

Synthesis of 2-amino-3,4-dihydroquinazolines and imidazo[2,1-*b*]quinazoline-2-ones

Amita Mishra, Sanjay Batra*

Medicinal and Process Chemistry Division, Central Drug Research Institute, PO Box 173, Lucknow 226001, India

Fax: +91-522-2623405

E-mail: batra_san@yahoo.co.uk

Abstract: A facile method for the synthesis of 2-amino-3,4-dihydroquinazolines from the Baylis-Hillman derivatives has been disclosed. The protocol involves the sequential S_N2 -reaction of a primary amine on the Baylis-Hillman acetate of 2-nitrobenzaldehyde, CNBr-mediated nitrile addition and Fe-AcOH-promoted reductive cyclization. The approach has been extended for constructing imidazo[2,1-*b*]quinazoline-2-ones and imidazo[2,1-*b*]quinazolines in one pot.

Key words: Quinazoline, Anagrelide, Baylis-Hillman, imidazo[2,1-*b*]quinazoline, allyl amine

Recently, we have developed a general protocol for obtaining pyrimido[2,1-*b*]quinazolines from the primary allyl amines afforded by the Baylis-Hillman acetates.¹ In context of our program to develop heterocyclic systems of biological relevance from the derivatives of the Baylis-Hillman reaction² we envisioned to extend the methodology for the synthesis of substituted imidazo[2,1-*b*]quinazoline-2-one, which is the basic skeleton of the drug anagrelide.³ The retro-synthetic analysis displayed in Figure 1 provide the basis for our work in this direction. Cleavage of the imidazole ring results in the 2-aminoquinazoline **I** which in turn could be generated from the cyanamide **II**. The intermediate **II** could be readily obtained from the allyl amine afforded from the S_N2 '- S_N2 ' displacement reaction (S_N2 -reaction) of a primary amine with the acetyl derivative of the Baylis-Hillman adduct.

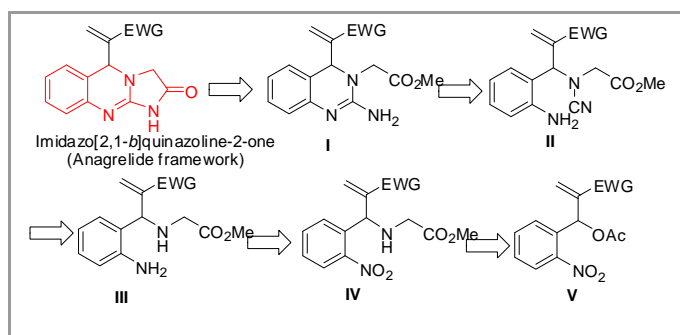
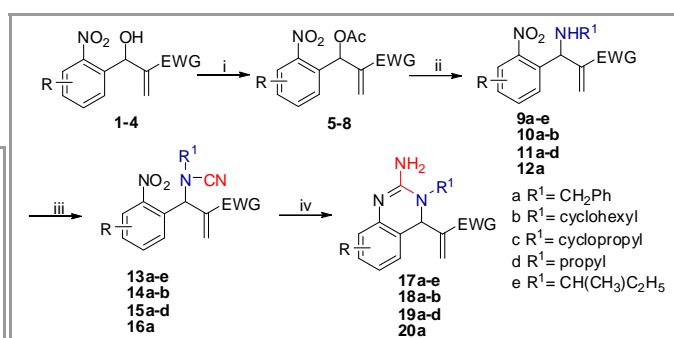


Figure 1 Retrosynthetic analysis for the synthesis of Imidazo[2,1-*b*]quinazoline-2-one.

A survey of the literature revealed that substituted 2-aminoquinazoline have served as precursor to imidazo[2,1-*b*]quinazoline-2-one which also form component unit of hypotensive, ionotropic, antimetastatic and hypoglycemic agents.⁴ Significantly different 2-amino-3,4-dihydroquinazolines themselves are ascribed with several pharmacological properties.⁵ There are a variety

of elegant strategies predated in the literature which describe the synthesis of 2-amino-3,4-dihydroquinazolines.⁶ Notably, these derivatives are either unsubstituted at the 4-position or else may possess an aromatic group or a carbonyl moiety at this position. The approach using the Baylis-Hillman chemistry would provide a new alternative to obtain 2-aminoquinazoline scaffold bearing a vinyl chain at 4-position which may serve as prelude to further synthetic achievements.

The execution of the strategy commenced from the synthesis of the Baylis-Hillman adducts **1-4** from 2-nitrobenzaldehydes following standard procedure. The synthesis of respective acetyl derivatives **5-8** was readily achieved by acetyl chloride in the presence of pyridine. With the objective to optimize conditions for the envisaged synthesis, initially the S_N2 -reaction of compound **5** with benzyl amine in the presence of DABCO under aqueous condition was conducted to generate the required allyl amine **9a** in 71% yield. Treatment of **9a** with cyanogen bromide in the presence of NaHCO_3 in methanol at room temperature for 48 h resulted in the formation of the cyanamide derivative **13a** in 81% yields (scheme 1). Next reductive cyclization of the cyanamide



Scheme 1. Reagents and conditions (i) AcCl , pyridine, CH_2Cl_2 , 0°C , 30 min. (ii) $\text{R}'\text{NH}_2$, DABCO, $\text{THF}:\text{H}_2\text{O}$ (1:1), 2 h. (iii) CNBr , NaHCO_3 , MeOH , rt, 40-48 h (for $\text{EWG} = \text{CN}$), 6-7 h (for $\text{EWG} = \text{CO}_2\text{Me}$). (iv) Fe-AcOH , 95°C , 20 min. (for key to R and EWG refer to Table 1.)

13a, after a series of reactions, was optimized to be accomplished in the presence of Fe-AcOH mixture under heating at 95°C for 20 min. to afford the desired 2-aminoquinazoline (**17a**). It was found that this protocol was general in nature to yield compounds **17b-e**, **18a-b** from amines **9b-e**, **10a-b** in good yields (Table 1). Satisfied of the outcome with acetates **5** and **6**, we further investigated acetates **7** and **8** obtained from the adducts **3**

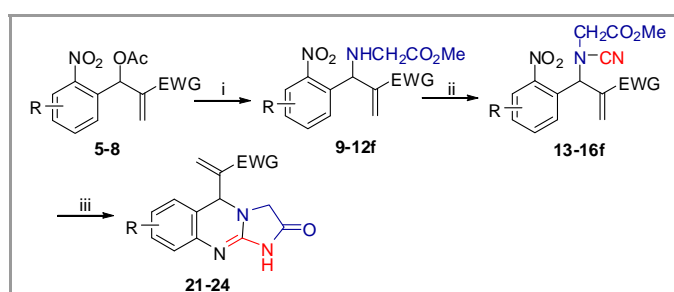
Table 1 Key to R, EWG and R¹ and yields (isolated) for all the synthesized compounds

Compd. No	R	EWG	R ¹	Yield (%)
9a	H	CN	CH ₂ Ph	71
9b	H	CN	Cyclohexyl	70
9c	H	CN	Cyclopropyl	80
9d	H	CN	Propyl	87
9e	H	CN	CH(CH ₃)C ₂ H ₅	63
9f	H	CN	CH ₂ CO ₂ Me	60
9g	H	CN	CH ₂ CH(OMe) ₂	81
10a	3,4-(OMe) ₂	CN	CH ₂ Ph	71
10b	3,4-(OMe) ₂	CN	Cyclohexyl	64
10f	3,4-(OMe) ₂	CN	CH ₂ CO ₂ Me	64
11a	H	CO ₂ Me	CH ₂ Ph	65
11b	H	CO ₂ Me	Cyclohexyl	70
11c	H	CO ₂ Me	Cyclopropyl	75
11d	H	CO ₂ Me	Propyl	70
11f	H	CO ₂ Me	CH ₂ CO ₂ Me	68
11g	H	CO ₂ Me	CH ₂ CH(OMe) ₂	71
12a	3,4-(OMe) ₂	CO ₂ Me	CH ₂ Ph	82
12f	3,4-(OMe) ₂	CO ₂ Me	CH ₂ CO ₂ Me	61
13a	H	CN	CH ₂ Ph	81
13b	H	CN	Cyclohexyl	88
13c	H	CN	Cyclopropyl	73
13d	H	CN	Propyl	77
13e	H	CN	CH(CH ₃)C ₂ H ₅	63
13f	H	CN	CH ₂ CO ₂ Me	70
13g	H	CN	CH ₂ CH(OMe) ₂	72
14a	3,4-(OMe) ₂	CN	CH ₂ Ph	80
14b	3,4-(OMe) ₂	CN	Cyclohexyl	70
14f	3,4-(OMe) ₂	CN	CH ₂ CO ₂ Me	80
15a	H	CO ₂ Me	CH ₂ Ph	94
15b	H	CO ₂ Me	Cyclohexyl	82
15c	H	CO ₂ Me	Cyclopropyl	96
15d	H	CO ₂ Me	Propyl	87
15f	H	CO ₂ Me	CH ₂ CO ₂ Me	71
15g	H	CO ₂ Me	CH ₂ CH(OMe) ₂	83
16a	3,4-(OMe) ₂	CO ₂ Me	CH ₂ Ph	75
16f	3,4-(OMe) ₂	CO ₂ Me	CH ₂ CO ₂ Me	57
17a	H	CN	CH ₂ Ph	53
17b	H	CN	Cyclohexyl	66
17c	H	CN	Cyclopropyl	67
17d	H	CN	Propyl	60
17e	H	CN	CH(CH ₃)C ₂ H ₅	61
17g	H	CN	CH ₂ CH(OMe) ₂	65
18a	3,4-(OMe) ₂	CN	CH ₂ Ph	55
18b	3,4-(OMe) ₂	CN	Cyclohexyl	66
19a	H	CO ₂ Me	CH ₂ Ph	60
19b	H	CO ₂ Me	Cyclohexyl	58
19c	H	CO ₂ Me	Cyclopropyl	60
19d	H	CO ₂ Me	Propyl	60
19g	H	CO ₂ Me	CH ₂ CH(OMe) ₂	60
20a	H	CO ₂ Me	CH ₂ Ph	56
21	H	CN	CH ₂ CO ₂ Me	55
22	3,4-(OMe) ₂	CN	CH ₂ CO ₂ Me	60
23	H	CO ₂ Me	CH ₂ CO ₂ Me	55
24	3,4-(OMe) ₂	CO ₂ Me	CH ₂ CO ₂ Me	53
25	H	CN	CH ₂ CH(OMe) ₂	72
26	H	CO ₂ Me	CH ₂ CH(OMe) ₂	65

and **4** of acrylates. Here too the allyl amines **11a-d** and **12a** were furnished in good yields. Interestingly unlike **9** and **10**, the cyanamides **15a-d** and **16a** of **11a-d** and **12a** were formed in 6-7 h only. Reducing the nitro group in **15b-d**, **16a** under the influence of Fe-AcOH smoothly produced the 2-aminoquinazolines **19b-d**, **20a**. In contrast **15a** did not undergo neat transformation in the presence of Fe-AcOH. Fortunately, however, we discov-

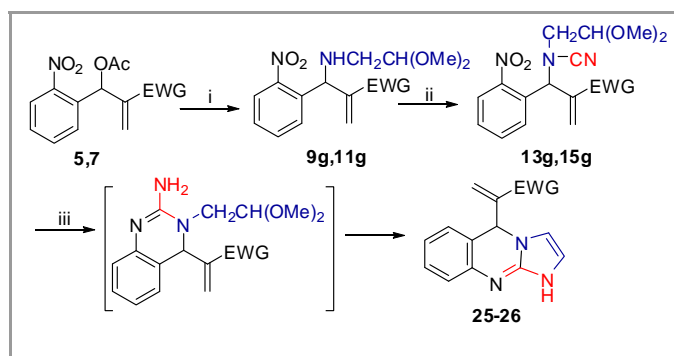
ered that replacing AcOH with HCl in the reaction of **15a** produced the required **19a** in 60% yield.

Having established the condition for the synthesis of 2-aminoquinazolines, we turned our focus toward the synthesis of imidazo[2,1-*b*]quinazoline-2-one. Consequently secondary allyl amines **9f,10f,11f,12f** were prepared by reaction between glycine methyl ester and the Baylis-Hillman acetates **5-8** (scheme 2).⁷ Following the standardized conditions these amines were initially converted to cyanamides **13f,14f,15f,16f** by reacting with cyanogen bromide. Reducing the aromatic nitro group with Fe-AcOH in these cyanamides resulted in a clean reaction leading to isolation of products in 55-60% yields. Based on the spectroscopic analysis these products were established to be the desired imidazo[2,1-*b*]quinazoline-2-ones **21-24**. This result delineated that the reduction of the nitro group triggered a cascade reaction to afford the final products.



Scheme 2. Reagents and Conditions (i) CO₂MeCH₂NH₂, DABCO, THF: H₂O (1:1), 2 h. (ii) CNBr, NaHCO₃, MeOH, rt, 48 h (for EWG=CN), 5 h (for EWG=CO₂Me). (iii) Fe-AcOH, 95 °C, 20 min.

These results motivated us to investigate the utility of the strategy further. In principle installing aminoacetaldehyde dimethyl acetal as the amine component under similar reaction sequence shall result in imidazo[2,1-*b*]quinazoline. Therefore, **9g** was prepared from **5** and transformed to the cyanamide **13g** (72%). Fe-AcOH-promoted reduction of the aromatic nitro group gave a product, which could be obtained in pure form in low yield. The structure of the product was identified as **17g**. This result showed that AcOH was inefficient to unmask the formyl group for further reaction. Subsequently in a modified protocol instead of isolating **17g**, conc. HCl



Scheme 3. Reagents and Conditions (i) (OMe)₂CHCH₂NH₂, DABCO, THF: H₂O (1:1), 2 h. (ii) CNBr, NaHCO₃, MeOH, rt, 42 h (for EWG=

CN), 6 h (for EWG= CO₂Me). (iii) a) Fe-AcOH, 95 °C, 20 min. b) AcOH-HCl, 100 °C, 30 min.

was directly added to the reaction mixture to demonstrate the general nature of this procedure, it was pleasing to note that this one-pot procedure afforded the desired product **25** in 72% yields. To demonstrate the general nature of this protocol compound **15g** was prepared and subjected to similar set of reactions to furnish **26** in 65% yield.

In summary we have demonstrated a simple and elegant approach for obtaining 4-vinyl-3,4-dihydro-2-aminoquinazoline which has been extended to one-pot synthesis of substituted imidazo[2,1-*b*]quinazoline-2-ones and imidazo[2,1-*b*]quinazolines. It is assumed that a variety of polycyclic quinazolines can be synthesized following this strategy by simply bringing variation in amine component.

Melting points are uncorrected and were determined in capillary tubes on an apparatus containing silicon oil. IR spectra were recorded using a Perkin Elmer's RX I FTIR spectrophotometer. ¹H NMR and ¹³C NMR spectra were recorded either on a Bruker DPX-200 FT or Bruker Avance DRX-300 spectrometer, using TMS as an internal standard (chemical shifts in δ). The ESMS were recorded on MICROMASS Quadro-II LCMS system. The HRMS spectra were recorded as EI-HRMS on a JEOL system. Elemental analyses were performed on a Carlo Erba's 108 or an Elementar's Vario EL III microanalyzer.

General Procedure for the preparation of **9a-g**; **10a-b,f**; **11a-d,f,g**; **12a,f** as exemplified for **9a**.

To a stirred solution of Baylis-Hillman acetate **5** (2.00 g, 8.13 mmol) in a mixture of THF/water (30 mL, 1:1, v/v), was added DABCO (1.37 g, 12.20 mmol) and reaction was continued for 15 min at room temperature. Thereafter benzyl amine (0.98 mL, 8.94 mmol) was added and the reaction was continued for 2 h. After completion of the reaction (checked by TLC) THF was evaporated under vacuum and the residue was extracted with EtOAc (3 x 30 mL). The organic layers were combined, washed with brine (50 mL), dried over Na₂SO₄ and concentrated to yield the crude product. Purification via silica gel column chromatography using EtOAc:Hexanes (1:9, v/v) afforded **9a** (1.70 g, 71%) as brown oil.

2-[(Benzylamino)(2-nitrophenyl)methyl]acrylonitrile (**9a**)

R_f = 0.53 (Ethylacetate: Hexanes, 1:4).

IR (Neat): 2220 (CN), 3430 (NH) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): δ = 3.75 (d, 2H, *J* = 1.6 Hz, CH₂), 5.09 (s, 1H, CH), 6.12 (s, 1H, =CH₂), 6.13 (d, 1H, *J* = 0.8 Hz, =CH₂), 7.27-7.35 (m, 5H, ArH), 7.46-7.54

(m, 1H, ArH), 7.69 (dt, 1H, *J*₁ = 7.6 Hz, *J*₂ = 1.3 Hz, ArH), 7.90 (s, 1H, ArH), 7.94 (s, 1H, ArH).

¹³C NMR (CDCl₃, 50 MHz): δ = 52.1, 59.7, 117.4, 124.8, 125.3, 127.9, 128.6, 129.0, 129.6, 129.7, 133.1, 133.96, 134.05, 139.2.

MS (ES⁺): *m/z* = 294.1 (M⁺+1).

Anal. Calcd. for C₁₇H₁₅N₃O (293.12): C, 69.61; H, 5.15; N, 14.33. Found: C, 69.82; H, 4.89; N, 14.67.

2-[(Cyclohexylamino)(2-nitrophenyl)methyl]acrylonitrile (**9b**)

As brown oil (1.60 g from 2.00 g); R_f = 0.61 (Ethylacetate: Hexanes, 1:4).

IR (Neat): 2226 (CN), 3428 (NH) cm⁻¹.

¹H NMR (CDCl₃, 300 MHz): δ = 1.03-1.25 (m, 6H, 3 x CH₂), 1.70-1.90 (m, 4H, 2 x CH₂), 2.37-2.41 (m, 1H, CH), 5.25 (s, 1H, CH), 6.01 (d, 1H, *J* = 0.8 Hz, =CH₂), 6.04 (s, 1H, =CH₂), 7.45-7.50 (m, 1H, ArH), 7.66 (dt, 1H, *J*₁ = 7.6 Hz, *J*₂ = 1.2 Hz, ArH), 7.86 (dt, 2H, *J*₁ = 8.7 Hz, *J*₂ = 1.2 Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): δ = 25.2, 26.4, 33.9, 50.1, 117.0, 125.5, 129.4, 130.7, 131.4, 132.2, 133.7, 134.5, 140.9, 147.6.

MS (ES⁺) *m/z* = 286.1 (M⁺+1).

Anal. Calcd. for C₁₆H₁₉N₃O₂ (285.15): C, 67.35; H, 6.71; N, 14.73. Found: C, 67.63; H, 6.43; N, 14.92.

2-[(Cyclopropylamino)(2-nitrophenyl)methyl]acrylonitrile (**9c**)

As brown oil (1.50 g from 2.00 g); R_f = 0.61 (Ethylacetate: Hexanes, 1:4).

IR (Neat): 2226 (CN), 3426 (NH) cm⁻¹.

¹H NMR (CDCl₃, 300 MHz): δ = 0.37-0.53 (m, 4H, 2 x CH₂), 2.04-2.12 (m, 1H, CH), 5.15 (s, 1H, CH), 6.06 (s, 1H, =CH₂), 6.08 (s, 1H, =CH₂), 7.48 (t, 1H, *J* = 7.8 Hz, ArH), 7.66 (t, 1H, *J* = 7.5 Hz, ArH), 7.73 (d, 1H, *J* = 7.7 Hz, ArH), 7.88 (d, 1H, *J* = 8.1 Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): δ = 6.6, 7.5, 29.3, 60.7, 117.6, 125.0, 125.2, 129.3, 129.5, 132.6, 133.7, 134.4, 149.7.

MS (ES⁺) *m/z* = 244.0 (M⁺+1).

Anal. Calcd. for C₁₃H₁₃N₃O₂ (243.10): C, 64.19; H, 5.39; N, 17.27. Found: C, 64.38; H, 5.72; N, 17.11.

2-[(2-Nitrophenyl)(propylamino)methyl]acrylonitrile (**9d**)

As yellow oil (1.30 g from 1.50 g); R_f = 0.71 (Ethylacetate: Hexanes, 1:4).

IR (Neat): 2200 (CN), 3428 (NH) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): δ = 0.93 (t, 3H, *J* = 7.4 Hz, CH₃), 1.43-1.61 (m, 2H, CH₂), 2.41-2.65 (m, 2H, CH₂), 5.02 (s, 1H, CH), 6.08 (s, 1H, =CH₂), 6.10 (d, 1H, *J* = 0.8 Hz, =CH₂), 7.48 (dt, 1H, *J*₁ = 8.5 Hz, *J*₂ = 1.5 Hz, ArH), 7.67 (dt, 1H, *J*₁ = 7.6 Hz, *J*₂ = 1.3 Hz, ArH), 7.87 (dt, 2H, *J*₁ = 7.5 Hz, *J*₂ = 1.4 Hz, ArH).

^{13}C NMR (CDCl_3 , 50 MHz): δ = 12.1, 23.5, 50.0, 50.8, 117.5, 125.5, 129.5, 130.4, 132.7, 133.9, 134.7, 141.2.

MS (ES+) m/z = 246.2 (M^+ +1).

Anal. Calcd. for $\text{C}_{13}\text{H}_{15}\text{N}_3\text{O}_2$ (245.12): C, 63.66; H, 6.16; N, 17.13. Found: C, 63.69; H, 5.89; N, 17.48.

2-[(sec-Butylamino)(2-nitrophenyl)methyl]acrylonitrile (9e)

Diastereomeric ratio 1:1; brown oil (1.00 g from 1.50 g); R_f = 0.68 (Ethylacetate: Hexanes, 3:17).

IR (Neat): 2223 (CN), 3452 (NH) cm^{-1} .

^1H NMR (CDCl_3 , 300 MHz): δ = 0.86 (t, 3H, J = 7.4 Hz, CH_3), 0.93 (t, 3H, J = 7.4 Hz, CH_3), 1.01 (d, 3H, J = 6.3 Hz, CH_3), 1.06 (d, 3H, J = 6.3 Hz, CH_3), 1.24-1.51 (m, 4H, 2 x CH_2), 2.46-2.56 (m, 2H, 2 x CH), 5.20-5.21 (m, 2H, 2 x CH), 6.02-6.04 (m, 4H, 2 x $=\text{CH}_2$), 7.45-7.50 (m, 2H, 2 x ArH), 7.67 (t, 2H, J = 7.7 Hz, 2 x ArH), 7.86 (d, 2H, J = 1.6 Hz, 2 x ArH), 7.88 (s, 2H, 2 x ArH).

^{13}C NMR (CDCl_3 , 50 MHz): δ = 10.4, 10.5, 20.0, 20.4, 29.9, 30.2, 52.3, 52.5, 57.27, 57.33, 117.5, 125.1 (2), 125.5, 125.8, 129.4, 129.5, 129.6, 132.1, 132.4, 133.7, 134.8.

MS (ES+) m/z = 260.1 (M^+ +1).

Anal. Calcd. for $\text{C}_{14}\text{H}_{17}\text{N}_3\text{O}_2$ (259.13): C, 64.85; H, 6.61; N, 16.20. Found: C, 65.02; H, 6.85; N, 15.94.

Methyl 2-(2-cyano-1-(2-nitrophenyl)allylamino)acetate (9f)

As a white solid (1.00 g from 1.50 g); mp 122-123 °C; R_f = 0.45 (Ethylacetate: Hexanes, 1:4).

IR (KBr): 1727 (CO_2CH_3), 2228 (CN), 3491 (NH) cm^{-1} .

^1H NMR (CDCl_3 , 300 MHz): δ = 3.39 (s, 2H, CH_2), 3.73 (s, 3H, OCH_3), 5.13 (s, 1H, CH), 6.09 (s, 1H, $=\text{CH}_2$), 6.17 (d, 1H, J = 0.4 Hz, $=\text{CH}_2$), 7.49-7.53 (m, 1H, ArH), 7.68-7.72 (m, 1H, ArH), 7.91-7.96 (m, 2H, ArH).

^{13}C NMR (CDCl_3 , 50 MHz): δ = 48.6, 52.5, 59.4, 117.1, 124.4, 125.3, 129.6, 129.9, 133.4, 134.1, 149.7, 172.2.

MS (ES+) m/z = 276.0 (M^+ +1).

Anal. Calcd. for $\text{C}_{13}\text{H}_{13}\text{N}_3\text{O}_4$ (275.09): C, 56.72; H, 4.76; N, 15.27. Found: C, 56.97; H, 4.58; N, 15.58.

2-[(2,2-dimethoxyethyl)amino](2-nitrophenyl)methyl]acrylonitrile (9g)

As brown oil (2.50 g from 2.60 g); R_f = 0.21 (Ethylacetate: Hexanes, 1:4).

IR (Neat): 2218 (CN), 3414 (NH) cm^{-1} .

^1H NMR (CDCl_3 , 300 MHz): δ = 2.61-2.76 (m, 2H, CH_2), 3.36 (s, 3H, OCH_3), 3.38 (s, 3H, OCH_3), 4.47 (t, 1H, J = 5.3 Hz, CH), 5.08 (s, 1H, CH), 6.09 (s, 1H, $=\text{CH}_2$), 6.12 (s, 1H, $=\text{CH}_2$), 7.47-7.52 (m, 1H, ArH), 7.66-7.71 (m, 1H, ArH), 7.84-7.92 (m, 2H, ArH).

^{13}C NMR (CDCl_3 , 50 MHz): δ = 55.0, 55.6, 57.8, 105.1, 114.4, 117.6, 125.5, 130.3, 131.0, 131.5, 134.7, 143.1, 147.6.

MS (ES+) m/z = 292.1 (M^+ +1).

Anal. Calcd. for $\text{C}_{14}\text{H}_{17}\text{N}_3\text{O}_4$ (291.12): C, 57.72; H, 5.88; N, 14.42. Found: C, 58.02; H, 5.68; N, 14.74.

2-[(Benzylamino)(4,5-dimethoxy-2-nitrophenyl)methyl]acrylonitrile (10a)

As yellow oil (1.23 g from 1.50 g); R_f = 0.51 (Ethylacetate: Hexanes, 1:4).

IR (Neat): 2200 (CN), 3428 (NH) cm^{-1} .

^1H NMR (CDCl_3 , 200 MHz): δ = 3.74 (d, 2H, J = 2.3 Hz, CH_2), 3.96 (s, 3H, OCH_3), 4.00 (s, 3H, OCH_3), 5.28 (d, 1H, J = 5.6 Hz, CH), 6.06 (s, 1H, $=\text{CH}_2$), 6.15 (d, 1H, J = 0.7 Hz, $=\text{CH}_2$), 7.29-7.35 (m, 5H, ArH), 7.50 (s, 1H, ArH), 7.58 (s, 1H, ArH).

^{13}C NMR (CDCl_3 , 50 MHz): δ = 52.0, 56.8, 57.0, 59.6, 108.7, 110.0, 110.9, 117.7, 125.0, 127.9, 128.6, 129.0, 129.2, 132.9, 139.3, 141.8, 148.9, 154.0.

MS (ES+) m/z = 354.0 (M^+ +1).

Anal. Calcd. for $\text{C}_{19}\text{H}_{19}\text{N}_3\text{O}_4$ (353.14): C, 64.58; H, 5.42; N, 11.89. Found: C, 64.86; H, 5.34; N, 11.66.

2-[(Cyclohexylamino)(4,5-dimethoxy-2-nitrophenyl)methyl]acrylonitrile (10b)

As brown oil (1.45 g from 2.00 g); R_f = 0.25 (Ethylacetate: Hexanes, 1:4).

IR (Neat): 2200 (CN), 3428 (NH) cm^{-1} .

^1H NMR (CDCl_3 , 300 MHz): δ = 1.09-1.23 (m, 6H, 3 x CH_2), 1.68-1.81 (m, 4H, 2 x CH_2), 2.35-2.42 (m, 1H, CH), 3.97 (s, 3H, OCH_3), 4.03 (s, 3H, OCH_3), 5.47 (s, 1H, CH), 5.99 (s, 1H, $=\text{CH}_2$), 6.05 (s, 1H, $=\text{CH}_2$), 7.51 (s, 1H, ArH), 7.59 (s, 1H, ArH).

^{13}C NMR (CDCl_3 , 50 MHz): δ = 25.2, 29.8, 30.1, 32.3, 56.9, 57.2, 112.7, 119.6, 128.8, 129.1, 130.5, 133.6, 136.2, 139.1, 146.2.

MS (ES+) m/z = 346.0 (M^+ +1).

Anal. Calcd. for $\text{C}_{18}\text{H}_{23}\text{N}_3\text{O}_4$ (345.17): C, 62.59; H, 6.71; N, 12.17. Found: C, 62.78; H, 6.66; N, 12.10.

Methyl 2-[[2-cyano-1-(4,5-dimethoxy-2-nitrophenyl)allyl]amino]acetate (10f)

As brown oil (0.70 g from 1.00 g); R_f = 0.21 (Ethylacetate: Hexanes, 1:4).

IR (Neat): 1716 (CO_2CH_3), 2220 (CN), 3428 (NH) cm^{-1} .

^1H NMR (CDCl_3 , 200 MHz): δ = 3.38 (s, 2H, CH_2), 3.74 (s, 3H, OCH_3), 3.96 (s, 3H, OCH_3), 4.02 (s, 3H, OCH_3), 5.32 (s, 1H, CH), 6.07 (s, 1H, $=\text{CH}_2$), 6.21 (s, 1H, $=\text{CH}_2$), 7.50 (s, 1H, ArH), 7.58 (s, 1H, ArH).

^{13}C NMR (CDCl_3 , 75 MHz): δ = 48.1, 52.1, 56.4, 56.7, 58.9, 110.3, 117.0, 124.0, 128.1, 130.0, 133.1, 141.3, 148.6, 153.6, 172.0.

MS (ES+) m/z = 336.0 (M^+ +1).

Anal. Calcd. for $\text{C}_{15}\text{H}_{17}\text{N}_3\text{O}_6$ (335.11): C, 53.73; H, 5.11; N, 12.53. Found: C, 53.73; H, 5.11; N, 12.53.

Methyl 2-[(benzylamino)(2-nitrophenyl)methyl]acrylate (11a)

As brown oil (1.30g from 1.80g); $R_f = 0.53$ (Ethylacetate: Hexanes, 3:17).

IR (Neat): 1710 (CO₂CH₃), 3426 (NH) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): $\delta = 3.67$ (s, 3H, OCH₃), 3.75-3.86 (m, 2H, CH₂), 5.34 (s, 1H, CH), 5.97 (s, 1H, =CH₂), 6.44 (s, 1H, =CH₂), 7.28-7.34 (m, 5H, ArH), 7.40-7.44 (m, 1H, ArH), 7.53-7.61 (m, 1H, ArH), 7.71-7.75 (m, 1H, ArH), 7.79-7.83 (m, 1H, ArH).

¹³C NMR (CDCl₃, 50 MHz): $\delta = 52.4, 52.8, 57.7, 124.7, 125.2, 127.1, 127.6, 128.6, 128.7, 128.9, 129.9, 132.0, 136.4, 139.0, 140.2, 141.0, 166.8$.

MS (ES+) $m/z = 327.2$ (M⁺+1).

Anal. Calcd. for C₁₈H₁₈N₂O₄ (326.13): C, 66.25; H, 5.56; N, 8.58. Found: C, 66.34; H, 5.23; N, 8.87.

Methyl 2-[(cyclohexylamino)(2-nitrophenyl)methyl]acrylate (11b)

As brown oil (1.60 g from 2.00 g); $R_f = 0.63$ (Ethylacetate: Hexanes, 1:4).

IR (Neat): 1726 (CO₂CH₃), 3427 (NH) cm⁻¹.

¹H NMR (CDCl₃, 300 MHz): $\delta = 1.05$ -1.21 (m, 6H, 3 x CH₂), 1.55 (brs, 4H, 2 x CH₂), 2.32-2.45 (m, 1H, CH), 3.68 (s, 3H, OCH₃), 5.45 (s, 1H, CH), 5.79 (s, 1H, =CH₂), 6.35 (s, 1H, =CH₂), 7.37 (t, 1H, $J = 7.7$ Hz, ArH), 7.55 (t, 1H, $J = 7.5$ Hz, ArH), 7.72 (d, 1H, $J = 7.8$ Hz, ArH), 7.79 (d, 1H, $J = 8.0$ Hz, ArH).

¹³C NMR (CDCl₃, 75 MHz): $\delta = 25.2, 26.5, 33.6, 43.5, 52.7, 56.3, 125.2, 129.6, 131.6, 132.2, 132.5, 133.9, 138.6, 148.0, 168.1$.

MS (ES+) $m/z = 319.2$ (M⁺+1).

Anal. Calcd. for C₁₇H₂₂N₂O₄ (318.16): C, 64.13; H, 6.97; N, 8.80. Found: C, 63.92; H, 7.33; N, 8.60.

Methyl 2-[(cyclopropylamino)(2-nitrophenyl)methyl]acrylate (11c)

As brown oil (1.49 g from 2.00 g); $R_f = 0.55$ (Ethylacetate: Hexanes, 1:4).

IR (Neat): 1758 (CO₂CH₃), 3414 (NH) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): $\delta = 0.32$ -0.46 (m, 4H, 2 x CH₂), 2.16-2.21 (m, 1H, CH), 3.68 (s, 3H, OCH₃), 5.40 (s, 1H, CH), 5.79 (t, 1H, $J = 1.1$ Hz, =CH₂), 6.38 (t, 1H, $J = 0.7$ Hz, =CH₂), 7.35-7.42 (m, 1H, ArH), 7.50-7.63 (m, 2H, ArH), 7.79 (dd, 1H, $J_1 = 7.2$ Hz, $J_2 = 1.4$ Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): $\delta = 7.0, 29.8, 52.4, 58.2, 124.7, 126.7, 128.4, 129.7, 132.8, 136.7, 141.3, 150.2, 166.8$.

MS (ES+) $m/z = 277.1$ (M⁺+1).

Anal. Calcd. for C₁₄H₁₆N₂O₄ (276.11): C, 60.86; H, 5.84; N, 10.14. Found: C, 61.26; H, 5.96; N, 9.89.

Methyl 2-[(2-nitrophenyl)(propylamino)methyl]acrylate (11d)

As brown oil (1.39 g from 2.00 g); $R_f = 0.47$ (Ethylacetate: Hexanes, 3:17).

IR (Neat): 1716 (CO₂CH₃), 3425 (NH) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): $\delta = 0.92$ (t, 3H, $J = 7.3$ Hz, CH₃), 1.46-1.60 (m, 2H, CH₂), 2.43-2.64 (m, 2H, CH₂), 3.66 (s, 3H, OCH₃), 5.21 (s, 1H, CH), 5.89 (s, 1H, =CH₂), 6.40 (s, 1H, =CH₂), 7.34-7.42 (m, 1H, ArH), 7.55 (dt, 1H, $J_1 = 7.9$ Hz, $J_2 = 1.2$ Hz, ArH), 7.65 (dd, 1H, $J_1 = 7.8$ Hz, $J_2 = 1.5$ Hz, ArH), 7.80 (dd, 1H, $J_1 = 8.0$ Hz, $J_2 = 1.2$ Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): $\delta = 12.0, 23.7, 50.5, 52.3, 57.7, 124.6, 126.7, 128.4, 129.8, 133.0, 136.7, 141.3, 150.2, 166.8$.

MS (ES+) $m/z = 279.1$ (M⁺+1).

Anal. Calcd. for C₁₄H₁₈N₂O₄ (278.13): C, 60.42; H, 6.52; N, 10.07. Found: C, 60.63; H, 6.85; N, 9.89.

Methyl 2-[(sec-butylamino)(2-nitrophenyl)methyl]acrylate (11e)

Diastereomeric ratio 1:1; brown oil (1.65 g from 2.10 g); $R_f = 0.68$ (Ethylacetate: Hexanes, 3:17).

IR (Neat): 1718 (CO₂CH₃), 3426 (NH) cm⁻¹.

¹H NMR (CDCl₃, 300 MHz): $\delta = 0.82$ -0.92 (m, 6H, 2 x CH₃), 1.01 (d, 3H, $J = 6.3$ Hz, CH₃), 1.08 (d, 3H, $J = 6.3$ Hz, CH₃), 1.25-1.44 (m, 4H, 2 x CH₂), 2.50-2.59 (m, 2H, 2 x CH), 3.67 (s, 3H, OCH₃), 3.68 (s, 3H, OCH₃), 5.39 (s, 1H, CH), 5.43 (s, 1H, CH), 5.79 (s, 1H, =CH₂), 5.82 (d, 1H, $J = 1.0$ Hz, =CH₂), 6.33 (s, 1H, =CH₂), 6.36 (s, 1H, =CH₂), 7.34-7.40 (m, 2H, 2 x ArH), 7.52-7.59 (m, 2H, 2 x ArH), 7.69-7.73 (m, 2H, 2 x ArH), 7.75-7.80 (m, 2H, 2 x ArH).

¹³C NMR (CDCl₃, 50 MHz): $\delta = 10.6, 10.7, 20.3, 20.5, 29.7, 30.3, 52.3, 52.6, 52.9, 54.5, 54.7, 54.9, 124.5, 125.2, 126.6, 126.8, 128.3, 129.9, 130.1, 131.6, 132.2, 132.6, 132.9, 133.8, 137.2, 141.7, 142.4, 148.0, 166.9, 168.2$.

MS (ES+) $m/z = 293.1$ (M⁺+1).

Anal. Calcd. for C₁₅H₂₀N₂O₄ (292.14): C, 61.63; H, 6.90; N, 9.58. Found: C, 61.41; H, 7.18; N, 9.36.

Methyl 2-[(2-methoxy-2-oxoethyl)amino](2-nitrophenyl)methyl]acrylate (11f)

As brown oil (1.50 g from 2.00 g); $R_f = 0.32$ (Ethylacetate: Hexanes, 1:4).

IR (Neat): 1726 (CO₂CH₃), 3430 (NH) cm⁻¹.

¹H NMR (CDCl₃, 300 MHz): $\delta = 3.35$ -3.48 (m, 2H, CH₂), 3.64 (s, 3H, OCH₃), 3.74 (s, 3H, OCH₃), 5.31 (s, 1H, CH), 5.99 (s, 1H, =CH₂), 6.42 (s, 1H, =CH₂), 7.37-7.42 (m, 1H, ArH), 7.56 (t, 1H, $J = 7.6$ Hz, ArH), 7.65 (d, 1H, $J = 7.9$ Hz, ArH), 7.79 (d, 1H, $J = 8.0$ Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): $\delta = 49.3, 52.3, 52.4, 56.3, 124.6, 126.4, 128.8, 130.0, 133.2, 135.6, 141.3, 150.5, 166.3, 172.7$.

MS (ES+) $m/z = 309.1$ (M⁺+1).

Anal. Calcd. for C₁₄H₁₆N₂O₆ (308.10): C, 54.54; H, 5.23; N, 9.09. Found: C, 54.31; H, 5.58; N, 9.23.

Methyl 2-[[2-(2-dimethoxyethyl)amino](2-nitrophenyl)methyl]acrylate (11g)

As brown oil (1.65 g from 2.00 g); $R_f = 0.30$ (Ethylacetate: Hexanes, 1:4).

IR (Neat): 1717 (CO₂CH₃), 3449 (NH) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): $\delta = 2.64$ -2.84 (m, 2H, CH₂), 3.35 (s, 3H, OCH₃), 3.37 (s, 3H, OCH₃), 3.66 (s, 3H, OCH₃), 4.50 (t, 1H, $J = 5.4$ Hz, CH), 5.26 (s, 1H, CH), 5.93 (t, 1H, $J = 1.2$ Hz, =CH₂), 6.41 (t, 1H, $J = 0.8$ Hz, =CH₂), 7.34-7.43 (m, 1H, ArH), 7.51-7.66 (m, 2H, ArH), 7.81 (dd, 1H, $J_1 = 8.0$ Hz, $J_2 = 1.4$ Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): $\delta = 49.6$, 52.4, 54.0, 54.3, 57.2, 103.9, 124.7, 126.8, 128.6, 129.8, 133.1, 136.3, 141.1, 150.3, 166.7.

MS (ES+) $m/z = 325.0$ (M⁺+1).

Anal. Calcd. for C₁₅H₂₀N₂O₆ (324.13): C, 55.55; H, 6.22; N, 8.64. Found: C, 55.60; H, 5.97; N, 8.89.

Methyl 2-[(benzylamino)(4,5-dimethoxy-2-nitrophenyl)methyl]acrylate (12a)

As yellow oil (1.40 g from 1.50 g); $R_f = 0.58$ (Ethylacetate: Hexanes, 3:7).

IR (Neat): 1716 (CO₂CH₃), 3429 (NH) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): $\delta = 3.68$ -3.80 (m, 5H, CH₂ and OCH₃), 3.94 (s, 6H, 2 x OCH₃), 5.48 (s, 1H, CH), 5.79 (t, 1H, $J = 1.1$ Hz, =CH₂), 6.36 (d, 1H, $J = 0.5$ Hz, =CH₂), 7.29-7.35 (m, 6H, ArH), 7.54 (s, 1H, ArH).

¹³C NMR (CDCl₃, 50 MHz): $\delta = 30.1$, 52.5, 53.1, 56.8, 57.9, 108.5, 111.3, 126.6, 127.6, 128.1, 128.6, 128.8, 128.9, 131.5, 140.3, 141.8, 142.2, 148.2, 153.4, 167.0.

MS (ES+) $m/z = 387.1$ (M⁺+1).

Anal. Calcd. for C₂₀H₂₂N₂O₆ (386.15): C, 62.17; H, 5.74; N, 7.25. Found: C, 62.52; H, 5.44; N, 7.45.

Methyl 2-[(4,5-dimethoxy-2-nitrophenyl)[(2-methoxy-2-oxoethyl)amino]methyl]acrylate (12f)

As yellow oil (1.00 g from 1.50 g); $R_f = 0.50$ (Ethylacetate: Hexanes, 3:7).

IR (Neat): 1736 (CO₂CH₃), 3445 (NH) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): $\delta = 3.33$ -3.52 (m, 2H, CH₂), 3.69 (s, 3H, OCH₃), 3.74 (s, 3H, OCH₃), 3.94 (s, 6H, 2 x OCH₃), 5.44 (s, 1H, CH), 5.88 (t, 1H, $J = 1.1$ Hz, =CH₂), 6.37 (s, 1H, =CH₂), 7.17 (s, 1H, ArH), 7.47 (s, 1H, ArH).

¹³C NMR (CDCl₃, 50 MHz): $\delta = 49.4$, 52.3, 52.4, 56.6, 56.7, 56.8, 108.2, 111.0, 126.1, 130.3, 141.8, 142.5, 148.3, 153.3, 166.5, 172.7.

MS (ES+) $m/z = 369.0$ (M⁺+1).

Anal. Calcd. for C₁₆H₂₀N₂O₈ (368.12): C, 52.17; H, 5.47; N, 7.61. Found: C, 52.07; H, 5.24; N, 7.85.

General Procedure for the preparation of 13a-g; 14a-b,f; 15a-d,f,g; 16a,f as exemplified for 13a.

To a stirred solution of compound **9a** (1.50 g, 5.12 mmol) in MeOH (20 mL), CNBr (0.65 g, 6.14 mmol) and NaHCO₃ (0.52 g, 6.14 mmol) was added and the reaction was allowed to continue at room temperature for 48 h. After completion of the reaction, MeOH was re-

moved and the residue was diluted with EtOAc (40 mL) and water (40 mL). The aqueous layer was separated and extracted with EtOAc (4 x 20 mL). The combined organic layer was dried over Na₂SO₄ and concentrated to obtain the crude product, which was purified by column chromatography on silica-gel. Column was eluted with EtOAc: Hexanes (1:3, v/v) to yield the pure compound **13a** as yellow oil (1.32 g, 81%).

Benzyl[2-cyano-1-(2-nitrophenyl)allyl]cyanamide (13a)

$R_f = 0.43$ (Ethylacetate: Hexanes, 1:4).

IR (Neat): 2200 (CN) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): $\delta = 4.23$ (d, 1H, $J = 14.0$ Hz, CH₂), 4.41 (d, 1H, $J = 13.7$ Hz, CH₂), 5.59 (s, 1H, CH), 5.91 (s, 1H, =CH₂), 6.27 (s, 1H, =CH₂), 7.27-7.38 (m, 5H, ArH), 7.63 (t, 1H, $J = 7.5$ Hz, ArH), 7.79 (t, 1H, $J = 7.5$ Hz, ArH), 7.85 (d, 1H, $J = 7.5$ Hz, ArH), 8.09 (d, 1H, $J = 8.1$ Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): $\delta = 34.4$, 62.1, 114.3, 116.8, 120.9, 126.5, 129.5, 129.7, 131.3, 134.75, 134.78, 148.8.

MS (ES+) $m/z = 319.1$ (M⁺+1).

Anal. Calcd. for C₁₈H₁₄N₄O₂ (318.11): C, 67.91; H, 4.43; N, 17.60. Found: C, 68.28; H, 4.78; N, 17.89.

2-Cyano-1-(2-nitrophenyl)allyl(cyclohexyl)cyanamide (13b)

As a white solid (0.70 g from 0.80 g); mp 107-109 °C; $R_f = 0.31$ (Ethylacetate: Hexanes, 1:4).

IR (KBr): 2211 (CN) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): $\delta = 1.18$ -1.31 (m, 4H, 2 x CH₂), 1.50-1.67 (m, 6H, 3 x CH₂), 2.08-2.98 (m, 1H, CH), 5.74 (s, 1H, CH), 5.85 (s, 1H, =CH₂), 6.27 (s, 1H, =CH₂), 7.62-7.67 (m, 1H, ArH), 7.77-7.86 (m, 2H, ArH), 8.13 (d, 1H, $J = 8.1$ Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): $\delta = 25.3$, 25.48, 25.51, 31.7, 31.8, 60.5, 61.6, 113.8, 116.8, 121.6, 126.4, 129.9, 130.5, 131.1, 134.8.

MS (ES+) $m/z = 311.1$ (M⁺+1).

Anal. Calcd. for C₁₇H₁₈N₄O₂ (310.14): C, 65.79; H, 5.85; N, 18.05. Found: C, 65.97; H, 6.11; N, 17.71.

2-Cyano-1-(2-nitrophenyl)allyl(cyclopropyl)cyanamide (13c)

As yellow oil (1.21 g from 1.50 g); $R_f = 0.31$ (Ethylacetate: Hexanes, 3:7).

IR (Neat): 2221 (CN) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): $\delta = 0.85$ -0.93 (m, 2H, CH₂), 0.95-1.00 (m, 2H, CH₂), 2.78-2.83 (m, 1H, CH), 5.73 (t, 1H, $J = 1.2$ Hz, =CH), 5.87-5.88 (m, 1H, =CH₂), 6.30 (t, 1H, $J = 0.7$ Hz, =CH₂), 7.66-7.70 (m, 1H, ArH), 7.80 (d, 1H, $J = 1.2$ Hz, ArH), 7.83 (d, 1H, $J = 0.9$ Hz, ArH), 8.13-8.17 (m, 1H, ArH).

¹³C NMR (CDCl₃, 50 MHz): $\delta = 8.4$, 8.8, 34.4, 62.1, 114.3, 116.8, 120.9, 126.5, 129.5, 129.7, 131.3, 134.8, 148.8.

MS (ES+) m/z = 269.1 (M^+ +1).

Anal. Calcd. for $C_{14}H_{12}N_4O_2$ (268.10): C, 62.68; H, 4.51; N, 20.88. Found: C, 62.87; H, 4.69; N, 20.52.

2-Cyano-1-(2-nitrophenyl)allyl(propyl)cyanamide (13d)

As brown oil (1.04 g from 1.23 g); R_f = 0.30 (Ethylacetate: Hexanes, 1:4).

IR (Neat): 2215 (CN) cm^{-1} .

1H NMR ($CDCl_3$, 200 MHz): δ = 1.01 (t, 3H, J = 7.4 Hz, CH_3), 1.69-1.87 (m, 2H, CH_2), 3.01-3.23 (m, 2H, CH_2), 5.64 (s, 1H, CH), 5.99 (t, 1H, J = 0.6 Hz, = CH_2), 6.32 (s, 1H, = CH_2), 7.61-7.72 (m, 1H, ArH), 7.77-7.82 (m, 2H, ArH), 8.15 (d, 1H, J = 7.9 Hz, ArH).

^{13}C NMR ($CDCl_3$, 50 MHz): δ = 11.4, 21.6, 54.7, 61.9, 114.8, 116.7, 120.9, 126.6, 129.6, 129.8, 131.3, 134.8, 135.0.

MS (ES+) m/z = 271.2 (M^+ +1).

Anal. Calcd. for $C_{14}H_{14}N_4O_2$ (270.11): C, 62.21; H, 5.22; N, 20.73. Found: C, 62.54; H, 4.98; N, 20.86.

sec-Butyl[2-cyano-1-(2-nitrophenyl)allyl]cyanamide (13e)

Diastereomeric ratio (1:1); brown oil; R_f = 0.38 (Ethylacetate: Hexanes, 3:17).

IR (Neat): 2212 (CN) cm^{-1} .

1H NMR ($CDCl_3$, 200 MHz): δ = 0.91 (t, 3H, J = 7.4 Hz, CH_3), 1.04 (t, 3H, J = 7.4 Hz, CH_3), 1.27 (d, 3H, J = 6.6 Hz, CH_3), 1.35 (d, 3H, J = 6.5 Hz, CH_3), 1.58-1.98 (m, 4H, 2 x CH_2), 3.00-3.11 (m, 2H, 2 x CH), 5.70-5.71 (m, 2H, 2 x CH), 5.86-5.89 (m, 2H, 2 x = CH_2), 6.27-6.28 (m, 2H, 2 x = CH_2), 7.64-7.72 (m, 2H, 2 x ArH), 7.80-7.90 (m, 4H, 2 x 2ArH), 8.12 (dd, 2H, J_1 = 8.1 Hz, J_2 = 1.2 Hz, 2 x ArH).

^{13}C NMR ($CDCl_3$, 50 MHz): δ = 10.5, 10.7, 18.2, 18.4, 28.0, 28.2, 59.8, 60.3, 60.5, 113.3, 116.4, 121.0, 121.2, 125.9, 129.4, 129.6, 130.1, 130.3, 130.7, 134.31, 134.35, 134.8, 135.0, 148.1.

MS (ES+) m/z = 285.0 (M^+ +1).

Anal. Calcd. for $C_{15}H_{16}N_4O_2$ (284.13): C, 63.37; H, 5.67; N, 19.71. Found: C, 63.68; H, 5.48; N, 19.98.

Methyl 2-{cyano[2-cyano-1-(2-nitrophenyl)allyl]amino}acetate (13f)

As a white solid (1.22 g from 1.60 g); mp 105-106 °C; R_f = 0.23 (Ethylacetate: Hexanes, 1:4).

IR (KBr): 1752 (CO_2CH_3), 2224 (CN) cm^{-1} .

1H NMR ($CDCl_3$, 300 MHz): δ = 3.81 (s, 3H, OCH_3), 3.88-4.08 (m, 2H, CH_2), 5.88 (s, 1H, CH), 6.31 (s, 1H, = CH_2), 6.39 (s, 1H, = CH_2), 7.67 (t, 1H, J = 7.5 Hz, ArH), 7.81-7.89 (m, 2H, ArH), 8.14 (d, 1H, J = 8.1 Hz, ArH).

^{13}C NMR ($CDCl_3$, 50 MHz): δ = 53.0, 53.4, 61.9, 116.2, 120.2, 126.5, 129.0, 130.0, 131.5, 134.8, 136.6, 167.8.

MS (ES+) m/z = 301.2 (M^+ +1).

Anal. Calcd. for $C_{14}H_{12}N_4O_4$ (300.09): C, 56.00; H, 4.03; N, 18.66. Found: C, 56.24; H, 3.87; N, 18.89.

Benzyl[2-cyano-1-(4,5-dimethoxy-2-nitrophenyl)allyl]cyanamide (14a)

As a yellow solid (1.03 g from 1.20 g); mp 120-121 °C; R_f = 0.34 (Ethylacetate: Hexanes, 2:3).

IR (KBr): 2208 (CN) cm^{-1} .

1H NMR ($CDCl_3$, 200 MHz): δ = 3.98 (s, 3H, OCH_3), 3.99 (s, 3H, OCH_3), 4.22-4.40 (m, 2H, CH_2), 5.74 (t, 1H, J = 1.1 Hz, CH), 5.96 (d, 1H, J = 1.1 Hz, = CH_2), 6.25 (s, 1H, = CH_2), 7.21 (s, 1H, ArH), 7.24-7.29 (m, 2H, ArH), 7.35-7.39 (m, 3H, ArH), 7.66 (s, 1H, ArH).

^{13}C NMR ($CDCl_3$, 50 MHz): δ = 56.85, 56.94, 57.1, 60.5, 109.1, 110.7, 115.4, 116.6, 120.9, 123.9, 129.3, 129.5, 129.6, 133.4, 135.5, 141.3, 149.8, 154.1.

MS (ES+) m/z = 379.1 (M^+ +1).

Anal. Calcd. for $C_{20}H_{18}N_4O_4$ (378.13): C, 63.48; H, 4.79; N, 14.81. Found: C, 63.79; H, 4.58; N, 15.01.

2-Cyano-1-(4,5-dimethoxy-2-nitrophenyl)allyl(cyclohexyl)cyanamide (14b)

As a white solid (0.60 g from 0.80 g); mp 84-85 °C; R_f = 0.28 (Ethylacetate: Hexanes, 3:7).

IR (KBr): 2208 (CN) cm^{-1} .

1H NMR ($CDCl_3$, 200 MHz): δ = 1.22-1.37 (m, 4H, 2 x CH_2), 1.44-1.67 (m, 4H, 2 x CH_2), 1.85-2.07 (m, 2H, CH_2), 2.82-2.97 (m, 1H, CH), 3.99 (s, 3H, OCH_3), 4.03 (s, 3H, OCH_3), 5.87 (s, 1H, CH), 5.89 (s, 1H, = CH_2), 6.24 (s, 1H, = CH_2), 7.26 (s, 1H, ArH), 7.72 (s, 1H, ArH).

^{13}C NMR ($CDCl_3$, 50 MHz): δ = 25.3, 25.50, 25.54, 31.7, 31.8, 57.0, 57.2, 60.5, 61.4, 109.3, 110.9, 114.2, 117.0, 121.9, 125.3, 134.6, 140.9, 149.9, 154.2.

MS (ES+) m/z = 371.0 (M^+ +1).

Anal. Calcd. for $C_{19}H_{22}N_4O_4$ (370.16): C, 61.61; H, 5.99; N, 15.13. Found: C, 61.93; H, 5.87; N, 15.38.

Methyl 2-{cyano[2-cyano-1-(4,5-dimethoxy-2-nitrophenyl)allyl]amino}acetate (14f)

As brown oil (0.43 g from 0.50 g); R_f = 0.32 (Ethylacetate: Hexanes 3:7).

IR (Neat): 1753 (CO_2Me), 2224 (CN) cm^{-1} .

1H NMR ($CDCl_3$, 200 MHz): δ = 3.79 (s, 3H, OCH_3), 3.98 (s, 2H, CH_2), 4.00 (s, 3H, OCH_3), 4.05 (s, 3H, OCH_3), 6.01 (s, 1H, =CH), 6.32 (d, 1H, J = 1.2 Hz, = CH_2), 6.35 (s, 1H, = CH_2), 7.29 (s, 1H, ArH), 7.70 (s, 1H, ArH).

^{13}C NMR ($CDCl_3$, 50 MHz): δ = 52.8, 53.3, 57.0, 57.3, 62.1, 109.3, 111.1, 114.6, 116.5, 120.4, 123.4, 136.6, 141.4, 150.1, 154.3, 168.0.

MS (ES+) m/z = 360.1 (M^+ +1).

Anal. Calcd. for $C_{16}H_{16}N_4O_6$ (360.11): C, 53.33; H, 4.48; N, 15.55. Found: C, 53.51; H, 4.78; N, 15.61.

Methyl 2-[[benzyl(cyano)amino](2-nitrophenyl)methyl]acrylate (15a)

As a white solid (0.91 g from 0.90 g); mp 78-80 °C; R_f = 0.38 (Ethylacetate: Hexanes, 3:7).

IR (KBr): 1724 (CO₂CH₃), 2212 (CN) cm⁻¹.

¹H NMR (CDCl₃, 300 MHz): δ= 3.78 (s, 3H, OCH₃), 4.31-4.42 (m, 2H, CH₂), 5.56 (s, 1H, CH), 5.96 (s, 1H, =CH₂), 6.55 (s, 1H, =CH₂), 7.31 (s, 5H, ArH), 7.52 (t, 1H, *J*= 7.6 Hz, ArH), 7.68-7.75 (m, 2H, ArH), 8.03 (d, 1H, *J*= 8.1 Hz, ArH).

¹³C NMR (CDCl₃, 75 MHz): δ= 52.9, 57.7, 59.3, 116.0, 126.0, 129.2, 129.3, 129.5, 129.7, 129.86, 129.94, 132.6, 133.9, 134.0, 137.8, 148.3, 165.5.

MS (ES+) *m/z*= 351.9 (M⁺+1).

Anal. Calcd. for C₁₉H₁₇N₃O₄ (351.12): C, 64.95; H, 4.88; N, 11.96. Found: C, 65.24; H, 4.68; N, 12.25.

Methyl 2-[[cyano(cyclohexyl)amino](2-nitrophenyl)methyl]acrylate (15b)

As yellow oil (0.80 g from 0.90 g); *R*_f= 0.50 (Ethylacetate: Hexanes, 1:4).

IR (Neat): 1722 (CO₂CH₃), 2207 (CN) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): δ= 1.47-1.65 (m, 6H, 3 x CH₂), 1.79-1.91 (m, 4H, 2 x CH₂), 2.82-2.98 (m, 1H, CH), 3.82 (s, 3H, OCH₃), 5.51 (d, 1H, *J*= 1.1 Hz, CH), 6.04 (s, 1H, =CH₂), 6.53 (s, 1H, =CH₂), 7.51-7.59 (m, 1H, ArH), 7.69-7.83 (m, 2H, ArH), 8.09 (dd, 1H, *J*₁= 8.1 Hz, *J*₂= 1.4 Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): δ= 25.4, 25.5, 25.6, 31.6, 32.2, 53.0, 58.9, 61.6, 115.0, 126.2, 129.6, 129.9, 130.0, 133.7, 134.2, 138.5, 148.3, 165.7.

MS (ES+) *m/z*= 344.1 (M⁺+1).

Anal. Calcd. for C₁₈H₂₁N₃O₄ (343.15): C, 62.96; H, 6.16; N, 12.24. Found: C, 62.67; H, 6.47; N, 12.50.

Methyl 2-[[cyano(cyclopropyl)amino](2-nitrophenyl)methyl]acrylate (15c)

As a yellow solid (1.05 g from 1.0 g); mp 67-70 °C; *R*_f= 0.35 (Ethylacetate: Hexanes, 1:4).

IR (KBr) 1723 (CO₂CH₃), 2215 (CN) cm⁻¹.

¹H NMR (CDCl₃, 300 MHz): δ= 0.78-0.84 (m, 2H, CH₂), 0.89-0.93 (m, 1H, CH₂), 1.05-1.09 (m, 1H, CH₂), 2.84-2.87 (m, 1H, CH), 3.81 (s, 3H, OCH₃), 5.52 (s, 1H, CH), 6.03 (s, 1H, =CH₂), 6.52 (s, 1H, =CH₂), 7.56-7.59 (m, 1H, ArH), 7.75 (d, 2H, *J*= 3.0 Hz, ArH), 8.10 (d, 1H, *J*= 8.2 Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): δ= 8.2, 8.3, 34.3, 53.0, 60.3, 115.5, 126.3, 129.2, 129.6, 130.0, 132.8, 134.3, 137.9, 148.4, 165.6.

MS (ES+) *m/z*= 302.1 (M⁺+1).

Anal. Calcd. for C₁₅H₁₅N₃O₄ (301.11): C, 59.79; H, 5.02; N, 13.95. Found: C, 59.48; H, 4.73; N, 14.18.

Methyl 2-[[cyano(propyl)amino](2-nitrophenyl)methyl]acrylate (15d)

As a yellow solid (0.85 g from 0.90 g); mp 80-82 °C; *R*_f= 0.28 (Ethylacetate: Hexane, 2:3).

IR (KBr): 1718 (CO₂CH₃), 2207 (CN) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): δ= 0.98 (t, 3H, *J*= 7.4 Hz, CH₃), 1.67-1.82 (m, 2H, CH₂), 3.16 (dt, 2H, *J*₁= 7.5 Hz,

*J*₂= 1.8 Hz, CH₂), 3.81 (s, 3H, OCH₃), 5.59 (d, 1H, *J*= 1.1 Hz, CH), 5.93 (s, 1H, =CH₂), 6.56 (s, 1H, =CH₂), 7.52-7.61 (m, 1H, ArH), 7.74 (dd, 2H, *J*₁= 5.1 Hz, *J*₂= 1.2 Hz, ArH), 8.10 (d, 1H, *J*= 8.0 Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): δ= 11.5, 21.6, 53.0, 55.1, 60.0, 116.0, 126.3, 129.4, 129.5, 130.1, 132.7, 134.3, 138.0, 148.5, 165.6.

MS (ES+) *m/z*= 303.6 (M⁺+1).

Anal. Calcd. for C₁₅H₁₇N₃O₄ (303.12): C, 59.40; H, 5.65; N, 13.85. Found: C, 59.76; H, 5.98; N, 13.61.

Methyl 2-[[sec-butyl(cyano)amino](2-nitrophenyl)methyl]acrylate (15e)

Diastereomeric ratio(1:1); white solid (1.30 g from 1.30 g); mp 74-75 °C; *R*_f= 0.23 (Ethylacetate: Hexanes, 3:17).

IR (KBr): 1722 (CO₂CH₃), 2206 (CN) cm⁻¹.

¹H NMR (CDCl₃, 300 MHz): δ= 0.90 (t, 3H, *J*= 7.4 Hz, CH₃), 0.98 (t, 3H, *J*= 7.4 Hz, CH₃), 1.27 (d, 3H, *J*= 6.6 Hz, CH₃), 1.35 (d, 3H, *J*= 6.5 Hz, CH₃), 1.55-1.88 (m, 4H, 2 x CH₂), 3.07-3.12 (m, 2H, 2 x CH), 3.83 (s, 6H, 3 x OCH₃), 5.54-5.55 (m, 2H, CH), 6.01 (s, 2H, 2 x =CH₂), 6.55 (d, 2H, *J*= 2.5 Hz, =CH₂), 7.56 (t, 2H, *J*= 7.7 Hz, ArH), 7.75 (t, 2H, *J*= 7.6 Hz, ArH), 7.82-7.86 (m, 2H, ArH), 8.08 (d, 2H, *J*= 8.1 Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): δ= 10.8, 11.1, 18.4, 18.9, 28.2, 28.8, 53.0, 59.0, 59.2, 60.2, 60.7, 114.8, 126.1, 126.2, 129.6, 129.8, 129.96, 130.02, 133.6, 133.7, 134.1, 134.2, 138.35, 138.44, 165.6, 165.7.

MS (ES+) *m/z*= 318.0 (M⁺+1)

Anal. Calcd. for C₁₆H₁₉N₃O₄ (317.14): C, 60.56; H, 6.03; N, 13.24. Found: C, 60.84; H, 5.74; N, 13.55.

Methyl 2-[[cyano(2-methoxy-2-oxoethyl)amino](2-nitrophenyl)methyl]acrylate (15f)

As green oil (1.00 g from 1.30 g); *R*_f= 0.32 (Ethylacetate: Hexanes, 2:3).

IR (Neat): 1726 (CO₂CH₃), 2220 (CN) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): δ= 3.73 (s, 3H, OCH₃), 3.80 (s, 3H, OCH₃), 4.00-4.22 (m, 2H, CH₂), 5.67 (d, 1H, *J*= 0.9 Hz, CH), 5.99 (s, 1H, =CH₂), 6.54 (s, 1H, =CH₂), 7.52-7.61 (m, 1H, ArH), 7.76 (dt, 1H, *J*₁= 7.6 Hz, *J*₂= 1.3 Hz, ArH), 7.92 (d, 1H, *J*= 6.9 Hz, ArH), 8.08 (dd, 1H, *J*₁= 8.1 Hz, *J*₂= 1.2 Hz, ArH).

¹³C NMR (CDCl₃, 50 MHz): δ= 53.0, 54.5, 61.5, 115.3, 126.1, 129.4, 129.8, 130.2, 132.1, 134.3, 137.8, 148.2, 165.7, 168.4.

MS (ES+) *m/z*= 334.1 (M⁺+1).

Anal. Calcd. for C₁₅H₁₅N₃O₆ (333.10): C, 54.05; H, 4.54; N, 12.61. Found: C, 54.28; H, 4.89; N, 12.32.

Methyl 2-[[cyano(dimethoxymethyl)amino](2-nitrophenyl)methyl]acrylate (15g)

As a white solid (0.90 g from 1.00 g); mp 62-65 °C; *R*_f= 0.20 (Ethylacetate: Hexanes, 1:4).

IR (KBr): 1721 (CO₂CH₃), 2214 (CN) cm⁻¹.

^1H NMR (CDCl_3 , 300 MHz): δ = 3.28 (s, 3H, OCH_3), 3.32 (d, 1H, J = 5.0 Hz, CH_2), 3.36-3.39 (m, 4H, OCH_3 and 1 of CH_2), 3.82 (s, 3H, OCH_3), 4.54 (t, 1H, J = 5.2 Hz, CH), 5.56 (d, 1H, J = 1.1 Hz, CH), 5.99 (s, 1H, $=\text{CH}_2$), 6.54 (s, 1H, $=\text{CH}_2$), 7.52-7.58 (m, 1H, ArH), 7.74 (dt, 1H, J_1 = 8.0 Hz, J_2 = 1.2 Hz, ArH), 7.80-7.83 (m, 1H, ArH), 8.08 (dd, 1H, J_1 = 8.2 Hz, J_2 = 1.2 Hz, ArH).

^{13}C NMR (CDCl_3 , 50 MHz): δ = 53.0, 54.6, 54.8, 54.9, 60.6, 102.4, 116.2, 126.1, 129.5, 129.7, 129.9, 133.0, 134.2, 138.0, 148.4, 165.7.

MS (ES+) m/z = 350.3 (M^+ +1).

Anal. Calcd. for $\text{C}_{16}\text{H}_{19}\text{N}_3\text{O}_6$ (349.13): C, 54.89; H, 5.48; N, 12.03. Found: C, 54.57; H, 5.66; N, 12.33.

Methyl 2-[[benzyl(cyano)amino](4,5-dimethoxy-2-nitrophenyl)methyl]acrylate (16a)

As a yellow solid (0.80 g from 1.00 g); mp 110-111 °C; R_f = 0.31 (Ethylacetate: Hexanes, 3:7).

IR (KBr): 1718 (CO_2CH_3), 2211 (CN) cm^{-1} .

^1H NMR (CDCl_3 , 200 MHz): δ = 3.81 (s, 3H, OCH_3), 3.91 (s, 3H, OCH_3), 3.95 (s, 3H, OCH_3), 4.31-4.46 (m, 2H, CH_2), 5.53 (d, 1H, J = 1.1 Hz, CH), 6.08 (s, 1H, $=\text{CH}_2$), 6.50 (s, 1H, $=\text{CH}_2$), 7.06 (s, 1H, ArH), 7.30-7.35 (m, 5H, ArH), 7.66 (s, 1H, ArH).

^{13}C NMR (CDCl_3 , 50 MHz): δ = 53.0, 56.9, 57.0, 58.0, 60.1, 109.3, 110.8, 116.4, 127.6, 129.3, 129.37, 129.44, 129.7, 134.4, 138.3, 140.5, 149.0, 153.8, 165.8.

MS (ES+) m/z = 412.0 (M^+ +1).

Anal. Calcd. for $\text{C}_{21}\text{H}_{21}\text{N}_3\text{O}_6$ (411.14): C, 61.31; H, 5.14; N, 10.21. Found: C, 61.42; H, 5.38; N, 10.19.

Methyl 2-[[cyano(2-methoxy-2-oxoethyl)amino](4,5-dimethoxy-2-nitrophenyl)methyl]acrylate (16f)

As a yellow solid (0.43 g from 0.70 g); mp 128-129 °C; R_f = 0.79 (Ethylacetate: Hexanes, 1:4).

IR (KBr): 1725 (CO_2CH_3), 2219 (CN) cm^{-1} .

^1H NMR (CDCl_3 , 200 MHz): δ = 3.74 (s, 3H, OCH_3), 3.82 (s, 3H, OCH_3), 3.97 (s, 3H, OCH_3), 4.08-4.23 (m, 5H, OCH_3 and CH_2), 5.61 (d, 1H, J = 0.9 Hz, $=\text{CH}$), 6.06 (s, 1H, $=\text{CH}_2$), 6.48 (s, 1H, $=\text{CH}_2$), 7.50 (s, 1H, ArH), 7.71 (s, 1H, ArH).

^{13}C NMR (CDCl_3 , 50 MHz): δ = 53.1, 54.8, 56.9, 57.2, 62.4, 109.3, 111.4, 115.5, 127.3, 128.9, 138.3, 140.1, 149.0, 154.0, 168.6.

MS (ES+) m/z = 394.1 (M^+ +1).

Anal. Calcd. for $\text{C}_{17}\text{H}_{19}\text{N}_3\text{O}_8$ (393.12): C, 51.91; H, 4.87; N, 10.68. Found: C, 52.09; H, 4.98; N, 10.45.

General Procedure for the preparation of 17a-e,g; 18a-b; 19b-d,g; 20a; 21-24 as exemplified for 17a.

To a solution of compound **13a** (0.50 g, 1.57 mmol) in AcOH (10 mL), Fe powder (0.44 g, 7.86 mmol) was added and the mixture was heated at 95 °C for 20 min. Then the reaction mixture was cooled to room temperature and poured in ice water followed by neutralization with aqueous NaHCO_3 . The precipitated solid was separated by filtration through a celite bed which was repeat-

edly washed with EtOAc. The organic layers were pooled, washed with brine, dried (Na_2SO_4) and concentrated to obtain a residue. The residue was crystallized using EtOAc/ Hexanes mixture to furnish pure product **0.24 g** (53%) of **17a** as a brown solid.

2-(2-Amino-3-benzyl-3,4-dihydroquinazolin-4-yl)acrylonitrile (17a)

Mp 120-121 °C; R_f = 0.21 (Methanol: Chloroform, 1:4).

IR (KBr): 1657 (C=N), 2225 (CN), 3424 (NH_2) cm^{-1} .

^1H NMR (DMSO-d_6 , 300 MHz): δ = 4.51-4.60 (m, 2H, CH_2), 5.69 (s, 1H, CH), 6.23 (s, 1H, $=\text{CH}_2$), 6.28 (s, 1H, $=\text{CH}_2$), 7.30-7.38 (m, 9H, ArH).

^{13}C NMR (DMSO-d_6 , 75 MHz): δ = 51.1, 61.0, 116.0, 116.8, 117.7, 121.3, 125.2, 127.5, 127.8, 128.6, 129.3, 130.7, 132.6, 134.7, 135.1, 152.1.

MS (ES+) m/z = 289.3 (M^+ +1).

Anal. Calcd. for $\text{C}_{18}\text{H}_{16}\text{N}_4$ (288.14): C, 74.98; H, 5.59; N, 19.43. Found: C, 75.15; H, 5.77; N, 19.41.

2-(2-Amino-3-cyclohexyl-3,4-dihydroquinazolin-4-yl)acrylonitrile (17b)

As a white solid (0.30 g from 0.54 g); mp 129-130 °C; R_f = 0.23 (Methanol: Chloroform, 1:4)

IR (KBr): 1645 (C=N), 2225 (CN), 3367 (NH_2) cm^{-1} .

^1H NMR (DMSO-d_6 , 300 MHz): δ = 1.09-1.42 (m, 4H, 2 x CH_2), 1.49-1.61 (m, 3H, CH_2), 1.70-1.76 (m, 3H, CH_2), 4.01-4.08 (m, 1H, CH), 5.89 (s, 1H, CH), 6.16 (s, 1H, $=\text{CH}_2$), 6.20 (s, 1H, $=\text{CH}_2$), 7.03 (d, 1H, J = 7.8 Hz, ArH), 7.15 (t, 1H, J = 7.3 Hz, ArH), 7.31-7.39 (m, 2H, ArH).

^{13}C NMR (DMSO-d_6 , 50 MHz): δ = 25.3, 26.0, 26.3, 30.8, 31.2, 54.7, 58.2, 116.6, 117.7, 120.5, 124.2, 124.6, 127.1, 130.4, 148.3, 153.9.

MS (ES+) m/z = 281.3 (M^+ +1).

Anal. Calcd. for $\text{C}_{17}\text{H}_{20}\text{N}_4$ (280.17): C, 72.83; H, 7.19; N, 19.98. Found: C, 72.56; H, 7.34; N, 19.76.

2-(2-Amino-3-cyclopropyl-3,4-dihydroquinazolin-4-yl)acrylonitrile (17c)

As a white solid (0.60 g from 1.00 g); mp 137-139 °C; R_f = 0.21 (Methanol:Chloroform 1:4).

IR (KBr): 1680 (C=N), 2225 (CN), 3424 (NH_2) cm^{-1} .

^1H NMR (DMSO-d_6 , 300 MHz): δ = 0.70-0.85 (m, 3H, CH_2), 1.02-1.04 (m, 1H, CH_2), 2.58 (s, 1H, CH), 5.34 (s, 1H, CH), 6.13 (s, 1H, $=\text{CH}_2$), 6.17 (s, 1H, $=\text{CH}_2$), 6.82 (d, 1H, J = 7.9 Hz, ArH), 6.90 (t, 1H, J = 7.3 Hz, ArH), 7.08 (d, 1H, J = 7.4 Hz, ArH), 7.18 (t, 1H, J = 7.4 Hz, ArH).

^{13}C NMR (DMSO-d_6 , 75 MHz): δ = 7.7, 29.0, 61.2, 117.3, 118.9, 122.5, 123.4, 127.5, 130.4, 134.0, 137.1, 154.6, 177.2.

MS (ES+) m/z = 239.2 (M^+ +1).

Anal. Calcd. for $\text{C}_{14}\text{H}_{14}\text{N}_4$ (238.12): C, 70.57; H, 5.92; N, 23.51. Found: C, 70.48; H, 5.87; N, 23.83.

2-(2-Amino-3-propyl-3,4-dihydroquinazolin-4-yl)acrylonitrile (17d)

As a white solid (0.46 g from 0.86 g); mp 157-158 °C; R_f = 0.15 (Methanol: Chloroform, 1:9).

IR (KBr): 1678 (C=N), 2210 (CN), 3417 (NH₂) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): δ = 0.82 (d, 3H, J = 6.8 Hz, CH₃), 1.57 (d, 2H, J = 5.9 Hz, CH₂), 3.03 (t, 2H, J = 6.6 Hz, CH₂), 5.46 (s, 1H, CH), 6.11 (s, 1H, =CH₂), 6.14 (s, 1H, =CH₂), 6.84-6.95 (m, 2H, ArH), 7.07 (d, 1H, J = 6.4 Hz, ArH), 7.13-7.18 (m, 1H, ArH).

¹³C NMR (DMSO-d₆, 50 MHz): δ = 11.3, 24.9, 49.7, 61.4, 117.2, 117.6, 123.2, 127.2, 130.3, 133.4, 137.6, 153.2.

MS (ES+) m/z = 241.3 (M⁺+1).

Anal. Calcd. for C₁₄H₁₆N₄ (240.14): C, 69.97; H, 6.71; N, 23.32. Found: C, 70.11; H, 6.53; N, 23.57.

2-(2-Amino-3-sec-butyl-3,4-dihydroquinazolin-4-yl)acrylonitrile (17e)

Diastereomeric ratio(1:1); white solid (0.44 g from 0.80 g); mp 157-158 °C; R_f = 0.15 (Methanol: Chloroform, 1:9).

IR (Neat): 1665 (C=N), 2212 (CN), 3458 (NH₂) cm⁻¹.

¹H NMR (CDCl₃, 200 MHz): δ = 0.76 (t, 3H, J = 7.4 Hz, CH₃), 1.05 (t, 3H, J = 7.3 Hz, CH₃), 1.30-1.40 (m, 6H, 2 x CH₃), 1.58-1.72 (m, 3H, CH₂ and 1H of CH₂), 1.82-1.96 (m, 1H, CH₂), 4.07-4.18 (m, 1H, CH), 4.30-4.37 (m, 1H, CH), 5.01 (s, 1H, CH), 5.10 (s, 1H, CH), 5.85 (s, 2H, 2 x =CH₂), 5.97 (s, 2H, 2 x =CH₂), 7.08-7.17 (m, 3H, 2 x ArH and ArH), 7.23-7.38 (m, 5H, 2 x ArH and ArH).

¹³C NMR (DMSO, 75 MHz): δ = 11.4, 11.5, 17.9, 19.4, 27.1, 27.5, 53.3, 53.5, 55.7, 56.2, 117.0, 117.5, 120.2, 120.3, 123.2, 124.3, 124.5, 129.8, 131.7, 132.1, 153.6, 154.4, 176.6.

MS (ES+) m/z = 255.2 (M⁺+1).

Anal. Calcd. for C₁₅H₁₈N₄ (254.15): C, 70.84; H, 7.13; N, 22.03. Found: C, 71.11; H, 6.87; N, 22.14.

2-[2-amino-3-(2,2-dimethoxyethyl)-3,4-dihydroquinazolin-4-yl]acrylonitrile (17g)

As a white solid (1.00 g from 1.70 g); mp 157-158 °C; R_f = 0.21 (Methanol: Chloroform, 1:4).

IR (KBr): 1650 (C=N), 2224 (CN), 3406 (NH₂) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): δ = 3.12 (dd, 1H, J_1 = 15.1 Hz, J_2 = 6.5 Hz, CH₂), 3.27 (s, 6H, 2 x OCH₃), 3.73 (dd, 1H, J_1 = 15.2 Hz, J_2 = 3.5 Hz, CH₂), 4.48-4.52 (m, 1H, CH), 5.27 (s, 1H, CH), 5.92 (s, 1H, =CH₂), 5.99 (s, 2H, NH₂), 6.05 (s, 1H, =CH₂), 6.69 (d, 1H, J = 7.8 Hz, ArH), 6.78 (t, 1H, J = 6.7 Hz, ArH), 6.97 (d, 1H, J = 7.1 Hz, ArH), 7.08 (t, 1H, J = 7.0 Hz, ArH).

¹³C NMR (DMSO-d₆, 75 MHz): δ = 50.7, 54.3, 55.5, 62.3, 103.1, 118.0, 120.6, 121.3, 123.9, 126.2, 129.1, 130.6, 145.4, 153.5.

MS (ES+) m/z = 287.0 (M⁺+1).

HRMS Calcd. for C₁₅H₁₈N₄O₂: 286.1430. Found: 286.1427.

2-(2-Amino-3-benzyl-6,7-dimethoxy-3,4-dihydroquinazolin-4-yl)acrylonitrile (18a)

As a yellow solid (0.40 g from 0.80 g); mp 141-142 °C; R_f = 0.21 (Methanol: Chloroform, 1:4).

IR (KBr): 1662 (C=N), 2225 (CN), 3424 (NH₂) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): δ = 3.69 (s, 6H, 2 x OCH₃), 3.99-4.17 (m, 2H, CH₂), 6.00-6.06 (m, 1H, CH), 6.37 (s, 1H, =CH₂), 6.54 (s, 1H, =CH₂), 7.23-7.32 (m, 7H, ArH).

¹³C NMR (DMSO-d₆, 75 MHz): δ = 51.4, 56.3, 57.0, 60.9, 110.6, 118.5, 123.7, 128.1, 128.5, 129.7, 137.7, 144.7, 150.8, 171.6.

MS (ES+) m/z = 349.3 (M⁺+1).

Anal. Calcd. for C₂₀H₂₀N₄O₂ (348.16): C, 68.95; H, 5.79; N, 16.08. Found: C, 69.06; H, 6.01; N, 15.84.

2-(2-Amino-3-cyclohexyl-6,7-dimethoxy-3,4-dihydroquinazolin-4-yl)acrylonitrile (18b)

As a brown solid (0.30 g from 0.54 g); mp 129-130 °C; R_f = 0.21 (Methanol: Chloroform, 1:4).

IR (KBr): 1645 (C=N), 2225 (CN), 3367 (NH₂) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): δ = 1.09-1.22 (m, 6H, 3 x CH₂), 1.30-1.43 (m, 4H, 2 x CH₂), 1.85-1.97 (m, 1H, CH), 3.67 (s, 3H, OCH₃), 3.69 (s, 3H, OCH₃), 5.42 (s, 1H, CH), 5.93 (s, 1H, =CH₂), 6.00 (s, 1H, =CH₂), 6.40 (s, 1H, ArH), 6.81 (s, 1H, ArH).

¹³C NMR (DMSO-d₆, 75 MHz): δ = 25.3, 25.50, 25.54, 31.7, 31.8, 57.0, 57.2, 110.9, 114.2, 117.0, 125.3, 134.6, 140.9, 148.3, 149.9, 154.2, 171.1.

MS (ES+) m/z = 341.3 (M⁺+1).

Anal. Calcd. for C₁₉H₂₄N₄O₂ (340.19): C, 67.04; H, 7.11; N, 16.46. Found: C, 67.04; H, 7.11; N, 16.46.

Methyl 2-(2-amino-3-cyclohexyl-3,4-dihydroquinazolin-4-yl)acrylate (19b)

As a white solid (0.42 g from 0.80 g); mp 119-120 °C; R_f = 0.29 (Methanol: Chloroform, 3:17).

IR (KBr): 1657 (C=N), 1728 (CO₂CH₃), 3391 (NH₂) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): δ = 1.05-1.37 (m, 6H, 3 x CH₂), 1.70-1.76 (m, 4H, 2 x CH₂), 3.68 (s, 3H, OCH₃), 3.98-4.05 (m, 1H, CH), 5.77 (s, 1H, CH), 5.88 (s, 1H, =CH₂), 6.19 (s, 1H, =CH₂), 7.00 (d, 1H, J = 8.0 Hz, ArH), 7.09 (t, 1H, J = 7.4 Hz, ArH), 7.26-7.30 (m, 2H, ArH).

¹³C NMR (DMSO-d₆, 75 MHz): δ = 24.7, 25.0, 29.7, 30.6, 52.6, 53.9, 57.7, 124.6, 125.5, 126.9, 127.4, 129.9, 132.9, 140.0, 141.0, 168.7.

MS (ES+) m/z = 314.3 (M⁺+1).

Anal. Calcd. for C₁₈H₂₃N₃O₂ (313.18): C, 68.98; H, 7.40; N, 13.41. Found: C, 68.62; H, 7.73; N, 13.64.

Methyl 2-(2-amino-3-cyclopropyl-3,4-dihydroquinazolin-4-yl)acrylate (19c)

As a white solid (0.54 g from 1.00 g); mp 137-139 °C; $R_f = 0.28$ (Methanol: Chloroform, 3:17).

IR (KBr): 1652 (C=N), 1723 (CO₂CH₃), 3423 (NH₂) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): $\delta = 0.72$ -1.02 (m, 4H, 2 x CH₂), 2.42 (brs, 1H, CH), 3.66 (s, 3H, OCH₃), 5.48 (s, 1H, CH), 5.89 (s, 1H, =CH₂), 6.23 (s, 1H, =CH₂), 6.84-6.92 (m, 2H, ArH), 7.05 (d, 1H, $J = 7.4$ Hz, ArH), 7.15 (t, 1H, $J = 7.3$ Hz, ArH).

¹³C NMR (DMSO-d₆, 75 MHz): $\delta = 7.5, 28.9, 52.8, 60.1, 116.2, 120.2, 123.4, 127.1, 128.5, 129.6, 135.2, 139.0, 155.0, 165.9$.

MS (ES+) $m/z = 272.3$ (M⁺+1)

Anal. Calcd. for C₁₅H₁₇N₃O₂ (271.13): C, 66.40; H, 6.32; N, 15.49. Found: C 66.76; H, 6.53; N, 15.68.

Methyl 2-(2-amino-3-propyl-3,4-dihydroquinazolin-4-yl)acrylate (19d)

As a white solid (0.44 g from 0.80 g); mp 148-149 °C; $R_f = 0.28$ (Methanol: Chloroform, 3:17).

IR (KBr): 1670 (C=N), 1716 (CO₂CH₃), 3385 (NH₂) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): $\delta = 0.82$ (t, 3H, $J = 7.3$ Hz, CH₃), 1.45-1.64 (m, 2H, CH₂), 2.99-3.09 (m, 1H, CH₂), 3.44-3.54 (m, 1H, CH₂), 3.64 (s, 3H, OCH₃), 5.53 (s, 1H, CH), 5.87 (s, 1H, =CH₂), 6.22 (s, 1H, =CH₂), 6.89-6.95 (m, 2H, ArH), 7.07 (d, 1H, $J = 7.3$ Hz, ArH), 7.18 (t, 1H, $J = 7.3$ Hz, ArH).

¹³C NMR (DMSO-d₆, 50 MHz): $\delta = 11.5, 20.8, 49.6, 52.9, 60.3, 116.1, 120.0, 123.4, 127.1, 129.7, 139.5, 153.3, 165.7, 177.4$.

MS (ES+) $m/z = 274.3$ (M⁺+1).

Anal. Calcd. for C₁₅H₁₉N₃O₂ (273.15): C, 65.91; H, 7.01; N, 15.37. Found: C, 65.78; H, 6.89; N, 15.67.

Methyl 2-(2-amino-3-(2,2-dimethoxyethyl)-3,4-dihydroquinazolin-4-yl)acrylate (19g)

As a white solid (0.44 g from 0.8 g); mp 118-119 °C; $R_f = 0.30$ (Methanol: Chloroform, 3:17).

IR (KBr): 1668 (C=N), 1722 (CO₂CH₃), 3417 (NH₂) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): $\delta = 3.11$ -3.26 (m, 5H, OCH₃ and CH₂), 3.44 (s, 3H, OCH₃), 4.06 (s, 3H, OCH₃), 4.31 (brs, 1H, CH), 6.17 (s, 1H, CH), 6.30 (s, 1H, =CH₂), 6.42 (s, 1H, =CH₂), 7.17 (s, 1H, ArH), 7.30 (d, 1H, $J = 7.0$ Hz, ArH), 7.46 (s, 1H, ArH), 7.65 (s, 1H, ArH).

MS (ES+) $m/z = 320.3$ (M⁺+1).

Anal. Calcd. for C₁₆H₂₁N₃O₄ (319.15): C, 60.17; H, 6.63; N, 13.16. Found: C, 60.45; H, 6.59; N, 13.33.

Methyl 2-(2-amino-3-benzyl-6,7-dimethoxy-3,4-dihydroquinazolin-4-yl)acrylate (20a)

As a white solid (0.28 g from 0.54 g); mp 161-162 °C; $R_f = 0.28$ (Methanol: Chloroform, 1:9).

IR (KBr): 1671 (C=N), 1728 (CO₂CH₃), 3746 (NH₂) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): $\delta = 3.70$ (s, 3H, OCH₃), 3.77 (s, 3H, OCH₃), 3.79 (s, 3H, OCH₃), 4.21 (d, 2H, $J = 5.8$ Hz, CH₂), 5.30 (s, 1H, CH), 5.78 (s, 1H, =CH₂), 6.21 (s, 1H, =CH₂), 6.49 (s, 1H, ArH), 6.85 (s, 1H, ArH), 7.23-7.35 (m, 5H, ArH).

¹³C NMR (DMSO-d₆, 50 MHz): $\delta = 50.3, 52.5, 56.1, 56.3, 59.6, 110.3, 110.6, 127.0, 127.5, 127.6, 127.9, 128.2, 128.6, 129.2, 138.6, 145.2, 149.9, 162.0, 165.5$.

MS (ES+) $m/z = 382.2$ (M⁺+1).

Anal. Calcd. for C₂₁H₂₃N₃O₄ (381.17): C, 66.13; H, 6.08; N, 11.02. Found: C, 66.45; H, 5.79; N, 11.25.

2-(2-Oxo-1,2,3,5-tetrahydroimidazo[2,1-b]quinazolin-5-yl)acrylonitrile (21)

As a yellow solid (0.26 g from 0.54 g); mp 137-139 °C; $R_f = 0.28$ (Methanol: Chloroform, 1:9).

IR (KBr): 1648 (C=N), 2210 (CN), 3449 (NH) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): $\delta = 3.73$ -3.88 (m, 2H, CH₂), 5.58 (s, 1H, CH), 6.33 (s, 1H, =CH₂), 6.43 (s, 1H, =CH₂), 7.03-7.12 (m, 3H, ArH), 7.33 (s, 1H, ArH), 11.3 (s, 1H, NH).

¹³C NMR (DMSO-d₆, 75 MHz): $\delta = 51.6, 58.4, 116.5, 117.3, 117.4, 121.5, 123.9, 127.4, 129.9, 134.9, 135.5, 163.7, 182.4$.

MS (ES+) $m/z = 239.2$ (M⁺+1).

Anal. Calcd. for C₁₃H₁₀N₄O (238.09): C, 65.54; H, 4.23; N, 23.52. Found: C, 65.50; H, 4.37; N, 23.58.

2-(7,8-Dimethoxy-2-oxo-1,2,3,5-tetrahydroimidazo[2,1-b]quinazolin-5-yl)acrylonitrile (22)

As a brown solid (0.22 g from 0.45 g); mp 104-105 °C; $R_f = 0.21$ (Methanol: Chloroform, 1:4).

IR (KBr): 1653 (C=N), 2191 (CN), 3428 (NH) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): $\delta = 3.62$ -3.87 (m, 8H, 2 x OCH₃ and CH₂), 5.46 (s, 1H, CH), 6.28 (s, 1H, =CH₂), 6.40 (s, 1H, =CH₂), 6.64-6.65 (m, 2H, ArH).

¹³C NMR (DMSO-d₆, 75 MHz): $\delta = 49.0, 52.7, 106.9, 117.5, 128.6, 146.3, 148.5, 152.3, 153.1, 153.9, 154.2, 155.3, 171.0$.

MS (ES+) $m/z = 299.3$ (M⁺+1).

Anal. Calcd. for C₁₅H₁₄N₄O₃ (298.11): C, 60.40; H, 4.73; N, 18.78. Found: C, 60.67; H, 4.64; N, 18.65.

Methyl 2-(2-oxo-1,2,3,5-tetrahydroimidazo[2,1-b]quinazolin-5-yl)acrylate (23)

As a yellow solid (0.36 g from 0.80 g); mp 156-157 °C; $R_f = 0.28$ (Methanol: Chloroform, 1:9).

IR (KBr): 1649 (C=N), 1729 (CO₂CH₃), 3438 (NH) cm⁻¹.

¹H NMR (DMSO-d₆, 300 MHz): $\delta = 3.60$ (s, 3H, OCH₃), 3.76-3.84 (m, 2H, CH₂), 5.63 (s, 1H, CH), 6.08 (s, 1H, =CH₂), 6.31 (s, 1H, =CH₂), 6.97-7.03 (m, 3H, ArH), 7.21-7.24 (m, 1H, ArH).

^{13}C NMR (DMSO- d_6 , 75 MHz): δ = 52.4, 56.4, 62.1, 117.4, 121.9, 122.7, 123.3, 127.3, 129.2, 134.2, 145.7, 163.2, 165.0, 172.6.

MS (ES+) m/z = 272.3 (M^+ +1).

Anal. Calcd. for $\text{C}_{14}\text{H}_{13}\text{N}_3\text{O}_3$ (271.10): C, 61.99; H, 4.83; N, 15.49. Found: C, 62.23; H, 5.19; N, 15.18.

Methyl 2-(7,8-dimethoxy-2-oxo-1,2,3,5-tetrahydroimidazo[2,1-*b*]quinazolin-5-yl)acrylate (24)

As a brown solid (0.10 g from 0.23 g); mp 137-139 °C; R_f = 0.28 (Methanol: Chloroform, 1:9).

IR (KBr) 1653 (C=N), 1723 (CO_2CH_3), 3460 (NH) cm^{-1} .

^1H NMR (DMSO- d_6 , 300 MHz): δ = 3.60-3.72 (m, 9H, 3 x OCH_3), 3.80 (s, 2H, CH_2), 5.52 (s, 1H, CH), 6.01 (s, 1H, = CH_2), 6.28 (s, 1H, = CH_2), 6.58 (s, 1H, ArH), 6.62 (s, 1H, ArH).

^{13}C NMR (DMSO- d_6 , 50 MHz): δ = 52.4, 56.4, 56.6, 56.8, 98.3, 113.1, 120.1, 121.8, 129.2, 134.2, 145.7, 165.0, 172.6.

MS (ES+) m/z = 332.2 (M^+ +1).

Anal. Calcd. for $\text{C}_{16}\text{H}_{17}\text{N}_3\text{O}_5$ (331.12): C, 58.00; H, 5.17; N, 12.68. Found: C, 58.34; H, 5.48; N, 12.66.

Typical procedure for the preparation of 19a.

To a solution of compound **15a** (0.80 g, 2.29 mmol) in abs. EtOH (15 mL), Fe powder (0.64 g, 11.45 mmol) and 0.50 mL conc. HCl was added and the reaction mixture was heated at 100 °C for 45 min. Organic solvent was evaporated under reduced pressure and the residue obtained was diluted with EtOAc (50 mL) and neutralised with saturated NaHCO_3 solution. The solution was passed through celite bed which was thoroughly washed with EtOAc. The organic layer was pooled, washed with brine (100 mL), dried over Na_2SO_4 , and concentrated to obtain the residue. The residue was crystallized using EtOAc/ Hexanes mixture to furnish pure product **19a** (0.44 g, 60%) as a white solid.

Methyl 2-(2-amino-3-benzyl-3,4-dihydroquinazolin-4-yl)acrylate (19a)

Mp 120-121 °C; R_f = 0.25 (Methanol: Chloroform, 3:17).

IR (KBr): 1659 (C=N), 1722 (CO_2CH_3), 3417 (NH_2) cm^{-1} .

^1H NMR (DMSO- d_6 , 300 MHz): δ = 3.63 (s, 3H, OCH_3), 3.99-4.07 (m, 2H, CH_2), 5.56 (s, 1H, CH), 5.98 (s, 1H, = CH_2), 6.25 (s, 1H, = CH_2), 7.22-7.27 (m, 5H, ArH), 7.31-7.36 (m, 4H, ArH).

^{13}C NMR (DMSO- d_6 , 75 MHz): δ = 51.1, 52.9, 60.7, 119.8, 124.6, 127.3, 127.8, 128.1, 128.8, 129.3, 129.7, 130.1, 133.7, 135.6, 138.4, 152.9, 165.4.

MS (ES+) m/z = 322.3 (M^+ +1).

Anal. Calcd. for $\text{C}_{19}\text{H}_{19}\text{N}_3\text{O}_2$ (321.15): C, 71.01; H, 5.96; N, 13.08. Found: C, 71.13; H, 6.21; N, 12.95.

Typical procedure for the preparation of 25.

To a solution of **17g** (0.86 g, 3.01 mmol) in AcOH (0.74 mL), 1.23 mL conc. HCl was added and the mixture was

heated at 100 °C for 30 min. Then, the reaction mixture was cooled to room temperature and poured in ice water followed by neutralization with aqueous NaHCO_3 . The resulting mixture was extracted using EtOAc (3 x 25 mL) and water (30 mL). The organic layers were combined, washed with brine, dried (Na_2SO_4) and concentrated to afford a residue. The residue was crystallized using EtOAc/ hexanes mixture to furnish analytically pure product **25** (0.46 g, 72%) as a white solid.

2-(1,5-Dihydroimidazo[2,1-*b*]quinazolin-5-yl)acrylonitrile (25)

Mp 140-141 °C; R_f = 0.28 (Methanol: Chloroform, 1:9).

IR (KBr): 1642 (C=N), 2210 (CN), 3443 (NH) cm^{-1} .

^1H NMR (DMSO- d_6 , 300 MHz): δ = 6.24 (s, 1H, CH), 6.31 (s, 1H, = CH_2), 6.35 (s, 1H, = CH_2), 6.75 (s, 1H, =CH), 6.78 (s, 1H, =CH), 6.90-6.95 (m, 2H, ArH), 7.13 (d, 1H, J = 7.4 Hz, ArH), 7.25 (t, 1H, J = 7.3 Hz, ArH), 10.2 (s, 1H, NH).

^{13}C NMR (DMSO- d_6 , 75 MHz): δ = 59.4, 113.1, 113.9, 115.6, 117.1, 121.1, 124.3, 127.2, 128.5, 130.2, 133.8, 137.7.

MS (ES+) m/z = 223.2 (M^+ +1).

Anal. Calcd. for $\text{C}_{13}\text{H}_{10}\text{N}_4$ (Exact mass: 222.09): C, 70.26; H, 4.54; N, 25.21. Found: C, 70.22; H, 4.50; N, 25.25.

General procedure for one-pot preparation of 25-26 as exemplified for 26

To a solution of compound **15g** (0.80 g, 2.29 mmol) in AcOH (15 mL), Fe powder (0.64 g, 11.46 mmol) was added and the mixture was heated at 95 °C for 20 min. Then to this 1.20 mL of conc. HCl was added and continued for heating at 100 °C for 30 min. Then the reaction mixture was cooled to room temperature and poured in ice water followed by neutralization with aqueous NaHCO_3 . The precipitated solid was separated by filtration through a celite bed which was repeatedly washed with EtOAc. The organic layers were pooled, washed with brine, dried (Na_2SO_4) and concentrated to obtain a residue. The residue was crystallized using EtOAc/ hexanes mixture to furnish pure product 0.38 g (65%) of **26** as a white solid. Similar one-pot procedure for **17g** yielded 75% of **25**.

Methyl 2-(1,5-dihydroimidazo[2,1-*b*]quinazolin-5-yl)acrylate (26)

As a white solid (0.38 g from 0.80 g); mp 139-140 °C; R_f = 0.30 (100 % EtOAc).

IR (KBr): 1628 (C=N), 1719 (CO_2CH_3), 3445 (NH) cm^{-1} .

^1H NMR (CDCl_3 , 300 MHz): δ = 3.72 (s, 3H, OCH_3), 6.31 (s, 1H, CH), 6.33 (s, 1H, = CH_2), 6.60 (s, 1H, = CH_2), 6.83-6.97 (m, 4H, ArH), 7.11 (d, 1H, J = 7.6 Hz, ArH), 7.20 (t, 1H, J = 7.5 Hz, ArH).

^{13}C NMR (DMSO- d_6 , 50 MHz): δ = 52.6, 57.5, 114.5, 116.4, 121.7, 127.5, 129.0, 129.8, 139.6, 140.7, 165.0, 170.6.

MS (ES+) m/z = 256.2 (M^+ +1).

Anal. Calcd. for $C_{14}H_{13}N_3O_2$ (255.10): C, 65.87; H, 5.13; N, 16.46. Found: C, 66.09; H, 5.32; N, 16.74.

Please give a brief description of apparatus and methods used. Please give detailed information on how the reactions described in the text were carried out. For analytical data please use a new paragraph for each mode of analysis used. For detailed information see the instructions for authors: www.thieme-chemistry.com/thieme-chemistry/journals/info.

Acknowledgment

One of the authors (AM) gratefully acknowledges the financial support from CSIR, New Delhi in the form of fellowship. This work was supported by a DST grant.

References

This is CDRI Communication no. **7780**.

- (1) Nag, S.; Mishra, A.; Batra, S. *Tetrahedron* **2008**, *64*, 10162-10171.
- (2) (a) Singh, V.; Batra, S. *Tetrahedron* **2008**, *64*, 4511-4574 and references cited therein. (b) Nag, S.; Mishra, A.; Batra, S. *Eur. J. Org. Chem.* **2008**, 4334-4343. (c) Singh, V.; Huttait, S.; Batra, S. *Eur. J. Org. Chem.* **2009**, in press.
- (3) (a) Franklin, R.; Golding, B. T.; Cicala, P. A. U.S. Patent 2008176875, 2008; *Chem. Abstr.* **2008**, 149, 183694. (b) Pathi, S. L.; Kankan, R. N.; Rao, D. R. World Patent 2008096145, 2008; *Chem. Abstr.* **2008**, 149, 246279. (c) Widmann, R. S. World Patent 2005080398, 2005; *Chem. Abstr.* **2005**, 144:370110.
- (4) (a) Bell, A. S.; Campbell, S. F.; Roberts, D. A.; Ruddock, K. S. *J. Med. Chem.* **1989**, *32*, 2042-2049. (b) Jones, G. H.; Venuti, M. I. C.; Alvarez, R.; Bruno, J. J. Eur. Patent 116948, 1984; *Chem. Abstr.* **1984**, 102, 78902. (c) Ishikawa, F.; Ashida, S. Eur. Patent 129258, 1984, *Chem. Abstr.* **1984**, 102, 166773. (d) Kosasayama, A.; Higashi, K.; Ishikawa, F. *Chem. Pharm. Bull.* **1979**, *27*, 880-892.
- (5) (a) Baxter, E. W.; Conway, K. A.; Kennis, L.; Bischoff, F.; Mercken, M. H.; De Winter, H. L.; Reynolds, C. H.; Tounge, B. A.; Luo, Chi; Scott, M. K.; Huang, Y.; Braeken, M.; Pieters, S. M. A.; Berthelot, D. J. C.; Masure, S.; Bruinzeel, W. D.; Jordan, A. D.; Parker, M. H.; Boyd, R. E.; Qu, J.; Alexander, R. S.; Brenneman, D. E.; Reitz, A. B. *J. Med. Chem.* **2007**, *50*, 4261-4264. (b) Ishikawa, F.; Watanabe, Y.; Saegusa, *Chem. Pharm. Bull.* **1980**, *28*, 1357-1364. (c) Franklin, R.; Golding, B. World Patent 2008065445, 2008; *Chem. Abstr.* **2008**, 149, 17568. (d) Fried, J. H.; Venuti, M. C. Eur. Patent 254327, 1988; *Chem. Abstr.* **1988**, 109, 6541.
- (6) (a) Kundu, B.; Partani, P.; Duggineni, S.; Sawant, D. *J. Comb. Chem.* **2005**, *7*, 909-915. (b) Srivastava, G. K.; Kesarwani, A. P.; Grover, R. K.; Roy, R.; Srinivasan, T.; Kundu, B. *J. Comb. Chem.* **2003**, *5*, 769-774. (c) Shakhidoyatov, Kh. M.; Yun, L. M.; Samiev, R. A. *Uzbekskii Khimicheskii Zhurnal* **1990**, 42-45; *Chem. Abstr.* **1990**, 115:135414. (d) Spindler, J. *Chem-Ztg.* **1991**, *115*, 224-225. (e) Yamaguchi, H.; Ishikawa, F. *J. Heterocyclic Chem.* **1981**, *18*, 67-70.
- (7) Pathak, R.; Batra, S. *Tetrahedron* **2007**, *63*, 9448-9455.

Synthesis of 2-amino-3,4-dihydroquinazolines and imidazo[2,1-*b*]quinazoline-2-ones

Amita Mishra, Sanjay Batra*

