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Aminomethylation of 5-Substituted 6-Amino-2-oxo-1,2-dihydropyridine-3-carbonitriles

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Abstract—A number of 3,9-substituted 6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-7-carbonitriles were synthesized by reaction of 5-R-6-amino-2-oxo-1,2-dihydropyridine-3-carbonitriles with primary amines and excess formaldehyde.

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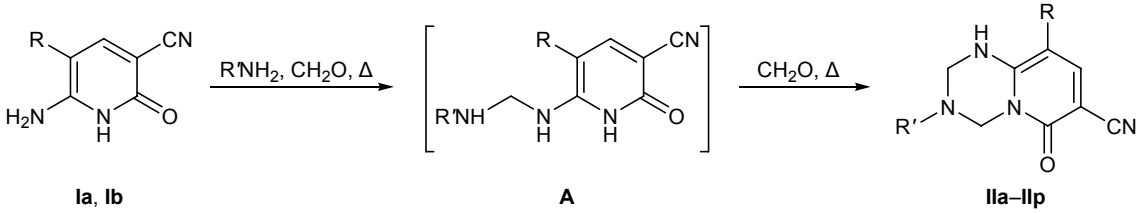
3-Cyanopyridine-2(1*H*)-chalcogenones and their derivatives possess a variety of useful properties and exhibit biological activity [1–4]. Mannich reactions with sulfur- and selenium-containing pyridines have been well documented [5–11]; however, only a few published data are available on the aminomethylation of their oxygen-containing analogs [12–15]. As we showed previously [16], Mannich reaction of 6-amino-4-aryl-2-oxo-1,2-dihydropyridine-3,5-dicarbonitriles yields pyrido[1,2-*a*][1,3,5]triazine derivatives. With the goal of determining the scope of this reaction and obtaining other pyrido[1,2-*a*][1,3,5]triazine derivatives, in the present work we examined aminomethylation of structurally related 5-substituted 6-amino-2-oxo-1,2-dihydropyridine-3-carbonitriles **Ia** and **Ib**.

Compounds **Ia** and **Ib** readily reacted with primary amines in the presence of excess formaldehyde to give the corresponding cyclocondensation products, 3,9-substituted 6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*]-[1,3,5]triazine-7-carbonitriles **IIa**–**IIp** (Scheme 1). Presumably, intermediate aminomethylation product **A** takes up the second formaldehyde molecule, yielding final compound **II**. Initial pyridinones **Ia** and **Ib** were synthesized according to the known procedure [17] by condensation of cyanoacetamide with ethoxymethylidenemalononitrile [18] and ethyl 2-cyano-3-ethoxyacrylate [19], respectively, on heating in boiling ethanol under base catalysis.

Due to the different solubilities of the initial compounds and final products, the aminomethylation of 5-R-6-amino-2-oxo-1,2-dihydropyridine-3-carbonitriles **Ia** and **Ib** was carried out under different conditions. 6-Amino-2-oxo-1,2-dihydropyridine-3,5-dicarbonitrile (**Ia**) is insoluble in ethanol; therefore, the reaction in that solvent could not be efficient. The reaction of **Ia** with benzylamine and formaldehyde in EtOH–DMF (1:1) afforded compound **IIc** in ~32% yield, whereas the yield of **IIc** in pure DMF increased to 47%. By contrast, compound **Ib** and its aminomethylation products are better soluble, and the optimum reaction medium was ethanol with addition of triethylamine as catalyst. For instance, the yield of

Scheme 1.



I, R = CN (**a**), COOEt (**b**); **II**, R = CN, R′ = Pr (**a**), 2-furylmethyl (**b**), $PhCH_2$ (**c**), Ph (**d**), 4-$MeOC_6H_4$ (**e**), 4-MeC_6H_4 (**f**), 2-MeC_6H_4 (**g**), 2-$EtOC_6H_4$ (**h**), 3,4-$Me_2C_6H_3$ (**i**); R = COOEt, R′ = Me (**j**), 2-furylmethyl (**k**), $PhCH_2$ (**l**), 4-EtC_6H_4 (**m**), 4-MeC_6H_4 (**n**), 4-$MeOC_6H_4$ (**o**), Ph (**p**).

pyridotriazine **IIj** in the Mannich reaction of **Ib** with methylamine and formaldehyde in ethanol was 38% against 28% in DMF. Compounds **IIa**–**IIp** were isolated as light yellow finely crystalline substances; pyridotriazines **IIa**–**IIi** are insoluble in ethanol and poorly soluble in acetone and DMF, while compounds **IIj**–**IIp** are moderately soluble in ethanol but readily soluble in acetone and DMF.

The structure of **IIa**–**IIp** was confirmed by spectral data. Their IR spectra contained absorption bands typical of stretching vibrations of C=O (ν 1665–1693 cm^{-1}), conjugated cyano (ν 2206–2232 cm^{-1}), and N–H groups (ν 3170–3482 cm^{-1}). In the spectra of **IIk**, **IIl**, and **IIn**, the C≡N stretching vibration band had a shoulder at ν 2170–2180 cm^{-1}. Compounds **IIa**–**IIp** displayed in the ^1H NMR spectra signals from methylene protons on C^2 and C^4 as broadened singlets at δ 4.34–5.11 and 4.92–5.59 ppm, respectively, and the NH proton resonated as a broadened singlet at δ 9.01–9.74 ppm.

In summary, we have shown that pyrido[1,2-*a*]-[1,3,5]triazine derivatives can be successfully synthesized by aminomethylation of 6-amino-2-oxo-1,2-dihydropyridine-3-carbonitriles with primary amines and formaldehyde under mild conditions. The reaction is general for all 6-aminopyridine-2-chalcogenones, and the proposed procedure is convenient from the preparative viewpoint and suitable for obtaining various combinatorial libraries of pyrido[1,2-*a*][1,3,5]triazines.

EXPERIMENTAL

The IR spectra were measured on an IKS-29 spectrometer from samples dispersed in mineral oil. The ^1H NMR spectra were recorded on Bruker DRX-500 (500.07 MHz; **IIa**–**IIo**) and Varian Unity Plus spectrometers (400.40 MHz; **IIp**) from solutions in DMSO-d_6 using tetramethylsilane as internal reference. The ^{13}C NMR spectra of **IIa**, **IIf**, and **IIh** were obtained on a Bruker DRX-500 instrument at 125.76 MHz using DMSO-d_6 as solvent and tetramethylsilane as internal reference. The elemental compositions were determined on a Carlo Erba 1106 Elemental Analyzer. HPLC/MS analyses were obtained using an Agilent 1100 chromatograph equipped with DAD and ELSD Sedex 75 detectors and coupled with an Agilent LC/MSD VL mass-selective detector (atmospheric pressure electrospray ionization). The purity of the isolated compounds was checked by TLC on Silufol UV-254 plates using acetone–hexane (1:1) as eluent; spots were visualized by treatment with iodine vapor or under UV light. The melting points were measured on a Kofler hot stage and are uncorrected.

Compounds IIa–IIi (*general procedure*). Compound **Ia**, 500 mg (3.1 mmol), was mixed with 3.4 mmol of the corresponding primary amine, 5 mL of DMF and 2.0 mL (26.6 mmol) of 37% aqueous formaldehyde (free from paraformaldehyde impurity) were added, and the mixture was stirred and heated for 3 min under reflux. Compounds **IIa**–**IIi** began to separate from the solution in 1 min after the mixture started to boil. The mixture was left to stand for 12 h at room temperature, 10 mL of ethanol was added, and the mixture was left to stand for 24 h more. The precipitate was filtered off and washed with ethanol. Compounds **IIa**–**IIi** were isolated as analytically pure substances.

6-Oxo-3-propyl-1,3,4,6-tetrahydro-2*H*-pyrido-[1,2-*a*][1,3,5]triazine-7,9-dicarbonitrile (IIa). Yield 160 mg (21%), light yellow crystals, mp 282–284°C (decomp.). IR spectrum, ν, cm^{-1}: 3440, 3213, 3172 (N–H); 2220 (C≡N), 1665 (C=O). We failed to obtain NMR spectra of **IIa** because of its poor solubility in DMSO-d_6. Mass spectrum: *m/z* 242.0 $[M - H]^-$. Found, %: C 59.13; H 5.41; N 28.73. $C_{12}H_{13}N_5O$. Calculated, %: C 59.25; H 5.39; N 28.79. *M* 243.26.

3-(Furan-2-ylmethyl)-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-7,9-dicarbonitrile (IIb). Yield 210 mg (24%), light yellow crystals, mp 239–241°C (decomp.). IR spectrum, ν, cm^{-1}: 3481, 3307 (N–H); 2212 (C≡N), 1673 (C=O). ^1H NMR spectrum, δ, ppm: 3.86 br.s (2H, 3-CH_2), 4.36 br.s (2H, 2-H), 4.88 br.s (2H, 4-H), 6.32–6.34 m (1H, 4′-H), 6.38–6.40 m (1H, 3′-H), 7.58–7.60 m (1H, 5′-H), 8.16 s (1H, 8-H), 9.04 br.s (1H, NH). Mass spectrum, *m*/*z*: 283.0 $[M + 2H]^+$; 280.0 $[M - H]^-$. Found, %: C 59.66; H 3.97; N 24.83. $C_{14}H_{11}N_5O_2$. Calculated, %: C 59.78; H 3.94; N 24.90. *M* 281.27.

3-Benzyl-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido-[1,2-*a*][1,3,5]triazine-7,9-dicarbonitrile (IIc). Yield 430 mg (47%), light yellow crystals, mp 255–257°C (decomp.). IR spectrum, ν, cm^{-1}: 3420, 3271 (N–H); 2217 (C≡N), 1670 (C=O). ^1H NMR spectrum, δ, ppm: 3.80 br.s (2H, C**H**$_2$Ph), 4.34 br.s (2H, 2-H), 4.88 br.s (2H, 4-H), 7.29–7.36 m (5H, CH_2**Ph**), 8.20 s (1H, 8-H), 9.01 br.s (1H, NH). Mass spectrum, *m*/*z*: 290.1 $[M - H]^-$. Found, %: C 65.79; H 4.52; N 23.98. $C_{16}H_{13}N_5O$. Calculated, %: C 65.97; H 4.50; N 24.04. *M* 291.31.

6-Oxo-3-phenyl-1,3,4,6-tetrahydro-2*H*-pyrido-[1,2-*a*][1,3,5]triazine-7,9-dicarbonitrile (IId). Yield

420 mg (49%), light yellow crystals, mp 218–220°C (decomp.). IR spectrum, ν, cm^{-1}: 3435, 3210 (N–H); 2223, 2210 (C≡N); 1665 (C=O). ^1H NMR spectrum, δ, ppm: 5.01 br.s (2H, 2-H), 5.55 br.s (2H, 4-H), 6.98–7.01 m (1H, *p*-H), 7.07–7.08 m (2H, *o*-H), 7.30–7.33 m (2H, *m*-H), 8.17 s (1H, 8-H), 9.38 br.s (1H, NH). Mass spectrum, *m*/*z*: 278.2 $[M + H]^+$; 276.2 $[M - H]^-$. Found, %: C 64.84; H 4.02; N 25.20. $C_{15}H_{11}N_5O$. Calculated, %: C 64.97; H 4.00; N 25.26. *M* 277.28.

3-(4-Methoxyphenyl)-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-7,9-dicarbonitrile (IIe). Yield 190 mg (20%), light yellow crystals, mp 246–248°C (decomp.). IR spectrum, ν, cm^{-1}: 3480, 3210 (N–H); 2228, 2211 (C≡N); 1680 (C=O). ^1H NMR spectrum, δ, ppm: 3.68 s (3H, OCH_3), 4.92 br.s (2H, 2-H, 5.46 br.s (2H, 4-H, 6.88 d and 7.00 d (2H each, H_{arom}, *J* = 9.0 Hz), 8.16 s (1H, 8-H), 9.34 br.s (1H, NH). We failed to characterize compound **IIe** by HPLC/MS data because of its poor solubility in standard solvents. Found, %: C 62.41; H 4.28; N 22.75. $C_{16}H_{13}N_5O_2$. Calculated, %: C 62.53; H 4.26; N 22.79.

3-(4-Methylphenyl)-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-7,9-dicarbonitrile (IIf). Yield 330 mg (36%), light yellow crystals, mp 262–264°C (decomp.). IR spectrum, ν, cm^{-1}: 3271, 3170 (N–H); 2211 (C≡N); 1680 (C=O). ^1H NMR spectrum, δ, ppm: 2.20 s (3H, CH_3), 4.95 br.s (2H, 2-H), 5.50 br.s (2H, 4-H), 6.96 d and 7.11 d (2H each, H_{arom}, *J* = 8.5 Hz), 8.17 s (1H, 8-H), 9.27 br.s (1H, NH). ^{13}C NMR spectrum, δ_C, ppm: 20.0* (CH_3), 59.1 and 60.1 (C^2, C^4), 73.5 (C^9), 86.0 (C^7), 115.1 and 116.3 (C≡N), 117.8* (C^o), 130.0* (C^m), 131.6 (C^p), 143.1 (C^{9a}), 149.0* (C^8), 154.2 (C^i), 158.4 (C^6). Mass spectrum, *m*/*z*: 292.2 $[M + H]^+$, 290.0 $[M - H]^-$. Found, %: C 65.87; H 4.52; N 24.00. $C_{16}H_{13}N_5O$. Calculated, %: C 65.97; H 4.50; N 24.04. *M* 291.31.

3-(2-Methylphenyl)-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-7,9-dicarbonitrile (IIg). Yield 415 mg (46%), light yellow crystals, mp 242–244°C (decomp.). IR spectrum, ν, cm^{-1}: 3420, 3210 (N–H); 2232, 2206 (C≡N); 1682 (C=O). ^1H NMR spectrum, δ, ppm: 2.30 s (3H, CH_3), 4.75 br.s (2H, 2-H), 5.29 br.s (2H, 4-H), 6.83–7.26 m (4H, H_{arom}), 8.21 s (1H, 8-H), 9.29 br.s (1H, NH). Mass spectrum: *m*/*z* 290.2 $[M - H]^-$. Found, %: C 65.85; H 4.52; N 23.99. $C_{16}H_{13}N_5O$. Calculated, %: C 65.97; H 4.50; N 24.04. *M* 291.31.

3-(2-Ethoxyphenyl)-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-7,9-dicarbonitrile (IIh). Yield 490 mg (49%), light yellow crystals, mp 248–250°C (decomp.). IR spectrum, ν, cm^{-1}: 3210 (N–H); 2222, 2211 (C≡N); 1687 (C=O). ^1H NMR spectrum, δ, ppm: 1.36 t (3H, $CH_2C\mathbf{H}_3$, *J* = 6.6 Hz), 4.09 q (2H, $C\mathbf{H}_2CH_3$, *J* = 6.6 Hz), 4.90 br.s (2H, 2-H), 5.45 br.s (2H, 4-H), 6.80–7.08 m (4H, H_{arom}), 8.18 s (1H, 8-H), 9.29 br.s (1H, NH). ^{13}C NMR spectrum, δ_C, ppm: 14.6* ($CH_2\mathbf{C}H_3$), 58.9 and 60.4 (C^2, C^4), 63.7 ($\mathbf{C}H_2CH_3$), 73.5 (C^9), 86.0 (C^7), 90.8* (C_{arom}), 113.4 (C_{arom}), 115.3* and 116.5* (C≡N), 119.0 (C_{arom}), 120.9 (C_{arom}), 125.0 (C_{arom}), 134.6* (C_{arom}), 150.7* (C_{arom}), 154.0* (C^{9a}), 158.4* (C^6). Mass spectrum, *m*/*z*: 322.2 $[M + H]^+$, 320.0 $[M - H]^-$. Found, %: C 63.40; H 4.74; N 21.74. $C_{17}H_{15}N_5O_2$. Calculated, %: C 63.54; H 4.71; N 21.79. *M* 321.33.

3-(3,4-Dimethylphenyl)-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-7,9-dicarbonitrile (IIi). Yield 520 mg (55%), light yellow crystals, mp 235–237°C (decomp.). IR spectrum, ν, cm^{-1}: 3286 (N–H); 2218, 2210 (C≡N), 1665 (C=O). ^1H NMR spectrum, δ, ppm: 2.10 s and 2.16 s (3H each, CH_3), 4.95 br.s (2H, 2-H), 5.50 br.s (2H, 4-H), 6.72–6.74 m and 6.92–6.93 m (1H each, 2′-H, 5′-H), 7.04 d (1H, 6′-H, *J* = 8.2 Hz), 8.15 s (1H, 8-H), 9.33 br.s (1H, NH). Mass spectrum, *m*/*z*: 306.2 $[M + H]^+$; 304.2 $[M - H]^-$. Found, %: C 66.74; H 4.98; N 22.90. $C_{17}H_{15}N_5O$. Calculated, %: C 66.87; H 4.95; N 22.94. *M* 305.33.

Compounds IIj–IIp (*general procedure*). To a mixture of 500 mg (2.4 mmol) of compound **Ib** and 2.6 mmol of the corresponding primary amine we added 20 mL of ethanol, 3.5 mL (2.5 mmol) of triethylamine, and 2.0 mL (26.6 mmol) of 37% aqueous formaldehyde containing no paraformaldehyde impurity. The mixture was heated for 3 h under reflux and filtered through a folded filter paper, and the filtrate was left to stand for 36–48 h at room temperature. The precipitate was filtered off and washed with ethanol. Compounds **IIj–IIp** were thus isolated as analytically pure substances.

Ethyl 7-cyano-3-methyl-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-9-carboxylate (IIj). Yield 240 mg (38%), light yellow crystals, mp 232–234°C. IR spectrum, ν, cm^{-1}: 3265 (N–H), 2218 (C≡N), 1682 (C=O). ^1H NMR spectrum, δ, ppm: 1.27 t (3H, $CH_2C\mathbf{H}_3$, *J* = 6.6 Hz), 2.41 s (3H, 3-CH_3), 4.20 q (2H, $C\mathbf{H}_2CH_3$, *J* = 6.6 Hz), 4.38 br.s (2H, 2-H), 4.87 br.s (2H, 4-H), 8.21 s (1H, 8-H), 9.50 br.s (1H, NH). Mass spectrum, *m*/*z*: 220.0 $[M - CH_3NCH]^+$, 263.2 $[M + H]^+$, 525.2 $[2M + H]^+$, 261.2 $[M - H]^-$. Found, %: C 54.83; H 5.41; N 21.32. $C_{12}H_{14}N_4O_3$. Calculated, %: C 54.96; H 5.38; N 21.36. *M* 262.26.

* Counterphase signal.

Ethyl 7-cyano-3-(furan-2-ylmethyl)-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-9-carboxylate (IIk). Yield 190 mg (24%), light yellow crystals, mp 179–181°C. IR spectrum, ν, cm^{-1}: 3420, 3270 (N–H); 2217, 2170 sh (C≡N); 1686 (C=O). ^{1}H NMR spectrum, δ, ppm: 1.28 t (3H, $CH_2C\mathbf{H}_3$, J = 6.9 Hz), 3.83 br.s (2H, 3-CH_2), 4.21 q (2H, $C\mathbf{H}_2CH_3$, J = 6.9 Hz), 4.45 br.s (2H, 2-H), 4.92 br.s (2H, 4-H), 6.31–6.33 m (1H, 4′-H), 6.38–6.40 m (1H, 3′-H), 7.57–7.59 m (1H, 5′-H), 8.19 s (1H, 8-H), 9.52 br.s (1H, NH). Mass spectrum, *m*/*z*: 329.1 $[M + H]^+$, 327.1 $[M - H]^-$. Found, %: C 58.41; H 4.93; N 17.03. $C_{16}H_{16}N_4O_4$. Calculated, %: C 58.53; H 4.91; N 17.06. *M* 328.32.

Ethyl 3-benzyl-7-cyano-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-9-carboxylate (IIl). Yield 170 mg (21%), light yellow crystals, mp 210–212°C. IR spectrum, ν, cm^{-1}: 3420, 3218 (N–H); 2217, 2180 sh (C≡N); 1692 (C=O). ^{1}H NMR spectrum, δ, ppm: 1.28 t (3H, $CH_2C\mathbf{H}_3$, J = 6.9 Hz), 3.79 br.s (2H, $C\mathbf{H}_2Ph$), 4.22 q (2H, $C\mathbf{H}_2CH_3$, J = 6.9 Hz), 4.45 br.s (2H, 2-H), 4.92 br.s (2H, 4-H), 7.28–7.34 m (5H, Ph), 8.22 s (1H, 8-H), 9.54 br.s (1H, NH). Mass spectrum, *m*/*z*: 339.2 $[M + H]^+$; 337.2 $[M - H]^-$. Found, %: C 63.75; H 5.39; N 16.53. $C_{18}H_{18}N_4O_3$. Calculated, %: C 63.89; H 5.36; N 16.56. *M* 338.36.

Ethyl 7-cyano-3-(4-ethylphenyl)-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-9-carboxylate (IIm). Yield 220 mg (26%), light yellow crystals, mp 186–188°C. IR spectrum, ν, cm^{-1}: 3482, 3241, 3210 (N–H); 2220 (C≡N); 1692 (C=O). ^{1}H NMR spectrum, δ, ppm: 1.10 t (3H, 4′-$CH_2C\mathbf{H}_3$, J = 7.1 Hz), 1.24 t (3H, $OCH_2C\mathbf{H}_3$, J = 6.6 Hz), 2.48 q (2H, 4′-$C\mathbf{H}_2CH_3$, J = 7.1 Hz), 4.17 q (2H, $OC\mathbf{H}_2CH_3$, J = 6.6 Hz), 5.08 br.s (2H, 2-H), 5.56 br.s (2H, 4-H), 6.98 d and 7.13 d (2H each, H_{arom}, J = 7.7 Hz), 8.17 s (1H, 8-H), 9.72 br.s (1H, NH). Mass spectrum, *m*/*z*: 134.2 $[EtC_6H_4NHCH_2]^+$, 353.2 $[M + H]^+$, 351.2 $[M - H]^-$. Found, %: C 64.62; H 5.74; N 15.86. $C_{19}H_{20}N_4O_3$. Calculated, %: C 64.76; H 5.72; N 15.90. *M* 352.39.

Ethyl 7-cyano-3-(4-methylphenyl)-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-9-carboxylate (IIn). Yield 180 mg (22%), light yellow crystals, mp 218–220°C. IR spectrum, ν, cm^{-1}: 3450, 3240 (N–H); 2219, 2178 sh (C≡N); 1693 (C=O). ^{1}H NMR spectrum, δ, ppm: 1.24 t (3H, $CH_2C\mathbf{H}_3$, J = 6.6 Hz), 2.19 br.s (3H, 4′-CH_3), 4.17 q (2H, $C\mathbf{H}_2CH_3$, J = 6.6 Hz), 5.07 br.s (2H, 2-H), 5.55 br.s (2H, 4-H), 6.96 d and 7.10 d (2H each, H_{arom}, J = 7.7 Hz), 8.17 s (1H, 8-H), 9.71 br.s (1H, NH). Mass spectrum, *m*/*z*: 120.2 $[CH_3C_6H_4NHCH_2]^+$, 220.2 $[M - CH_3C_6H_4NCH]^+$, 339.2 $[M + H]^+$, 218.2 $[M - CH_3C_6H_4NHCH_2]^-$, 337.2 $[M - H]^-$. Found, %: C 63.76; H 5.39; N 16.53. $C_{18}H_{18}N_4O_3$. Calculated, %: C 63.89; H 5.36; N 16.56. *M* 338.36.

Ethyl 7-cyano-3-(4-methoxyphenyl)-6-oxo-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-9-carboxylate (IIo). Yield 200 mg (23%), light yellow crystals, mp 208–210°C. IR spectrum, ν, cm^{-1}: 3240 (N–H), 2220 (C≡N); 1693 (C=O). ^{1}H NMR spectrum, δ, ppm: 1.24 t (3H, $CH_2C\mathbf{H}_3$, J = 6.6 Hz), 3.67 s (3H, OCH_3), 4.18 q (2H, $C\mathbf{H}_2CH_3$, J = 6.6 Hz), 5.02 br.s (2H, 2-H), 5.50 br.s (2H, 4-H), 6.87 d and 7.00 d (2H each, H_{arom}, J = 8.5 Hz), 8.18 s (1H, 8-H), 9.71 br.s (1H, NH). Mass spectrum, *m*/*z*: 136.1 $[CH_3OC_6H_4NHCH_2]^+$, 355.0 $[M + H]^+$, 353.0 $[M - H]^-$. Found, %: C 60.89; H 5.14; N 15.78. $C_{18}H_{18}N_4O_4$. Calculated, %: C 61.01; H 5.12; N 15.81. *M* 354.36.

Ethyl 7-cyano-6-oxo-3-phenyl-1,3,4,6-tetrahydro-2*H*-pyrido[1,2-*a*][1,3,5]triazine-9-carboxylate (IIp). Yield 180 mg (23%), light yellow crystals, mp 210–212°C. IR spectrum, ν, cm^{-1}: 3238 (N–H), 2221 (C≡N), 1680 (C=O). ^{1}H NMR spectrum, δ, ppm: 1.23 t (3H, $CH_2C\mathbf{H}_3$, J = 7.0 Hz), 4.17 q (2H, $C\mathbf{H}_2CH_3$, J = 7.0 Hz), 5.11 br.s (2H, 2-H), 5.59 br.s (2H, 4-H), 6.97 t (1H, *p*-H, J = 7.3 Hz), 7.07 d (2H, *o*-H, J = 8.3 Hz), 7.28–7.32 m (2H, *m*-H), 8.17 s (1H, 8-H), 9.74 br.s (1H, NH). Mass spectrum, *m*/*z*: 220.2 $[M - C_6H_5NCH]^+$, 325.0 $[M + H]^+$, 218.0 $[M - C_6H_5NHCH_2]^-$, 323.2 $[M - H]^-$. Found, %: C 62.83; H 4.99; N 17.23. $C_{17}H_{16}N_4O_3$. Calculated, %: C 62.95; H 4.97; N 17.27. *M* 324.33.

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