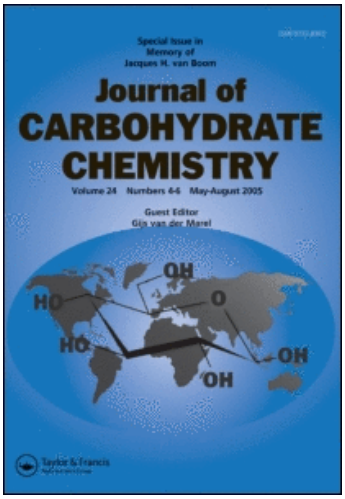


Journal of Carbohydrate Chemistry

Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713617200

Synthesis of 3-(Tetritol-1-YL)-6-Phenyl-1,2,4-Triazolo[3,4-*a*]Phthalazines and Conformational Analysis of their Acetates

Mohammed A. E. Shaban; Mamdouh A. M. Taha

To cite this Article Shaban, Mohammed A. E. and Taha, Mamdouh A. M.(1991) 'Synthesis of 3-(Tetritol-1-YL)-6-Phenyl-1,2,4-Triazolo[3,4-*a*]Phthalazines and Conformational Analysis of their Acetates', Journal of Carbohydrate Chemistry, 10: 5, 757 — 769

To link to this Article: DOI: 10.1080/07328309108543949

URL: http://dx.doi.org/10.1080/07328309108543949

J. CARBOHYDRATE CHEMISTRY, 10(5), 757-769 (1991)

SYNTHESIS OF 3-(TETRITOL-1-YL)-6-PHENYL-1,2,4-TRIAZOLO[3,4-a]PHTHALAZINES[1] AND CONFORMATIONAL ANALYSIS OF THEIR ACETATES

Mohammed A. E. Shaban* and Mamdouh A. M. Taha

Department of Chemistry
Faculty of Science, Alexandria University
Alexandria, Egypt.

Received September 1, 1990 - Final Form May 2, 1991

ABSTRACT

Condensation of 1-hydrazino-4-phenylphthalazine with D-arabinose, L-arabinose, D-lyxose, and D-xylose gave the corresponding 3-(tetritol-1-yl)-6-phenyl-1,2,4-triazolo[3,4-a]phthalazines (acyclic *C*-nucleoside analogs). D-Ribose, on the other hand, reacted with the same hydrazine to give the corresponding *aldehydo*-D-ribo-(4-phenyl-1-phthalazinyl) hydrazone. Catalytic dehydrogenative cyclization of this hydrazone with palladium-on-charcoal affected its transformation into the corresponding triazolophthalazine. Acetylation of the prepared acyclic *C*-nucleoside analogs gave the corresponding tetra-*O*-acetyl derivatives, the conformational analysis of which has been studied using proton magnetic resonance spectroscopy. Results of some biological activities of the prepared compounds are reported.

INTRODUCTION

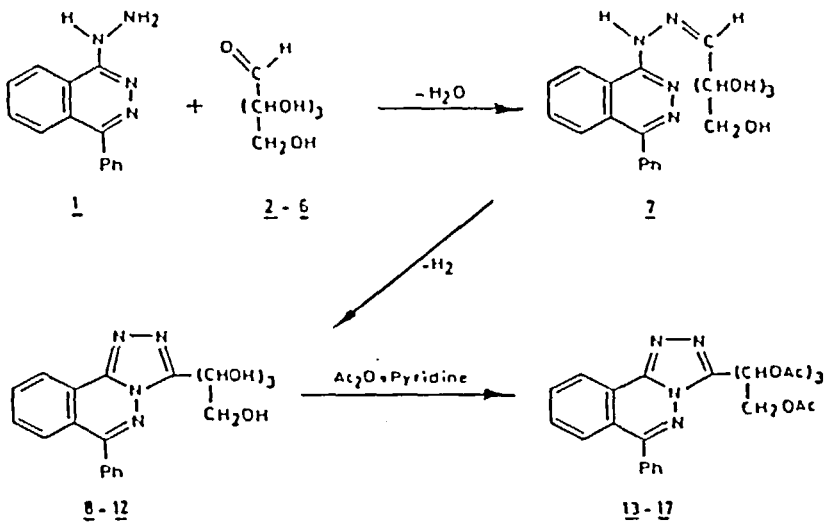
We have been interested in studying the reactions of sugars with aroylhydrazines[2-6] and cyclic amidrazones[1,7] and transforming the obtained *aldehydo*-sugar hydrazones or their acetates to acyclic *C*-nucle-

oside analogs by oxidative,[5,6] dehydrogenative,[1,7] or dehydrative[8,9] cyclization. Continuing our work along this line, we now describe the reaction of aldopentoses 2-6 with 1-hydrazino-4-phenylphthalazine (1). The synthesis[10-14] of *C*-nucleosides and their acyclic analogs has attracted the attention of many investigators as a result of their various biological activities.[15] 3-Substituted-1,2,4-triazolo[3,4-*a*] phthalazines were reported to possess hypotensive activity[16,17] and some of their 3-alkyl derivatives were found[16] to be potent as theophylline in inhibiting cyclic adenosine monophosphate phosphodiesterase and to act as muscle relaxants. We speculated, therefore, that 1,2,4-triazolo[3,4-*a*]phthalazines carrying a hydrophilic alditolyl chain at position 3 may possess enhanced biological activities and less adverse effects as a result of increasing penetration into and secretion out of biological systems.

RESULTS AND DISCUSSION

Whereas the condensation of equimolar amounts of D-arabinose (2), L-arabinose (3), D-lyxose (4), and D-xylose (6) with 1-hydrazino-4-phenylphthalazine[18,19] (1) gave colorless products, D-ribose (5) gave a yellow product.

The yellow product obtained from D-ribose had an elemental analysis agreeing with that calculated for the molecular formula $C_{19}H_{20}N_4O_4$; that is, one molecule of water less than the sum of the two reactants. The UV spectrum of this product exhibited three absorption maxima at 344, 284, and 246 nm and its IR spectrum showed OH, NH, and C=N absorptions. These data indicated that the yellow product was *aldehydo*-D-ribose (4-phenyl-1-phthalazinyl)hydrazone (7). Catalytic dehydrogenative cyclization of 7 with 10% palladium-on-charcoal gave a colorless crystalline product which showed only one absorption band at 246 nm and lacked the other two bands of the parent hydrazone. Its IR spectrum also lacked the NH absorption and its elemental analysis agreed with the molecular formula $C_{19}H_{18}N_4O_4$. Thus, this compound contained two hydrogens less than the starting hydrazone. The product was assigned the structure of 6-phenyl-3-(D-*ribo*-tetritol-1-yl)-1,2,4-triazolo[3,4-*a*] phthalazine (11).



1 2 - 6 7

8 - 12 13 - 17

2, 8, 13 (D-*arabino*-); 3, 9, 14 (L-*arabino*-); 4, 10, 15 (D-*lyxo*); 5, 7, 11, 16 (D-*ribo*-); 6, 12, 17 (D-*xylo*-)

Acetylation of 11 with acetic anhydride in the presence of pyridine gave the expected 3-(1,2,3,4-tetra-*O*-acetyl-D-*ribo*-tetritol-1-yl)-6-phenyl-1,2,4-triazolo[3,4-*a*]phthalazine (16) which exhibited strong ester carbonyl absorption and gave ^{1}H NMR signal for four *O*-acetyl groups.

It was interesting to find that the reaction of D-arabinose (2), L-arabinose (3), D-lyxose (4), and D-xylose (6) with 1 under the same conditions which were used for the reaction with D-ribose (5) gave directly the corresponding colorless 3-(tetritol-1-yl)-6-phenyl-1,2,4-triazolo[3,4-*a*]phthalazines 8, 9, 10, and 12 which were formed by autodehydrogenative cyclization of the initially formed hydrazone intermediates. The mass spectra of 8-12 did not reveal molecular ion peaks, yet showed peaks characteristic of the assigned structures at m/z 305 [B-CHOH-CH=O$^+$H] (B = the triazolophthalazine nucleus), m/z 276 [(B-CH_2OH)$^+$], m/z 274 [B-CHO)$^+$], m/z 246 [B-H)$^+$], and m/z 245 [B$^+$] in addition to the fragments characteristic of the breakdown of the alditolyl chain.

TABLE 1

Chemical Shifts[a] (δ) of Alditolyl-Chain Protons of 3-(1,2,3,4-Tetra-*O*-Acetyl-Tetritol-1-yl)-6-Phenyl-1,2,4-Triazolo[3,4-a] Phthalazines ($CDCl_3$).

Compound	Configuration	H-1	H-2	H-3	H-4	H-4'
13	D-*arabino*	6.70d	5.85dd	5.41m	4.35dd	4.12dd
14	L-*arabino*	6.72d	5.88dd	5.41m	4.40dd	4.16dd
15	D-*lyxo*	6.67d	6.18dd	5.62m	4.33dd	4.05dd
16	D-*ribo*	6.77d	5.97dd	5.27m	4.43dd	4.20dd
17	D-*xylo*	6.61d	5.97dd	5.12m	4.28dd	3.97dd

a Multiplicity of signals: d = doublet, dd = doublet of doublet, and m = multiplet.

Acetylation of the alditolyl triazolophthalazines (8, 9, 10, and 12) yielded the corresponding crystalline tetra-*O*-acetyl derivatives 13, 14, 15, and 17, respectively. The ^1H NMR spectra of 13-17 each had nine aromatic proton signal multiplets between δ 8.90 and δ 7.40 and alditolyl chain protons which appeared between δ 6.77 and δ 3.97 (See TABLE 1). The signal mutiplicities of these protons compared very well with those of acetylated alditolyl derivatives of 1,2,3-triazoles,[20] tetrazoles,[21] 1,3,4-oxadiazoles,[22] thiazoles,[23] and benzothiazoles.[24]

Accepting the values [23,25-28] of $\leq$4 Hz and $\geq$ 7 Hz to correspond to *gauche* and *antiparallel* orientation of vicinal protons (dihedral angles $\approx$ 60° and 180° respectively), it was possible to predict the most stable conformations of the acetylated alditolyl chains of compounds 13-17 by analyzing the observed coupling constants from their protons (See TABLE 2). The small $J_{1,2}$ and large $J_{2,3}$ values (4 and 9 Hz, respectively) of the acetylated D-*arabino*-tetritolyl chain of 13 indicated a preferred *gauche* orientation of H-1 and H-2 and an *antiparallel* orientation of H-2 and H-3. Compound 13 exists, therefore, predominantly in the extended, planar, zigzag conformation 18. The bulky triazolophthalazine ring nucleus would be expected to extend away from the alditolyl chain. The coupling constants of the protons of the acetylated alditolyl chain of the L-*arabino* derivative 14 were of the same magnitude as those of its D-enantiomer 13, and 14 was assigned the conformation 19 which is the

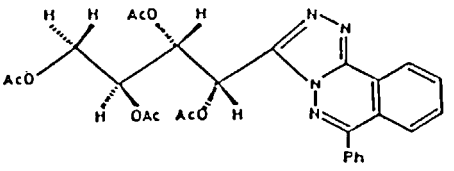
TABLE 2

Observed Coupling Constants (Hz) of Alditolyl-Chain Protons of 3-(1,2,3,4-Tetra-*O*-Acetyl-Tetritol-1-yl)-6-Phenyl-1,2,4-Triazolo-[3,4-a]Phthalazines

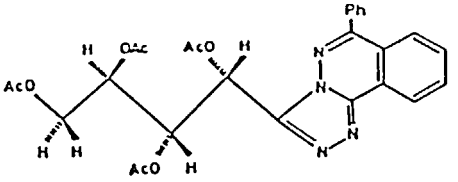
Compound	Configuration	$J_{1,1}$	$J_{1,3}$	$J_{3,4}$	$J_{3,4'}$	$J_{4,4'}$
13	D-*arabino*	4	9	3	6	12
14	L-*arabino*	4	9	3	6	12
15	D-*lyxo*	8	3	4.5	6	12
16	D-*ribo*	5	6	3	6	12
17	D-*xylo*	7	4	5	5	12

mirror-image of 18. The large $J_{1,2}$ and small $J_{2,3}$ couplings (8 and 3 Hz, respectively) of the acetylated D-*lyxo*-tetritolyl chain of 15 indicated an *antiparallel* orientation of H-1 and H-2 and *gauche* orientation of H-2 and H-3. These orientations are also consistent with a predominantly planar, zigzag conformation 20 assigned for this derivative. On the other hand, the similar intermediate values of both $J_{1,2}$ and $J_{2,3}$ (5 and 6 Hz, respectively) of the acetylated D-*ribo*-tetritolyl chain of 16 suggest a mixture of conformers possibly with considerable contribution from the "sickle" conformation 21. The D-*xylo*-derivative 17 has H-1 and H-2 in an *antiparallel* arrangement ($J_{1,2}$ = 7 Hz) and H-2 and H-3 in a *gauche* arrangement ($J_{2,3}$ = 4 Hz) which is compatible with the "sickle" conformation 22 shown for this derivative, being the major constituent in a mixture of conformations.

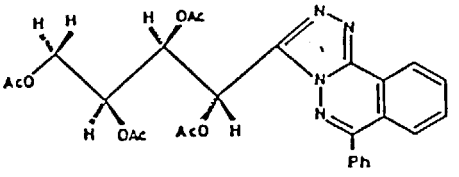
The antileukemic activity of compounds 8 and 11 was tested at the dose levels of 100, 200, and 400 mg/kg of the test animals and found to be inactive. Compound 1 showed no insecticidal activity when applied at a rate of 1000 ppm for 48 hours to the following insect species/host plant systems: mexican beet beetle (*Epilachna varivestis* Muslant)/pinto bean (*Phaseolus vulgaris*); pea aphid (*Acrythosiphon pisum* Harris)/ fave bean (*Vicia faba*); southern armyworm (*Sodoptera cridania* Gramer)/ pinto bean; and the two-spotted spider mite (*Tetranychus urticae*)/ pinto bean. Compound 7 was also found to be inactive as a nematicide when applied at the rate of 10 ppm against root-knot nematode (*Meloidogyne incognita*)



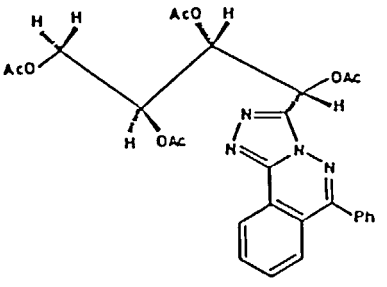
18



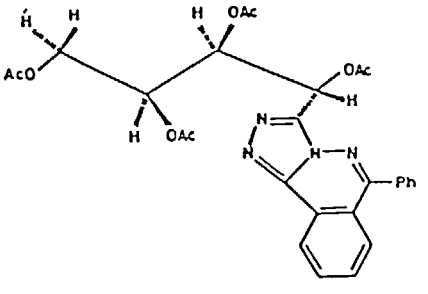
19



20



21



22

hosted on cucumber (*Cucumis sativus*). Recently,[29,30] we found that compound 11 acts as a good corrosion inhibitor for aluminium in acid media.

EXPERIMENTAL

General Methods. Melting points were determined with a Kofler block and are uncorrected. Infrared spectra (IR) were recorded as potassium bromide discs on Unicam SP-1025 or Pye-Unicam SP-2000 spectrophotometers. Ultraviolet spectra (UV) were recorded for 50% ethanolic solutions using a Unicam SP-1750 spectrophotometer. Proton magnetic resonance spectra (^{1}H NMR) were carried out at 90 MHz with a Varian EM-390 spectrometer for solutions in $CDCl_3$ or $(CD_3)_2SO$. Mass spectra were performed on an analytical system consisting of a Du Pont 21-491 mass spectrometer interfaced with a Du Pont 492-094 data-acquisition system. The homogeneity of nonpolar compounds was checked by thin-layer chromatography (TLC) on plates precoated with silica gel G (Merck; layer thickness 0.25 mm), used without pretreatment. The distance of solvent travel was 5 cm, and the spots were detected by exposure to iodine vapour. Concentrations were performed on a rotary evaporator with the bath temperature being kept below 50°C. Elemental microanalyses were performed in the Microanalysis Laboratory, Department of Chemistry, Faculty of Science, Alexandria University with Perkin-Elmer PE-240 analyzer and in the Microanalysis Unit at Cairo University, Cairo, Egypt.

***Aldehydo*-D-Ribose (4-phenyl-1-phthalazinyl)hydrazone (7).** D-Ribose (5, 0.6 g) was dissolved in the least amount of water (≈ 0.2 mL) and treated with a solution of 1-hydrazino-4-phenylphthalazine[18,19] (1, 1 g) in methanol (30 mL). The mixture was heated for 10 min on a boiling water-bath and the product which seperated after cooling was filtered, washed with chloroform and ether, and crystallized from water-methanol to give 1 g (64%) of 7, as yellow needles, mp 228-230 °C; TLC in 1:1 chloroform-methanol, R_f: 0.45; UV λ_{max} 344, 284, and 246 nm (log ε: 2.41, 2.73, and 3.73); IR (KBr) 3520, 3440 (OH), 3300 (NH), and 1630 cm^{-1} (C=N); ^{1}H NMR [$(CD_3)_2SO$] δ 8.68-7.40 (m, 9H, aromatic H), 5.78 (d, 1H, deuteratable, OH), 5.30 (m, 1H, alditolyl H), 4.66 (m, 2H, deuteratable, 2 OH) and 4.35 (m, 3H, deuteratable, OH + tetritolyl CH_2). The

other protons together with the solvent absorption were congregated in a broad signal at δ 3.50.

Anal. Calcd for $C_{19}H_{20}N_4O_4$: C, 61.95; H, 5.47; N, 15.21. Found: C, 62.15; H, 5.01; N, 14.82.

6-Phenyl-3-(D-*ribo*-tetritol-1-yl)-1,2,4-triazolo[3,4-*a*]phthalazine (11). To a solution of 7 (1 g) in water (10 mL) and methanol (30 mL), 10% palladium-on-charcoal (0.5 g) was added and the mixture was heated under reflux for 3 h. The catalyst was filtered off on a bed of celite and the filtrate was concentrated to dryness. Crystallization of the residue from water-methanol gave 0.8 g (81%) of 11, mp 215 °C; TLC in 1:1 chloroform-methanol, R_f: 0.52; UV λ_{max} 246 nm (log ϵ: 3.64); IR (KBr) 3450 (broad, OH), and 1640 cm^{-1} (C=N); ^1H NMR [$(CD_3)_2SO$] δ 8.75-7.50 (m, 9H, aromatic H), 5.85 (d, 1H, deuteratable, OH), 5.34 (m, 1H, alditolyl H), 4.75 (m, 2H, deuteratable, 2 OH) and 4.42 (m, 2H, tetritolyl CH_2). The other protons together with the solvent absorption were gathered in a broad signal at δ 3.55.

Anal. Calcd for $C_{19}H_{20}N_4O_4$: C, 62.29; H, 4.95; N, 15.29. Found: C, 61.96; H, 4.99; N, 14.98.

3-(1,2,3,4-Tetra-*O*-acetyl-D-*ribo*-tetritol-1-yl)-6-phenyl-1,2,4-triazolo[3,4-*a*]phthalazine (16). A solution of 11 (1 g) in pyridine (4 mL) was treated with acetic anhydride (4 mL), for 24 h at room temperature. The mixture was poured onto crushed ice and the product which separated was filtered, washed several times with water, and crystallized from methanol to give 0.8 g (55%) of 16, mp 145-148 °C; TLC in 9:1 chloroform-methanol R_f: 0.63; IR (KBr) 1770 cm^{-1} (ester-carbonyl, *O*-acetyl groups); ^1H NMR ($CDCl_3$) δ 8.90-7.42 (m, 9H, aromatic H), 6.77 (d, 1H, alditolyl H-1), 5.97 (dd, 1H, alditolyl H-2). 5.27 (m, 1H, alditolyl H-3), 4.34 (dd, 1H, alditolyl H-4), 4.20 (dd, 1H, alditolyl H-4'), 2.15 (s, 3H, acetyl group), 2.05 (s, 6H, 2 acetyl groups) and 1.80 (s, 3H, acetyl group).

Anal. Calcd for $C_{27}H_{26}N_4O_8$: C, 60.67; H, 4.87; N, 10.49. Found: C, 60.98; H, 5.09; N, 10.10.

6-Phenyl-3-(D-*arabino*-tetritol-1-yl)-1,2,4-triazolo[3,4-*a*] phthalazine (8). A solution of 1 (1 g) in methanol (30 mL), was added to a solution of D-arabinose (2, 0.6 g) in the least amount of water ($\approx$ 0.2 mL) and the mixture was heated for 15 min on a boiling water-bath.

The mixture was left to attain ambient temperature and the product which separated was filtered, washed with chloroform and ether, and crystallized from water-methanol to give 1 g (64%) of 8, mp 205-209 °C; TLC in 1:1 chloroform-methanol, R_f: 0.46; IR (KBr) 3300 (broad, OH) and 1630 cm^{-1} (C=N); ^1H NMR [$(CD_3)_2SO$] δ 8.73-7.53 (m, 9H, aromatic H), 5.45 (d, deuteratable, OH + alditolyl H), 4.83 (d, 1H, deuteratable, OH), 4.64 (d, 1H, deuteratable, OH), 4.30 (t, 1H, deuteratable, OH) and 4.18 (m, 2H, tetritolyl CH_2). The other protons together with the solvent absorption were congregated in a broad signal at δ 3.55.

Anal. Calcd for $C_{19}H_{18}N_4O_4$: C, 62.29; H, 4.95; N, 15.29. Found: C, 62.75; H, 5.13; N, 15.34.

3-(1,2,3,4-Tetra-*O*-acetyl-D-*arabino*-tetritol-1-yl)-6-phenyl-1,2,4-triazolo[3,4-*a*]phthalazine (13). Compound 13 was prepared by acetylation of 8 (1 g) as described for the preparation of 16. It crystallized from methanol (yield: 0.9 g, 62%), mp 170-172 °C; TLC in 9:1 chloroform-methanol, R_f: 0.59; IR (KBr) 1760 cm^{-1} (ester-carbonyl, *O*-acetyl groups); ^1H NMR ($CDCl_3$) δ 8.81-7.45 (m, 9H, aromatic H), 6.70 (d, 1H, alditolyl H-1), 5.85 (dd, 1H, alditolyl H-2), 5.41 (m, 1H, alditolyl H-3), 4.35 (dd, 1H, alditolyl H-4), 4.12 (dd, 1H, alditolyl H-4'), 2.15, 2.05, 2.00 and 1.98 (s, 3H each, 4 acetyl groups).

Anal. Calcd for $C_{27}H_{26}N_4O_8$: C, 60.67; H, 4.87; N, 10.49. Found: C, 60.72; H, 5.13; N, 10.45.

6-Phenyl-3-(L-*arabino*-tetritol-1-yl)-1,2,4-triazolo[3,4-*a*]phthalazine (9). Compound 9 was prepared from 1 (1 g) and L-arabinose (3, 0.6 g) as described for the preparation of 8. It crystallized from water-methanol (yield: 1 g, 64%), mp 220-222 °C; TLC in 1:1 chloroform-methanol, R_f: 0.55; IR (KBr) 3440 (broad, OH) and 1620 cm^{-1} (C=N); ^1H NMR [$(CD_3)_2SO$] δ 8.68-7.45 (m, 9H, aromatic H), 5.32 (m, 2H, deuteratable, 2 OH), 4.20 (t, 1H, deuteratable, OH) and 4.00 (m, 2H, tetritolyl CH_2). The rest of the protons were associated with the solvent absorption forming a broad signal at δ 3.45.

Anal. Calcd for $C_{19}H_{18}N_4O_4$: C, 62.29; H, 4.95; N, 15.29. Found: C, 62.49; H, 5.01; N, 15.12.

3-(1,2,3,4-Tetra-*O*-acetyl-L-*arabino*-tetritol-1-yl)-6-phenyl-1,2,4-triazolo[3,4-*a*]phthalazine (14). Compound 14 was prepared from 9 (1 g) as described for the preparation of 16. It crystallized from methanol

(yield: 0.7 g, 48%), mp 168-170 °C; TLC in 9:1 chloroform-methanol, R_f: 0.56; IR (KBr) 1760 cm^{-1} (ester-carbonyl, *O*-acetyl groups); ^1H NMR ($CDCl_3$) δ 8.85-7.47 (m, 9H, aromatic H), 6.72 (d, 1H, alditolyl H-1), 5.88 (dd, 1H, alditolyl H-2), 5.41 (m, 1H, alditolyl H-3), 4.40 (dd, 1H, alditolyl H-4), 4.16 (dd, 1H, alditolyl H-4'), 2.15, 2.05, 2.02 and 2.00 (s, 3H each, 4 acetyl groups).

Anal. Calcd for $C_{27}H_{26}N_4O_8$: C, 60.67; H, 4.87; N, 10.49. Found: C, 60.71; H, 4.94, N, 10.48.

6-Phenyl-3-(D-*lyxo*-tetritolyl-1-yl)-1,2,4-triazolo[3,4-*a*] phthalazine (10). Compound 10 was prepared from 1 (1 g) and D-lyxose (4, 0.6 g) as described for the preparation of 8. It crystallized from methanol-water (yield: 0.9 g; 58%), mp 185 °C; TLC in 1:1 chloroform-methanol, R_f: 0.61; IR (KBr) 3300 (braod, OH) and 1625 cm^{-1} (C=N); ^1H NMR [$(CD_3)_2SO$] δ 8.70-7.50 (m, 9H, aromatic H), 5.70 (d, 1H, deuteratable, OH), 2.25 (m, 1H, alditolyl H) and 4.35 (m, 3H, deuteratable, 2 OH + alditolyl H). The other protons together with the solvent absorption were gathered in a broad signal at δ3.50.

Anal. Calcd for $C_{19}H_{18}N_4O_4.1/2\ H_2O$: C, 60.79; H, 5.10; N, 14.93. Found: C, 60.66; H, 5.35; N, 14.92.

3-(1,2,3,4-Tetra-O-acetyl-D-*lyxo*-tetritol-1-yl)-6-phenyl-1,2,4-triazolo[3,4-*a*]phthalazine (15). Compound 15 was prepared by acetylation of 10 (1 g) as described for the preparation of 16. It crystallized from methanol (yield: 0.7 g, 48%), mp 120-123 °C; TLC in 9:1 chloroform-methanol, R_f: 0.56; IR (KBr) 1770 (ester-carbonyl, *O*-acetyl groups) and 1640 cm^{-1} (C=N); ^1H NMR ($CDCl_3$) δ 8.86-7.50 (m, 9H, aromatic H), 6.67 (d, 1H, alditolyl H-1), 6.18 (dd, 1H, alditolyl H-2), 5.62 (m, 1H, alditolyl H-3), 4.33 (dd, 1H, alditolyl H-4), 4.05 (dd, 1H, alditolyl H-4'), 2.05 (s, 6H, 2 acetyl groups), 2.00 and 1.84 (s, 3H each, 2 acetyl groups).

Anal. Calcd for $C_{27}H_{26}N_4O_8.\ H_2O$: C, 58.70; H, 5.07; N, 10.15. Found: C, 59.07; H, 5.07; N, 10.36.

6-Phenyl-3-(D-*xylo*-tetritol-1-yl)-1,2,4-triazolo[3,4-*a*]phthalazine (12). Compound 12 was prepared from 1 (1 g) and D-xylose (6, 0.6g) as described for the preparation of 8. It crystallized from water-methanol (yield: 0.8g, 52%), mp 225-228 °C; TLC in 1:1 chloroform-methanol, R_f: 0.65; IR (KBr) 3300 (broad, OH) and 1630 cm^{-1} (C=N); ^1H NMR [$(CD_3)_2SO$] δ

8.75-7.53 (m, 9H, aromatic H), 5.60 (d, 1H, deuteratable, OH), 5.33 (m, 1H, alditolyl H), 4.69 (d, 1H, deuteratable, OH) and 4.35 (m, 3H, deuteratable, 2 OH + alditolyl H). The rest of the protons were associated with the solvent absorption forming a broad signal at δ 3.35.

Anal. Calcd for $C_{19}H_{18}N_4O_4$: C, 62.29; H, 4.95; N, 15.29. Found: C, 62.38; 5.15; N, 15.04.

3-(1,2,3,4-Tetra-O-acetyl-D-*xylo*-tetritol-1-yl)-6-phenyl-1,2,4-triazolo[3,4-*a*]phthalazine (17). This compound was prepared by acetylation of 12 (1 g) as described for 16. It crystallized from methanol (yield: 0.8 g, 55%), mp 138-140 °C; TLC in 9:1 chloroform-methanol, R_f: 0.59; IR (KBr) 1760 cm^{-1} (ester-carbonyl, *O*-acetyl groups); ^1H NMR ($CDCl_3$) δ 8.76-7.40 (m, 9H, aromatic H), 6.61 (d, 1H, alditolyl H-1), 5.97 (dd, 1H, alditolyl H-2), 5.12 (m, 1H, alditolyl H-3), 4.28 (dd, 1H, alditolyl H-4), 3.97 (dd, 1H, alditolyl H-4'), 2.08, 2.00, 1.86 and 1.75 (s, 3H each, 4 acetyl groups).

Anal. Calcd for $C_{27}H_{26}N_4O_8 \cdot 1/2\ H_2O$: C, 59.67; H, 4.97; N, 10.31. Found: C, 59.41; H, 4.92; N, 10.70.

ACKNOWLEDGEMENTS

We would like to thank Dr. V. L. Narayanan, Division of Cancer Treatment, National Cancer Institute, Bethesda, Maryland, USA for providing the antileukemic results and Dr. S. Abd El-Baky, Deparmtment of Chemistry, Northeastern University, Boston, Massachusetts, USA for carrying out the mass spectral measurements.

REFERENCES

1. Preliminary reports on this work: M. A. E. Shaban, M. A. M. Nassr, and M. A. M. Taha, *Carbohydr. Res.*, 113, C16 (1983); M. A. E. Shaban and M. A. M. Nassr, *Amer. Chem. Soc. 186th National Meeting*, Washington, D.C., Carb-23 (1983).

2. H. El-Khadem, M. A. E. Shaban, *J. Chem. Soc.*, C, 519 (1967).

3. H. El-Khadem, M. A. M. Nassr, and M. A. E. Shaban, *J. Chem. Soc.*, C, 1465 (1968).

4. H. El-Khadem, M. A. E. Shaban, and M. A. M. Nassr, *J. Chem. Soc.*, C, 1416 (1968).

5. H. El-Khadem, M. A. E. Shaban, and M. A. M. Nassr, *Carbohydr. Res.*, 13, 470 (1970); 23, 103 (1972).

6. M. A. E. Shaban and M. A. M. Nassr, *Org. Prep. Proced. Int.*, 8, 107 (1976).

7. M. A. E. Shaban, R. S. Ali, and S. M. El Badry, *Carbohydr. Res.*, 95, 51 (1981).

8. M. A. E. Shaban and M. A. M. Nassr, *Carbohydr. Res.*, 36, C12 (1974); *Org. Prep. Proced Int.*, 8, 113 (1976).

9. M. A. M. Nassr, M. A. M. Taha, and M. A. E. Shaban, *Carbohydr. Res.*, *121*, 125 (1983).

10. S. Hanessian and A. G. Prenet, *Adv. Carbohydr. Chem. Biochem.*, 33, 11 (1976).

11. M. A. E. Shaban, *Bull. Faculty of Science, King Abdul Aziz Univ.*, 5, 153 (1981).

12. J. G. Buchanan and R. H. Wightman, *Top. Antibiot. Chem.*, 6, 304 (1982); *Chem. Abstr.*, 98, 34845t (1983).

13. J. G. Buchanan, *Prog. Chem. Nat. Prod.*, 44, 243 (1983); *Chem. Abstr.*, 100, 51895m (1984).

14. J. G. Buchanan, *Nucleosides and Nucleotides*, 4, 13 (1985).

15. R. J. Suhadolnik, "Nucleoside Antibiotics", Wiley-Interscience, New York, New York, 1970, pp354-404.

16. A. Ishii, K. Kubo, T. Deguchi, and M. Tanaka, *Yakaguku Zasshi*, 99, 533 (1979); *Chem. Abstr.*, 91, 133826z (1979).

17. H. M. Faid-Allah and R. Soliman, *J. Heterocycl. Chem.*, 24, 667 (1987).

18. J. Druey and B. H. Ringier, *Helv. Chem. Acta*, 34, 195 (1951).

19. M. A. E. Shaban, unpublished results.

20. H. El-Khadem, D. Horton, and J. D. Wander, *J. Org. Chem.*, 37, 1630 (1972).

21. A. M. Seldes, I. M. E. Thiel, and J. O. Deferrari, *Carbohydr. Res.*, 39, 11 (1975).

22. A. M. Seldes, E. G. Gros, I. M. E. Thiel and J. O. Deferrari, *Carbohydr. Res.*, 49, 49 (1976).

23. J. B. Lee and B. F. Scanlon, *Tetrahedron*, 25, 3413 (1969).

24. L. Szilagyi, R. Bognar, and I. Farkas, *Carbohydr. Res.*, 26, 305 (1973).

25. L. D. Hall, *Advan. Carbohydr. Chem.*, 19, 51 (1964).

26. R. U. Lemieux and J. D. Stevens, *Can. J. Chem.*, 43, 2059 (1965).

27. B. Coxon, *Tetrahedron*, 21, 3481 (1965).

28. J. M. Williams, *Carbohydr. Res.*, 11, 437 (1969).

29. B. A. Abdel-Nabey, M. Shaban, and M. Essa, *Proceeding 6th. Eur. Symp. on Corrosion Inhibitors, Ferrara, Italy*, p.295 (1985).

30. B. A. Abdel-Nabey, M. M. Essa, and M. A. E. Shaban, *Surface Technol.*, 26, 165 (1985).