5-CINNAMOYL- AND 5-(ETHOXYCARBONYL)-6-STYRYL DERIVATIVES OF 4-ARYL-3,4-DIHYDROPYRIMIDIN-2(1*H*)-ONES

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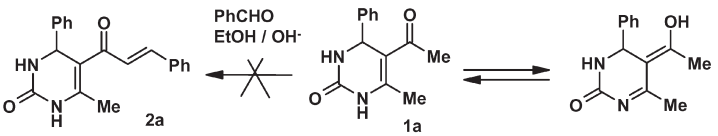
Several 5-cinnamoyl- and 5-(ethoxycarbonyl)-6-styryl derivatives of 4-aryl-3,4-dihydropyrimidin-2(1*H*)-ones were obtained and their physicochemical properties were investigated. The introduction of alkyl substituent in position 1 of dihydropyrimidine ring was shown to promote the Claisen–Schmidt reaction on acetyl group only; without the alkyl both acetyl and 6-methyl groups participate in the reaction.

Keywords: 5-Acetyl-4-aryl-3,4-dihydropyrimidin-2(1*H*)-ones; Pyrimidines; Benzaldehydes; Chalcones; Claisen–Schmidt reactions; Cinnamoyl derivatives.

4-Aryl-3,4-dihydropyrimidin-2(1*H*)-ones, the products of the Biginelli reaction, still remain of great interest at present[1]. At the same time, their 5-acetyl and 5-cinnamoyl derivatives **1** and **2**, which might be suitable synthones for partially hydrogenated heterocycles, received insufficient attention. For example, synthesis of compound **2a** was described by Zigeuner with co-workers[2], but neither detailed procedure nor characteristics for the substance obtained were reported.

We tried to obtain compound **2a** under standard conditions of the Claisen–Schmidt reaction; however, the starting dihydropyrimidine **1a**[3] remained unreacted. A possible explanation is the low activity of the methyl group in the acetyl substituent due to the potential tautomerism of compounds like **1** (Scheme 1).



SCHEME 1

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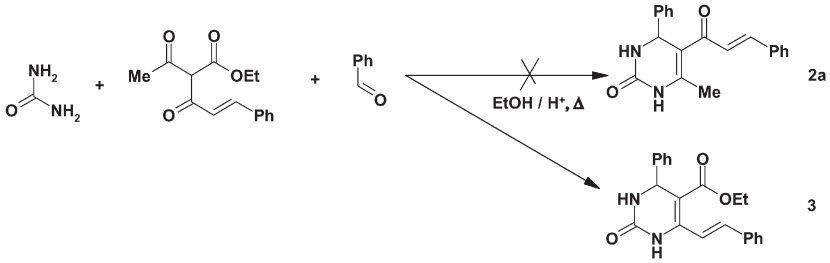
We also studied the reaction of cinnamoylacetoacetic ester with urea and benzaldehyde in ethanol in the presence of catalytic amounts of HCl as an alternative way to compound **2a** (Scheme 2).



SCHEME 2

However, the desired compound **2a** was not formed either. Instead, compound **3** was isolated in 30% yield. Its structure was proved by ^{1}H NMR spectrum: there are two signals of NH protons (9.24 and 7.87 ppm), the signals of vinyl and aromatic protons (7.93–7.18 ppm), the doublet of C(4)H-proton (5.25 ppm, ^3J = 3.4 Hz) and the signals of ethoxy group protons. Obviously, the rate decomposition of starting cinnamoylacetic ester is faster than that of ketone. Earlier Kappe and Falsone[4] obtained compound **3** starting from 5-(ethoxycarbonyl)-6-methyl-4-phenyl-3,4-dihydropyrimidin-2-one and benzaldehyde in the presence of TsOH.

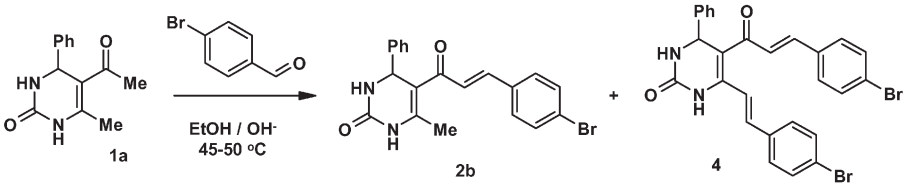
Since we have failed to obtain 5-cinnamoyl derivatives of 4-aryl-3,4-dihydropyrimidin-2(1*H*)-ones under classical protocol of the Claisen–Schmidt condensation, an attempt was made to carry out this reaction under more hard conditions using compound **1a** and 4-bromobenzaldehyde as starting reagents.

The superbasic medium (DMSO/CsOH)[5] provided too severe conditions even at room temperature: conversion of starting dihydropyrimidine **1a** reached 85% within 24 h and resulted in a complex mixture (at least 6 compounds were detected by HPLC).

Under milder conditions (heating the reactants with KOH in ethanol at 45–50 °C for 24 h) only two compounds of the above mixture were formed. We have succeeded in isolation of both new substances (**2b** and **4**) from the reaction mixture by fractional crystallisation from ethanol and benzene, respectively; however, with low yields (Scheme 3).

Structures of both new compounds, **2b** and **4**, were proved by ^{1}H NMR and LC-MS methods (see Experimental). It should be noted that the regioselectivity interaction of methyl groups in compound **1c**, resulting in the formation of **2b**, was revealed by NOE experiment: the suppression of

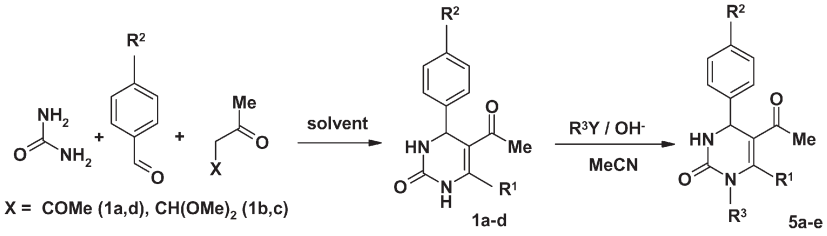
the only methyl group signal of compound **2b** led to increase in the intensity of the N(1)H-proton signal.



SCHEME 3

The absence of isomeric monobenzylidene derivative of **1a** on the 6-Me group in the reaction mixture brings on unambiguous evidence that the first step is the introduction of the benzylidene fragment on the acetyl group.

According to our hypothesis about the reduced activity of Me in acetyl group of compounds of the type **1** in the crotonic condensation, it might be enhanced in N^1-alkylated analogues of **1** (compounds **5**), where tautomerism is prevented. The required starting compounds (**1a**–**1d**) were obtained as described previously[6] by condensation of urea with aromatic aldehydes and acetoacetic aldehyde dimethylacetal (or acetylacetone) (see Experimental). Compounds **5** were synthesized by the treatment of **1** with iodomethane or bromoethane in heterogeneous system (concentrated aqueous KOH solution–MeCN)[6] (Scheme 4).



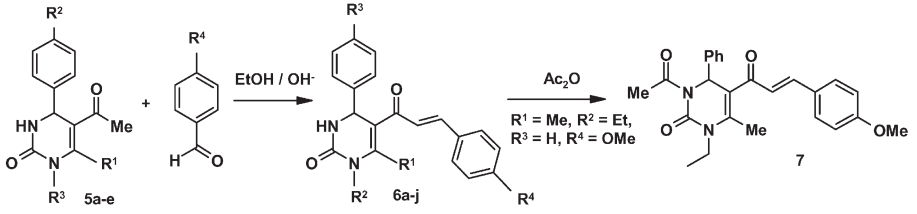
Solvent:
HOAc (for compounds a, b),
DMF (c),
EtOH / H+ (d)

1	R^1	R^2
a	Me	H
b	H	OMe
c	H	H
d	Me	OMe

5	R^1	R^2	R^3Y
a	H	H	EtBr
b	H	OMe	EtBr
c	Me	H	MeI
d	Me	H	EtBr
e	Me	OMe	EtBr

SCHEME 4

As it was expected, compounds **5a**–**5e**, in contrast to their N^1-unsubstituted analogues **1**, reacted readily with aromatic aldehydes in ethanol in the presence of KOH, forming corresponding cinnamoyl derivatives **6a**–**6j** (Scheme 5).



6	a	b	c	d	e	f	g	h	i	j
R^1	H	H	H	Me	Me	Me	Me	Me	Me	Me
R^2	Et	Et	Et	Me	Et	Et	Et	Et	Et	Et
R^3	H	H	OMe	H	H	H	H	H	OMe	OMe
R^4	OMe	Br	OMe	OMe	H	OMe	NMe_2	Br	H	OMe

SCHEME 5

The structure of compounds obtained was proved by ^{1}H NMR spectroscopy. Thus, in contrast to spectra of compounds **5a**–**5e**, the signal of acetyl protons disappeared in the case of compounds **6a**–**6j**, but two doublets of vinyl protons near 6.86–7.36 ppm (α-H) and 7.52–7.15 ppm (β-H) appeared. The coupling constants for these products (15.6–16.0 Hz) confirm *trans*-configuration of the cinnamoyl group. The structure of compound **6f** was also supported by X-ray analysis (Fig. 1).

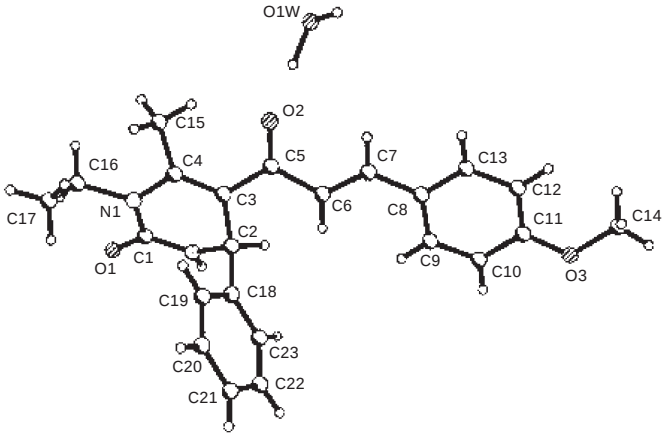


FIG. 1
Structure of compound **6f**

The tetrahydropyrimidine ring adopts somewhat asymmetric boat conformation (the puckering parameters are $S = 0.48$, $\Theta = 65.3°$, $\Psi = 9.7°$)[7]. The deviations of N(1) and C(2) atoms from the plane of remaining atoms of the ring are 0.17 and 0.40 Å, respectively.

The phenyl group at the C(2) atom has a pseudoaxial orientation (C(18)–C(2)–C(3)–C(4) torsion angle is –93.3(5)°) and is rotated relative to the C(3)–C(2) bond (C(3)–C(2)–C(18)–C(19) torsion angle is 28.5(6)°). This orientation of the phenyl group leads to the appearance of the shortened intramolecular contacts H(19)···C(3) 2.66 Å and H(19)···C(4) 2.82 Å (the sum of the corresponding van der Waals radii is 2.87 Å)[8].

The C(5)=O(2) carbonyl group of the substituent at the C(3) atom is coplanar with respect to the C(3)=C(4) endocyclic double bond (C(4)–C(3)–C(5)–O(2) torsion angle is –3.9(7)°) in spite of steric strain in this fragment (shortened intramolecular contacts H(2)···C(6) 2.47 (2.87) Å, H(2)···H(6) 1.92 (2.34) Å, H(6)···C(2) 2.47 (2.87) Å). One can assume that this orientation of the carbonyl group is stabilized by the intramolecular hydrogen bond C(15)–H(15c)···O(2) (H···O 1.98 Å, C–H···O 136°). The C(6)=C(7) double bond has a *s-cis*-conformation relative to the carbonyl group (O(2)–C(5)–C(6)–C(7) torsion angle is –1.6(7)°) and the benzene ring has antiperiplanar orientation relative to the C(5)–C(6) bond (C(5)–C(6)–C(7)–C(8) torsion angle is –179.4(4)°). The repulsion between the C(6), H(6) and C(9), H(9) atoms (the shortened contacts H(6)···C(9) 2.78 (2.87) Å, H(6)···H(9) 2.27 (2.34) Å, H(9)···C(6) 2.79 (2.87) Å) leads to an increase in the C(6)–C(7)–C(8) bond angle to 127.9(5)° and a slight benzene ring rotation relative to the C(6)–C(7) bond (C(6)–C(7)–C(8)–C(9) torsion angle is 9.5(7)°). The methoxy group lies in the plane of the benzene ring (C(14)–O(3)–C(11)–C(12) torsion angle is 0.1(7)°) in spite of the shortened intramolecular contacts (H(12)···C(14) 2.46 (2.87) Å, H(12)···H(14b) 2.22 (2.34) Å, H(12)···H(14c) 2.28 (2.34) Å, H(14b)···C(12) 2.68 (2.87) Å, H(14c)···C(12) 2.72 (2.87) Å).

The ethyl substituent at the N(1) atom is situated perpendicularly to the plane of the dihydro ring (C(4)–N(1)–C(16)–C(17) torsion angle is –79.3(7)°), perhaps as a result of repulsion between the ethyl group atoms, the methyl substituent at C(4) and the C(1)=O(1) carbonyl group (the shortened contacts H(15a)···C(16) 2.81 (2.87) Å, H(15a)···C(17) 2.84 (2.87) Å, H(15a)···H(17b) 2.13 (2.34) Å, H(15b)···C(16) 2.74 (2.87) Å, H(15b)···H(16a) 2.14 (2.34) Å, H(16a)···C(15) 2.56 (2.87) Å, H(16b)···O(1) 2.25 (2.46) Å, H(17b)···C(15) 2.82 (2.87) Å).

Molecules of **6f** in the crystal are bonded with each other and with water molecules by intermolecular hydrogen bonds O(1w)–H(1ow)···O(2)′ (*x*, *y*, *z*)

H···O′ 1.56 Å, O–H···O′ 170°; O(1w)–H(2ow)···O(1)′ (*x*, *y* – 1, *z*) H···O′ 1.98 Å, O–H···O′ 155°; N(2)–H(2a)···O(1)′ (–*x*, 1 – *y*, 1 – *z*) H···O′ 2.11 Å, N–H···O′ 177°. The formation of hydrogen bonds leads to an increase in the C(1)–O(1) bond length (1.244(5) Å) as compared with its mean value 1.210 Å [9].

Compound **6f** was shown to be readily acylated with acetic anhydride to give N^3-acetyl derivative **7** (Scheme 5).

^{1}H NMR spectrum of compound **7** does not contain the N^3-H-proton signal, the C(4)-H-proton signal appears as singlet (6.50 ppm, cf. the doublet at 5.34 ppm in compound **6f**) and the singlet of acetyl group (2.24 ppm) is observed.

In conclusion, we have examined the Claisen–Schmidt reaction of 5-acetyl-4-aryl-3,4-dihydropyrimidin-2(1*H*)-ones and a number of their arylidene derivatives, which are promising reagents for further construction of various heterocycles.

EXPERIMENTAL

Starting aromatic aldehydes, urea, alkyl halides, acetic anhydride and dicarbonyl compound derivatives were commercially available. Cinnamoylacetoacetic ester was prepared as described in literature[10]. Column chromatography was performed using Al_2O_3 (60–100 μm) with EtOAc–hexane mixtures as eluents. The purity of compounds, monitoring of the reaction course and fraction selection in preparative column chromatography were performed by TLC (Silufol UV-254 plates using mixture of EtOAc–hexane (1:1) as eluent) or by HPLC analysis on a microcolumn chromatograph Milichrom 5 equipped with the reverse phase Silasorb 600 C18 column (acetonitrile–water mixtures were used as eluents). Melting points were determined using a Kofler apparatus. ^{1}H NMR spectra were recorded in DMSO-d_6 at 200 MHz using a Varian Mercury VX-200 spectrometer with $Si(CH_3)_4$ as internal standard. Chemical shifts are reported in ppm (δ-scale), coupling constants (^3J) in Hz. IR spectra (wavenumbers in cm^{-1}) were measured using a Specord 75IR spectrometer in KBr pellets (for compound **5j** as a thin layer). LC-MS spectra were obtained using an Agillent 1100 instrument.

X-ray diffraction study. Yellow single crystals of **6f** are triclinic. At 293 K a = 9.189(2), b = 10.568(3), c = 11.773(4) Å, α = 65.00(2)°, β = 80.98(2)°, γ = 85.89(2)°, V = 1023.3(5) Å^3, M_r = 394.46, Z = 2, space group $P\bar{1}$, d_{calc} = 1.280 g/cm^3, μ(MoKα) = 0.088 mm^{-1}, F(000) = 420. Intensity of 3646 reflections (3418 independent, R_{int} = 0.066) were measured using automatic four-circle Siemens P3/PC diffractometer (graphite-monochromatized MoKα radiation, θ/2θ scaning, $2\theta_{max}$ = 50°). The structure was solved by direct method using the SHELXTL package[10]. Positions of hydrogen atoms were located from electron density difference maps and refined by the "riding" model with $U_{iso} = nU_{eq}$ of non-hydrogen atom bonded to a given hydrogen atom (n = 1.5 for methyl group and n = 1.2 for other hydrogen atoms). Full-matrix least-squares refinement against F^2 in anisotropic approximation using 3297 reflections converged to R_1 = 0.065 (for 1246 reflections with $F > 4\sigma(F)$), wR_2 = 0.145, S = 0.894. CCDC 638682 contains the supplementary crystallographic data for this paper. These data can be obtained free of charge via www.ccdc.cam.ac.uk/conts/retrieving.html (or from

the Cambridge Crystallographic Data Centre, 12, Union Road, Cambridge, CB2 1EZ, UK; fax: +44 1223 336033; or deposit@ccdc.cam.ac.uk).

Compounds **1b**–**1d** and **5a**–**5e** were obtained similarly as described in literature[6]. Spectral data for compounds **1a**, **1c**, **1d** and **5a**, **5c**–**5e** agree well with reported values[6].

5-Acetyl-6-methyl-4-phenyl-3,4-dihydropyrimidin-2(1*H*)-one (**1a**)

A solution of urea (8.94 g, 0.149 mol), benzaldehyde (15.75 g, 0.149 mol) and acetylacetone (14.9 g, 0.149 mol) in DMF (12 ml) was refluxed for 1 h. Ethanol (30 ml) was added and the mixture was refluxed for another 10 min. After cooling, the precipitate was filtered off and washed with ethanol. Compound **1a** (17.5 g, 51%) was obtained. M.p. 242–244 °C. For $C_{13}H_{14}N_2O_2$ (230.3) calculated: 12.17% N; found: 12.01% N.

5-Acetyl-4-(4-methoxyphenyl)-3,4-dihydropyrimidin-2(1*H*)-one (**1b**)

Yield 22%. M.p. 250–252 °C. For $C_{13}H_{14}N_2O_3$ (246.3) calculated: 11.38% N; found: 11.60% N. IR: 1589 (C=C), 1669 (C=O). ^{1}H NMR: 9.33 bd, ^3J = 6.0, 1 H (NH-1); 7.64 bd, ^3J = 3.0, 1 H (NH-3); 7.48 d, ^3J = 6.0, 1 H (H-6); 7.11 d, ^3J = 8.4, 2 H (ArH); 6.83 d, ^3J = 8.4, 2 H (ArH); 5.11 d, ^3J = 3.0, 1 H (H-4); 3.68 s, 3 H (OCH_3); 2.12 s, 3 H ($COCH_3$).

5-[(2*E*)-3-(4-Bromophenyl)prop-2-enoyl]-6-methyl-4-phenyl-3,4-dihydropyrimidin-2(1*H*)-one (**2b**) and
6-[(1*E*)-2-(4-Bromophenyl)eth-1-enyl]-5-[(2*E*)-3-(4-bromophenyl)prop-2-enoyl]-4-phenyl-3,4-dihydropyrimidin-2(1*H*)-one (**4**)

A solution of compound **1a** (2 g, 8.7 mmol), 4-bromobenzaldehyde (1.61 g, 8.7 mmol) and KOH (0.12 g, 2.1 mmol) in ethanol (40 ml) was stirred at 60 °C for 24 h. After cooling, the precipitate was filtered off and, after crystallization from ethanol (40 ml), compound **2b** (0.18 g, 5%) was obtained. The mother liquor was evaporated to dryness and the residue was recrystallized from benzene giving 0.24 g (5%) of compound **4**.

Compound (**2b**). M.p. 224–225 °C. For $C_{20}H_{17}BrN_2O_2$ (397.3) calculated: 7.05% N; found: 6.87% N. IR: 1578 (C=C), 1695 (C=O). LC-MS, *m/z* (rel.%): 397 (90), 399 (100) [M^+]. ^{1}H NMR: 9.25 bs, 1 H (NH-1); 7.80 bd, ^3J = 3.4, 1 H (NH-3); 7.15–7.65 m, 11 H (Ar + vinyl); 5.45 d, ^3J = 3.4, 1 H (H-4); 2.27 s, 3 H (CH_3).

Compound (**4**). M.p. 246–248 °C. For $C_{27}H_{20}Br_2N_2O_2$ (564.3) calculated: 4.96% N; found: 4.80% N. IR: 1578 (C=C), 1615 (C=O), 1709 (C=O). LC-MS, *m/z* (rel.%): 565 (100) [M^+], 566 (50) [M^+], 563 (30), 568 (15). ^{1}H NMR: 9.31 bs, 1 H (NH-1); 8.01 bd, ^3J = 3.2, 1 H (NH-3); 7.15–7.65 m, 17 H (Ar + vinyl); 5.52 d, ^3J = 3.2, 1 H (H-4).

Ethyl 2-Oxo-4-phenyl-6-styryl-1,2,3,4-tetrahydropyrimidine-5-carboxylate (**3**)

A solution of urea (0.23 g, 3.8 mmol), benzaldehyde (0.39 ml, 3.8 mmol), ethyl 2-acetyl-3-oxo-5-phenylpent-4-enoate (1 g, 3.8 mmol) and 3 drops of concentrated HCl in EtOH (2 ml) was refluxed for 1.5 h. After cooling, the precipitate of compound **3** was filtered off, the mother liquor was refluxed for another 2 h and the precipitate formed was filtered off. Total yield 0.40 g (30%) of compound **3**. M.p. 253–255 °C. For $C_{21}H_{20}N_2O_3$ (348.4) calculated: 8.04% N; found: 7.85% N. IR: 1602 (C=C), 1702 (C=O). ^{1}H NMR: 9.24 bs, 1 H (NH-1); 7.93 d,

^3J = 16.8, 1 H (vinyl); 7.87 bd, ^3J = 3.4, 1 H (NH-3); 7.18–7.58 m, 11 H (Ar + vinyl); 5.25 d, ^3J = 3.4, 1 H (H-4); 4.06 q, ^3J = 7.0, 2 H (CH_2); 1.14 t, ^3J = 7.0, 3 H ($C\mathbf{H}_3CH_2$).

5-Acetyl-1-ethyl-4-(4-methoxyphenyl)-3,4-dihydropyrimidin-2(1*H*)-one (**5b**)

Yield 80%. M.p. 123–124 °C. For $C_{15}H_{18}N_2O_3$ (274.3) calculated: 10.21% N; found: 9.97% N. IR: 1642 (C=C), 1684 (C=O). ^{1}H NMR: 7.76 s, 1 H (H-6); 7.73 bd, ^3J = 3.2, 1 H (NH-3); 7.11 d, ^3J = 8.4, 2 H (Ar); 6.84 d, ^3J = 8.4, 2 H (Ar); 5.13 d, ^3J = 3.2, 1 H (H-4); 3.4–3.7 m, 2 H (CH_2); 3.70 s, 3 H (OCH_3); 2.16 s, 3 H ($COCH_3$); 1.15 t, ^3J = 7.2, 3 H ($CH_2C\mathbf{H}_3$).

Compounds **6a**–**6j**. General Procedure

A solution of **5d** (2.5 g, 9.7 mmol), 4-methoxybenzaldehyde (1.53 ml, 12.6 mmol) and potassium hydroxide (25% aqueous solution, 1.5 ml) in EtOH (11 ml) was stirred at ambient temperature for 3.5 h. The precipitate was filtered off and washed 3 times with EtOH (5 ml). Compound **6f** (2.29 g, 63%) was obtained. Compounds **6a**–**6e** and **6g**–**6j** were synthesized similarly.

1-Ethyl-5-[(2E)-3-(4-methoxyphenyl)prop-2-enoyl]-4-phenyl-3,4-dihydropyrimidin-2(1H)-one (**6a**). Yield 24%. M.p. 218–220 °C. For $C_{22}H_{22}N_2O_3$ (362.4) calculated: 7.73% N; found: 7.93% N. IR: 1569 (C=C), 1689 (C=O). ^{1}H NMR: 8.18 s, 1 H (H-6); 7.88 bd, ^3J = 2.8, 1 H (NH-3); 7.69 d, ^3J = 9.0, 2 H (Ar); 7.52 d, ^3J = 16.0, 1 H (β-vinyl); 7.36 d, ^3J = 16.0, 1 H (α-vinyl); 7.13–7.36 m, 5 H (Ph); 6.96 d, ^3J = 9.0, 2 H (Ar); 5.34 d, ^3J = 2.8, 1 H (H-4); 3.78 s, 3 H (OCH_3); 3.5–3.9 m, 2 H (NCH_2); 1.20 t, ^3J = 7.0, 3 H ($C\mathbf{H}_3CH_2$).

1-Ethyl-5-[(2E)-3-(4-bromophenyl)prop-2-enoyl]-4-phenyl-3,4-dihydropyrimidin-2(1H)-one (**6b**). Yield 87%. M.p. 193–195 °C. For $C_{21}H_{19}BrN_2O_2$ (411.3) calculated: 6.81% N; found: 7.02% N. IR: 1582 (C=C), 1635 (C=O), 1682 (C=O). ^{1}H NMR: 8.23 s, 1 H (H-6); 7.91 bd, ^3J = 3, 1 H (NH-3); 7.1–7.8 m, 11 H (Ar + vinyl); 5.34 d, ^3J = 3.0, 1 H (H-4); 3.4–3.8 m, 2 H (NCH_2); 1.20 t, ^3J = 7.0, 3 H ($C\mathbf{H}_3CH_2$).

1-Ethyl-4-(4-methoxyphenyl)-5-[(2E)-3-(4-methoxyphenyl)prop-2-enoyl]-3,4-dihydropyrimidin-2(1H)-one (**6c**). Yield 85%. M.p. 117–118 °C. For $C_{23}H_{24}N_2O_4$ (392.5) calculated: 7.14% N; found: 7.30% N. IR: 1569 (C=C), 1602 (C=C), 1635 (C=O), 1682 (C=O). ^{1}H NMR: 8.15 s, 1 H (H-6); 7.81 bd, ^3J = 3.0, 1 H (NH-3); 7.70 d, ^3J = 8.4, 2 H (Ar); 7.52 d, ^3J = 15.6, 1 H (β-vinyl); 7.36 d, ^3J = 15.6, 1 H (α-vinyl); 7.16 d, ^3J = 8.4, 2 H (Ar); 6.96 d, ^3J = 8.4, 2 H (Ar); 6.85 d, ^3J = 8.4, 2 H (Ar); 5.29 d, ^3J = 3.0, 1 H (H-4); 3.4–3.8 m, 2 H (NCH_2); 3.78 s, 3 H (OCH_3); 3.69 s, 3 H (OCH_3); 1.20 t, ^3J = 7.0, 3 H ($C\mathbf{H}_3CH_2$).

1,6-Dimethyl-5-[(2E)-3-(4-methoxyphenyl)prop-2-enoyl]-4-phenyl-3,4-dihydropyrimidin-2(1H)-one (**6d**). Yield 24%. M.p. 183–185 °C. For $C_{22}H_{22}N_2O_3$ (362.4) calculated: 7.73% N; found: 7.99% N. IR: 1611 (C=C), 1694 (C=O). ^{1}H NMR: 7.98 bd, ^3J = 3.4, 1 H (NH-3); 7.60 d, ^3J = 9.0, 2 H (Ar); 7.35 d, ^3J = 16.0, 1 H (β-vinyl); 7.15–7.35 m, 5 H (Ph); 7.03 d, ^3J = 16.0, 1 H (α-vinyl); 6.93 d, ^3J = 9.0, 2 H (Ar); 5.35 d, ^3J = 3.4, 1 H (H-4); 3.76 s, 3 H (OCH_3); 3.1 s, 3 H (NCH_3); 2.34 s, 3 H (CH_3-6).

5-Cinnamoyl-1-ethyl-6-methyl-4-phenyl-3,4-dihydropyrimidin-2(1H)-one (**6e**). Yield 43%. M.p. 139–141 °C. For $C_{22}H_{22}N_2O_2$ (346.4) calculated: 8.09% N; found: 8.14% N. IR: 1575 (C=C), 1689 (C=O). ^{1}H NMR: 7.96 bd, ^3J = 3.4, 1 H (NH-3); 7.60–7.70 m, 2 H (Ar); 7.15–7.45 m, 10 H (vinyl + Ar); 5.33 d, ^3J = 3.4, 1 H (H-4); 3.7–3.9 m, 1 H (NCH_2); 3.5–3.7 m, 1 H (NCH_2); 2.38 s, 3 H (CH_3-6); 1.08 t, ^3J = 7.0, 3 H ($C\mathbf{H}_3CH_2$).

1-Ethyl-5-[(2E)-3-(4-methoxyphenyl)prop-2-enoyl]-6-methyl-4-phenyl-3,4-dihydropyrimidin-2(1H)-one (**6f**). Yield 63%. M.p. 150–152 °C. For $C_{23}H_{24}N_2O_3$ (376.5) calculated: 7.44% N; found: 7.62% N. IR: 1597 (C=C), 1678 (C=O). MS (EI), *m/z* (%): 376 (M, 100). ^{1}H NMR: 7.90 bd, ^3J = 3.4, 1 H (NH-3); 7.61 d, ^3J = 9.0, 2 H (Ar); 7.33 d, ^3J = 16.0, 1 H (β-vinyl); 7.13–7.36 m, 5 H (Ph); 7.05 d, ^3J = 16.0, 1 H (α-vinyl); 6.91 d, ^3J = 9.0, 2 H (Ar); 5.31 d, ^3J = 3.4, 1 H (H-4); 3.77 s, 3 H (OCH_3); 3.7–3.9 m, 1 H (NCH_2); 3.5–3.7 m, 1 H (NCH_2); 2.35 s, 3 H (CH_3-6); 1.08 t, ^3J = 7.0, 3 H ($C\mathbf{H}_3CH_2$).

5-{(2E)-3-[4-(N,N-Dimethylamino)phenyl]prop-2-enoyl}-1-ethyl-6-methyl-4-phenyl-3,4-dihydropyrimidin-2(1H)-one (**6g**). Yield 55%. M.p. 210–212 °C. For $C_{24}H_{27}N_3O_2$ (389.5) calculated: 10.79% N; found: 11.01% N. IR: 1590 (C=C), 1695 (C=O). ^{1}H NMR: 7.80 bd, ^3J = 3.4, 1 H (NH-3); 7.46 d, ^3J = 8.0, 2 H (Ar); 7.15–7.37 m, 6 H (Ph + β-vinyl); 6.86 d, ^3J = 16.0, 1 H (α-vinyl); 6.67 d, ^3J = 8.0, 2 H (Ar); 5.27 d, ^3J = 3.4, 1 H (H-4); 3.7–3.9 m, 1 H (NCH_2); 3.45–3.65 m, 1 H (NCH_2); 2.96 s, 6 H ($N(CH_3)_2$); 2.32 s, 3 H (CH_3-6); 1.08 t, ^3J = 7.0, 3 H ($C\mathbf{H}_3CH_2$).

5-[(2E)-3-(4-Bromophenyl)prop-2-enoyl]-1-ethyl-6-methyl-4-phenyl-3,4-dihydropyrimidin-2(1H)-one (**6h**). Yield 45%. M.p. 158–160 °C. For $C_{22}H_{21}BrN_2O_2$ (425.3) calculated: 6.59% N; found: 6.80% N. IR: 1562 (C=C), 1582 (C=C), 1635 (C=O), 1689 (C=O). ^{1}H NMR: 7.91 bd, ^3J = 3.4, 1 H (NH-3); 7.54–7.66 m, 4 H (Ar + vinyl); 7.15–7.4 m, 7 H (Ar + vinyl); 5.34 d, ^3J = 3.4, 1 H (H-4); 3.5–4.0 m, 2 H (NCH_2); 2.37 s, 3 H (CH_3-6); 1.07 t, ^3J = 7.0, 3 H ($C\mathbf{H}_3CH_2$).

5-Cinnamoyl-1-ethyl-6-methyl-4-(4-methoxyphenyl)-3,4-dihydropyrimidin-2(1H)-one (**6i**). Yield 90%. M.p. 121–122 °C. For $C_{23}H_{24}N_2O_3$ (376.5) calculated: 7.44% N; found: 7.56% N. IR: 1562 (C=C), 1602 (C=C), 1642 (C=O), 1715 (C=O). ^{1}H NMR: 7.87 bd, ^3J = 3.4, 1 H (NH-3); 7.60–7.70 m, 2 H (Ar); 7.1–7.45 m, 7 H (vinyl + Ar); 6.85 d, ^3J = 8.4, 2 H (Ar); 5.29 d, ^3J = 3.4, 1 H (H-4); 3.4–3.9 m, 2 H (NCH_2); 3.67 s, 3 H (OCH_3); 2.37 s, 3 H (CH_3-6); 1.09 t, ^3J = 7.0, 3 H ($C\mathbf{H}_3CH_2$).

1-Ethyl-5-[(2E)-3-(4-methoxyphenyl)prop-2-enoyl]-4-(4-methoxyphenyl)-6-methyl-3,4-dihydropyrimidin-2(1H)-one (**6j**). Yield 19%. Oil, purified by column chromatography (150 g of Al_2O_3 (60–100 μm), eluted with octane–ethyl acetate 2:1, 500 ml; 1:2, 500 ml; EtOAc, 500 ml). IR: 1569 (C=C), 1689 (C=O). ^{1}H NMR: 7.82 bd, ^3J = 3.4, 1 H (NH-3); 7.60 d, ^3J = 9.0, 2 H (Ar); 7.34 d, ^3J = 16.0, 1 H (β-vinyl); 7.15 d, ^3J = 8.0, 2 H (Ar); 7.02 d, ^3J = 16.0, 1 H (α-vinyl); 6.93 d, ^3J = 9.0, 2 H (Ar); 6.84 d, ^3J = 9.0, 2 H (Ar); 5.27 d, ^3J = 3.4, 1 H (H-4); 3.77 s, 3 H (OCH_3); 3.68 s, 3 H (OCH_3); 3.7–3.9 m, 1 H (NCH_2); 3.5–3.7 m, 1 H (NCH_2); 2.35 s, 3 H (CH_3-6); 1.08 t, ^3J = 7.0, 3 H ($C\mathbf{H}_3CH_2$).

3-Acetyl-1-ethyl-5-[(2*E*)-3-(4-methoxyphenyl)prop-2-enoyl]-6-methyl-4-phenyl-3,4-dihydropyrimidin-2(1*H*)-one (**7**)

A solution of **6f** (0.4 g, 1.0 mmol) in Ac_2O (3 ml) was refluxed for 3 h. After cooling, water (20 ml) was added and the precipitate formed was crystallized from MeOH to give 0.23 g (52%) of compound **7**. M.p. 125 °C. For $C_{25}H_{26}N_2O_4$ (418.5) calculated: 6.69% N; found: 7.05% N. IR: 1509 (C=C), 1702 (C=O). ^{1}H NMR: 7.65 d, ^3J = 9.0, 2 H (Ar); 7.50 d, ^3J = 16.0, 1 H (β-vinyl); 7.12–7.38 m, 5 H (Ph); 7.07 d, ^3J = 16.0, 1 H (α-vinyl); 6.97 d, ^3J = 9.0, 2 H (Ar); 6.50 s, 1 H (H-4); 3.78 s, 3 H (OCH_3); 3.74–4.04 m, 1 H (NCH_2); 3.38–3.66 m, 1 H (NCH_2); 2.42 s, 3 H ($COCH_3$); 2.37 s, 3 H (CH_3-6); 1.0 t, ^3J = 7.0, 3 H ($C\mathbf{H}_3CH_2$).

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