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Synthesis of 5*H*-[1,3]Thiazolo[3,2-*a*]pyrimidin-5-one Derivatives

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Abstract—The reaction of 2-aminothiazoles with ethyl acetoacetate in acetic or polyphosphoric acid gave a series of 5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one derivatives which were nitrated with a mixture of nitric and sulfuric acid to 6-nitro-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-ones, and the latter were reduced to the corresponding amines.

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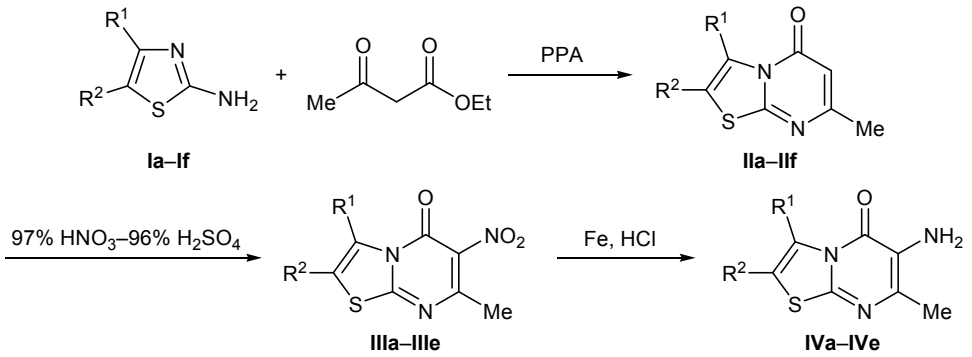
Thiazolopyrimidine derivatives exhibit a broad spectrum of physiological activity [1–3]; however, compounds of this series remain poorly studied. Among known thiazolopyrimidine derivatives, Ritanserin [1] acts as antidepressant, anxiolytic, and 5-HT2A-receptor antagonist. Thiazolopyrimidine derivatives were reported as metabotropic glutamate receptor antagonists and were found to possess antiallergic, anti-inflammatory, antiulcer, immune stimulating, and psychotropic properties [2, 3].

Fused heterocyclic systems containing a pyrimidine and another nitrogen heterocycle can be synthesized by reaction of β-ketoesters with amino-substituted nitrogen heterocycles. For example, triazolopyrimidinone derivatives were obtained by reaction of 5-amino-1,2,4-triazoles with β-ketoesters [4–6]. Depending on the conditions, either [1,2,4]triazolo[1,5-*a*]pyrimidin-5-ones (in acid medium) or [1,2,4]triazolo[1,5-*a*]-pyrimidin-7-ones (in basic medium) were formed. The reaction under solvent-free conditions in the absence of other reagents afforded [1,2,4]triazolo[1,5-*a*]pyrimidin-7-ones or their mixtures with isomeric 5-oxo derivatives [4–6]. 2-Aminothiazoles reacted with ethyl acetoacetate or other β-ketoesters in polyphosphoric acid (PPA) to produce the corresponding thiazolo-[3,2-*a*]pyrimidin-5-ones [2, 7, 8].

With a view to synthesize potentially biologically active compounds on the basis of amino derivatives of thiazolopyrimidine, aminothiazoles **Ia**–**If** were brought into reaction with ethyl acetoacetate in acid medium, the resulting thiazolopyrimidines **IIa**–**IIf** were subjected to nitration, and nitro derivatives **IIIa**–**IIIe** were reduced to amines **IVa**–**IVe** (Scheme 1).

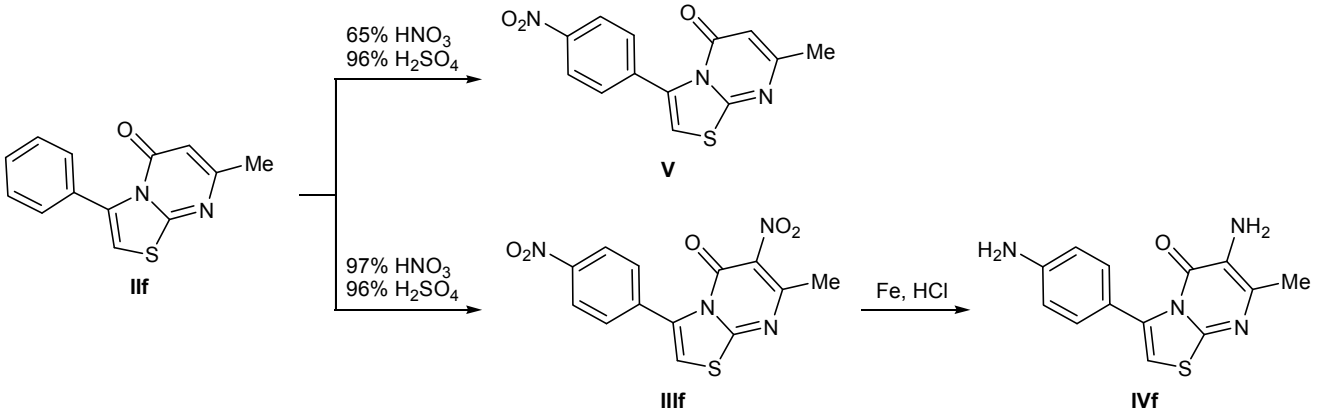
1,3-Thiazol-2-amine (**Ia**) reacted with ethyl acetoacetate in acetic acid to give 7-methyl-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one (**IIa**) as the only product in 37% yield. Introduction of alkyl (**Ib**–**Ie**) or aryl (**If**) substituents into aminothiazole molecule reduced its

Scheme 1.



$R^1 = R^2 = H$ (**a**); $R^1 = H$, $R^2 = Me$ (**b**); $R^1 = Me$, $R^2 = H$ (**c**); $R^1 = Et$, $R^2 = H$ (**d**); $R^1 = R^2 = Me$ (**e**); $R^1 = Ph$, $R^2 = H$ (**f**).

Scheme 2.



reactivity, and we failed to obtain the corresponding condensation products with ethyl acetoacetate under the same conditions. Thiazolopyrimidin-5-ones **IIb**–**IIf** were synthesized using PPA as condensing agent; in this case, the yield of **IIa** was also improved.

It is known that the 6-position in fused azolopyrimidines is active in electrophilic substitution reactions [6, 9]. In fact, the nitration of **IIa**–**IIe** with 97% nitric acid in 96% sulfuric acid led to the formation of the corresponding 6-nitro-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-ones **IIIa**–**IIIe**. The yield depended on the number and position of alkyl substituents in the thiazole ring. Presumably, alkyl substituents, especially those in the 3-position, destabilize thiazolopyrimidines under the nitration conditions and favor their decomposition. The contribution of side reactions can be reduced by using a lesser excess of nitric acid.

The nitration of the heteroring in compound **IIf** with 97% nitric acid in 96% sulfuric acid was accompanied by nitration of the phenyl substituent, and the product was 7-methyl-6-nitro-3-(4-nitrophenyl)-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one (**IIIf**). Under milder conditions (equimolar amount of 65% nitric acid) we obtained 7-methyl-3-(4-nitrophenyl)-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one (**V**) as the only product (Scheme 2).

Nitro derivatives **IIIa**–**IIIe** were reduced to the corresponding amines **IVa**–**IVe** with iron in hydrochloric acid; the yield of **IVa**–**IVe** ranged from 50 to 80%. The reduction of **IIIf** under analogous conditions afforded no more than 5% of 6-amino-3-(4-aminophenyl)-7-methyl-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one (**IVf**).

The purity of the isolated compounds was checked by TLC, and their structure was confirmed by elemental analyses and ^{1}H NMR spectra.

EXPERIMENTAL

The ^{1}H NMR spectra were recorded on a Bruker WM-400 spectrometer using tetramethylsilane as internal reference. Analytical thin-layer chromatography was performed on PTSKh-AF-V plates using chloroform–ethyl acetate (5 : 1) or chloroform–ethyl acetate–ethanol (5 : 1 : 1) as eluent; spots were detected under UV light (λ 254 nm). The elemental compositions were determined on a Hewlett Packard 185B analyzer.

Initial 4-phenyl-1,3-thiazol-2-amine (**If**) [10], 4-ethyl-1,3-thiazol-2-amine (**Id**) [11], and 4,5-dimethyl-1,3-thiazol-2-amine (**Ie**) [12] were synthesized according to known procedures. The other aminothiazoles were commercial products.

4-Ethyl-1,3-thiazol-2-amine (**Ie**) was synthesized from 1-chlorobutan-2-one. Yield 73%, mp 71–72°C. ^{1}H NMR spectrum ($CDCl_3$), δ, ppm: 1.13 t (3H, CH_3, ^3J = 7.3 Hz), 2.48 q (2H, CH_2, ^3J = 7.3 Hz), 5.58 br.s (2H, NH_2), 5.96 s (1H, 4-H). Found, %: C 46.95; H 6.35; N 21.66. $C_5H_8N_2S$. Calculated, %: C 46.85; H 6.29; N 21.85.

4,5-Dimethyl-1,3-thiazol-2-amine (Ie). Thiourea, 30.4 g (0.4 mol), was added to a solution of 42.6 g (0.4 mol) of 3-chlorobutan-2-one in 250 ml of propan-2-ol, and the mixture was heated for 5 min under reflux with stirring. The precipitate (aminothiazole hydrochloride) was filtered off, washed with propan-2-ol, and dissolved in water, the solution was adjusted to pH 11 by adding sodium carbonate and extracted with methylene chloride (2 × 30 ml), the extract was dried over sodium sulfate and evaporated under reduced pressure, and the residue was used without additional purification. Yield 32.2 g (63%), mp 80–81°C. ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 1.96 s (3H, CH_3), 2.09 s (3H, CH_3), 6.38 br.s (2H, NH_2). Found,

%: C 46.92; H 6.37; N 21.76. $C_5H_8N_2S$. Calculated, %: C 46.85; H 6.29; N 21.85.

2,7-Dimethyl-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one (IIb). A mixture of 21.0 g (0.182 mol) of 85% phosphoric acid and 24.0 g (0.169 mol) of phosphoric anhydride was stirred for 2 h at 120°C. Polyphosphoric acid thus obtained was cooled to 35°C, 13.5 g (0.104 mol) of ethyl acetoacetate was slowly added dropwise, the mixture was stirred for 10 min, and 10 g (0.088 mol) of 5-methyl-1,3-thiazol-2-amine (**Ib**) was added. The mixture was slowly heated to 120–130°C and was stirred for 4 h at that temperature. After cooling, the mixture was treated with 200 ml of water and neutralized to pH 5–6 with sodium carbonate. The precipitate was filtered off, washed with water, and recrystallized. Yield 8.9 g (56%), mp 162–164°C (from H_2O–*i*-PrOH, 1:2). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.25 s (3H, CH_3), 2.41 s (3H, CH_3), 6.04 s (1H, 6-H), 7.76 s (1H, 3-H). Found, %: C 53.34; H 4.41; N 15.45. $C_8H_8N_2OS$. Calculated, %: C 53.31; H 4.47; N 15.54.

Compounds **IIa** and **IIc**–**IIe** were synthesized in a similar way.

7-Methyl-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one (IIa). Yield 57%, mp 130–132°C (from H_2O). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.28 s (3H, CH_3), 6.08 s (1H, 6-H), 7.47 d (1H, 2-H, ^3J = 4.9 Hz), 7.94 d (1H, 3-H, ^3J = 4.9 Hz). Found, %: C 50.51; H 3.67; N 16.89. $C_7H_6N_2OS$. Calculated, %: C 50.59; H 3.64; N 16.85.

3,7-Dimethyl-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one (IIc). Yield 62%, mp 138–140°C (from H_2O–*i*-PrOH, 1:2). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.21 s (3H, CH_3), 2.66 s (3H, CH_3), 5.93 s (1H, 6-H), 6.92 s (1H, 2-H). Found, %: C 53.25; H 4.41; N 15.57. $C_8H_8N_2OS$. Calculated, %: C 53.31; H 4.47; N 15.54.

3-Ethyl-7-methyl-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one (IId). Yield 51%, mp 131–132°C (from H_2O–*i*-PrOH, 1:2). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 1.21 t (3H, CH_3, ^3J = 6.9 Hz), 2.21 s (3H, 7-CH_3), 3.14 q (2H, CH_2, ^3J = 6.9 Hz), 5.95 s (1H, 6-H), 6.92 s (1H, 2-H). Found, %: C 55.59; H 5.26; N 14.47. $C_9H_{10}N_2OS$. Calculated, %: C 55.65; H 5.19; N 14.42.

2,3,7-Trimethyl-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one (IIe). Yield 63%, mp 111–113°C (from H_2O). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.20 s (3H, CH_3), 2.26 s (3H, CH_3), 2.60 s (3H, CH_3), 5.91 s (1H, 6-H). Found, %: C 55.62; H 5.15; N 14.49. $C_9H_{10}N_2OS$. Calculated, %: C 55.65; H 5.19; N 14.42.

7-Methyl-3-phenyl-5*H*-[1,3]thiazolo[3,2-*a*]-pyrimidin-5-one (IIf). Phosphoric anhydride, 20.0 g (0.141 mol), was added under stirring to 21.0 g (0.182 mol) of 85% phosphoric acid, and the mixture was heated for 2 h at 120°C. Polyphosphoric acid thus obtained was cooled to 35°C, 9.0 g (0.069 mol) of ethyl acetoacetate was slowly added dropwise, the mixture was stirred for 10 min, and 10.0 g (0.057 mol) of 4-phenyl-1,3-thiazol-2-amine (**If**) was added. The mixture was slowly heated to 120–130°C and was stirred for 4 h at that temperature. After cooling, the mixture was diluted with 300 ml of water and neutralized to pH 5–6 with sodium carbonate. The precipitate was filtered off, washed with water, and recrystallized from propan-2-ol. The product was treated with dilute hydrochloric acid to remove unreacted aminothiazole, washed with water, and recrystallized. Yield 3.85 g (28%), mp 202–204°C (from *i*-PrOH). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.27 s (3H, CH_3), 5.99 s (1H, 6-H), 7.24 s (1H, 2-H), 7.36 s (5H, H_{arom}). Found, %: C 64.53; H 4.21; N 11.47. $C_{13}H_{10}N_2OS$. Calculated, %: C 64.44; H 4.16; N 11.56.

7-Methyl-6-nitro-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one (IIIa). Compound **IIa**, 18.7 g (0.113 mol), was dissolved at 10–15°C in 60 ml of 96% sulfuric acid, and 14.2 g (0.219 mol) of 97% nitric acid was added dropwise under stirring, maintaining the temperature at 10–15°C. The mixture was then allowed to slowly warm up to 23–25°C, kept for 1 h at that temperature, and poured onto ice. The precipitate was filtered off, washed with water, and recrystallized. Yield 22.0 g (92%), mp 166–168°C (from *i*-PrOH–EtOAc, 4:1). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.45 s (3H, CH_3), 7.72 d (1H, 2-H, ^3J = 4.9 Hz), 8.16 d (1H, 3-H, ^3J = 4.9 Hz). Found, %: C 39.87; H 2.46; N 19.81. $C_7H_5N_3O_3S$. Calculated, %: C 39.81; H 2.39; N 19.90.

Compounds **IIIb** and **IIIf** were synthesized in a similar way.

2,7-Dimethyl-6-nitro-5*H*-[1,3]thiazolo[3,2-*a*]-pyrimidin-5-one (IIIb). Yield 72%, mp 178–180°C (from *i*-PrOH–EtOAc, 4:1). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.43 s (3H, CH_3), 2.48 s (3H, CH_3), 8.04 s (1H, 3-H). Found, %: C 42.59; H 3.18; N 18.78. $C_8H_7N_3O_3S$. Calculated, %: C 42.66; H 3.13; N 18.66.

7-Methyl-6-nitro-3-(4-nitrophenyl)-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidin-5-one (IIIf). Yield 42%, mp 222–224°C (from *i*-PrOH–EtOAc, 4:1). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.45 s (3H, CH_3), 7.69 s

(1H, 2-H), 7.73 d (2H, H_{arom}, ^3J = 8.9 Hz), 8.25 d (2H, H_{arom}, ^3J = 8.9 Hz). Found, %: C 46.87; H 2.36; N 16.98. $C_{13}H_8N_4O_5S$. Calculated, %: C 46.99; H 2.43; N 16.86.

3,7-Dimethyl-6-nitro-5*H*-[1,3]thiazolo[3,2-*a*]-pyrimidin-5-one (IIIc). Compound **IIc**, 20.3 g (0.113 mol), was dissolved at 10–15°C in 70 ml of 96% sulfuric acid, and 10.8 g (0.167 mol) of 97% nitric acid was added dropwise under stirring, maintaining the temperature at 10–15°C. The mixture was allowed to slowly warm up to 23–25°C, kept for 1 h at that temperature, and poured onto ice. The precipitate was quickly filtered off, washed with water, and recrystallized. Yield 14.2 g (56%), mp 152–154°C (from *i*-PrOH–EtOAc, 4:1). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.37 s (3H, CH_3), 2.72 s (3H, CH_3), 7.21 s (1H, 2-H). Found, %: C 42.57; H 3.21; N 18.80. $C_8H_7N_3O_3S$. Calculated, %: C 42.66; H 3.13; N 18.66.

Compounds **IIId** and **IIIe** were synthesized in a similar way.

2-Ethyl-7-methyl-6-nitro-5*H*-[1,3]thiazolo[3,2-*a*]-pyrimidin-5-one (IIId). Yield 68%, mp 154–154°C (from H_2O–*i*-PrOH, 1:2). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 1.25 t (3H, CH_3, ^3J = 6.9 Hz), 2.38 s (3H, 7-CH_3), 3.19 q (2H, CH_2, ^3J = 6.9 Hz), 7.21 s (1H, 2-H). Found, %: C 45.11; H 3.73; N 17.67. $C_9H_9N_3O_3S$. Calculated, %: C 45.18; H 3.79; N 17.56.

2,3,7-Trimethyl-6-nitro-5*H*-[1,3]thiazolo[3,2-*a*]-pyrimidin-5-one (IIIe). Yield 27%, mp 149–151°C (without recrystallization). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.34 s (3H, CH_3), 2.36 s (3H, CH_3), 2.65 s (3H, CH_3). Found, %: C 45.09; H 3.68; N 17.71. $C_9H_9N_3O_3S$. Calculated, %: C 45.18; H 3.79; N 17.56.

6-Amino-7-methyl-5*H*-1,3-thiazolo[3,2-*a*]pyrimidin-5-one (IVa). A three-necked flask equipped with a mechanical stirrer and reflux condenser was charged with a mixture of 500 ml of propan-2-ol and 120 ml of water, 39.0 g (0.696 mol) of reduced iron powder was added under vigorous stirring, and 11.7 g (0.112 mol) of 35% aqueous HCl was then added dropwise from a dropping funnel. The mixture was heated to 75°C, kept for 5 min at that temperature, and cooled to room temperature, 36.3 g (0.172 mol) of nitro compound **IIIa** was added, and 24.6 g (0.236 mol) of 35% aqueous HCl was slowly added dropwise from a dropping funnel. The mixture was heated for 4 h at 75–80°C, a saturated solution of 18.5 g (0.174 mol) of sodium carbonate was added, and the mixture was kept for 1 h at 75–80°C. The mixture was filtered while hot, and the precipitate was washed on a filter with hot propan-2-ol (150 ml) and treated with chloroform (50 ml). The filtrate was combined with the washings, evaporated to a volume of 10–15 ml, and extracted with chloroform (3×50 ml). The combined extracts were dried over sodium sulfate and evaporated, and the residue was recrystallized from propan-2-ol. Yield 17.7 g (57%), mp 162–164°C (from *i*-PrOH). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.22 s (3H, CH_3), 4.45 br.s (2H, NH_2), 7.35 d (1H, 2-H, ^3J = 4.9 Hz), 7.82 d (1H, 3-H, ^3J = 4.9 Hz). Found, %: C 46.84; H 3.96; N 23.08. $C_7H_7N_3OS$. Calculated, %: C 46.40; H 3.89; N 23.19.

Compounds **IVb**–**IVe** were synthesized in a similar way.

6-Amino-2,7-dimethyl-5*H*-[1,3]thiazolo[3,2-*a*]-pyrimidin-5-one (IVb). Yield 70%, mp 139–141°C (from *i*-PrOH). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.19 s (3H, CH_3), 2.37 s (3H, CH_3), 4.40 br.s (2H, NH_2), 7.62 s (1H, 3-H). Found, %: C 49.28; H 4.73; N 21.44. $C_8H_9N_3OS$. Calculated, %: C 49.21; H 4.65; N 21.52.

6-Amino-3,7-dimethyl-5*H*-[1,3]thiazolo[3,2-*a*]-pyrimidin-5-one (IVc). Yield 52%, mp 201–204°C (from *i*-PrOH). ^{1}H NMR spectrum, δ, ppm: 2.17 s (3H, CH_3), 2.68 s (3H, CH_3), 4.35 br.s (2H, NH_2), 6.79 s (1H, 2-H). Found, %: C 49.15; H 4.54; N 21.61. $C_8H_9N_3OS$. Calculated, %: C 49.21; H 4.65; N 21.52.

6-Amino-3-ethyl-7-methyl-5*H*-[1,3]thiazolo-[3,2-*a*]pyrimidin-5-one (IVd). Yield 81%, mp 150–151°C (from *i*-PrOH). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 1.22 t (3H, CH_3, ^3J = 6.9 Hz), 2.17 s (3H, 7-CH_3), 3.16 q (2H, CH_2, ^3J = 6.9 Hz), 4.36 br.s (2H, NH_2), 6.79 s (1H, 2-H). Found, %: C 51.57; H 5.37; N 20.17. $C_9H_{11}N_3OS$. Calculated, %: C 51.66; H 5.30; N 20.08.

6-Amino-2,3,7-trimethyl-5*H*-[1,3]thiazolo[3,2-*a*]-pyrimidin-5-one (IVe). Yield 71%, mp 164–167°C (from *i*-PrOH). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.15 s (3H, CH_3), 2.21 s (3H, CH_3), 2.62 s (3H, CH_3), 4.31 br.s (2H, NH_2). Found, %: C 51.51; H 5.26; N 20.15. $C_9H_{11}N_3OS$. Calculated, %: C 51.66; H 5.30; N 20.08.

6-Amino-3-(4-aminophenyl)-7-methyl-5*H*-[1,3]-thiazolo[3,2-*a*]pyrimidin-5-one (IVf). A three-necked flask equipped with a mechanical stirrer and reflux condenser was charged with a mixture of 45 ml of propan-2-ol and 11 ml of water, 2.8 g (0.05 mol) of iron powder was added under vigorous stirring, and

1.17 g (0.0112 mol) of 35% aqueous HCl was then added from a dropping funnel. The mixture was heated to 75°C, kept for 5 min at that temperature, and cooled to room temperature, 1.8 g (0.0054 mol) of compound **IIIf** was added, and 1.5 g (0.0144 mol) of 35% aqueous HCl was slowly added from a dropping funnel. The mixture was heated for 4 h at 75–80°C, a saturated solution of 1.4 g (0.0132 mol) of sodium carbonate was added, and the mixture was kept for 1 h at 75–80°C and filtered while hot. The precipitate was washed on a filter with hot propan-2-ol and treated with chloroform. The filtrate was combined with the washings, evaporated to a small volume, and extracted with chloroform (3×50 ml). The combined extracts were dried over sodium sulfate and evaporated under reduced pressure, and the residue was recrystallized from propan-2-ol. Yield 0.08 g (5%), mp 233–235°C (from *i*-PrOH–EtOAc, 4:1). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.20 s (3H, CH_3), 4.52 br.s (2H, NH_2), 4.91 br.s (2H, NH_2), 6.51 d (2H, H_{arom}, ^3J = 7.9 Hz), 6.83 s (1H, 2-H), 7.01 d (2H, H_{arom}, ^3J = 7.9 Hz). Found, %: C 57.41; H 4.57; N 20.43. $C_{13}H_{12}N_4OS$. Calculated, %: C 57.34; H 4.44; N 20.57.

7-Methyl-3-(4-nitrophenyl)-5*H*-[1,3]thiazolo-[3,2-*a*]pyrimidin-5-one (V). Thiazolopyrimidinone **IIf**, 3.80 g (0.0157 mol), was dissolved in a mixture of 10 ml of 96% sulfuric acid and 0.70 g (0.0071 mol) of 65% nitric acid on cooling to 0–5°C, 0.83 g (0.0086 mol) of 65% nitric acid was added dropwise under stirring at 0–5°C, and the mixture was stirred for 3 h, allowing it to slowly warm up to 15°C. The mixture was poured onto ice, and the precipitate was filtered off, washed with water, and recrystallized from propan-2-ol. The product was dissolved in ethyl acetate, the solution was filtered, and the solvent was removed under reduced pressure. Yield 1.90 g (42%), mp 210–213°C (from *i*-PrOH). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 2.30 s (3H, CH_3), 6.03 s (1H, 6-H), 7.49 s (1H, 2-H), 7.64 d (2H, H_{arom}, ^3J = 8.9 Hz), 8.21 d (2H, H_{arom}, ^3J = 8.9 Hz). Found, %: C 54.47; H 3.25; N 14.55. $C_{13}H_9N_3O_3S$. Calculated, %: C 54.35; H 3.16; N 14.63.

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