Isocyanide-Based Five-Component Synthesis of 2-Aryl-2-(2,3,4,5-tetrahydro-2,4-dioxo-1*H*-1,5-benzodiazepin-3-yl)acetamides (= α-Aryl-2,3,4,5-tetrahydro-2,4-dioxo-1*H*-1,5-benzodiazepine-3-acetamides)

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An efficient and simple method for the synthesis of new 2-aryl-2-(2,3,4,5-tetrahydro-2,4-dioxo-1*H*-1,5-benzodiazepin-3-yl)acetamides (= α-aryl-2,3,4,5-tetrahydro-2,4-dioxo-1*H*-1,5-benzodiazepine-3-acetamides) by a five-component condensation reaction of benzene-1,2-diamine (**1**), *Meldrum*'s acid (**2**), aldehydes **3**, isocyanides **4**, and H_2O in CH_2Cl_2 at room temperature is reported (*Table 1* and *Scheme 2*). These products were evaluated *in vitro* for their antibacterial activities (*Table 2*).

Introduction. – Within the past decade, the resurgence of interest in multicomponent reactions (MCRs) has been driven not only by their convergent nature, superior atom economy, and straightforward experimental procedures but also because of their value in pharmaceutical industry for the construction of low-molecular-mass compound libraries through combinatorial design and parallel synthesis [1]. Isocyanide-based multicomponent reactions (IMCRs) are particularly interesting as they are more versatile and diverse than other MCRs [2]. The great potential of isocyanides for the development of multicomponent reactions lies in the diversity of their bond forming processes, functional group tolerance, and the high levels of chemo-, regio-, and stereoselectivity often observed. Moreover, there is virtually no restriction on the nature of the nucleophiles and electrophiles in IMCRs. The MCRs involving isocyanides have emerged as valuable tools for the preparation of structurally diverse chemical libraries of drug-like heterocyclic compounds [3]. In this context, benzodiazepine derivatives show interesting features that make them attractive for the use in IMCRs [4].

Benzodiazepines have attracted considerable interest in recent years. Its derivatives are known to display a wide range of pharmacological activities as anticonvulsant, antianxiety, analgesic, sedative, antidepressive, and hypnotic agents [5] and as anti-inflammatory agents [6]. Some benzodiazepines also find commercial use as dyes for acrylic fibers [7]. More recently, the area of biological interest of 1,5-benzodiazepines has been extended to antibiotics [8], and various diseases such as cancer [9], viral infection (HIV) [10], and cardiovascular disorders [11]. Among the 1,5-benzodiazepines, the 1,5-benzodiazepin-2-ones such as lofendazam [12], telenzepine [13], triflubazam [14], and clobazam [15] (*Fig.*) are clinically used as anxiolytic or antisecretory agents. Furthermore, compound **I** exhibits interleukin-1β converting

enzyme inhibition activity [16] and compound **II** was considered as cholecystokinin-B receptor antagonist [17] (*Fig.*). Two recently published patents indicate that 2,3,4,5-tetrahydro-1*H*-1,5-benzodiazepine derivatives carrying carboxamide substituents are potentially important as therapeutic and prophylactic agents for diabetes, diabetic nephropathy, or glomerulosclerosis [18].

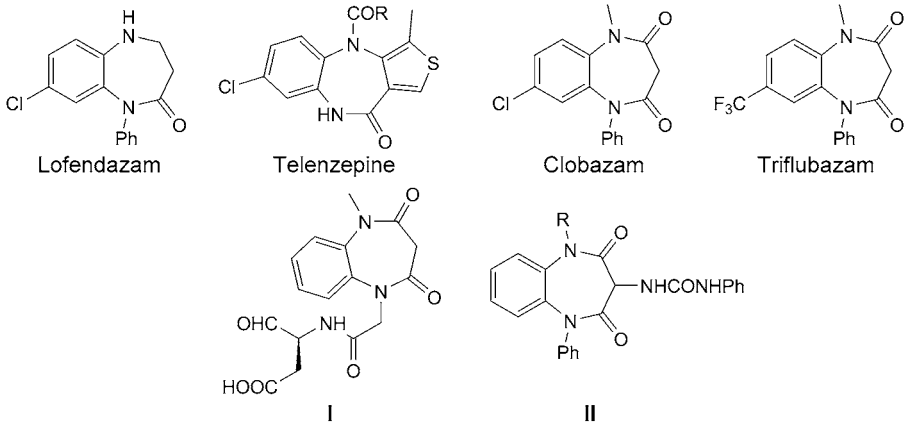


Figure. *Important biologically active 1*H-*1,5-benzodiazepines*

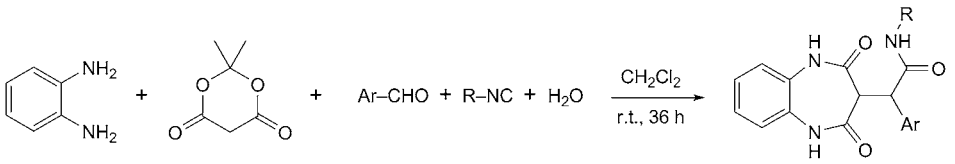
Due to the wide range of pharmacological activity and industrial applications of 1,5-benzodiazepines, research on this class of compounds is still very active and is directed toward the synthesis of compounds with enhanced pharmacological activity. Generally, these compounds are synthesized by the condensation of benzene-1,2-diamines with α,β-unsaturated C=O compounds, β-halo ketones, or ketones [19][20]. However, most of these methods have their pitfalls, including severe reaction conditions as well as side-reactions [20]. Some research has been undertaken on the benzodiazepine 3-carboxamide derivatives. These compounds were synthesized *via* a multistep approach in the presence of expensive catalysts under sensitive conditions [14–16]. Recently, isocyanide-based multicomponent reactions of diamines have been applied to the synthesis of the most important 1,5-benzodiazepines [4e–g]. *Shaabani* and co-workers reported the synthesis of 2,3,4,5-tetrahydro-α-methyl-2,4-dioxo-1*H*-1,5-benzodiazepine-3-propanamides by the three-component reaction of an aromatic diamine, *Meldrum*'s acid (=2,2-dimethyl-1,3-dioxane-4,6-dione), and isocyanide [4g]. Although isocyanide-based multicomponent reactions were applied to the synthesis of various 1,5-benzodiazepines, to the best of our knowledge, no one has yet reported the synthesis of α-aryl-tetrahydro-1*H*-1,5-benzodiazepine-3-acetamides which proceeds *via* the formation of five new bonds (2 N–C + 2 C–C + C–O) in a five-component one-pot reaction.

Due to the biological activity of 2,3,4,5-tetrahydro-1*H*-1,5-benzodiazepines [18] and our interest in the synthesis of heterocyclic compounds [21], we report herein an efficient isocyanide-based five-component method for the preparation of novel 2-aryl-2-(2,3,4,5-tetrahydro-2,4-dioxo-1*H*-1,5-benzodiazepin-3-yl)acetamides (=α-aryl-2,3,4,5-tetrahydro-2,4-dioxo-1*H*-1,5-benzodiazepine-3-acetamides). These compounds

have closely related ring systems to those of triflubazam, clobazam, and other 1,5-benzodiazepines which have a broad spectrum of biological activities.

Results and Discussion. – The one-pot five-component condensation reactions of benzene-1,2-diamine (**1**), *Meldrum*'s acid (**2**), aldehydes **3**, isocyanides **4**, and H_2O proceeded spontaneously at room temperature in CH_2Cl_2 and were complete after 24 h affording the corresponding α-aryl-2,3,4,5-tetrahydro-2,4-dioxo-1*H*-1,5-benzodiazepine-3-acetamides **5** in good yields (*Table 1*). ^{1}H-NMR Spectra of the crude products clearly indicated the formation of **5**. All the products were characterized by IR, mass, and ^{1}H-NMR spectra and by elemental analysis.

Table 1. *Synthesis of α-Aryl-2,3,4,5-tetrahydro-2,4-dioxo-1*H*-1,5-benzodiazepine-3-acetamides* **5**



1 **2** **3** **4** **5**

3	Ar	**4**	R	Product **5**	Yield [%]
3a	Ph	**4a**	cyclohexyl	**5a**	75
3b	4-Cl–C_6H_4	**4a**	cyclohexyl	**5b**	88
3c	2-Cl–C_6H_4	**4a**	cyclohexyl	**5c**	64
3d	4-Me–C_6H_4	**4a**	cyclohexyl	**5d**	70
3e	4-Br–C_6H_4	**4a**	cyclohexyl	**5e**	78
3f	3-Br–C_6H_4	**4a**	cyclohexyl	**5f**	75
3g	3-NO_2–C_6H_4	**4a**	cyclohexyl	**5g**	78
3h	3-MeO–C_6H_4	**4a**	cyclohexyl	**5h**	88
3i	Ph	**4b**	4-Me–C_6H_4–SO_2CH_2	**5i**	55
3i	Ph	**4c**	2,6-$Me_2C_6H_3$	**5j**	65
3b	4-Cl–C_6H_4	**4c**	2,6-$Me_2C_6H_3$	**5k**	69
3h	3-MeO–C_6H_4	**4c**	2,6-$Me_2C_6H_3$	**5l**	63

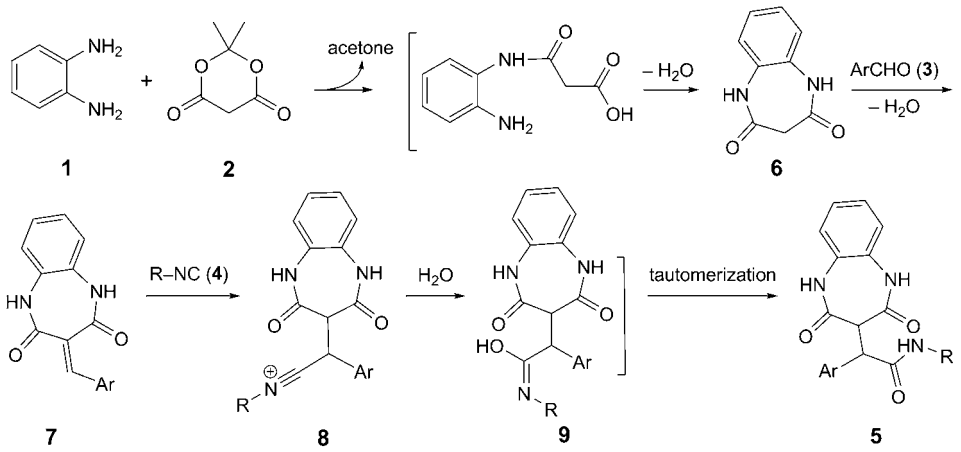
The mass spectrum of **5a** shows the molecular-ion peak at *m*/*z* 391. The IR spectrum of **5a** exhibits absorption bands due to C=O groups at 1700 and 1649 cm^{-1} and two broad absorption bands for the NH groups at 3331 and 3283 cm^{-1}. The ^{1}H-NMR spectrum of **5a** consists of a *m* for the cyclohexane CH_2 groups (δ(H) 0.99–1.74), a NH–C*H* resonance (δ(H) 3.35, overlap with solvent), and two *d* for the two CH groups (δ(H) 3.74 and 4.33, $J = 10.4$), besides three broad resonances (δ(H) 8.03, 10.29, and 10.49) for the NH groups and characteristic signals for the aromatic H-atoms. Due to the very low solubility of **5a**, we were unable to obtain the ^{13}C-NMR spectrum.

The study of the scope and limitations of the described IMCR with respect to the aldehyde component ArCHO (**3**) revealed that substituted aromatic aldehydes containing electron-withdrawing groups and electron-donating groups all tolerate the reaction conditions giving rise to good yields (*Table 1*). When the reaction was carried out with an aliphatic aldehyde such as butanal or propanal, TLC and ^{1}H-NMR spectra

of the reaction mixture showed a combination of starting materials and numerous products and the yield of the expected product was very low.

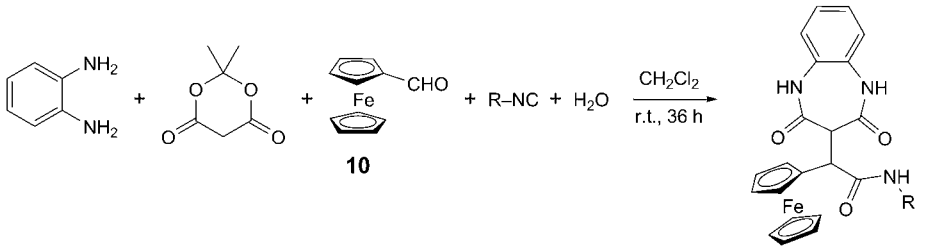
The formation of acetamides **5** can be rationalized by the initial formation of a 1,5-benzodiazepine **6** *via* condensation of **1** and **2**. Then, *Knoevenagel* condensation reaction of **3** and **6** produces intermediate **7**. Intermediate **8** is generated by the *Michael*-type addition reaction of an isocyanide **4** to **7**, and subsequent uptake of H_2O yields **9** which is tautomerized to amide **5** (*Scheme 1*) [4g].

Scheme 1. *Proposed Mechanism of the One-Pot Isocyanide-Based Multicomponent Reaction*



Ferrocene derivatives containing heterocyclic systems have attracted special attention in recent years [22]. Due to the importance of ferrocene-containing heterocyclic compounds, we also used ferrocenecarboxaldehyde (**10**) in the above described reaction. This made it possible to synthesize the new ferrocene-containing benzodiazepines **11** (*Scheme 2*).

Scheme 2. *Synthesis of Ferrocene-Containing Benzodiazepines of Type* **5**



11a R = cyclohexyl (67%)
11b R = 2,6-$Me_2C_6H_3$ (58%)

Finally, some of the synthesized compounds were screened for antimicrobial activity. The microorganisms used in this study were *Bacillus subtilis* ATCC 465 and *Staphylococcus aureus* ATCC 25923 (*Gram*-positive bacteria), *Escherichia coli* ATCC 25922 and *Pseudomonas aeruginusa* ATCC 85327 (*Gram*-negative bacteria), and

Candida albicans ATCC 10231 and *Saccharomyses cervisiae* ATCC 9763 (fungi). The minimum inhibitory concentration (*MIC*) of the synthesized compounds was determined by the microdilution method [23] (*Table 2*). As can be seen from *Table 2*, good to improved antibacterial activity was observed for most of the compounds against all species of *Gram*-positive and *Gram*-negative bacteria and fungi used in the study. Compounds **5i** and **5b** were found to be selectively active against the tested fungi and *Gram*-positive bacteria, respectively.

Table 2. MIC *Values of Some Products* **5** *and* **11a**

	MIC [μg/ml]								
	5a	**5b**	**5c**	**5f**	**5h**	**5i**	**5j**	**5k**	**11a**
Bacillus subtilis	128	64	32	16	16	–	32	8	64
Staphylococcus aureus	128	256	–	–	–	–	64	64	32
Escherichia coli	16	–	128	16	4	–	64	64	256
Pseudomonas aeruginosa	16	–	256	32	16	–	256	16	–
Candida albicans	64	–	128	32	32	16	32	32	128
Saccharomyses cervisiae	32	–	16	16	32	32	128	64	–

In conclusion, we developed an efficient one-pot synthesis of α-aryl-2,3,4,5-tetrahydro-2,4-dioxo-1*H*-1,5-benzodiazepine-3-acetamides starting from simple and readily available precursors under neutral conditions without any need of activation or modifications. The products are of potential synthetic and pharmacological interest. The simplicity of the presented procedure makes it an interesting alternative to the complex multistep approaches for the synthesis of 1,5-benzodiazepines.

We gratefully acknowledge financial support from the *Research Council of Shahid Beheshti University.*

Experimental Part

General. All chemicals were obtained from *Fluka* and *Merck* and used without further purification. M.p.: *Electrothermal-9100* apparatus; uncorrected. IR Spectra (KBr): *Bomem-MB* FT-IR apparatus; in cm^{-1}. ^{1}H-NMR Spectra: *Bruker-DRX-300-Avance* spectrometer; at 300.13 MHz in (D_6)DMSO; δ in ppm rel. to Me_4Si as internal standard, *J* in Hz. ^{13}C-NMR Spectra: no data due to the very low solubility of the products. EI-MS (70 eV): *Finningan-MAT-8430* mass spectrometer; in *m*/*z*. Elemental analyses: *Heraeus-CHN-O-Rapid* analyzer.

Acetamides **5**: *General Procedure* (*Table 1*). A mixture of benzene-1,2-diamine (**1**; 1 mmol), *Meldrum*'s acid (**2**; 1 mmol), aldehyde **3** (1 mmol), cyclohexyl isocyanide **4** (1 mmol), and H_2O (0.5 ml) in CH_2Cl_2 (4 ml) was stirred for 36 h at r.t. After completion of the reaction (TLC (AcOEt/hexane 1:1) monitoring), hexane (3 ml) was added, the mixture filtered, and the precipitate washed with EtOH (5 ml) to afford the pure product.

N-*Cyclohexyl-2,3,4,5-tetrahydro-2,4-dioxo-α-phenyl-1*H-*1,5-benzodiazepine-3-acetamide* (**5a**): Yield 75%. White powder. M.p. >260°. IR: 3331, 3283, 3065 (NH), 1700, 1649, 1606 (C=O). ^{1}H-NMR: 0.99–1.74 (*m*, 5 CH_2 of Chx); 3.35 (br. *s*, CH of Chx, overlap with solvent); 3.74 (*d*, *J* = 10.4, CH); 4.33 (*d*, *J* = 10.4, CH); 7.11–7.39 (*m*, 9 arom. H); 8.03 (br. *s*, N*H*–Chx); 10.29 (*s*, NH); 10.49 (*s*, NH). EI-MS: 391 (M^+). Anal. calc. for $C_{23}H_{25}N_3O_3$ (391.46): C 70.57, H 6.44, N 10.73; found: C 70.48, H 6.38, N 10.65.

α-(4-Chlorophenyl)-N-*cyclohexyl-2,3,4,5-tetrahydro-2,4-dioxo-1*H-*1,5-benzodiazepine-3-acetamide* (**5b**): Yield 88%. White powder. M.p. >260°. IR: 3319, 3216, 3074 (NH), 1699, 1646, 1602(C=O). ^{1}H-NMR: 0.98–1.65 (*m*, 5 CH_2 of Chx); 3.36 (br. *s*, CH of Chx, overlap with solvent); 3.71 (*d*, *J* = 11.3,

CH); 4.35 (*d*, *J* = 11.3, CH); 7.10–7.42 (*m*, 8 arom. H); 8.08 (*d*, *J* = 7.1, N*H*–Chx); 10.34 (*s*, NH); 10.53 (*s*, NH). EI-MS: 425 (M^+). Anal. calc. for $C_{23}H_{24}ClN_3O_3$ (425.91): C 64.86, H 5.68, N 9.87; found: C 64.74, H 5.59, N 9.96.

α-(2-Chlorophenyl)-N-*cyclohexyl-2,3,4,5-tetrahydro-2,4-dioxo-1*H-*1,5-benzodiazepine-3-acetamide* (**5c**): Yield 64%. White powder. M.p. >260°. IR: 3346, 3265, 3080 (NH), 1701, 1651, 1605 (C=O). ^{1}H-NMR: 1.08–1.69 (*m*, 5 CH_2 of Chx); 3.47 (br. *s*, CH of Chx, overlap with solvent); 3.95 (*d*, *J* = 11.2, CH); 4.72 (*d*, *J* = 11.2, CH); 7.14–7.37 (*m*, 8 arom. H); 7.57 (*d*, *J* = 8.1, N*H*–Chx); 10.31 (*s*, NH); 10.62 (*s*, NH). EI-MS: 425 (M^+). Anal. calc. for $C_{23}H_{24}ClN_3O_3$ (425.91): C 64.86, H 5.68, N 9.87; found: C 64.94, H 5.48, N 9.80.

N-*Cyclohexyl-2,3,4,5-tetrahydro-α-(4-methylphenyl)-2,4-dioxo-1*H-*1,5-benzodiazepine-3-acetamide* (**5d**): Yield 70%. White powder. M.p. >260°. IR: 3324, 3214, 3075 (NH), 1699, 1647, 1603 (C=O). ^{1}H-NMR: 0.94–1.65 (*m*, 5 CH_2 of Chx); 2.20 (*s*, Me); 3.36 (br. *s*, CH of Chx, overlap with solvent); 3.69 (*d*, *J* = 11.3, CH); 4.28 (*d*, *J* = 11.2, CH); 6.97–7.27 (*m*, 8 arom. H); 7.99 (*d*, *J* = 7.8, N*H*–Chx); 10.26 (*s*, NH); 10.48 (*s*, NH). EI-MS: 405 (M^+). Anal. calc. for $C_{24}H_{27}N_3O_3$ (405.49): C 71.09, H 6.71, N 10.36; found: C 70.99, H 6.79, N 10.45.

α-(4-Bromophenyl)-N-*cyclohexyl-2,3,4,5-tetrahydro-2,4-dioxo-1*H-*1,5-benzodiazepine-3-acetamide* (**5e**): Yield 78%. White powder. M.p. >270°. IR: 3315, 3214, 3071 (NH), 1699, 1647, 1603 (C=O). ^{1}H-NMR: 0.99–1.66 (*m*, 5 CH_2 of Chx); 3.33 (br. *s*, CH of Chx, overlap with solvent); 3.73 (*d*, *J* = 8.8, CH); 4.35 (*d*, *J* = 8.8, CH); 6.95–7.49 (*m*, 8 arom. H); 8.03 (br. *s*, N*H*–Chx); 10.28 (*s*, NH); 10.47 (*s*, NH). EI-MS: 471 (M^+), 469 (M^+). Anal. calc. for $C_{23}H_{24}BrN_3O_3$ (470.36): C 58.73, H 5.14, N 8.93; found: C 58.81, H 5.21, N 8.82.

α-(3-Bromophenyl)-N-*cyclohexyl-2,3,4,5-tetrahydro-2,4-dioxo-1*H-*1,5-benzodiazepine-3-acetamide* (**5f**): Yield 75%. White powder. M.p. >270°. IR: 3317, 3185, 3069 (NH), 1700, 1648, 1601 (C=O). ^{1}H-NMR: 1.14–1.65 (*m*, 5 CH_2 of Chx); 3.38 (br. *s*, CH of Chx, overlap with solvent); 3.71 (*d*, *J* = 9.6, CH); 4.32 (*d*, *J* = 9.6, CH); 7.20–7.48 (*m*, 8 arom. H); 8.10 (br. *s*, N*H*–Chx); 10.37 (*s*, NH); 10.55 (*s*, NH). EI-MS: 471 (M^+), 469 (M^+). Anal. calc. for $C_{23}H_{24}BrN_3O_3$ (470.36): C 58.73, H 5.14, N 8.93; found: C 58.60, H 5.07, N 8.81.

N-*Cyclohexyl-2,3,4,5-tetrahydro-α-(3-nitrophenyl)-2,4-dioxo-1*H-*1,5-benzodiazepine-3-acetamide* (**5g**): Yield 78%. White powder. M.p. >260°. IR: 3316, 3216, 3069 (NH), 1700, 1646, 1605 (C=O). ^{1}H-NMR: 0.94–1.76 (*m*, 5 CH_2 of Chx); 3.36 (br. *s*, CH of Chx, overlap with solvent); 3.79 (*d*, *J* = 11.3, CH); 4.52 (*d*, *J* = 11.3, CH); 7.08–8.21 (*m*, 7 arom. H); 8.05 (*d*, *J* = 8, N*H*–Chx); 8.18–8.21 (*m*, 2 arom. H); 10.38 (*s*, NH); 10.60 (*s*, NH). EI-MS: 436 (M^+). Anal. calc. for $C_{23}H_{24}N_4O_5$ (436.46): C 63.29, H 5.54, N 12.84; found: C 63.36, H 5.62, N 12.75.

N-*Cyclohexyl-2,3,4,5-tetrahydro-α-(3-methoxyphenyl)-2,4-dioxo-1*H-*1,5-benzodiazepine-3-acetamide* (**5h**): Yield 88%. White powder. M.p. >260°. IR: 3361, 3260, 3060 (NH), 1690, 1677, 1605 (C=O). ^{1}H-NMR: 1.15–1.65 (*m*, 5 CH_2 of Chx); 3.38 (br. *s*, CH of Chx, overlap with solvent); 3.67 (br. *s*, MeO, CH); 4.29 (br. *s*, CH); 6.77–7.21 (*m*, 8 arom. H); 8.03 (br. *s*, N*H*–Chx); 10.30 (*s*, NH); 10.49 (*s*, NH). EI-MS: 421 (M^+). Anal. calc. for $C_{24}H_{27}N_3O_4$ (421.49): C 68.39, H 6.46, N 9.97; found: C 68.28, H 6.38, N 10.09.

2,3,4,5-Tetrahydro-N-*{[(4-methylphenyl)sulfonyl]methyl}-2,4-dioxo-α-phenyl-1*H-*1,5-benzodiazepine-3-acetamide* (**5i**): Yield 55%. White powder. M.p. 228–232°. IR: 3555, 3300, 3266 (NH), 1687, 1630, 1601 (C=O). ^{1}H-NMR: 2.34 (*s*, Me); 4.29–4.71 (*m*, 2 CH, CH_2); 6.41–7.32 (*m*, 13 arom. H, NH); 8.95 (br. *s*, NH); 9.18 (br. *s*, NH). EI-MS: 477 (M^+). Anal. calc. for $C_{25}H_{23}N_3O_5S$ (477.53): C 62.88, H 4.85, N 8.80; found: C 62.74, H 4.73, N 8.71.

N-*(2,6-Dimethylphenyl)-2,3,4,5-tetrahydro-2,4-dioxo-α-phenyl-1*H-*1,5-benzodiazepine-3-acetamide* (**5j**): Yield 64%. White powder. M.p. >260°. IR: 3450, 3256, 3064 (NH), 1702, 1656, 1601 (C=O). ^{1}H-NMR: 1.88 (*s*, 2 Me); 3.84 (*d*, *J* = 10.8, CH); 4.64 (*d*, *J* = 10.8, CH); 6.96–7.55 (*m*, 12 arom. H); 9.40 (*s*, NH); 10.16 (*s*, NH); 10.63 (*s*, NH). EI-MS: 413 (M^+). Anal. calc. for $C_{25}H_{23}N_3O_3$ (413.47): C 72.62, H 5.61, N 10.16; found: C 72.79, H 5.55, N 10.23.

α-(4-Chlorophenyl)-N-*(2,6-dimethylphenyl)-2,3,4,5-tetrahydro-2,4-dioxo-1*H-*1,5-benzodiazepine-3-acetamide* (**5k**): Yield 69%. White powder. M.p. >260°. IR: 3450, 3300, 3290 (NH), 1699, 1662, 1600 (C=O). ^{1}H-NMR: 1.94 (*s*, 2 Me); 3.81 (*d*, *J* = 12.9, CH); 4.65 (*d*, *J* = 12.9, CH); 6.97–7.54 (*m*, 11 arom.

H); 9.65 (*s*, NH); 10.39 (*s*, NH); 10.67 (*s*, NH). EI-MS: 447 (M^+). Anal. calc. for $C_{25}H_{22}ClN_3O_3$ (447.91): C 67.04, H 4.95, N 9.38; found: C 67.14, H 4.87, N 9.31.

N-*(2,6-Dimethylphenyl)-2,3,4,5-tetrahydro-α-(3-methoxyphenyl)-2,4-dioxo-1*H-*1,5-benzodiazepine-3-acetamide* (**5l**): Yield 63%. White powder. M.p. >260°. IR: 3291, 3228, 3078 (NH), 1700, 1656 (C=O). ^{1}H-NMR: 1.92 (*s*, 2 Me); 3.77 (*s*, MeO); 3.85 (*d*, *J* = 11.2, CH); 4.62 (*d*, *J* = 11.2, CH); 6.76–7.20 (*m*, 11 arom. H); 9.40 (*s*, NH); 10.17 (*s*, NH); 10.42 (*s*, NH). EI-MS: 443 (M^+). Anal. calc. for $C_{26}H_{25}N_3O_4$ (443.49): C 70.41, H 5.68, N 9.47; found: C 70.30, H 5.61; N 9.55.

*[2-(Cyclohexylamino)-2-oxo-1-(2,3,4,5-tetrahydro-2,4-dioxo-1*H-*1,5-benzodiazepin-3-yl)ethyl]ferrocene* (**11a**): Yield 67%. Light yellow solid. M.p. >260°. IR: 3460, 3300, 3074 (NH), 1700, 1655, 1603 (C=O). ^{1}H-NMR: 1.19–1.83 (*m*, 5 CH_2 of Chx); 3.56 (br. *s*, CH of Chx); 3.94–4.18 (*m*, CH_{fer}, 2 CH); 7.08–7.18 (*m*, 4 arom. H); 8.10 (*d*, *J* = 7.6, NH–Chx); 10.38 (*s*, NH); 10.40 (*s*, NH). EI-MS: 499 (M^+). Anal. calc. for $C_{27}H_{29}FeN_3O_3$: C 64.94, H 5.85, N 8.41; found: C 64.81, H 5.76, N 8.49.

*{2-[(2,6-Dimethylphenyl)amino]-2-oxo-1-(2,3,4,5-tetrahydro-2,4-dioxo-1*H-*1,5-benzodiazepin-3-yl)ethyl}ferrocene* (**11b**): Yield 58%. White powder. M.p. 228–235°. IR: 3450, 3300, 3261 (NH), 1680, 1662, 1600 (C=O). ^{1}H-NMR: 2.19 (*s*, 2 Me); 4.22–4.80 (*m*, CH_{fer}, 2 CH); 6.53–7.31 (*m*, 7 arom. H); 9.09 (*s*, NH); 9.20 (*s*, NH); 9.65 (*s*, NH). EI-MS: 521 (M^+). Anal. calc. for $C_{29}H_{27}FeN_3O_3$: C 66.80, H 5.22, N 8.06; found: C 66.89, H 5.28, N 7.99.

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