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Interaction of methyl (2-methylsulfanyl-6-phenyl-4-thioxopyrimidin-3(4*H*)-yl)acetate with hydrazine hydrate

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Methyl (2-methylsulfanyl-6-phenyl-4-thioxopyrimidin-3(4*H*)-yl)acetate (**2**) reacted with hydrazine hydrate at room temperature in 1-butanol to give the corresponding hydrazide **3**. The same reaction at reflux in different solvents (methanol, acetonitrile, n-butanol or dimethylformamide) underwent thermally induced cyclization to yield 1-amino-7-phenyl-5-thioxo-1,5-dihydroimidazo[1,2-*a*]pyrimidin-2(3*H*)-one (**4**) and 6-hydrazino-8-phenyl-2*H*-pyrimido[6,1-*c*][1,2,4]triazin-3(4*H*)-one (**5**). The latter **5** was synthesized by an alternative method from 4-hydrazino-6-phenyl-2-methylsulfanylpyrimidine. New compounds are characterized by ^{1}H, ^{13}C NMR, IR spectroscopy and analytical data.

Key words: heterocyclization, 4-thioxopyrimidine, imidazo[1,2-*a*]pyrimidine, pyrimido[6,1-*c*][1,2,4]triazine, hydrazine hydrate

INTRODUCTION

Pyrimidine and its annelated derivatives are important due their biological and pharmacological properties. Imidazopyrimidines and pyrimido[1,2,4]triazines are of considerable interest from this point of view. These heterocyclic systems are well explored as compounds with potential anti-inflammatory, antiviral, antimicrobial and anticancer activity [1–7]. The most common synthetic pathway to biologically active imidazopyrimidines or pyrimidotriazines is intramolecular cyclization of the corresponding pyrimidine derivatives [8–14]. Earlier we reported that (2-methylsulfanyl-4-oxopyrimidin-3(4*H*)-yl)acetohydrazides on treatment with N-nucleophiles undergo intramolecular heterocyclization to give either imidazo[1,2-a]pyrimidine-2,5-dione or pyrimido[2,1-c][1,2,4]triazinediones [15, 16].

Continuing our previous research and being interested in the synthesis of new heterocyclic compounds, herein we present the study of the reaction of analogous sulphur containing ester, methyl (2-methylsulfanyl-4-thioxo-6-phenylpyrimidin-3(4*H*)-yl)acetate (**2**), with hydrazine hydrate.

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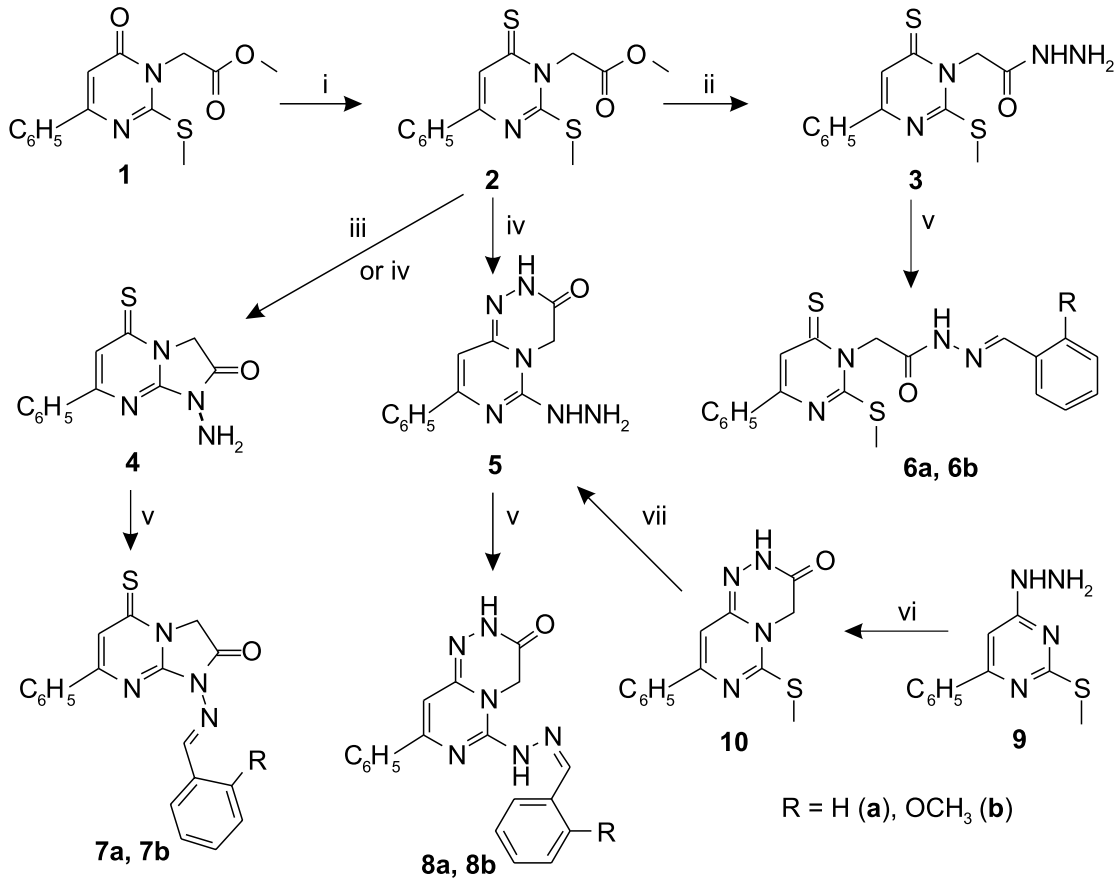
RESULTS AND DISCUSSION

The starting ester **2** was synthesized by the reaction of 4-oxo derivative **1** with the Lawesson's reagent (LR) as shown in the Scheme. Thionation with this reagent is widely used [17]. We adapted the known methods for the synthesis of ester **2**. Thus, ester **1** was refluxed with the Lawesson's reagent in dry toluene for 4 hours to give 4-thioxo ester **2** in 85% yield. The replacement with sulphur at $C_{(4)}$ was obvious by comparison of the spectral data of **2** with that of the starting ester **1**. In the IR spectra 4-thioxo ester **2** displayed strong absorption band characteristic for ester carbonyl at 1 750 cm^{-1} and no absorption was observed for the lactam carbonyl group. In the ^{1}H NMR spectra the singlet of the $C_{(5)}$H-pyrimidine proton was found at 7.81 ppm, i. e. shifted downfield by 0.94 ppm in comparison to that of the starting 4-oxo ester **1** [15].

4-Thioxo ester **2** contains three electrophilic centres ($C_{(2)}$ and $C_{(4)}$ of the pyrimidine ring along with the C atom of the



Scheme. Reagents and conditions: (i) LR, toluene, reflux, 4 h.; (ii) $N_2H_4 \cdot H_2O$, n-BuOH, r. t., 6 days; (iii) $N_2H_4 \cdot H_2O$, MeOH, reflux, 4 h; (iv) $N_2H_4 \cdot H_2O$, MeCN, reflux, 6 h; (v) ArCHO, DMF, reflux, 15–30 min; (vi) $ClCH_2COCl$, K_2CO_3, DMF, reflux, 3 h; (vii) $N_2H_4 \cdot H_2O$, DMF, 40 °C, 4 h

ester carbonyl group), which are possible sites for nucleophile attack. Herein we present the results of our study on the reaction of 4-thioxo ester **2** with hydrazine hydrate. Reactions were carried out in different solvents at room temperature or at reflux.

First we performed the reaction of 4-thioxo ester **2** with hydrazine hydrate in methanol at room temperature. Under these conditions the reaction appeared to be very slow. After prolonged stirring (6 days) of thioxo derivative **2** with hydrazine hydrate at room temperature only 25% yield of hydrazide **3** was obtained**.** Replacement of methanol with 1-butanol improved conversion to 64%, however, the reaction proceeded slowly.

Another set of experiments showed that increase of reaction temperature is highly favourable to cyclization products formation. Under reflux of ester **2** and hydrazine hydrate in either of solvents (methanol, 1-butanol, acetonitrile or dimethylformamide) complex mixtures were obtained. Using methanol from the reaction mixture imidazopyrimidine **4** was isolated in 44% yield. It seems that cyclization involves nucleophilic addition of hydrazine hydrate to ester **2** to give hydrazide **3** followed by the attack of hydrazine function on the $C_{(2)}$ electrophilic site of the pyrimidine ring to form imidazopyrimidine **4**. When the same reaction was performed in n-butanol or dimethylformamide at reflux, only miserly amounts of cyclic compounds **4** and **5** were isolated from a complex hardly identifiable mixture. We found that satisfactory yields of either of cyclization product **4** or **5** can be obtained using acetonitrile as a solvent. The lower solubility triazine **5** precipitated on formation and was immediately filtered off, while more soluble imidazopyrimidine **4** crystallized from acetonitrile solution on cooling. Apparently, at higher temperature along with nucleophilic addition of hydrazine hydrate to ester **2**, displacement of 2-methylsulfanyl group with hydrazine hydrate is more favourable prior to cyclization. Consequently ring closure afterwards occurs at the $C_{(4)}$ position of the pyrimidine ring. Formation of triazine **5** was proved by alternative synthesis from the reaction of 4-hydrazino-2-methylsulfanyl-6-phenylpyrimidine (**9**) with chloroacetyl chloride. Additionally, compounds **3**, **4** and **5** were reacted with aromatic aldehydes to form corresponding benzylidene derivatives **6–8**.

The structures of compounds **3–8** were established by spectral data and elemental analyses. Noteworthy, in ^{1}H NMR spectra of compounds with unreplaced thioxo group (**3**, **4**, **6a**, **6b** and **7a**, **7b**) the characteristic downfield shift for $C_{(5)}$ H-pyrimidine (adjacent to C=S group) was observed between 7.62 and 7.82 ppm. Also in ^{13}C NMR the C=S signal appeared

in the area of 180.6–186.1 ppm. In the ^{1}H NMR spectra of triazines **5**, **8a** and **8b** the signal of $C_{(5)}$H-pyrimidine was observed in the area of 5.81–6.17 ppm, and the singlet for lactamic NH proton was found at 10.49–10.75 ppm. The chemical shifts for other pyrimidine ring substituents are consistent with the structures of compounds. Besides, the IR spectra of imidazopyrimidines **4**, **7a** and **7b** revealed characteristic absorption bands for carbonyl group in a region of 1 760–1 786 cm^{-1}, while triazine ring containing compounds **5**, **8a** and **8b** showed strong absorption of lactam between 1 674 and 1 684 cm^{-1}.

EXPERIMENTAL

Melting points were determined in open capillaries using a digital melting point IA9100 series apparatus (Fisher Scientific) and are uncorrected. ^{1}H and ^{13}C NMR spectra were recorded on a Unity Varian INOVA spectrometer (300 and 75 MHz, respectively) using residual solvents signals as the internal standard. The IR spectra were recorded on a Spectrum BX FT-IR (Perkin-Elmer) in KBr discs. The reactions and purities of the compounds were monitored by TLC on Silica Gel 60 F254 aluminium plates (Merck), visualised by UV light. Elemental analyses were performed at the Microanalyses Laboratory of the Department. Reagents and solvents were purchased from commercial sources and toluene was dried and distilled before use, the others were used without additional purification.

Methyl (2-methylsulfanyl-4-oxo-6-phenyl-3(4*H*)-pyrimidinyl)acetate (**1**) was synthesized as reported in ref. [15], 4-hydrazino-2-methylsulfanyl-6-phenylpyrimidine (**9**) was synthesized according to ref. [18].

Methyl (2-methylsulfanyl-6-phenyl-4-thioxopyrimidin-3(4*H*)-yl)acetate (2)

Lawesson's reagent (2.43 g, 6.0 mmol) was added to a magnetically stirred solution of ester **1** (2.90 g, 10 mmol) in dry toluene (45 ml). The mixture was refluxed for 4 hours and filtered. The filtrate then was cooled to room temperature and the precipitate was filtered, recrystallized from 2-propanol to give yellow crystals of **2**, yield 85%, 2.61 g, mp 158–160 °C; IR (z_{max}, cm^{-1}): 1 750 (C=O). ^{1}H NMR (300 MHz, DMSO-d_6): δ_H 2.75 (s, 3H, SCH_3), 3.76 (s, 3H, OCH_3), 5.49 (s br, 2H, NCH_2), 7.52–7.59 (m, 3H, C_6H_5), 7.81 (s, 1H, $C_{(5)}$-H), 8.20–8.22 (m, 2H, C_6H_5) ppm. ^{13}C NMR (75 MHz, DMSO-d_6): δ_C 16.6 (SCH_3), 51.6 (NCH_2), 53.5 (OCH_3), 118.9 (C-5), 128.1, 129.8, 132.3 and 135.1 (C-C_6H_5), 152.7, 164.5, 166.8 (C-2, C-6, C=O), 185.9 (C=S) ppm. Anal. calcd. for $C_{14}H_{14}N_2O_2S_2$ (306.41): C, 54.88; H, 4.61; N, 9.14%. Found: C, 55.15; H, 4.54; N, 8.92%.

(2-Methylsulfanyl-6-phenyl-4-thioxopyrimidin-3(4*H*)-yl) acetohydrazide (3)

A mixture of ester **2** (0.5 g, 1.63 mmol), hydrazine hydrate (0.33 g, 6.52 mmol) and 1-butanol (3 ml) was stirred at room temperature for 6 days. The precipitate formed was then collected, washed with methanol and recrystallized from acetonitrile to give hydrazide **3** as a yellowish solid, 64%, 0.32 g, mp 260–263 °C (decomp.); IR (ν_{max}, cm^{-1}): 3 405, 3 302 (NH_2, NH), 1 658 (C=O). ^{1}H NMR (300 MHz, DMSO-d_6): δ_H δ 2.73 (s, 3H, SCH_3), 4.35, 4.66 (2s, 2H, NH_2, exchang.), 5.34 (s br, 2H, NCH_2), 7.52–7.59 (m, 3H, C_6H_5), 7.77 (s, 1H, $C_{(5)}$-H), 8.20–8.23 (m, 2H, C_6H_5), 8.90, 9.43 (2s, 1H, NH, exchang.) ppm. ^{13}C NMR (75 MHz, DMSO-d_6): δ_C 16.5 (SCH_3), 51.3 (N-CH_2), 118.9 (C-5), 128.0, 129.8, 132.1 and 135.4 (C-C_6H_5), 152.4, 164.4, 164.9 (C-2, C-6, C=O), 186.1 (C=S) ppm. Anal. calcd. for $C_{13}H_{14}N_4OS_2$ (306.41): C, 50.96; H, 4.61; N, 18.29%. Found: C, 51.04; H, 4.86; N, 17.96%.

1-Amino-7-phenyl-5-thioxo-1,5-dihydroimidazo[1,2-a] pyrimidin-2(3*H*)-one (4)

A solution of ester **2** (0.50 g, 1.63 mmol), hydrazine hydrate (0.40 g, 8 mmol) and methanol (8 ml) was refluxed for 4 hours. The resulting precipitate was filtered, washed with methanol and recrystallized from acetonitrile to give **4** as a yellow solid. From the filtrate 0.17 g of unreacted ester **2** was recovered. Yield of **4** 44%, 0.18 g, mp 236–239 °C; IR (ν_{max}, cm^{-1}): 3 298, 3 182 (NH_2), 1 760 (C=O). ^{1}H NMR (300 MHz, DMSO-d_6): δ_H 4.64 (s, 2H, NCH_2), 5.39 (s, 2H, NH_2), 7.55–7.57 (m, 3H, C_6H_5), 7.62 (s, 1H, $C_{(6)}$-H), 8.22–8.24 (m, 2H, C_6H_5) ppm. ^{13}C NMR (75 MHz, DMSO-d_6): δ_C 51.1 (N-CH_2), 116.8 (C-6), 128.0, 129.6, 132.0 and 135.8 (C-C_6H_5), 155.6, 156.4, 168.0 (C-7, C-8a, C=O), 180.7 (C=S) ppm. Anal. calcd. for $C_{12}H_{10}N_4OS$ (258.30): C, 55.80; H, 3.90; N, 21.69%. Found: C, 55.64; H, 4.01; N, 21.96%.

6-Hydrazinyl-8-phenyl-2*H*-pyrimido[6,1-c][1,2,4]triazin-3(4*H*)-one (5)

A solution of ester **2** (0.50 g, 1.63 mmol), hydrazine hydrate (0.40 g, 8 mmol) and acetonitrile (15 ml) was refluxed for 6 hours. The hot reaction mixture was filtered immediately, the precipitate was washed with ethanol and dried to yield a yellowish solid of **5**, 31%, 0.13 g, mp 270–275 °C (decomp.); IR (ν_{max}, cm^{-1}): 3 424, 3 303, 3 226 (NH_2, NH), 1 678 (C=O). ^{1}H NMR (300 MHz, DMSO-d_6): δ_H 4.30 (s, 2H, CH_2), 4.64 (s br, 2H, NH_2, exchang.), 6.17 (s, 1H, $C_{(9)}$-H), 7.40–7.45 (m, 3H, C_6H_5), 7.99–8.02 (m, 2H, C_6H_5), 8.28 (s br, 1H, NH exchang.), 10.49 (s, 1H, NH) ppm. ^{13}C NMR (75 MHz, DMSO-d_6): δ_C 44.6 (N-CH_2), 97.0 (C-9), 126.6, 129.0, 129.9 and 137.4 (C-C_6H_5), 141.0, 150.5, 153.4, 158.8 (C-6, C-8, C-9a, C=O) ppm. Anal. calcd. for $C_{12}H_{12}N_6O$ (256.26): C, 56.24; H, 4.72; N, 32.79%. Found: C, 56.42; H, 4.84; N, 32.78%.

The filtrate was cooled, the precipitate was filtered, washed with ethanol and crystallized from acetonitrile to give a yellow solid of **4**, 36%, 0.15 g, mp 236–239 °C.

General procedure for the synthesis of compounds 6a, 6b, 7a, 7b, 8a and 8b

A mixture of compound **3** (**4** or **5**) (1 mmol) and aromatic aldehyde (1.04 mmol) in acetic acid (5 ml) was heated at reflux for 15–30 min. After being cooled to room temperature, the solid was filtered, washed with ethanol and dried.

N'-Benzylidene-2-(2-methylsulfanyl-6-phenyl-4-thioxopyrimidin-3(4*H*)-yl)acetohydrazide (6a)

Yellowish crystals, yield 78%, mp 248–249 °C; IR (ν_{max}, cm^{-1}): 3 426, 3 195 (NH), 1 683 (C=O). ^{1}H NMR (300 MHz, DMSO-d_6): δ_H 2.75 (s, 3H, SCH_3), 5.21, 6.63 (2s br, 2H, NCH_2), 7.47–7.58 (m, 6H, C_6H_5), 7.75–7.78 (m, 2H, C_6H_5), 7.82 (s, 1H, $C_{(5)}$-H), 8.09 (s, 1H, N=CH), 8.22–8.25 (m, 2H, C_6H_5), 11.95 (s, 1H, NH) ppm. ^{13}C NMR (75 MHz, DMSO-d_6): δ_C 16.5 (SCH_3), 51.9 (N-CH_2), 118.9 (C-5), 127.7, 128.1, 129.6, 129.8, 130.9, 132.2, 134.5 and 135.3 (C-2C_6H_5), 145.4 152.6, 164.9, 166.1 (C-2, C-6, N=CH, C=O), 186.1 (C=S) ppm. Anal. calcd. for $C_{20}H_{18}N_4OS_2$ (394.52): C, 60.89; H, 4.60; N, 14.20%. Found: C, 60.98; H, 4.74; N, 14.06%.

N'-2-Methoxybenzylidene-2-(2-methylsulfanyl-6-phenyl-4-thioxopyrimidin-3(4*H*)-yl)acetohydrazide (6b)

Yellow solid, yield 80%, mp 255–256 °C; IR (ν_{max}, cm^{-1}): 3 423, 3 210 (NH), 1 675 (C=O). ^{1}H NMR (300 MHz, DMSO-d_6): δ_H 2.74 (s, 3H, SCH_3), 3.87 (s, 3H, OCH_3), 5.17, 6.61 (2s br, 2H, CH_2), 7.01–7.06 (m, 1H, C_6H_4), 7.12 (d, J = 7.8 Hz, 1H, C_6H_4), 7.42–7.47 (m, 1H, C_6H_4), 7.53–7.57 (m, 3H, C_6H_5), 7.81 (s, 1H, $C_{(5)}$-H), 7.89 (d, J = 7.8 Hz, 1H, C_6H_4), 8.21–8.24 (m, 2H, C_6H_5), 8.41 (s, 1H, N=CH), 11.90 (s, 1H, NH) ppm. ^{13}C NMR (75 MHz, DMSO-d_6): δ_C 16.5 (SCH_3), 51.9 (N-CH_2), 56.5 (OCH_3), 118.9 (C-5), 112.6, 121.5, 122.5, 126.3, 128.1, 129.8, 132.1, 132.4, 135.3, 141.0 and 158.4 (C-C_6H_5, C-C_6H_4), 152.6, 164.9, 166.0 (C-2, C-6, C=O), 186.2 (C=S) ppm. Anal. calcd. for $C_{21}H_{20}N_4O_2S_2$ (424.54): C, 59.41; H, 4.75; N, 13.20%. Found: C, 59.77; H, 4.87; N, 13.48%.

1-Benzylideneamino-7-phenyl-5-thioxo-1,5-dihydroimidazo[1,2-a]pyrimidin-2(3*H*)-one (7a)

Yellowish crystals, yield 60%, mp 250–253 °C (dimethylformamide); IR (ν_{max}, cm^{-1}): 1 786 (C=O). ^{1}H NMR (300 MHz, DMSO-d_6): δ_H 4.75 (s, 2H, CH_2), 7.56–7.63 (m, 6H, C_6H_5), 7.72 (s, 1H, $C_{(6)}$-H), 7.98–8.01 (m, 2H, C_6H_5), 8.18–8.21 (m, 2H, C_6H_5), 9.50 (s, 1H, N=CH) ppm. ^{13}C NMR (75 MHz, DMSO-d_6): δ_C 51.6 (N-CH_2), 117.6 (C-6), 128.0, 129.0, 129.8, 130.0, 132.1, 133.1, 133.5 and 135.6 (C-2C_6H_5), 153.2, 156.2, 161.6, 165.7 (C-7, C-8a, N=CH, C=O), 180.6 (C=S) ppm. Anal. calcd. for $C_{19}H_{14}N_4OS$ (346.41): C, 65.88; H, 4.07; N, 16.17%. Found: C, 65.61; H, 4.25; N, 16.19%.

1-(2-Methoxybenzylidene)amino-7-phenyl-5-thioxo-1,5-dihydroimidazo[1,2-a]pyrimidin-2(3*H*)-one (7b)

Yellow crystals, yield 62%, mp > 300 °C (decomp., dimethylformamide); IR (ν_{max}, cm^{-1}): 1 772 (C=O). ^{1}H NMR (300 MHz, DMSO-d_6): δ_H 3.98 (s, 3H, OCH_3), 4.71 (s, 2H, NCH_2), 7.16 (t, J = 7.7 Hz, 1H, C_6H_4), 7.26 (d, J = 8.1 Hz, 1H, C_6H_4), 7.59–7.62 (m, 3H+1H, C_6H_5, C_6H_4), 7.73 (s, 1H, $C_{(6)}$-H), 8.05 (d, J = 8.1 Hz, 1H, C_6H_4), 8.21–8.23 (m, 2H, C_6H_5), 9.96 (s, 1H, N=CH) ppm. ^{13}C NMR (75 MHz, DMSO-d_6): δ_C 51.3 (N-CH_2), 56.7 (OCH_3), 117.6 (C-6), 112.6, 113.0, 121.4, 121.8, 126.5, 127.9, 128.1, 129.8, 132.2, 134.8, 135.5, 155.9 (C-C_6H_5, C-C_6H_4), 153.3, 156.1, 159.7, 165.6 (C-7, C-8a, N=CH, C=O), 180.7 (C=S) ppm. Anal. calcd. for $C_{20}H_{16}N_4O_2S$ (376.43): C, 63.81; H, 4.28; N, 14.88%. Found: C, 64.02; H, 4.26; N, 14.54%.

6-(2-Benzylidenehydrazinyl)-8-phenyl-2*H*-pyrimido[6,1-c][1,2,4]triazin-3(4*H*)-one (8a)

Yellowish solid, yield 82%, mp > 300 °C; IR (ν_{max}, cm^{-1}): 3 355, 3 240 (NH), 1 684 (C=O). ^{1}H NMR (300 MHz, DMSO-d_6): δ_H 4.31 (s, 2H, NCH_2), 5.83 (s, 1H, $C_{(9)}$-H), 7.40–7.46 (m, 3H, C_6H_5), 7.54–7.56 (m, 3H, C_6H_5), 7.70–7.73 (m, 2H, C_6H_5), 7.90–7.93 (m, 2H, C_6H_5), 8.42 (s, 1H, NH), 9.45 (s, 1H, N=CH), 10.75 (s, 1H, NH) ppm. ^{13}C NMR (75 MHz, DMSO-d_6): δ_C 44.6 (N-CH_2), 96.2 (C-9), 126.4, 128.4, 129.3, 129.7, 130.9, 133.0, 135.7 and 137.7 (C-C_6H_5, C-C_6H_4), 141.1, 149.8, 153.0, 158.3, 159.8 (C-6, C-8, C-9a, N=CH, C=O) ppm. Anal. calcd. for $C_{19}H_{16}N_6O$ (344.37): C, 66.27; H, 4.68; N, 24.40%. Found: C, 66.36; H, 4.76; N, 24.11%.

6-((2-Methoxybenzylidene)hydrazinyl)-8-phenyl-2*H*-pyrimido[6,1-c][1,2,4]triazin-3(4*H*)-one (8b)

Yellowish solid 80%, mp > 300 °C; IR (ν_{max}, cm^{-1}): 3 374, 3 206 (NH), 1 674 (C=O). ^{1}H NMR (300 MHz, DMSO-d_6): δ_H 3.87 (s, 3H, OCH_3), 4.30 (s, 2H, NCH_2), 5.81 (s, 1H, $C_{(9)}$-H), 7.02 (t, J = 7.5 Hz, 1H, C_6H_4), 7.10 (d, J = 8.4 Hz, 1H, C_6H_4), 7.38–7.44 (m, 1H, C_6H_4), 7.53–7.56 (m, 3H, C_6H_5), 7.68–7.71 (m, 2H, C_6H_5), 8.14–8.17 (m, 1H, C_6H_4), 8.64 (s, 1H, CH), 9.40 (s, 1H, N=CH), 10.73 (s, 1H, NH) ppm. ^{13}C NMR (75 MHz, DMSO-d_6): δ_C 44.5 (N-CH_2), 56.4 (OCH_3), 96.0 (C-9), 112.3, 113.4, 121.2, 123.6, 126.4, 127.6, 129.7, 130.9, 132.0, 133.1 and 137.7 (C-C_6H_5, C-C_6H_4), 141.1, 149.4, 149.6, 158.5, 159.9 (C-6, C-8, C-9a, N=CH, C=O) ppm. Anal. calcd. for $C_{20}H_{18}N_6O_2$ (374.40): C, 64.16; H, 4.85; N, 22.45%. Found: C, 64.56; H, 4.99; N, 22.57%.

6-Methylsulfanyl-8-phenyl-2*H*-pyrimido[6,1-c][1,2,4]triazin-3(4*H*)-one (10)

Chloroacetyl chloride (0.15 g, 0.12 ml, 1.35 mmol) was added dropwise at room temperature to a stirred suspension of 4-hydrazino-2-methylsulfanyl-6-phenylpyrimidine **9** (0.3 g, 1.3 mmol) and K_2CO_3 (0.21 g, 1.5 mmol) in abs. dimethylformamide (10 ml). The reaction mixture was stirred for 2 hours at room temperature, then for 2 hours at 40 °C and refluxed for 3 hours. The inorganic salt was filtered off, the excess of solvent was distilled in vacuo and the residue was diluted with methanol (~5 ml). The precipitate was filtered and recrystallized from dimethylformamide-methanol solution to give a yellowish solid of **10**, 36%, 0.12 g, mp 248–250 °C (decomp.); IR (ν_{max}, cm^{-1}): 3 303 (NH), 1 656 (C=O). ^{1}H NMR (300 MHz, DMSO-d_6): δ_H 2.69 (s, 3H, SCH_3), 4.30 (s, 2H, NCH_2), 6.06 (s, 1H, $C_{(9)}$-H), 7.41–7.45 (m, 3H, C_6H_5), 7.94–7.99 (m, 2H, C_6H_5), 10.51 (s, 1H, NH) ppm. ^{13}C NMR (75 MHz, DMSO-d_6): δ_C 16.3 (SCH_3), 44.6 (N-CH_2), 96.6 (C-9), 126.4, 128.9, 129.9 and 137.6 (C-C_6H_5), 140.6, 148.5, 153.7, 159.0 (C-6, C-8, C-9a, C=O) ppm. Anal. calcd. for $C_{13}H_{12}N_4OS$ (272.33): C, 57.34; H, 4.44; N, 20.57%. Found: C, 57.49; H, 4.70; N, 20.73%.

CONCLUSIONS

We have found that products of the reaction of the title 4-thioxo ester **2** with hydrazine hydrate are highly dependent on the solvent and reaction temperature used. 2-Methylsulfanyl-6-phenyl-4-thioxopyrimidin-3(4*H*)-yl)acetohydrazide (**3**) was produced in 1-butanol at room temperature, while at reflux (in methanol, acetonitrile, 1-butanol or dimethylformamide) heterocyclization reaction products **4** and **5** were formed. It might be assumed that cyclization could occur via hydrazide **3** attack either at $C_{(2)}$ or $C_{(4)}$ electrophilic sites of the pyrimidine ring to form imidazo[1,2-a]pyrimidine **4** and pyrimido[6,1-c][1,2,4]triazine **5**, respectively. Satisfactory yields of either of cyclization products **4** and **5** can be obtained using acetonitrile as a solvent.

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METIL-(6-FENIL-2-METILSULFANIL-4-TIOKSOPIRIMIDIN-3(4*H*)-IL)ACETATO REAKCIJOS SU HIDRAZINHIDRATU TYRIMAS

S a n t r a u k a

Atliktos metil-(6-fenil-2-metilsulfanil-4-tioksopirimidin-3(4*H*)-il) acetato (**2**) reakcijos su hidrazinhidratu įvairiuose kambario ir virimo temperatūros tirpikliuose. Nustatyta, kad 1-butanolyje kambario temperatūroje susidaro atitinkamas hidrazidas (**3**), o virimo temperatūroje (metanolyje, 1-butanolyje, acetonitrile ir dimetilformamide) vykstant vidinei molekulinei ciklizacijai susidaro 1-amino-7-fenil-5-tiokso-1,5-dihidroimidazo[1,2-a]pirimidin-2(3*H*)-onas (**4**) ir 8-fenil-6-hidrazinil-2*H*-pirimido[6,1-c][1,2,4]triazin-3(4*H*)-onas (**5**). Pirimidotriazinas (**5**) buvo susintetintas ir kitu būdu – veikiant 6-fenil-4-hidrazino-2-metilsulfanilpirimidiną chloracetilchloridu. Susintetintų junginių struktūrą patvirtina ^{1}H, ^{13}C BMR ir IR spektroskopijos bei elementinės analizės duomenys.