Synthesis of new trichloromethyl- and alkoxy-substituted pyrido[2,3-*d*]pyrimidine derivatives*

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A series of new trichloromethyl- and alkoxy-substituted pyrido[2,3-*d*]pyrimidine derivatives were obtained from trichloromethyl-substituted pyrimidines with vicinal amino and acyl groups synthesized based on the reaction of trichloroacetonitrile with β-diketone diaminomethylidene derivatives.

Key words: trichloroacetonitlile, α,α-diacyl ketene aminals, *N*-acyl-α-acetyl ketene aminals, amidines, pyrimidines, pyrido[2,3-*d*]pyrimidines.

In recent years, the design and study of chemical properties and biological activity of molecules containing heterocycles bonded directly and through spacers or condensed ones became one of the rapidly developing directions of organic synthesis.[1] It should also be noted that nitrogen-containing heterocyclic compounds are used as efficient ligands for the preparation of active palladium catalysts for cross-coupling reactions in aqueous media.[2] A great number of articles and reviews have been devoted in recent years to pyridopyrimidines,[3—9] which belong to the most important class of condensed azaheterocyclic systems. The interest to these compounds, especially to pyrido[2,3-*d*]pyrimidine derivatives, is primarily due to their very broad spectrum of biological activity, for example, anticancer,[10—12] antimicrobial,[13—15] antiinflammatory and analgesic,[16,17] hypotensive,[18] antihistamine.[19] The approaches to the design and the application of pyrido[2,3-*d*]pyrimidines are described in detail in a recently published review,[20] which includes our works[21—24] reporting on the synthesis of substituted pyrido[2,3-*d*]-pyrimidines by the annulation of a pyridine ring to a pyrimidine one containing vicinal amino and acyl groups.[25] Later we reported[26] that 4-amino-2-trichloromethylpyrimidine-5-carboxylic esters can be obtained by heating of α-acetyl-α-alkoxycarbonyl ketene aminals with trichloroacetonitrile in toluene in a sealed tube. In the present work, in continuation of this research we studied the reaction of α,α-diacyl- and α-acetyl ketene aminals with trichloroacetonitrile.

The starting α,α-diacyl ketene aminals **1a—c** were synthesized by the $Ni(acac)_2$-catalyzed addition reaction of benzoylcyanamide to β-diketones with subsequent debenzoylation of adducts **2** (Scheme 1).[27]

We found that ketene aminal **1a** obtained from acetylacetone reacted with trichloroacetonitrile upon reflux in THF to give pyrimidine **4a** in 82% yield. However, ketene aminals **1b**,**c** synthesized from dibenzoylmethane and benzoylacetone, respectively, did not give target pyrimidines **4b**,**c** under similar conditions, rather, they were obtained under more drastic conditions (heating of aminals **1b**,**c** with CCl_3CN in toluene at 120—130 °C in a sealed tube). Note that the reaction of ketene aminal **1c** synthesized from unsymmetrical diketone (benzoylacetone) together with heterocycle **4c** also gives its isomer pyrimidine **5c** in about 4 : 1 ratio (^{1}H NMR data), *i.e.*, the cyclization of intermediate **3c** can involve both the benzoyl and the acetyl fragment. Pyrimidine **5c**, unlike its isomer **4c**, is poorly soluble in a number of organic solvents (acetonitrile, benzene, toluene), therefore, both isomers **4c** and **5c** were easily isolated in the individual state.

Earlier,[23] pyrimidines **4** were alternatively synthesized by heating a mixture of *N*-cyanotrichloroacetamidine **6** with acetylacetone to 130—140 °C in the presence of an equimolar amount of $Ni(OAc)_2$ (see Scheme 1). However, such drastic conditions led in both cases to the formation of a by-product, pyrimidine **7** (~18%), which was isolated in the individual state in the synthesis of pyrimidine **4b**. The formation of compound **7** can apparently be explained by the possibility of the 1,3-C≡N migration of the benzoyl group (Scheme 2).

Colorless 2-trichloromethylpyrimidines **4a—c** and **7** are well soluble in chloroform, acetone, benzene, toluene and poorly soluble in light petroleum ether. Their mass spectra contain peaks of molecular ions. Their ^{1}H NMR spectra ($CDCl_3$) exhibit, along with the signals for the Me

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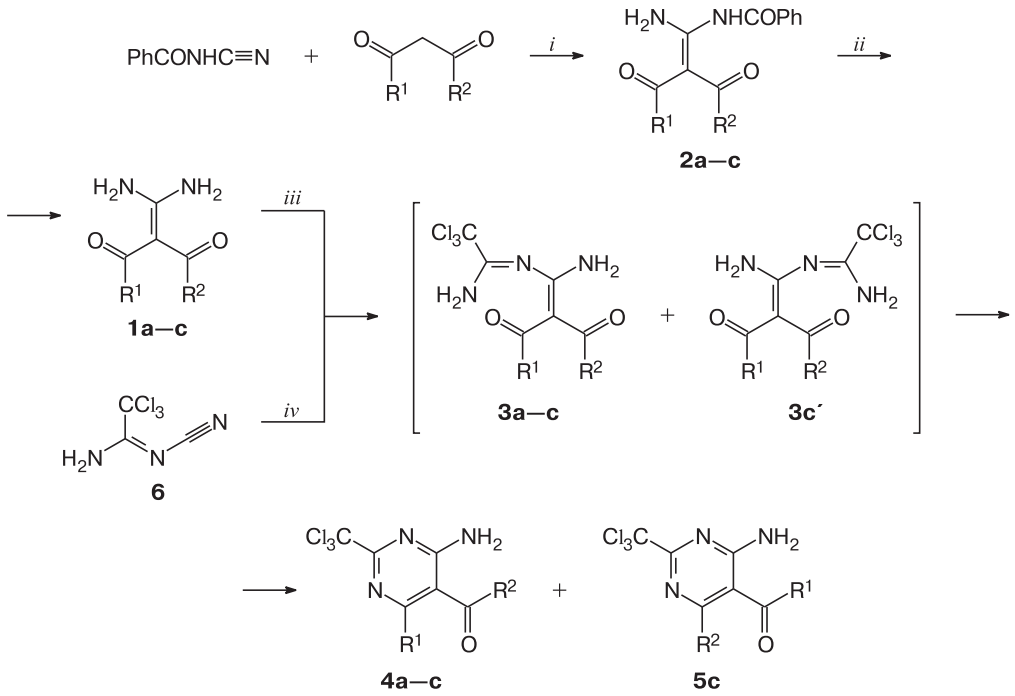
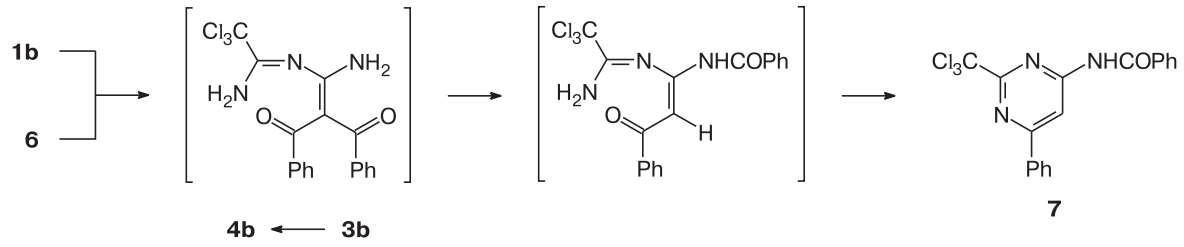
Scheme 1



$R^1 = R^2$ = Me (**a**); Ph (**b**); R^1 = Me, R^2 = Ph (**c**)

Reagents and conditions: *i.* 3—5 mol.% of $Ni(acac)_2$, THF, Δ; *ii.* MeONa, MeOH, 20 °C; *iii.* CCl_3CN, THF, Δ or toluene, 120—130 °C; *iv.* $R^1COCH_2COR^2$, $Ni(OAc)_2$, 130—140 °C.

Scheme 2

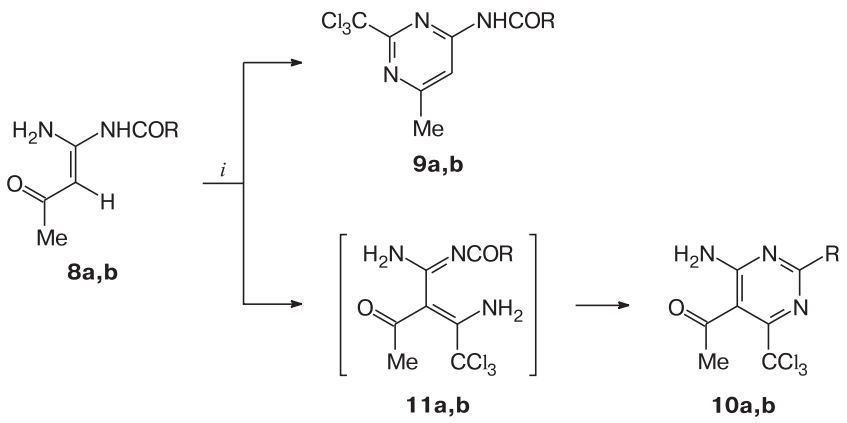


and Ph group protons, broad singlets for the protons of the NH_2 group. The IR spectra ($CHCl_3$) contain absorption bands in the following regions: 1660—1665 cm^{-1} (COMe), 1645—1650 cm^{-1} (COPh), 3495—3505 and 3360—3400 cm^{-1} (NH_2). The structures of isomeric pyrimidines **4c** and **5c** were confirmed by ^{13}C NMR spectra. Thus, compound **4c** has characteristic signals at δ 31.5 (MeCO) and 203.0 (COMe), whereas heterocycle **5c** at δ 22.1 (6-Me) and 195.0 (COPh). In the IR spectrum ($CHCl_3$) of benzoylaminopyrimidine **7**, absorption bands are observed at 3400 cm^{-1} (NH) and 1695 cm^{-1} (CON), while its ^1H NMR spectrum ($CDCl_3$) exhibits a singlet at δ 8.88 (H(5)) and a broad singlet at δ 8.80 (NH).

We further found that *N*-acyl-α-acetyl ketene aminals **8a**,**b** obtained by $Co(OAc)_2$-catalyzed selective C-deacetylation of the corresponding diacetyl ketene aminals **2** (see Ref. 28) react with CCl_3CN upon reflux in THF. However, instead of the expected *N*-acylamino-2-trichloromethylpyrimidines **9a**,**b** this reaction led to 2-methyl- and 2-phenyl-substituted 5-acetyl-4-amino-6-trichloromethylpyrimidine **10a** and **10b**, respectively, with an admixture of ~13% of derivative **9b** (Scheme 3).

Pyrimidines **10a**,**b** are apparently resulted from the attack of trichloroacetonitrile on the nucleophilic C atom of ketene aminals **8a**,**b**, which is accompanied by the cyclization of intermediates **11a**,**b** involving the acylamide fragment. The structures of compounds **10a**,**b** were con-

Scheme 3



R = Me (**a**), Ph (**b**)

Reagents and conditions: *i.* CCl_3CN, THF, Δ.

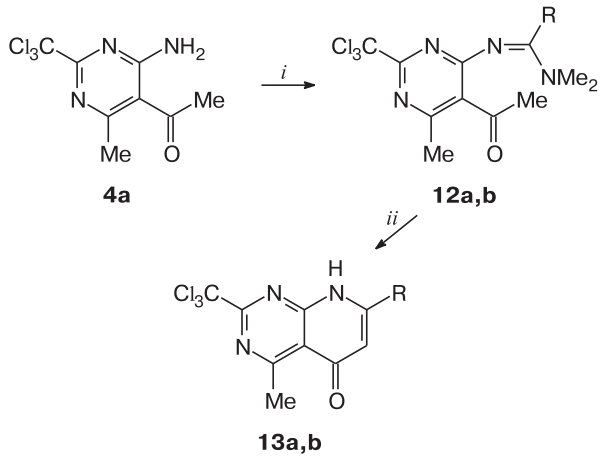
firmed by IR, ^1H and ^{13}C NMR spectroscopy, and mass spectrometry (see Experimental). Note that 4-amino-5-acetylpyrimidines **10a**,**b** and **4a**,**c** are structural isomers in the position of CCl_3 and Me (or Ph) groups in the pyrimidine ring. In the ^1H NMR spectra ($CDCl_3$) of heterocycles **10a**,**b**, the singlet for the NH_2 protons is observed in the higher field compared to that of pyrimidines **4a**,**c** (δ 5.58—5.62 for **10a**,**b** and 6.78—6.91 for **4a**,**c**). The IR spectra ($CHCl_3$) of compounds **10a**,**b** exhibit two sharp absorption bands of the NH_2 group (3510—3512 and 3400—3404 cm^{-1}), whereas pyrimidines **4a**,**c** have one sharp (3495—3500 cm^{-1}) and one broad band (3360—3380 cm^{-1}). In addition, a high-frequency shift of the acetyl carbonyl group is observed for compounds **10a**,**b** (1688—1690 cm^{-1} for **10a**,**b** and 1660—1665 cm^{-1} for **4a**,**c**). These spectral data can be explained by the absence in pyrimidines **10a**,**b**, in contrast to compounds **4a**,**c**, of the intramolecular hydrogen bond between the NH_2 and COMe groups, which may be due to the reduced basicity of the NH_2 group. The mass spectra of pyrimidines **10a**,**b** contain the peaks of molecular ions. The ^1H NMR spectrum of compound **10b** exhibits a low-field value (δ 8.45) of the signal for the *ortho*-protons of the Ph group, which confirms its localization between the nitrogen atoms of the pyrimidine ring.

Note that there are patent data on the possibility of using a number of 2-trichloromethylpyrimidine derivatives as fungicides.[29—31]

The synthesized pyrimidines **4a**,**c** and **10a**,**b** with vicinal NH_2 and COMe groups are convenient blocks for the preparation of fused heterocyclic systems. Earlier, we have shown[23] that compound **4a** reacts with diethyl oxalate in MeOH in the presence of MeONa to form methyl 4-methyl-5-oxo-2-trichloromethyl-5,8-dihydropyrido[2,3-*d*]-pyrimidine-7-carboxylate. Another way to build a pyrido[2,3-*d*]pyrimidine system involves the reaction of pyrimidines **4** and **10** with amide acetals and subsequent annulation of the pyridine ring under the action of Na alkoxides. We used this method previously to obtain pyrido[2,3-*d*]-pyrimidine derivatives containing no CCl_3 group,[22,32], as well as functionally substituted furazano[2,3-*b*]naphthyridines[33] and thieno[2,3-*b*;4,5-*b′*]bipyridine derivatives.[34]

It was found that pyrimidine **4a** readily reacts with dimethylformamide (DMF) and dimethylacetamide (DMAA) dimethyl acetals in refluxing benzene to form amidines **12a**,**b**, which then upon reflux with EtONa in EtOH undergo cyclization to pyrido[2,3-*d*] pyrimidinones **13a**,**b** (Scheme 4). The CCl_3 group remains intact when

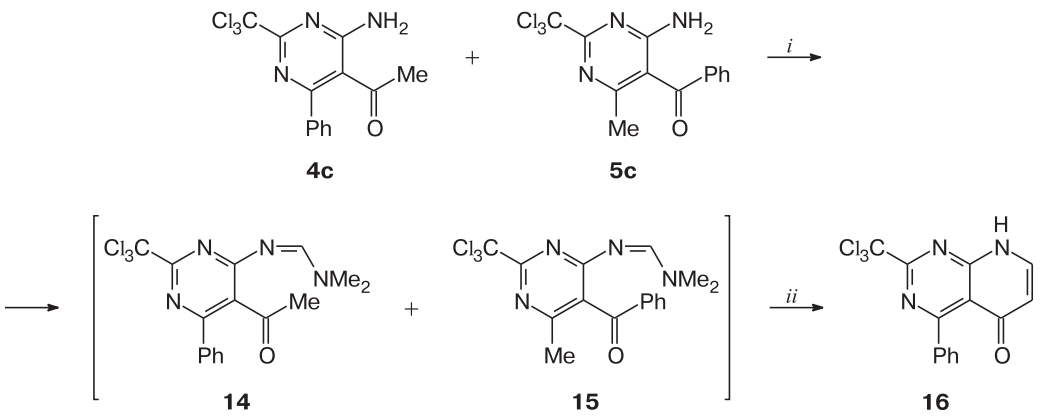
Scheme 4



R = H (**a**), Me (**b**)

Reagents and conditions: *i.* $(MeO)_2C(R)NMe_2$, PhH, Δ; *ii.* EtONa, EtOH, Δ or MeONa, MeOH, Δ.

Scheme 5



Reagents and conditions: *i.* $(MeO)_2CHNMe_2$, PhH, Δ; *ii.* MeONa, MeOH, Δ.

amidine **12a** is refluxed for 6 h with a large excess of MeONa (20 equiv.) in MeOH; in this case, the yield of bicyclic compound **13a** is 85%.

A similar reaction of a 4 : 1 mixture of pyrimidines **4c** and **5c** with DMF dimethyl acetal leads to a mixture of amidines **14** and **15**, treatment of which with MeONa in refluxing MeOH results in the intramolecular cyclization of amidine **14** to pyridopyrimidinone **16** (Scheme 5). The low solubility of the latter in MeOH allowed us to easily isolate it in the individual state in 78% yield.

Amidines **12a,b** (characterized by ^{1}H NMR spectra and elemental analysis) are well soluble in organic solvents except light petroleum ether, while pyridopyrimidinones **13a**,**b** and **16** are poorly soluble in chloroform, acetone, benzene, moderately soluble in alcohols, and well soluble in DMSO. The mass spectra of bicycles **13a**,**b** and **16** exhibit abundant peaks of $[M]^+$ and $[M - Cl]^+$ions. The IR spectra (KBr) contain absorption bands of the CO groups at 1650—1658 cm^{-1}, while the ^{1}H NMR spectra (DMSO-d_6) contain two doublets at δ 6.22—6.24 (H(6)) and 7.91—7.97 (H(7)) for compounds **13a** and **16** and a singlet at δ 6.14 (H(6)) for heterocycle **13b**, as well as broad singlets for the NH protons at δ 12.50—12.75. The ^{13}C NMR spectrum of compound **13a** exhibits a signal at δ 177.8 attributed to the carbonyl group.

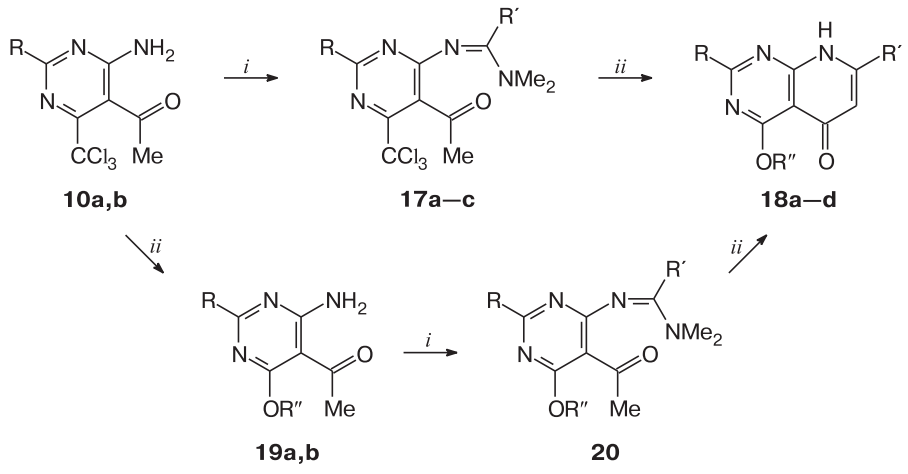
The reaction of 6-trichloromethylpyrimidines **10a**,**b** with amide acetals in refluxing benzene also gives the corresponding amidines **17a**—**c**. However, it turned out that reflux of the latter with an excess of Na alkoxide in alcohol leads not only to the pyridine ring closure, but also to the replacement of the CCl_3 group by the alkoxy one, giving 4-alkoxypyrido[2,3-*d*]pyrimidin-5-ones **18a**—**d** in 58—85% isolated yields (Scheme 6).

It was also found that the CCl_3 group in pyrimidines **10a**,**b** can be also replaced by an alkoxy one. Thus, their reflux with MeONa in MeOH gave the corresponding 5-acetyl-4-amino-6-methoxypyrimidines **19a**,**b** in 50—66% yields (see Scheme 6). In turn, pyrimidines **19**, like compounds **10a**,**b**, can be used to obtain pyridopyrimidinones. Using heterocycle **19b** as an example, it was shown that its reaction with DMF dimethyl acetal in refluxing benzene resulted in the corresponding amidine **20**, which treated with MeONa in MeOH was converted to pyridopyrimidinone **18c**.

Amidines **17a**—**c** and **20** are well soluble in chloroform, benzene, acetone and poorly soluble in light petroleum ether. Compounds **17b**,**c** are poorly soluble in alcohols. Colorless pyridopyrimidinones **18a**—**d**, like their analogs **13a,b** and **16** containing a CCl_3 group, are poorly soluble in organic solvents and only moderately soluble in DMSO. The mass spectra of bicycles **18a—d** exhibit peaks of molecular ions. The ^{1}H NMR spectra of these compounds contain signals for the OMe and OEt protons; for the rest, they are similar to the spectra of pyridopyrimidinones **13a,b** and **16**. Colorless crystalline 5-acetyl-4-amino-6-methoxypyrimidines **19a,b** are well soluble in chloroform, benzene, moderately soluble in ethanol, and poorly soluble in light petroleum ether. Their structures were confirmed by IR and ^{1}H NMR spectroscopy and mass spectrometry (see Experimental). In the ^{1}H NMR spectra ($CDCl_3$) of these compounds, in contrast to the spectra of heterocycles **4a**—**c**, **5c**, **10a**,**b** and similar pyrimidines[22,32,35] having alkyl, aryl, and methylsulfanyl substituents instead of the CCl_3 group, the NH_2 group appears as two broad singlets at δ 5.75—5.80 and 9.02—9.18. Their IR spectra ($CHCl_3$) exhibit a low-frequency absorption band of the carbonyl group (1632—1635 cm^{-1}; *cf.* with the IR spectra for pyrimidines **4a**,**c** (1660—1665 cm^{-1}) and pyrimidines **10a**,**b** (1688—1690 cm^{-1})). Apparently, this can be explained by the presence of an intermolecular hydrogen bond between the NH_2 and COMe groups.

In conclusion, using the reaction of diaminomethylidene derivatives of β-diketones with trichloroacetonitrile leading to trichloromethyl-substituted pyrimidines with

Scheme 6



	10a	10b	17a	17b	17c	18a	18b	18c	18d	19a	19b	20
R	Me	Ph	Me	Ph	Ph	Me	Me	Ph	Ph	Me	Ph	Ph
R′	—	—	Me	H	Me	Me	Me	H	Me	—	—	H
R″	—	—	—	—	—	Me	Et	Me	Me	Me	Me	Me

Reagents and conditions: *i.* $(MeO)_2C(R')NMe_2$, PhH, Δ; *ii.* R″ONa, R″OH, Δ.

vicinal amino and acyl groups as a basis, we have developed an approach to the synthesis of 2-trichloromethyl- and 4-alkoxy-substituted pyrido[2,3-*d*]pyrimidin-5(8*H*)-one derivatives, which are of interest for biological screening.

Experimental

^{1}H and ^{13}C NMR spectra were recorded on a Bruker AM-300 spectrometer (300 MHz), using residual signals of nondeuterated solvent as a reference (δ 7.27 for $CDCl_3$ and δ 2.50 for DMSO-d_6 in ^{1}H NMR spectra and δ 39.50 for DMSO-d_6 in ^{13}C NMR spectra). IR spectra were recorded on a Specord-M 82 spectrometer. Mass spectra were recorded on a Kratos MS-30 instrument (EI, 70 eV, the ionization chamber temperature was 250 °C, direct injection of the sample). In the mass spectra of trichloromethylpyrimidines, only peaks for isotope ^{35}Cl are indicated. Aminals of α,α-diacyl ketenes **1a,b**,[27] *N*-acylaminals of α-monoacetyl ketenes **8a,b**,[28] *N*-cyanotrichloroacetamidine **6**[36] were synthesized according to the known procedures. Trichloroacetonitrile used in the synthesis was purchased from Lancaster. Column chromatography was performed on Merck silica gel 60 (0.063—0.200 mm).

2-[(Benzoylamino)aminomethylidene]-1-phenylbutane-1,3-dione (2c). A mixture of benzoylcyanamide (2.19 g, 15 mmol), benzoylacetone (2.43 g, 15 mmol), and $Ni(acac)_2$ (0.12 g, 0.45 mmol) in anhydrous THF (15 mL) was refluxed for 20 h, the solvent was evaporated *in vacuo*, the residue was diluted with benzene (10 mL), the undissolved precipitate of nickel complex was filtered off. Hexane (20 mL) was added to the filtrate, a precipitate formed was collected by filtration to obtain ketene aminal **2c** (3.1 g, 67%), m.p. 102—103 °C. Found (%): C, 69.79; H, 5.08; N, 9.35. $C_{18}H_{16}N_2O_3$. Calculated (%): C, 70.11; H, 5.23; N, 9.09. IR ($CHCl_3$), ν/cm^{-1}: 3340 (NH), 3200—2900 (NH, CH), 1680 (CO), 1630 (CO), 1600, 1530. ^{1}H NMR ($CDCl_3$), δ, *E/Z*-isomers in the ratio of ~1 : 1: 1.79/1.87 (s, 3 H, Me); 7.40—8.20 (m, 10 H, 2 Ph); 9.90/10.00 (br.s, 1 H, NH); 10.50/11.10 (br.s, 1 H, NH); 14.40/15.00 (br.s, 1 H, NH).

2-(Diaminomethylidene)-1-phenylbutane-1,3-dione (1c). A mixture of ketene aminal **2c** (3.08 g, 10 mmol) and MeONa (10 mmol) in MeOH (12 mL) was stirred for 20 min at 20 °C, acidified with AcOH, concentrated *in vacuo*, the residue was chromatographed on a column with SiO_2 (eluent benzene, then mixtures of benzene—chloroform and chloroform—acetone). The solvents were evaporated *in vacuo*, the residue was recrystallized from a mixture of benzene—hexane to obtain ketene aminal **1c** (1.42 g, 70%), m.p. 150—152 °C. Found (%): C, 64.61; H, 5.99; N, 13.64. $C_{11}H_{12}N_2O_2$. Calculated (%): C, 64.69; H, 5.92; N, 13.72. IR ($CHCl_3$), ν/cm^{-1}: 3470 (NH), 3300—3000 (NH, CH), 1600 (CO). ^{1}H NMR (DMSO-d_6), δ: 1.50 (s, 3 H, Me); 7.30 (br.s, 2 H, 2 NH); 7.37—7.51 (m, 5 H, Ph); 9.30 (br.s, 2 H, 2 NH).

5-Acetyl-4-amino-6-methyl-2-trichloromethylpyrimidine (4a). A mixture of ketene aminal **1a** (0.57 g, 4 mmol) and CCl_3CN (0.81 mL, 8 mmol) in anhydrous THF (5 mL) was refluxed for 2 h, the solvent was evaporated *in vacuo*, the residue was dissolved in toluene and chromatographed on a column with SiO_2 (eluent toluene). The solvent was evaporated, the residue was washed with hexane to obtain pyrimidine **4a** (0.88 g, 82%), m.p. 131—132 °C (Ref. 23: 133—134 °C). ^{13}C NMR ($CDCl_3$), δ: 26.2 (q, Me, ^1J = 129 Hz); 33.0 (q, CO<u>Me</u>, ^1J = 129 Hz); 96.4 (CCl_3); 113.2 (C(5)); 162.5 (C(4)); 164.4 (C(2)); 167.8 (q, C(6), ^2J = 5.0 Hz); 201.3 (q, CO, ^3J = 5.0 Hz).

4-Amino-5-benzoyl-6-phenyl-2-trichloromethylpyrimidine (4b) and 4-benzoylamino-6-phenyl-2-trichloromethylpyrimidine (7). Method *A*. A mixture of ketene aminal **1b** (0.27 g, 1 mmol) and CCl_3CN (0.35 mL, 3.5 mmol) in anhydrous toluene (5 mL) was heated in a sealed tube at 130 °C for 10 h. The solvent was evaporated *in vacuo*, the residue was chromatographed on a column with SiO_2 (eluent a mixture of benzene—hexane, then

benzene). Pyrimidines **7** (0.09 g, 23%) and **4b** (0.14 g, 34%) were sequentially obtained by evaporation of the solvent from the corresponding fractions.

Method *B*. A mixture of *N*-cyanotrichloroacetamidine **6** (0.51 g, 2.7 mmol), dibenzoylmethane (1.21 g, 5.4 mmol), and $Ni(OAc)_2$ (0.48 g, 2.7 mmol) was heated for 2 h at 130—140 °C, cooled to 20 °C, and chromatographed on a column with SiO_2 (eluent CCl_4). Pyrimidines **7** (0.19 g, 18%) and **4b** (0.45 g, 42%) were sequentially obtained by evaporation of the solvent from the corresponding fractions.

Pyrimidine **4b**, m.p. 159—160 °C (from a mixture of benzene—hexane). Found (%): C, 54.82; H, 3.60; Cl, 26.81; N, 10.46. $C_{18}H_{12}Cl_3N_3O$. Calculated (%): C, 55.06; H, 3.08; Cl, 27.09; N, 10.70. MS, *m/z* (I_{rel} (%)): 391 $[M]^+$ (14), 76 (100). IR ($CHCl_3$), ν/cm^{-1}: 3500 and 3390 (NH_2), 1645 (CO), 1605, 1535. ^{1}H NMR ($CDCl_3$), δ: 6.28 (br.s, 2 H, NH_2); 7.10—7.40 (m, 6 H, 2 Ph); 7.48—7.65 (m, 4 H, 2 Ph). ^{13}C NMR ($CDCl_3$), δ: 96.9 (CCl_3); 111.2 (C(5)); 128.4, 129.4, 130.2, 130.7, 133.4, 137.5, 137.6 (2 Ph); 163.4 (C(4)); 164.9 (C(2)); 166.1 (t, C(6), ^3J = 3.5 Hz); 197.4 (t, CO, ^3J = 3.5 Hz).

Pyrimidine **7**, m.p. 154—155 °C (from hexane). Found (%): C, 55.09; H, 3.19; Cl, 27.29; N, 10.27. $C_{18}H_{12}Cl_3N_3O$. Calculated (%): C, 55.06; H, 3.08; Cl, 27.09; N, 10.70. MS, *m/z* (I_{rel} (%)): 391 $[M]^+$ (15), 105 $[PhCO]^+$ (100). IR ($CHCl_3$), ν/cm^{-1}: 3400 (NH), 1695 (CO), 1590, 1548. ^{1}H NMR ($CDCl_3$), δ: 7.48—7.70 (m, 6 H, 2 Ph); 7.95—8.05 (m, 2 H, Ph); 8.25—8.35 (m, 2 H, Ph); 8.80 (br.s, 1 H, NH); 8.88 (s, 1 H, H(5)). ^{13}C NMR ($CDCl_3$), δ: 96.9 (CCl_3); 105.1 (C(5)); 127.5, 127.8, 129.1, 131.7, 133.2, 136.0 (2 Ph); 159.1 (C(4)); 164.9 (C(2)); 166.3, 166.7 (both t, CO, C(6), ^3J = 3.4 Hz).

5-Acetyl-4-amino-6-phenyl-2-trichloromethylpyrimidine (4c) and 4-amino-5-benzoyl-6-methyl-2-trichloromethylpyrimidine (5c). Method *A*. A mixture of ketene aminal **1c** (0.204 g, 1 mmol) and CCl_3CN (0.20 mL, 2 mmol) in anhydrous toluene (4 mL) was heated for 12 h in a sealed tube at 120 °C. The solvent was evaporated *in vacuo*, the residue was recrystallized from toluene to obtain pyrimidine **5c** (0.086 g, 26%). The toluene filtrate was concentrated *in vacuo*, the residue was chromatographed on a column with SiO_2 (eluent benzene) to obtain a mixture of pyrimidines **4c** and **5c** (0.143 g, 43%) in the ratio of 5 : 1 (^{1}H NMR data).

Method *B*. A mixture of *N*-cyanotrichloroacetamidine **6** (1 g, 5.36 mmol), benzoylacetone (1.74 g, 10.7 mmol), and $Ni(OAc)_2$ (0.95 g, 5.36 mmol) was heated for 2 h at 130—140 °C, then cooled to 20 °C, and recrystallized from acetonitrile (10 mL) with hot filtration from Ni complexes to obtain pyrimidine **5c** (0.19 g). The filtrate was concentrated and the residue was recrystallized from toluene to additionally obtain pyrimidine **5c** (0.12 g), a total yield of 17.5%. The filtrate was concentrated, the residue was treated with hexane (20 mL) to obtain a mixture of pyrimidines **4c** and **5c** (0.75 g, 42%) in the ratio of 4 : 1 (^{1}H NMR data). This mixture was chromatographed on a column with SiO_2 (eluent CCl_4, then a 5 : 1 mixture of CCl_4—chloroform) to obtain pyrimidine **4c** (0.25 g, 14%) (with ~5% of isomer **5c** according to the ^{1}H NMR data).

Pyrimidine **4c**, m.p. 145—146 °C. Found (%): C, 46.95; H, 2.81; Cl, 31.88; N, 12.37. $C_{13}H_{10}Cl_3N_3O$. Calculated (%): C, 47.23; H, 3.05; Cl, 32.17; N, 12.71. IR ($CHCl_3$), ν/cm^{-1}: 3500 and 3380 (NH_2), 1665 (CO), 1600, 1532. ^{1}H NMR ($CDCl_3$), δ: 1.95 (s, 3 H, Me); 6.78 (br.s, 2 H, NH_2); 7.46—7.61 (m, 3 H, Ph); 7.65—7.72 (m, 2 H, Ph). ^{13}C NMR ($CDCl_3$), δ: 31.5 (Me); 96.3 (CCl_3); 112.4 (C(5)); 128.9, 129.7, 131.3, 138.1 (Ph); 162.2 (C(4)); 164.3 (C(2)); 167.3 (C(6)); 203.0 (CO).

Pyrimidine **5c**, m.p. 185—186 °C. Found (%): C, 46.91; H, 2.86; Cl, 31.89; N, 12.51. $C_{13}H_{10}Cl_3N_3O$. Calculated (%): C, 47.23; H, 3.05; Cl, 32.17; N, 12.71. IR ($CHCl_3$), ν/cm^{-1}: 3505 and 3400 (NH_2), 1650 (CO), 1605, 1545. ^{1}H NMR ($CDCl_3$), δ: 2.22 (s, 3 H, Me); 5.82 (br.s, 2 H, NH_2); 7.52 (t, 2 H, Ph, J = 7.5 Hz); 7.68 (t, 1 H, Ph, J = 7.5 Hz); 7.81 (d, 2 H, Ph, J = 7.5 Hz). ^{13}C NMR (DMSO-d_6), δ: 22.1 (Me); 96.7 (CCl_3); 110.2 (C(5)); 129.0, 134.2, 136.1 (Ph); 160.9 (C(4)); 162.2 (q, C(6), ^2J = 6.6 Hz); 163.4 (C(2)); 195.0 (t, CO, ^3J = 4.2 Hz).

5-Acetyl-4-amino-2-methyl-6-trichloromethylpyrimidine (10a). A mixture of ketene aminal **8a** (0.568 g, 4 mmol) and CCl_3CN (0.800 mL, 8 mmol) in anhydrous THF (5 mL) was refluxed for 6 h, the solvent was evaporated *in vacuo*, the residue was chromatographed on a column with SiO_2 (eluent chloroform). The solvent was evaporated *in vacuo*, the residue was recrystallized from a mixture of benzene—hexane (1 : 1) to obtain pyrimidine **10a** (0.330 g, 31%), m.p. 204—205 °C. Found (%): C, 35.53; H, 2.81; Cl, 39.41; N, 15.35. $C_8H_8Cl_3N_3O$. Calculated (%): C, 35.75; H, 2.98; Cl, 39.66; N, 15.64. MS, *m/z* (I_{rel} (%)): 267 $[M]^+$ (4), 252 $[M - Me]^+$ (16), 232 $[M - Cl]^+$ (12), 43 $[COMe]^+$ (100). IR ($CHCl_3$), ν/cm^{-1}: 3510 and 3400 (NH_2), 1690 (CO), 1605, 1550. ^{1}H NMR ($CDCl_3$), δ: 2.58 (s, 3 H, Me); 2.70 (s, 3 H, Me); 5.58 (br.s, 2 H, NH_2). ^{13}C NMR (DMSO-d_6), δ: 25.3 (q, Me, ^1J = 127.4 Hz); 32.5 (q, CO<u>Me</u>, ^1J = 128.8 Hz); 95.9 (CCl_3); 111.7 (t, C(5), ^3J = 4.9 Hz); 157.4 (C(6)); 161.1 (C(4)); 166.1 (q, C(2), ^2J = 6.6 Hz); 202.0 (q, CO, J = 6.2 Hz).

5-Acetyl-4-amino-2-phenyl-6-trichloromethylpyrimidine (10b) and 4-benzoylamino-6-methyl-2-trichloromethylpyrimidine (9b). A mixture of ketene aminal **8b** (0.51 g, 2.5 mmol) and CCl_3CN (0.75 mL, 7.5 mmol) in anhydrous THF (5 mL) was refluxed for 5 h. The solvent was evaporated *in vacuo*, the residue was chromatographed on a column with SiO_2 (eluent benzene). The solvent was evaporated *in vacuo*, the residue was recrystallized from a mixture of benzene—hexane (1 : 2) to obtain pyrimidine **10b** (0.28 g, 34%), m.p. 176—177 °C. Found (%): C, 47.21; H, 3.20; Cl, 32.45; N, 12.68. $C_{13}H_{10}Cl_3N_3O$. Calculated (%): C, 47.23; H, 3.05; Cl, 32.17; N, 12.71. MS, *m/z* (I_{rel} (%)): 329 $[M]^+$ (32), 314 $[M - Me]^+$ (80), 104 $[PhC{=}NH]^+$ (85), 43 $[COMe]^+$ (100). IR ($CHCl_3$), ν/cm^{-1}: 3512 and 3404 (NH_2), 1688 (CO), 1608, 1524. ^{1}H NMR ($CDCl_3$), δ: 2.73 (s, 3 H, COMe); 5.62 (br.s, 2 H, NH_2), 7.50 (m, 3 H, Ph); 8.45 (m, 2 H, Ph). The filtrate was concentrated *in vacuo*, the residue was re-chromatographed on a column with SiO_2 (eluent a mixture of benzene—hexane (1 : 1), then benzene). The solvent was evaporated *in vacuo* to obtain pyrimidine **9b** (0.107 g, 13%), m.p. 180—181 °C (from hexane). Found (%): C, 46.99; H, 2.82; Cl, 32.46; N, 12.69. $C_{13}H_{10}Cl_3N_3O$. Calculated (%): C, 47.23; H, 3.05; Cl, 32.17; N, 12.71. MS, *m/z* (I_{rel} (%)): 329 $[M]^+$ (20), 294 $[M - Cl]^+$ (58), 105 $[COPh]^+$ (100). IR ($CHCl_3$), ν/cm^{-1}: 3416 (NH), 1700 (CO), 1596. ^{1}H NMR ($CDCl_3$), δ: 2.69 (s, 3 H, Me); 7.56 (t, 2 H, Ph, J = 7.8 Hz); 7.62 (t, 1 H, Ph, J = 7.8 Hz); 7.98 (d, 2 H, Ph, J = 7.8 Hz); 8.78 (br.s, 1 H, NH).

5-Acetyl-4-(dimethylaminomethylidene)amino-6-methyl-2-trichloromethylpyrimidine (12a). A mixture of pyrimidine **4a** (0.805 g, 3 mmol) and DMF dimethyl acetal (0.800 mL, 6 mmol) in benzene (15 mL) was refluxed for 2 h, the solvent was evaporated *in vacuo*, the residue was washed with hexane to obtain amidine **12a** (0.86 g, 89%), m.p. 128—129 °C (from hexane). Found (%): C, 40.84; H, 4.26; Cl, 33.00; N, 17.41. $C_{11}H_{13}Cl_3N_4O$.

Calculated (%): C, 40.82; H, 4.05; Cl, 32.87; N, 17.31. ^{1}H NMR (DMSO-d_6), δ: 2.31 (s, 3 H, Me); 2.57 (s, 3 H, Me); 3.08, 3.21 (both s, 3 H each, NMe_2); 8.72 (s, 1 H, CH).

5-Acetyl-4-[1-(dimethylamino)ethylidene]amino-6-methyl-2-trichloromethylpyrimidine (12b). A mixture of pyrimidine **4a** (0.54 g, 2 mmol) and DMAA dimethyl acetal (0.46 mL, 3 mmol) in benzene (10 mL) was refluxed for 4 h. The solvent was evaporated *in vacuo*, the residue was chromatographed on a column with SiO_2 (eluent a mixture of CCl_4—chloroform, then chloroform). The solvent was evaporated *in vacuo*, the residue was recrystallized from hexane to obtain amidine **12b** (0.34 g, 50%), m.p. 126—127 °C. Found (%): C, 42.68; H, 4.51; Cl, 31.07; N, 16.94. $C_{12}H_{15}Cl_3N_4O$. Calculated (%): C, 42.68; H, 4.48; Cl, 31.50; N, 16.59. ^{1}H NMR ($CDCl_3$), δ: 2.28 (s, 3 H, N=CMe); 2.43 (s, 3 H, Me); 2.57 (s, 3 H, Me); 3.14, 3.15 (both s, 3 H each, NMe_2).

4-Methyl-2-trichloromethylpyrido[2,3-*d*]pyrimidin-5(8*H*)-one (13a). Method *A*. A mixture of amidine **12a** (0.32 g, 1 mmol) and EtONa (2 mmol) in EtOH (10 mL) was refluxed for 4 h, cooled to 20 °C, and acidified with AcOH. A precipitate formed was collected by filtration to obtain compound **13a** (0.08 g). The filtrate was diluted with water to additionally isolate 0.11 g of the product, a total yield was 68%.

Method *B*. A mixture of amidine **12a** (0.16 g, 0.5 mmol) and MeONa (10 mmol) in MeOH (15 mL) was refluxed for 6 h, cooled to 20 °C, acidified with AcOH, and diluted with water. A precipitate formed was collected by filtration to obtain bicycle **13a** (0.12 g, 85%), m.p. > 300 °C. Found (%): C, 38.98; H, 2.23; Cl, 38.13; N, 15.09. $C_9H_6Cl_3N_3O$. Calculated (%): C, 38.81; H, 2.17; Cl, 38.19; N, 15.09. MS, *m/z* (I_{rel} (%)): 277 $[M]^+$ (100), 242 $[M - Cl]^+$ (94). IR (KBr), ν/cm^{-1}: 3300—2500 (NH, CH), 1650 (CO), 1627, 1600, 1570, 1545. ^{1}H NMR (DMSO-d_6), δ: 2.99 (s, 3 H, Me); 6.24 (d, 1 H, H(6), J = 7.7 Hz); 7.91 (d, 1 H, H(7), J = 7.7 Hz); 12.70 (br.s, 1 H, NH). ^{13}C NMR (DMSO-d_6), δ: 25.4 (q, Me, ^1J = 130 Hz); 96.2 (CCl_3); 114.6 (C(4a)); 115.3 (dd, C(6), ^1J = 168.5 Hz, ^2J = 2.6 Hz); 139.9 (dd, C(7), ^1J = 180.5 Hz, ^2J = 3.9 Hz); 155.5 (d, C(8a), ^3J = 9.8 Hz); 162.6 (C(2)); 172.9 (q, C(4), ^2J = 7.4 Hz); 177.8 (d, C(5), ^2J = 8.8 Hz).

4,7-Dimethyl-2-trichloromethylpyrido[2,3-*d*]pyrimidin-5(8*H*)-one (13b) was synthesized similarly to compound **13a** from amidine **12b** and EtONa in EtOH. The yield was 74%, m.p. > 300 °C. Found (%): C, 40.74; H, 2.58; Cl, 36.03; N, 13.98. $C_{10}H_8Cl_3N_3O$. Calculated (%): C, 41.05; H, 2.76; Cl, 36.36; N, 14.36. MS, *m/z* (I_{rel} (%)): 291 $[M]^+$ (100), 256 $[M - Cl]^+$ (32), 228 $[M - Cl - CO]^+$ (83). IR (KBr), ν/cm^{-1}: 3300—2500 (NH, CH), 1658 (CO), 1635, 1600, 1545, 1500. ^{1}H NMR (DMSO-d_6), δ: 2.30 (s, 3 H, Me); 2.98 (s, 3 H, Me); 6.14 (s, 1 H, H(6)); 12.50 (br.s, 1 H, NH).

4-Phenyl-2-trichloromethylpyrido[2,3-*d*]pyrimidin-5(8*H*)-one (16). A 4 : 1 mixture of pyrimidines **4c** (0.28 g, 0.85 mmol) and **5c** and DMF dimethyl acetal (0.22 mL, 1.7 mmol) in benzene (5 mL) was refluxed for 4 h, the solvent and excessive acetal were evaporated *in vacuo*. The residue was treated with MeONa (1.7 mmol) in MeOH (7 mL) upon reflux for 2 h. The reaction mixture was cooled to 20 °C, acidified with AcOH, a precipitate formed was collected by filtration, and washed with MeOH (5 mL) to obtain compound **16** (0.18 g, 78%), m.p. > 300 °C. Found (%): C, 49.02; H, 2.15; Cl, 30.95; N, 11.99. $C_{14}H_8Cl_3N_3O$. Calculated (%): C, 49.37; H, 2.37; Cl, 31.23; N, 12.34. IR (KBr), ν/cm^{-1}: 3280—2740 (NH, CH), 1650 (CO), 1620, 1600, 1570, 1530. ^{1}H NMR (DMSO-d_6), δ: 6.22 (d, 1 H, H(6), J = 7.5 Hz); 7.40—7.58 (m, 3 H, Ph); 7.58—7.68 (m, 2 H, Ph); 7.97 (d, 1 H, H(7), J = 7.5 Hz); 12.75 (br.s, 1 H, NH).

5-Acetyl-4-[1-(dimethylamino)ethylidene]amino-2-methyl-6-trichloromethylpyrimidine (17a). A mixture of pyrimidine **10a** (0.27 g, 1 mmol) and DMAA dimethyl acetal (0.44 mL, 3 mmol) in benzene (5 mL) was refluxed for 4 h, the solvent was evaporated *in vacuo*. The reaction product was extracted from the residue by boiling hexane. After cooling to 20 °C, a precipitate formed was collected by filtration to obtain amidine **17a** (0.23 g, 68%), m.p. 105—106 °C. Found (%): C, 42.45; H, 4.39; Cl, 31.22; N, 16.41. $C_{12}H_{15}Cl_3N_4O$. Calculated (%): C, 42.68; H, 4.48; Cl, 31.50; N, 16.59. ^{1}H NMR ($CDCl_3$), δ: 2.19 (s, 3 H, N=CMe); 2.63 (s, 3 H, Me); 2.65 (s, 3 H, Me); 3.11 (s, 6 H, NMe_2).

5-Acetyl-4-(dimethylaminomethylidene)amino-2-phenyl-6-trichloromethylpyrimidine (17b). A mixture of pyrimidine **10b** (0.33 g, 1 mmol) and DMF dimethyl acetal (0.40 mL, 3 mmol) in benzene (5 mL) was refluxed for 3 h, the solvent was evaporated *in vacuo*, the residue was recrystallized from ethanol to obtain amidine **17b** (0.29 g, 76%), m.p. 180—181 °C. Found (%): C, 49.77; H, 3.97; Cl, 27.72; N, 14.42. $C_{16}H_{15}Cl_3N_4O$. Calculated (%): C, 49.83; H, 3.92; Cl, 27.58; N, 14.53. ^{1}H NMR ($CDCl_3$), δ: 2.71 (s, 3 H, COMe); 3.12, 3.21 (both s, 3 H each, NMe_2); 7.49 (m, 3 H, Ph); 8.50 (m, 2 H, Ph); 8.88 (s, 1 H, CH).

5-Acetyl-4-[1-(dimethylamino)ethylidene]amino-2-phenyl-6-trichloromethylpyrimidine (17c) was synthesized similarly to amidine **17b** from pyrimidine **10b** and DMAA dimethyl acetal. The yield was 52%, m.p. 204—205 °C (from ethanol). Found (%): C, 51.13; H, 4.25; Cl, 26.43; N, 14.03. $C_{17}H_{17}Cl_3N_4O$. Calculated (%): C, 51.08; H, 4.29; Cl, 26.61; N, 14.02. ^{1}H NMR (DMSO-d_6), δ: 2.38 (s, 3 H, N=CMe); 2.58 (s, 3 H, COMe); 3.12, 3.23 (both s, 3 H each, NMe_2); 7.52 (m, 3 H, Ph); 8.38 (m, 2 H, Ph).

4-Alkoxypyrido[2,3-*d*]pyrimidine-5(8*H*)-ones (18a—d) (general procedure). A mixture of the corresponding amidine **17a—c** (1 mmol) and MeONa or EtONa (3 mmol) in MeOH or EtOH (10 mL)) was refluxed for 6 h, cooled to 20 °C, acidified with AcOH, a precipitate formed was collected by filtration to obtain compounds **18a—d**. The filtrate was concentrated *in vacuo*, the residue was washed with water and hot acetonitrile to obtain an additional amount of bicycles **18a—d**. Analytical samples of these compounds were obtained by recrystallization from ethanol.

4-Methoxy-2,7-dimethylpyrido[2,3-*d*]pyrimidin-5(8*H*)-one (18a). The yield was 78%, m.p. > 300 °C. Found (%): C, 58.24; H, 5.59; N, 20.06. $C_{10}H_{11}N_3O_2$. Calculated (%): C, 58.53; H, 5.40; N, 20.48. MS, *m/z* (I_{rel} (%)): 205 $[M]^+$ (39), 176 $[M - CO - H]^+$ (21), 134 $[M - MeCN - CH_2O]^+$ (100). IR (KBr), ν/cm^{-1}: 3285—2710 (NH, CH), 1667 (CO), 1600, 1558. ^{1}H NMR (DMSO-d_6), δ: 2.22 (s, 3 H, Me); 2.50 (s, 3 H, Me); 3.99 (s, 3 H, OMe); 5.91 (s, 1 H, H(6)); 11.88 (br.s, 1 H, NH).

2,7-Dimethyl-4-ethoxypyrido[2,3-*d*]pyrimidin-5(8*H*)-one (18b). The yield was 82%, m.p. >300 °C. Found (%): C, 59.72; H, 6.19; N, 18.89. $C_{11}H_{13}N_3O_2$. Calculated (%): C, 60.26; H, 5.98; N, 19.17. MS, *m/z* (I_{rel} (%)): 219 $[M]^+$ (17), 204 $[M - Me]^+$ (6), 191 $[M - CO]^+$ (15), 175 $[M - Me - CO - H]^+$ (24), 134 $[M - MeCN - C_2H_4O]^+$ (100). IR (KBr), ν/cm^{-1}: 3300—2700 (NH, CH), 1667 (CO), 1560. ^{1}H NMR (DMSO-d_6), δ: 1.33 (t, 3 H, $\underline{Me}CH_2$, J = 6.9 Hz); 2.22 (s, 3 H, Me); 2.50 (s, 3 H, Me); 4.48 (q, 2 H, CH_2, J = 6.9 Hz); 5.89 (s, 1 H, H(6)); 11.84 (br.s, 1 H, NH).

4-Methoxy-2-phenylpyrido[2,3-*d*]pyrimidin-5(8*H*)-one (18c). The yield was 85%, m.p. 286—287 °C. Found (%): C, 66.42;

H, 4.32; N, 16.75. $C_{14}H_{11}N_3O_2$. Calculated (%): C, 66.39; H, 4.38; N, 16.59. MS, *m/z* (I_{rel} (%)): 253 $[M]^+$ (67), 224 $[M - CO - H]^+$ (17), 223 $[M - CH_2O]^+$ (15), 120 $[PhC(NH_2)=NH]^+$ (100). IR (KBr), ν/cm^{-1}: 3340—2720 (NH, CH), 1632 (CO), 1596, 1584, 1560. ^{1}H NMR (DMSO-d_6), δ: 4.14 (s, 3 H, OMe); 6.07 (br.s, 1 H, H(6)); 7.75 (m, 3 H, Ph); 7.69 (br.s, 1 H, H(7)); 8.41 (m, 2 H, Ph); 12.00 (br.s, 1 H, NH). ^{13}C NMR (DMSO-d_6), δ: 53.8 (OMe); 103.8 (C(4a)); 114.8 (C(6)); 128.1, 128.3, 131.3, 136.1 (Ph); 138.0 (C(7)); 157.5 (C(8a)); 162.7 (C(2)); 168.5 (C(4)); 175.4 (C(5)).

4-Methoxy-7-methyl-2-phenylpyrido[2,3-*d*]pyrimidin-5(8*H*)-one (18d). The yield was 58%, m.p. 301—302 °C. Found (%): C, 66.98; H, 4.87; N, 15.71. $C_{15}H_{13}N_3O_2$. Calculated (%): C, 67.40; H, 4.90; N, 15.72. MS, *m/z* (I_{rel} (%)): 267 $[M]^+$ (100), 238 $[M - CO - H]^+$ (39), 134 $[M - PhCN - CH_2O]^+$ (70). IR (KBr), ν/cm^{-1}: 3310—2550 (NH, CH), 1652 (CO), 1594, 1560. ^{1}H NMR (DMSO-d_6), δ: 2.27 (s, 3 H, Me); 4.12 (s, 3 H, OMe); 5.94 (s, 1 H, H(6)); 7.55 (m, 3 H, Ph); 8.42 (m, 2 H, Ph); 11.92 (br.s, 1 H, NH).

5-Acetyl-4-amino-6-methoxy-2-methylpyrimidine (19a). A mixture of pyrimidine **10a** (0.27 g, 1 mmol) and MeONa (2 mmol) in MeOH (5 mL) was refluxed for 6 h, cooled to 20 °C, acidified with AcOH, and concentrated *in vacuo*. The residue was diluted with chloroform (10 mL), a precipitate of sodium acetate was filtered off, the filtrate concentrated *in vacuo* and chromatographed on a column with SiO_2 (eluent chloroform, then a mixture of chloroform—acetone). The solvents were evaporated *in vacuo*, the residue was recrystallized from ethanol to obtain pyrimidine **19a** (0.12 g, 66%), m.p. 143—144 °C. Found (%): C, 52.71; H, 6.07; N, 22.85. $C_8H_{11}N_3O_2$. Calculated (%): C, 53.03; H, 6.12; N, 23.19. MS, *m/z* (I_{rel} (%)): 181 $[M]^+$ (30), 166 $[M - Me]^+$ (82), 43 $[COMe]^+$ (100). IR ($CHCl_3$), ν/cm^{-1}: 3488 and 3320 (NH_2), 1635 (CO), 1590, 1568, 1530. ^{1}H NMR ($CDCl_3$), δ: 2.40 (s, 3 H, Me); 2.59 (s, 3 H, Me); 4.02 (s, 3 H, OMe); 5.75, 9.02 (both br.s, 1 H each, NH_2).

5-Acetyl-4-amino-6-methoxy-2-phenylpyrimidine (19b) was synthesized similarly to compound **19a** from pyrimidine **10b**. The yield was 50%, m.p. 151—152 °C (from hexane). Found (%): C, 64.24; H, 5.74; N, 17.02. $C_{13}H_{13}N_3O_2$. Calculated (%): C, 64.18; H, 5.39; N, 17.27. MS, *m/z* (I_{rel} (%)): 243 $[M]^+$ (55), 228 $[M - Me]^+$ (100), 200 $[M - COMe]^+$ (15), 118 (99), 104 $[PhC=NH]^+$ (90), 77 $[Ph]^+$ (92). IR ($CHCl_3$), ν/cm^{-1}: 3496 and 3324 (NH_2), 1632 (CO), 1584, 1560, 1524. ^{1}H NMR ($CDCl_3$), δ: 2.65 (s, 3 H, COMe); 4.17 (s, 3 H, OMe); 5.80, 9.18 (both br.s, 1 H each, NH_2); 7.48 (m, 3 H, Ph); 8.42 (m, 2 H, Ph).

5-Acetyl-4-(dimethylaminomethylidene)amino-6-methoxy-2-phenylpyrimidine (20). A mixture of pyrimidine **20b** (0.15 g, 0.6 mmol) and DMF dimethyl acetal (0.16 mL, 1.2 mmol) in benzene (5 mL) was refluxed for 3 h, the solvent was evaporated *in vacuo*, the residue was recrystallized from a mixture of benzene—hexane to obtain amidine **20** (0.14 g, 78%), m.p. 124—125 °C. MS, *m/z* (I_{rel} (%)): 298 $[M]^+$ (53), 283 $[M - Me]^+$ (100), 255 $[M - COMe]^+$ (13), 118 (83), 104 $[PhC=NH]^+$ (31), 77 $[Ph]^+$ (65). IR ($CHCl_3$), ν/cm^{-1}: 3350—2790 (CH), 1696 (CO), 1628, 1588, 1552, 1536. ^{1}H NMR ($CDCl_3$), δ: 2.61 (s, 3 H, COMe); 3.11, 3.19 (both s, 3 H each, NMe_2); 4.09 (s, 3 H, OMe); 7.48 (m, 3 H, Ph); 8.43 (m, 2 H, Ph); 8.85 (s, 1 H, CH).

Conversion of amidine 20 to pyridopyrimidinone 18c. A mixture of amidine **20** (0.10 g, 0.34 mmol) and MeONa (0.68 mmol) in MeOH (4 mL) was refluxed for 5 h. Then, the reaction mixture was treated according to the general procedure for the synthesis of compounds **18** to obtain pyridopyrimidinone **18c** (0.06 g, 67%).

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