

Note

Synthesis of S-hepta-O-acetyl lactosyl-1,5-disubstituted-2-isothiobiurets and 1,5-disubstituted-2,4-isodithiobiurets

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Several S-hepta-O-acetyl lactosyl-1,5-disubstituted-2-isothiobiurets **4** and 1,5-disubstituted-2,4-isodithiobiurets **5** have been synthesized by the interaction of S-hepta-O-acetyl lactosyl-1-arylisothiocarbamides **3** with phenyl isocyanate and phenyl isothiocyanate, respectively. The identities of these newly synthesized compounds are established on the basis of elemental analysis, IR, NMR and mass spectral analysis.

Keywords: Isothiobiurets, isodithiobiurets, arylisothiocarbamides, phenyl isocyanate, phenyl isothiocyanate

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Recently, we have reported a method for the synthesis of S-hepta-O-acetyl lactosyl-1-arylisothiocarbamides **1** by the interaction of hepta-O-acetyl lactosyl bromide² and arylthiocarbamides. In view of the applications of S-lactosyl compounds in medicinal chemistry and in many other ways³, it appeared interesting to synthesize some more thiolactosides. In the present note the synthesis of several S-hepta-O-acetyl lactosyl-1,5-disubstituted-2-isothiobiurets **4** and 1,5-disubstituted-2,4-isodithiobiurets **5** has been reported by the interaction of S-hepta-O-acetyl lactosyl-1-arylisothiocarbamides **3** with phenyl isocyanate and phenyl isothiocyanate⁴, respectively (**Scheme I**).

S-Hepta-O-acetyl lactosyl-1-arylisothiocarbamides **3a-g** on reaction with phenyl isocyanate in dry benzene for 24 hr at room temperature gave clear solution. The benzene solution on trituration with pet. ether (60-80°) furnished granular solids **4** (**Table I**). These solids were purified with ethanol-water. Based on elemental analysis and IR^{5,7}, NMR^{6,10} and mass^{11,12} spectral analysis (see

Experimental) the structures of the compounds were assigned as S-hepta-O-acetyl-lactosyl-1-aryl-5-phenyl-2-isothiobiurets **4a-g** (**Scheme I**).

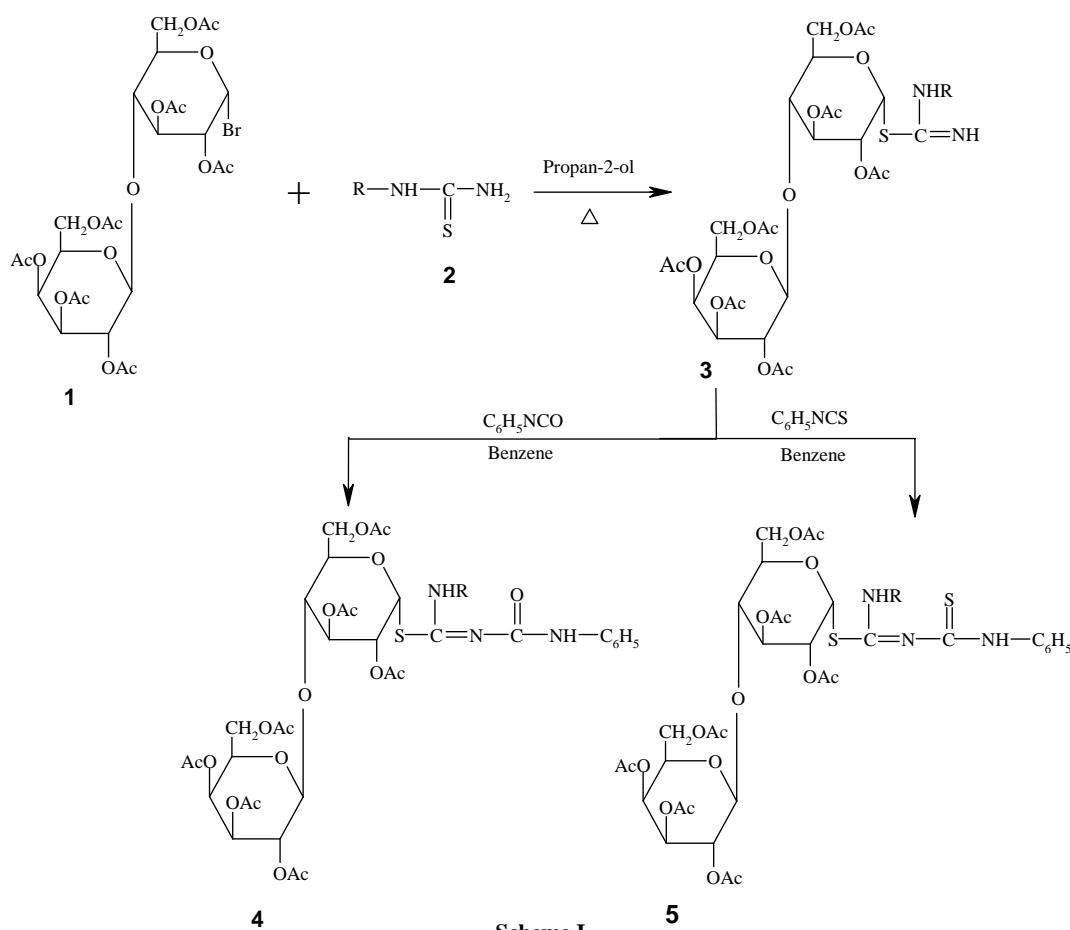
Condensation of S-hepta-O-acetyl lactosyl-1-aryl-isothiocarbamides **3a-g** with phenyl isothiocyanate was carried out by refluxing in benzene for 9 hr, it gave clear solution. The benzene solution was triturated with pet. ether (60-80°) to give crystalline solids **5a-g**. Based on elemental analysis (**Table I**) and IR⁶⁻⁸, NMR⁷⁻¹¹ and mass^{12,13} spectral analysis (see Experimental) the structures of **5a-g** were assigned as S-hepta-O-acetyl lactosyl-1-aryl-5-phenyl-2,4-isodithiobiurets (**Scheme I**).

Experimental Section

Melting points were recorded on a melting point apparatus and are uncorrected. IR spectra of the compounds were recorded in KBr on a FT IR Perkin-Elmer (4000-450cm⁻¹) spectrophotometer; ¹H NMR spectra in CDCl₃ on a Bruker DRX-300 (300 MHz FT NMR) spectrometer; and mass spectra on a Jeol SX-102 (FAB) instrument. Specific rotations were recorded on digital polarimeter.

S-Hepta-O-acetyl lactosyl-1-aryl-5-phenyl-2-isothiobiuret 4. General procedure. S-Hepta-O-acetyl lactosyl-1-arylisothiocarbamides (0.0025 M) and phenyl isocyanate (0.0025 M) in dry benzene at room temperature for 24 hr gave a clear solution. The benzene solution on trituration several times with pet. ether (60-80°) furnished granular solids **4**. The characterization data of compounds **4a-g** are given in (**Table I**).

S-Hepta-O-acetyl lactosyl-1-aryl-5-phenyl-2,4-isodithiobiuret 5. General procedure. Condensation of S-hepta-O-acetyl lactosyl-1-arylisothiocarbamides (0.0025 M) and phenyl isothiocyanate (0.0025M) by refluxing in dry benzene for 9 hr gave clear solution. The benzene solution triturated several times with pet. ether (60-80°) to give granular solids **5**. The characterization data of compounds **5a-g** are given in (**Table I**).



Scheme I

Where, R = a) phenyl, b) *o*-Cl-phenyl, c) *m*-Cl-phenyl, d) *p*-Cl-phenyl,
e) *o*-tolyl, f) *m*-tolyl, g) *p*-tolyl

Table I — Characterization data of compounds **4a-g** and **5a-g**

Compd	R	mp °C	Yield (%)	Found (Calcd) %	$[\alpha]_D^{31}$ (c, in CHCl_3)	^1H NMR (δ , ppm)	Mass (m/z)
4a	Phenyl	163-65	91.78	4.88 (4.72)	3.63 (3.59)	-350.87° (1.026)	7.8-7.0 (m, 10H, Ar-H) 5.8- 5.2 (s, 2H, NH) 4.8-3.4 (m, 14H, lactose unit) 2.3-1.8 (m, 21H, 7-Ac)
4b	<i>o</i> -Cl-phenyl	148-49	91.70	4.75 (4.55)	3.61 (3.46)	-315.27° (1.015)	7.8-6.8 (m, 9H, Ar-H), 5.5- 5.3 (s, 2H, NH), 5.3-3.4 (m, 14H, lactose unit), 2.4-1.8 (m, 21H, 7-Ac)
4c	<i>m</i> -Cl-phenyl	136-37	82.96	4.33 (4.55)	3.60 (3.46)	-197.43° (1.013)	-
4d	<i>p</i> -Cl-phenyl	165-67	65.50	4.58 (4.55)	3.76 (3.46)	-275.40° (1.053)	-
4e	<i>o</i> -tolyl	152-55	96.33	4.78 (4.65)	3.77 (3.54)	-245.28° (1.060)	7.8-6.8 (m, 9H, Ar-H), 5.5- 5.3 (s, 2H, NH), 5.3-3.4 (m, 14H, lactose unit) 2.3-1.8 (m, 21H, 7-Ac)

—Contd

Table I—Characterization data of compounds **4a-g** and **5a-g**—*Contd*

Compd	R	mp °C	Yield (%)	Found (Calcd) %	$[\alpha]_D^{31}$ (c, in CHCl_3)	^1H NMR (δ , ppm)	Mass (m/z)
4f	<i>m</i> -tolyl	143-44	87.15	4.79 (4.65)	3.80 (3.54)	-333.33° (1.020)	-
4g	<i>p</i> -tolyl	160-62	73.39	4.89 (4.65)	3.81 (3.54)	-280.00° (1.000)	-
5a	Phenyl	142-45	90.28	4.57 (4.64)	7.24 (7.07)	-331.26° (0.966)	7.5-4.9 (m, 10H, Ar-H) 4.7- 4.4 (d, J = 9.2, 2H, NH), 4.3- 3.0 (m, 14H, lactose unit), 2.3-1.9 (m, 21H, 7-Ac)
5b	<i>o</i> -Cl-phenyl	153-54	83.51	4.33 (4.47)	6.47 (6.81)	-260.00° (1.000)	7.5-7.2 (s, 9H, Ar-H), 5.1-4.9 (d, J = 9.3, 2H, NH), 4.9-2.4 (m, 14H, lactose unit), 2.2- 1.9 (m, 21H, 7-Ac)
5c	<i>m</i> -Cl-phenyl	130-32	75.60	4.55 (4.47)	7.07 (6.81)	-313.39° (1.053)	-
5d	<i>p</i> -Cl-phenyl	135	77.14	4.69 (4.47)	7.16 (6.81)	-310.00° (1.000)	-
5e	<i>o</i> -tolyl	123-25	88.31	4.51 (4.57)	7.11 (6.96)	-225.49° (1.020)	7.5-7.2 (s, 9H, Ar-H), 5.1-4.9 (d, J = 9.1, 2H, NH), 4.9-2.4 (m, 14H, lactose unit), 2.2- 1.9 (m, 21H, 7-Ac)
5f	<i>m</i> -tolyl	164-65	92.13	4.47 (4.57)	7.17 (6.96)	-251.76° (0.913)	-
5g	<i>p</i> -tolyl	160-62	79.77	4.71 (4.57)	7.29 (6.96)	-302.11° (0.993)	-

Satisfactory analyses of C and H were obtained for all the compounds.

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References

- 1 Mangte D V & Deshmukh S P, *J Indian Chem Soc*, **82**, **2005**, 1025.
- 2 Mangte D V & Deshmukh S P, *Int J Chem Sci*, **2**(2), **2004**, 159.
- 3 Clamp J R, Haugh L, Hickson J L & Whistler R L, *Adv Carbohydr Chem Biochem*, Vol 16, (Academic Press, New York), **1961**, 159.
- 4 Vogel A I, *A Textbook of Practical Organic Chemistry*, Vol 5, (ELBS, Longmann), **1989**, 967.
- 5 Segal L, O'Connor R T & Eggerton F V, *J Chem Soc*, **82**, **1960**, 2807.
- 6 Zhiqun D, Fanqui Q, Chengtai W & Wei L, *J Chem Res (S)*, **3**, **2001**, 106.
- 7 Varma R, Kulkarni S Y, Jose C I & Pansave V S, *Carbohydr Res*, **133**, **1984**, 25.
- 8 Isac-Garcia J, Calvo-Flores F G, Hernandez-Mateo F & Santoya-Gonzalez F, *Eur J Org Chem*, **2001**, 388.
- 9 Jimenez Blanco J L, Barria C S, Benito J M, Mellet C O, Fuentes J, Santoyo-Gonzalez F & Garcia Fernandez J M, *Synthesis*, **11**, **1999**, 1911.
- 10 Cao S, Tropper F D & Roy R, *Tetrahedron*, **51** (24), **1995**, 6679.
- 11 Lonngren J & Svensson S, *Adv Carbohydr Chem Biochem*, Vol 39, (Academic Press, New York), **1974**, 98.
- 12 Budzikiewicz H, Djerassi C & Williams D H, *Structural elucidation of natural products by mass spectroscopy*, **1964**.