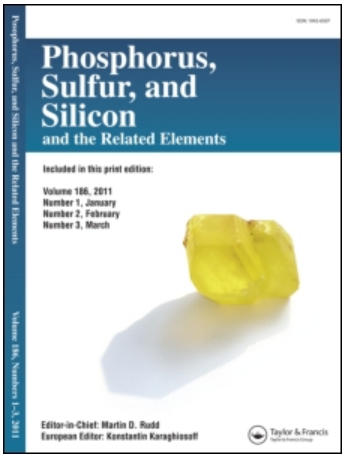


Phosphorus, Sulfur, and Silicon and the Related Elements

Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713618290

Synthesis of Heterocyclic Containing Benzoxazole Moiety

A. O. Abdelhamid[a]; V. B. Baghos[a]; M. M. A. Halim[b]
[a] Department of Chemistry, Faculty of Science, Cairo University, Giza, Egypt [b] Hormone Department, National Research Center, Dokki, Giza, Egypt

To cite this Article Abdelhamid, A. O. , Baghos, V. B. and Halim, M. M. A.(2008) 'Synthesis of Heterocyclic Containing Benzoxazole Moiety', Phosphorus, Sulfur, and Silicon and the Related Elements, 183: 6, 1313 — 1322
To link to this Article: DOI: 10.1080/10426500701641262
URL: http://dx.doi.org/10.1080/10426500701641262

Phosphorus, Sulfur, and Silicon, 183:1313–1322, 2008

ISSN: 1042-6507 print / 1563-5325 online
DOI: 10.1080/10426500701641262

Taylor & Francis
Taylor & Francis Group

Synthesis of Heterocyclic Containing Benzoxazole Moiety

A. O. Abdelhamid,[1] V. B. Baghos,[1] and M. M. A. Halim[2]
[1]Department of Chemistry, Faculty of Science, Cairo University, Giza, Egypt
[2]Hormone Department, National Research Center, Dokki, Giza, Egypt

3-Aryl-2-benzoxazol-2-yl-2-[4-oxo-5-(phenylmethylene)(1,3-thiazolidin-2-ylidene)-ethanenitrile, 3-aminothiophenes, thiazoles and 2,3-dihydro-1,3,4-thiadiazoles were synthesized from 2-benzoxazol-2-yl-2(4-oxo-3-phenylthiadiazolidin-2-ylidene)-ethanenitrile and the appropriate of each of halo ketones and hydrazonoyl halides. The newly synthesized compounds were elucidated by elemental analysis, spectral data, and alternative synthetic route whenever possible. All these compounds expected to possess biological activity.

Keywords 2,3-Dihydrothidiazoles 3-aminothiophenes; hydrazonoyl halides; thiazolidines

INTRODUCTION

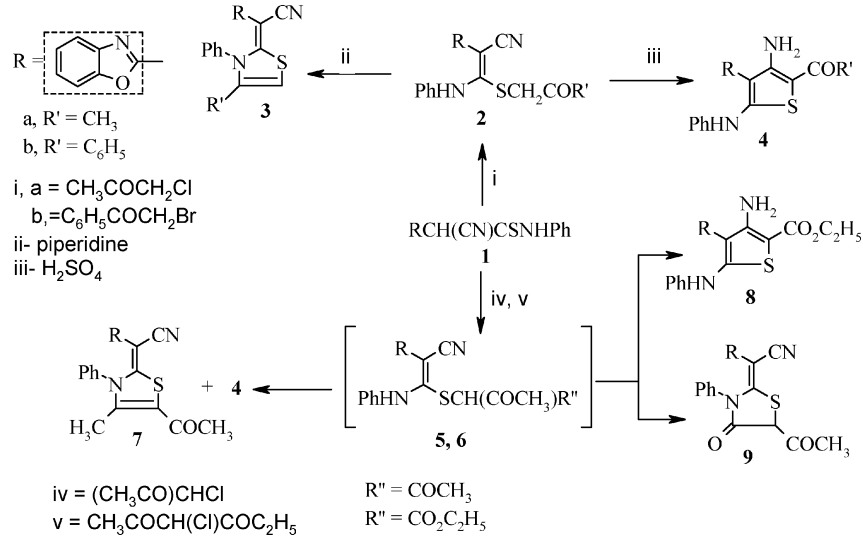
Medicinal compounds derived from oxazole include the antiepileptic drugs trimethadione and paramethadione,[1] the sedative and muscle-relaxant zoxazolamine, and furazolidone, which is effective against a wide range of enteric infections. Derivatives of oxazolidine show promise as appetite depressants.[2] Oxazole derivatives have attracted attention because of their potential biological activity and their use as a versatile starting material in organic synthetic transformations.[3] We report here several heterocyclic compounds expected to possess biological activity from 2-benzoxazol-2-yl-3-(phenylamino)-3-thioxopropanenitrile.[4]

RESULTS AND DISCUSSION

Treatment of 2-benzoxazol-2-yl-3-(phenylamino)-3-thioxopropanenitrile[4] (**1**) with each of chloroacetone and ω-bromoacetophenone

Received 5 June 2007; accepted 30 July 2007.
Address correspondence to A. O. Abdelhamid, Department of Chemistry, Faculty of Science, Cairo University, Giza 12622, Egypt. E-mail: Abdou_abdelhamid@yahoo.com

in *N*,*N*-dimethylformamide containing potassium hydroxide afforded 2-benzoxazol-2-yl-3-(2-oxopropylthio)-3-(phenylamino)prop-2-enenitrile (**2a**) and 2-benzoxazol-2-yl-3-(2-oxo-2-phenylethylthio)-3-(phenylamino)prop-2-enenitrile (**2b**), respectively (Scheme 1).



SCHEME 1

Structures **2a** and **2b** were confirmed by elemental analysis, spectral data, and chemical behavior. IR spectra of **2a** and **2b** revealed bands at 3112 (NH), 2186 (CN) and 1675–1645 (CO). ^{1}H NMR spectrum of **2a** showed signals at $\delta = 1.85$ (s, 3H, CH_3CO), 3.45 (s, 2H, CH_2) and 6.85–7.35 (m, 10 H, ArH's, and NH). Compounds **2a** and **2b** were converted to 3-aminothiophene derivatives **4a**,**b** via its boiling under reflux in ethanol containing catalytic amount of piperidine. IR spectra of **4a**,**b** revealed bands near 3473, 3280, 3190 (NH, NH_2), and 1673 (CO). ^{1}H NMR spectrum of **4b** showed signals at $\delta = 7.21$–7.72 (m, 14H, ArH's) and 11.18 (s, br., 3H, NH_2, and NH) exchangeable with D_2O.

Treatment of the appropriate **2a** and **2b** with sulfuric acid or polyphosphoric acid afforded the thiazoles **3a** and **3b**, respectively. The structure of **3** was confirmed based on elemental analysis and spectral data. Thus, IR spectra of **3**(**a**,**b**) revealed bands near 2188 (CN) and no bands between 2000-1600 due to the absence of (CO) group.[5] ^{1}H NMR spectrum of **3a** showed signals at δ 1.8 (s, 3H, CH_3) and 7.22–7.77 (m, 10H, Ar-H's and thiazole C-5).

Analogously, treatment of **1** with 3-chloropentane-2,4-dione in *N*, *N*-dimethyl-formamide containing potassium hydroxide, afforded

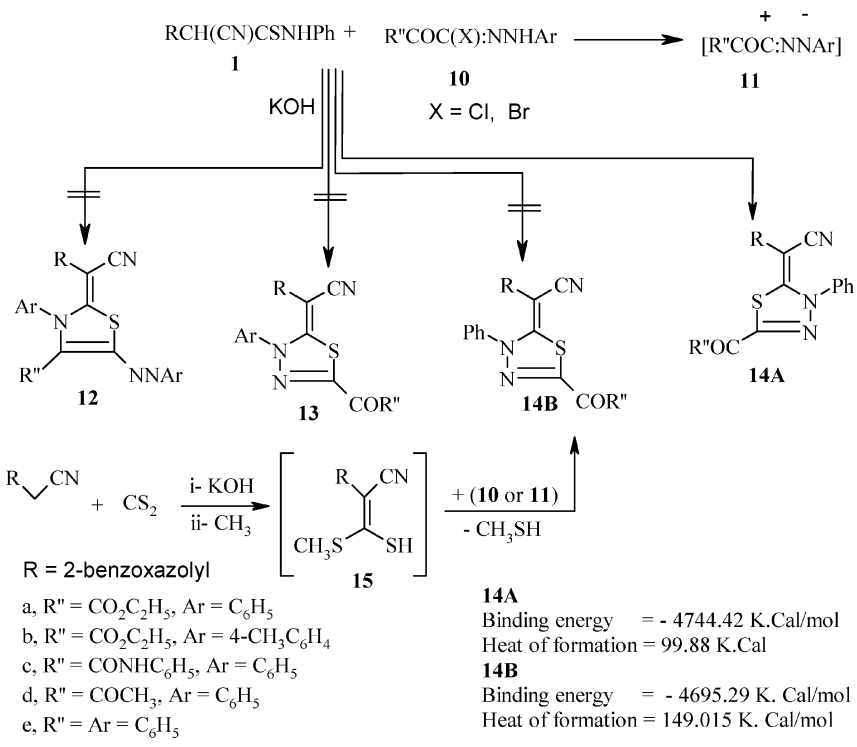
3-aminothiophene **4a** and thiazole **7** (Scheme 1). Structure **7** was elucidated by elemental analysis and spectral data. Thus, ^{1}H NMR spectrum of **7** showed signals at $\delta = 2.25$ (s, 3H, CH_3CO), 2.65 (s, 3H, CH_3 thiazole C-4), and 7.22–7.85 (m, 9H, ArH's). Its IR spectrum revealed bands near 2194 (CN), 1675 (CO) and 1602 (C=N). The formation of these products involves initial attack by one molecule of 3-chloropentane-2,4-dione to one molecule from thioanilide **1** to give intermediate **5** which cyclized to final products **7** via elimination of one molecule of water and **4a** through elimination of one molecule of acetic acid.

Also, ethyl 2-chloro-3-oxobutanoate reacted with thioanilide **1** in *N*, *N*-dimethylformamide containing potassium hydroxide to afford ethyl 3-amino-4-benzoxazol-2-yl-5-(phenylamino)-thiophene-2-carboxylate (**8**) and 2-(5-acetyl-4-oxo-3-phenyl(1,3-thiazolidin-2-ylidene)-2-benzoxazol-2-ylethanenitrile (**9**) (Scheme 1). Structures **8** and **9** were confirmed based on elemental analysis and spectral data. Thus, IR spectrum of **8** revealed band at 3303, 3228, 3163 (NH_2 and NH), 1658 (CO), and 1600. Its ^{1}H NMR (δ ppm) showed signals at 1.24 (t, 3H, $C\underline{H}_3CH_2$), 4.25 (q, 2H, $C\underline{H}_2CH_3$), 7.28–7.81 (m, 9H, ArH's), and 10.55 (s, br., 3H, NH_2 and NH). IR spectrum of **9** revealed bands at 2194 (CN), 1680, 1635 (CO's) and 1610 (C=N). Its ^{1}H NMR (δ ppm) showed signals at $\delta = 1.85$ (s, 1H, CH_3), 6.35 (s, 3H, thiazole C-5), and 6.95–7.77 (m, 9H, ArH's).

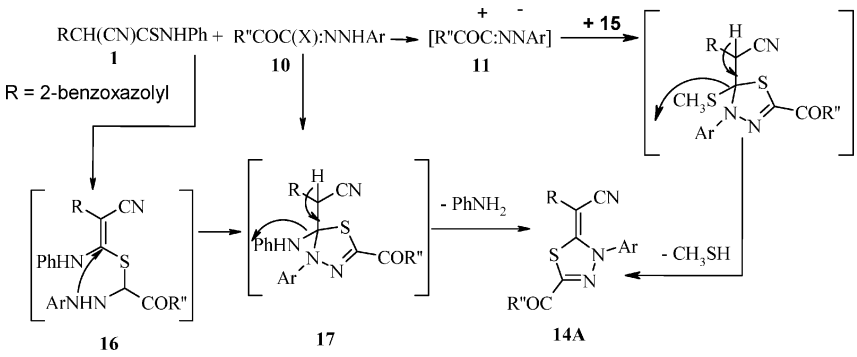
Treatment of thioanilide **1** with the appropriate hydrazonoyl halides **10a–e** in presence of potassium hydroxide to give 2,3-dihydro-1,3,4-thiadiazole derivatives **14a–e**, respectively (Scheme 2). Structure **14** was confirmed by elemental analysis, spectral data, and alternative method synthesis. Thus, ^{1}H NMR spectrum of **14a** showed signals at $\delta = 1.35$ (t, 3H, CH_3 CH_2), 4.55 (q, 2H, CH_2 CH_3), and 7.25 (m, 9H, ArH's). Its IR spectrum revealed band at 2204 (CN), 1743 (CO) and 1610 (C=N). ^{1}H NMR (δ ppm) spectrum of **14b** showed signals at $\delta = 1.35$ (t, 3H, CH_3 CH_2), 2.45 (s, 3H, 4-$CH_3C_6H_4$), 4.45 (q, 2H, CH_2 CH_3), and 7.25–7.80 (m, 8H, ArH's). Meanwhile, the product seemed to be one of two isomeric structures, **14a**, and **14b**. By M.O. calculation using Hyper-Chem and MBI_3 method indicated the isomeric **14a** more stable than isomeric **14b** (Scheme 2).

The formation of product **14** can be explained via elimination of aniline from the cycloadduct of nitrile imide **11** (which generated in situ by treatment of hydrazonoyl chloride **16** with base) to CS double bond of thioanilide **1** or by stepwise path involving substitution to give a cyclic hydrazone **16**, which easy transferred to cyclic intermediate **17**. The latter gave**14** via elimination of aniline (Scheme 3).

An unequivocal support for structure **14a**, came from reaction of the appropriate *C*-ethoxycarbonyl-*N*-phenylhydrazonoyl chloride **10a** with



SCHEME 2

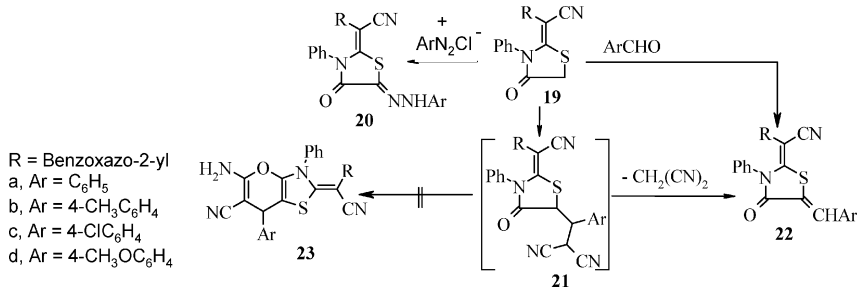


SCHEME 3

2-benzoxazol-2-yl-3-methylthio-3-sulfanylprop-2-enenitrile **15**, which prepared from 2-benzoxazol-2-yl-ethanenitrile with carbon disulfide in *N*,*N*-dimethylformamide containing potassium hydroxide followed by addition of iodomethane, in presence of triethylamine gave product

identical in all aspects (m.p., mixed m.p. and spectra) with **14a** via elimination of methyl mercaptan (Scheme 3).

On the other hand, treatment of the appropriate arenediazonium chloride with 2-benzoxazol-2-yl-2(4-oxo-3-phenylthiadiazolidin-2-ylidene)ethanenitrile[4] (**19**) in pyridine gave 2-{5-[aza(arylamino)-methylene]-4-oxo-3-phenylthiadiazolin-2-ylidene)}-2-benzoxazol-2-yl-ethane-nitrile **20**(**a**,**b**) (Scheme 4). Structure **20** was confirmed by elemental analysis and spectral data. Thus, IR spectra of **20** revealed bands at 2210 (CN), 1741 (CO), and 1610 (C=N). ^{1}H NMR spectrum of **20b** showed signals at δ 2.23 (s, 4-$CH_3C_6H_4$), 7.25–7.77 (m, 13H, ArH's), and 13.12 (s, br., 1H, NH).



SCHEME 4

Also, treatment of **19** with (phenylmethylene)methane-1,1-dicarbonitrile in ethanoic triethylamine under reflux gave 2-benzoxazol-2-yl-2-[4-oxo-3-phenyl-5-(phenylmethylene)(1,3-thiazolidin-2-ylidene)-ethanenitrile (**22a**). Structure of **22** was elucidated by elemental analysis, spectral data, and alternative synthetic method. IR spectrum of **22a** revealed bands at 3060 (CH, vinyl) 2216 (CN), 1708 (CO) and 1604 (C=N). Its ^{1}H NMR spectrum showed signals at δ = 7.22–7.75 (m, 9H, ArH'S) and 8.55 (s, 1H, CH=). Thus, compound **19** reacted with the benzaldehyde in ethanol containing catalytic amount of piperidine afforded product identical in all respects (mp, mixed m.p., and spectra) with**22a**. The reaction can be explained via Michael addition between **19** and (phenylmethylene)methane-1,1-dicarbonitrile in ethanoic triethylamine afforded intermediate **21**, which readily converted to **22a** *via* elimination of malononitrile and did not give 5-amino-2-(benzoxazol-2-ylcyanomethylene)-3,7-diphenyl-4H-pyran[2,3-*d*]1,3-thiazoline-6-carbonitrile (**23**) (Scheme 4).

EXPERIMENTAL

All melting points were uncorrected. IR spectra were recorded (KBr disc) on a Shimadzu FT-IR 8201 PC Spectrophotometer. ^{1}H-NMR spectra were recorded in $CDCl_3$or $(CD_3)_3SO$ on a Varian Gemini 200 MHz Spectrometer and chemical shifts were expressed in units using TMS as an internal reference. MS spectra were recorded on a GC-MS GP 1000 Shimadzu, Japan. Elemental analyses were carried out at the Microanalytical Center, Cairo University, Giza, Egypt and National Research Center. Hydrazonoyl halides[6–12]**10a–e**, 2-benzoxazol-2-ylethanenitrile,[13,14] and **1**[4] were prepared according to previous methods in literature.

Synthesis of 2-Benzoxazol-2-yl-3-(2-oxopropylthio)-3-(phenylamino)prop-2-enenitrile (2a) and 2-Benzoxazol-2-yl-3-(2-oxo-2-phenylethylthio)-3-(phenylamino)prop-2-enenitrile (2b)

To a mixture of 2-benzoxazol-2-ylethanenitrile (1.58 g, 10 mmol), potassium hydroxide (0.56 g, 10 mmol) and phenyl isothiocyanate (1.35 g, 10 mmol) in dry *N*, *N*-dimethylformamide (10 mL) was stirred for 2 h. Chloroacetone or phenacyl bromide (10 mmol) was added and the mixture was stirred for 2 h, and then diluted with water (10 mL). The solid product was collected by filtration, washed with water, and recrystallized from the proper solvent to give**8a** and **8b** (Tables I and II).

1-[3-Amino-4-benzoxazol-2-yl-5-(phenylamino)-2-thienyl]ethane-1-one (3a), and 1-[3-Amino-4-benzoxa-zol-2-yl-5-(phenylamino)-2-thienyl]phenyl-1-one (3b)

A mixture of the appropriate compounds **2a** or**2b** (10 mmol) in ethanol (50 mL) and (5 drops) piperidine was refluxed for 2 h. The reaction mixture was left to cool; the resulting product was collected and recrystallized from the proper solvent to give **3a** and **3b** (Tables I and II).

2-Benzoxazol-2-yl-2-[4-methyl-3-phenylthiazolin-2-ylidene]ethanenitrile (4a) and 2-Benzoxazol-2-yl-2-(3,4-Diphnylthiazolidin-2-ylidene ethanenitrile (4b)

A mixture of the appropriate weight of the compound **2a** (1.04 g, 3 mmol) or **2b** (1.23 g, 3 mmol)) and concentrated sulfuric acid (10 mL) was stirred for 1 h at room temperature. The reaction mixture was poured

TABLE I Characterization Data of the Newly Synthesized Compound

Compd. no.	M.p., °C solvent	Yield % color	Mol. formula mol. wt.	% Analyses, calcd./found C	H	N	S
2a	173–175	71	$C_{19}H_{15}N_3O_2S$	65.30	4.32	12.02	9.17
	EtOH	Colorless	349.40	65.50	4.00	12.40	9.30
2b	156–158	55	$C_{24}H_{17}N_3O_2S$	70.03	4.96	10.21	7.80
	EtOH	Colorless	411.46	70.20	4.60	9.91	7.70
3a	264–267	48	$C_{19}H_{13}N_3OS$	68.86	3.95	12.68	9.67
	Benzene	Yellow	331.37	68.57	3.72	12.52	9.63
3b	275–278	50	$C_{24}H_{15}N_3OS$	73.25	3.84	10.68	8.14
	Benzene	Yellow	393.45	73.10	3.72	10.54	8.21
4a	245	74	$C_{19}H_{15}N_3O_2S.$	65.30	4.32	12.20	8.80
	Dioxan	Pale yellow	349.40	65.60	4.30	12.20	8.80
4b	205–207	48	$C_{24}H_{17}N_3O_2S,$	70.05	4.16	10.21	7.79
	Dioxan	Pale yellow	411.46	70.00	4.40	10.10	8.00
7	297–300	34	$C_{21}H_{15}N_3O_2S$	67.54	4.04	11.25	8.58
	Dioxan	Pale yellow	373.40	67.00	4.06	11.21	8.60
8	175	31	$C_{20}H_{17}N_3O_3S$	63.30	4.51	11.07	8.45
	EtOH	Pale yellow	379.42	63.50	4.40	11.09	8.44
9	220–222	34	$C_{20}H_{13}N_3O_3S$	63.98	3.49	11.19	8.54
	Dioxan	Pale yellow	375.39	63.90	3.30	11.40	8.80
14Aa	265–267	71	$C_{20}H_{14}N_4O_3S$	61.52	3.61	14.35	8.21
	AcOH	Yellow	390.38	61.08	3.80	14.12	8.11
14Ab	233–235	66	$C_{21}H_{16}N_4O_3S$	62.36	3.98	13.85	7.91
	AcOH	Yellow	404.40	62.10	3.78	13.60	7.82
14Ac	314–316	64	$C_{24}H_{15}N_5O_2S$	65.89	3.45	16.00	7.32
	AcOH	Yellow	437.44	65.90	3.20	15.93	7.19
14Ad	272–274	75	$C_{19}H_{12}N_4O_2S$	63.32	3.35	15.54	8.89
	AcOH	Yellow	360.37	63.10	3.50	15.30	8.70
14Ae	310–312	66	$C_{24}H_{14}N_4O_2S$	68.23	3.34	13.26	7.58
	AcOH	Orange	422.43	68.24	3.31	13.27	7.50
20a	310–312	48	$C_{24}H_{15}N_5O_2S$	65.85	3.45	16.06	7.31
	EtOH	Yellow	437.7	65.62	3.30	16.00	7.10
20b	305–307	55	$C_{25}H_{17}N_5O_2S$	66.51	3.79	15.51	7.08
	EtOH	Yellow	451.40	66.30	3.50	15.30	7.00
22a	>350	45	$C_{25}H_{15}N_3O_2S$	71.24	3.58	9.97	7.60
	EtOH	Yellow	421.46	71.60	3.80	9.80	7.50
22b	335–336	41	$C_{26}H_{17}N_3O_2S$	71.70	3.93	9.64	7.36
	EtOH	Yellow	435.47	71.60	3.91	9.80	7.50
22c	338–340	42	$C_{25}H_{14}N_3O_2SCl$	65.86	3.09	9.21	7.03
	EtOH	Yellow	455.89	65.60	3.00	9.30	7.04
22d	330–333	42	$C_{26}H_{17}N_3O_3S$	69.16	3.79	9.30	7.10
	EtOH	Yellow	451.47	69.09	3.65	9.10	7.00

TABLE II IR Spectra, ^{1}HNMR Spectra and Mass Spectra of the Newly Synthesized Compounds

Comp. no.	Spectral data
2b	IR (KBr): 2202 (CN) and 1604 (CO). ^{1}H NMR ($CDCl_3$): 3.6 (d, 2H, CH_2), 6.8–7.7 (m, 15H, ArH's and NH).
3b	IR (KBr): 2188 (CN). ^{1}H NMR ($CDCl_3$): 7.22–7.77 (m, 15H, ArH's and thiazole C-5).
4b	IR (KBr): 3440, 3220 (NH_2) and 1604 (CO). ^{1}H NMR ($CDCl_3$, δ ppm): 7.21–7.38 (m, 14H, ArH's) and 11.18 (s, br, 3H, NH_2 and NH).
7	IR (KBr): 2194 (CN), 1675 (CO) and 1602 (C═N). ^{1}H NMR ($CDCl_3$): 2.25 (s, 3H, CH_3─CO), 2.65 (s, 3H, CH_3, thiazolo C-4) and 7.22–7.85 (m, 9H, ArH's).
14Aa	IR (KBr): 2204 (CN), 1743 (CO) and 1610 (C═N). ^{1}H NMR ($CDCl_3$): 1.35 (t, 3H, CH_3-CH_2), 4.55 (q, 2H, CH_2─CH_3) and 7.2–7.7 (m, 9H, ArH's).
14Ab	IR (KBr): 2209 (CN), 1745 (CO) and 1610 (C═N). ^{1}H NMR ($CDCl_3$): 1.35 (t, 3H, CH_3CH_2), 2.45 (s, 3H, $4CH_3C_6H_4$), 4.45 (q, 2H, CH_2─CH_3) and 7.25–7.80 (m, 8H, ArH's).
14Ac	IR (KBr): 2204 (CN), 1743 (C═O) and 1610 (C═N). ^{1}H NMR ($CDCl_3$): 7.28–7.90 (m, 14H, ArH's), 11.1 (s, 1H, NH).
14Ad	IR (KBr): 2204 (CN), 1743 (CO) and 1610 (C═N). ^{1}H NMR ($CDCl_3$): ppm): 2.45 (s, 3H, CH_3─CO) and 7.25 (m, 9H, ArH's).
14Ae	IR (KBr): 2202 (CN), 1645 (CO) and 1610 (C═N). ^{1}H NMR ($CDCl_3$): 7.25–7.80 (m, 14H, ArH's).
20a	IR (KBr): 2210 (CN), 1741 (CO) and 1610 (C═N). ^{1}H NMR ($CDCl_3$): 7.2–7.6 (m, 14H, ArH's) and 13.12 (s, 1H, NH).
20b	IR (KBr): 2208 (CN), 1743 (CO) and 1606 (C═N). ^{1}H NMR ($CDCl_3$): 2.23 (s, 3H, 4-CH_3PH), 7.25–7.77(m, 13H, ArH's) and 13.12 (s, br, 1H, NH).
22b	IR (KBr): 3025 (CH-vinyl), 2213 (CN), 1710 (CO). ^{1}H NMR ($CDCl_3$, δ ppm): 7.26–7.90 (m, 9H, ArH's), 2.47 (s, 3H, CH_3).
22c	IR (KBr): 3025 (CH-vinyl), 2211 (CN), 1706 (CO). ^{1}H NMR ($CDCl_3$): 7.40–7.90 (m, 9H, ArH's)

onto ice (50 g). The resulting solid was collected and crystallized from benzene to give **4a** and **4b**, respectively (Tables I and II).

Reaction of Thionilide 1 with Ethyl 2-Chloro-3-oxobutanoate

Ethyl 2-chloro-3-oxobutanoate (1.64 g, 10 mmol) was added to a mixture of compound **1** (2.93 g, 10 mmol) in dry *N*, *N*-dimethylformamide (10 mL) containing potassium hydroxide (0.056 g, 10 mmol). The reaction mixture was stirred for 2 h, and then left overnight, the resulting solid was purified via column of silica gel and ethyl acetate as eluent to give two compounds **8** and **9**, respectively (Tables I and II).

Reaction of Thionilide 1 with 3-Chloropentane-2,4-dione

A mixture of equimolar amount of compound**1**, potassium hydroxide and 3-chloropentane-2,4-dione (5 mmol each) in *N*, *N*-dimethylformamide (20 mL) was stirred for 2 h and left overnight. The resulting solid was collected and crystallized from dioxan to give **4** (Tables I and II). The second fraction, which did not dissolve in hot dioxan, was crystallized from acetic acid to give product identical in all aspects (m.p., mixed m.p., and spectra) with compound **3a**.

Synthesis of 2,3-Dihydro-1,3,4-thiadiazole Derivatives 14a-e

Method A

A mixture of benzoxazol-2-ylethanenitrile (1.58 g, 10 mmol), carbon disulfide (0.7 g, 10 mmol) and potassium hydroxide (0.56 g, 10 mmol) in *N*, *N*-dimethylformamide (15 mL) was stirred at room temperature for 1 hr. Iodomethane (1.4 g, 0.62 mL, 10 mmol) was added to the mixture. The reaction mixture was stirred for 2 h. The appropriate of hydrazonyl halides **10a-e** (10 mmol) and triethylamine (1.5 mL, 10 mmol) were added to the above mixture, and then the reaction mixture was stirred for 2 h. The resulting solid was collected and crystallized to give **14a-e**, respectively (Tables I and II).

Method B

A mixture of 2-benzoxazol-2-ylethanenitrile (1.56 g, 10 mmol), potassium hydroxide (0.56 g, 10 mmol) and phenyl isothiocyanate (1.35 g, 10 mmol) in dry *N*, *N*-dimethylformamide (10 ml) was stirred for 6 h, then add the appropriate hydrazonoyl halides **10a-e** (10 mmol) and stirring was continued for 2 h. The reaction mixture was left overnight then diluted with water (10 mL). The solid was collected by filtration, washed with water, dried, and crystallized from acetic acid to give products were identical in all respects that (m.p., mixed m.p. and spectra) with **14a-e** that were obtained from Method A.

Synthesis of 5-Aza-2-benzoxazol-2-yl-(4-oxo-3-phenyl)-5-phenylamino(3-thiazolidine-2-ylidine)ethanenitrile (20a) and 5-Aza-2-benzoxazol-2-yl-(4-oxo-3-phenyl)-5-methylphenylamino(3-thiazolidine-2-ylidine)ethanenitrile (20b)

To a cold solution of 2-benzoxazol-2-yl-(4-oxo-3-phenyl)-3-thiazolidine-2-ylidine)ethanenitrile (**19**) (1.66 g, 5 mmol) in pyridine (20 mL)-sodium hydroxide (0.2 g) solution The appropriate diazonium chloride

[prepared by adding sodium nitrite (0.35 g, 5 mmol in water) to a cold solution of the appropriate aromatic amine (5 mmol) was added while stirring for 1 h. The resulting solid was collected and recrystallized from ethanol to give compounds **20**(**a**,**b**) (Tables I and II).

2-Benzoxazol-2-yl-2-[4-oxo-3-phenyl-5-(arylmethylene)-(1,3-thiazolidin-2-ylidine)-ethanenitrile (22a-d)

Method A

A mixture of 2-benzoxazol-2-yl-(4-oxo-3-phenyl)-3-thiazolidine-2-ylidine)ethanenitrile (**19**) (1.66 g, 5 mmol) and the appropriate of aldehyde (5 mmol) in ethanol (20 mL). Sodium ethoxide solution was added to the above mixture while stirring. The resulting solid was collected and recrystallized to give **22a-d** (Tables I and II).

Method B

A mixture of **19** (1.66 g, 5 mmol) and the appropriate of 1-cyano-2-arylacrylonitrie (5 mmol) in ethanol (20 mL) and few drops of triethylamine was heated under reflux for 3 h. The resulting solid was collected and recrystallized to give product identical in all respects (m.p., mixed m.p., and spectra) with products obtained in Method A.

REFERENCES

[1] C. D. Withrow, *Adv. Neurol.*, **27,** 577 (1980).
[2] E. Tubaro, *Boll. Chem. Form.*, **104,** 602 (1965).
[3] P. Wipf, *Chem. Rev.*, **95,** 2115 (1995).
[4] M. Augustin and W. Doelling, *J. Prakt. Chem.*, 324, 322 (1982).
[5] L. T. Bellamy, *The infrared spectra of complex molecules* (John Wiley and Sons, Inc., New York, 1978).
[6] G. Favrel and J. Chvz, *Bull. Soc. Chem. France*, **41,** 1603 (1927).
[7] G. Favrel and R. Justoni, *Gazz. Chem. Ital.*, **67,** 3 (1937).
[8] A. S. Shawali and A. Osman, *Tetrahedron*, **27,** 2528 (1971).
[9] N. F. Eweiss and A. Osman, *J. Heterocycl. Chem.*, **17,** 1713 (1980).
[10] A. S. Shawali and A. O. Abdelhamid, *Bull. Chem. Soc. Jpn.*, **49,** 321 (1976).
[11] A. O. Abdelhamid and F. A. Attaby, *J. Heterocyclic Chem.*, **28,** 41 (1991).
[12] A. O. Abdelhamid and F. A. Attaby, *J. Heterocyclic Chem.*, **28,** 41 (1991).
[13] E. I. Gorbatov, *Neft Gaz Prod.*, 179 (1971); from *Ref. Zh. Khim.*, (1972), Abstr. No 5 Zh 193; *Chem. Abstr.*, **78,** 3644i (1973).
[14] P. Loew, H. Schwandez, and H. Kristinsson (Ciba Geigy A. G.) Ger. Offen. 2, 632, 402 (Cl. Co 7D 263/32), 10 Feb 1977; Swiss Appl. 75/9, 503, 21 Jul 1975; 15 pp; *Chem. Abstr.*, **86,** 189,939c (1977).