Studies with Phenylsulfone Derivatives: Synthesis Of Pyrrole, Thiophene And Their Fused Derivatives.

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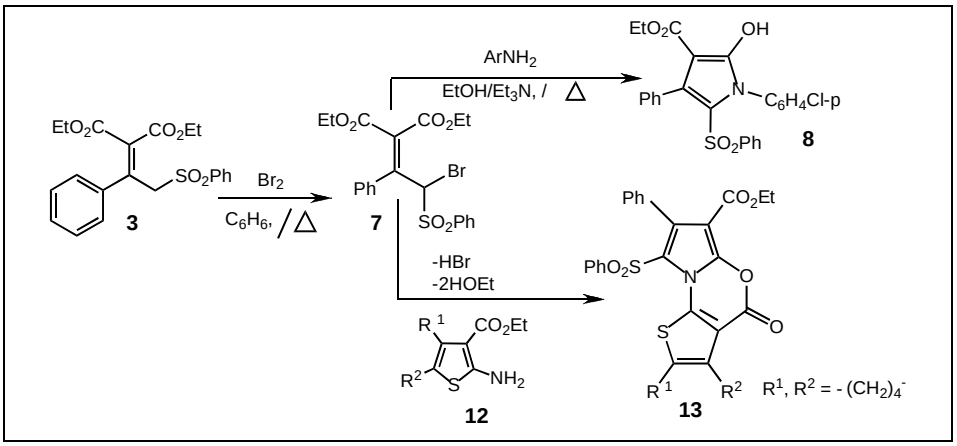

Diethyl 2-(1-phenyl-2-(phenylsulfonyl)ethylidene)malonate 3 has been prepared via the reaction of 6 with sodium benzenesulfinate. Compound 3 proved to be highly reactive towards various reagents and underwent numerous chemical transformation, resulting in the construction of a wide range of heterocyclic sulfone systems.

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INTRODUCTION

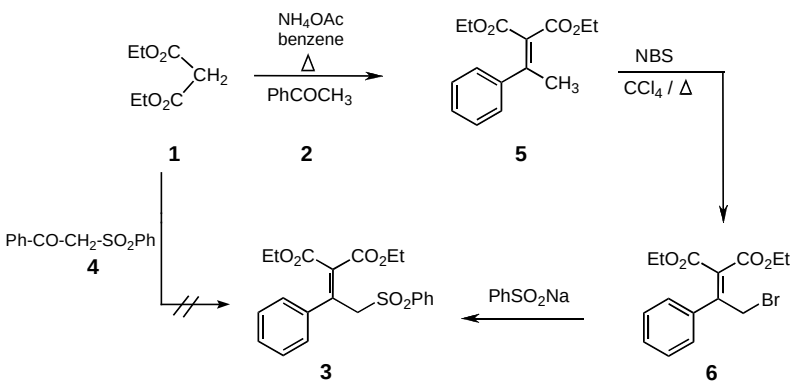
Phenyl sulfone derivatives have proven to be valuable synthons for the preparation of a wide variety of biologically active heterocyclic systems [1-6]. Phenyl sulfones shows anti-ulcer effect [7], and used for synthesis of KDN- α-C-glycosides and various stilbenes such as resveratrol [8,9]. Our aim in the work presented herein was to synthesize heterocyclic sulfone derivatives using phenylsulfone derivatives as building blocks.

RESULTS AND DISCUSSION

Diethyl malonate **1** reacts with acetophenone in benezene/ammonium acetate mixture to give compound **5** which reacted with NBS to afford compound **6** [2], the latter product reacted with equimolar amounts of sodium benzenesulfinate in ethanolic solution to yield compound **3**. Trials to prepare compound **3** by the reaction of **1** with arylsulfonyl acetophenone **4** in acidic or basic media failed (Scheme 1).

Compound **3** proved to be highly reactive towards various reagents and underwent numerous chemical transformations, resulting in the construction of a wide range of heterocyclic sulfone systems. Thus, compound **3** could be brominated when equimolar amounts of **3** and bromine in dry benzene were boiled under reflux to afford the corresponding diethyl 2-(2-bromo-1-phenyl-2-(phenylsulfonyl)ethylidene)malonate **7**. Treatment of **7**

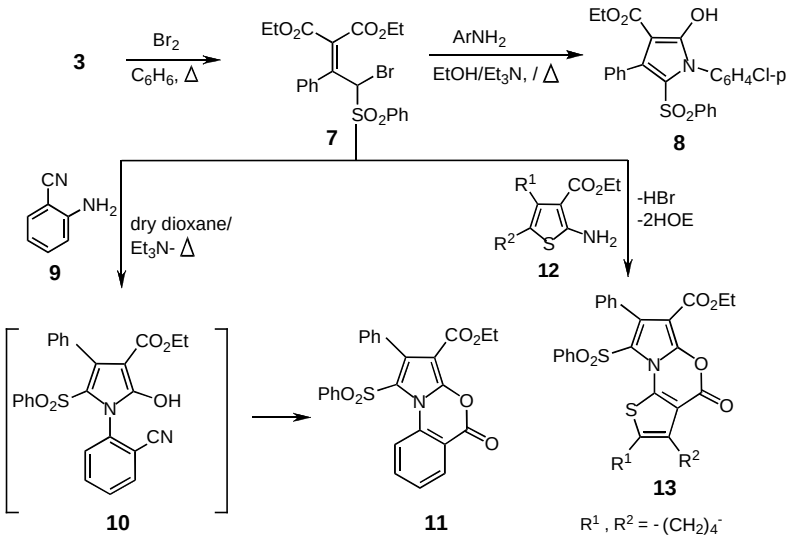
Scheme 1



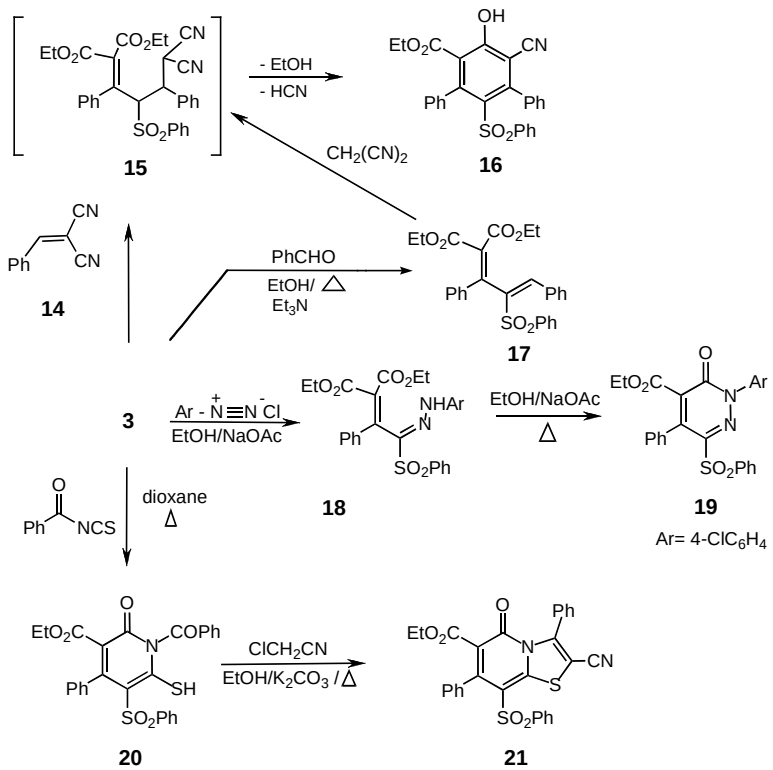
with the appropriate primary aromatic amine in ethanolic/triethylamine solutions afforded the corresponding ethyl 1-(4-chlorophenyl)-2-hydroxy-4-phenyl-5-(phenylsulfonyl)-1*H*-pyrrole-3-carboxylate **8**. In a one-pot reaction ethyl 5-oxo-2-phenyl-1-(phenylsulfonyl)pyrrolo[2,1-*b*]benzo-[*d*][1,3]oxazine-3-carboxylte **11**, and ethyl 6,7,8,9-tetra-hydro-5-oxo-2-phenyl-1(phenylsulfonyl)-pyrrolo[2,1-*b*]-thieno[2,3-*b*][1,3]oxazine-3-carboxylate **13** were obtained upon treating compound **7** with 2-aminobenzonitrile and ethyl 2-aminothiophene-3-carboxylate derivative **12** [10,11], respectively (Scheme 2).

Compound **3** reacted with arylidenemalononitrile **14** to yield the corresponding ethyl benzoate derivatives **16**. Compound **16** is assumed to be formed *via* addition of **3** to the activated double bond in **14** to yield the Michael adducts **15** which intra-molecularly cyclized and

Scheme 2



Scheme 3



aromatized *via* loss of HCN to give the final isolated ethyl benzoate derivatives **16**. Compound **16** could be prepared *via* an independent route involving the condensation of **3** with benzaldehyde and subsequent addition of malononitrile to the so-formed benzylidene derivative **17** (Scheme 3). Compound **3** coupled readily with equimolar amounts of arenediazonium chlorides to yield a coupling product which may be formulated as the hydrazone form **18** or its cyclic pyridazine form **19**. The hydrazone form **18** is preferred on the basis of ^{1}H NMR spectra which revealed the presence of multiplet signals corresponding to the two ester functions. Furthermore, pyridazines 19 could be obtained upon boiling hydrazone **18** in ethanolic sodium acetate solution. Ethyl 1-benzoyl-4-phenyl-1,2-dihydro-2-oxo-6-mercapto-5-(phenylsulfonyl)pyridine-3-carboxylate **20** was obtained in a good yield from the reaction of **3** with benzoylisothiocyanate in boiling dry dioxane. Compound **20** also reacted with chloroacetonitrile in the presence of K_2CO_3 to yield the corresponding ethylthiazolo[2,3-*a*]pyridine-6-carboxylate derivative **21**.

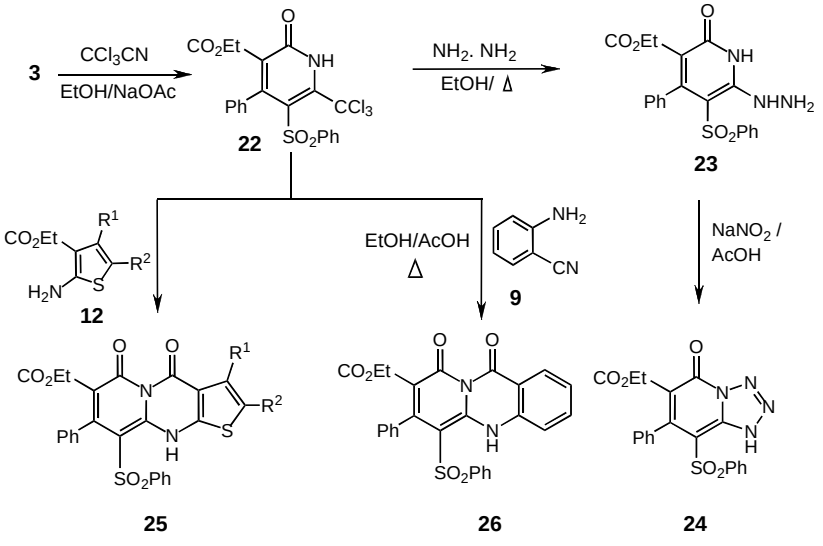
Compound **3** reacted with equimolar amounts of trichloroacetonitrile in ethanolic sodium acetate solutions to produce exclusively the corresponding ethyl 6-(trichloromethyl)-1,2-dihydro-2-oxo-4-phenyl-5-(phenylsulfonyl)pyridine-3-carboxylate **22**. The trichloro methyl group in **22** proved to be highly reactive towards nucleophilic reagents. Thus, compound **22** reacted readily with equimolar amounts of hydrazine hydrate in ethanol under reflux to yield the corresponding ethyl 6-hydrazinopyridine-3-carboxylate **23**. Compound **23** could be successfully cyclized into the corresponding ethyl 1,5-dihydro-5-oxo-7-phenyl-8-(phenylsulfonyl)tetrazolo[1,5-*a*]-pyridine-6-carboxylate **24** upon treatment with an equimolar proportion of sodium nitrite in glacial acetic acid (Scheme 4). Treatment of **22** with ethyl 2-aminothiophene-3-carboxylate **12** in absolute ethanol solution containing glacial acetic acid under reflux, furnished the corresponding ethyl 10-phenyl-7,8-dioxo-11-(phenylsulfony)-l,3,4,5,6-tetrahydro-1*H*-pyrido[1,2-*a*]-thieno[2,3-*d*]pyrimidine-9-carboxylate **25**. Similarly, ethyl 9,10-dihydro-9,11-dioxo-7-phenyl-6-(phenyl-sulfonyl)-5*H*-pyrido[2,1-*a*]quinazoline-8-carboxylate **26** could be obtained upon treatment of **22** with 2-aminobenzonitrile **9**.

EXPERIMENTAL

All melting points were measured on a Gallenkamp melting point apparatus and are uncorrected. IR spectra were recorded (KBr) on a Pye Unicam SP-1000 spectrometer. ^{1}H NMR spectra were obtained on a Varian Gemini 200 MHz spectrometer using TMS as an internal reference. Chemical shifts are expressed as δ (ppm). Mass spectra were recorded on a GCMS-QP 1000 EX mass spectrometer operating at 70 eV. Micro analytical data were performed by the Micro analytical Unit, Cairo University, Egypt.

Diethyl 2-(1-phenyl-2-(phenylsulfonyl)ethylidene)malonate 3. To a solution of **6** (0.02 mol) in ethanol (50 mL), sodium benzenesulfinate (0.02 mol) was added. The reaction mixture was refluxed for 3 h and the solvent was triturated with cold H_2O (20 mL). The solid product, so formed, was collected by filtration, washed thoroughly with H_2O, dried and crystallized from ethanol. Yield 65%, mp. 121°C; ir (KBr)$\nu/_{max}$ cm^{-1} 3000-2950 (CH_2), 1715, 1700 (2 C=O).^{1}H nmr (δ, ppm, DMSO-d_6): 1.08-1.30 (m, 6H, 2CH_3), 3.80-4.28 (m, 4H, 2CH_2), 4.66 (s, 2H, CH_2), 6.90-7.85 (m, 10H, Ar-H); MS *m/z*: 402 (M+, 18%). *Anal.* calcd. for $C_{21}H_{22}O_6S$ (402.46): C, 62.67; H, 5.51; S, 7.97. Found: C, 62.39; H, 5.38; S, 7.64%.

Scheme 4



R^1R^2=-$(CH_2)_4$-

Diethyl 2-(2-bromo-1-phenyl-2-(phenylsulfonyl)ethyl-idene)malonate 7. To a solution of **3** (0.02 mol) in dry benzene (50 mL), bromine (0.02 mol) was added dropwise. The reaction mixture was heated under reflux for 3 h. The solvent was then evaporated *in vacuo*. The residue was triturated with ethanol; the solid product so formed was collected by filtration, dried and crystallized from ethanol. Yield 59%, mp. 154-156°C; ir (KBr)ν/$_{max}$ cm^{-1} 1718, 1705(2 C=O). ^{1}H nmr (δ, ppm, DMSO-d_6): 1.05-1.33 (m, 6H, 2CH_3), 3.85-4.45 (m, 4H, 2CH_2), 4.61 (s, 1H, CH), 6.95-7.90 (m, 10H, Ar-H); *Anal.* calcd. for $C_{21}H_{21}BrO_6S$(481.36): C, 52.40; H, 4.40; S, 6.66. Found: C, 52.32; H, 4.60; S, 6.71%.

Ethyl 1-(4-chlorophenyl)-2-hydroxy-4-phenyl-5-(phenyl-sulfonyl)-1*H*-pyrrole-3-carboxylate 8. To a warm solution of **7** (0.003 mol) in absolute ethanol (25 mL) containing anhydrous Et_3N (0.5 mL), the appropriate primary aromatic amine (0.03 mol) was added. The reaction mixture was refluxed for 2 h, poured into cold water, and then neutralized with dilute HCl. The solid product so formed was collected by filtration, washed with water, dried and crystallized from methanol. Yield 56%, mp. 190-192°C; ir (KBr)ν/$_{max}$ cm^{-1}: 3500-3325(OH), 1712 (C=O). ^{1}H nmr (δ, ppm, DMSO-d_6): 1.28 (t, 3H, *J* = 8.2 Hz, CH_3), 3.10 (s, 1H, OH, exchangeable), 4.51 (q, 2H, *J* = 8.2 Hz, CH2), 6.95-7.80 (m, 14H, Ar-H). *Anal.* calcd. for $C_{25}H_{20}ClO_5NS$ (481.95): C, 62.30; H, 4.18; N, 2.91; S, 6.65. Found: C, 62.21; H. 4.35; N. 2.60;S. 6.55 %.

Ethyl 5-oxo-2-phenyl-1-(phenylsulfonyl)pyrrolo[2,1-*b*]-benzo[*d*][1,3]oxazine-3-carboxylate11. A mixture of **7** (0.003 mol) and 2-aminobenzonitrile **9** (0.003 mol) in dry dioxane (30 mL) containing anhydrous Et_3N (1.0 mL) was refluxed for 3 h. The reaction mixture was left aside at room temperature overnight, poured into an ice water mixture and neutralized with dilute HCl. The solid product so formed was collected by filtration, washed with water, dried and crystallized from dioxane. Yield 45%, mp.212°C; ir (KBr)ν/$_{max}$ cm^{-1}: 1715, 1708 (2C=O). ^{1}H nmr (δ, ppm, DMSO-d_6): 1.24 (t, 3H, *J* = 8.2 Hz, CH_3), 4.55 (q, 2H, *J* = 8.2 Hz, CH_2), 6.88-7.92 (m, 14H, Ar-H). MS *m/z*: 473 (M+, 16%). *Anal.* calcd. for $C_{26}H_{19}NO_6S$ (473.42): C, 65.95; H, 4.04; N, 2.95; S, 6.74. Found: C, 56.51; H, 4.25; N, 2.55; S, 6.59%.

Ethyl 6,7,8,9-tetrahydro-5-oxo-2-phenyl-1-(phenylsulfonyl)-pyrrolo[2,1-*b*]thieno[2,3-*b*][1,3]oxazine-3-carboxylate 13. A mixture of **7** (0.003 mol) and the appropriate ethyl 2-aminothiophene-3-carboxylate **12** (0.003 mol) in a dry dioxane (30 mL) containing Et_3N (1.0 mL) was refluxed for 3 h. The reaction mixture was poured into cold water and neutralized with dilute HCl. The resulting precipitate was collected by filtration, dried and crystallized from dioxane. Yield 42%, mp.218°C; ir (KBr)ν/$_{max}$ cm^{-1}: 2218 (CN), 1720, 1712 (2 C=O). ^{1}H nmr (δ, ppm, DMSO-d_6): 1.22 (t, 3H, *J*= 8.2 Hz, CH_3), 1.77-1.84(m, 4H, 2CH_2), 2.63-2.68(m,2H, CH_2), 2.84-2.91(m,2H, CH_2),4.15 (q, 2H, *J* = 8.2 Hz, CH_2), 6.85-7.96 (m,10H, Ar-H). MS *m/z*: 533 (M+, 14%). *Anal.* calcd. for $C_{28}H_{23}NO_6S_2$ (533.47): C, 63.03; H, 4.34; N, 2.62; S, 11.99. Found: C, 63.43; H, 4.74; N, 2.75; S, 12.59%.

Ethyl 6-phenyl-3-cyano-2-hydroxy-4-phenyl-5-(phenyl-sulfonyl)benzoate 16.

Method A. A mixture of **3** (0.002 mol) and the appropriate arylidenemalononitrile **14** (0.002 mol) in ethanol (25 mL) containing Et_3N (0.5 mL) was heated under reflux for 3 h. The reaction mixture was evaporated *in vacuo*, triturated with cold water and neutralized with dilute HCl. The solid product was collected by filtration, dried and crystallized from dioxane. Yield 66%, mp. 229-230°C; ir (KBr)ν/$_{max}$ cm^{-1}: 3495-3450 (OH), 2218 (CN), 1710 (CO). ^{1}H nmr (δ, ppm, DMSO-d_6): 0.92 (t, 3H, *J* = 8.2 Hz, CH_3), 2.94 (s, 1H, OH, exchangeable), 4.23 (q, 2H, *J* = 8.2 Hz, CH_2), 6.90-7.83 (m, 15H, Ar-H). *Anal.* calcd. for $C_{28}H_{21}NO_5S$(483.45): C, 69.55; H, 4.37;N, 2.89;S, 6.61. Found: C, 69.73; H, 4.56; N, 2.54; S, 6.70%.

Method B. A mixture of **17** (0.002 mol) and malononitrile (0.002 mol) in ethanol (25 mL) containing Et_3N (0.5mL) was refluxed for 3 h. The reaction mixture was poured onto cold water and neutralized with dilute HCl. The solid product so formed was collected by filtration, dried, crystallized from ethanol, and found to be identical in all aspects (mp., mixed mp. and IR spectrum) with an authentic sample of **16** prepared according to Method A.

Diethyl 2,4-diphenyl-3-(phenylsulfonyl)but-1,3-diene-1,1-dicarboxylate 17. A mixture of **3** (0.003 mol) and benzaldehyde (0.003 mol) in absolute ethanol (30 mL) containing Et_3N (0.5 mL) was refluxed for 3 h allowed to cool poured into ice-cold water and neutralized with dilute HCl. The solid product formed was collected by filtration, dried and crystallized from ethanol. Yield 69%. mp. 186°C; ir (KBr)ν/$_{max}$ cm^{-1}: 1715, 1708 (2 C=O), 1650 (C=C). ^{1}H nmr (δ, ppm, DMSO-d_6): 0.95-1.35 (m, 6H, 2CH_3), 3.92-4.25 (m, 4H, 2 CH_2), 6.75-7.83 (m, 16H, Ar-H +ylidene-CH). *Anal.* calcd. for $C_{28}H_{26}O_6S$ (490.57): C, 68.55; H, 5.34; S, 6.54. Found: C, 68.67; H, 5.41; S, 6.63%.

Diethyl 2-phenyl-3-(4-chlorophenyl)hydrazono-3-(phenyl-sulfonyl)but-1,1-di- carboxylate 18. To a stirred solution of **3** (0.003 mol) in ethanol (50 mL) NaOAc (2.0 g), the appropriate arene diazonium chloride (0.003 mol) [prepared by adding $NaNO_2$ (0.006 mol) to the appropriate primary aromatic amine (0.003 mol) in concentrated HCl (2 mL) at 0-5 °C while stirring] was added drop wise while cooling at 0-5°C and stirring. The solid product so formed was collected by filtration, dried and crystallized from ethanol. Yield 65%, mp. 222 °C; ir (KBr)ν/$_{max}$ cm^{-1}: 3350-3320 (NH), 1718, 1700 (2 C=O). ^{1}H nmr (δ, ppm, DMSO-d_6): 0.96-1.25 (m, 6H, 2CH_3), 3.95-4.05 (m, 4H, 2CH_2), 6.73-7.56 (m, 14H, Ar-H), 11.28 (br s, 1H, NH, exchangeable). *Anal.* calcd. for $C_{27}H_{25}N_2ClO_6S$(541.02): C, 59.94; H, 4.66; N, 5.18; S,5.93. Found: C, 59.86; H, 4.77; N, 5.46; S, 5.83%.

Ethyl 2-(4-chlorophenyl)-2,3-dihydro-3-oxo-5-phenyl-6-(phenylsulfonyl)-pyridazine-4-carboxylate 19. A solution of **18** (0.002 mol) in ethanol (30 mL) containing NaOAc (1.0 g) was refluxed for 3 h. The reaction mixture was poured onto cold water and neutralized with dil. HCl. The resulting precipitated solid was collected by filtration, dried and crystallized from dioxane. Yield 55%, mp 193-195°C; ir (KBr)ν/$_{max}$ cm^{-1}:1718, 1695 (2 C=O) ^{1}H nmr (δ, ppm, DMSO-d_6): 1.21 (t, 3H, *J* = 8.2 Hz, CH_3), 4.25 (q, 2H, *J* = 8.2 Hz, CH_2), 6.91-7.43 (m, 14H, Ar-H). MS *m/z*: 494(M+, 14%). *Anal.* calcd. for $C_{25}H_{19}N_2O_5ClS$ (494.95): C, 57.97; H, 3.69; N, 5.40; S, 6.19. Found: C, 57.30; H, 3.54; N, 5.81; S, 6.52%.

Ethyl 1-benzoyl-4-phenyl-1,2-dihydro-2-oxo-6-mercapto-5-(phenylsulfonyl)pyridine-3-carboxylate 20. To a suspension of NH_4SCN (0.005 mol) in dioxane (50 mL), benzoyl chloride (0.7 g, 0.005 mol) was added. The reaction mixture was refluxed for 15 min., then treated with **3** (0.005 mol). The reaction mixture was then refluxed for an additional 2 h, poured onto ice water, whereby the solid product so formed was collected by filtration and crystallized from dioxane. Yield 66%, mp. 174-176°C; ir (KBr)ν/$_{max}$ cm^{-1}: 2250(SH), 1718, 1705, 1684 (3 C=O).^{1}H nmr (δ, ppm, DMSO-d_6): 1.20 (t, 3H, *J* = 8.2 Hz, CH_3), 3.24 (s, 1H,

SH, exchangeable), 4.25 (q, 2H, *J* = 8.2 Hz, CH_2), 6.90-7.68 (m, 15H, Ar-H). MS *m/z*: 519 (M+,12%). *Anal.* calcd. for $C_{27}H_{21}NO_6S_2$(519.08): C, 62.41; H, 4.07; N, 2.70; S, 12.34 Found: C, 62.76; H, 4.3; N, 2.37; S, 12.33%.

Ethyl 2-cyano-5-oxo-3,7-diphenyl-8-(phenylsulfonyl)-5*H*-thiazolo[3,2-*a*]pyridine-6-carboxylate 21. To a suspension of **20** (0.002 mol) in ethanol (30 mL), an aqueous solution of K_2CO_3 (0.004 mol) (20 mL) and chloroacetonitrile (0.002 mol) were added. The reaction mixture was refluxed for 2 h, left to cool at room temperature and poured into cold water. The solid product formed was collected by filtration and crystallized from ethanol. Yield 62%, mp. 255°C; ir (KBr)$\nu/_{max}$ cm^{-1}: 2218 (CN), 1715, 1700 (2 C=O). ^{1}H nmr (δ, ppm, DMSO-d_6):1.15 (t, 3H, *J* = 8.2 Hz, CH_3), 4.12 (q, 2H, *J* = 8.2 Hz, CH_2), 6.93-7.55 (m, 15H, Ar-H). MS *m/z*: 540(M+, 16%). *Anal.* calcd. for $C_{29}H_{20}N_2O_5S_2$ (540.61): C, 64.43; H, 3.73; N, 5.18; S, 11.86. Found: C, 64.22; H, 3.74; N, 5.34; S, 11.65%.

Ethyl 6-(trichloromethyl)-1,2-dihydro-2-oxo-4-phenyl-5-(phenylsulfonyl)pyridine-3-carboxylate 22. To a solution of **3** (0.003 mol) in ethanol (30 mL) containing NaOAc (0.5 g), trichloroacetonitrile (0.005 mol) was added. The reaction mixture was heated for 2 h and left aside at room temperature overnight. The mixture was poured into ice water and neutralized with dilute HCl. The solid that formed was collected by filtration, washed with water, dried and crystallized from ethanol. Yield 61%, mp. 228-230°C; ir (KBr) $\nu/_{max}$ cm^{-1}3370 (NH), 1715, 1700 (2C=O). ^{1}H nmr (δ, ppm, DMSO-d_6): 1.12 (t, 3H, *J* = 8.2 Hz, CH_3), 4.12 (q, 2H, *J* = 8.2 Hz, CH_2), 6.70-7.82 (m, 10H, Ar-H), 9.98 (br s, 1H, NH, exchangeable). *Anal.* calcd. For $C_{21}H_{16}NCl_3O_5S$ (500.78): C, 50.37; H, 3.22; N, 2.80; S, 6.40. Found: C, 50.54; H, 3.62; N, 2.65; S, 6.51%

Ethyl 6-hydrazinyl-1,2-dihydro-2-oxo-4-phenyl-5-(phenylsulfonyl)pyridine-3-carboxylate 23. A mixture of **22** (0.003 mol) and hydrazine hydrate (0.003 mol) in ethanol (30 mL) was refluxed for 30 min. and then left to cool. The mixture was poured into cold water, whereby the solid product so formed was collected by filtration and crystallized from dioxane. Yield 65%, mp. 197-199°C; ir (KBr)$\nu/_{max}$ cm^{-1}3420-3380 (NH2, NH), 1712, 1700 (2 C=O). ^{1}H nmr (δ, ppm, DMSO-d_6): 1.10 (t, 3H, *J* = 8.2 Hz, CH_3), 3.25 (br s, 2H, NH_2, exchangeable), 4.14 (q, 2H, *J* = 8.2 Hz, CH_2), 6.29 (br s, 1H, NH, exchangeable), 6.89-7.48 (m, 10H, Ar-H), 8.35 (br s, 1H, NH, exchangeable). *Anal.* calcd. for $C_{20}H_{19}N_3O_5S$(413.45): C, 58.10; H, 4.63; N, 10.16; S, 7.76. Found: C, 58.52; H, 4.72; N, 10.5; S, 7.52%.

Ethyl 1,5-dihydro-5-oxo-7-phenyl-8-(phenylsulfonyl)tetrazolo[1,5-*a*]pyridine-6-carboxylate 24. A solution of **23** (0.002 mol) in glacial acetic acid (25 mL) was treated with $NaNO_2$ (0.004 mol) portion wise while stirring at room temperature. The reaction mixture was stirred for an additional 1 h, whereby the solid product that separated was collected by filtration, washed with water and crystallized from acetic acid. Yield 61%, mp. 279°C; ir (KBr)$\nu/_{max}$ cm^{-1} 3450-3415 (NH), 1715, 1705 (2 C=O). ^{1}H nmr (δ, ppm, DMSO-d_6): 0.95 (t, 3H, *J* = 8.2 Hz, CH_3), 4.00 (q, 2H, *J* =8.2 Hz, CH_2), 6.85-7.55 (m, 10H, Ar-H), 9.65 (brs, 1H, NH, exchangeable). *Anal.* calcd. for $C_{20}H16N4O_5S$(424.43): C, 56.60; H, 3.80; N, 13.20; S, 7.55. Found: C, 57.72; H, 3.65; N, 13.13; S, 7.45%.

Ethyl 10-phenyl-7,8-dioxo-11-(phenylsulfonyl)-3,4,5,6-tetrahydro-1*H*-pyrido-[1,2-*a*]-thieno[2,3-*d*]pyrimidine-9-carboxylate 25. To a solution of **22** (0.002 mol) in absolute ethanol (30 mL) containing glacial acetic acid (1 mL), ethyl-2-aminothiophene-3-carboxylate **12** (0.002 mol) was added. The reaction mixture was refluxed for 2 h, left aside to cool at room temperature and then poured onto cold water. The solid precipitated was collected by filtration, washed thoroughly with water and crystallized from DMF. Yield 64%, mp. >300°C; ir (KBr)$\nu/_{max}$ cm^{-1} 3450-3420 (NH), 2220 (CN), 1718, 1710, 1700 (3 C=O). ^{1}H nmr (δ, ppm, DMSO-d_6): 1.12 (t, 3H, *J* =8.2 Hz, CH_3), 1.77-1.84(m, 4H, $2CH_2$), 2.63-2.68(m, 2H, CH_2), 2.84-2.91(m, 2H, CH_2), 4.17 (q, 2H, *J* = 8.2Hz, CH_2), 6.88-7.56(m, 10H, Ar-H), 9.61 (brs, 1H, NH, exchangeable). *Anal.* calcd. For $C_{29}H_{24}N_2O_6S_2$ (542.5): C, 64.20; H, 4.45; N, 5.16; S, 8.47. Found: C, 64.54; H, 4.93; N, 5.25; S, 8.51%.

Ethyl 9,10-dihydro-9,11-dioxo-7-phenyl-6-(phenylsulfonyl)-5*H*-Pyrido[2,1-*a*]quinazoline-8-carboxylate 26. To a solution of **22** (0.002 mol) in absolute ethanol (30 mL) containing glacial acetic acid (10 mL), 2-aminobenzonitrile **9** (0.002 mol) was added. The reaction mixture was refluxed for 2 h, left to cool and then poured into ice-cold water. The solid product precipitated was collected by filtration, dried and crystallized from DMF. Yield 59%, mp. 273°C; ir (KBr)$\nu/_{max}$ cm^{-1} 3445-3400 (NH), 1720, 1712, 1705 (3 C=O).^{1}H nmr (δ, ppm, DMSO-d_6): 0.98 (s, 3H, *J* = 8.2 Hz, CH_3), 4.12 (q, 2H, *J* = 8.2 Hz, CH_2), 6.95-7.81 (m, 14H, Ar-H), 9.73 (brs, 1H, NH, exchangeable). *Anal.* calcd. for $C_{27}H_{20}N_2O_6S$(500.52): C, 64.79; H, 4.03; N, 5.60; S, 6.41. Found: C, 64.83; H, 4.13; N, 5.83; S, 6.52%.

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