Chapter-5

Synthesis of 4-(substituted benzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-ones
Introduction

Quinoline\textsuperscript{1-5} nucleus occurs in several natural compounds (Cinchona Alkaloids) and pharmacologically active substances displaying a broad range of biological activity. Various quinoline derivatives are also reported to exhibit several biological properties such as antimicrobial\textsuperscript{6}, antimalarial\textsuperscript{7} and antitubercular\textsuperscript{8} activities.

It was observed from the literature that certain five membered heterocyclic compounds possess interesting biological activity. Among them the compounds bearing pyrazole nucleus have wide applications in medicinal chemistry. Pyrazoles are known to possess numerous chemical, biological and medicinal applications because of their versatile biological activities such as antitumour\textsuperscript{9}, antileukemia\textsuperscript{10}, antidepressant\textsuperscript{11,12} and antitubercular\textsuperscript{13}.

On the basis of the above observations we planned the synthesis of pyrazole analogues containing quinoline moiety to have a synergistic feature useful to improve the antimicrobial efficacy.

Present work

This chapter concerns with the synthesis of 3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1\textit{H}-pyrazol-5(4\textit{H})-one 4 and 4-(substituted benzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1\textit{H}-pyrazol-5(4\textit{H})-ones 5a-i.

The precursor 3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1\textit{H}-pyrazol-5(4\textit{H})-one 4 was obtained by condensing 2-(quinolin-8-yloxy)acetohydrazide 3 (whose synthesis is described in Chapter-4, Scheme 4.1 & Scheme 4.2) with ethyl acetoacetate in ethanol and refluxing for 8 hr. IR spectrum of 4 revealed a band at
1601 cm$^{-1}$ due to C=N stretching in pyrazolin-5-one ring. A singlet was observed at $\delta$ 4.93 due to OCH$_2$ protons and a singlet at $\delta$ 2.55 corresponding to the methylene protons of heterocyclic ring. The mass spectrum of 4 showed molecular ion peak M$^+$ at m/z 283 corresponding to molecular formula C$_{15}$H$_{13}$N$_3$O$_3$.

![Scheme 5.1](image)

**Characterization data of 4**

Yield 70%. m.p. 238-240ºC.

IR (KBr)$v_{\text{max}}$: 3068 (C-H stretching in aromatics), 1700 (C=O stretching), 1601 (C=N stretching), 1504 (C=C stretching in aromatics), 1118, 1028 (sp$^2$/sp$^3$ C-O-C stretching) cm$^{-1}$.

$^1$H NMR (DMSO-d$_6$): $\delta$ 2.36 (s, 3H, CH$_3$), 2.55 (s, 2H, CH$_2$ in pyrazolin-5-one), 4.93 (s, 2H, OCH$_2$), 7.52 (m, 4H, quinoline-H$_3$, H$_5$, H$_6$ & H$_7$), 8.18 (d, 1H, quinoline-H$_4$), 8.96 (d, 1H, quinoline-H$_2$) ppm.

$^{13}$C NMR (DMSO-d$_6$): $\delta$ 16.5 (CH$_3$), 28.4 (CH$_2$ in pyrazolin-5-one), 66.3 (OCH$_2$), 108.2, 117.8, 121.8, 126.9, 129.8, 135.6, 140.4, 150.1, 155.9 (quinoline carbons), 159.8 (pyrazolin-5-one carbon), 163.2 (C=O in pyrazolin-5-one), 170.4 (C=O) ppm.
MS m/z: found 283 [M⁺]; calcd. 283. Anal. C₁₂H₁₃N₃O₃. Found C 63.31 (63.60), H 4.59 (4.63), N 14.62 (14.83).

The next step involves Knoevenegel condensation of compound 4 containing active methylene group with various substituted aromatic aldehydes in presence of imidazole to yield 4-(substituted benzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-ones 5a-i. A singlet was observed at δ 4.91 due to OCH₂ protons. The disappearance of the characteristic signal of methylene group of compound 4 and the appearance of new signal at around δ 7.64 corresponding to the methine proton of Knoevenegel adducts along with other characteristic peaks confirm the successful formation of the adducts 5a-i. The mass spectrum of 5a showed molecular ion peak M⁺ at m/z 371 corresponding to molecular formula C₂₂H₁₇N₃O₃.

\[ \text{Scheme 5.2} \]
Characterization data of 5a-i

4-benzylidene-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5a)

Yield 68%. m.p. 192-194ºC.

IR (KBr) $v_{max}$: 3064 (C-H stretching in aromatics), 2925 (aliphatic C-H stretching), 1620 (C=O stretching), 1506 (C=C stretching in aromatics), 1109, 1024 (sp$^2$/sp$^3$ C-O-C stretching) cm$^{-1}$.

$^1$H NMR (DMSO-d$_6$) : $\delta$ 2.38 (s, 3H, CH$_3$), 4.91 (s, 2H, OCH$_2$), 7.11 (t, J = 5.8 Hz, 1H, Ar-H), 7.35 (t, J = 6.2 Hz, 2H, Ar-H), 7.38 (d, J = 6 Hz, 2H, Ar-H), 7.41-7.64 (m, 5H, quinoline- H$_3$, H$_5$, H$_6$, H$_7$ & Ar-CH=), 8.39 (d, J = 6.8 Hz, 1H, quinoline- H$_4$), 8.94 (d, J = 7.2 Hz, 1H, quinoline- H$_2$) ppm.

$^{13}$C NMR (DMSO-d$_6$) : $\delta$ 14.7 (CH$_3$), 65.8 (OCH$_2$), 107.4, 116.9, 121.4, 127.2, 129.8, 135.9, 140.4, 148.6, 155.6 (quinolone carbons), 143.8 (=CH), 126.6, 147.8 (pyrazolin-5-one carbons), 171.8 (C=O in pyrazolin-5-one), 127.8, 128.4, 128.7, 133.1 (aromatic carbons), 170.9 (C=O) ppm.

MS m/z: found 371 [M$^+$]; calcd. 371. Anal. C$_{22}$H$_{17}$N$_3$O$_3$. Found C 70.62 (71.15), H 4.56 (4.61), N 11.09 (11.31).

4-(2-hydroxybenzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5b)

Yield 84%. m.p. 184-186ºC.
IR (KBr)\(v_{\text{max}}\) : 3328 (O-H stretching), 3075 (C-H stretching in aromatics), 2946 (aliphatic C-H stretching), 1641 (C=O stretching), 1493 (C=C stretching in aromatics), 1133, 1028 (sp\(^2\)/sp\(^3\) C-O-C stretching) cm\(^{-1}\).

\(^1\)H NMR (DMSO-d\(_6\)) : \(\delta\) 2.37 (s, 3H, CH\(_3\)), 4.91 (s, 2H, OCH\(_2\)), 5.36 (s, 1H, OH), 6.98-7.54 (m, 4H, Ar-H), 7.66 (s, 1H, Ar-CH=), 7.46-7.65 (m, 3H, quinoline-H\(_3\), H\(_5\) & H\(_7\)), 7.74 (t, \(J = 7.2\) Hz, 1H, quinoline-H\(_6\)), 8.34 (d, \(J = 6.8\) Hz, 1H, quinoline-H\(_4\)), 8.86 (d, \(J = 6.8\) Hz, 1H, quinoline-H\(_2\)) ppm.

\(^{13}\)C NMR (DMSO-d\(_6\)) : \(\delta\) 14.7 (CH\(_3\)), 66.9 (OCH\(_2\)), 108.1, 117.6, 121.6, 126.9, 129.2, 135.8, 140.0, 149.5, 155.8 (quinoline carbons), 143.4 (=CH), 126.2, 147.8 (pyrazolin-5-one carbons), 172.3 (C=O in pyrazolin-5-one), 117.8, 120.1, 121.4, 128.9, 133.1, 156.8 (aromatic carbons), 170.7 (C=O) ppm.

MS m/z: found 387 [M\(^+\)]; calcd. 387. Anal. C\(_{22}\)H\(_{17}\)N\(_3\)O\(_4\). Found C 67.84 (68.21), H 4.38 (4.42), N 10.63 (10.85).

\textit{4-(4-hydroxybenzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5c)}

Yield 76%. m.p. 200-202ºC.

IR (KBr)\(v_{\text{max}}\) : 3340 (O-H stretching), 3053 (C-H stretching in aromatics), 2922 (aliphatic C-H stretching), 1634 (C=O stretching), 1511 (C=C stretching in aromatics), 1111, 1031 (sp\(^2\)/sp\(^3\) C-O-C stretching) cm\(^{-1}\).

\(^1\)H NMR (DMSO-d\(_6\)) : \(\delta\) 2.37 (s, 3H, CH\(_3\)), 4.95 (s, 2H, OCH\(_2\)), 5.36 (s, 1H, OH), 6.87 (d, \(J = 5.8\) Hz, 2H, Ar-H), 7.95 (d, \(J = 6\) Hz, 2H, Ar-H), 7.69 (s, 1H, Ar-CH=),
7.41-7.68 (m, 3H, quinoline-H$_3$ H$_5$ & H$_7$), 7.79 (t, J = 6.8 Hz, 1H, quinoline-H$_6$),
8.31 (d, J = 6.4 Hz, 1H, quinoline-H$_4$), 8.86 (d, J = 6.8 Hz, 1H, quinoline-H$_2$) ppm.

$^{13}$C NMR (DMSO-d$_6$) : δ 14.6 (CH$_3$), 66.5 (OCH$_2$), 107.8, 117.6, 121.9, 126.4,
128.9, 136.1, 140.2, 149.3, 155.7 (quinoline carbons), 143.5 (=CH), 126.5, 148.3
(pyrazolin-5-one carbons), 172.0 (C=O in pyrazolin-5-one), 115.9, 125.8, 130.4,
157.8 (aromatic carbons), 170.6 (C=O) ppm.

MS m/z: found 387 [M$^+$]; calcd. 387. Anal. C$_{22}$H$_{17}$N$_3$O$_4$. Found C 67.82 (68.21), H
4.37 (4.42), N 10.61 (10.85).

$^4$-(2-methoxybenzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-
5(4H)-one (5d)

Yield 64%. m.p. 194-196ºC.

IR (KBr)$v_{max}$ : 3058 (C-H stretching in aromatics), 2925 (aliphatic C-H stretching),
1665 (C=O stretching), 1598 (C=C stretching in aromatics), 1228, 1017 (sp$^2$/sp$^3$ C-
O-C stretching) cm$^{-1}$.

$^1$H NMR (DMSO-d$_6$) : δ 2.38 (s, 3H, CH$_3$), 3.84 (s, 3H, OCH$_3$), 4.92 (s, 2H,
OCH$_2$), 6.94-7.26 (m, 4H, Ar-H), 8.06 (s, 1H, Ar-CH=), 7.51-7.63 (m, 3H,
quinoline-H$_3$, H$_5$ & H$_7$), 7.78 (t, J = 7.0 Hz, 1H, quinoline-H$_6$), 8.31 (d, J = 6.8 Hz,
1H, quinoline-H$_4$), 8.82 (d, J = 6.8 Hz, 1H, quinoline-H$_2$) ppm.

$^{13}$C NMR (DMSO-d$_6$) : δ 14.8 (CH$_3$), 56.2 (OCH$_3$), 66.5 (OCH$_2$), 108.8, 117.6,
121.9, 127.3, 128.8, 136.1, 140.3, 148.8, 155.6 (quinoline carbons), 143.5 (=CH),
126.8, 147.9 (pyrazolin-5-one carbons), 173.1 (C=O in pyrazolin-5-one), 114.8,
121.1, 122.3, 128.6, 134.1, 160.3 (aromatic carbons), 170.6 (C=O) ppm.
4-(4-methoxybenzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5e)

Yield 78%. m.p. 206-208°C.

IR (KBr)νₘₐₓ : 3061 (C-H stretching in aromatics), 2927 (aliphatic C-H stretching), 1673 (C=O stretching), 1603 (C=C stretching in aromatics), 1278, 1013 (sp²/sp³ C-O-C stretching) cm⁻¹.

¹H NMR (DMSO-d₆) : δ 2.37 (s, 3H, CH₃), 3.81 (s, 3H, OCH₃), 4.94 (s, 2H, OCH₂), 6.91 (d, J = 6.0 Hz, 2H, Ar-H), 8.36 (d, J = 5.8 Hz, 2H, Ar-H), 7.81 (s, 1H, Ar-CH=), 7.49–7.64 (m, 3H, quinoline-H₃, H₅ & H₇), 7.78 (t, J = 7.2 Hz, 1H, quinoline-H₆), 8.32 (d, J = 6.8 Hz, 1H, quinoline-H₄), 8.81 (d, J = 7.2 Hz, 1H, quinoline-H₂) ppm.

¹³C NMR (DMSO-d₆) : δ 14.7 (CH₃), 55.4 (OCH₃), 66.2 (OCH₂), 107.2, 116.9, 121.7, 126.7, 129.6, 135.8, 140.1, 149.3, 155.5 (quinoline carbons), 143.9 (=CH), 126.5, 147.6 (pyrazolin-5-one carbons), 171.8 (C=O in pyrazolin-5-one), 114.6, 125.6, 130.1, 160.1 (aromatic carbons), 170.3 (C=O) ppm.

MS m/z: found 401 [M⁺]; calcd. 401. Anal. C₂₃H₁₉N₅O₄. Found C 68.22 (68.82), H 4.72 (4.77), N 10.39 (10.47).

3-methyl-4-(2-nitrobenzylidene)-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5f)
Yield 78%. m.p. 224-226°C.

IR (KBr)ν<sub>max</sub> : 3078 (C-H stretching in aromatics), 2950 (aliphatic C-H stretching), 1628 (C=O stretching), 1554 (N-O stretching), 1502 (C=C stretching in aromatics), 1121, 1026 (sp<sup>2</sup>/sp<sup>3</sup>C-O-C stretching) cm<sup>-1</sup>.

<sup>1</sup>H NMR (DMSO-d<sub>6</sub>) : δ 2.36 (s, 3H, CH<sub>3</sub>), 4.94 (s, 2H, OCH<sub>2</sub>), 7.80-8.14 (m, 4H, Ar-H), 8.34 (s, 1H, Ar-CH=), 7.51-7.65 (m, 3H, quinoline-H<sub>3</sub>, H<sub>5</sub> & H<sub>7</sub>), 7.78 (t, J = 7.2 Hz, 1H, quinoline-H<sub>6</sub>), 8.36 (d, J = 6.8 Hz, 1H, quinoline-H<sub>4</sub>), 8.87 (d, J = 7.2 Hz, 1H, quinoline-H<sub>2</sub>) ppm.

<sup>13</sup>C NMR (DMSO-d<sub>6</sub>) : δ 14.5 (CH<sub>3</sub>), 66.4 (OCH<sub>2</sub>), 106.8, 117.2, 121.5, 126.6, 129.3, 135.6, 140.3, 148.8, 155.5 (quinoline carbons), 143.4 (=CH), 126.8, 147.7 (pyrazolin-5-one carbons), 172.1 (C=O in pyrazolin-5-one), 123.7, 128.6, 129.9, 130.3, 134.8, 147.6 (aromatic carbons), 170.7 (C=O) ppm.

MS m/z: found 416 [M<sup>+</sup>]; calcd. 416. Anal. C<sub>22</sub>H<sub>16</sub>N<sub>4</sub>O<sub>5</sub>. Found C 62.74 (63.46), H 3.83 (3.87), N 13.35 (13.46).

**3-methyl-4-(4-nitrobenzylidene)-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5g)**

Yield 70%. m.p. 208-210°C.

IR (KBr)ν<sub>max</sub> : 3062 (C-H stretching in aromatics), 2946 (aliphatic C-H stretching), 1632 (C=O stretching), 1559 (N-O stretching), 1504 (C=C stretch in aromatics), 1126, 1024 (sp<sup>2</sup>/sp<sup>3</sup>C-O-C stretching) cm<sup>-1</sup>.
$^1$H NMR (DMSO-$d_6$) : $\delta$ 2.37 (s, 3H, CH$_3$), 4.93 (s, 2H, OCH$_2$), 8.08 (d, $J = 6.0$ Hz, 2H, Ar-H), 8.24 (d, $J = 5.8$ Hz, 2H, Ar-H), 7.96 (s, 1H, Ar-CH=), 7.50-7.63 (m, 3H, quinoline-H$_3$, H$_5$ & H$_7$), 7.78 (t, $J = 7.2$ Hz, 1H, quinoline-H$_6$), 8.35 (d, $J = 6.8$ Hz, 1H, quinoline-H$_4$), 8.87 (d, $J = 6.8$ Hz, 1H, quinoline-H$_2$) ppm.

$^{13}$C NMR (DMSO-$d_6$) : $\delta$ 14.8 (CH$_3$), 66.2 (OCH$_2$), 106.9, 117.2, 121.6, 126.7, 130.1, 135.6, 140.5, 149.8, 155.5 (quinoline carbons), 143.6 (=CH), 126.2, 148.2 (pyrazolin-5-one carbons), 172.1 (C=O in pyrazolin-5-one), 123.8, 132.5, 139.4, 147.5 (aromatic carbons), 170.9 (C=O) ppm.

MS m/z: found 416 [M$^+$]; calcd. 416. Anal. C$_{22}$H$_{16}$N$_4$O$_5$. Found C 62.89 (63.46), H 3.81 (3.87), N 13.37 (13.46).

4-(2-chlorobenzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5h)

Yield 68%. m.p. 182-184ºC.

IR (KBr)$_{\nu_{max}}$ : 3065 (C-H stretching in aromatics), 2924 (aliphatic C-H stretching), 1672 (C=O stretching), 1509 (C=C stretch in aromatics), 1238, 1128 (sp$^2$/sp$^3$ C-O-C stretching), 1094 (aromatic C-Cl stretching) cm$^{-1}$.

$^1$H NMR (DMSO-$d_6$) : $\delta$ 2.35 (s, 3H, CH$_3$), 4.95 (s, 2H, OCH$_2$), 7.26-7.43 (m, 4H, Ar-H), 8.08 (s, 1H, Ar-CH=), 7.48-7.69 (m, 3H, quinoline-H$_3$, H$_5$ & H$_7$), 7.78 (t, $J = 7.0$ Hz, 1H, quinoline-H$_6$), 8.33 (d, $J = 6.8$ Hz, 1H, quinoline-H$_4$), 8.92 (d, $J = 6.8$ Hz, 1H, quinoline-H$_2$) ppm.

$^{13}$C NMR (DMSO-$d_6$) : $\delta$ 14.9 (CH$_3$), 66.5 (OCH$_2$), 108.3, 117.5, 122.1, 127.2, 129.9, 136.5, 140.5, 149.3, 155.6 (quinoline carbons), 143.7 (=CH), 126.8, 147.9
(pyrazolin-5-one carbons), 171.8 (C=O in pyrazolin-5-one), 126.9, 127.8, 129.5, 130.2, 133.6, 134.7 (aromatic carbons), 171.2 (C=O) ppm.

MS m/z: found 407 [M+2], 405 [M⁺]; calcd. 405. Anal. C_{22}H_{16}ClN_{3}O_{3}. Found C 64.56 (65.11), H 3.93 (3.97), N 10.24 (10.35).

4-(4-chlorobenzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5i)

Yield 74%. m.p. 194-196ºC.

IR (KBr)\(\nu_{\text{max}}\): 3058 (C-H stretching in aromatics), 2913 (aliphatic C-H stretching), 1685 (C=O stretching), 1504 (C=C stretch in aromatics), 1336, 1180 (sp²/sp³ C-O-C stretching), 1045 (aromatic C-Cl stretching) cm\(^{-1}\).

\(^1\)H NMR (DMSO-d\(_6\)) : \(\delta\) 2.36 (s, 3H, CH\(_3\)), 4.94 (s, 2H, OCH\(_2\)), 7.44 (d, J = 6.0 Hz, 2H, Ar-H), 7.69 (d, J = 5.8 Hz, 2H, Ar-H), 7.82 (s, 1H, Ar-CH=), 7.46-7.68 (m, 3H, quinoline-H\(_3\), H\(_5\) & H\(_7\)), 7.77 (t, J = 7.2 Hz, 1H, quinoline-H\(_6\)), 8.35 (d, J = 6.4 Hz, 1H, quinoline-H\(_4\)), 8.90 (d, J = 6.8 Hz, 1H, quinoline-H\(_2\)) ppm.

\(^{13}\)C NMR (DMSO-d\(_6\)) : \(\delta\) 15.2 (CH\(_3\)), 67.2 (OCH\(_2\)), 107.5, 117.6, 122.3, 126.5, 129.3, 135.9, 140.3, 149.2, 155.3 (quinoline carbons), 143.6 (=CH), 126.5, 148.2 (pyrazolin-5-one carbons), 172.4 (C=O in pyrazolin-5-one), 128.9, 131.3, 133.8, 135.2 (aromatic carbons), 170.8 (C=O) ppm.

MS m/z: found 407 [M+2], 405 [M⁺]; calcd. 405. Anal. C_{22}H_{16}ClN_{3}O_{3}. Found C 64.48 (65.11), H 3.91 (3.97), N 10.25 (10.35).
Experimental

Synthesis of 3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (4)

To a mixture of ethyl acetoacetate (0.01 mol) and 2-(quinolin-8-yloxy)acetohydrazide 3 (0.01 mol) in absolute ethanol (20 mL), catalytic amount of triethyl amine (1 mL) was added. The reaction mixture was refluxed for 8 hr. at 80ºC and after the completion of the reaction; the resultant heavy reddish syrup was allowed to cool to room temperature. The residue was dissolved in water, neutralized with NaHCO\textsubscript{3}, filtered and washed thoroughly with ether to remove impurities. The crude solid thus separated out was filtered off and purified by recrystallization from ethanol to furnish the pure compound 4.

Synthesis of 4-(substituted benzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-ones (5a-i)

A mixture of 3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one 4 (0.01 mol) and different aldehydes (0.01 mol) were suspended in dichloromethane (20 mL) and refluxed for 1 hr. at 70ºC using imidazole as a catalyst. On cooling, the crude product was precipitated, filtered under vacuum and washed with cold methanol to remove impurities and recrystallized from ethanol to afford 5a-i.
Fig 5.1 IR Spectrum of 3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (4)
Fig 5.2 $^1$H NMR Spectrum of 3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (4)
Fig 5.3 IR Spectrum of 4-benzylidene-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5a)
Fig 5.4 IR Spectrum of 4-(4-chlorobenzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5i)
Fig 5.5 $^1$H NMR Spectrum of 4-benzylidene-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5a)
Fig 5.6 $^{13}$C NMR Spectrum of 4-benzyldene-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5a)
Fig 5.7 Mass spectrum of 4-(4-methoxybenzylidene)-3-methyl-1-(2-(quinolin-8-yloxy)acetyl)-1H-pyrazol-5(4H)-one (5e)
References


