brown crystals; m.p. 121-122 ℃; yield 80 %; Anal. for $C_{24}H_{23}N_3O_2$ (m.w. 385); Found: C, 74.53; H, 5.63; N, 10.79; Calcd: C, 74.80; H, 5.97; N, 10.90; IR υ ($cm^{-1}$) 1620 (C=N), 1675 (C=O), 3250 (NH). MS: *m/z* (int. %) $[M+H]^+$ 385 (72.0), 387 (34.2), 228 (13.3), 230 (1.2), 198 (12.7), 200 (0.1), 194 (16.1), 196 (0.4), 191 (100), 193 (24.8), 175 (53.3), 177 (8.7), 157 (7.1), 159 (1.4), 154 (1.2), 156 (0.2), 130 (46.3), 132 (0.1), 78 (0.3), 80 (0.1); $^1$H-NMR (DMSO-$d_6$) δ 1.22 (t, 3H; -$OCH_2CH_3$, $J$ = 6.9 Hz), 2.21- 2.29 (s, 6H; 2Ar$CH_3$), 4.40 (q, 2H; -$OCH_2CH_3$ $J$ = 6.9 Hz), 5.08 (2H, s, $NH_2$), 6.90-7.80 (m, 6H; biphenyl-H), 7.33-8.19 (m, 4H, quinazolinone).

*3-[4-(4-aminobenzenesulfonyl)phenyl]-2-ethoxyquinazolin-4(3H)-one* **8.** Benzoxazinone **1** (0.01 mol) was dissolved in 20 ml of ethanol and then dapsone (0.03 mol) was added to it. The mixture was refluxed for 4h and cooled. The separated solid **8** was crystallized from ethanol as colorless crystals; m.p. 144-146°C; yield 61%; Anal. For $C_{22}H_{19}N_3O_4S$ (m.w. 421); Found: C, 62.77; H, 4.53; N, 99. 86; Calcd: C, 62.71; H, 4.51; N, 99.77; IR υ ($cm^{-1}$) 1162 (S=O), 1631 (C=N), 1764 (C=O), 3230 (NH). MS: *m/z* (int. %) $[M+H]^+$ 421 (12.0); 119 (100); $^1$H-NMR (DMSO-$d_6$) δ 1.22 (t, 3H; -$OCH_2CH_3$, $J$ = 6.9 Hz), 4.47 (q, 2H; -$OCH_2CH_3$ $J$ = 6.9 Hz), 5.08 (2H, s, $NH_2$), 7.30-8.20 (m, 4H, quinazolinone), 7.22-8.35 (m, 8H; Ar-H).

*Synthesis of compounds* **9** *and* **10**

A mixture of compound **1** and *o*-hydroxyaniline or *p*-hydroxyaniline (0.01 mol each) in 40 mL of boiling ethanol was refluxed for 3 h. The obtained precipitate was heated in a round bottom flask (25 mL) in an oil bath at 160 ℃ for 30 minutes. After cooling the products were crystallized from the proper solvent to give the corresponding quinazolinones **9** and **10**, respectively.

*2-Ethoxy-3-(2-hydroxyphenyl)quinazolin-4-one* **9.** Dark brown crystals from light petroleum (100-120 ℃); m.p. 89-90 ℃; yield 80 %; Anal. for $C_{16}H_{14}N_2O_3$ (m.w. 284); Found: C, 67.31; H, 4.73; N, 9.89; Calcd: C, 67.60; H, 4.93; N, 9.86; IR υ ($cm^{-1}$) 1669 (C=O), 2988 (OH); MS: *m/z* (int. %) $[M+H]^+$ 284 (48.0), 286 (6.3), 191 (100), 193 (43.3), 175 (18.2), 177 (0.1), 157 (4.7), 159 (1.2), 130 (67.1), 132 (6.3); $^1$H-NMR (DMSO-$d_6$) δ 1.22 (t, 3H; -OCH$_2$*CH$_3$*, *J* = 7.4 Hz), 4.36 (q, 2H; -O*CH$_2$*CH$_3$ *J* = 7.4 Hz), 5.55 (s, H; OH), 6.76 – 7.67 (m, 4H; Ph-H), 7.30 – 8.19 (m, 4H, quinazolinone).

*2-Ethoxy-3-(4-hydroxyphenyl)quinazolin-4-one* **10.** Dark brown crystals from benzene; m.p. 105-106 ℃; yield 80 %; Anal. for $C_{16}H_{14}N_2O_3$ (m.w. 284); Found: C, 67.42; H, 4.70; N, 9.81; Calcd: C, 67.60; H, 4.93; N, 9.86; IR υ ($cm^{-1}$) 1671(C=O), 2992 (OH); MS: *m/z* (int. %) $[M+H]^+$ 284 (43.0), 286 (16.3), 191 (100), 193 (52.3), 175 (20.8), 177 (0.1), 157 (4.3), 159 (0.5), 130 (57.4), 132 (7.9); $^1$H-NMR (DMSO-$d_6$) δ 1.22 (t, 3H; -OCH$_2$*CH$_3$*, *J* = 7.4 Hz), 4.35 (q, 2H; -O*CH$_2$*CH$_3$ *J* = 7.4 Hz), 5.35 (s, H; OH), 6.68-7.69 (m, 4H; Ph-H), 7.43–8.19 (m, 4H, quinazolinone).

*4-[2-Ethoxy-4-quinazolon-3-yl]benzoic acid* **11.** A mixture of compound **1** (0.01 mol) and *p*-aminobenzoic acid in boiling butanol (30 mL) was refluxed for 3 h. Concentration of the solution gave a solid which was washed, filtered, dried and then crystallized from ethanol affording derivatives **11** as light brown crystals of m.p. 151-152 ℃; yield 80 %; Anal. for $C_{17}H_{14}N_2O_4$ (m. w. 310); Found: C, 65.44; H, 4.72; N, 9.00; Calcd: C, 65.80; H, 4.52; N, 9.03; IR υ ($cm^{-1}$) 1675, 1705 (2xC=O), 3355 (chelated OH); MS: *m/z* (int. %) $[M+H]^+$ 310 (63.0), 312 (28.2), 191 (100), 193 (27.8), 175 (34.3), 177 (0.6), 130 (59.3), 132 (0.2), 122 (1.8), 124 (0.2), 78 (0.1), 80 (0.1); $^1$H-NMR (DMSO-$d_6$) δ 1.22 (t, 3H; OCH$_2$*CH$_3$*, *J* = 6.9Hz), 4.36 (q, 2H;O*CH$_2$*CH$_3$, *J* = 6.9 Hz), 7.40-8.00 (m, 4H; PhH), 7.43-8.19 (m, 4H, quinazolinone), 10.6 (1H, acid proton).

*2-[2-Ethoxy-4-oxoquinazolin-384H)-yl]pyridine-3-caboxylic acid* **12.** A mixture of benzoxazinone **1** (0.01 mol) and 2–aminonicotinic acid (0.01 mol) in boiling butanol (30 mL) was refluxed for 6 h. Concentrating the solution gave a solid which was washed, filtered, dried and then crystallized from ethanol affording the quinazolinone **12** as brown crystals; m.p. 298-300 ℃; yield 80 %; Anal. for $C_{16}H_{13}N_3O_4$ (m.w. 311); Found: C, 61.58; H, 4.26; N, 13.20; Calcd: C, 61.74; H, 4.18; N, 13.50; IR υ ($cm^{-1}$) 1669, 1704 (2xC=O), 3255 (chelated OH); MS: *m/z* (int. %) $[M+H]^+$ 311 (36.0), 313 (19.5), 191 (100), 193 (28.6), 175 (61.8), 177 (7.6), 157 (5.2), 159 (1.1), 130 (58.2), 132 (0.6), 123 (0.7), 125 (0.2), 79 (0.7), 81 (0.1) ; $^1$H-NMR (DMSO-$d_6$) δ 1.22 (t, 3H; -OCH$_2$*CH$_3$*, *J* = 6.9 Hz), 4.37 (q, 2H; -O*CH$_2$*CH$_3$ *J* = 6.9 Hz), 7.44 - 8.20 (m, 4H; quinazolinone), 6.97, 7.87, 8.41 (m, 3H; H-4, H-5, H-6, pyridine moiety).

*3-Ethoxycarbonyl-2-ethoxyquinazolin-4-one* **13.** Compound **2** (0.01 mol) was heated under refluxed with ethyl chloroformate (0.01 mol) in 50 mL of dry pyridine for 4h. The excess solvent was distilled off and the solution was left to cool and then poured onto ice with stirring to obtain a crude product, which was filtered off, thoroughly washed with cold water, dried and crystallized from benzene affording products **13** as white crystals; m.p. 177-178 ℃; yield 92 %. Anal. for $C_{13}H_{14}N_2O_4$ (m.w. 262); Found: C, 59.65; H, 5.39; N, 10.68; Calcd: C, 59.54; H, 5.34; N, 10.69; IR υ ($cm^{-1}$) 1672, 1762 (2 C=O); MS: *m/z* (int. %) $[M+H]^+$ 262 (88.5); $^1$H-NMR (DMSO-$d_6$) δ 1.19 (t, 3H, -OCH$_2$*CH$_3$*, *J* = 7.4 Hz), 1.15 (t, 3H, CH$_3$, COOCH$_2$*CH$_3$*), 4.24 (q, 2H, CH$_2$, COO*CH$_2$*CH$_3$), 4.34 (q, 2H; -O*CH$_2$*CH$_3$, *J* = 7.4 Hz), 7.43-8.17 (m, 4H, ArH).

*2-Ethoxy-4(3H)quinazolin-4-thione* **14.** A solution of compound **2** and $P_2S_5$ (0.03 mol each) in dry xylene (50 mL) was boiled for 6 h. The reaction mixture was filtered while hot and then concentrated. The product

separated on cooling was crystallized from ethanol to give the product **14**. Brown crystals of m.p. 137-138 ℃; yield 65 %. Anal. for $C_{10}H_{10}N_2OS$ (m.w. 206); Found: C, 58.15; H, 4.81; N, 13.52; S, 15.53; Calcd: C, 58.25; H, 4.85; N, 13.59; S, 15,53; IR υ ($cm^{-1}$) 1319 (C=S), 1597 (C=N), 3137 (NH); MS: *m/z* (int. %) $[M+H]^+$ 206 (55.7); $^1$H-NMR (DMSO-$d_6$) δ 1.19 (t, 3H, -$OCH_2CH_3$, *J* = 7.4 Hz), 4.39 (q, 2H; -$OCH_2CH_3$, *J* = 7.4 Hz), 7.29-7.67 (m, 4H, ArH), 12.3 (br s, 1H, *NH*).

*4-Chloro-2-ethoxyquinazoline* **15.** A solution of 2-ethoxy-4(3*H*)quinazolinone **1** (0.01 mol) in phosphorus oxychloride (20 mL) was heated on a water bath at 70 ℃ for 2 h. The reaction mixture was then cooled and diluted with ice/water and the resulting precipitate was collected by filtration and recrystallized from $CHCl_3$ chloroform giving product **15** as light brown crystals; m.p. 180-182 ℃; yield 85 %. Anal. For $C_{10}H_9N_2OCl$ (m.w. 208.5); Found: C, 57.45; H, 4.31; N, 13.42; Cl, 17.00; Calcd: C, 57.55; H, 4.30; N, 13.43; Cl, 17.02; IR υ ($cm^{-1}$) 1622 (C=N); MS: *m/z* (int. %) $[M+H]^+$ 208.5 (57.9); $^1$H-NMR (DMSO-$d_6$) δ 1.19 (t, 3H, $OCH_2CH_3$, *J* = 7.4 Hz), 4.19 (q, 2H; -$OCH_2CH_3$, *J* = 7.4 Hz), 7.49-8.86 (m, 4H, ArH).

*2-Ethoxyquinazolin-4-ylhydrazine* **16.** An emulsion of product **15** (0.01mol) and hydrazine hydrate (0.05 mol) in benzene (15 mL) was stirred for 2 h. The benzene-insoluble gum obtained was treated and washed with water, dried and crystallized from ethanol giving reddish brown crystals of product **16**. Yield 68 %; m. p. 156-158 ℃. *Anal*. for $C_{10}H_{12}N_4O$ (M. wt. 204); Found: C, 58.86; H, 5.78; N, 27.45; Calcd: C, 58.82; H, 5.88; N, 27.45; IR υ ($cm^{-1}$) 1620 (C=N), 3160(NH), 3250, 3300 ($NH_2$); MS: *m/z* $[M+H]^+$ 204; $^1$H-NMR (DMSO-$d_6$) δ 1.18 (t, 3H, $CH_3$ of ethoxy J = 7.4 Hz), 4.17 (q, 2H, $CH_2$ of ethoxy J = 7.4 Hz), 7.40 - 8.06 (m, 4H, ArH), 8.65 (br. s, 3H, N*H* and $NH_2$).

*4-(2-Ethoxyquinazolin-4-yl)thiosemicarbazide* **17.** A mixture of the quinazoline **15** and thiosemicarbazide (0.01 mol each) was heated under reflux in acetic acid / fused sodium acetate (30 mL / 2 g) for 3 h. Pouring the solution onto ice/water left a white solid which was filtered, washed with water, dried and recrystallized from ethanol giving white crystals of compound **17**; yield 74 %; m.p. 128 -130 ℃. *Anal.* for $C_{11}H_{13}N_5OS$ (m.wt. 263); Found: C, 53.38; H, 5.19; N, 28.39; Calcd: C, 53.44; H, 5.26; N, 28.34; IR υ ($cm^{-1}$) 1381 (C=S), 1620 (C=N), 3418, 3250 (NH and $NH_2$). MS: *m/z* $[M+H]^+$ 263 (77%). $^1$H-NMR (DMSO-$d_6$) δ 1.20 (t, 3H; $CH_3$ of ethoxy J = 7.2 Hz), 4.15 (q, 2H; $CH_2$ of ethoxy J = 7.2), 7.44-8.06(4d, 4H, ArH), 8.41 - 9.34 (2 br. s, 4H, 2N*H* and $NH_2$).

*Synthesis of Compounds* **18a-c**

A mixture of compound **1** (0.01 mol) and the aminothiadiazole derivatives 2-phenyl-5-aminothiadiazole, 2-cinnamyl-5-aminothiadiazole and 2-phthalimidomethyl-5-aminothiadiazole (0.01 mol) was heated under reflux in boiling acetic acid / fused sodium acetate (30 mL / 2 g) for 3 h. The solution was poured into an ice / water mixture, stirred and left to settle down affording a white solid. The resulting solid was filtered, washed, dried and finally recrystallized from the proper solvent affording the derivatives **18a-c**.

*5-[2-Ethoxy-quinazolone-3-yl]-2-phenylthiadiazole* **18a.** Brown crystals from DMF; m.p. 172-173 ℃; yield 85 %. Anal. for $C_{18}H_{14}N_4O_2S$ (m.w. 350); Found: C, 61.88; H, 4.04; N, 16.08; S, 9.17; Calcd: C, 61.71; H, 4.00; N, 16.00; S, 9.14. IR υ ($cm^{-1}$) 1630 (C=N), 1669 (C=O). MS: *m/z* (int. %) $[M+H]^+$ 350 (78.0), 352 (31.1), 191 (100), 193 (23.7), 157 (4.4), 159 (0.1), 175 (49.5), 177 (9.7), 162 (38.2), 164 (3.6), 130 (61.2), 132 (4.1), 103 (1.8), 105 (0.2), 78 (0.7), 80 (0.1); $^1$H-NMR (DMSO-$d_6$) δ 1.22 (t, 3H; -$OCH_2CH_3$, *J* = 7.1 Hz), 4.40 (q, 2H; -$OCH_2CH_3$, *J* = 7.1 Hz), 7.41 - 7.94 (m, 5H, Ph-H), 7.44 - 8.20 (m, 4H, quinazolinone).

*5-[2-Ethoxy-quinazolone-3-yl]-2-cinnamylthiadiazole* **18b.** Brown crystals from DMF; m.p. 289-290 ℃; yield 85 %. Anal. for $C_{20}H_{16}N_4O_2S$ (m.w. 376); Found: C, 68.99; H, 4.72; N, 16.00; S, 9.03; Calcd:

C, 68.97; H, 4.60; N, 16.09; S, 9.20. IR υ ($cm^{-1}$) 1633 (C=N), 1689 (C=O). MS: *m/z* (int. %) $[M+H]^+$ 376 (72.0), 378 (14.9), 191 (100), 193 (17.5), 188 (14.2), 190 (3.1), 175 (48.2), 177 (12.7), 157 (5.7), 159 (0.2), 130 (67.1), 132 (1.8), 129 (0.8), 131 (0.2), 122 (1.3), 124 (0.1), 78 (0.6), 80 (0.1). $^1$H-NMR (DMSO-$d_6$) δ 1.23 (t, 3H; -OCH$_2$*CH$_3$*, *J* = 7.1 Hz), 4.43 (q, 2H; -O*CH$_2$*CH$_3$, *J* = 7.1 Hz); 7.42- 8.20 (4d, 4H, quinazolinone), 7.35 - 7.45 (m, 5H, Ph-H), 7.20, 7.47 (2d, 2H, *J* = 15.8 Hz, olefinic-H).

*5-[2-Ethoxyquinazolone-3-yl]-2-phthalamidomethylthiadiazole* **18c.** Brown crystals from DMF; m.p. 303-304 ℃; yield 85 %. Anal. for $C_{21}H_{15}N_5O_4S$ (m.w. 433); found: C, 58.72; H, 3.66; N, 16.31; S, 7.42; Calcd: C, 58.20; H, 3.46; N, 16.17; S, 7.39. IR υ ($cm^{-1}$) 1631 (C=N), 1670, 1727, 1776 (3xC=O). MS: *m/z* (int. %) $[M+H]^+$ 433 (58.0), 435 (22.8), 245 (36.4), 247 (3.4), 191 (100), 193 (56.1), 186 (78.0), 188 (12.7), 175 (30.1), 177 (8.1), 157 (3.2), 159 (0.1), 147 (8.3), 149 (0.3), 130 (48.3), 132 (6.4), 122 (4.5), 124 (0.2), 78 (0.3), 80 (0.1); $^1$H-NMR (DMSO-$d_6$) δ 1.21 (t, 3H; -OCH$_2$*CH$_3$*, *J* = 7.1 Hz), 4.48 (q, 2H; -O*CH$_2$*CH$_3$, *J* = 7.1 Hz), 5.16 (s, 2H; *CH$_2$*, phthalimidomethyl), 7.32 - 7.86 (m, 4H, quinazolinone), 7.94 - 8.03 (m, 4H, phthalimido-H).

*Synthesis of Compounds* **19a-c**

The quinazolinone thiadiazole derivative **18a-c** was heated under reflux with formamide (0.01 mol each) for 3 h. The mixture was poured onto ice/water mixture with stirring leaving a white material to separate out and then begin to solidify forming gum. This material was washed with water, filtered and crystallized from ethanol as off-white needles of **19a-c**.

*5-[2-Amino-4-oxoquinazolin-3(4H)-yl]-2-phenylthiadiazole* **19a.** Yield 73 %, m.p. 243-245 ℃. Anal. for $C_{18}H_{14}N_4O_2S$ (m.w. 350); Found: C, 61.76; H, 4.04; N, 16.02; S, 9.17; Calcd: C, 61.71; H, 4.00; N, 16.00; S, 9.14; IR υ ($cm^{-1}$) 1669 (C=O), 1531 (C=N); 3330 (NH); 3444 (CH); MS: *m/z* (int. %) $[M+H]^+$ 350 (72.3); $^1$H-NMR (DMSO-$d_6$) δ 2.11 (s, 2H, N*H$_2$* ), 7.28-7.77 (m, 4H; quinazolinone), 7.41-7.93 (m, 5H; ph-H).

*5-[2-Amino-4-oxoquinazolin-3(4H)-yl]-2-cinnamylthiadiazole* **19b.** Yield 78 %, m.p. 262-263 ℃. Anal. for $C_{20}H_{16}N_4O_2S$ (m.w. 376); Found: C, 63.87; H, 4.27; N, 14.91; S, 8.53; Calcd: C, 63.83; H, 4.26; N, 14.89; S, 8.51; IR υ ($cm^{-1}$) 1670 (C=O), 1529 (C=N); 3392 (NH); 3433 (CH); MS: *m/z* (int. %) $[M+H]^+$ 376 (78.3); $^1$H-NMR (DMSO-$d_6$) δ 2.04 (s, NH, N*H$_2$*), 7.20, 7.47 (2d, 2H, *J* = 15.8 Hz, olefinic-H), 7.34-7.44 (m, 5H, Ph-H), 7.30-7.77 (m, 4 H, quinazolinone).

*2-{[5-(2-Amino-4-oxoquinazolin-3(4H)-yl)-1,3,4-thiadiazol-2-yl] methyl}-1H-isoindole-1,3(2H)-dione* **19c.** Yield 68 %, m.p. 272-273 ℃. Anal. for $C_{19}H_{12}N_6O_3S$ (m.w. 404); Found: C, 56.49; H, 2.99; N, 20.83; S, 7.95; Calcd: C, 56.44; H, 2.97; N, 20.79; S, 7.92; IR υ ($cm^{-1}$) 1671, 1730, 1790 (3xC=O), 1528 (C=N); 3389 (NH); 3443 (CH); MS: *m/z* (int. %) $[M+H]^+$ 404 (78.3); $^1$H-NMR (DMSO-$d_6$) δ 2.00 (s, 2H, N*H$_2$*), 7.29-8.19 (m, 4H; ArH), 7.30-7.77 (m, 4 H, quinazolinone) .

*Synthesis of Compounds **20a-c***

Compound **19a-c** (0.01 mol) was dissolved in 50 mL of dry toluene and cooled to 15 ℃. To this solution was added drop wise an equimolar amount of chloroacetyl chloride with frequent stirring. The temperature of the reaction was brought slowly to room temperature an then the solution was heated under reflux for 4h. The excess toluene was distilled off and the resultant precipitate was filtered, washed repeatedly with dry toluene, dried and crystallized from aqueous dioxane affording compounds **20a-c**.

*2-Chloro-N-[3-(5-phenyl-1,3,4-thiadiazol-2-yl)-4-oxo-3,4-dihydroquinazolin-2-yl]acetamide* **20a.** White crystals from dioxane; m.p. 163-164 ℃, yield 77 %. Anal. For $C_{18}H_{12}ClN_5O_2S$ (m.w. 397.5); Found: C, 54.38; H, 3.05; Cl, 8.96; N, 17.66; S, 8.08; Calcd: C, 54.34 ; H, 3.02; Cl, 8.93; N, 17.61; S, 8.05; IR υ ($cm^{-1}$) 3230 (N-H), 3023 (Ar-H), 2995 ($CH_2$), 1668, 1699 (CO), 763 (CCl); MS: *m/z* (int. %) $[M+H]^+$ 397.5

(68.4); $^1$H-NMR (DMSO-$d_6$) δ 4.41 (s, 2H, *$CH_2$*Cl), 8.11 (s, 1H, *NH*), 7.38-7.93 (m, 4H, Ph-H) 7.21-8.19 (m, 4H, quinazolinone).

*2-Chloro-N-(4-oxo-3-{5-[(E)-2-phenylethenyl]-1,3,4-thiadiazol-2-yl}-3,4-dihydroquinazolin-2-yl)acetamide* **20b.** White crystals from dioxane; m.p. 171-173 ℃, yield 81 %. Anal. For $C_{20}H_{14}Cl\,N_5O_2S$ (m.w. 423.5); Found: C, 56.71; H, 3.33; Cl, 8.40; N, 16.55; S, 7.58; Calcd: C, 56.67 ; H, 3.31; Cl, 8.38; N, 16.53; S, 7.56; IR υ (cm$^{-1}$) 3205 (N-H), 3010 (Ar-H), 2935 ($CH_2$), 1666, 1694, (CO), 775 (CCl); MS: *m/z* (int. %) $[M+H]^+$ 423.5 (73.4); $^1$H-NMR (DMSO-$d_6$) δ 4.41 (s, 2H, *$CH_2$*Cl),8.00 (s, 1H, *NH*), 7.20, 7.47 (2 d, 2 H, olefin-H), 7.28-7.45 (m, 4H, cinnamyl moiety), 7.27-8.14 (m, 4H, quinazolinone).

*2-Chloro-N-(3-{5-[(1,3-dioxo-1,3-dihydro-2H-isoindol-2-yl)methyl]-1,3,4-thiadiazol-2-yl}-4-oxo-3,4-dihydroquinazolin-2-yl)acetamide* **20c.** White crystals from dioxane; m.p. 179-181 ℃, yield 73 %. Anal. for $C_{21}H_{13}ClN_6O_4S$ (m.w. 480.5); Found: C, 52.48; H, 2.74; Cl, 7.43; N, 14.57; S, 6.71; Calcd: C, 52.44 ; H, 2.71; Cl, 7.39; N, 14.48; S, 6.66; IR υ (cm$^{-1}$) 3205 (N-H), 3010 (Ar-H), 2935 ($CH_2$), 1666, 1694, 1776 (CO), 775 (CCl); MS: *m/z* (int. %) $[M+H]^+$ 480.5 (73.4); $^1$H-NMR (DMSO-$d_6$) δ 4.60 (s, 2H, *$CH_2$*Cl), 8.00 (s, 1H, *NH*), 7.25-7.85 (m, 4H, quinazolinone), 7.96-8.03 (m, 4H, phthalimido moiety).

*2-Chloro-N-(2-ethoxy-4-oxoquinazolin-3(4H)-yl)acetamide* **21.** Compound **3** (0.01 mol) was dissolved in 50 mL of dry toluene and cooled to 15 ℃. To this solution was added drop wise an equimolar amount of chloroacetyl chloride with frequent stirring. The temperature of the reaction was brought slowly to room temperature and then the solution was heated under reflux for 4 h. The excess toluene was distilled off and the resultant precipitate was filtered, washed repeatedly with dry toluene, dried and then crystallized from aqueous dioxane as white crystals of compound **21**, m.p. 149-151 ℃, yield 73 %. Anal. for $C_{12}H_{12}Cl\,N_3O_3$ (m.w. 281.5); Found: C, 51.15; H, 4.26; N, 14.92; Cl, 12.61; Calcd: C, 51.22 ; H, 4.29; N, 14.99; Cl, 12.66; IR υ (cm$^{-1}$) 3205 (N-H), 3010 (ArC-H), 2935 ($CH_2$), 1666, 1694 (CO), 1568, 1328 (CN), 775 (CCl); MS: *m/z* (int. %) $[M+H]^+$ 281 (73.4); $^1$H-NMR (DMSO-$d_6$) δ 1.15 (t, 3H; $OCH_2$*$CH_3$*), 4.31 (s, 2H, *$CH_2$*Cl), 4.43 (q, 2H; O*$CH_2$*$CH_3$), 8.0 (s, 1H, *NH*), 7.28-8.20 (m, 4H, ArH).

*3-Chloroacetyl-2-ethoxyquinazolin-4-one* **22.** Compound **2** (0.01 mol) was refluxed with chloroacetyl chloride (0.01 mol) in 50 mL of dry pyridine for 4 h. The excess solvent was distilled off and the solution was left to cool and then poured onto ice with frequent stirring till a crude product was obtained. The latter was filtered off, thoroughly washed with cold water, dried and crystallized from ethanol affording brownish white crystals of derivative **8**; m.p. 152-153 ℃; yield 85 %. Anal. for $C_{12}H_{11}N_2O_3Cl$ (m.w. 266.5); Found: C, 54.52; H, 5.69; N, 7.92; Cl, 13.32; Calcd: C, 54.54; H, 5.68; N, 7.95; Cl, 13.28; IR υ (cm$^{-1}$) 1668, 1717 (2 C=O), 2823 (CH); MS: *m/z* (int. %) $[M+H]^+$ 266.5 (77.3); $^1$H-NMR (DMSO-$d_6$) δ 1.2 (t, 3H, -$OCH_2$*$CH_3$*, *J* = 7.4 Hz), 4.36 (q, 2H; -O*$CH_2$*$CH_3$, *J* = 7.4 Hz), 4.29 (d, 2H, *$CH_2$*Cl), 7.45-8.20 (m, 4H, ArH).

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