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

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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-chloroisothiocarbamoyl chloride. The structure of these new 3-N-glycosylated-5-N-lactosylated-1,2,4-dithiazolidine hydrochlorides have been established on the basis of usual chemical transformations and IR, 1H 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 activity1-3. 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 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-chloroisothiocarbamoyl chloride. Required 1-tetra-O-benzoyl-β-D-glucopyranosyl-3-aryl thiocarbamides have been prepared by already known method5 and N-hepta-O-acetyl-β-D-lactosyl-S-chloroisothiocarbamoyl 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 method6,7.

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-chloroisothiocarbamoyl chloride 2 in CHCl3 for 3 hr. After condensation, solvent was distilled off when a sticky residue obtained was triturated with petroleum ether (60-80°) 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, 1200-13008,9 and characteristics of glucosyl unit in the range at 840-900 cm-1 10. 1H 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 [α]D measured on a Equip-Tronics digital polarimeter model no.EQ 800 at 31° C in CHCl3. IR spectra were recorded on a Perkin-Elmer spectrum RXI (4000-450 cm-1) FTIR spectrometer. 1H NMR were obtained on a Bruker DRX-300 (300 MHz FT NMR) NMR spectrometer for a sample in CDCl3 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-chloroisothiocarbamoyl chloride 2 was prepared by the extension of earlier method13 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 CHCl3, 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

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

**Synthesis of 4a-g.** The reaction of \( N \)-hepta-O-acetyl-\( \beta \)-D-lactosyl-S-chloro isothiocarbamoyl chloride 2, 0.0019 mole in CHCl\(_3\), 5mL and 1-tetra-O-benzoyl-\( \beta \)-D-glucopyranosylimino-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 Rf value are shown in Table I.

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<th>m.p. °C</th>
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(monosubstituted benzene ring); ¹H NMR (δ, CDCl₃), 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-CH₂), 2.34-2.25 (3H, s, Ar-CH₃), 2.15-1.97 (21H, m, COCH₃); MS (m/z): 1492 (M⁺), 1307 (M-C₁₃H₁₃O₂), 819 (M-C₂₇H₃₁O₁₇NS), 786 (C₃₂H₄₆O₁₇N₂S⁺), 744 (TBGC(=S)NH₂C₆H₄CH₃⁺), 730 (C₁₄H₁₉O₉⁺), 637 (TBGNCS⁺), 580 (TBG⁺=C₃₄H₂₈O₉⁺), 331 (C₁₄H₁₉O₉⁺), 169 (C₁₄H₁₉O₉-C₆H₁₀O₃), 136 (C₆H₅CO₂⁺)

4g: IR (CHCl₃, cm⁻¹): 3023 C-H (Ar-H), 2969, 2873 C-H (CH₃,CH₂), 1740 (C=O), 1585 (S-C=N), 1537 (C=C=N), 1316 (C-N), 1232 (C-O), 1070-911 (lactosyl ring deformation), 843 (glucopyranosyl ring deformation), 711 (monosubstituted benzene ring), 668 (C-Cl); ¹H NMR (δ, CDCl₃), 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-CH₂), 2.15-1.97 (21H, m, COCH₃); MS (m/z): 1512 (M⁺), 1326 (M-C₆H₆Cl,2HCl), 764 [TBGNHCl(S)NH₂C₆H₄Cl], 648 (HALNHCH₂⁺), 640 (TBGNHCH₂S⁺), 580 (TBG⁺=C₃₄H₂₈O₉⁺), 560 (HAL=CH₂COOH), 457 (TBG-C₆H₄O₂), 442 (HAL-C₆H₁₀O₆), 331 (C₁₄H₁₉O₉⁺), 169 (C₁₄H₁₉O₉-C₆H₁₀O₃), 105 (C₆H₅CO₂⁺), 88 (2CH₃CHO⁺).

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References
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