Indian Journal of Chemistry
Vol. 45B, March 2006, pp. 829-831

Note

Synthesis of 4-aryl-5-hepta-O-acetyl-β-D-lactosylimino-3-tetra-O-benzoyl-β-D glucopyranosylimino-1,2,4-dithiazolidine hydrochlorides

M G Dhonde[a], P V Tale[b] & S P Deshmukh[b]*

[a]Shri Mathuradas Mohota College of Science, Umrer Road, Nagpur, India

[b]P G Department of Chemistry, Shri Shivaji College, Akola 444 001, India
E-mail: Madhudash2001@yahoo.co.in

Received 31 March 2005; accepted (revised) 30 August 2005

4-Aryl-5-hepta-O-acetyl-β-D-lactosylimino-3-tetra-O-benzoyl-β-D-glucopyranosylimino-1,2,4-dithiazolidine hydrochlorides have been prepared by the interaction of 1-tetra-O-benzoyl-β-D-glucopyranosyl-3-aryl thiocarbamides and *N*-hepta-O-acetyl-β-D-lactosyl-*S*-chloro isothiocarbamoyl chloride. The structure of these new 3-*N*-glcosylated-5-*N*-lactosylated-1,2,4-dithiazolidine hydrochlorides have been established on the basis of usual chemical transformations and IR, ^{1}H NMR and mass spectral studies.

Keywords: Thiocarbamides, isothiocarbamoyl chloride, dithiazolidine hydrochloride

IPC: **Int.Cl.[7] C 07 D**

Very few thioamido group containing compounds having lactosyl and glucosyl substituent on nitrogen have been reported and tested for their biological activity[1-3]. In view of our interest in the synthesis of newer types of 1,2,4-dithiazolidines report herein the simple method for the synthesis 1,2,4-dithiazolidine containing glucosyl[4] and lactosyl substituent by the interaction of 1-tetra-O-benzoyl-β-D-glucopyranosyl-3-aryl thiocarbamides and *N*-hepta-O-acetyl-β-D-lactosyl-*S*-chloro isothiocarbamoyl chloride. Required 1-tetra-O-benzoyl-β-D-glucopyranosyl-3-aryl thiocarbamides have been prepared by already known method[5] and *N*-hepta-O-acetyl-β-D-lactosyl-*S*-chloro isothiocarbamoyl chloride was prepared for the first time by the interaction of hepta-O-acetyl-β-D-lactosyl isothiocyanate with chlorine gas. Required hepta-O-acetyl-β-D-lactosyl isothiocyanate was prepared by already known method[6,7].

Results and Discussion

4-Aryl-5-hepta-O-acetyl-β-D-lactosylimino-3-tetra-O-benzoyl-β-D-glucopyranosylimino-1,2,4-dithiazolidine hydrochlorides **4a-g** (**Scheme I**) were prepared by the condensation reaction of 1-tetra-O-benzoyl-β-D-glucopyranosyl-3-aryl thiocarbamides **3a-g** and *N*-hepta-O-acetyl-β-D-lactosyl-*S*-chloro-isothiocarbamoyl chloride **2** in $CHCl_3$ for 3 hr. After condensation, solvent was distilled off when a sticky residue obtained was triturated with petroleum ether (60-80º) to afford granular pale yellow solid **4a-g** **(Table I)**. The products were found to be non-desulphurised when boiled with alkaline lead acetate solution. IR spectra of the products show characteristics of lactose unit in the range of 900-910, 1000-1100, 1200-1300[8,9] and characteristics of glucosyl unit in the range of 840-900 cm^{-1} [10]. ^{1}H NMR spectra of the products show characteristics of lactose protons at δ 5.8-3.7 (ref. 9) and glucosyl protons in the range at δ 5.89-4.38 (refs. 11 &12).

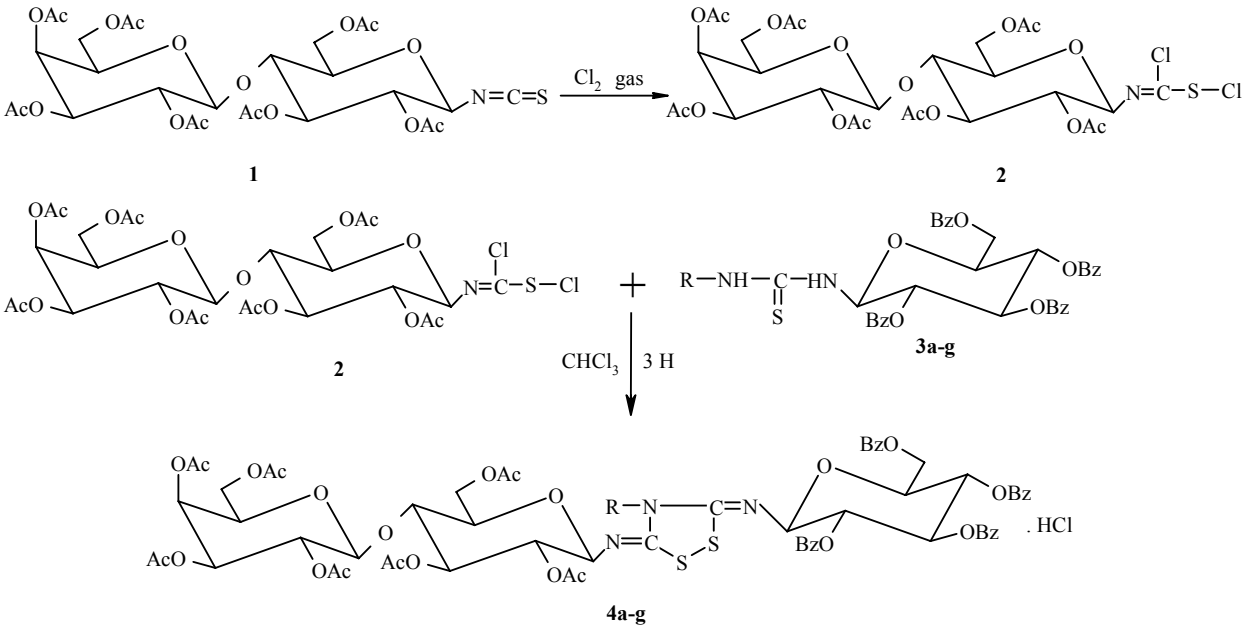
Experimental Section

General Methods

Optical rotations $[\alpha]_D$ measured on a Equip-Tronics digital polarimeter model no.EQ 800 at 31°C in $CHCl_3$. IR spectra were recorded on a Perkin-Elmer spectrum RXI (4000-450 cm^{-1}) FTIR spectrometer. ^{1}H NMR were obtained on a Bruker DRX-300 (300 MHz FT NMR) NMR spectrometer for a sample in $CDCl_3$ solution with TMS as an internal reference. The mass spectra were recorded on a Jeol SX-102 mass spectrometer.

***N*-hepta-O-acetyl-β-D-lactosyl-*S*-chloroisothiocarbamoyl chloride 2**. *N*-hepta-O-acetyl-β-D-lactosyl-*S*-chloro isothiocarbamoyl chloride **2** was prepared by the extension of earlier method[13] by passing calculated quantity of gaseous chlorine into the chloroformic solution of hepta-O-acetyl-β-D-lactosyl isothiocyanate.

Through a chloroformic solution of hepta-O-acetyl-β-D-lactosyl isothiocyanate **1**, (1.28 g, 0.0019 mole in $CHCl_3$, 5 mL), pure and dry chlorine gas (0.14 g) was passed. During chlorination the temperature of reaction mixture was maintained at 4-5°C by keeping it in freezing mixture. After chlorination the resultant



R=**3-4 a**, phenyl; **b**, *o*-tolyl; **c**, *m*-tolyl; **d**, *p*-tolyl; **e**, *o*-chloro; **f**, *m*-chloro; **g**, *p*-chloro. Bz = -COC_6H_5, Ac = -$COCH_3$

Scheme I

Table I –Aryl-5-hepta-O-acetyl-β–D-lactosylimino-3-tetra-O-benzoyl-β–D-glucopyranosylimino-1,2,4–dithiazolidine hydrochlorides **4a-g**

Sr. No.	R	Yield (%)	m.p. °C	$[\infty]_D^{31}$ in $CHCl_3$	R_f	Found %	(Calcd) %
						N	S
1	**4a**	67.65	152	+ 26.88 (*c*, 1.116)	0.48	2.50 (2.84	4.09 4.33)
2	**4b**	87.13	139	+ 44.01 (*c*, 1.136)	0.62	2.96 (2.81	4.42 4.28)
3	**4c**	67.02	167	+ 80.64 (*c*, 0.992)	0.54	2.81 (2.81	4.32 4.28)
4	**4d**	89.81	152	+ 28.62 (*c*, 1.048)	0.58	2.41 (2.81	4.31 4.28)
5	**4e**	84.65	102	+ 41.94 (*c*, 1.192)	0.61	2.67 (2.77	3.98 4.23)
6	**4f**	52.91	126	+ 9.96 (*c*, 1.004)	0.68	2.92 (2.77	4.51 4.23)
7	**4g**	78.04	112	+ 56.17 (*c*, 1.068)	0.57	2.72 (2.77	4.11 4.23)

yellow solution was mixed with petroleum-ether when a *N*-hepta-O-acetyl-β-D-lactosyl-*S*-chloro iso-thiocarbamoyl chloride **2** was obtained as a pale yellow oil **2**, (1.42 g), (Found: N, 1.84; S, 4.25. $C_{27}H_{35}O_{17}NSCl_2$ Calcd N, 1.87; S, 4.27%).

Synthesis of 4a-g. The reaction of *N*-hepta-O-acetyl-β-D-lactosyl-*S*-chloro isothiocarbamoyl chloride **2**, 0.0019 mole in $CHCl_3$, 5mL and 1-tetra-O-benzoyl-β-D-glucopyranosyl-3-aryl thiocarbamides **3a-g**, 0.0019 mole in $CHCl_3$, 15 mL was carried on boiling water-bath for 3 hr. After condensation, the solvent was distilled off and a sticky residue obtained was triturated with petroleum-ether (60-80º) to afford a pale yellow solid **4a-g**. The product recrystallised from ethanol-water. The purity of the products was checked by TLC; m.p., % yield, Optical rotations, elemental analysis and R_f value are shown in **Table I**.

4a: IR ($CHCl_3$, cm^{-1}): 3026 C-H(Ar-H), 2980, 2889 C-H(CH_3,CH_2), 1753 (C=O), 1585 (S-C=N), 1532 (C=N), 1315 (C-N), 1229 (C-O), 1069-912 (lactosyl ring deformation), 853 (glucopyranosyl ring deformation), 712 (monosubstituted benzene ring);. ^1H NMR (δ, $CDCl_3$), 8.34-6.69 (25H, m, Ar-H), 5.71-4.55 (10 H, m, lactosyl ring protons), 5.32-4.42 (5H, m, glucopyranosyl ring protons), 4.07-3.76 (6H, d, O-CH_2), 2.15-1.96 (21H, m, -$COCH_3$); MS (m/z): 1478 (M^+), 1418 (M-CH_3COOH), 1194 (M-$C_{14}H_{11}O_2$. 2HCl), 1134 (M-$C_{16}H_{15}O_4$,2HCl), 732 [TBG-NHCH(SH)$NHPh^+$], 620 (HAL^+=$C_{26}H_{36}O_{17}^+$), 580 (TBG^+=$C_{34}H_{28}O_9^+$), 560 (HAL-CH_3COOH), 457 (TBG-$C_7H_7O_2$), 331 ($C_{14}H_{19}O_9^+$), 169 ($C_{14}H_{19}O_9$-$C_6H_{10}O_5$), 105 ($C_6H_5CO^+$), 88 ($2CH_3CHO^+$).

4c: IR ($CHCl_3$, cm^{-1}): 3024 C-H (Ar-H), 2955, 2873 C-H (CH_3,CH_2), 1733 (C=O), 1585 (S-C=N), 1536 (C=N), 1316 (C-N), 1269 (C-O), 1093-903 (lactosyl ring deformation), 854 (glucopyranosyl ring deformation), 801 (1,3-disubstituted ring); 711

(monosubstituted benzene ring); ^{1}H NMR (δ, $CDCl_3$), 7.96-6.93 (24H, m, Ar-H), 5.73-4.46 (10H, m, lactosyl ring protons), 5.32-4.97 (5H, m, glucopyranosyl ring protons), 4.10-3.80 (6H, d, O-CH_2), 2.34-2.25 (3H, s, Ar-CH_3), 2.15-1.97 (21H, m,-$COCH_3$); MS (m/z): 1492 (M^+), 1307 (M-$C_{13}H_{13}O_2$), 819 (M-$C_{27}H_{31}O_{17}NS$), 786 ($C_{34}H_{46}O_{17}N_2S^+$), 744 (TBGC(=S)$NHC_6H_4CH_3^+$), 730 ($C_{41}H_{34}O_9N_2S^+$) 637 (TBGNCS$^+$), 580 (TBG$^+$=$C_{34}H_{28}O_9^+$), 331 ($C_{14}H_{19}O_9^+$), 169 ($C_{14}H_{19}O_9$-$C_6H_{10}O_5$), 136 ($C_6H_5COOCH_3^+$), 105 ($C_6H_5CO^+$).

4g: IR ($CHCl_3$, cm^{-1}): 3023 C-H (Ar-H), 2969, 2873 C-H (CH_3,CH_2), 1740 (C=O), 1585 (S-C=N), 1537 (C=N), 1316 (C-N), 1232 (C-O), 1070-911 (lactosyl ring deformation), 843 (glucopyranosyl ring deformation), 711 (monosubstituted benzene ring), 668 (C-Cl); ^{1}H NMR (δ, $CDCl_3$), 7.95-7.27 (24H, m, Ar-H), 5.59-4.46 (10H, m, lactosyl ring protons), 4.97-4.46 (5H, m, glucopyranosyl ring protons), 4.09-3.75 (6H, d, O-CH_2), 2.15-1.97 (21H, m, $COCH_3$); MS (m/z): 1512 (M^+), 1326 (M- C_6H_6Cl,2HCl), 764 [TBGNHC(=S)NHC_6H_4Cl], 648 ($HALNHCH_2^+$), 640 (TBGNHCH_2S^+), 580 (TBG$^+$=$C_{34}H_{28}O_9^+$), 560 (HAL=CH_3COOH), 457 (TBG–$C_7H_7O_2$), 442 (HAL–$C_6H_{10}O_6$), 331 ($C_{14}H_{19}O_9^+$), 169 ($C_{14}H_{19}O_9$-$C_6H_{10}O_5$), 105 ($C_6H_5CO^+$), 88 ($2CH_3CHO^+$).

Acknowledgement

The authors acknowledge the help of RSIC, CDRI, Lucknow for providing spectral data. They are also thankful to Principal R N Kale for encouragement and necessary facilities.

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