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Synthesis of 2,4,6-Trisubstituted 5-(2-Alkylsulfanylethyl)-pyrimidines and Some Their Transformations

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Abstract—New 2,4,6-trisubstituted 5-(2-alkylsulfanylethyl)pyrimidines were synthesized by condensation of ethyl 2-(2-alkylsulfanylethyl)-3-oxobutanoates with various amidines and thiourea. Fusion of substituted 2,6-dimethylpyrimidin-4(3*H*)-ones with aromatic aldehydes gave the corresponding 6-styrylpyrimidines. Some 5-(2-alkylsulfanylethyl)pyrimidines were oxidized to sulfoxides, and amination of 5-[2-(butylsulfanyl)ethyl]-6-methyl-2-propylsulfanylpyrimidin-4(3*H*)-one with 4-aminobenzoic acid afforded 4-{5-[2-(butylsulfanyl)ethyl]-4-methyl-6-oxo-1,6-dihydropyrimidin-2-ylamino}benzoic acid.

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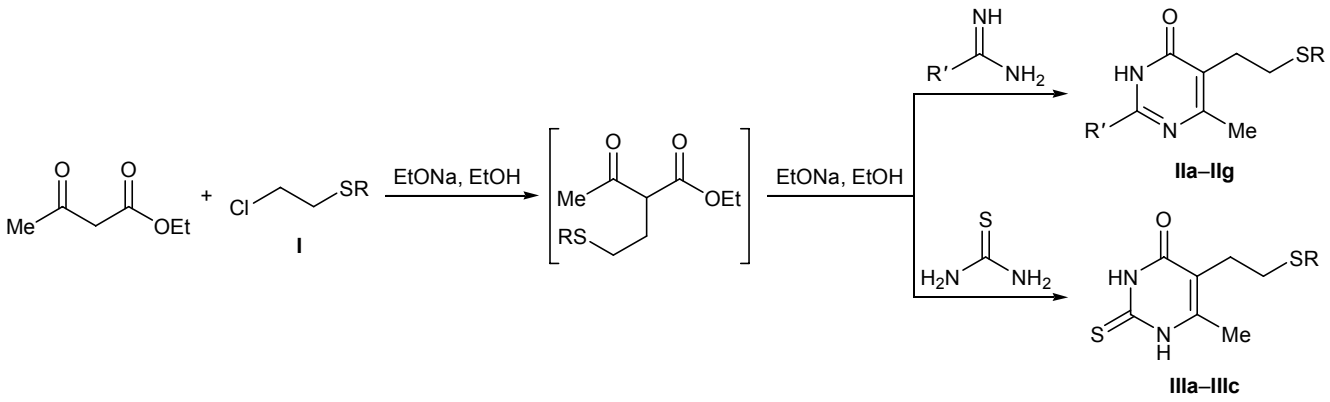
Many pyrimidine derivatives, in particular substituted sulfur-containing pyrimidines, act as nucleic exchange antimetabolites and thus exhibit pronounced antitumor, antibacterial, antiviral, antiprotozoa, and antithyroid activity [1]. However, in most of the synthesized sulfur-containing pyrimidines the sulfur atom is linked directly to the pyrimidine ring, whereas pyrimidines with a side-chain sulfur atom are few in number though they are promising as potential chemotherapeutically active compounds.

Introduction of a reactive sulfoxide group into molecules of pyrimidine derivatives also seems to be reasonable. Such modification is believed to ensure covalent bonding with a number of cell targets via the Pummerer reaction, as was proposed for the mechanism of action of the natural pyrimidine antibiotic sparsomycin which possesses a sulfoxide group [2].

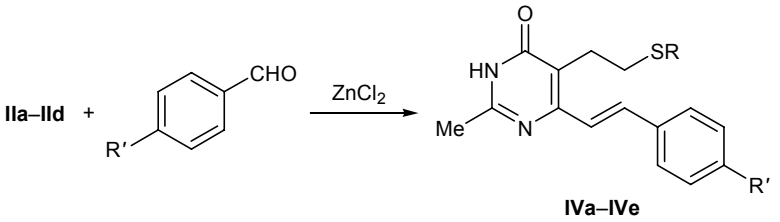
In view of the above stated, in continuation of studies on new biologically active substituted pyrimidines [3], the present article reports on the synthesis of 2,4,6-trisubstituted 5-[2-(alkylsulfanyl)ethyl]pyrimidines **II**–**VII**. Alkylation of ethyl acetoacetate with 1-(2-chloroethylsulfanyl)alkanes **I** gave ethyl 2-(2-alkylsulfanylethyl)-3-oxobutanoates which were subjected (without isolation) to cyclization with amidines and thiourea; as a result, substituted pyrimidines **IIa**–

Scheme 1.



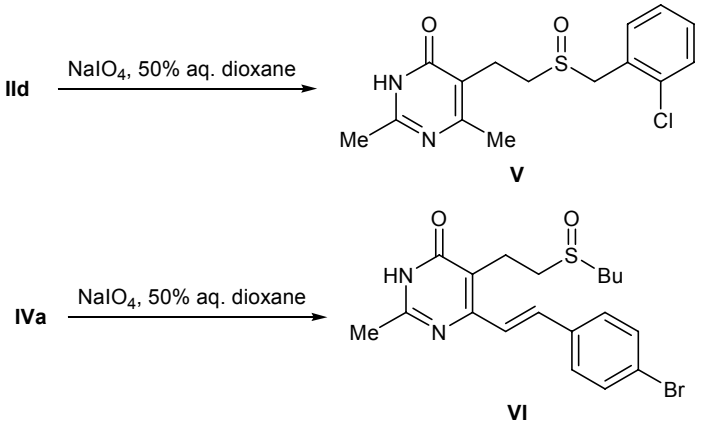
II, R′ = Me, R = Bu (**a**), *i*-Bu (**b**), C_5H_{11} (**c**), 2-$ClC_6H_4CH_2$ (**d**); R = C_5H_{11}, R′ = Ph (**e**), $PhCH_2$ (**f**); R′ = Ph, R = CH_2=C(Me)CH_2 (**g**);
III, R = Bu (**a**), C_5H_{11} (**b**), 4-$EtOC_6H_4CH_2$ (**c**).

Scheme 2.



IV, R′ = Br, R = Bu (**a**), *i*-Bu (**b**); R′ = O_2N, R = C_5H_{11} (**c**), 2-$ClC_6H_4CH_2$ (**d**); R = 2-$ClC_6H_4CH_2$, R′ = Me_2N (**e**).

Scheme 3.



IIg and **IIIa**–**IIIc** were obtained in moderate yields (Scheme 1).

2,6-Dimethylpyrimidines **IIa**–**IId** smoothly reacted at the 6-methyl group with some aromatic aldehydes in the presence of $ZnCl_2$ to afford 6-styryl-substituted derivatives **IVa**–**IVe** via a Claisen-type condensation (Scheme 2). Sulfides **IId** and **IVa** were oxidized to the corresponding sulfoxides **V** and **VI** with sodium periodate in aqueous dioxane (Scheme 3). Compounds **V** and **VI** were isolated as racemates. 2-Thioxopyrimidine **IIIa** was treated with propyl bromide in the presence of alkali to obtain sulfide **VII**, and fusion of the latter with 4-aminobenzoic acid gave 2-(4-carboxyphenylamino)pyrimidine **VIII** (Scheme 4)

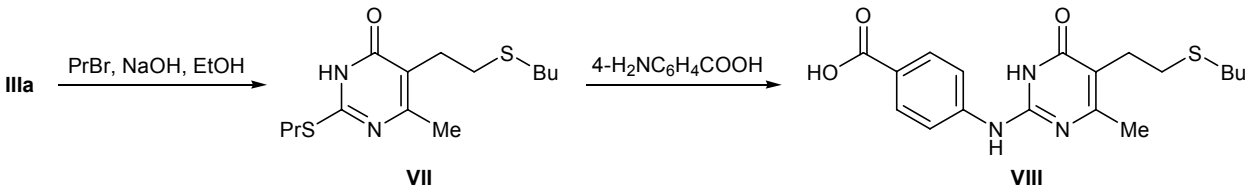
The structure of the newly synthesized compounds was proved by their IR, NMR, and mass spectra and elemental analyses, and their purity was checked by analytical TLC.

Compounds **IIc**–**IIe**, **IIIb**, **IIIc**, **IVa**, **IVc**, **IVe**, and **V** were tested for antibacterial activity against *S. aureus* 209 p 1, *Sh. dysenteriae Flexneri* 6858, and *E. coli* 0-55. All compounds, except for pyrimidines **IIc**, **IIe**, and **IIIe**, showed a weak activity in all bacterial strains used.

EXPERIMENTAL

Analytical thin-layer chromatography was performed on Silufol UV-254 plates; spots were detected by treatment with iodine vapor. The IR spectra were recorded on a Nicolet Avatar 330 spectrometer from samples dispersed in mineral oil. The ^1H NMR spectra were measured on a Varian Mercury-300 instrument at 300 MHz using tetramethylsilane as internal standard. The mass spectra were obtained on an MKh-1321A mass spectrometer with direct sample admission into the ion source.

Scheme 4.



5-(2-R-Sulfanylethyl)-2,6-dimethylpyrimidin-4(3*H*)-ones IIa–IIg and 5-(2-R-sulfanylethyl)-6-methyl-2-thioxo-2,3-dihydropyrimidin-4(1*H*)-ones IIIa–IIIc (*general procedure***).** Metallic sodium, 2.3 g (0.1 mol), was dissolved in 100 mL of anhydrous ethanol, 13.0 g (0.1 mol) of ethyl acetoacetate was added, 0.1 mol of the corresponding 1-(2-chloroethylsulfanyl)alkane was then added, the mixture was stirred for 24 h, and 0.09 mol of amidine or thiourea and a solution of 4.6 g (0.2 mol) of sodium in 100 mL of anhydrous ethanol were added. The resulting suspension was heated for 8 h under reflux with stirring and evaporated to dryness, 100 mL of water was added to the residue, and the mixture was neutralized with acetic acid and left overnight in a refrigerator. The precipitate was filtered off, dried, and recrystallized from 80% ethanol.

5-(2-Butylsulfanylethyl)-2,6-dimethylpyrimidin-4(3*H*)-one (IIa) was synthesized from ethyl acetoacetate, 1-(2-chloroethylsulfanyl)butane [4], and acetamidine hydrochloride. Yield 37%, mp 62–63°C, R_f 0.43 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1652 s (C=O), 1605. ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.93 t (3H, C**H**$_3$CH$_2$, J = 7.2 Hz), 1.36–1.48 m (2H, C**H**$_2$CH$_3$), 1.51–1.61 m (2H, C**H**$_2$CH$_2$CH$_3$), 2.19 s and 2.21 s (3H each, CH$_3$), 2.49–2.56 m (4H) and 2.58–2.65 m (2H) (CH$_2$CH$_2$SCH$_2$), 12.14 br.s (1H, NH). Found, %: N 11.35; S 13.48. $C_{12}H_{20}N_2OS$. Calculated, %: N 11.65; S 13.34.

5-(2-Isobutylsulfanylethyl)-2,6-dimethylpyrimidin-4(3*H*)-one (IIb) was synthesized from ethyl acetoacetate, 2-methyl-1-(2-chloroethylsulfanyl)propane [5], and acetamidine hydrochloride. Yield 30%, mp 117–118°C, R_f 0.31 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1634 s (C=O), 1605. ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.99 d [6H, CH(C**H**$_3$)$_2$, J = 6.6 Hz], 1.80 t.sept (1H, C**H**Me$_2$, J = 6.8, 6.6 Hz), 2.19 s and 2.21 s (3H each, 2-CH$_3$, 6-CH$_3$), 2.41 d (2H, SC**H**$_2$CH, J = 6.8 Hz), 2.49–2.55 m and 2.58–2.64 m (2H each, CH$_2$CH$_2$), 12.14 br.s (1H, NH). Found, %: N 11.42; S 13.50. $C_{12}H_{20}N_2OS$. Calculated, %: N 11.65; S 13.34.

2,6-Dimethyl-5-(2-pentylsulfanylethyl)pyrimidin-4(3*H*)-one (IIc) was synthesized from ethyl acetoacetate, 1-(2-chloroethylsulfanyl)pentane [6], and acetamidine hydrochloride. Yield 40%, mp 77–78°C, R_f 0.41 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1660 s (C=O), 1608. ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.91 m (3H, CH$_2$C**H**$_3$), 1.29–1.43 m (4H, C**H**$_2$C**H**$_2$CH$_3$), 1.58 m (2H, SCH$_2$CH$_2$), 2.19 s (3H, CH$_3$), 2.21 s (3H, CH$_3$), 2.48–2.56 m (4H, CH$_2$), 2.58–2.65 m (2H, CH$_2$), 12.14 br.s (1H, NH). Found, %: N 11.24; S 12.31. $C_{13}H_{22}N_2OS$. Calculated, %: N 11.01; S 12.60.

5-[2-(2-Chlorobenzylsulfanyl)ethyl]-2,6-dimethylpyrimidin-4(3*H*)-one (IId) was synthesized from ethyl acetoacetate, 1-chloro-2-(2-chloroethylsulfanylmethyl)benzene [7], and acetamidine hydrochloride. Yield 38%, mp 164–165°C, R_f 0.61 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1645 s (C=O), 1610. ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 2.17 s and 2.21 s (3H each, 2-CH$_3$, 6-CH$_3$), 2.55 m (2H, SCH$_2$C**H**$_2$), 2.66 m (2H, SC**H**$_2$CH$_2$), 3.84 s (2H, SCH$_2$); 7.15–7.24 m (2H), 7.34 m (1H), and 7.47 m (1H) (C_6H_4); 12.17 br.s (1H, NH). Found, %: N 8.62; S 10.63. $C_{15}H_{17}ClN_2OS$. Calculated, %: N 9.07; S 10.38.

6-Methyl-5-[2-(pentylsulfanyl)ethyl]-2-phenylpyrimidine-4(3*H*)-one (IIe) was synthesized from ethyl acetoacetate, 1-(2-chloroethylsulfanyl)pentane, and benzamidine hydrochloride. Yield 48%, mp 128–129°C, R_f 0.71 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1660 s (C=O), 1600. ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.92 m (3H, CH$_3$), 1.30–1.43 m (4H, C**H**$_2$C**H**$_2$CH$_3$), 1.60 m (2H, SCH$_2$C**H**$_2$CH$_2$), 2.36 s (3H, 6-CH$_3$), 2.55 m (2H, SC**H**$_2$CH$_2$CH$_2$), 2.63 m and 2.71 m (2H each, 5-CH$_2$CH$_2$S), 7.39–7.48 m (3H) and 8.15 m (2H) (C_6H_5), 12.45 br.s (1H, NH). Found, %: N 9.05; S 10.47. $C_{18}H_{24}N_2OS$. Calculated, %: N 8.85; S 10.13.

2-Benzyl-4-methyl-5-[2-(pentylsulfanyl)ethyl]-pyrimidin-4(3*H*)-one (IIf) was synthesized from ethyl acetoacetate, 1-(2-chloroethylsulfanyl)pentane, and phenylacetamidine hydrochloride. Yield 53%, mp 125–126°C, R_f 0.57 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1636 s (C=O), 1605. ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.91 m (3H, CH$_3$), 1.28–1.40 m (4H, C**H**$_2$C**H**$_2$CH$_3$), 1.57 m (2H, SCH$_2$C**H**$_2$CH$_2$), 2.23 s (3H, 6-CH$_3$), 2.47–2.64 m (6H, 5-CH$_2$CH$_2$SCH$_2$), 3.75 s (2H, C**H**$_2$Ph), 7.14–7.28 m (2H) and 7.34 m (3H) (C_6H_5), 12.33 br.s (1H, NH). Found, %: N 8.25; S 9.98. $C_{19}H_{26}N_2OS$. Calculated, %: N 8.48; S 9.70.

6-Methyl-5-[2-(2-methylprop2-en-1-ylsulfanyl)-ethyl]-2-phenylpyrimidin-4(3*H*)-one (IIg) was synthesized from ethyl acetoacetate, 3-(2-chloroethylsulfanyl)-2-methylprop-1-ene [8], and benzamidine hydrochloride. Yield 36%, mp 155–156°C, R_f 0.46 (octane–ethyl acetate, 1:1). IR spectrum: ν 1640 cm^{-1}, s

(C=O). ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 1.82 t (3H, C**H**$_3$CCH$_2$, J = 1.0 Hz), 2.35 s (3H, CH_3), 2.52–2.57 m and 2.69–2.75 m (2H each, CH_2CH_2S), 3.14 s (2H, SC**H**$_2$CCH), 4.81 br.s and 4.89 br.s (1H each, =CH_2), 7.39–7.49 m (3H) and 8.12–8.16 m (2H, C_6H_5), 12.28 br.s (1H, NH). Found, %: N 9.55; S 10.38. $C_{17}H_{20}N_2OS$. Calculated, %: N 9.32; S 10.67.

5-[2-(Butylsulfanyl)ethyl]-6-methyl-2-thioxo-2,3-dihydropyrimidin-4(1*H*)-one (IIIa) was synthesized from ethyl acetoacetate, 1-(2-chloroethylsulfanyl)-butane, and thiourea. Yield 55%, mp 137–138°C, R_f 0.56 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1636 s (C=O), 1564. ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.92 t (3H, CH_2C**H**$_3$, J = 7.3 Hz), 1.34–1.46 m (2H, C**H**$_2$CH$_3$), 1.49–1.59 m (2H, SCH$_2$C**H**$_2$CH$_2$), 2.15 s (3H, 6-CH_3), 2.47–2.52 m (6H, 5-$CH_2CH_2SCH_2$), 11.93 br.s (2H, NH). Found, %: N 10.61; S 24.70. $C_{11}H_{18}N_2OS_2$. Calculated, %: N 10.84; S 24.81.

6-Methyl-5-[2-(pentylsulfanyl)ethyl]-2-thioxo-2,3-dihydropyrimidin-4(1*H*)-one (IIIb) was synthesized from ethyl acetoacetate, 1-(2-chloroethylsulfanyl)pentane, and thiourea. Yield 45%, mp 135–136°C, R_f 0.58 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1636 s (C=O), 1572. ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.91 m (3H, CH_2C**H**$_3$), 1.29–1.41 m (4H, C**H**$_2$C**H**$_2$CH$_3$), 1.51–1.61 m (2H, SCH$_2$C**H**$_2$CH$_2$), 2.16 s (3H, 6-CH_3), 2.47–2.52 m (6H, 5-$CH_2CH_2SCH_2$), 11.92 br.s and 11.96 br.s (1H each, NH). Found, %: N 10.40; S 23.22. $C_{12}H_{20}N_2OS_2$. Calculated, %: N 10.28; S 23.54.

5-[2-(4-Ethoxybenzylsulfanyl)ethyl]-6-methyl-2-thioxo-2,3-dihydropyrimidin-4(1*H*)-one (IIIc) was synthesized from ethyl acetoacetate, 1-[2-(chloroethyl)sulfanylmethyl]-4-ethoxybenzene [9], and thiourea. Yield 40%, mp 177–178°C, R_f 0.59 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1648 s (C=O), 1564. ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 1.39 t (3H, CH_2C**H**$_3$, J = 7.0 Hz), 2.10 s (3H, CH_3), 2.40–2.46 m and 2.47–2.54 m (2H each, CH_2CH_2S), 3.65 s (2H, SC**H**$_2$C$_6$H$_4$), 3.99 q (2H, OCH_2, J = 7.0 Hz), 6.75 m and 7.18 m (2H each, C_6H_4), 11.90 br.s and 11.95 br.s (1H each, NH). Found, %: N 8.57; S 19.30. $C_{16}H_{20}N_2O_2S_2$. Calculated, %: N 8.33; S 19.06.

6-Styrylpyrimidin-4(3*H*)-ones IVa–IVe (*general procedure*). A mixture of 0.01 mol of pyrimidine **IIa**–**IId**, 0.011 mol of the corresponding aromatic aldehyde, and 1.36 g (0.01 mol) of $ZnCl_2$ was heated for 2 h at 150–160°C on a Wood's metal bath. The mixture was cooled, and the product was washed with water, dried, and recrystallized from 2-ethoxyethanol.

6-[(*E*)-2-(4-Bromophenyl)ethenyl]-5-[2-(butylsulfanyl)ethyl]-2-methylpyrimidin-4(3*H*)-one (IVa) was synthesized from compound **IIa** and 4-bromobenzaldehyde. Yield 53%, mp 191–193°C, R_f 0.20 (octane–ethyl acetate, 1:1). IR spectrum: ν 1649 cm^{-1}, s (C=O). ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.94 t (3H, CH_2C**H**$_3$, J = 7.3 Hz), 1.43 m (2H, C**H**$_2$CH$_3$), 1.58 m (2H, C**H**$_2$CH$_2$CH$_3$), 2.30 s (3H, 2-CH_3), 2.54 m (2H, SC**H**$_2$CH$_2$CH$_2$CH$_3$), 2.59 m (2H, 5-CH_2), 2.67 m (2H, 5-CH_2C**H**$_2$S), 6.79 d (1H, =CH, J = 16.1 Hz), 7.47 m and 7.52 m (2H each, C_6H_4), 7.77 d (1H, =CH, J = 16.1 Hz), 12.28 br.s (1H, NH). Found, %: N 6.59; S 7.65. $C_{19}H_{23}BrN_2OS$. Calculated, %: N 6.88; S 7.87.

6-[(*E*)-2-(4-Bromophenyl)ethenyl]-5-[2-(isobutylsulfanylethyl)-2-methylpyrimidin-4(3*H*)-one (IVb) was synthesized from compound **IIb** and 4-bromobenzaldehyde. Yield 60%, mp 149–151°C, R_f 0.26 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1644 (C=O), 1572. ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 1.00 d [6H, (C**H**$_3$)$_2$CH, J = 6.6 Hz], 1.81 m (1H, CH), 2.30 s (3H, 2-CH_3), 2.43 d (2H, CHC**H**$_2$, J = 6.8 Hz), 2.54–2.61 m and 2.64–2.71 m (2H each, CH_2CH_2S), 6.79 d (1H, =CH, J = 16.1 Hz), 7.44–7.54 m (4H, C_6H_4), 7.77 d (1H, =CH, J = 16.1 Hz), 12.30 br.s (1H, NH). Found, %: N 6.70; S 7.52. $C_{19}H_{23}BrN_2OS$. Calculated, %: N 6.88; S 7.87.

2-Methyl-6-[(*E*)-2-(4-nitrophenyl)ethenyl]-5-[2-(pentylsulfanyl)ethyl]pyrimidin-4(3*H*)-one (IVc) was synthesized from compound **IIc** and 4-nitrobenzaldehyde. Yield 63%, mp 198–199°C, R_f 0.38 (octane–ethyl acetate, 1:1). IR spectrum: ν 1649 cm^{-1} (C=O). ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.92 m (3H, CH_2C**H**$_3$), 1.30–1.45 m (4H, C**H**$_2$C**H**$_2$CH$_3$), 1.60 m (2H, SCH$_2$C**H**$_2$CH$_2$), 2.32 s (3H, 2-CH_3), 2.52–2.74 m (6H, 5-$CH_2CH_2SCH_2$), 6.98 d (1H, =CH, J = 16.1 Hz), 7.78 m and 8.24 m (2H each, C_6H_4), 7.88 d (1H, =CH, J = 16.1 Hz), 12.40 br.s (1H, NH). Found, %: N 10.61; S 8.45. $C_{20}H_{25}N_3O_3S$. Calculated, %: N 10.84; S 8.27.

5-[2-(2-Chlorobenzylsulfanyl)ethyl]-2-methyl-6-[(*E*)-2-(4-nitrophenyl)ethenyl]pyrimidin-4(3*H*)-one (IVd) was synthesized from compound **IId** and 4-nitrobenzaldehyde. Yield 65%, mp 230–231°C, R_f 0.26 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1644 (C=O), 1597. ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 2.29 s (3H, 2-CH_3),

2.61 m and 2.73 m (2H each, CH_2CH_2), 3.86 s (2H, SCH_2Ar), 6.98 d (1H, =CH, J = 16.1 Hz); 7.16–7.25 m (2H), 7.35 m (1H), and 7.48 m (1H) (C_6H_4Cl); 7.79 m and 8.24 m (2H each, C_6H_4), 7.89 d (1H, =CH, J = 16.1 Hz), 12.05 br.s (1H, NH). Mass spectrum, m/z (I_{rel}, %): 443/441 (9.7/28.5) $[M]^+$, 317 (40.3) $[M - CH_2C_6H_4Cl]^+$. Found, %: N 9.80; S 7.52. $C_{22}H_{20}ClN_3O_3S$. Calculated, %: N 9.51; S 7.25. M 441.09.

5-[2-(2-Chlorobenzylsulfanyl)ethyl]-6-[(*E*)-2-(4-dimethylaminophenyl)ethenyl]-2-methylpyrimidin-4(3*H*)-one (IVe) was synthesized from compound **IId** and 4-dimethylaminobenzaldehyde. Yield 55%, mp 201–202°C, R_f 0.50 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1624 (C=O), 1604. ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 2.25 s (3H, 2-CH_3), 2.54–2.61 m and 2.68–2.74 m (2H, CH_2CH_2), 3.02 s [6H, $N(CH_3)_2$], 3.86 s (2H, SCH_2Ar), 6.50 d (1H, =CH, J = 15.8 Hz), 6.67 m and 7.38 m (2H, $C_6H_4NMe_2$); 7.16–7.24 m (2H), 7.32–7.36 m (1H), and 7.48–7.51 m (1H) (C_6H_4Cl); 7.71 d (1H, =CH, J = 15.8 Hz), 12.41 br.s (1H, NH). Mass spectrum, m/z (I_{rel}, %): 441/439 (6.2/16.6) $[M]^+$, 314 (88.8) $[M - CH_2C_6H_4Cl]^+$, 268 (100) $[M - CH_2SCH_2C_6H_4Cl]^+$. Found, %: N 9.28; S 7.42. $C_{24}H_{26}ClN_3OS$. Calculated, %: N 9.55; S 7.29. M 439.15.

Sulfoxides V and VI (*general procedure*). A mixture of 0.01 mol of compound **IId** or **IVa**, 2.14 g (0.01 mol) of $NaIO_4$, 25 mL of dioxane, and 25 mL of water was stirred for 8 h at room temperature. The mixture was then left overnight in a refrigerator, and the precipitate was filtered off, washed with water, and dried.

5-[2-(2-Chlorobenzenesulfinyl)ethyl]-2,6-dimethylpyrimidin-4(3*H*)-one (V) was synthesized from compound **IId**. Yield 82%, mp 200–202°C (from EtOH), R_f 0.29 (octane–ethyl acetate, 1:1). IR spectrum, ν, cm^{-1}: 1657 (C=O), 1606. ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 2.20 s and 2.22 s (3H each, 2-CH_3, 6-CH_3), 2.69–2.88 m (3H) and 2.95–3.04 m (1H) [$CH_2CH_2S(O)$], 4.12 d and 4.33 d [1H each, $S(O)CH_2Ar$, ^2J = 12.8 Hz], 7.31–7.59 m (4H, C_6H_4), 12.30 br.s (1H, NH). Found, %: N 8.39; S 9.55. $C_{15}H_{17}ClN_2O_2S$. Calculated, %: N 8.62; S 9.87.

4-[(*E*)-2-(4-Bromophenyl)ethenyl]-5-[2-(butanesulfinyl)ethyl]-2-methylpyrimidin-4(3*H*)-one (VI) was synthesized from compound **IIIa**. Yield 74%, mp 228–230°C (from 2-ethoxyethanol), R_f 0.46 (ethanol–dichloroethane, 1:10). IR spectrum, ν, cm^{-1}: 1649 (C=O), 1540. ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.99 t (3H, CH_2CH_3, J = 7.3 Hz), 1.50 m (2H, CH_2CH_3), 1.70 m (2H, $CH_2CH_2CH_3$), 2.35 s (3H, 2-CH_3), 2.62–2.76 m (2H) and 2.78–2.94 m (4H) [5-$CH_2CH_2S(O)CH_2$], 6.81 d (1H, =CH, J = 16.1 Hz), 7.47 m and 7.53 m (2H each, C_6H_4), 7.78 d (1H, =CH, J = 16.1 Hz), 12.37 br.s (1H, NH). Found, %: N 6.85; S 7.30. $C_{19}H_{23}BrN_2OS$. Calculated, %: N 6.62; S 7.57.

5-[2-(Butylsulfanyl)ethyl]-6-methyl-2-(propylsulfanyl)pyrimidin-4(3*H*)-one (VII). Propyl bromide, 1.23 g (0.01 mol), was added to a solution of 2.58 g (0.01 mol) of 2-thioxopyrimidine **IIIa** and 0.4 g (0.01 mol) of sodium hydroxide in 80 mL of 80% ethanol, the mixture was heated for 6 h under reflux and evaporated to dryness, the residue was treated with 50 mL of water, and the precipitate was filtered off. Yield 78%, mp 54–55°C (from 70% EtOH), R_f 0.88 (octane–ethyl acetate, 1:1). IR spectrum: ν 1648 cm^{-1} (C=O), 1545. ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.93 t (3H, CH_3, J = 7.2 Hz), 1.03 t (3H, $SCH_2CH_2CH_3$, J = 7.3 Hz), 1.41 m (2H, CH_2), 1.55 m (2H, CH_2), 1.71 m (2H, CH_2), 2.23 s (3H, 6-CH_3), 2.48–2.63 m (6H, 5-$CH_2CH_2SCH_2$), 3.06 t (2H, 2-SCH_2, J = 7.1 Hz), 12.28 br.s (1H, NH). Found, %: N 9.05; S 21.58. $C_{14}H_{24}N_2OS_2$. Calculated, %: N 9.32; S 21.34.

4-{5-[2-(Butylsulfanyl)ethyl]-4-methyl-6-oxo-1,6-dihydropyrimidin-2-ylamino}benzoic acid (VIII). A mixture of 1.50 g (5 mmol) of pyrimidine **VII** and 0.69 g (5 mmol) of 4-aminobenzoic acid was fused for 4 h at 150–160°C on a Wood's metal bath. The melt was cooled and treated with 20 mL of ethanol, and the precipitate was filtered off. Yield 82%, mp 268–269°C (from 70% EtOH), R_f 0.28 (ethanol–dichloroethane, 1:10). IR spectrum, ν, cm^{-1}: 3441 and 3410 (OH, NH), 1641 (C=O), 1582. ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.94 t (3H, CH_2CH_3, J = 7.3 Hz), 1.37–1.49 m (2H, CH_2CH_3), 1.52–1.63 m (2H, $CH_2CH_2CH_3$), 2.26 s (3H, 4-CH_3), 2.49–2.64 m (6H, $CH_2CH_2SCH_2$), 7.70 m and 7.86 m (2H each, C_6H_4), 8.64 br.s (1H) and 11.18 br.s (2H) (NH, COOH). Found, %: N 11.42; S 8.59. $C_{18}H_{23}N_3O_3S$. Calculated, %: N 11.63; S 8.87.

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