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New Efficient Synthesis of 6-Aminopyrano[3,4-*c*]pyridines via Smiles Type Rearrangement

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Abstract—A new efficient procedure has been developed for the synthesis of 6-aminopyrano[3,4-*c*]pyridines via Smiles type rearrangement. The procedure is characterized by improved overall yield and avoidance of experimentally difficult chlorination step.

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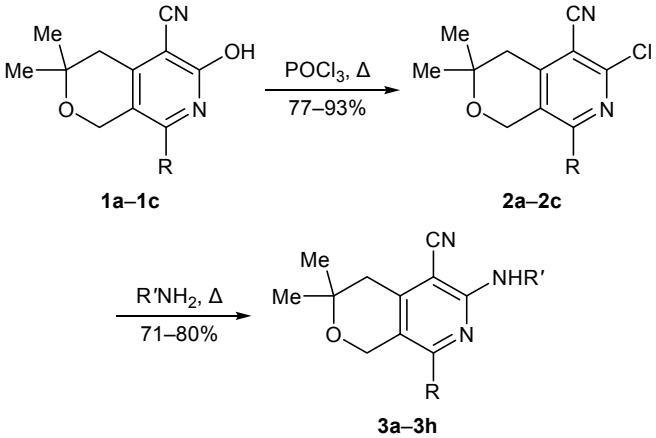
Taking into account the results of biological testing of 6-aminopyrano[3,4-*c*]pyridines [1–3] and published data [4, 5], we have developed a new, more efficient procedure for the synthesis of these compounds. 6-Aminopyrano[3,4-*c*]pyridines were previously obtained by a classical method based on nucleophilic substitution of the chlorine atom in 6-chloropyrano-[3,4-*c*]pyridines **2a**–**2c** [1, 2, 6] by various amines. Compounds **2a**–**2c** were prepared in turn by reaction of the corresponding 8-alkyl(aryl)-6-hydroxy-3,3-dimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridine-5-carbonitriles **1a**–**1c** [7] with phosphoryl chloride.

Scheme 1.

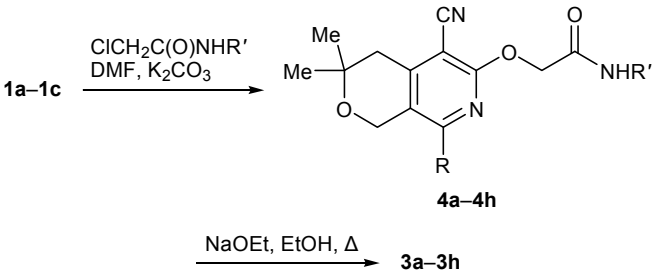


1, **2**, R = Me (**a**), Bu (**b**), Ph (**c**); **3**, R = Me, R′ = H (**a**), $PhCH_2$ (**b**), furan-2-ylmethyl (**c**); R = Bu, R′ = H (**d**), furan-2-ylmethyl (**e**), tetrahydrofuran-2-ylmethyl (**f**), $PhCH_2CH_2$ (**g**); R = Ph, R′ = H (**h**).

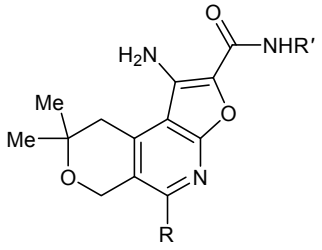
Nucleophilic substitution of the chlorine atom in compounds **2** requires harsh conditions, in particular heating under reflux in excess amine or (with ammonia) at 180°C under pressure. The target 8-alkyl-(aryl)-6-amino-3,3-dimethyl-3,4-dihydro-1*H*-pyrano-[3,4-*c*]pyridine-5-carbonitriles **3a**–**3h** are thus obtained in ~65% yield over two steps (Scheme 1).

Herein we propose a new efficient method for the synthesis of pyrano[3,4-*c*]pyridines **3a**–**3h** which attract interest as potential biologically active compounds. The procedure is based on the Smiles type rearrangement recently discovered by us [8, 9]. The initial compounds were 2-[(8-alkyl(aryl)-5-cyano-3,3-dimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridin-6-yl)-oxy]acetamides **4a**–**4h** which were obtained by alkylation of 6-hydroxy derivatives **1a**–**1c** with the corresponding chloroacetamides. Rearrangement of acetamides **4a**–**4h** on heating in ethanol in the presence of sodium ethoxide afforded target nitriles **3a**–**3h** in an overall yield of ~70% (Scheme 2).

Scheme 2.



However, the proposed procedure is applicable to the synthesis of compounds **3** only from chloroacetamides with an aliphatic substituent on the nitrogen atom, whereas in other cases (*N*,*N*-disubstituted chloroacetamides or *N*-aryl derivatives) the reaction was accompanied by intramolecular cyclization with formation of fused furans **5** [8, 9].



5

The structure of amino derivatives **3a**–**3h** was confirmed by IR spectra which clearly showed a CN stretching vibration band at 2208–2218 cm^{-1}; the presence of a cyano group indicated that no cyclization to structure **5** occurred [8, 9]. The ^1H and ^{13}C NMR spectra and elemental analyses of **3a**–**3h** were also consistent with their structure.

The proposed procedure is advantageous due to experimental simplicity (laborious chlorination of 6-hydroxypyranopyridines is avoided) and fairly mild conditions (there is no need of high pressure in the synthesis of ammonia and low-boiling amine derivatives).

EXPERIMENTAL

The ^1H and ^{13}C NMR spectra were recorded on a Varian Mercury 300VX spectrometer at 300 and 75 MHz, respectively, using tetramethylsilane as internal standard. The IR spectra were measured on a Nicolet Avatar 330-FT-IR spectrometer from samples dispersed in mineral oil. The elemental analyses were obtained by the Korshun–Klimova (C, H) and Dumas–Pregl methods (N). The melting points were determined with a Boetius micro hot stage.

Compounds 4a–4h (*general procedure*). The corresponding chloroacetamide, 12 mmol, was added with stirring to a suspension of 10 mmol of compound **1a**–**1c** and 1.66 g (12 mmol) of K_2CO_3 in 25 mL of anhydrous DMF. The mixture was stirred for 2 h at 100°C, cooled to room temperature, and poured into cold water. The precipitate was filtered off, washed with water, dried, and recrystallized from ethanol.

2-[(5-Cyano-3,3,8-trimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridin-6-yl)oxy]acetamide (4a). Yield 79%, mp 122–124°C. IR spectrum, ν, cm^{-1}: 3443, 3216 (NH_2), 2235 (C≡N), 1692 (C=O). ^1H NMR spectrum ($CDCl_3$), δ, ppm: 1.32 s (6H, 3-Me), 2.37 s (3H, 8-Me), 2.83 s (2H, CH_2), 4.64 s (2H, OCH_2), 4.89 s (2H, CH_2CO), 5.63 br and 6.44 br (1H each, NH_2). ^{13}C NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ_C, ppm: 20.8 (CH_3), 25.9 (2C, CH_3), 37.7 (CH_2), 45.2 (O**C**H_2CO), 59.3 (C^1), 64.1 (CO), 68.9 (C^3), 87.0 (C^5), 115.5 (CN), 115.6, 144.9, 157.1, 158.0. Found, %: C 60.76; H 6.41; N 15.03. $C_{14}H_{17}N_3O_3$. Calculated, %: C 61.08; H 6.22; N 15.26.

***N*-Benzyl-2-[(5-cyano-3,3,8-trimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridin-6-yl)oxy]acetamide (4b).** Yield 80%, mp 161–162°C. IR spectrum, ν, cm^{-1}: 3278, 3102 (NH), 2222 (C≡N), 1667 (C=O). ^1H NMR spectrum ($CDCl_3$), δ, ppm: 1.32 s (6H, 3-CH_3), 2.37 s (3H, 8-CH_3), 2.83 s (2H, CH_2), 4.51 s (2H, OCH_2), 4.55 s (2H, CH_2CO), 4.83 br (2H, NHC**H**$_2$), 7.14–7.31 m (5H, Ph), 8.36 br (1H, NH). Found, %: C 68.75; H 6.49; N 11.69. $C_{21}H_{23}N_3O_3$. Calculated, %: C 69.02; H 6.34; N 11.50.

2-[(5-Cyano-3,3,8-trimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridin-6-yl)oxy]-*N*-(furan-2-ylmethyl)-acetamide (4c). Yield 86%, mp 141–143°C. IR spectrum, ν, cm^{-1}: 3301, 3078 (NH), 2220 (C≡N), 1661 (C=O). ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 1.29 s (6H, 3-Me), 2.23 s (3H, 8-CH_3), 2.71 s (2H, CH_2), 4.33 d (2H, NHC**H**$_2$, J = 5.6 Hz), 4.54 s (2H, OCH_2), 4.80 s (2H, CH_2CO), 6.24 d.d (1H, 3′-H, J = 3.3, 0.8 Hz), 6.32 d.d (1H, 4′-H, J = 3.3, 1.8 Hz), 7.42 d.d (1H, 5′-H, J = 1.8, 0.8 Hz), 8.62 t (1H, NH, J = 5.6 Hz). Found, %: C 64.46; H 6.11; N 11.62. $C_{19}H_{21}N_3O_4$. Calculated, %: C 64.21; H 5.96; N 11.82.

2-[(8-Butyl-5-cyano-3,3-dimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridin-6-yl)oxy]acetamide (4d). Yield 83%, mp 179–180°C. IR spectrum, ν, cm^{-1}: 3420, 3182 (NH_2), 2239 (C≡N), 1698 (C=O). ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.95 t (3H, CH_3, J = 7.3 Hz), 1.27 s (6H, 3-Me), 1.31–1.44 m (2H, C**H**$_2$CH$_3$), 1.63–1.73 m (2H, C**H**$_2$C$_2$H$_5$), 2.55 t (2H, 8-CH_2, J = 7.5 Hz), 2.77 s (2H, CH_2), 4.62 s (2H, OCH_2), 4.76 s (2H, CH_2CO), 6.98 br and 7.07 br (1H each, NH_2). Found, %: C 64.02; H 7.50; N 13.48. $C_{17}H_{23}N_3O_3$. Calculated, %: C 64.33; H 7.30; N 13.24.

2-[(8-Butyl-5-cyano-3,3-dimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridin-6-yl)oxy]-*N*-(furan-2-ylmethyl)acetamide (4e). Yield 87%, mp 113–115°C. IR spectrum, ν, cm^{-1}: 3266, 3083 (NH), 2224 (C≡N), 1655 (C=O). ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.94 t (3H, CH_3, J = 7.3 Hz), 1.28 s (6H,

3-Me), 1.31–1.42 m (2H, C**H**$_2$CH$_3$), 1.58–1.69 m (2H, C**H**$_2$C$_2$H$_5$), 2.52 t (2H, 8-CH$_2$, J = 7.4 Hz), 2.77 s (2H, CH$_2$), 4.31 t (2H, NHC**H**$_2$, J = 5.7 Hz), 4.62 s (2H, OCH$_2$), 4.82 s (2H, CH$_2$CO), 6.16 d.d (1H, 3′-H, J = 3.2, 0.9 Hz), 6.29 d.d (1H, 4′-H, J = 3.2, 1.8 Hz), 7.37 d.d (1H, 5′-H, J = 1.8, 0.9 Hz), 8.16 t (1H, NH, J = 5.7 Hz). Found, %: C 66.25; H 6.69; N 10.75. $C_{22}H_{27}N_3O_4$. Calculated, %: C 66.48; H 6.85; N 10.57.

2-[(8-Butyl-5-cyano-3,3-dimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridin-6-yl)oxy]-*N*-(tetrahydrofuran-2-ylmethyl)acetamide (4f). Yield 89%, mp 80–82°C. IR spectrum, ν, cm^{-1}: 3275, 3089 (NH), 2225 (C≡N), 1660 (C=O). ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.94 t (3H, CH$_3$, J = 7.3 Hz), 1.27 s (6H, 3-Me), 1.30–1.42 m (2H, C**H**$_2$CH$_3$), 1.45–1.59 m (1H) and 1.79–1.95 m (3H) (3′-H, 4′-H), 1.60–1.71 m (2H, C**H**$_2$C$_2$H$_5$), 2.53 t (2H, 8-CH$_2$, J = 7.4 Hz), 2.77 s (2H, CH$_2$), 3.16 d.t (1H, NHC**H**$_2$, J = 13.5, 6.0 Hz), 3.27 d.d.d (1H, NHC**H**$_2$, J = 13.5, 5.8, 4.8 Hz), 3.60–3.68 m and 3.76–3.82 m (1H each, 5′-H), 3.82–3.91 m (1H, 2′-H), 4.62 s (2H, OCH$_2$), 4.78 s (2H, CH$_2$CO), 7.59 t (1H, NH, J = 5.8 Hz). Found, %: C 66.09; H 7.92; N 10.68. $C_{22}H_{31}N_3O_4$. Calculated, %: C 65.81; H 7.78; N 10.47.

2-[(8-Butyl-5-cyano-3,3-dimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridin-6-yl)oxy]-*N*-(2-phenylethyl)acetamide (4g). Yield 90%, mp 120–121°C. IR spectrum, ν, cm^{-1}: 3427, 3276, 3099 (NH), 2221 (C≡N), 1665 (C=O). ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.94 t (3H, CH$_3$, J = 7.3 Hz), 1.28 s (6H, 3-Me), 1.31–1.42 m (2H, C**H**$_2$CH$_3$), 1.60–1.71 m (2H, C**H**$_2$C$_2$H$_5$), 2.53 t (2H, 8-CH$_2$, J = 7.5 Hz), 2.72–2.77 m (2H, C**H**$_2$Ph), 2.78 s (2H, CH$_2$), 3.31–3.39 m (2H, NHC**H**$_2$), 4.62 s (2H, OCH$_2$), 4.76 s (2H, CH$_2$CO), 7.10–7.25 m (5H, Ph), 7.63 t (1H, NH, J = 5.7 Hz). Found, %: C 70.97; H 7.59; N 9.75. $C_{25}H_{31}N_3O_3$. Calculated, %: C 71.23; H 7.41; N 9.97.

2-[(5-Cyano-3,3-dimethyl-8-phenyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridin-6-yl)oxy]acetamide (4h). Yield 81%, mp 99–101°C. IR spectrum, ν, cm^{-1}: 3442, 3164 (NH$_2$), 2232 (C≡N), 1694 (C=O). ^{1}H NMR spectrum ($CDCl_3$), δ, ppm: 1.37 s (6H, 3-Me), 2.94 s (2H, CH$_2$), 4.73 s (2H, OCH$_2$), 4.96 s (2H, CH$_2$CO), 5.66 br and 6.47 br (1H each, NH$_2$), 7.40–7.51 m (5H, Ph). Found, %: C 67.96; H 5.47; N 12.71. $C_{19}H_{19}N_3O_3$. Calculated, %: C 67.64; H 5.68; N 12.46.

Compounds 3a–3h (*general procedures*). *a*. Compound **4a**–**4h**, 10 mmol, was added to a solution of sodium ethoxide prepared from 0.12 g (5 mmol) of sodium and 30 mL of anhydrous ethanol. The mixture was refluxed for 1 h, cooled, and poured onto ice, and the precipitate was filtered off, washed with water, dried, and recrystallized from ethanol.

b. Compounds **3b**, **3c**, and **3e**–**3g**. A mixture of 10 mmol of compound **2a**–**2c** and 100 mmol of the corresponding amine was refluxed for 4 h. The mixture was cooled and diluted with 100 mL of water, and the precipitate was treated as described above in *a*.

c. Compounds **3a**, **3d**, and **3h**. A mixture of 10 mmol of compound **2a**–**2c** and 50 mL of 20% ethanolic ammonia was heated for 18 h at 180°C in a steel bomb. The mixture was cooled, the solvent was distilled off, the residue was treated with water, and the precipitate was treated as described above in *a*.

6-Amino-3,3,8-trimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridine-5-carbonitrile (3a). Yield 79 (*a*), 71% (*c*); mp 220–221°C. IR spectrum, ν, cm^{-1}: 3471, 3289 (NH$_2$), 2214 (C≡N). ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 1.25 s (6H, 3-Me), 2.20 s (3H, 8-CH$_3$), 2.62 s (2H, CH$_2$), 4.49 s (2H, OCH$_2$), 6.06 br.s (2H, NH$_2$). ^{13}C NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ_C, ppm: 20.6 (CH$_3$), 25.8 (2C, CH$_3$), 37.5 (CH$_2$), 59.3 (OCH$_2$), 68.9 (C^3), 87.0 (**C**CN), 115.3 (CN), 115.9, 145.9, 156.3, 158.2. Found, %: C 66.05; H 6.79; N 19.55. $C_{12}H_{15}N_3O$. Calculated, %: C 66.34; H 6.96; N 19.34.

6-(Benzylamino)-3,3,8-trimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridine-5-carbonitrile (3b). Yield 84 (*a*), 75% (*b*); mp 178–179°C. IR spectrum, ν, cm^{-1}: 3390 (NH), 2218 (C≡N). ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 1.21 s (6H, 3-CH$_3$), 2.22 s (3H, 8-CH$_3$), 2.64 s (2H, CH$_2$), 4.51 s (2H, OCH$_2$), 4.71 d (2H, NHC**H**$_2$, J = 6.1 Hz), 7.25–7.35 m (5H, Ph), 7.50 t (1H, NH, J = 6.1 Hz). ^{13}C NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ_C, ppm: 20.3 (CH$_3$), 25.7 (2C, CH$_3$), 37.9 (CH$_2$), 59.8 (OCH$_2$), 61.4 (**C**H$_2$Ph), 68.4 (C^3), 87.6 (**C**CN), 115.0 (CN), 115.7, 126.5, 128.2, 128.7, 137.9, 145.7, 156.8, 158.5. Found, %: C 74.49; H 6.74; N 13.49. $C_{19}H_{21}N_3O$. Calculated, %: C 74.24; H 6.89; N 13.67.

6-[(Furan-2-ylmethyl)amino]-3,3,8-trimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridine-5-carbonitrile (3c). Yield 81 (*a*), 78% (*b*); mp 169–171°C. IR spectrum, ν, cm^{-1}: 3363 (NH), 2212 (C≡N). ^{1}H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 1.25 s (6H, 3-CH$_3$), 2.25 s (3H, 8-CH$_3$), 2.63 s (2H, CH$_2$), 4.50 s (2H, OCH$_2$), 4.60 d (2H, NHC**H**$_2$, J = 5.8 Hz), 6.17 d.d (1H, 3′-H, J = 3.3, 0.8 Hz), 6.26 d.d (1H, 4′-H, J = 3.3, 1.8 Hz), 6.77 t (1H, NH, J = 5.8 Hz), 7.34 d.d (1H,

5′-H, J = 1.8, 0.8 Hz). Found, %: C 68.94; H 6.57; N 13.91. $C_{17}H_{19}N_3O_2$. Calculated, %: C 68.67; H 6.44; N 14.13.

6-Amino-8-butyl-3,3-dimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridine-5-carbonitrile (3d). Yield 79 (*a*), 76% (*c*); mp 165–167°C. IR spectrum, ν, cm^{-1}: 3475, 3262 (NH_2), 2210 (C≡N). ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.94 t (3H, CH_3, J = 7.3 Hz), 1.25 s (6H, 3-Me), 1.31–1.44 m (2H, C**H**$_2$CH$_3$), 1.54–1.65 m (2H, C**H**$_2$C$_2$H$_5$), 2.39–2.45 m (2H, 8-CH_2), 2.62 s (2H, CH_2), 4.53 s (2H, OCH_2), 6.02 br (2H, NH_2). Found, %: C 69.16; H 7.97; N 16.44. $C_{15}H_{21}N_3O$. Calculated, %: C 69.47; H 8.16; N 16.20.

8-Butyl-6-[(furan-2-ylmethyl)amino]-3,3-dimethyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridine-5-carbonitrile (3e). Yield 82 (*a*), 73% (*b*); mp 135–136°C. IR spectrum, ν, cm^{-1}: 3363 (NH), 2216 (C≡N). ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.93 t (3H, CH_3, J = 7.3 Hz), 1.25 s (6H, 3-CH_3), 1.31–1.42 m (2H, C**H**$_2$CH$_3$), 1.58–1.69 m (2H, C**H**$_2$C$_2$H$_5$), 2.45 t (2H, 8-CH_2, J = 7.5 Hz), 2.63 s (2H, CH_2), 4.53 s (2H, OCH_2), 4.59 d (2H, NHC**H**$_2$, J = 5.7 Hz), 6.14 d.d (1H, 3′-H, J = 3.1, 0.8 Hz), 6.25 d.d (1H, 4′-H, J = 3.1, 1.8 Hz), 6.84 t (1H, N**H**CH$_2$, J = 5.7 Hz), 7.33 d.d (1H, 5′-H, J = 1.8, 0.8 Hz). Found, %: C 70.54; H 7.31; N 12.22. $C_{20}H_{25}N_3O_2$. Calculated, %: C 70.77; H 7.42; N 12.38.

8-Butyl-3,3-dimethyl-6-[(tetrahydrofuran-2-ylmethyl)amino]-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridine-5-carbonitrile (3f). Yield 85 (*a*), 80% (*b*); mp 98–100°C. IR spectrum, ν, cm^{-1}: 3357 (NH), 2211 (C≡N). ^1H NMR spectrum ($CDCl_3$), δ, ppm: 0.95 t (3H, CH_3, J = 7.3 Hz), 1.29 s (6H, 3-CH_3), 1.32–1.45 m (2H, C**H**$_2$CH$_3$), 1.58–1.65 m (1H) and 1.87–2.06 m (3H) (3′-H, 4′-H), 1.61–1.72 m (2H, C**H**$_2$C$_2$H$_5$), 2.45–2.51 m (2H, 8-CH_2), 2.71 s (2H, CH_2), 3.54 d.d.d (1H, NHC**H**$_2$, J = 13.6, 6.6, 5.4 Hz), 3.74 d.d.d (1H, NHC**H**$_2$, J = 13.6, 6.0, 4.0 Hz), 3.76–3.82 m and 3.88–3.96 m (1H each, 5′-H), 4.07–4.15 m (1H, 2′-H), 4.63 s (2H, OCH_2), 5.30 br (1H, NH). Found, %: C 70.22; H 8.35; N 12.44. $C_{20}H_{29}N_3O_2$. Calculated, %: C 69.94; H 8.51; N 12.23.

8-Butyl-3,3-dimethyl-6-[(2-phenylethyl)amino]-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridine-5-carbonitrile (3g). Yield 80 (*a*), 77% (*b*); mp 121–123°C. IR spectrum, ν, cm^{-1}: 3359 (NH), 2213 (C≡N). ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 0.97 t (3H, CH_3, J = 7.3 Hz), 1.26 s (6H, 3-CH_3), 1.35–1.48 m (2H, C**H**$_2$CH$_3$), 1.66–1.77 m (2H, C**H**$_2$C$_2$H$_5$), 2.49 t (2H, 8-CH_2, J = 7.4 Hz), 2.62 s (2H, CH_2), 2.83–2.92 m (2H, C**H**$_2$Ph), 3.57–3.65 m (2H, NHC**H**$_2$), 4.54 s (2H, OCH_2), 6.45 t (1H, NH, J = 5.8 Hz), 7.10–7.27 m (5H, Ph). Found, %: C 75.67; H 8.22; N 11.31. $C_{23}H_{29}N_3O$. Calculated, %: C 76.00; H 8.04; N 11.56.

6-Amino-3,3-dimethyl-8-phenyl-3,4-dihydro-1*H*-pyrano[3,4-*c*]pyridine-5-carbonitrile (3h). Yield 78 (*a*), 72% (*c*); mp 194–195°C. IR spectrum, ν, cm^{-1}: 3480, 3284 (NH_2), 2208 (C≡N). ^1H NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ, ppm: 1.30 s (6H, 3-CH_3), 2.73 s (2H, CH_2), 4.47 s (2H, OCH_2), 6.31 br (2H, NH_2), 7.37–7.45 m (5H, Ph). ^{13}C NMR spectrum (DMSO-d_6–CCl_4, 1:3), δ_C, ppm: 26.2 (2C, CH_3), 38.0 (CH_2), 59.7 (OCH_2), 69.1 (C^3), 88.5 (C^5), 115.2 (CN), 115.9, 127.5, 127.8, 128.1, 138.3, 147.9, 157.4, 158.3. Found, %: C 73.36; H 6.27; N 14.85. $C_{17}H_{17}N_3O$. Calculated, %: C 73.10; H 6.13; N 15.04.

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