Chemistry of Natural Compounds, Vol. 41, No. 5, 2005

B R I E F C O M M U N I C A T I O N S

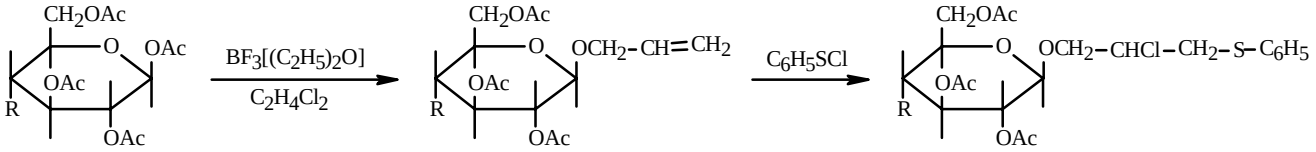
SYNTHESIS OF CERTAIN S-CONTAINING DISACCHARIDE DERIVATIVES

L. V. Tabatadze, N. N. Sidamonidze, N. O. Pirveli, and R. A. Gakhokidze

UDC 577.1;547.661.1;342.945.25

S-containing disaccharides play an important role in the vital activity of animals and plants and occupy a special place among carbohydrate derivatives [1].

The present communication reports on the synthesis of the S-containing disaccharides hepta-O-acetyl-1-*O*-(2-chloro-3-phenylthiopropyl)-β-D-maltose and hepta-O-acetyl-1-O-(3-chloro-2-phenylthiopropyl)-β-D-lactose by reaction of allylmaltose and allyllactose with phenylsulfenyl chloride (Scheme 1).



1, 2 **3, 4**

1, 3: R = Ac4-α-D-Glc*p*1

2, 4: R = Ac4-β-D-Glc*p*1

Scheme 1

Optical rotation was measured on a SU-3 universal saccharimeter at 20±2°C. TLC was performed on Silufol UV-254 plates using the solvent system (by vol) $CH_3C_6H_5$:$CHCl_3$ (2:1). Compounds were developed by spraying with H_2SO_4:H_2O (95:5) or anilinium phthalate. IR spectra were recorded on a UR-20 spectrometer in KBr disks. ^{13}C NMR spectra were recorded on a Bruker AM-300 spectrometer (75.5 and 300 MHz) in $CDCl_3$.

1-O-Allyl-hepta-O-acetylmaltose (1). Yield 70%, mp 108-109°C (lit. [2, 3] mp 109-110°C), R_f 0.4, $[\alpha]_D^{26}$ +46° (*c* 1.5, $CHCl_3$). Found, %: C 51.50, H 6. $C_{29}H_{40}O_{18}$. Calc., %: C 51.46, H 5.90.

1-O-Allyl-hepta-O-acetyllactose (2). Yield 69%, mp 68-70°C (lit. [4] mp 70°C), R_f 0.6, $[\alpha]_D^{26}$ +30° (*c* 1.5, $CHCl_3$). Found, %: C 51.44, H 5.25. $C_{29}H_{40}O_{18}$. Calc., %: C 51.48, H 5.85.

Hepta-O-acetyl-1-O-(2-chloro-3-phenylthiopropyl)-β-D-maltose (3). A solution of phenylsulfenyyl chloride (1.35 mL) in CCl_4 (20 mL) under N_2 to exclude moisture was treated with allylated octa-O-acetylmaltose (1 g, 0.0014 mol) in $CHCl_3$ (15 mL) until the solution became colorless. Vacuum distillation and recrystallization from hexane afforded a product (0.68 g, 56%), mp 92-96°C, $[\alpha]_D^{20}$ -15° ($CHCl_3$), R_f 0.67. Found, %: C 50.30, H 5.72, Cl 4.40, S 3.90. $C_{35}H_{45}O_{18}SCl$. Calc., %: C 51.1, H 5.47, S 3.89, Cl 4.44.

IR spectra lacked absorption bands at 1643-1660 cm^{-1} for allyl and contained characteristic bands at 1061, 1147 (C–O–C), 543, 600 (C–S), 690, 739 (C–Cl), 2924 (CH_2), and 2850 (CH_3).

I. Dzhavakhishvili Tbilisi State University, Georgia, 0128, Tbilisi, pr. I. Chavchavadze, 1, e-mail: rgakhokizde@yahoo.com. Translated from Khimiya Prirodnykh Soedinenii, No. 5, pp. 484-485, September-October, 2005. Original article submitted June 15, 2005.

 0009-3130/05/4105-0592

TABLE 1. Effect of S-Containing Glycosides on Microorganism Growth

Test culture	Compound					
	3			**4**		
	concentration, g/L					
	0.1	0.01	0.001	0.1	0.01	0.001
	Test-culture suppression zone, mm					
Bacillus subtilis	2.0	1.0	0	4.0	3.0	1.0
Streptomyces albogriseolus	3.0	0	0	1.0	0	0
Pseudomonas fluorescens	4.0	3.0	3.0	3.0	2.0	1.0
Pseudomonas tumefaciens	1.0	0	0	3.0	1.0	1.0

^{13}C NMR spectrum (δ, ppm): 168.7-175.8 (7×RO–$\underline{C}$O–CH_3), 20.6-20.7 (7×RO–CO–$\underline{C}H_3$), 60.980 (R–O–$\underline{C}H_2$–), 100.8 (C-1), 92.0 (C-1′), 61.8 (C-6), 61.4 (C-6′), 77.5, 76.65, 71.05, 70.8, 67.8, 66.8 ($C_{2\text{-}5}$, $C_{2'\text{-}5'}$), 29.725-29.386 (–CH_2–), 127.1-137.086 (C_6H_5).

Hepta-O-acetyl-1-O-(2-chloro-3-phenylthiopropyl)-β-D-lactose (4). A solution of phenylsulfenyl chloride (1.35 mL) in CCl_4 (20 mL) protected from moisture was treated with allylated octa-O-acetyllactose (1 g, 0.0014 mol) in $CHCl_3$ until the solution became colorless. Vacuum distillation afforded a product (0.80 g, 66%), mp 86°C, $[\alpha]_D^{20}$ -6° ($CHCl_3$), R_f 0.63. Found, %: C 50.53, H 5.22, Cl 4.40, S 3.30. $C_{35}H_{45}O_{18}SCl$. Calc., %: C 51.1, H 5.47, S 3.89, Cl 4.44.

IR spectrum (ν, cm^{-1}): 1060, 1150 (C–O–C), 591 (C–S), 693, 742 (C–Cl), 3060 (C–P_{arom}), 2923 (CH_2), 2850 (CH_3).

^{13}C NMR spectrum (δ, ppm): 170.4-175.6 (7×RO–CO–$\underline{C}H_3$), 20.605-20.878 (7×RO–CO–$\underline{C}H_3$), 60.980 (R–O–$\underline{C}H_2$–), 100.865 (C-1), 955.5 (C-1′), 62.5 (C-6), 62.2 (C-6′), 77.517, 77.096, 76.668, 71.054, 72.5, 70.733, 66.815 ($C_{2\text{-}5}$, $C_{2'\text{-}5'}$), 29.716 (–CH_2–), 127.184-137.059 (C_6H_5).

Bactericidal activity of the S-containing disaccharides was investigated.

Table 1 presents the results and shows that the tested compounds were toxic and inhibited the growth of the investigated test strains. It should be noted that **3** actively inhibited growth and development of the tested microorganisms. Apparently this is due to the presence of maltose in the glycoside.

REFERENCES

1. F. Challenger, *Problems in the Chemistry of S-Containing Organic Compounds* [Russian translation], Inostr. Lit., Moscow (1963).
2. C. S. Hudson and J. M. Jonson, *J. Am. Chem. Soc.*, **37**, 1276 (1915).
3. W. T. Haskins, R. M. Hann, and G. S. Hudson, *J. Am. Chem. Soc.*, **64**, 1852 (1948).
4. T. Takano, F. Nakatsuho, and K. Murakami, *Carbohydr. Res.*, **203**, 341 (1990).