Synthesis and Reactions of Some New thieno[2,3-b]quinolines and pyrrolylthienoquinolines

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Síntesis y reacciones de algunas nuevas tieno[2,3-b]quinolinas y pirroliltienoquinolinas

Síntesi i reaccions d'algunes noves tieno[2,3-b]quinolines i pirroliltienoquinolines

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RESUMEN

Se sintetiza 8-benciliden-3-ciano-4-fenil-5,6,7,8-tetrahidroquinolin-2(1*H*)tiona (2) y se usa como producto de partida para la síntesis de heterociclos policondensados, tales como tienoquinolinas, oxadiazoliltienoquinolinas y pirroliltienoquinolinas.

Palabras clave: Síntesis, tienoquinolinas, pirroliltienoquinolinas, oxadiazolilquinolinas.

SUMMARY

8-Benzylidene-3-cyano-4-phenyl-5,6,7,8-tetrahydroquinolin-2(1*H*)thione (2) was synthesized and used as starting material for the synthesis of poly fused heterocycles e.g thienoquinolines, oxadiazolylthienoquinolines and pyrrolylthienoquinolines

Key words: Synthesis, Thienoquinolines, pyrrolylthienoquinolines, oxadiazolylquinolines.

RESUM

Es sintetitza 8-benziliden-3-ciano-4-fenil-5,6,7,8-tetrahidroquinolin-2(1*H*)tiona (2) i s'empra com a producte de partida per a la síntesi d'heterocicles policondensats, tals com tienoquinolines, oxadiazoliltienoquinolines i pirroliltienoquinolines.

Mots clau: Síntesi, tienoquinolines, pirroliltienoquinolines, oxadiazolilquinolines.

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INTRODUCTION

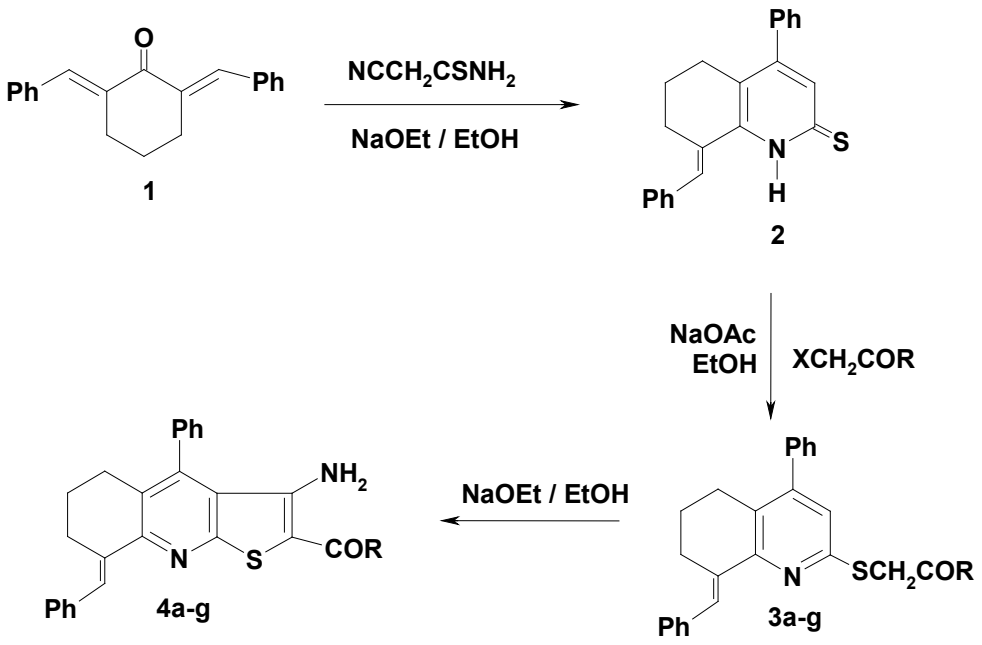
An increasing interest in thienoquinolines derivatives in recent years has been caused by the fact that this kind of heterocycle possess a broad spectrum of biological activities. Some of them are useful as memory enhancers [1], anti-allergics [2], antiinflammatorics, immunoregulators, analgesics and antipyretics [3]. Others are reported to exhibit a good antibacterial [4-6] and antianaphylactic[7] activity. On the other hand, several series of heterocyclic compounds possessing a bridgehead pyrrolyl moiety play a vital role in many biological activities [7-9].

RESULTS AND DISCUSSION

The starting compound 8-benzylidene-3-cyano-4-phenyl-5,6,7,8-tetrahydroquinoline(1*H*)thione 2 was synthesized by reacting the dibenzylidene cyclohexanone 1 with cyanothioacetamide in the presence of ethanolic sodium ethoxide as basic catalyst, the hexahydro derivative was firstly separated which on refluxing in absolute ethanol was converted to the desired tetrahydro quinoline derivative 2. Quinolin-2(1*H*)thione 2 was reacted with different halo derivative namely chloroacetone, ethyl chloroacetate, chloroacetamide, chloroanilides and phenacyl bromide in ethanol containing anhydrous sodium acetate to give 2-substituted derivatives 3a-g. Thieno[2,3-*b*]quinolines 4a-g were obtained by refluxing the intermediates 3a-g in ethanolic sodium ethoxide solution.

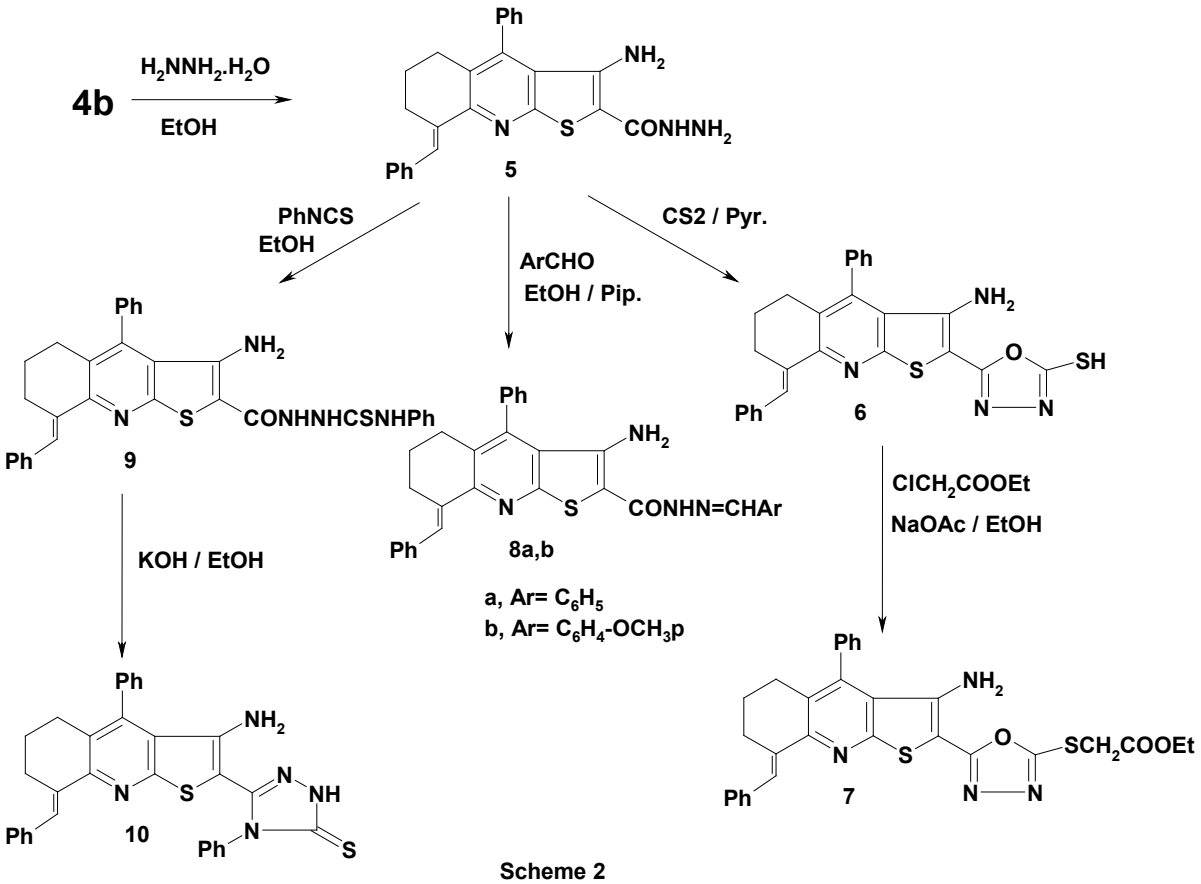
The IR spectra of the cyclized products Revealed the disappearance of bands corresponding cyano group and appear of the two bands for the amino group, (Scheme 1). Hydrazonolysis of ethyl 3-amino-8-benzylidene-4-phenyl-5,6,7,8-tetrahydro- thieno[2,3-*b*]quinoline 2-carboxylate 4b leads to the formation of the corresponding carbohydrazide derivative 5 (Scheme 2). Several thienoquinolines substituted at position-2 with different heterocyclic residues were obtained via treatment of 5 with different reagents. Thus, the mercaptooxadiazolyl derivative 6 was synthesized from the reaction of 5 with carbon disulfide in pyridine. The mercaptooxadiazolyl compound 6 was easily converted into the corresponding S-alkylated product 7 upon treatment with ethyl chloroacetate in ethanol containing anhydrous sodium acetate. Also, the carbohydrazide 5 easily condensed with aromatic aldehydes in ethanol in the presence of piperidine as basic catalyst to afford the arylidenehyrazono derivatives 8a,b. On the other hand, 5 was reacted with phenyl isothiocyanate in absolute ethanol to give the thiosemicarbazide derivative 9 which in turn was cyclized by the action of alcoholic potassium hydroxide to afford finally the triazolthione 10, (Scheme 2).

The amino groups of 4a,b were converted into the 1-pyrrolyl moiety via the interaction with 2,5-dimethoxytetrahydrfuran in boiling acetic acid to afford the corresponding pyrrolyl derivatives 11a,b in good yield . IR spectra of the pyrrolyl derivatives represent the disappearance of the bands corresponding the amino group and high value for the carbonyl group as a result of cancel of the ortho amino carbonyl effect. On the other hand 1HNMR spectra of compounds 11a,b showed bands characteristic for two sets of pyrrole CH protons.

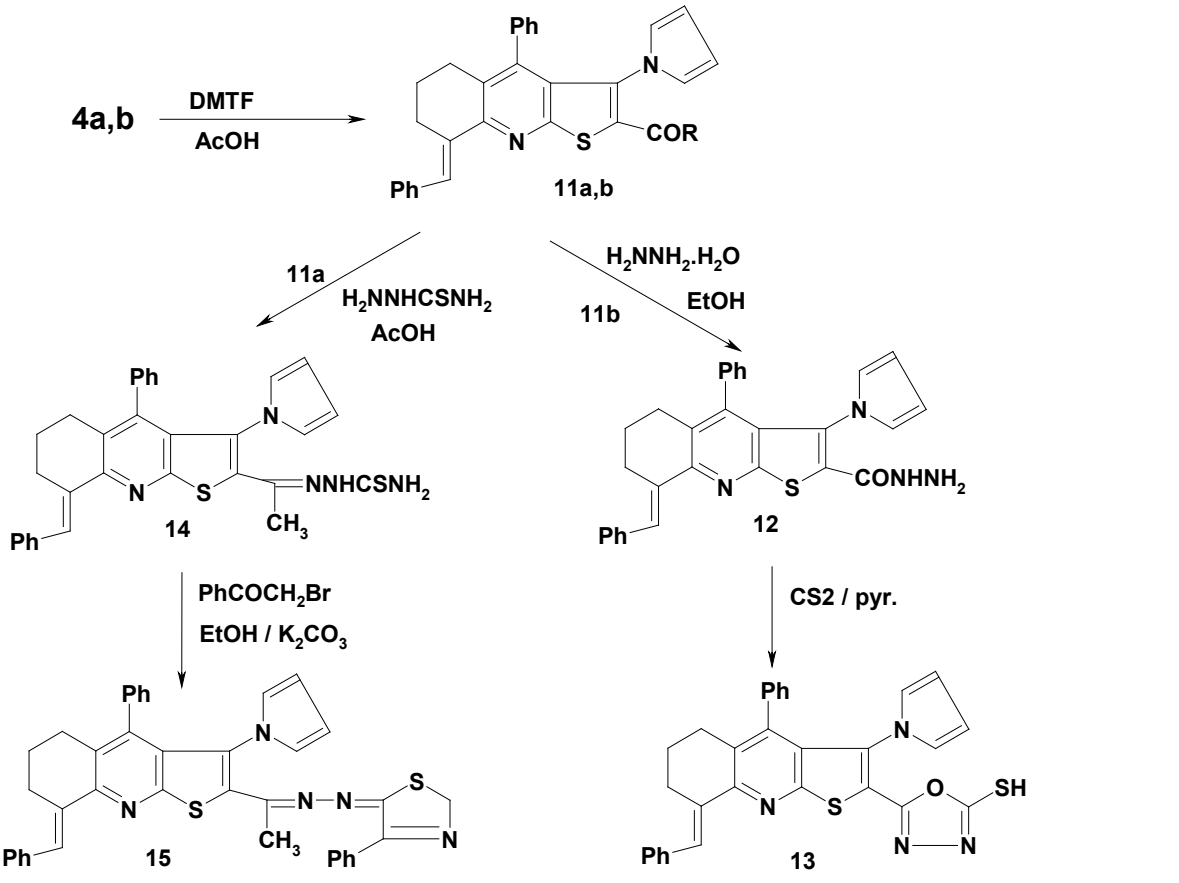


a, R= CH_3 **e, R= NHC_6H_4-Clp**
b, R= OEt **f, R= NHC_6H4-CH_3p**
c, R= NH_2 **g, R= Ph**
d, R= NHPh

Scheme 1



Scheme 2



Scheme 3

Ethyl 8-benzylidene-4-phenyl-3-pyrrolyl-5,6,7,8 tetrahydrothieno[2,3-*b*]quinoline 2-carboxylate 11b was subjected to react with hydrazine hydrate in refluxing ethanol to give the corresponding carbohydrazide derivative 12 (Scheme 3). The mercaptooxadiazolyl derivative 13 was synthesized from the reaction of 12 with carbon disulfide in pyridine.

On the other hand, 2-acetyl-3-pyrrolyl derivative 11a was allowed to react with thiosemicarbazide in glacial acetic acid to give the corresponding thiosemicarbazone 14, which was further reacted with phenacyl bromide in boiling ethanol in the presence of anhydrous potassium carbonate to afford the thiazoline derivative 15 in a considerable yield.

EXPERIMENTAL

Melting points are uncorrected and were measured on a Gallenkamp apparatus. IR spectra were recorded on a Pye-Unicam SP3-100 spectrophotometer using KBr discs. ^{1}H NMR spectra were obtained with a Jeol LA 400 MHz FT.NMR spectrometer (d in ppm). MS on a Jeol JMS-600 mass spectrometer. Elemental analyses were determined using a Perkin-Elmer 240C microanalyzer and all compounds gave results in acceptable range.

Table 1 *Physical and spectral data of compounds 2-15.*

Compd.no	Mp(oC) (Yield %)	Mol. Formula (M.wt.)	IR(cm^{-1})	1HNMR(d;ppm)
2	170 59	$C_{23}H_{18}N_2S$ (354.47)	2200 (CN) 1230 (C=S)	($CDCl_3$)1.7-1.9(m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 7.3-7.7 (m, 10H, Ar-H), 8.1(s, 1H, CH)
3a	182 72	$C_{26}H_{22}N_2OS$ (410.53)	2200 (CN) 1645 (CO)	($CDCl_3$) 1.7-1.9(m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 2.5 (s, 3H, CH_3), 4.1(s, 2H, CH_2) 7.3-7.7(m, 10H, Ar-H), 8.1(s, 1H, CH)
3b	150 81	$C_{27}H_{24}N_2O_2S$ (440.56)	2200 (CN), 1730 (CO)	($CDCl_3$) 1.7-1.9(m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 2.1-2.3(t, 2H, CH_2), 4.1(s, 2H, CH_2), 4.2-4.4(q, 2H, CH_2), 7.3-7.8(m, 10H, Ar-H), 8.1(s, 1H, CH)
3c	210 68	$C_{25}H_{21}N_3OS$ (411.52)	2200 (CN); 3400, 3360 (NH2); 1660 (CO)	($CDCl_3$) 1.7-1.9(m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2),5.3 (br, 2H, NH_2), 4.1(s, 2H, CH_2), 7.3-7.7(m, 10H, Ar-H), 8.1(s, 1H, CH)
3d	220 74	$C_{31}H_{25}N_3OS$ (487.62)	2200 (CN); 3360 (NH); 1665 (CO)	($CDCl_3$) 1.7-1.9(m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 9.8 (s, 1H, NH), 4.1(s, 2H, CH_2), 7.2-7.8 (m, 15H, Ar-H), 8.1(s, 1H, CH)
3e	255 78	$C_{31}H_{24}ClN_3OS$ (522.06)	2200 (CN); 3300 (NH); 1660 (CO)	($CDCl_3$) 1.7-1.9(m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2),9.5 (s, 1H, NH), 4.1(s, 2H, CH_2), 7.3-7.7(m, 14H, Ar-H), 8.1(s, 1H, CH)
3f	140 58	$C_{32}H_{27}N_3OS$ (501.64)	2200 (CN); 3320 (NH); 1660 (CO)	($CDCl_3$) 1.7-1.9(m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 4.1(q, 2H, CH_2), 1.8 (s, 3H, CH_3), 7.3-7.7(m, 14H, Ar-H), 8.1(s, 1H, CH), 9.5 (s, 1H, NH)
3g	155 77	$C_{31}H_{24}N_2OS$ (472.60)	2200 (CN); 1660 (CO)	($CDCl_3$) 1.7-1.9(m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 4.1 (s, 2H, CH_2), 7.3-7.7 (m, 15H, Ar-H), 8.1(s, 1H, CH)
4a	216 79	$C_{26}H_{22}N_2OS$ (410.53)	3450, 3280 (NH_2) ; 1675 (CO)	($CDCl_3$) 1.7-1.9(m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 1.5 (s, 3H, CH_3), 6.20 (s, 2H, NH_2), 7.3-7.7(m, 10H, Ar-H), 8.1(s, 1H, CH)
4b	280 82	$C_{27}H_24N_2O_2S$ (440.56)	3500, 3400 (NH_2), 1690 (CO)	($CDCl_3$) 1.7-1.9(m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 4.3 (q, 2H, CH_2), 5.4 (br, 2H, NH_2), 1.4 (t, 3H, CH_3), 7.3-7.7(m, 10H, Ar-H), 8.1(s, 1H, CH)
4c	235 66	$C_25H_{21}N_3OS$ (411.52)	3390, 3300 (NH_2) ; 1645 (CO).	($CDCl_3$) 1.7-1.9(m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 5.4-5.6 (br, 4H, 2NH_2), 7.3-7.7(m, 10H, Ar-H), 8.1(s, 1H, CH)
4d	130 58	$C_{31}H_{25}N_3OS$ (487.62)	3480, 3400 (NH_2) ; 1660 (CO)	($CDCl_3$) 1.7-1.9(m, 2H, CH2), 2.5 (t, 2H, CH2), 3.0 (t, 2H, CH2),11.4 (s, 1H, NH), 7.3-7.7(m, 15H, Ar-H), 8.1(s, 1H, CH)
4e	145 61	$C_{31}H_{24}ClN_3OS$ (522.06)	3480,3360 (NH_2), 1640(CO)	($CDCl_3$) 1.7-1.9 (m, 2H, CH2), 2.5 (t, 2H, CH2), 3.0 (t, 2H, CH2), 11.2 (s, 1H, NH), 7.3-7.7(m, 14H, Ar-H), 8.1(s, 1H, CH).
4f	230 66	$C_{32}H_{27}N_3OS$ (501.64)	3450, 3360 (NH_2) ; 1650 (CO)	($CDCl_3$) 1.3 (s, 3H, CH_3), 1.7-1.9 (m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 11.3 (s, 1H, NH), 7.3-7.7(m, 14H, Ar-H), 8.1(s, 1H, CH).
4g	185 79	$C_{31}H_{24}N_2OS$ (472.60)	3480, 3400 (NH_2) ; 1670 (CO)	($CDCl_3$) 1.7-1.9 (m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 5.3 (br, 2H, NH_2), 7.3-7.7(m, 15H, Ar-H), 8.1(s, 1H, CH).
5	255 63	$C_{25}H_{22}N_4OS$ (426.53)	3460, 3400 (NH_2)	(DMSO-d6) 1.5-1.6 (m, 2H, CH_2), 2.3 (t, 2H, CH_2), 2.8 (t, 2H, CH_2), 8.3 (s, 4H, 2NH_2), 7.3-7.7(m, 10H, Ar-H), 8.1(s, 1H, CH),10.3 (s, 1H, NH).

6	240 77	$C_{26}H_{20}N_4OS_2$ (468.59)	3460, 3400 (NH, NH2) ; 1680 (CO)	($CDCl_3$) 1.7-1.9 (m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.0 (t, 2H, CH_2), 5.5 (br, 2H, NH_2), 7.3-7.7(m, 10H, Ar-H), 8.1(s, 1H, CH).
7	245 79	$C_{30}H_{26}N_4O_3S_2$ (554.68)	3450, 3290 (NH_2) ; 1650 (CO)	(DMSO-d6) 1.3-1.7(m, 2H, CH_2), 2.2 (t, 2H, CH_2), 2.8 (t, 2H, CH_2), 5.2-5.4 (br, 2H, NH_2), 4.1(q, 2H, CH_2), 1.8 (s, 3H, CH_3), 7.3-7.6(m, 10H, Ar-H), 8.4(s, 1H, CH)
8a	332 67	$C_{32}H_{26}N_4OS$ (514.64)	3480, 3400, 3360 (NH_2, NH); 1660 (CO)	(DMSO-d6) 1.3-1.5 (m, 2H, CH_2), 2.2 (t, 2H, CH_2), 2.7 (t, 2H, CH_2), 6.5 (s, 2H, NH_2), 7.0-7.7(m, 15H, Ar-H+ N=CH-), 8.3(s, 1H, CH), 10.2 (s, 1H, NH).
8b	320 71	$C_{33}H_{24}N_4O_2S$ (544.67)	3460, 3400, 3280 (NH_2, NH), 1690 (CO)	(CDCl3) 1.5-1.8 (m, 2H, CH_2), 2.5 (t, 2H, CH_2), 3.2 (t, 2H, CH_2), 1.4 (s, 3H, CH_3), 5.5 (s, 2H, NH_2), 7.3-7.9(m, 15H, Ar-H+ N=CH-), 8.3(s, 1H, CH), 10.2 (s, 1H, NH).
9	215 79	$C_{32}H_{27}N_5OS_2$ (561.72)	3400, 3360 (NH_2); 1640 (CO); 1230 (C=S)	(DMSO-d6) 1.3-1.5 (m, 2H, CH_2), 2.2 (t, 2H, CH_2), 2.7 (t, 2H, CH_2), 6.5 (s, 2H, NH_2), 7.0-7.7(m, 15H, Ar-H), 8.3(s, 1H, CH), 8.4, 8.9, 9.8 (3s, 3H, 3NH).
10	155 55	$C_{32}H_{25}N_5S_2$ (543.70)	3460, 3400 (NH_2); 3140 (NH)	(DMSO-d6) 1.5-1.7 (m, 2H, CH_2), 2.4 (t, 2H, CH_2), 2.8 (t, 2H, CH_2), 6.7 (s, 2H, NH_2), 7.2-7.8 (m, 15H, Ar-H), 8.4 (s, 1H, CH), 11.4 (s, H, NH).
11a	270 73	$C_{30}H_{24}N_2OS$ (460.59)	1665 (CO)	($CDCl_3$) 1.7-1.9 (m, 2H, CH_2), 2.5 (t, 2H, CH2), 2.9 (t, 2H, CH_2), 1.3 (s, 3H, CH_3), 5.9 (m, 2H, 2CH pyrrole), 6.4 (m, 2H, 2CH, pyrrole), 7.1-7.7 (m, 10H, Ar-H), 8.2 (s, 1H, CH).
11b	202 82	$C_{31}H_{26}N_2O_2S$ (490.62)	1690	($CDCl_3$) 1.7-1.9 (m, 2H, CH_2), 2.5 (t, 2H, CH_2), 2.9 (t, 2H, CH_2), 1.3 (s, 3H, CH_3), 4.3 (q, 3H, CH_3), 5.8 (m, 2H, 2CH pyrrole), 6.3 (m, 2H, 2CH, pyrrole), 7.1-7.7 (m, 10H, Ar-H), 8.4 (s, 1H, CH).
12	265 66	$C_{29}H_{24}N_4OS$ (476.59)	3400, 3460, 3320 (NH_2, NH); 1680 (CO)	($CDCl_3$) 1.7 (m, 2H, CH_2), 2.5 (t, 2H, CH2), 2.9 (t, 2H, CH_2), 4.1 (br, 2H, NH_2), 5.8 (m, 2H, 2CH pyrrole), 6.1 (s, 1H, NH), 6.4 (m, 2H, 2CH, pyrrole), 7.1-7.7 (m, 10H, Ar-H), 8.3 (s, 1H, CH).
13	235 69	$C_{30}H_{22}N_4OS_2$ (518.65)	2960 (CH aliph.), 1620 (C=N)	(DMSO-d6) 1.7 (m, 2H, CH_2), 2.3 (t, 2H, CH_2), 2.7 (t, 2H, CH_2), 3.2 (s, 1H, SH), 5.8 (m, 2H, 2CH pyrrole), 6.4 (m, 2H, 2CH, pyrrole), 7.2-7.8 (m, 10H, Ar-H), 8.2 (s, 1H, CH)
14	195 78	$C_{31}H_{27}N_5S_2$ (533.71)	3400, 3360, 3310 (NH_2, NH); 1230 (C=S); 1620 (C=N)	($CDCl_3$) 1.8 (m, 2H, CH_2), 2.6 (t, 2H, CH_2), 3.5 (t, 2H, CH_2), 4.3 (br, 2H, NH_2), 5.8 (m, 2H, 2CH pyrrole), 6.4 (m, 2H, 2CH, pyrrole), 7.1-7.7 (m, 10H, Ar-H), 8.3 (s, 1H, CH), 9.7 (s, 1H, NH).
15	280 58	$C_{39}H_{31}N5S_2$ (533.71)	2950 (CH aliph); 1620 (C=N)	($CDCl_3$) 1.6-1.9 (m, 7H, CH_3, $2CH_2$), 2.3-2.5 (t, 2H, CH_2), 3.0-3.2 (t, 2H, CH_2), 5.4 (s, 2H, SCH_2), 5.8 (m, 2H, 2CH pyrrole), 6.2 (m, 2H, 2CH, pyrrole), 7.2-7.8 (m, 15H, Ar-H), 8.2 (s, 1H, CH).

8-Benzylidene-3-cyano-4-phenyl-5,6,7,8-tetrahydroquinolin-2(1*H*)thione (2)

To a solution of dibenzylidenecyclohexanone (0.01 mol) in methanolic sodium methoxide solution (230 mg Na in 50 ml methanol), cyanothioacetamide (0.01 mol) was added. The mixture was heated on water bath for 12 hr, then cool. The solvent was removed under reduced pressure and the residue was acidified with dil. hydrochloric acid. The separated solid was filtered off, air dried and again dissolved in absolute ethanol (50 ml). The mixture was refluxed for two hr, the solid product separated from the hot mixture was filtered off and recrystallised from dioxan into orange crystals.

8-Benzylidene-3-cyano-4-phenyl-2-substituted-5,6,7,8-tetrahydroquinolines (3a-g)

A mixture of 2 (0.01 mol) and α halo compounds namely chloroacetone, ethyl chloroacetate, chloroacetamide, chloroanilides and phenacyl bromide was refluxed in ethanol containing anhydrous sodium acetate for 30 min, then cool. The solid products were filtered off, washed with water and recrystallized from ethanol into pale yellow crystals of 3a-g. The physical and spectral data were summarized in Table 1.

3-Amino-8-benzylidene-4-phenyl-2-substituted-5,6,7,8-tetrahydrothieno[2,3-*b*]quinolines (4a-g)

A mixture of 3a-g (0.01 mol) and ethanolic sodium ethoxide (230 mg Na in 50 ml absolute ethanol) was refluxed for 30 min, then cool. The solid products were filtered off, and recrystallized from ethanol into yellow crystals of 4a-g. The physical and spectral data were summarized in Table 1.

3-Amino-8-benzylidene-4-phenyl-5,6,7,8-tetrahydrothieno[2,3-*b*]quinoline 2-carbohydrazide (5)

A mixture of 4b (0.01 mol) and hydrazine hydrate (3 ml) was refluxed in absolute ethanol (20 ml) for 6h. The solid product separated from the hot mixture was filtered off and recrystallized from dioxane to give pale yellow crystals of the carbohydrazide derivative 5.

3-Amino-8-benzylidene-2-(5-mercapto-1,3,4-oxadiazol-2-yl)-4-phenyl-5,6,7,8-tetrahydrothieno [2,3-*b*] quinoline (6)

A mixture of the carbohydrazide 5 (0.005 mol) and carbon disulfide (4 ml) in pyridine (20 ml) was heated on a water bath for 24h, then cool. The precipitated product was filtered off and washed several times with ethanol. Recrystallisation from acetic acid afforded orange crystals of 6.

3-Amino-8-benzylidene-2-(5-ethoxycarbonylmethylthio-1,3,4-oxadiazol-2-yl)-4-phenyl-5,6,7,8-tetrahydrothieno[2,3-*b*]quinoline (7)
A mixture of 6 (0.005 mol) and ethyl chloroacetate (0.005 mol) in ethanol containing anhydrous sodium acetate (2g) was refluxed for 2h. After cooling, the crude product was filtered off, washed with water and air dried. Recrystallisation from ethanol afford yellow crystals of 7. The physical and spectral data were summarized in Table 1.

Arylidene 3-amino-8-benzylidene-4-phenyl-5,6,7,8-tetrahydrothieno[2,3-*b*]quinoline 2-carbohydrazone (8a,b)
A mixture of the carbohydrazide 5 (0.005 mol) and aromatic aldehydes (0.005 mol) in absolute ethanol (20 ml) in presence of few drops of piperidine as basic catalyst was refluxed for two hr, then cool. The solid product was filtered off and recrystallized from acetic acid into yellow crystals of 8a,b.

Reaction of the carbohydrazide 5 with phenyl isothiocyanate, formation of thiosemicarbazide derivative 9
A mixture of the carbohydrazide 5 (0.01 mol) and phenyl isothiocyanate (0.01 mol) in absolute ethanol (50 ml) was refluxed for 30 min, then cool. The solid product separated from the hot mixture was filtered off and recrystallized from dioxane to give pale yellow crystals of the compound 9.

3-Amino-8-benzylidene-2-(4-phenyl-1,2,4-triazo-5(1*H*)thion-3-yl)-4-phenyl-5,6,7,8-terahydrothieno[2,3-*b*]quinoline (10)
A mixture of thiosemicarbazide derivative (0.005 mol) and alcoholic potassium hydroxide (50 ml 10 %) was refluxed for 3 hr, the solvent was reduced to one half under reduced pressure, then cool. Acidification with dilute hydrochloric acid gave orange precipitate which was, washed with water and air dried. Recrystallisation from acetic acid afford orange crystals of 10. The physical and spectral data were summarized in Table 1.

8-Benzylidene-4-phenyl-3-pyrrolyl-2-substituted-5,6,7,8-terahydrothieno[2,3-*b*]quinolines (11a,b), General proceedure
A mixture of 4a,b (0.01 mol) and 2,5-dimethoxytetrahydrofuran (0.01 mol) in glacial acetic acid (20 ml) was refluxed for 2h, the solvent was reduced to one half of its volume under reduced pressure and then cool. The precipitated products pyrrolyl derivatives were separated and collected by filtration. Recrystallisation from ethanol afford buff crystals of 11a,b. The physical and spectral data were summarized in Table 1.

8-Benzylidene-4-phenyl-3-pyrrolyl-5,6,7,8-tetrahydrothieno[2,3-*b*]quinoline 2-carbohydrazide (12)
A mixture of 11b (0.01 mol) and hydrazine hydrate (4 ml) was refluxed in absolute ethanol (30 ml) for 4h. The solid product separated from the hot mixture was filtered off and recrystallized from dioxan to give pale yellow crystals of the carbohydrazide derivative 12.

8-Benzylidene-2-(5-mercapto-1,3,4-oxadiazol-2-yl)-4-phenyl-3-pyrrolyl-5,6,7,8-tetrahydrothieno [2,3-*b*] quinoline (13)
This compound was synthesized according procedure analogous for the synthesis of compound 6. Compound 13 was crystallized from acetic acid and separated as orange crystals.

Condensation of compound 11a with thiosemicarbazide (formation of thiosemicarbazone 14).
A mixture of 11a (0.01 mol) and thiosemicarbazide (0.01 mol) in glacial acetic acid (20 ml) was refluxed for 2h, then cool. The solvend was removed under reduced pressure and The solid product formed was filtered off, washed with cold ethanol and air dried. Recrystallisation from acetic acid afford yellow crystals of 14. The physical and spectral data were summarized in Table 1.

Reaction of thiosemicarbazone 14 with phenacyl bromide (formation of compounds 15).
A mixture of 14 (0.005 mol) and phenacyl bromide (0.005 mol) in ethanol (30 ml) in the presence of anhydrous potassium carbonate (2g). The mixture was refluxed for 4h, then filtered off, and the solid precipitated on cooling was collected by filtration, washed with water and air dried. Recrystallisation from ethanol afford yellow crystals of 15.

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