*Russian Journal of Organic Chemistry, Vol. 39, No. 5, 2003, pp. 753–754. Translated from Zhurnal Organicheskoi Khimii, Vol. 39, No. 5, 2003, pp. 797–798.*


## SHORT COMMUNICATIONS

# Synthesis of Methyl 6-Acyl-7-aryl-4,7-dihydrotetrazolo-[1,5-*a*]pyrimidine-5-carboxylates

**V. L. Gein[1], L. F. Gein[2], E. P. Tsyplyakova[1], and E. A. Rozova[1]**

[1] *Perm State Pharmaceutical Academy, pr. Lenina 48, Perm, 614070 Russia*
*e-mail: pfa@degacom.ru*

[2] *Perm State Medical Academy, Perm, Russia*

Received July 31, 2002

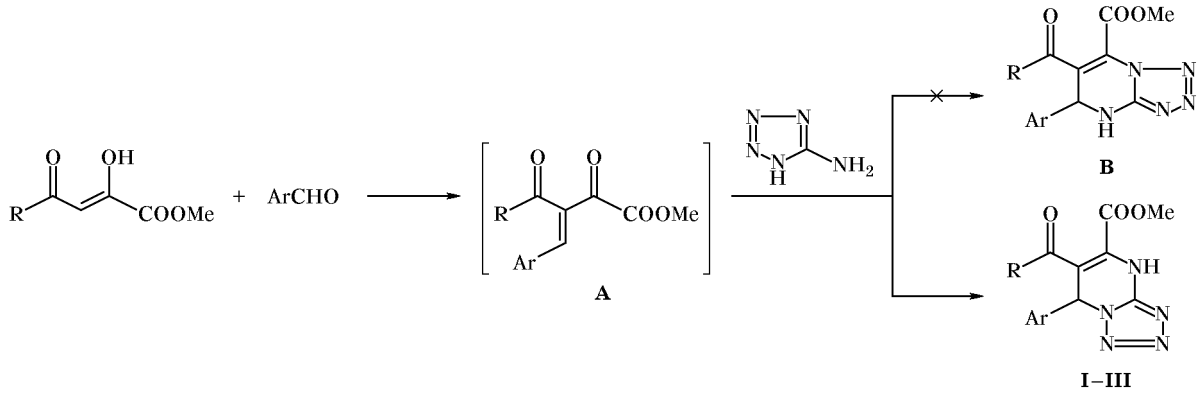
We have found that fusion of methyl acylpyruvates with 5-aminotetrazole and aromatic aldehydes at 120–150°C gives methyl 6-acyl-7-aryl-4,7-dihydrotetrazolo[1,5-*a*]pyrimidine-5-carboxylates **I**–**III**. Compounds **I**–**III** are colorless crystalline substances readily soluble in DMSO and DMF, soluble in hot alcohol, acetic acid, and dioxane, and insoluble in water. Their $^1$H NMR spectra contain a singlet from the methoxy protons at δ 3.30–3.85 ppm, a singlet from the 7-H proton at δ 6.85–7.40 ppm, a group of signals centered at δ 7.45–7.65 ppm from aromatic protons, and a singlet from the NH proton (4-H) at δ 11.65–12.15 ppm. Compound **I** also displays a singlet at δ 2.00 ppm from three protons of the acetyl moiety.

In the IR spectra of **I**–**III** we observed absorption bands at 1728–1734 cm$^{-1}$ from the ester carbonyl group, at 1641–1644 cm$^{-1}$ from the ketone carbonyl, and at 3120–3142 cm$^{-1}$ from the N–H bond. Compounds **I**–**III** show in the mass spectra the corresponding molecular ion peaks and fragment ion peaks, which are fully consistent with the assumed structures.

Presumably, in the first reaction stage unsaturated compound **A** is formed. Its reaction with 5-aminotetrazole leads to products **I**–**III** (Scheme 1). No isomeric structure **B** is formed because of the lower thermodynamic stability of 1,2-dihydro derivatives relative to 1,4-dihydro compounds **I**–**III**. In the $^1$H NMR spectra of the products we observed no coupling between protons in positions *4*, *5*, typical of the *AB* system in structure **B**.

**Methyl 6-acetyl-7-(4-*tert*-butylphenyl)-4,7-dihydrotetrazolo[1,5-*a*]pyrimidine-5-carboxylate (I).** A mixture of 0.01 mol of methyl acetylpyruvate, 0.01 mol of 4-*tert*-butylbenzaldehyde, and 0.01 mol of 5-aminotetrazole was heated on a metal bath at 120–150°C until gaseous products no longer evolved. The melt was cooled and treated with ethanol, and the precipitate was filtered off and recrystallized from ethanol. Yield 1.27 g (35%), mp 228–230°C. IR

**Scheme 1.**




**I**, R = Me; **II**, **III**, R = Ph; **I**, Ar = 4-*t*-Bu$C_6H_4$; **II**, Ar = 4-Br$C_6H_4$; **III**, Ar = 2-$NO_2C_6H_4$.

1070-4280/03/3905-0753 $25.00 © 2003 MAIK "Nauka / Interperiodica"

spectrum, ν, $cm^{-1}$: 3142 (NH), 1734 (C=O, ester), 1642 (C=O, ketone). $^1H$ NMR spectrum, δ, ppm: 12.15 s (1H, NH), 7.35 d and 7.45 d (4H, $H_{arom}$), 7.1 s (1H, 7-H), 3.85 s (3H, OMe), 2.00 s (3H, $CH_3$), 1.25 s (9H, *t*-Bu). Mass spectrum: *m*/*z* 355 $M^+$ 355 ($I_{rel}$ = 19.5%). Found, %: C 60.83; H 5.95; N 19.70. $C_{18}H_{21}N_5O_3$. Calculated, %: C 60.96; H 5.78; N 19.51.

**Methyl 6-benzoyl-7-(4-bromophenyl)-5,8-dihydrotetrazolo[1,5-*a*]pyrimidine-5-carboxylate (II)** was synthesized in a similar way. Yield 2.0 g (45%), mp 218–221°C (from EtOH). IR spectrum, ν, $cm^{-1}$: 3120 (NH), 1728 (C=O, ester), 1644 (C=O, ketone). $^1H$ NMR spectrum, δ, ppm: 11.65 s (1H, NH), 7.45 m (9H, $H_{arom}$), 6.85 s (1H, 7-H), 3.30 s (3H, OMe). Mass spectrum: *m*/*z* 440 $M^+$ ($I_{rel}$ = 17.0%). Found, %: C 51.83; H 3.20; Br 18.23; N 15.90. $C_{19}H_{14}BrN_5O_3$. Calculated, %: C 51.68; H 3.18; Br 18.23; N 15.99.

**Methyl 6-benzoyl-7-(4-nitrophenyl)-4,7-dihydrotetrazolo[1,5-*a*]pyrimidine-5-carboxylate (III)** was synthesized in a similar way. Yield 1.0 g (25%), mp 233–234°C (from EtOH). IR spectrum, ν, $cm^{-1}$: 3142 (NH), 1734 (C=O, ester), 1641 (C=O, ketone). $^1H$ NMR spectrum, δ, ppm: 11.65 s (1H, NH), 7.65 m (9H, $H_{arom}$), 7.39 s (1H, 7-H), 3.30 s (3H, OMe). Mass spectrum, *m*/*z* 406 $M^+$ ($I_{rel}$ = 2.43%). Found, %: C 56.15; H 3.46; N 20.68. $C_{19}H_{14}N_6O_5$. Calculated, %: C 56.22; H 3.51; N 20.60.

The IR spectra were recorded on a UR-20 spectrometer from samples dispersed in mineral oil. The $^1H$ NMR spectra were obtained on a Bruker DRX 500 instrument (500.13 MHz) in DMSO-$d_6$. The mass spectra (electron impact, 70 eV) were recorded on an MKh-1320 mass spectrmeter.

This study was financially supported by the Russian Foundation for Basic Research (project no. 02-03-96415).