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Research Article

A GREEN AND EFFICIENT METHOD FOR THE SYNTHESIS OF HOMODIMERIC (B-DICARBONYL) ARYLMETHANES AND DIHYDROPYRIDINE FROM DIMEDONE IN WATER

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ABSTRACT

A direct method has been developed for the synthesis of the dihydropyridine ring system by means of Michael reaction. The reaction of dimedone with 1 .0 equiv. of amines in water provides intermediate product, which allowed dihydropyridine derivatives by intramolecular cyclization in various yields. Of particular interest is the use of the water as solvent of reaction and in absence of catalyst. Also these operating conditions protect the environment and economic points of view.

Keywords aqueous synthesis; bioactivity; dihydropyridine; dimedone; green method; selective conditions.

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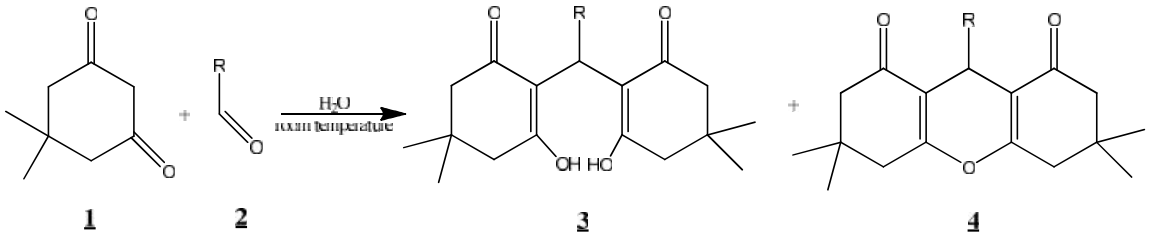
1. INTRODUCTION

Homodimeric (β-dicarbonyl) arylmethane derivatives have attracted considerable attention since they exhibit potent bioactivity, like anti-inflammatory, antibiotic and anti-oxydant principle *[1-3]*. Several syntheses have been developed for the preparation of these homodimeric compounds. These routes usually involved condensation of aldehydes with electron-rich carbon nucleophiles (enols, etheroaromatics) *[4-6]*.

The molecule dimedone **1**, known for a long time, has been scarcely used in the synthesis of heterocyclic structures *[7-13]*. According to the literature, the homodimer **3** of dimedone has been obtained in various organic solvents like acetic acid and in the presence of toxic and not toxic catalysts such as cyanuric chloride and triethylamine.

In this work, we have obtained selectively, the homodimer **3** of dimedone along with the xanthene structure **4** by a green method as we have discover that in aqueous solution, no catalysis is required and products are isolated by filtration avoiding the use of any organic solvent (Scheme 1). Under these clean operating conditions, we have improved yields and master their reaction times compared to those cited in the literature *[14]*. Our interest in this type of structure is mainly based on its functional groups likely to give new heterocyclic structures. In particular, the action of primary amines on **3** forms a structure dihydropyridine (DHP) which exhibit an interesting functionalization.



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

R = CH_3, C_6H_5, C_6H_4-p-CH_3, C_6H_4-p-NO_2, C_6H_4-p-F, C_6H_4-p-CO_2CH_3.

Scheme 1

2. RESULTS AND DISCUSSION

When two equivalents of dimedone **1** (5,5-Dimethyl-1,3-cyclohexanedione) and one equivalent of aldehyde **2** are dissolved in dichloromethane under magnetic stirring, at room temperature or heated under reflux, only the structure **4** was obtained. The same result is obtained in a 50:50 mixture of CH_2Cl_2 / H_2O. On the other hand, the use of H_2O as a solvent drives the reaction selectively to **3** or **4** depending on the temperature and time. Thus, heating

at 100°C, promotes the formation of the structure **4**. At room temperature, we obtained selectively **3** and **4**, depending on the reaction time.

Table 1 : Conditions of formation and physical data of **3** and **4** in water at 25 °C.

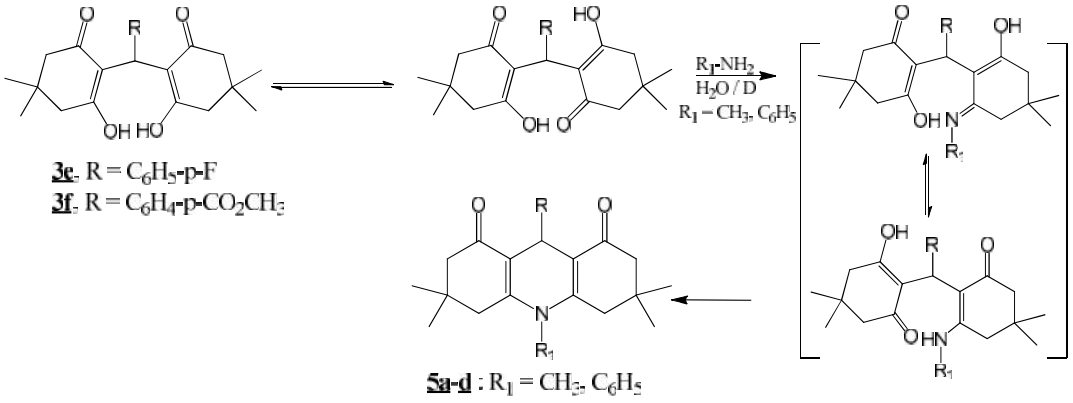
Compounds	R	Time(h)	Yield (%)	mp (°C)
3a	CH_3	3	55	129-131
3b	C_6H_5	2.30	83	188-190
3c	$C_6H_4CH_3$	//	61	131-133
3d	$C_6H_4NO_2$	//	78	192-194
3e	C_6H_4F	//	86	165-167
3f	$C_6H_4CO_2CH_3$	//	89	197-199
3g	C_6H_4OH	//	75	209-211
4a	CH_3	5	67	184-186
4b	C_6H_5	4.30	88	196-198
4c	$C_6H_4CH_3$	//	74	219-221
4d	$C_6H_4NO_2$	//	96	231-233
4e	C_6H_4F	//	93	213-215
4f	$C_6H_4CO_2CH_3$	//	97	229-231
4g	C_6H_4OH	//	81	241-243

The formation of **3** and **4**, can be explained by the condensation of the enolic form of the dimedone on aldehyde, according to the reaction of Knoevenagel, followed by an addition on a second molecule of dimedone, according to the reaction of Michael (Scheme 1).

In CH_2Cl_2 or CH_2Cl_2/ H_2O at 50%, the interactions OH---O=C, present in **3**, are weak and lead in each case to structure **4**. On the other hand in H_2O, the hydrogen bonds OH---O=C are accentuated and consolidated by the polarity of H_2O. These interactions support the formation of **3**. But energy brought, in the course of the reaction time under the effect of agitation, is favorable to the rupture of the hydrogen bonds, to transform **3** into **4**, by an intramolecular ceto-enolic condensation.

Since our objective is to obtain new heterocyclic molecules, as the dihydropyridine **5**, potentially active in various fields of applications *[15-17]*. As a first step, we valued structure

3 in the synthesis of new heterocyclic molecules, standard dihydropyridine, by subjecting it to the action of two monoamines (Scheme 2).



Scheme 2

Under clean operating conditions i.e. H_2O at 100 °C, we easily isolated the structure dihydropyridine **5**, according to the reaction of Hantzsch *[18]*.

All compounds **5** were characterized by the various spectroscopic methods. Their physical properties are summarized in table 2.

Table 2 : Conditions of formation and physical data of **5** at 100 °C.

Compounds	R	R_1	Time (h)	Yield (%)	mp (°C)
5a	C_6H_4-F	CH_3	5	45	215-217
5b	//	C_6H_5	4	63	231-233
5c	C_6H_4-CO_2CH_3	CH_3	6	51	223-225
5d	//	C_6H_5	3	67	239-241

The amine's basicity allows, in a first step, the breaking of the hydrogen bond OH---O=C by electronic interaction N---H, according to the acid-base properties of Lewis. In a second step, the primary amine reacts with the carbonyl present in **3** to form the corresponding imine. Finally, the equilibrium enol-ketone and imine-enamine present in the reactional intermediary, leads, by interaction ketone-enamine to a heterocyclization of the structure dihydropyridine **5**.

3. EXPERIMENTAL

All chemicals were obtained from Aldrich. Melting points were taken on a Thomas Hoover apparatus and are uncorrected. Nuclear magnetic resonance spectra were obtained with a Bruker AC 300 at 300 MHz (^{1}H) or 75 MHz (^{13}C). The chemical shifts are reported in ppm

(δ-scale) relative to internal TMS and coupling constants are reported in Hertz (Hz). The impact ionization mass spectra were recorded on a Nermag R10-10C at 70 eV.

General procedure for synthesis of 3 and 4

In 20 ml water, a dimedone **1** (2.10^{-2} mol) was reacted with aldehydes **2** (**a** to **g**) (10^{-2} mol). The mixture was stirred at room temperature 2 hours or refluxed for 4 h under magnetic stirring. We obtained selectively, after filtration and dry vacuum the corresponding compound **3** (**a** to **g**) or **4** (**a** to **g**).

General procedure for synthesis of 5

Homodimer compound **3** (10^{-2} mol) in 20 ml of water, reacted with monoamines (10^{-2} mol). The mixture was refluxed for 4 h at 100 °C, under magnetic stirring. After filtration and dry vacuum, we obtained the corresponding compounds **5** (**a** to **d**).

2,2'-(ethane-1,1-diyl)bis(3-hydroxy-5,5-dimethylcyclohex-2-enone) 3a

Yield: 55%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) 1.07 (s, 6H, $2CH_3$), 1.12 (s, 6H, $2CH_3$), 1.29 (d, J=6.1 Hz, 3H, CH_3), 2.13-2.18 (m, 8H, $4CH_2$), 4.89 (d, J=6.1Hz, 1H, CH), 10.98 (s, 1H, OH); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 21 (CH_3), 25 ($2CH_3$), 28 ($2CH_3$), 30 (2Cq), 31 (CH), 43($2CH_2$), 45($2CH_2$), 113(2Cq), 161(2 =C-OH), 187(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 306 (14)

2,2'-(phenylmethylene)bis(3-hydroxy-5,5-dimethylcyclohex-2-enone) 3b

Yield: 83%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.04 (s, 6H, $2CH_3$), 1.11 (s, 6H, $2CH_3$), 2.31-2.39 (m, 8H, $4CH_2$), 5.39 (s, 1H, CH), 7.03-7.15 (m, 5H, CH_{arom}), 11.81 (s, 1H, OH); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 28 ($2CH_3$), 32 ($2CH_3$), 33 (2Cq), 34 (CH), 48($2CH_2$), 51($2CH_2$), 126-127-129-158($6C_{arom}$), 116(2Cq), 163(2 =C-OH), 188(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 368 (40), 229 (100)

2,2'-(p-tolylmethylene)bis(3-hydroxy-5,5-dimethylcyclohex-2-enone) 3c

Yield: 61%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.07 (s, 6H, $2CH_3$), 1.20 (s, 6H, $2CH_3$), 2.27 (s, 3H, CH_3), 2.37-2.41 (m, 8H, $4CH_2$), 5.48 (s, 1H, CH), 6.97-7.04 (m, 4H, CH_{arom}), 11.87 (s, 1H, OH); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 26 ($CH_{3\ arom}$), 27 ($2CH_3$), 29 ($2CH_3$), 30 (2Cq), 31 (CH), 44($2CH_2$), 45($2CH_2$), 112(2Cq), 127-128-134-156($6C_{arom}$), 161(2 =C-OH), 191(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 382 (33), 243 (59).

2,2'-((4-nitrophenyl)methylene)bis(3-hydroxy-5,5-dimethylcyclohex-2-enone) 3d

Yield: 78%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.12 (s, 6H, $2CH_3$), 1.25 (s, 6H, $2CH_3$), 2.35-2.49 (m, 8H, $4CH_2$), 5.54 (s, 1H, CH), 7.19-8.01 (m, 4H, CH_{arom}), 11.87 (s, 1H, OH); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 28 ($2CH_3$), 32 ($2CH_3$), 34 (2Cq), 35 (CH), 49($2CH_2$), 52($2CH_2$), 116(2Cq), 123-129-141-157($6C_{arom}$), 164(2 =C-OH), 189(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 413 (27), 275(65).

2,2'-((4-fluorophenyl)methylene)bis(3-hydroxy-5,5-dimethylcyclohex-2-enone) 3e

Yield: 86%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.01 (s, 6H, $2CH_3$), 1.22 (s, 6H, $2CH_3$), 2.40-2.43 (m, 8H, $4CH_2$), 5.48 (s, 1H, CH), 6.92-7.03 (m, 4H, CH_{arom}), 11.88 (s, 1H, OH); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 27 ($2CH_3$), 30 ($2CH_3$), 31 (2Cq), 32 (CH), 46($2CH_2$), 47($2CH_2$), 115(2Cq), 117-128-133-159($6C_{arom}$), 162(2 =C-OH), 189(2C=O). C.I. (NH_3) : $MH^{\urcorner +}$ = 387 (23%), 244(5%).

Methyl- 4-(bis(2-hydroxy-4,4-dimethyl-6-oxocyclohex-1-en-1-yl)methyl)benzoate 3f

Yield: 89%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.10 (s, 6H, $2CH_3$), 1.23 (s, 6H, $2CH_3$), 2.34-2.45 (m, 8H, $4CH_2$), 3.88(s, 3H, O-CH_3), 5.53 (s, 1H, CH), 7.16-7.94 (m, 4H, CH_{arom}), 11.84 (s, 1H, OH); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 27 ($2CH_3$), 32 ($2CH_3$), 34 (2Cq), 35 (CH), 48($2CH_2$), 49(O-CH_3), 53($2CH_2$), 118(2Cq), 129-130-131-159($6C_{arom}$), 165(2 =C-OH), 167(Cq), 192(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 436 (15), 298 (64).

2,2'-((4-hydroxyphenyl)methylene)bis(3-hydroxy-5,5-dimethylcyclohex-2-enone) 3g

Yield: 75%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.08 (s, 6H, $2CH_3$), 1.19 (s, 6H, $2CH_3$), 2.36-2.41 (m, 8H, $4CH_2$), 5.47 (s, 1H, CH), 6.20(s, 1H, OH), 7.01-7.11 (m, 4H, CH_{arom}), 11.85 (s, 1H, OH); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 26 ($2CH_3$), 31 ($2CH_3$), 32 (2Cq), 33 (CH), 47($2CH_2$), 50($2CH_2$), 117(2Cq), 119-129-136-157($6C_{arom}$), 163(2 =C-OH), 191(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 384 (23), 246 (57).

3,3,6,6,9-pentamethyl-3,4,5,6,7,9-hexahydro-1H-xanthene-1,8(2H)-dione 4a

Yield: 67%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.04 (s, 6H, $2CH_3$), 1.09 (s, 6H, $2CH_3$), 1.24 (d, J=6.1 Hz, 3H, CH_3), 2.01-2.13 (m, 8H, $4CH_2$), 4.57 (d, J=6.1Hz, 1H, CH); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 19 (CH_3), 22 ($2CH_3$), 25 ($2CH_3$), 28 (2Cq), 30 (CH), 41($2CH_2$), 43($2CH_2$), 111(2Cq), 157(2 =C-O), 183(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 288 (33), 166

(37).

3,3,6,6-tetramethyl-9-phenyl-3,4,5,6,7,9-hexahydro-1H-xanthene-1,8(2H)-dione 4b

Yield: 88%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.01 (s, 6H, $2CH_3$), 1.09 (s, 6H, $2CH_3$), 2.21-2.31 (m, 8H, $4CH_2$), 4.59 (s, 1H, CH), 7.01-7.24 (m, 5H, CH_{arom}); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 25 ($2CH_3$), 30 ($2CH_3$), 32 (2Cq), 34 (CH), 45($2CH_2$), 49($2CH_2$), 123-125-127-154($6C_{arom}$), 114(2Cq), 159(2 =C-O), 184(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 350 (45), 228 (7)

3,3,6,6-tetramethyl-9-(p-tolyl)-3,4,5,6,7,9-hexahydro-1H-xanthene-1,8(2H)-dione 4c

Yield: 74%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.03 (s, 6H, $2CH_3$), 1.11 (s, 6H, $2CH_3$), 2.15-2.27 (m, 8H, $4CH_2$), 2.47 (s, 3H, CH_3), 4.72 (s, 1H, CH), 6.86-7.24 (m, 4H, CH_{arom}); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 24 ($CH_{3\ arom}$), 26 ($2CH_3$), 28 ($2CH_3$), 30 (2Cq), 31 (CH), 41($2CH_2$), 43($2CH_2$), 110(2Cq), 125-126-131-152($6C_{arom}$), 160(2 =C-O), 189(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 364 (38), 242 (51).

3,3,6,6-tetramethyl-9-(4-nitrophenyl)-3,4,5,6,7,9-hexahydro-1H-xanthene-1,8(2H)-dione 4d

Yield: 96%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.02 (s, 6H, $2CH_3$), 1.15 (s, 6H, $2CH_3$), 2.15-2.46 (m, 8H, $4CH_2$), 4.74 (s, 1H, CH), 7.39-8.06 (m, 4H, CH_{arom}); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 26 ($2CH_3$), 30 ($2CH_3$), 33 (2Cq), 35 (CH), 47($2CH_2$), 51($2CH_2$), 114(2Cq), 121-127-140-155($6C_{arom}$), 162(2 =C-O), 185(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 395 (39), 273(65).

9-(4-fluorophenyl)-3,3,6,6-tetramethyl-3,4,5,6,7,9-hexahydro-1H-xanthene-1,8(2H)-dione 4e

Yield: 93%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.01 (s, 6H, $2CH_3$), 1.14 (s, 6H, $2CH_3$), 2.31-2.42 (m, 8H, $4CH_2$), 4.69 (s, 1H, CH), 6.91-7.04 (m, 4H, CH_{arom}); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 25 ($2CH_3$), 28 ($2CH_3$), 31 (2Cq), 33 (CH), 45($2CH_2$), 49($2CH_2$), 113(2Cq), 117-125-131-157($6C_{arom}$), 160(2 =C-O), 187(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 368 (32), 246 (43).

Methyl-4-(3,3,6,6-tetramethyl-1,8-dioxo-2,3,4,5,6,7,8,9-octahydro-1H-xanthen-9-yl)benzoate 4f

Yield: 97%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.02 (s, 6H, $2CH_3$), 1.13 (s, 6H, $2CH_3$), 2.33-2.46 (m, 8H, $4CH_2$), 3.86(s, 3H, O-CH_3), 4.71 (s, 1H, CH), 7.14-7.93 (m, 4H, CH_{arom}); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 27 ($2CH_3$), 32 ($2CH_3$), 34 (2Cq), 35 (CH), 48($2CH_2$), 49(O-CH_3), 53($2CH_2$), 118(2Cq), 129-130-131-159($6C_{arom}$), 163(2 =C-O), 167(Cq), 192(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 348 (15).

9-(4-hydroxyphenyl)-3,3,6,6-tetramethyl-3,4,5,6,7,9-hexahydro-1H-xanthene-1,8(2H)-dione 4g

Yield: 81%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.01 (s, 6H, $2CH_3$), 1.11 (s, 6H, $2CH_3$), 2.31-2.39 (m, 8H, $4CH_2$), 4.57 (s, 1H, CH), 6.20(s, 1H, OH), 6.69-7.08 (m, 4H, CH_{arom}); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 26 ($2CH_3$), 31 ($2CH_3$), 32 (2Cq), 33 (CH), 47($2CH_2$), 50($2CH_2$), 117(2Cq), 119-129-136-157($6C_{arom}$), 163(2 =C-O), 191(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 366 (32), 244(43).

9-(4-fluorophenyl)-3,3,6,6,10-pentamethyl-3,4,6,7,9,10-hexahydroacridine-1,8(2H,5H)-dione 5a

Yield: 45%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 0.98 (s, 6H, $2CH_3$), 1.07 (s, 6H, $2CH_3$), 2.15-2.33 (m, 8H, $4CH_2$), 2.95(s, 3H, N-CH_3), 5.07 (s, 1H, CH), 6.91-7.02 (m, 4H, CH_{arom}); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 26 ($2CH_3$), 32 ($2CH_3$), 29 (2Cq), 34 (CH), 44($2CH_2$), 47($2CH_2$), 112(2Cq), 116-129-134-158($6C_{arom}$), 161(2 =C-N), 191(2C=O). C.I. (NH_3) : $MH^{\urcorner +}$ = 382 (41%), 244(43%).

9-(4-fluorophenyl)-3,3,6,6-tetramethyl-10-phenyl-3,4,6,7,9,10-hexahydroacridine-1,8(2H,5H)-dione 5b

Yield: 63%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 0.97 (s, 6H, $2CH_3$), 1.08 (s, 6H, $2CH_3$), 2.17-2.36 (m, 8H, $4CH_2$), 5.06 (s, 1H, CH), 6.77-7.41 (m, 9H, CH_{arom}); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 27 ($2CH_3$), 32 ($2CH_3$), 31 (2Cq), 33 (CH), 46($2CH_2$), 49($2CH_2$), 113(2Cq), 115-117-118-124-128-133-134-156($12C_{arom}$), 163(2 =C-N), 192(2C=O). C.I. (NH_3) : $MH^{\urcorner +}$ = 444 (37%), 231(29%).

Methyl-4-(3,3,6,6,10-pentamethyl-1,8-dioxo-1,2,3,4,5,6,7,8,9,10-decahydroacridin-9-yl)benzoate 5c

Yield: 51%; ^{1}H NMR (300MHz, $CDCl_3$): δ (ppm) : 0.99 (s, 6H, $2CH_3$), 1.12 (s, 6H, $2CH_3$),

2.31-2.39 (m, 8H, $4CH_2$), 3.01(s, 3H, N-CH_3), 3.83(s, 3H, O-CH_3), 5.12 (s, 1H, CH), 7.09-7.88 (m, 4H, CH_{arom}); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 25 ($2CH_3$), 33 ($2CH_3$), 34 (2Cq), 36 (CH), 39(N-CH_3), 46(O-CH_3), 48($2CH_2$), 55($2CH_2$), 114(2Cq), 126-129-131-159($6C_{arom}$), 165(2 =C-N), 167(Cq), 193(2C=O). E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 390 (43), 244(39).

Methyl-4-(3,3,6,6-tetramethyl-1,8-dioxo-10-phenyl-1,2,3,4,5,6,7,8,9,10-decahydroacridin-9-yl)benzoate 5d

Yield: 67%; ^1H NMR (300MHz, $CDCl_3$): δ (ppm) : 1.09 (s, 6H, $2CH_3$), 1.21 (s, 6H, $2CH_3$), 2.33-2.41 (m, 8H, $4CH_2$), 3.87(s, 3H, O-CH_3), 5.11 (s, 1H, CH), 6.89-7.91 (m, 9H, CH_{arom}); ^{13}C NMR (75 MHz, $CDCl_3$): δ (ppm) 26 ($2CH_3$), 31 ($2CH_3$), 35 (2Cq), 37 (CH), 47(O-CH_3), 49($2CH_2$), 56($2CH_2$), 114(2Cq), 116-119-123-128-130-132-134-159($12C_{arom}$), 162(2 =C-N), 168(Cq), 194(2C=O).E.I. (70 eV), m/z (%) : $M^{\urcorner +\cdot}$ = 466 (49), 308 (76).

4. CONCLUSION

In this work, we achieved the synthesis of a new type of dihydropyridinemolecules **5** under clean operating conditions: H_2O as a solvent, no-catalystsand a simply work-up by filtration. The selectivity formation of structures **3** and **4**, obtained with good yields, is determined to be conditioned by the reaction time.

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