ISSN: 2278-4632
Vol-10 Issue-6 No. 4 June 2020

# SYNTHESIS OF 1-ARYL – 5 - TETRA – *O* – ACETYL – B – GLUCOSYL – 2 - *S* – BENZYL – 2, ISOTHIOBIURETS

**Ashish G. Sarap**
**Shri R. L. T. College of Science, Akola-444 001**
**Maharashtra, India.**
**E-mail: sarap.aashish1@gmail.com**

## ABSTRACT:

Several 1-aryl – 5 - tetra – *O* – acetyl – β – glucosyl – 2 - *S* – benzyl – 2, isothiobiurets have been prepared by the interaction of aryl – *S* – benzyl isothiocarbamides and tetra – *O* – acetyl - β – glucosyl isocyanate. The structures of the newly synthesized compounds have been established on the basis of usual chemical transformations and IR, NMR and Mass spectral studies.

**Keywords:** *N* - glucosides, aryl – *S* – benzyl isothiocarbamides, glucosyl isocyanate, isothiobiurets.

## INTRODUCTION:

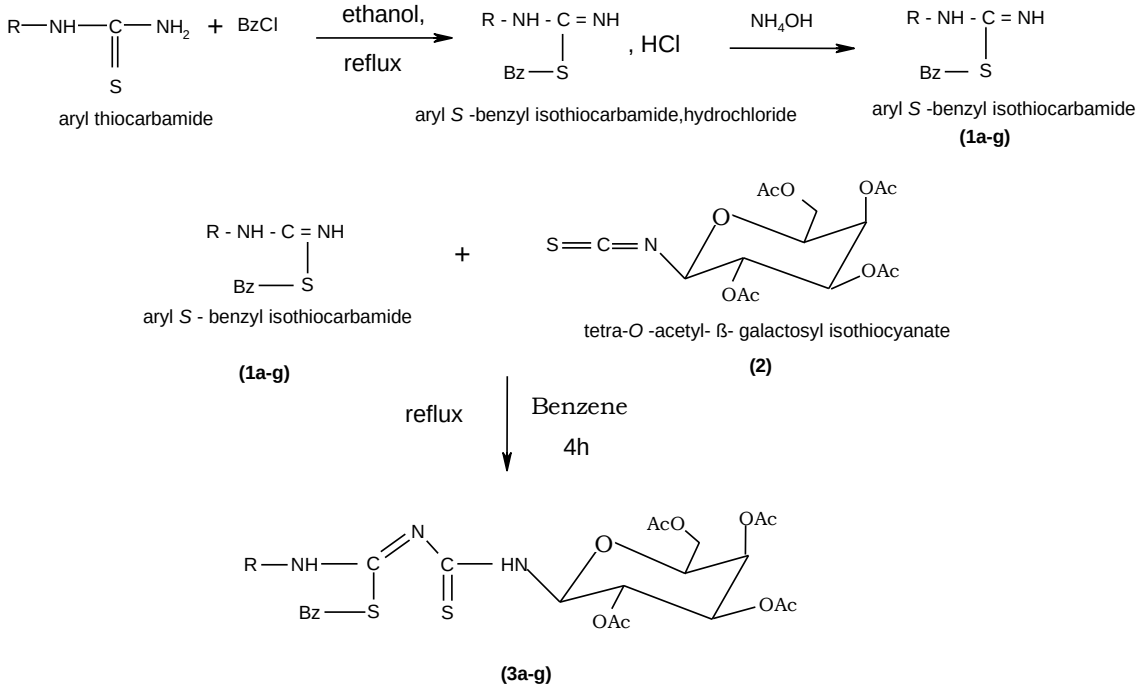
Glycosyl Carbamides and Glycosyl thiocarbamides have great pharmacological and biochemical aspects[1]. Many of these derivatives have been found to possess wide applications in industry as Carbohydrate based detergent[2] and in medicine as anticancer agent[3] and antifungal agents[4].

Glucosyl isocynate and isothiocyanate[5], likewise other glycosyl isocyanates has a significant role in synthetic Carbohydrate Chemistry. Many compounds have been synthesized by the use of glycosyl isocyanate, for example, galactosyl isocyanide[6], galactosyl amino derivatives[7] and other heterocycles[8].But there is no report on the synthesis of isothiobiurets having a β - glucosyl substituent. On the basis of knowledge gained on the work done on *N*-glucosylated isomonothio and dithiobiurets[9-10], it was quit interesting to synthesize some new *N*-glucosylated thioamides.

In the present Communication, we report the synthesis of 1-aryl – 5 – tetra – *O* – acetyl – β – glucosyl -2-*S*-benzyl- 2, isothiobiurets by the interaction of tetra – *O* – acetyl – β - glucosyl isocyanate and aryl-*S*-benzyl isothiocarbamides. All the products obtained have been crystallized form alcohol .IR spectra of the products show characteristic absorption of prominent peaks,[1]H NMR spectra shows characteristics peaks due to N-H, acetyl and glycosidic protons, while the ESI Mass spectra shows peaks due to acetogalactose unit [11-13].

ISSN: 2278-4632
Vol-10 Issue-6 No. 4 June 2020




**Scheme -1**

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. Ac = $-COCH_3$ Bz = $- CH_2C_6H_5$.

## RESULT AND DISCUSSION:

Several 1-aryl – 5 – tetra – *O* – acetyl – β – glucosyl -2-*S*-benzyl- 2, isothiobiurets (**3a-g**)(**Sceme-1**) were prepared by the condensation of aryl-*S*-benzyl isothiocarbamides (**1a-g**) and tetra-*O*-acetyl- β-glucosyl isocyanate (**2**) in benzene for 4h. The reaction was monitored by TLC, after complete reaction, the solvent was distilled off and the resultant sticky residue was triturated with petroleum ether (bp 60-80$^0$ C) to afford the products (**3a-g**). All the products were crystallized from alcohol. Structures of all products synthesized were established on the basis of usual Chemical transformations and IR, NMR and Mass spectral studies.

## METHODOLOGY:

### 1. General methods:

Melting points are uncorrected. Optical rotations $[\square]_D$ were measured on a Equip-Tronics digital polarimeter model no. EQ 800 in $CHCl_3$ at 39$^0$C. IR spectra were recorded on a Perkin-Elmer spectrum RXI (4000-450cm$^{-1}$) FTIR spectrometer. $^1$HNMR were obtained on a Bruker DRX-300 (300 MHz FT NMR) NMR spectrometer for a sample in $CDCl_3$ solution with

ISSN: 2278-4632
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TMS as an internal reference. The mass spectra were recorded on a Micromass Quattro II triple quadruple mass spectrometer.

**2. Aryl-*S*-benzyl isothiocarbamides (1a-g):**

The required aryl *S*-benzyl isothicarbamides (**1a-g**) were prepared by the already known method[14], which involves interaction of benzyl Chloride with aryl thiocarbamides in ethanol, refluxed for 90 min., followed by the basification of the resultant solution using dilute ammonium hydroxide to give the isothiocarbamides (**1a-g**).

**3. Tetra-*O*-acetyl –β- glucosyl isocyanate (2):**

Tetra-*O*-acetyl- β - glucosyl isocyanate (**2**) was prepared by employing the classical Fischer's method[15] using lead cyanate instead of silver cyanate in anhydrous Xylene medium.

**4. 1-aryl – 5 – tetra – *O* – acetyl – β – glucosyl -2-*S*-benzyl- 2, isothiobiurets (3a-g) (Sceme-1) .**

Condensation of aryl – *S* - benzyl isothiocarbamides (**1a-g**, 0.005M) and tetra-*O*-acetyl- β- glucosyl isocyantae (**2**, 0.005M, 2g), in benzene(20mL) was carried out on boiling water bath for 4h.. The reaction was monitored by TLC, after complete reaction, the solvent was distilled off and the resultant sticky residue was triturated with petroleum ether (bp 60-80$^0$ C) to afford the products (**3a-g**). All the products were crystallized from alcohol before recording the physical data (**table-1**). The purity of compounds (**3a-g**) was checked by TLC. The compounds formed have β configuration which is elaborated by the high value of vicinal coupling constant of proton at anomeric position[16-17].

## DATA ANALYSIS :-

**4.1 1-phenyl-5-tetra-*O*-acetyl - β - glucosyl -2-*S*- benzyl -2, isothiobiuret (3a).**

IR (KBr) :- υ 3336 (N-H); 2929 (Ar-H); 1749 (C=O); 1551 (C = N) 1366 (C-N); 1223 (C-O); 1044 (C=S). $^1$HNMR ($CDCl_3$) : δ 7.43-7.23 (m,11H,N-H(Ar.) and Ar-H); 6.97 (d, 1H,j=9Hz, NH(gal.)); 5.72 (t, 1H, j=9Hz, $H_1$); 5.49 (d, 1H,j=3Hz, $H_4$); 5.43-5.14 (m,2H, $H_2$, $H_3$); 4.35-3.95 (m, 5H, $H_{5,6,6'}$ and Ar-$CH_2$); 2.17-1.60 (m, 12H, 4$COCH_3$).

ESI Mass (M/z) : 632.4 ($M^+$.+1), 331.3, 211.1, 169, 108.9, 90.9.

Anal. Calcd. for:- $C_{29}H_{33}N_3O_9S_2$: C, 55.15; H, 5.22; N, 6.65; S,10.14, found, C, 54.99; H, 5.16; N, 6.51; S,10.01,%.

**4.2 1-*o*-Cl-phenyl-5-tetra-*O*-acetyl - β -glucosyl -2-*S*- benzyl -2, isothiobiuret (3b).**

 

$^1$HNMR ($CDCl_3$) : δ 7.43-7.22 (m,10H,N-H(Ar.) and Ar-H); 6.38 (d, 1H,j=9Hz, NH(gal.)); 5.71 (t, 1H, j=9Hz, $H_1$); 5.50 (d, 1H,j=3Hz, $H_4$); 5.43-5.10 (m,2H, $H_2$, $H_3$); 4.35-4.01 (m, 5H, $H_{5,6,6'}$ and Ar-$CH_2$);2.16-1.97 (m,12H,4$COCH_3$).Anal. Calcd. for:- $C_{29}H_{32}N_3O_9S_2Cl$: , 52.28; H, 4.84; N, 6.31; S, 9.62, found, C, 52.33; H, 4.78; N, 6.13; S, 9.52, %.

### 4.3 1-*m*-Cl-phenyl-5-tetra-*O*-acetyl - β - glucosyl -2-*S*- benzyl -2, isothiobiuret (3c).

IR (KBr) :- υ 3336 (N-H); 2930 (Ar-H); 1751 (C=O); 1548 (C = N) 1366 (C-N); 1223 (C-O); 1045 (C=S). $^1$HNMR ($CDCl_3$) : δ 7.38-7.16 (m,10H,N-H(Ar.) and Ar-H); 6.38 (d, 1H,j=9Hz, NH(gal.)); 5.69 (t, 1H, j=9Hz, $H_1$); 5.49 (d, 1H,j=3Hz, $H_4$); 5.43-5.10 (m,2H, $H_2$, $H_3$); 4.32-4.00 (m, 5H, $H_{5,6,6'}$ and Ar-$CH_2$); 2.16-1.67 (m, 12H, 4$COCH_3$).

ESI Mass (M/z) : 666.4 ($M^+$.), 331.3, 211.1, 169, 108.9, 90.9(100%).

Anal. Calcd. for:- $C_{29}H_{32}N_3O_9S_2Cl$: C, 52.28; H, 4.84; N, 6.31; S,9.62, found, C, 52.22; H, 4.88; N, 6.22; S,9.69,%.

### 4.4 1-*p*- Cl-phenyl-5-tetra-*O*-acetyl - β - glucosyl -2-*S*- benzyl -2, 4 isothiobiuret (3d).

$^1$HNMR ($CDCl_3$) : δ 7.43-7.19 (m,10H,N-H(Ar.) and Ar-H); 6.38 (d, 1H,j=9Hz, NH(gal.)); 5.70 (t, 1H, j=9Hz, $H_1$); 5.50 (d, 1H,j=3Hz, $H_4$); 5.44-5.17 (m,2H, $H_2$, $H_3$); 4.35-3.99 (m, 5H, $H_{5,6,6'}$ and Ar-$CH_2$); 2.16-1.68 (m, 12H, 4$COCH_3$). Anal. Calcd. for:- $C_{29}H_{32}N_3O_9S_2Cl$: C, 52.28; H, 4.84; N, 6.31; S,9.62, found, C, 52.32; H, 4.79; N, 6.40; S,9.55,%.

### 4.5 1-*o*-tolyl-5-tetra-*O*-acetyl - β - glucosyl -2-*S*- benzyl -2, isothiobiuret (3e).

$^1$HNMR ($CDCl_3$) : δ 7.34-7.19 (m,10H,N-H(Ar.) and Ar-H); 6.97 (d, 1H,j=9Hz, NH(gal.)); 5.72 (t, 1H, j=9Hz, $H_1$); 5.49 (d, 1H,j=3Hz, $H_4$); 5.40-5.11 (m,2H, $H_2$, $H_3$); 4.30-4.01 (m, 5H, $H_{5,6,6'}$ and Ar- $CH_2$);2.36(m,3H,Ar-$CH_3$); 2.17-1.60 (m, 12H, 4$COCH_3$).Anal. Calcd. for:- $C_{30}H_{35}N_3O_9S_2$: C, 55.80; H, 5.42; N, 6.51; S,9.92 found, C, 55.84; H, 5.36; N, 6.42; S,9.86%.

### 4.6 1-*m*-tolyl-5-tetra-*O*-acetyl - β - glucosyl -2-*S*- benzyl -2, isothiobiuret (3f).

IR (KBr) :- υ 3333 (N-H); 2929 (Ar-H); 1749 (C=O); 1550 (C = N); 1365 (C-N); 1221 (C-O); 1046 (C=S). $^1$HNMR ($CDCl_3$) : δ 7.36-7.12 (m,10H,N-H(Ar.) and Ar-H); 6.96 (d, 1H,j=9Hz, NH(gal.)); 5.72 (t, 1H, j=9Hz, $H_1$); 5.48 (d, 1H,j=3Hz,

 

ISSN: 2278-4632
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$H_4$); 5.35-5.13 (m,2H, $H_2$, $H_3$); 4.30-4.00 (m, 5H, $H_{5,6,6'}$ and Ar-$CH_2$);2.36(m,3H,Ar-$CH_3$); 2.16-1.62 (m, 12H, 4$COCH_3$). ESI Mass (M/z) : 646.5 ($M^+$.+1)(100%), 331.3, 211.1, 169, 108.9, 90.9. Anal. Calcd. for:- $C_{30}H_{35}N_3O_9S_2$: C, 55.80; H, 5.42; N, 6.51; S,9.92, found, C, 55.84; H, 5.39; N, 6.59; S,10.01%.

**4.7 1-*p*-tolyl-5-tetra-*O*-acetyl - β - glucosyl -2-*S*- benzyl -2, isothiobiuret (3g).**

$^1$HNMR ($CDCl_3$) : δ 7.34-7.15 (m,10H,N-H(Ar.) and Ar-H); 6.98 (d, 1H,j=9Hz, NH(gal.)); 5.72 (t, 1H, j=9Hz, $H_1$); 5.50 (d, 1H,j=3Hz, $H_4$); 5.35-5.10 (m,2H, $H_2$, $H_3$); 4.29-4.00 (m, 5H, $H_{5,6,6'}$ and Ar-$CH_2$);2.34(m,3H,Ar-$CH_3$); 2.16-1.61 (m, 12H, 4$COCH_3$).Anal. Calcd. for:- $C_{30}H_{35}N_3O_9S_2$: C, 55.80; H, 5.42; N, 6.51; S,9.92, found, C, 55.78; H, 5.48; N, 6.59; S,9.99%.

**Table -1:- Physical data of 1-aryl – 5 – tetra – *O* – acetyl – β –glucosyl -2-*S*-benzyl- 2- isothiobiurets (3a-g) (Sceme-1) .**

| Sr. No. | Reactant 1a-g (g) | Product (3a-g) | m. p. ($^0$C) | Yield, g (%) | $[\alpha]_D^{39}$ (c,$CHCl_3$) | $R_f$ (3:2,$CCl_4$:EtOAc) |
|---|---|---|---|---|---|---|
| 1 | **1a** (1.21) | **3a** | 174-176 | 2.1 (65.6) | $122.2^0$ (0.9) | 0.83 |
| 2 | **1b** (1.38) | **3b** | 116-118 | 2.5 (73.5) | $-21.5^0$ (0.93) | 0.84 |
| 3 | **1c** (1.38) | **3c** | 162-164 | 2.6 (76.4) | $-84.2^0$ (0.95) | 0.48 |
| 4 | **1d** (1.38) | **3d** | 158-160 | 2.2 (64.7) | $85.1^0$ (0.94) | 0.53 |
| 5 | **1e** (1.28) | **3e** | 136-138 | 2.1 (63.6) | $52.0^0$ (0.96) | 0.71 |
| 6 | **1f** (1.28) | **3f** | 150-152 | 2.4 (72.7) | $-33.3^0$ (0.9) | 0.77 |
| 7 | **1g** (1.28) | **3g** | 138-140 | 2.5 (75.7) | $43.0^0$ (0.93) | 0.70 |

**ACKNOWLEDGEMENT**

Authors are thankful to RSIC, CDRI Lucknow for providing the spectral data. Authors also thanks to Dr. S. G. Bhadange, Principal for encouragement and providing necessary facilities.

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