Supporting Information

Cp^*Co^{III}-Catalyzed Alkylation of Primary and Secondary $C(sp^3)$-H Bonds of 8-Alkylquinolines with Maleimides

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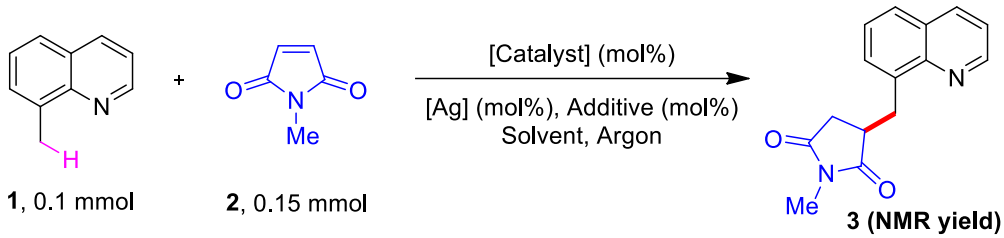
1. Reaction of 8-methyl quinoline with N-methyl maleimide

1.1 *Table S1. Optimization details*

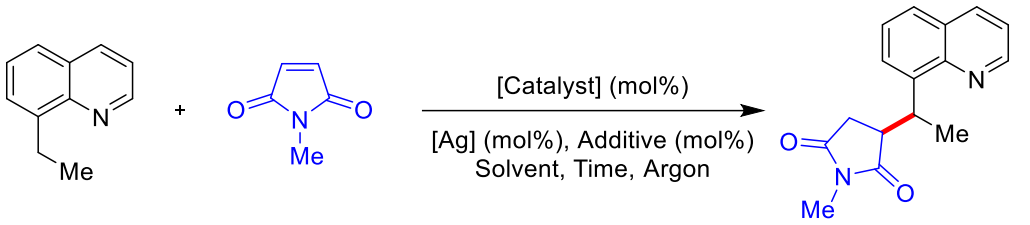


Entry	Catalyst (mol%)	[Ag] (mol%)	Additive (mol%)	Solvent	Temp. (℃)	NMR Yield (%)[b]
1	$Cp^*Co(CO)I_2$ (10)	$AgSbF_6$ (20)	-	TFE	100	10
2	$Cp^*Co(CO)I_2$ (10)	-	AdCOOH (20)	TFE	100	25
3	$Cp^*Co(CO)I_2$ (10)	-	-	TFE	100	n.d.
4	-	AgOTf (20)	AdCOOH (20)	TFE	100	n.d.
5	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	NaOAc (20)	TFE	100	40
6	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	PivOH (20)	TFE	100	22
7	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AcOH (20)	TFE	100	25
8	**$Cp^*Co(CO)I_2$ (10)**	**$AgNTf_2$ (20)**	**AdCOOH (20)**	**TFE**	**100**	**98**
9	$Cp^*Co(CO)I_2$ (10)	$AgSbF_6$ (20)	AdCOOH (20)	TFE	100	85
10	**$Cp^*Co(CO)I_2$ (10)**	**AgOTf (20)**	**NaOPiv (20)**	**TFE**	**100**	**95**
11	**$Cp^*Co(CO)I_2$ (10)**	**AgOTf (20)**	**AdCOOH (20)**	**TFE**	**100**	**98**
12	**$Cp^*Co(CO)I_2$ (5)**	**AgOTf (10)**	**AdCOOH (10)**	**TFE**	**100**	**95 (92)[c]**
13	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	TFE	Rt	15
14	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	TFE	50	30
15	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	TFE	80	75
16	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	TFE	70	70
17	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	TFE	90	90
18	$[Ru(p\text{-cymene})Cl_2]_2$ (5)	AgOTf (20)	AdCOOH (20)	TFE	100	40
19	$[Cp^*RhCl_2]_2$ (5)	AgOTf (20)	AdCOOH (20)	TFE	100	40
20	$[Cp^*IrCl_2]_2$ (5)	AgOTf (20)	AdCOOH (20)	TFE	100	n.d.
21	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	DCE	100	46
22	$Cp^*Co(CO)I_2$(10)	AgOTf (20)	AdCOOH (20)	toluene	100	n.d.
23	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	ACN	100	n.d.
24	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	H_2O	100	n.d.
25[c]	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	TFE	100	46

[a]reaction conditions: 1a (0.1 mmol), 2a (0.15 mmol), solvent (0.5 ml), under argon. [b]NMR yield of crude reaction mixture was calculated by using tetrachloroethane (TCE) as internal standard, [c]isolated yield, [d]2a (2 equiv.).

2. Reaction of 8-ethyl quinoline with N-methyl maleimide

2.1 Table S2. Optimization details

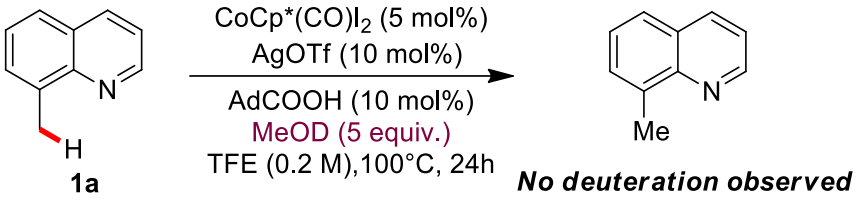


Entry	Catalyst (mol%)	[Ag] (mol%)	Additive (mol%)	Solvent	Time	Temp. (℃)	NMR Yield (%)[b]
1	$Cp^*Co(CO)I_2$ (5)	AgOTf (10)	AdCOOH (10)	TFE	48h	100	33 (30)[c]
2	**$Cp^*Co(CO)I_2$ (10)**	**AgOTf (20)**	**AdCOOH (20)**	**TFE**	**24h**	**100**	**48 (44)[c]**
3	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	TFE	48h	100	45
4	$Cp^*Co(CO)I_2$ (2.5)	AgOTf (10)	AdCOOH (10)	TFE	24h	100	<5
5	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (10)	TFE	24h	100	42
6	$Cp^*Co(CO)I_2$ (10)	AgOTf (10)	AdCOOH (20)	TFE	24h	100	<5
7	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (100)	TFE	24h	100	<5
8	$Cp^*Co(CO)I_2$ (10)	AgOTf (100)	AdCOOH (20)	TFE	24h	100	<5
9[d]	$Cp^*Co(CO)I_2$ (20)	AgOTf (30)	AdCOOH (30)	TFE	24h	100	31
10	$Cp^*Co(CO)I_2$ (10)	AgOTf (40)	AdCOOH (20)	TFE	24h	100	<5
11	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	HFIP	24h	100	n.d.
12	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	DCE	24h	100	<5
13	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	toluene	24h	100	n.d.
14	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	1,4 dioxane	24h	100	n.d.
15	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	DMF	24 h	100	n.d.
16	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AdCOOH (20)	DME	24h	100	n.d.
17	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	NaOPiv (20)	TFE	24h	100	>5
18	$Cp^*Co(CO)I_2$ (10)	AgOTf (20)	AcOH (20)	TFE	24h	100	15

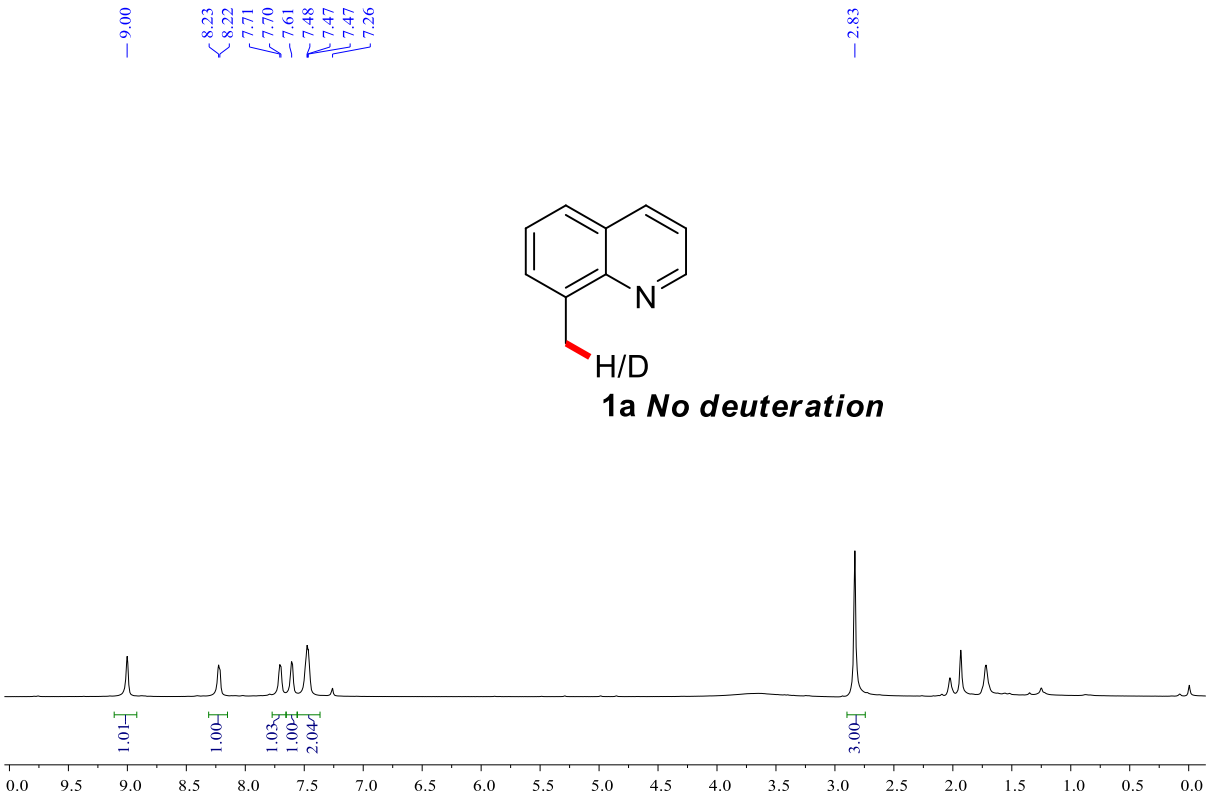
[a]reaction conditions: 1a (0.1 mmol), 2a (0.15 mmol), solvent (0.5 ml), under argon. [b]NMR yield of crude reaction mixture was calculated by using tetrachloroethane (TCE) as internal standard, [c]isolated yield, [d]**2a** (2 equiv.).

3. Mechanistic study

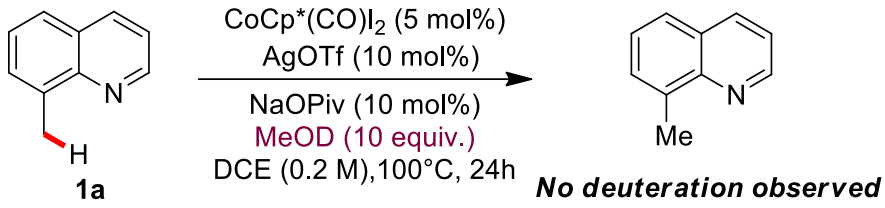
3.1 Scheme S1. Deuterium lebling experiments



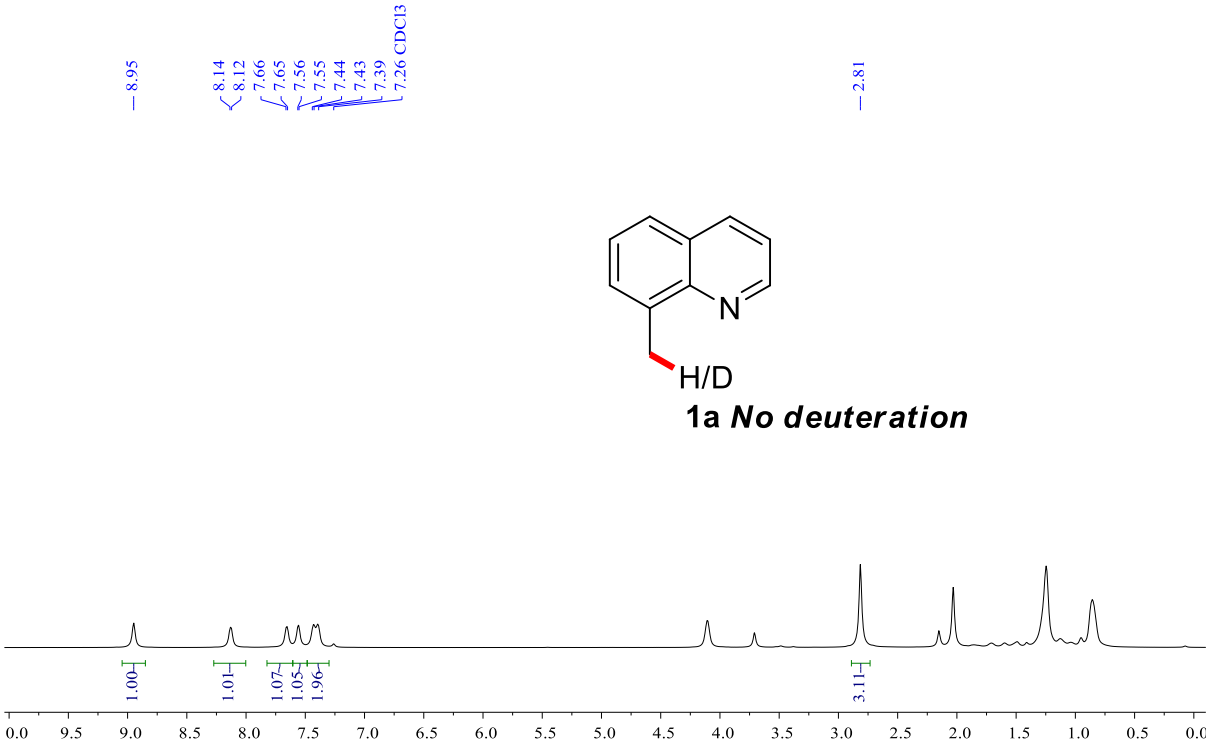
To an oven-dried screw cap reaction vial charged with a spin vane magnetic stir-bar, [Cp*Co(CO)I_2] (5 mol%), AgOTf (10 mol%), AdCOOH (10 mol%) were added under argon atmosphere followed by addition of 8-methyl quinoline (0.1 mmol), CD_3OD (5 equiv.), and 2,2,2-Trifluoroethanol (0.5 mL) subsequent reaction mixture was stir at 100 ℃ for 24 h. The solvent was evaporated under reduced pressure and the crude mixture was purified by flash chromatography using silica gel (230-400 mesh size) and *n*-hexane: EtOAc as eluent. No deuteration was observed in the ^{1}H NMR analysis.



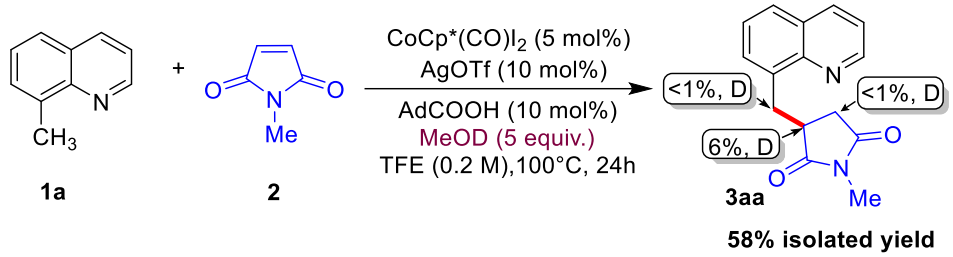
3.2 Scheme S2. Deuterium lebling experiments



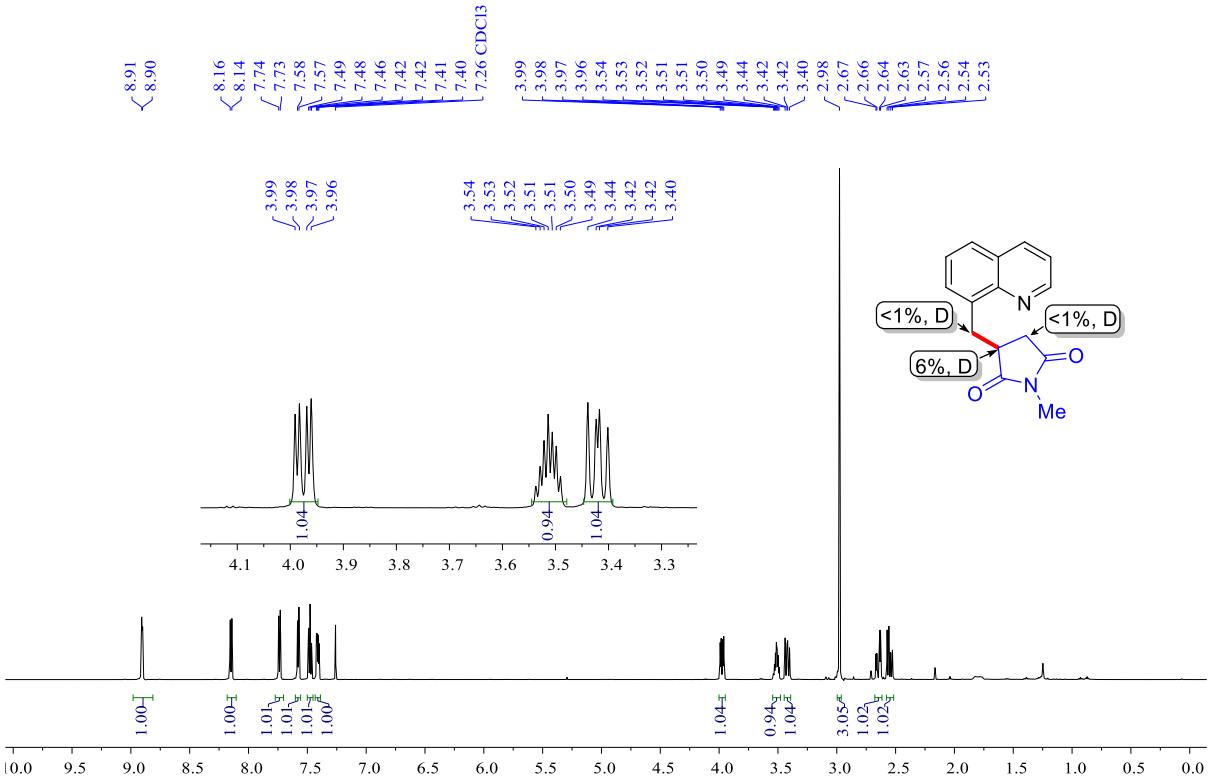
To an oven-dried screw cap reaction vial charged with a spin vane magnetic stir-bar, [Cp*Co(CO)I_2] (5 mol%), AgOTf (10 mol%), NaOPiv (10 mol%) were added under argon atmosphere followed by addition of 8-methyl quinoline (0.1 mmol), CD_3OD (10 equiv.), and DCE (0.5 mL) subsequent reaction mixture was stir at 100 ℃ for 24 h. Solvent was evaporated under reduced pressure and the crude mixture was purified by flash chromatography using silica gel (230-400 mesh size) and *n*-hexane: EtOAc as eluent. No deuteration was observed in the ^{1}H NMR analysis.



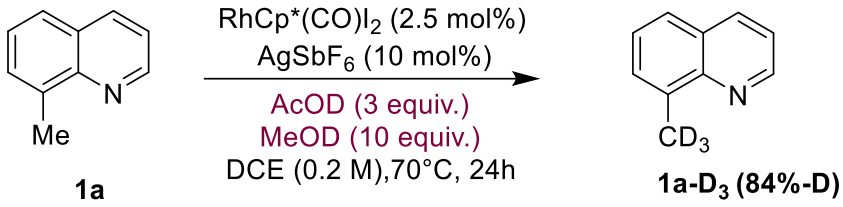
3.3 Scheme S3. Deuterium lebling experiments



To an oven-dried screw cap reaction vial charged with a spin vane magnetic stir-bar, *N*-methyl maleimide (0.3 mmol), [Cp*Co(CO)I_2] (5 mol%), AgOTf (10 mol%), AdCOOH (10 mol%) were added under argon atmosphere followed by addition of 8-methyl quinoline (0.2 mmol), CD_3OD (5 equiv.), and 2,2,2-Trifluoroethanol (1.0 mL) subsequent reaction mixture was stir at 100 ℃ for 24 h. The solvent was evaporated under reduced pressure and the crude mixture was purified by flash chromatography using silica gel (230-400 mesh size) and *n*-hexane: EtOAc as eluent. No deuteration was observed in the ^{1}H NMR analysis.

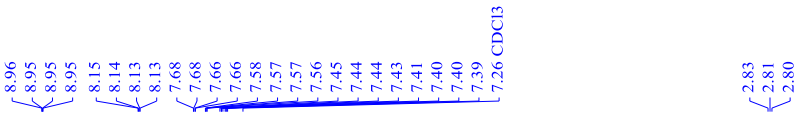


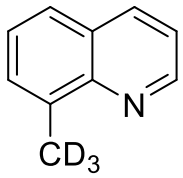
*3.4 Scheme S4. Synthesis of **1a-D$_3$***



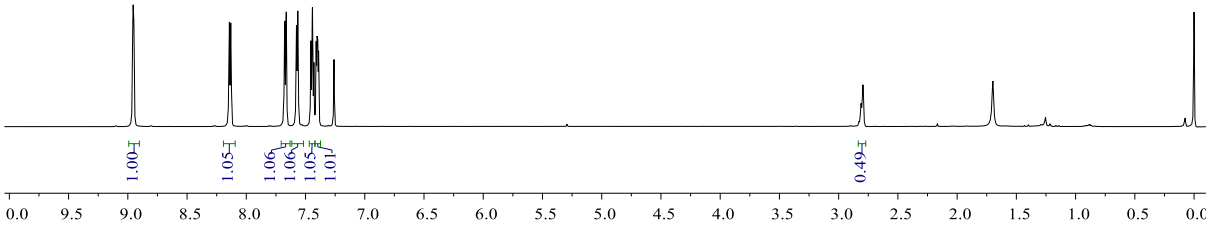
1a **1a-D$_3$ (84%-D)**

To an oven-dried screw cap reaction vial charged with a spin vane magnetic stir-bar, 8-methylquinoline (**1a**) (0.2 mmol), $[RhCp^*Cl_2]_2$ (2.5 mol %), AcOD (3 equiv.) and MeOD (20.0 equiv.) and AgSbF6 (10 mol %) were added in DCE (1 mL) under air at room temperature subsequent reaction mixture was stir at 70℃ for 24 h. The solvent was evaporated under reduced pressure and the crude mixture was purified by flash chromatography using silica gel (230-400 mesh size) and n-hexane: EtOAc as eluent.

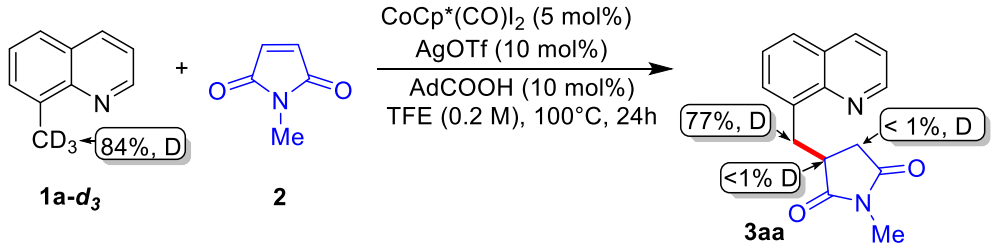




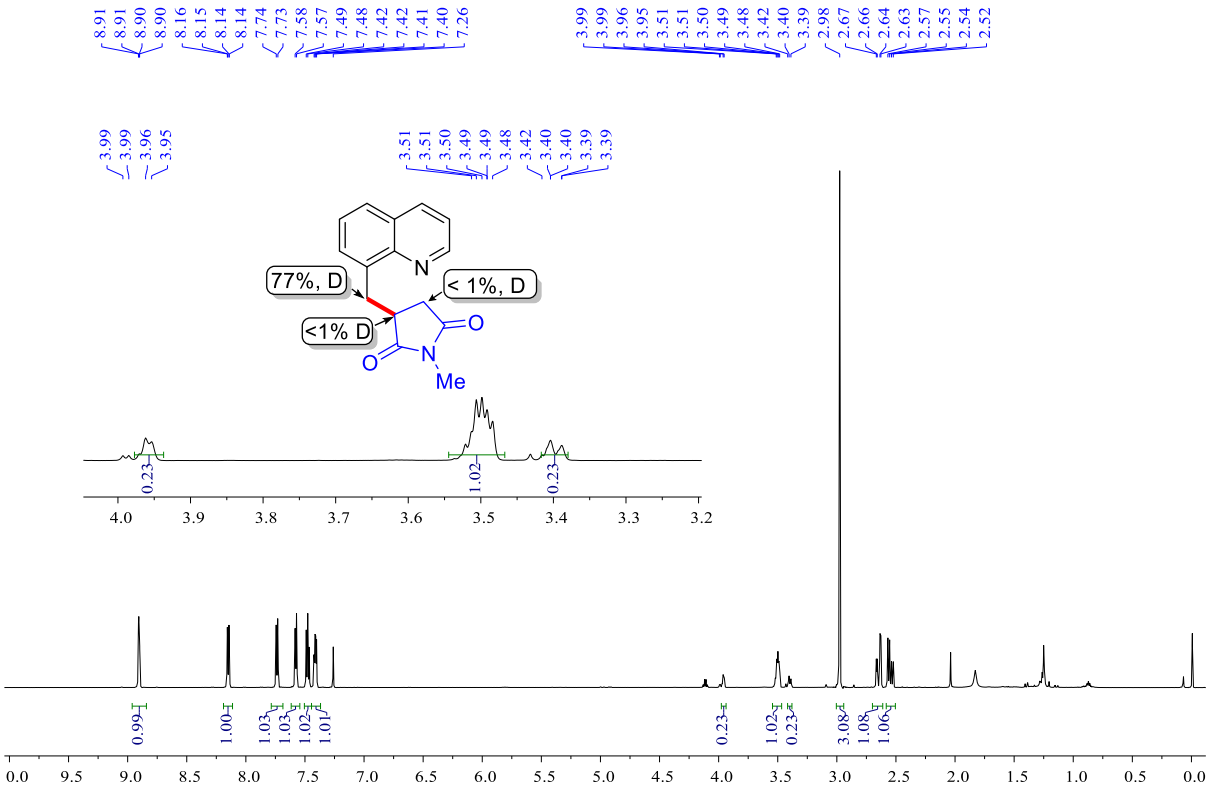
1a-D$_3$ (84%-D)



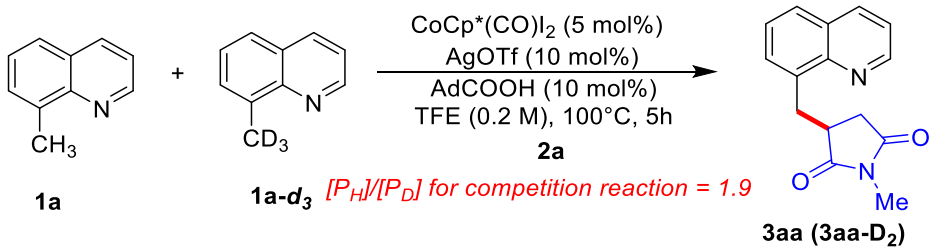
3.5 Scheme S5. Deuterium lebling experiment



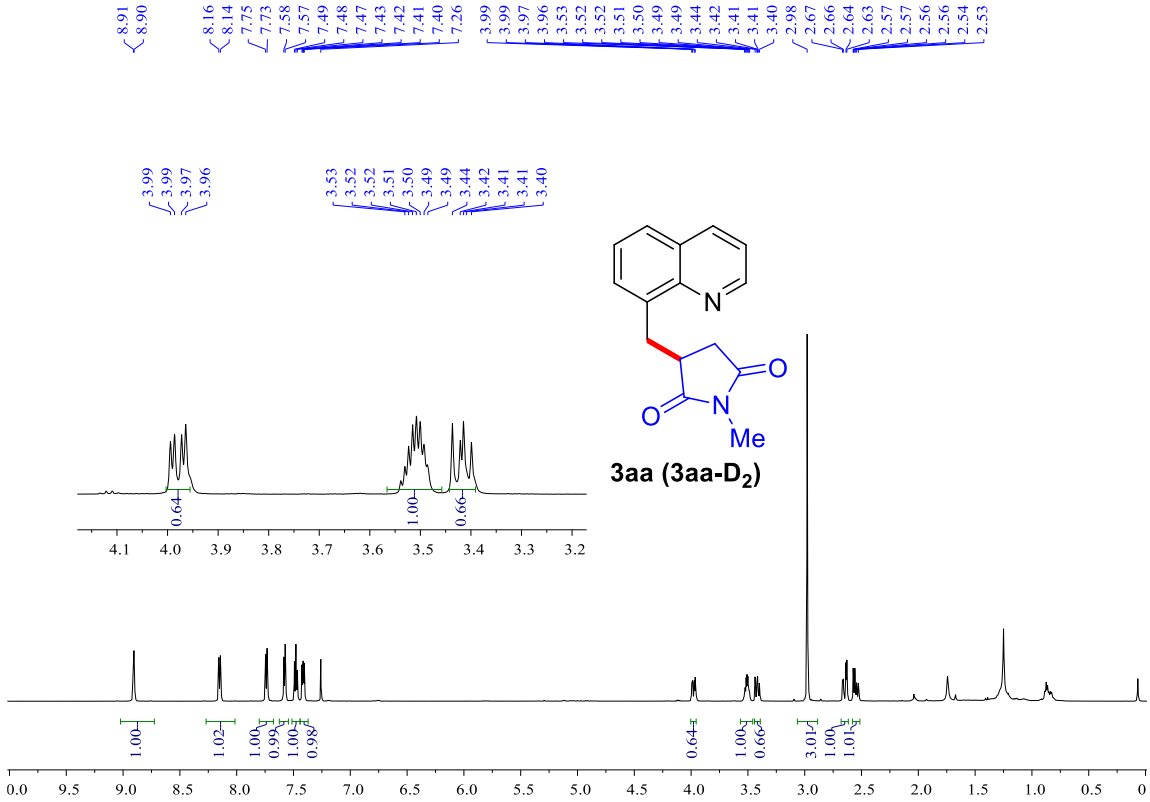
To an oven-dried screw cap reaction vial charged with a spin vane magnetic stir-bar, *N*-methyl maleimide (0.3 mmol), [Cp*Co(CO)I_2] (5 mol%), AgOTf (10 mol%), AdCOOH (10 mol%) were added under argon atmosphere followed by addition of 8-methyl quinoline-D_3 (0.2 mmol), and 2,2,2-Trifluoroethanol (1.0 mL) subsequent reaction mixture was stir at 100 ℃ for 24 h. The solvent was evaporated under reduced pressure and the crude mixture was purified by flash chromatography using silica gel (230-400 mesh size) and *n*-hexane: EtOAc as eluent. No deuterium exchange was observed in the ^{1}H NMR analysis.



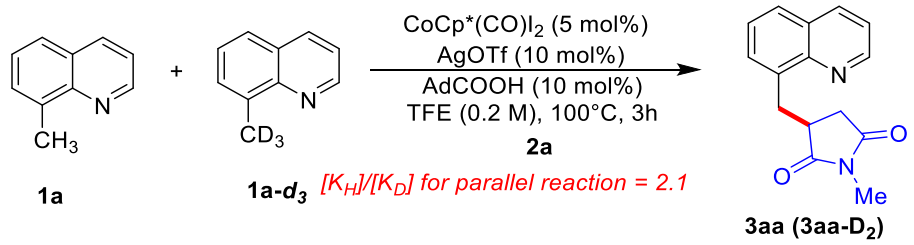
3.6 Scheme S6. Competition experiment Kinetic isotopic effect



To an oven-dried screw cap reaction vial charged with a spin vane magnetic stir-bar, *N*-methyl maleimide (0.3 mmol), [Cp*Co(CO)I_2] (5 mol%), AgOTf (10 mol%), AdCOOH (10 mol%) were added under argon atmosphere followed by addition of 8-methyl quinoline (0.1 mmol), 8-methyl quinoline-D_3 (0.1 mmol), and 2,2,2-Trifluoroethanol (1.0 mL) subsequent reaction mixture was stir at 100 ℃ for 24 h. The solvent was evaporated under reduced pressure and the crude mixture was purified by flash chromatography using silica gel (230-400 mesh size) and *n*-hexane: EtOAc as eluent. The kinetic isotopic effect value (k_H/k_D) was calculated from ^{1}H NMR analysis and found 1.9.

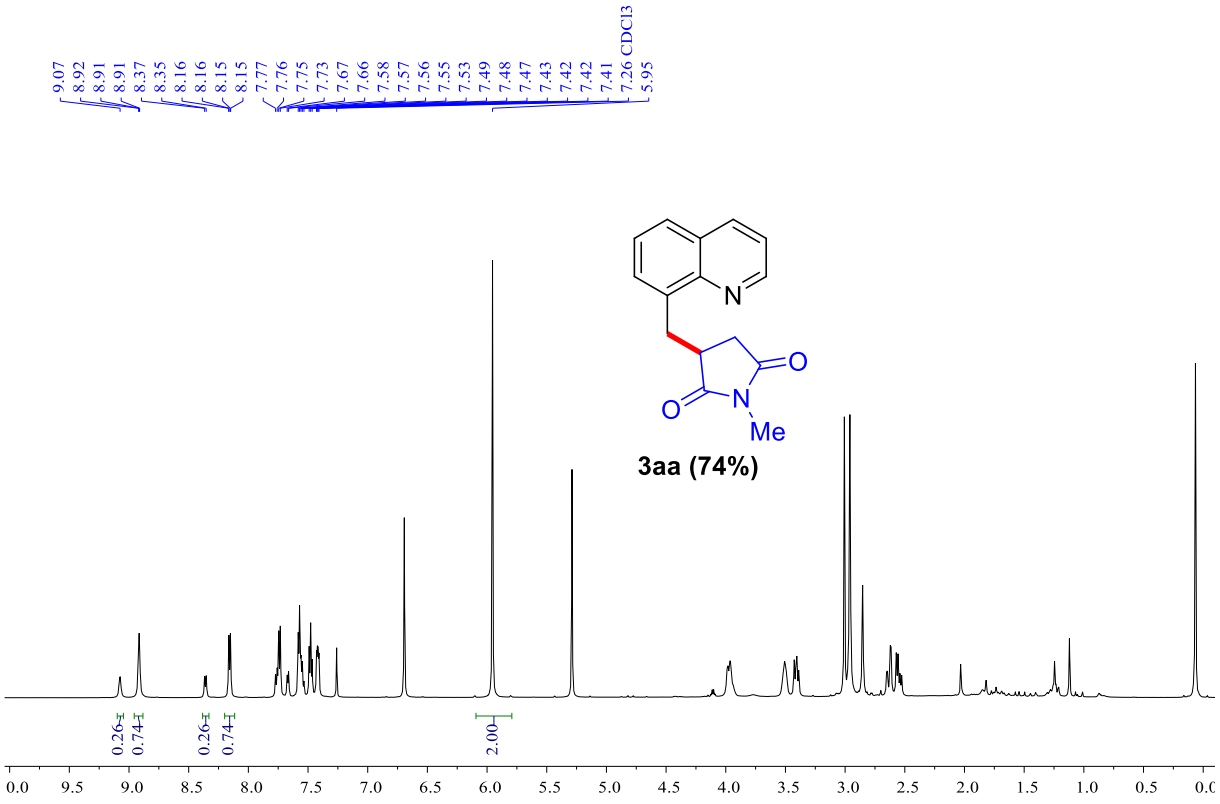


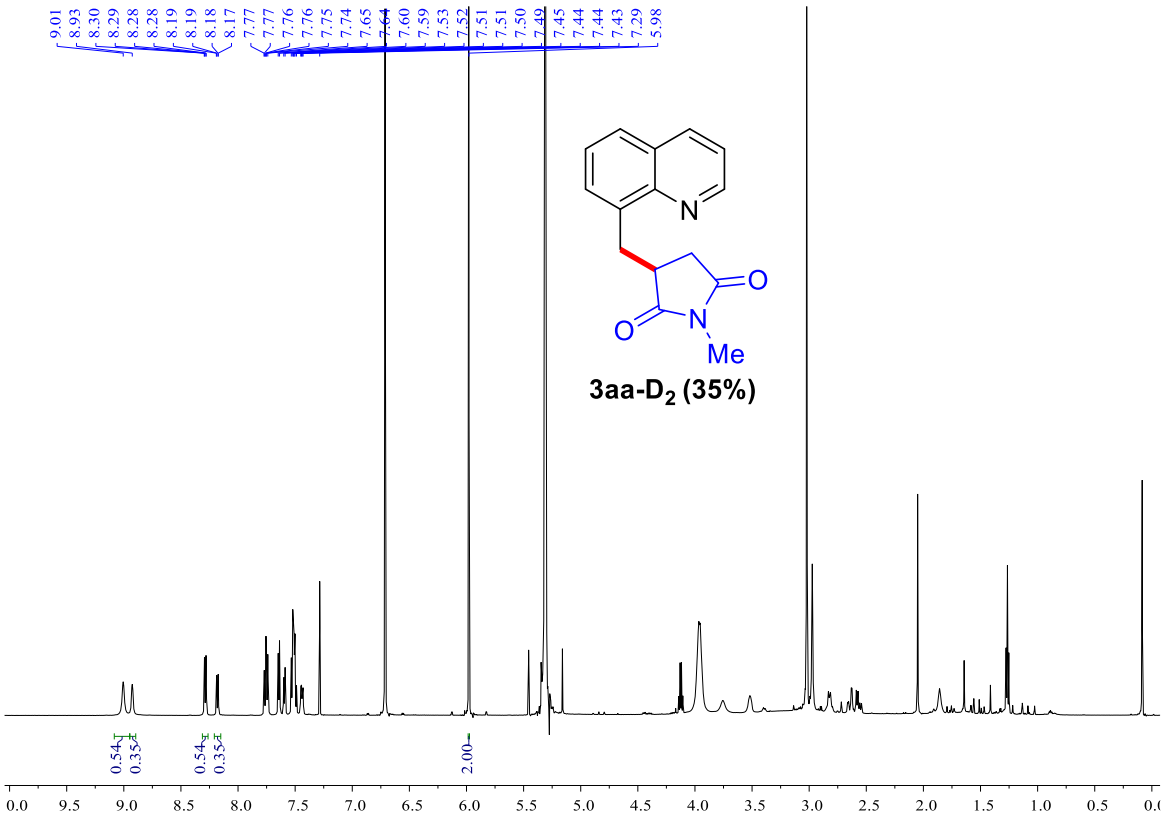
3.7 Scheme S7. Parallel experiment Kinetic isotopic effect



1a **1a-d_3** $[K_H]/[K_D]$ for parallel reaction = 2.1 **3aa (3aa-D_2)**

To an oven-dried screw cap reaction vial charged with a spin vane magnetic stir-bar, *N*-methyl maleimide (0.15 mmol), [Cp*Co(CO)I_2] (5 mol%), AgOTf (10 mol%), AdCOOH (10 mol%) were added under argon atmosphere followed by addition of 8-methyl quinoline (0.1 mmol), and 2,2,2-Trifluoroethanol (1.0 mL). In another reaction tube 8-methyl quinoline-d_3 (0.1 mmol) was used instead of 8-methyl quinoline. The two-reaction mixtures were allowed to stir at 100 ℃ for 3h. Both reaction mixtures were analysed through 1HNMR using TCE as an internal standard and the calculated NMR yields of products **3aa** and **3aa-D2** was 74% and 35% respectively. The kinetic isotope effect value (*k*H/*k*D) was found 2.1.

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7.50
7.49
7.45
7.44
7.44
7.43
7.29
5.98
N
O
O
N
Me
3aa-D2 (35%)
0.54
0.35
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0.35
2.00
0.0
9.5
9.0
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7.5
7.0
6.5
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4.5
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3.5
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2.5
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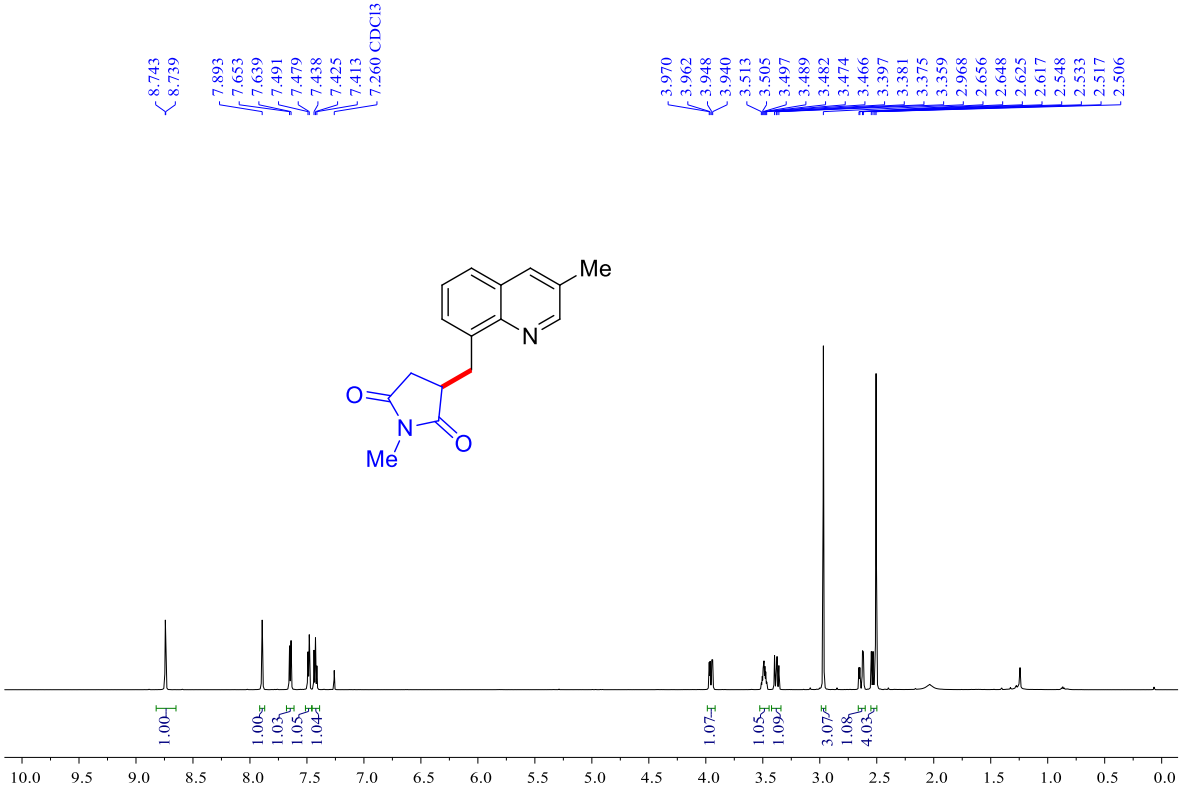
1.5
1.0
0.5

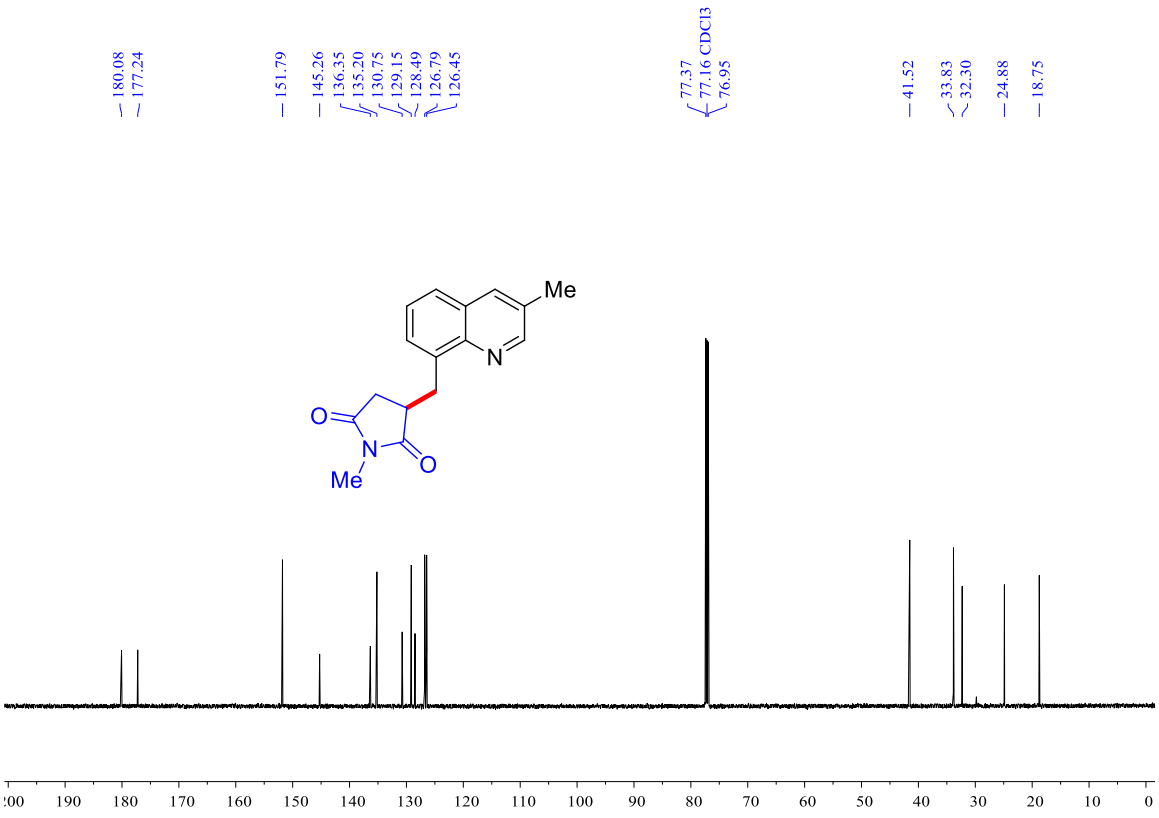
4. ^{1}H and ^{13}C Spectral Data

***1-Methyl-3-((3-methylquinolin-8-yl)methyl)pyrrolidine-2,5-dione (Table 2, entry 3ba)*:**

^{1}H NMR

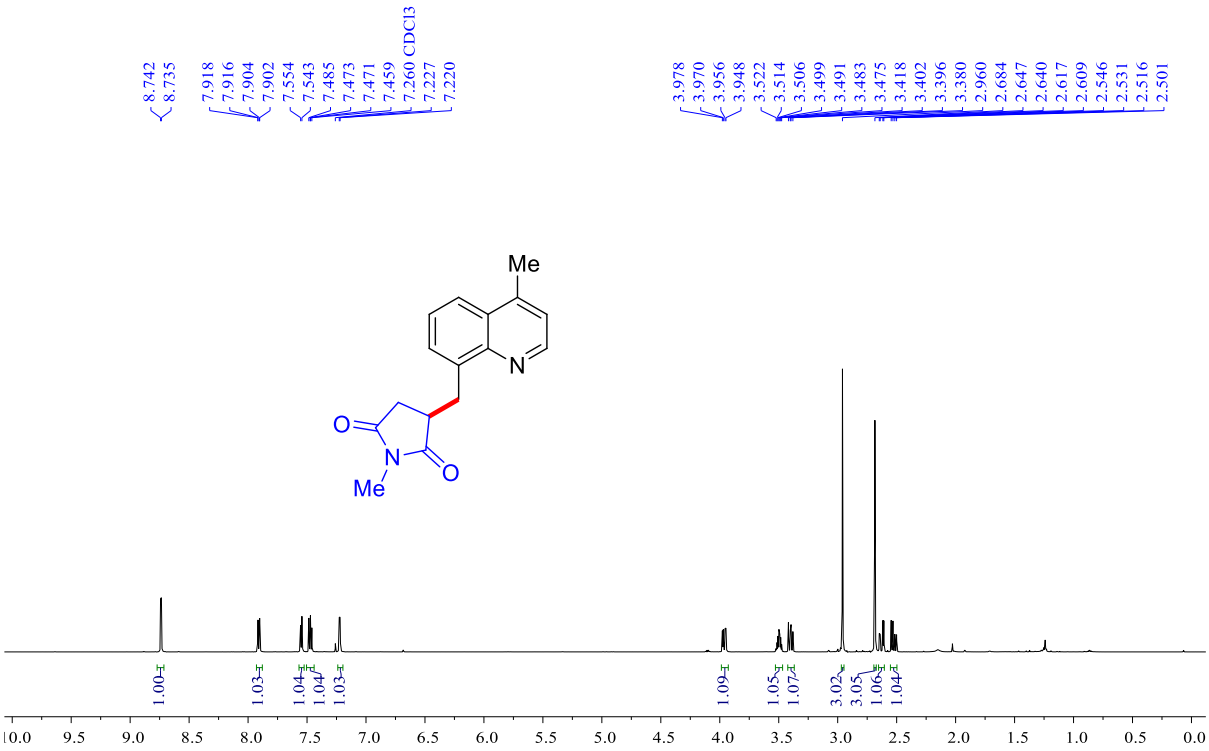


^{13}C NMR

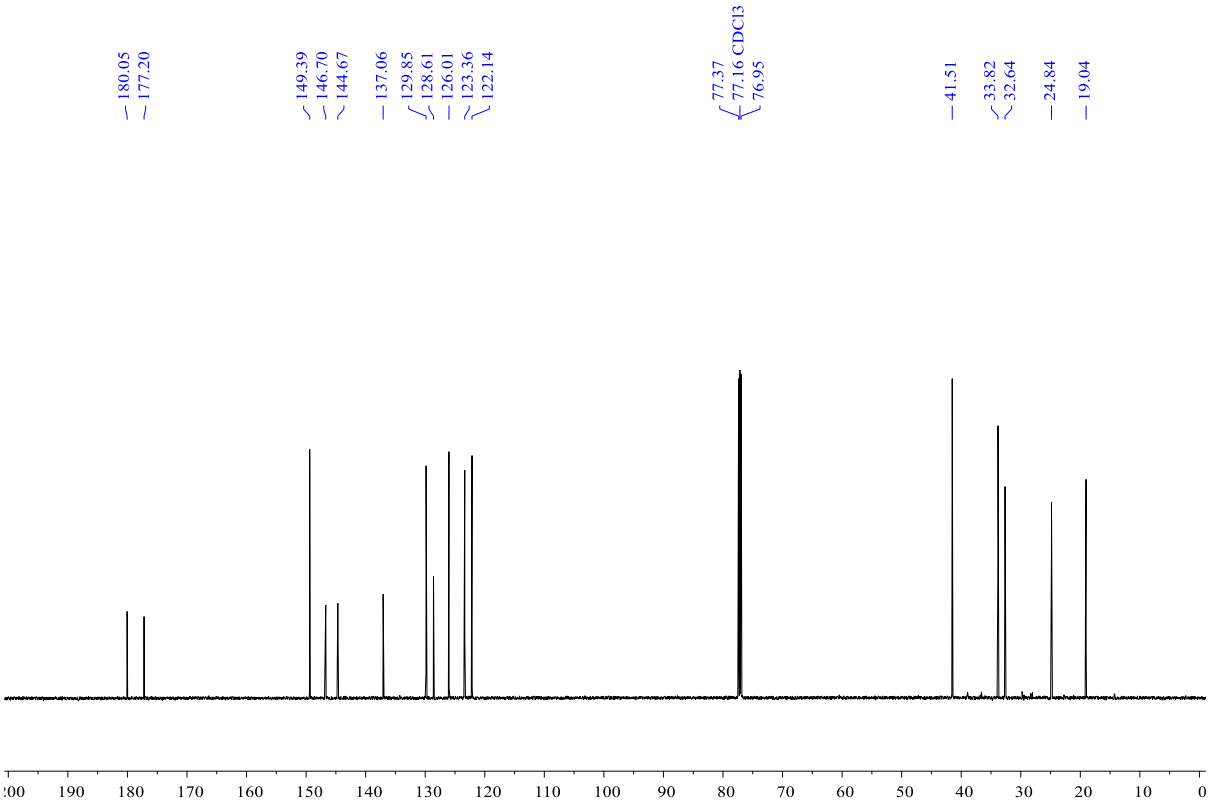


***1-Methyl-3-((4-methylquinolin-8-yl)methyl)pyrrolidine-2,5-dione (Table 2, entry 3ca)*:**

^{1}H NMR

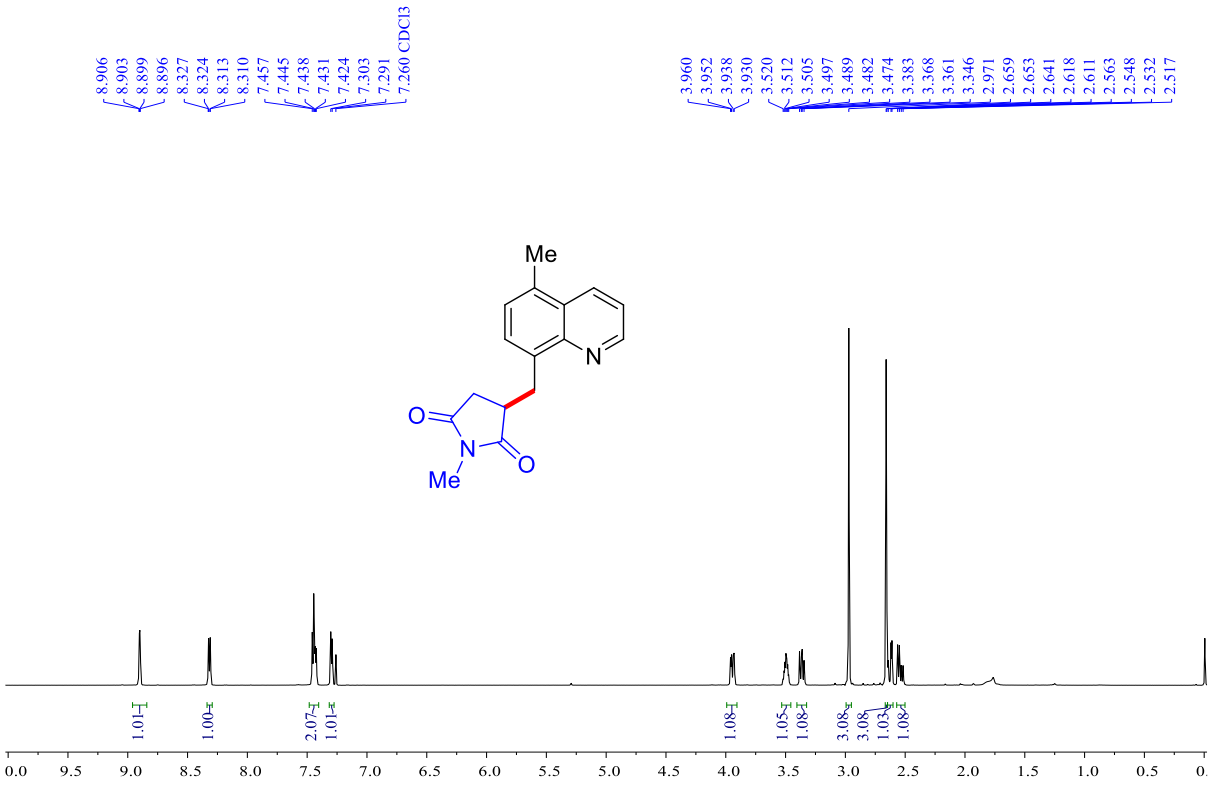


^{13}C NMR

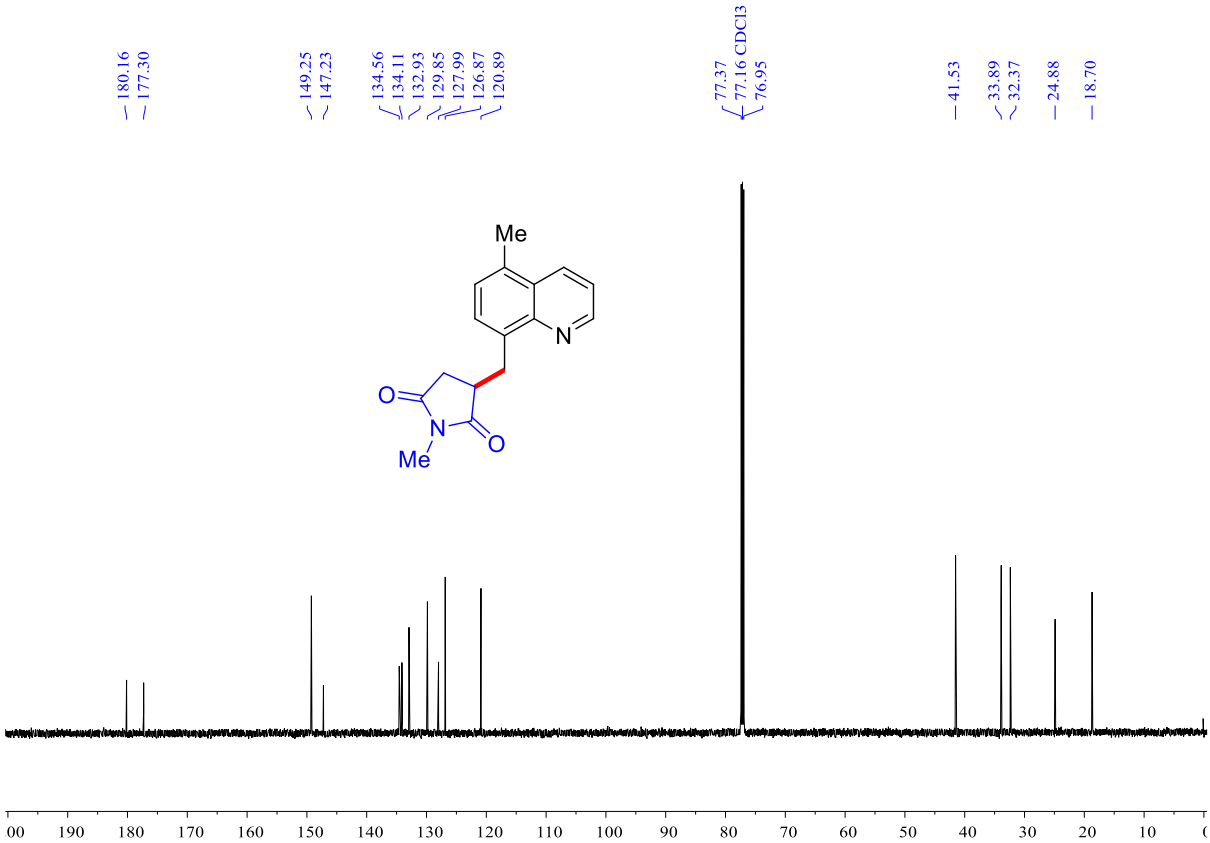


1-Methyl-3-((5-methylquinolin-8-yl)methyl)pyrrolidine-2,5-dione *(Table 2, entry 3da)*:

^{1}H NMR

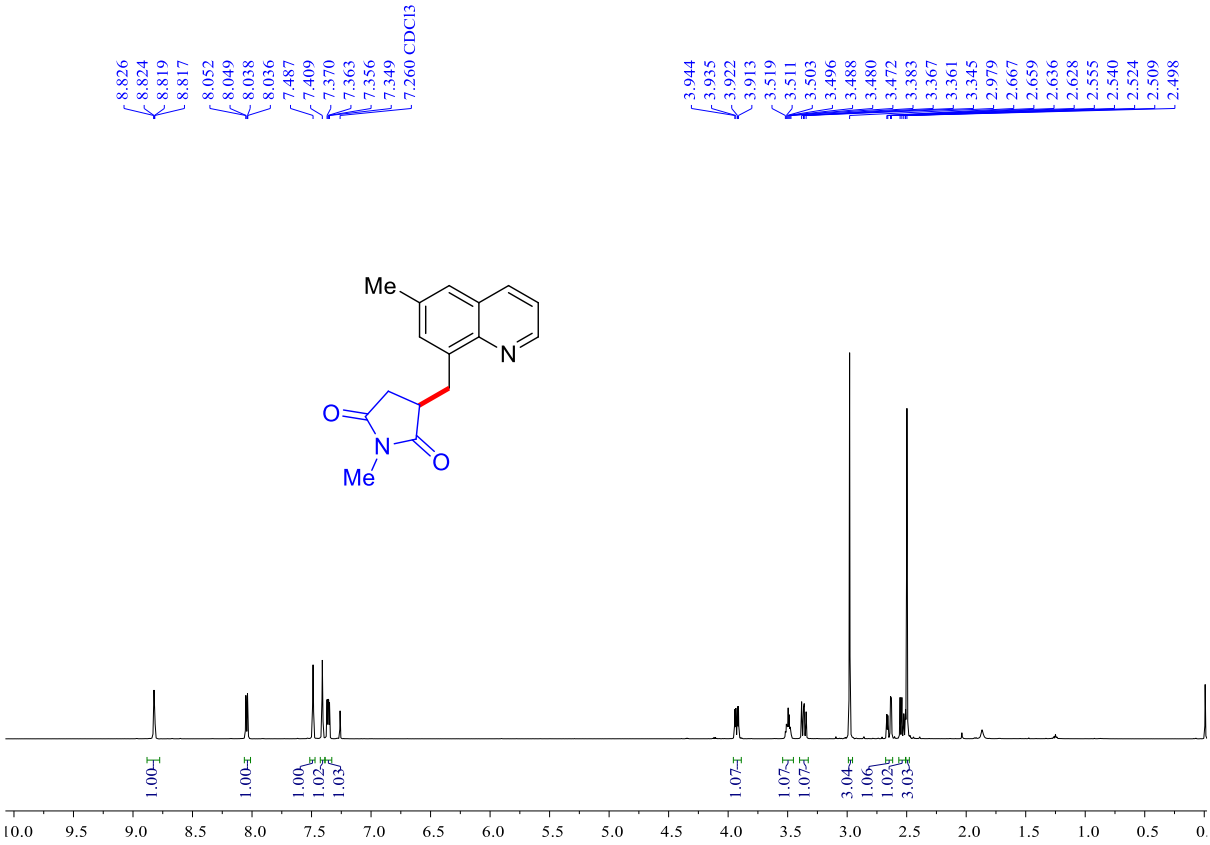


^{13}C NMR

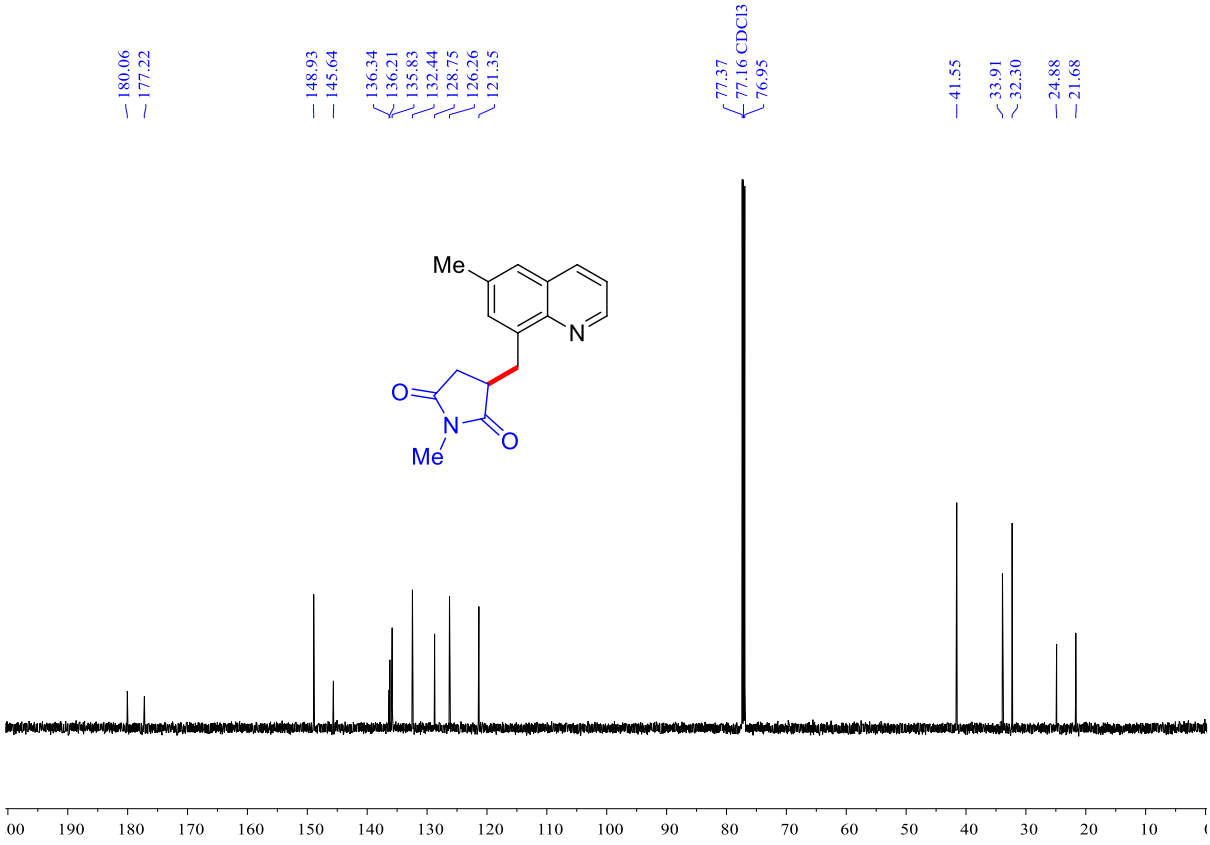


***1-Methyl-3-((6-methylquinolin-8-yl)methyl)pyrrolidine-2,5-dione (Table 2, entry 3ea)*:**

^{1}H NMR

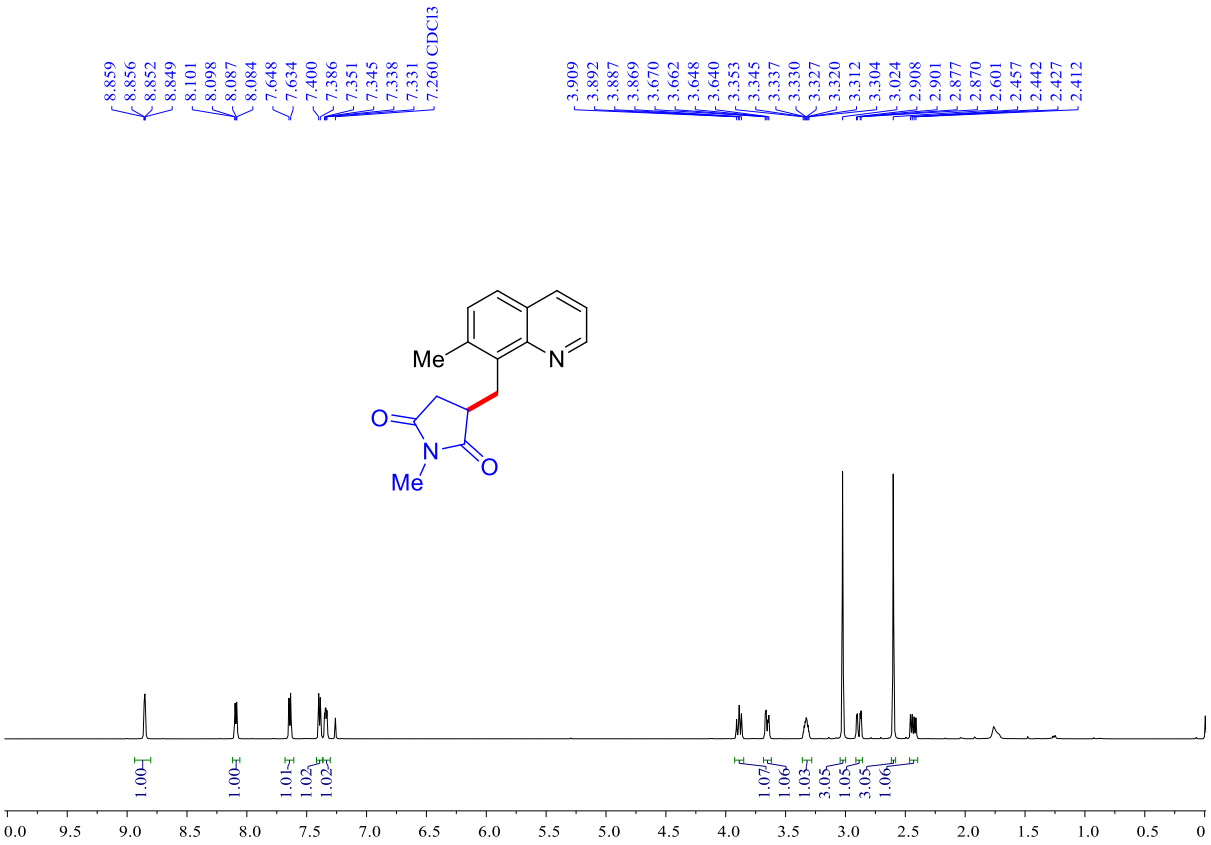


^{13}C NMR

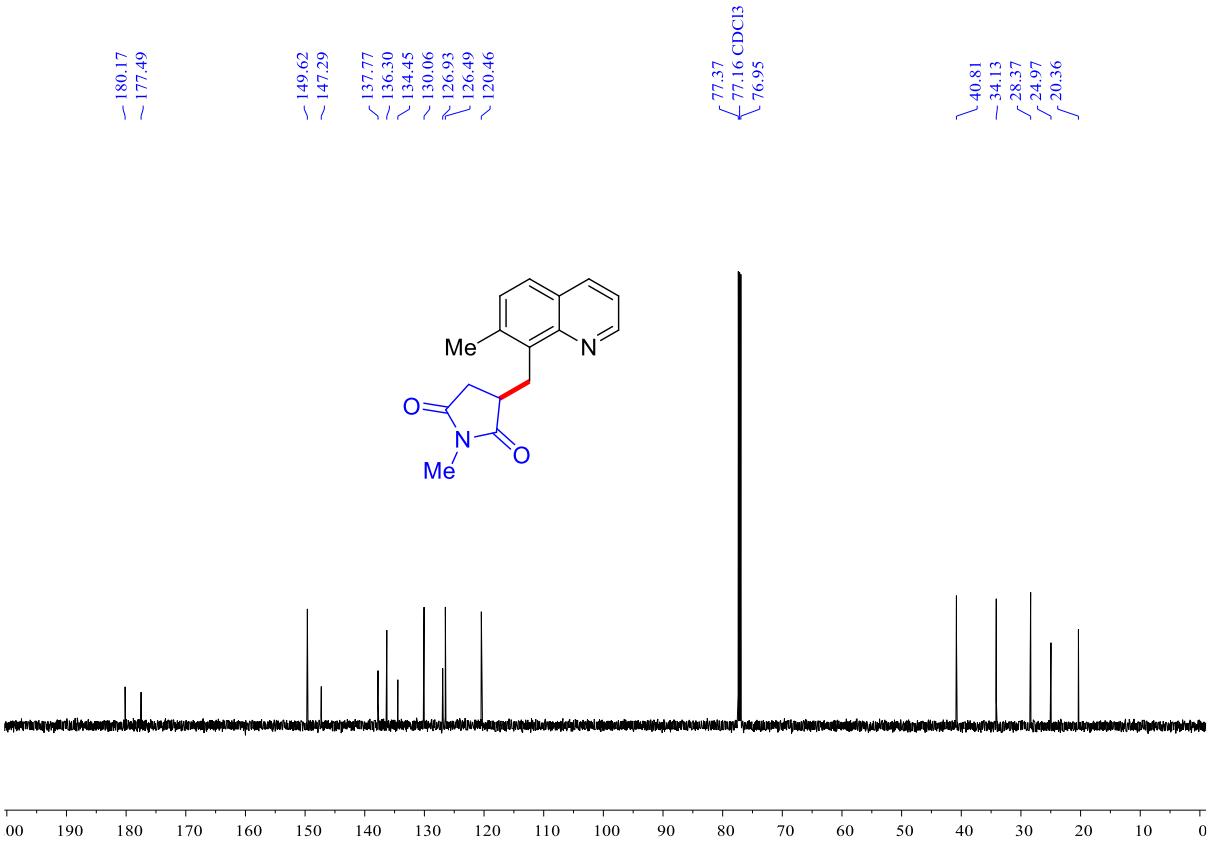


1-Methyl-3-((7-methylquinolin-8-yl)methyl)pyrrolidine-2,5-dione *(Table 2, entry 3fa)*:

^{1}H NMR

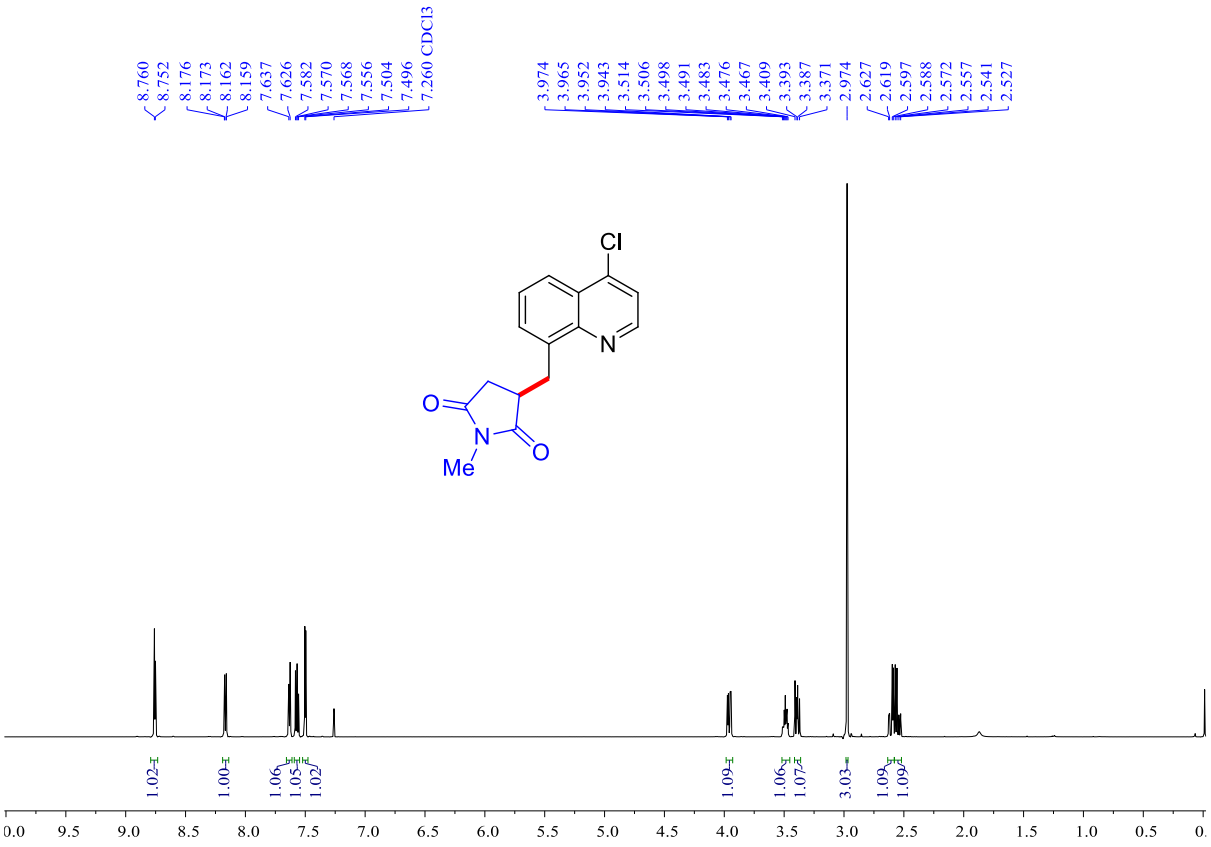


^{13}C NMR

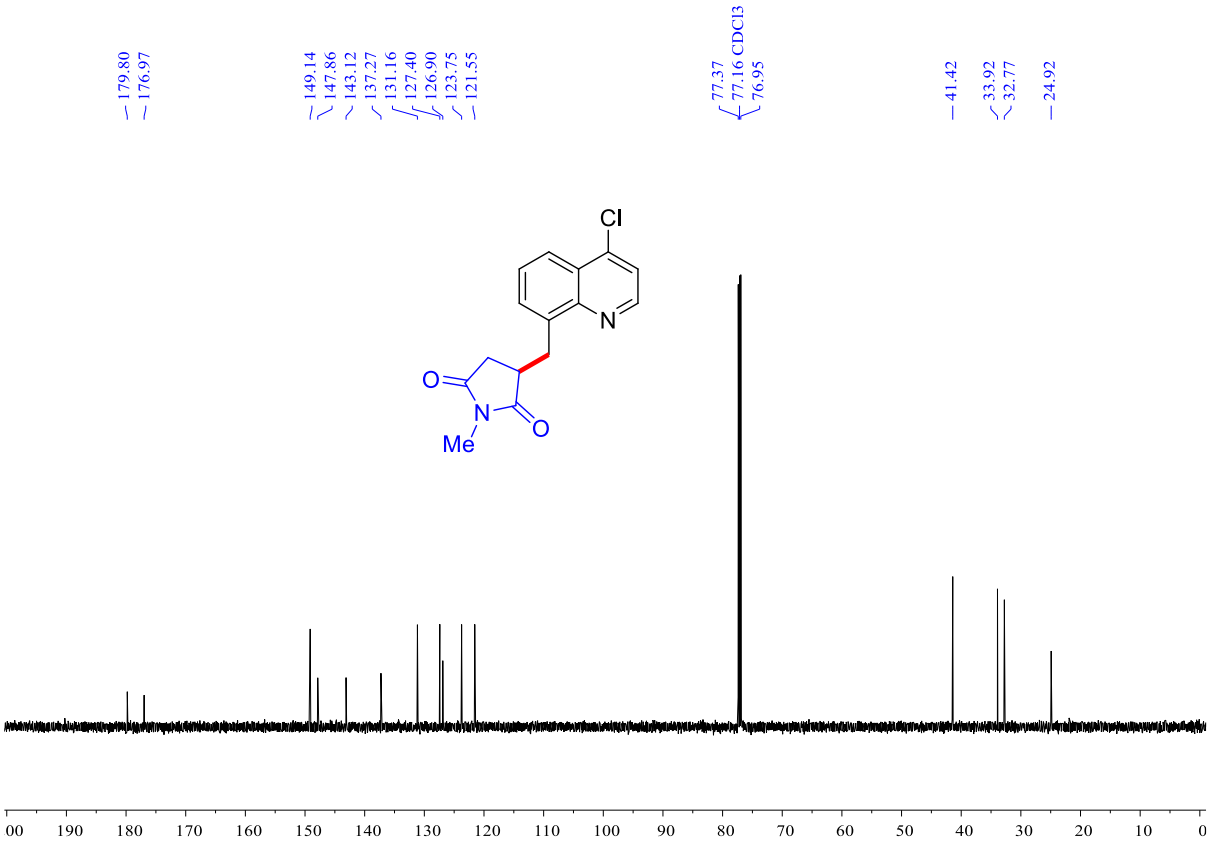


3-((4-Chloroquinolin-8-yl)methyl)-1-methylpyrrolidine-2,5-dione *(Table 2, entry 3ga)*:

^{1}H NMR

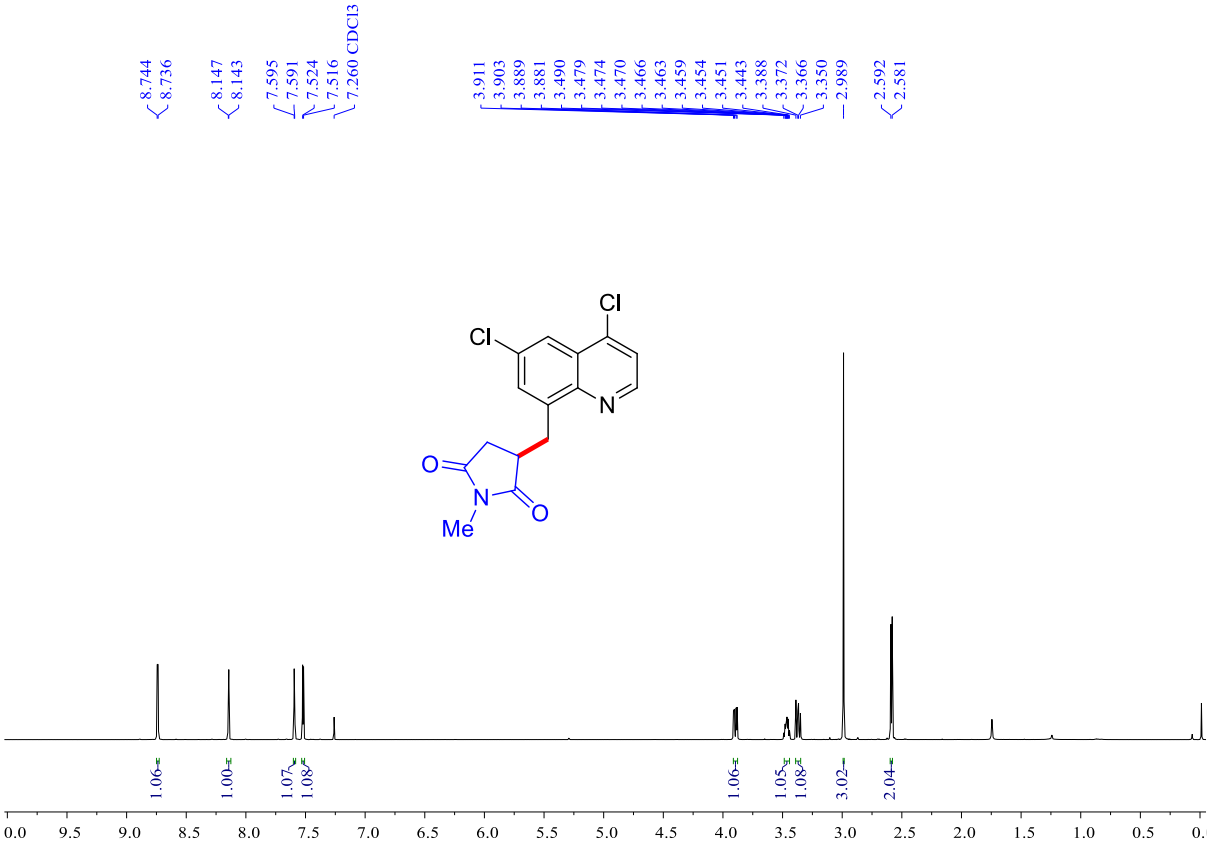


^{13}C NMR

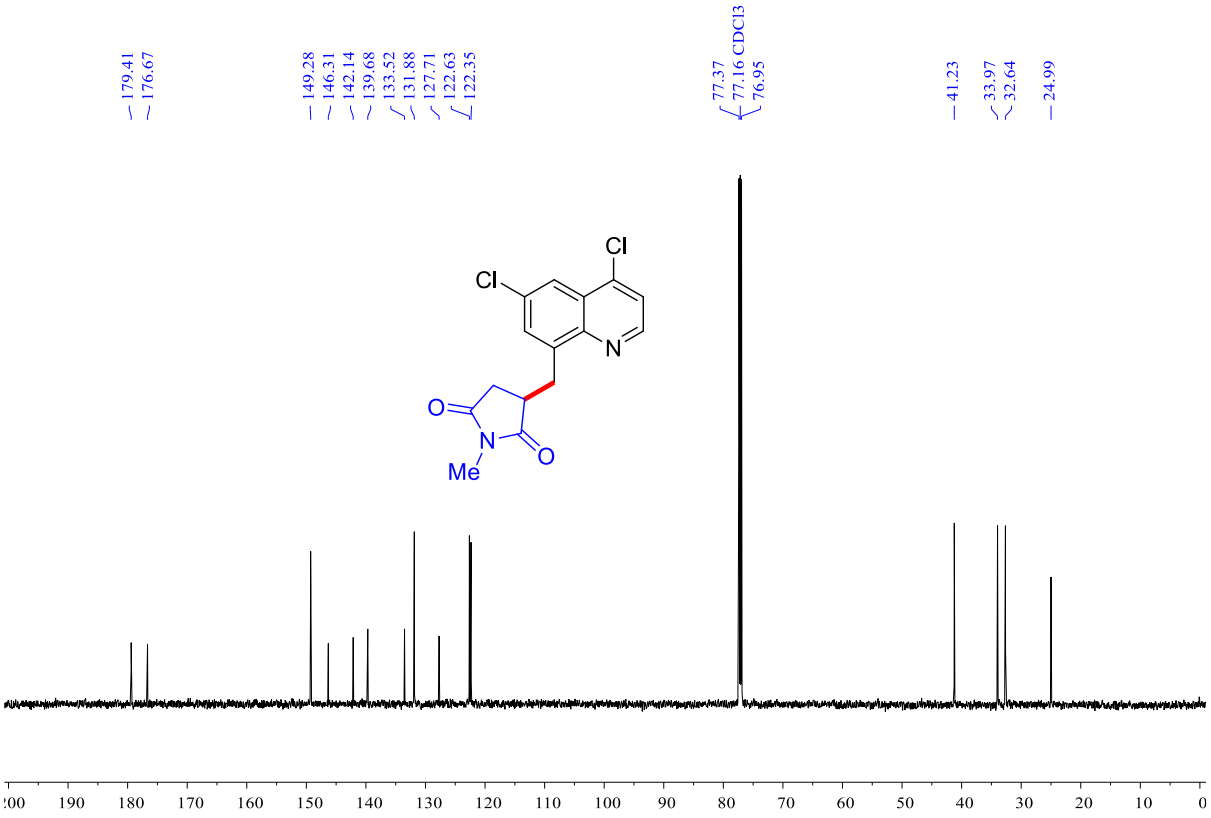


***3-((4,6-Dichloroquinolin-8-yl)methyl)-1-methylpyrrolidine-2,5-dione (Table 2, entry ha)*:**

^{1}H NMR

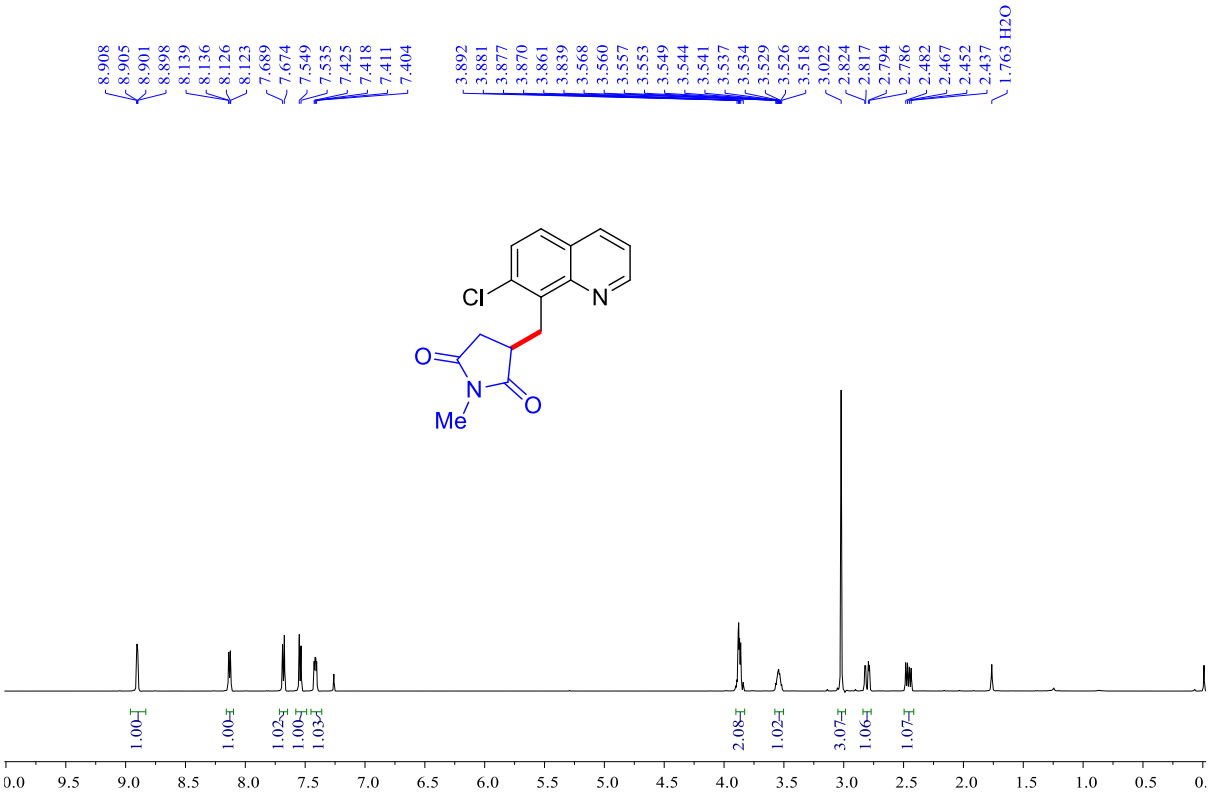


^{13}C NMR

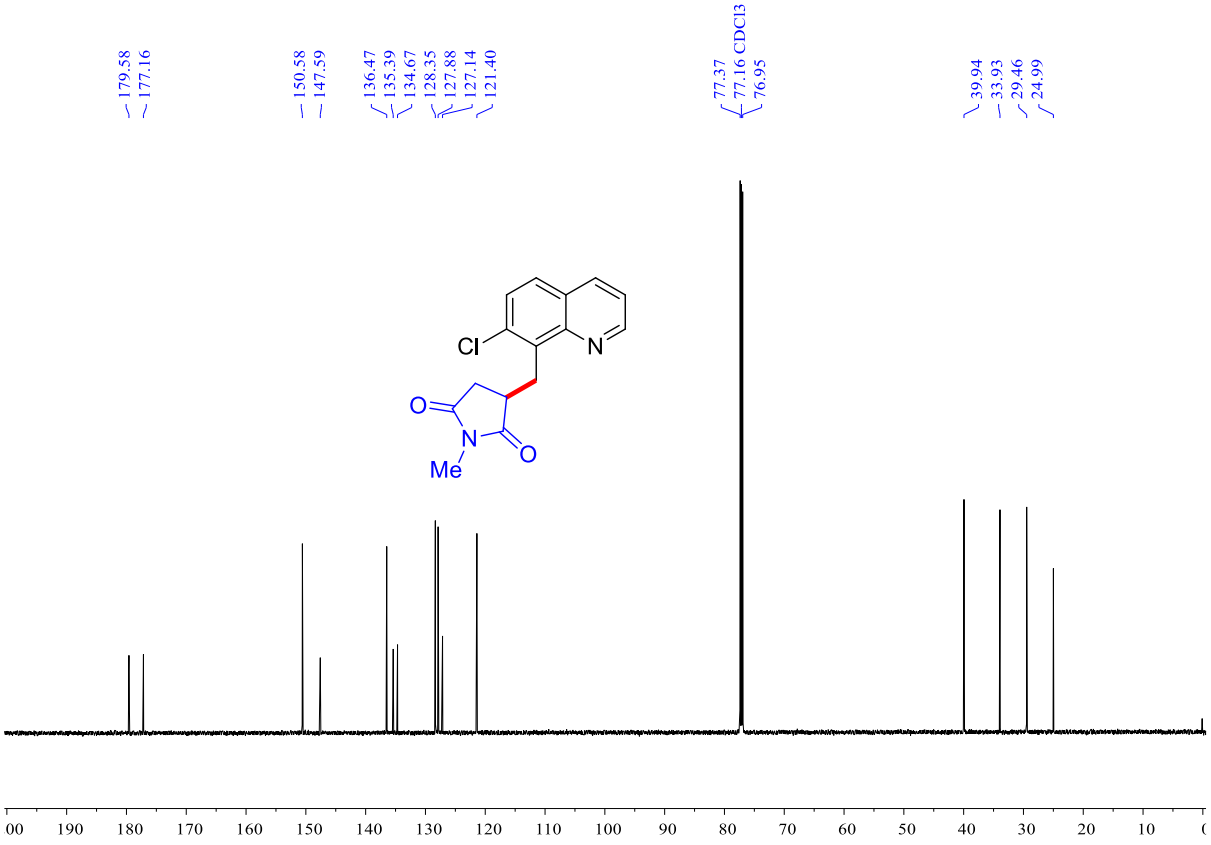


***3-((7-Chloroquinolin-8-yl)methyl)-1-methylpyrrolidine-2,5-dione (Table 2, entry ia)*:**

^{1}H NMR

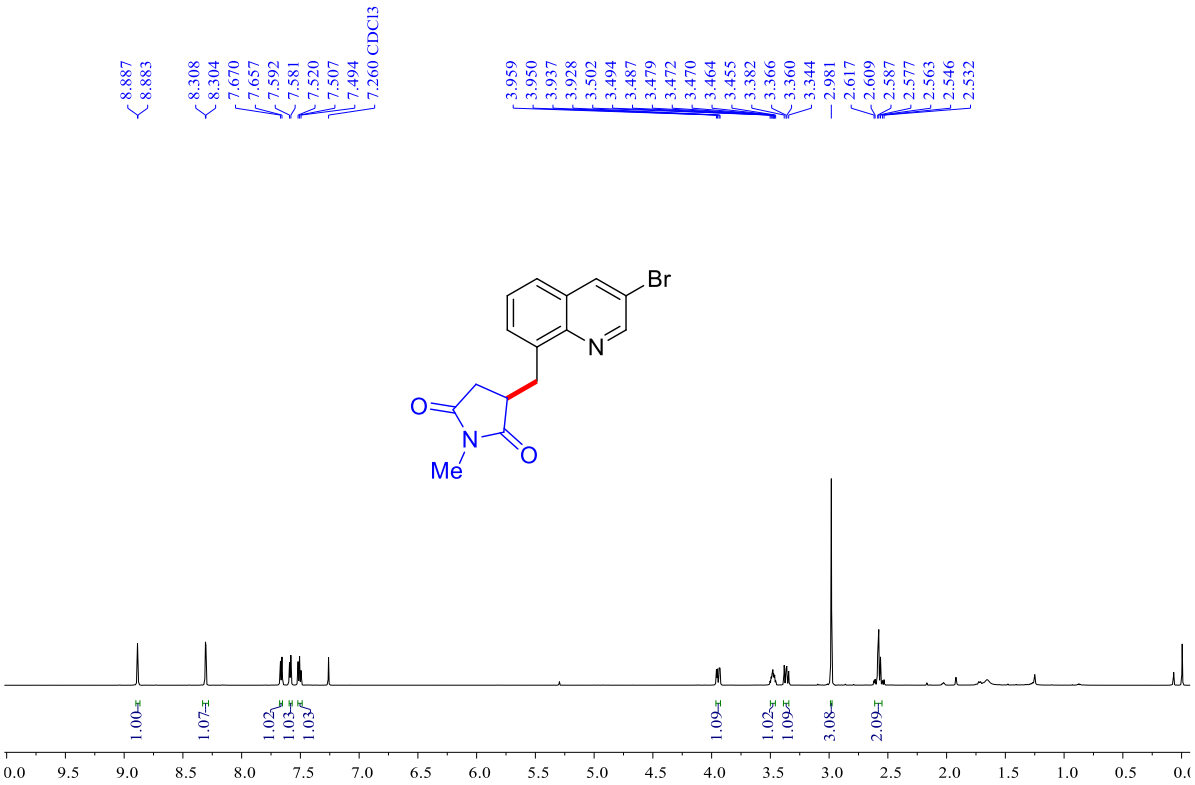


^{13}C NMR

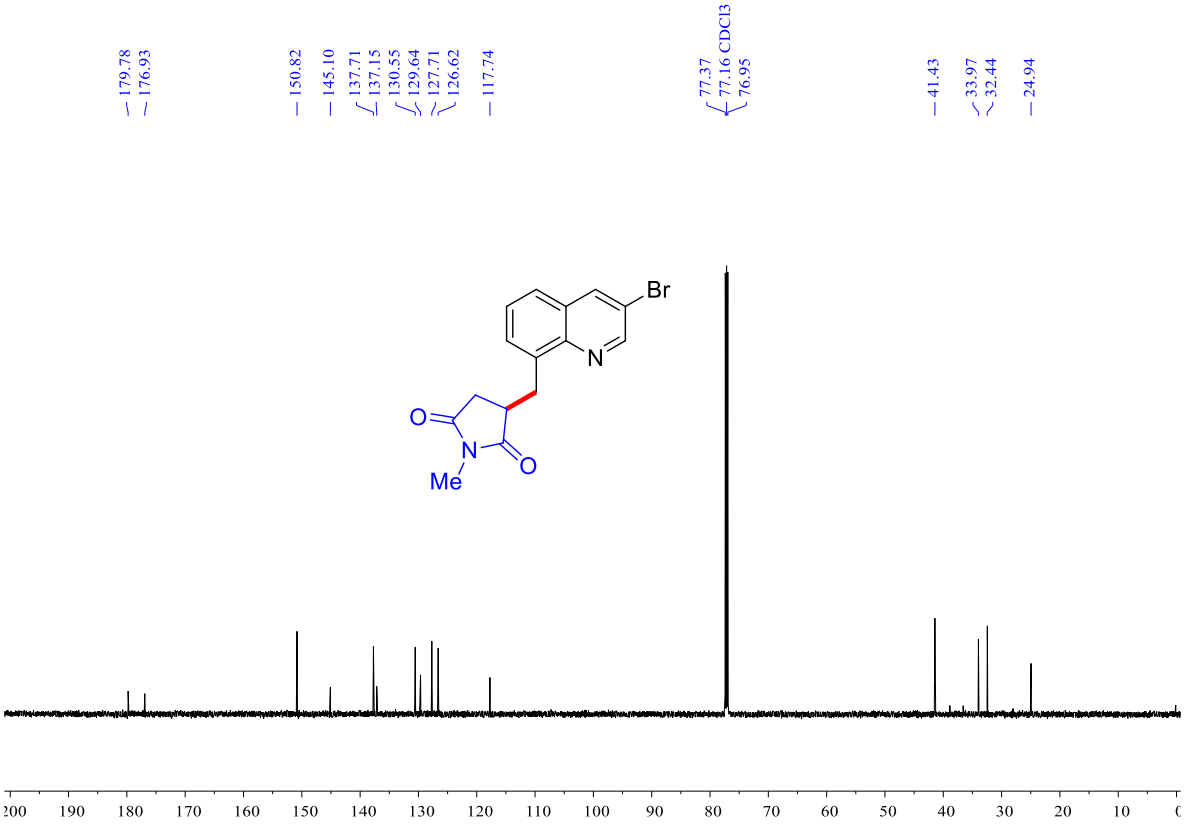


3-((3-Bromoquinolin-8-yl)methyl)-1-methylpyrrolidine-2,5-dione *(Table 2, entry 3ja)*:

^{1}H NMR

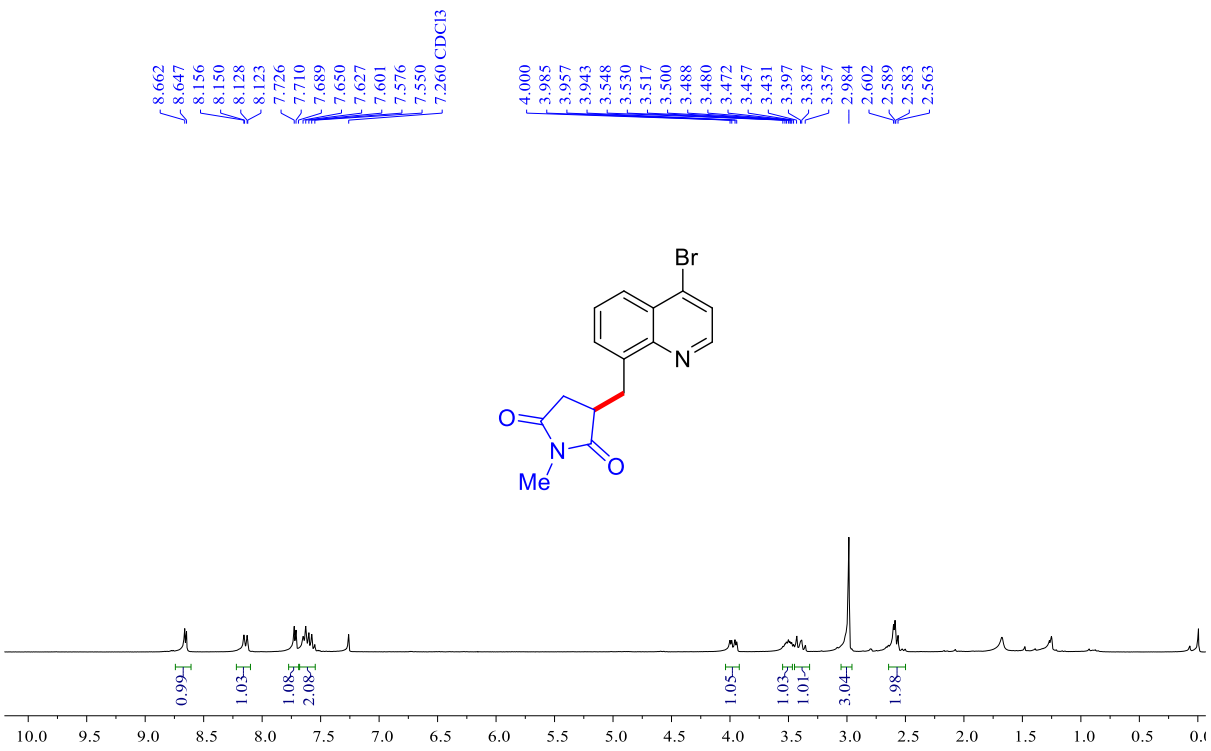


^{13}C NMR

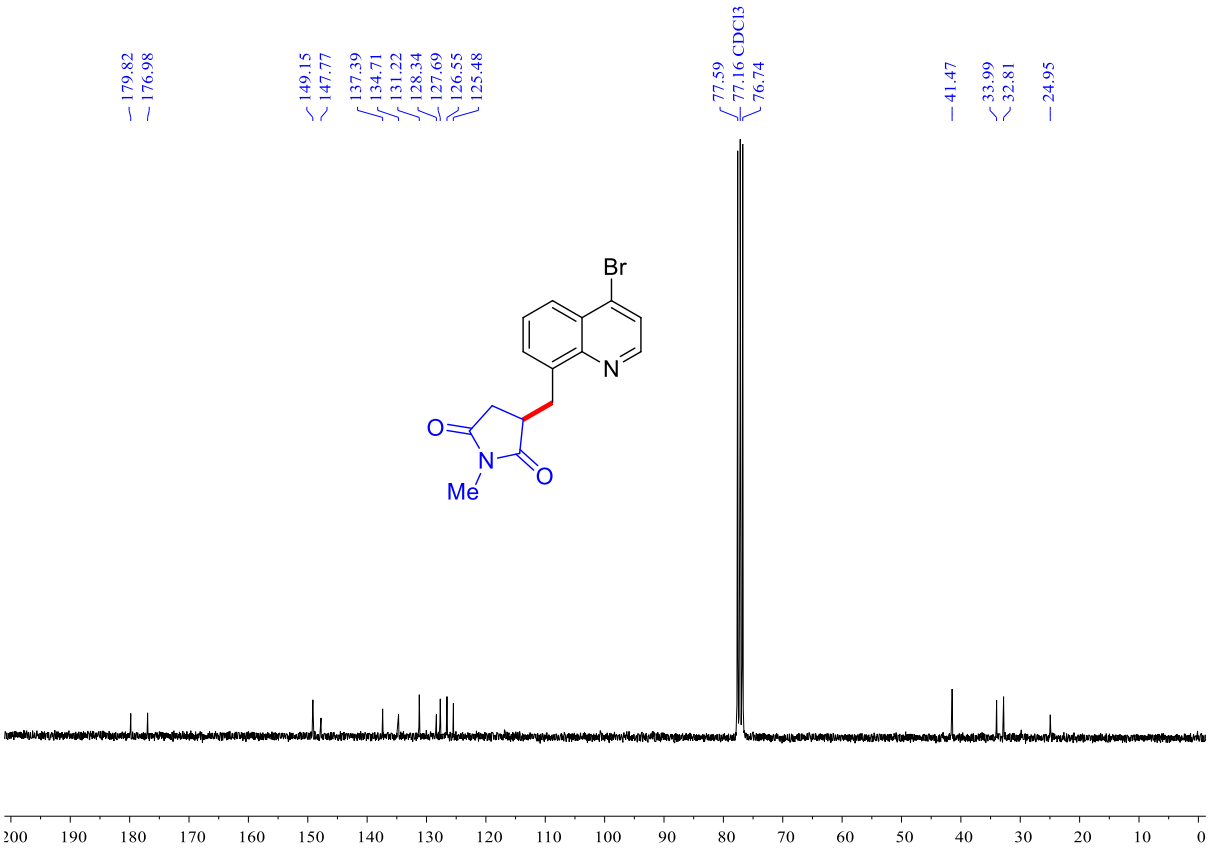


***3-((4-bromoquinolin-8-yl)methyl)-1-methylpyrrolidine-2,5-dione (Table 2, entry 3ka)*:**

^{1}H NMR

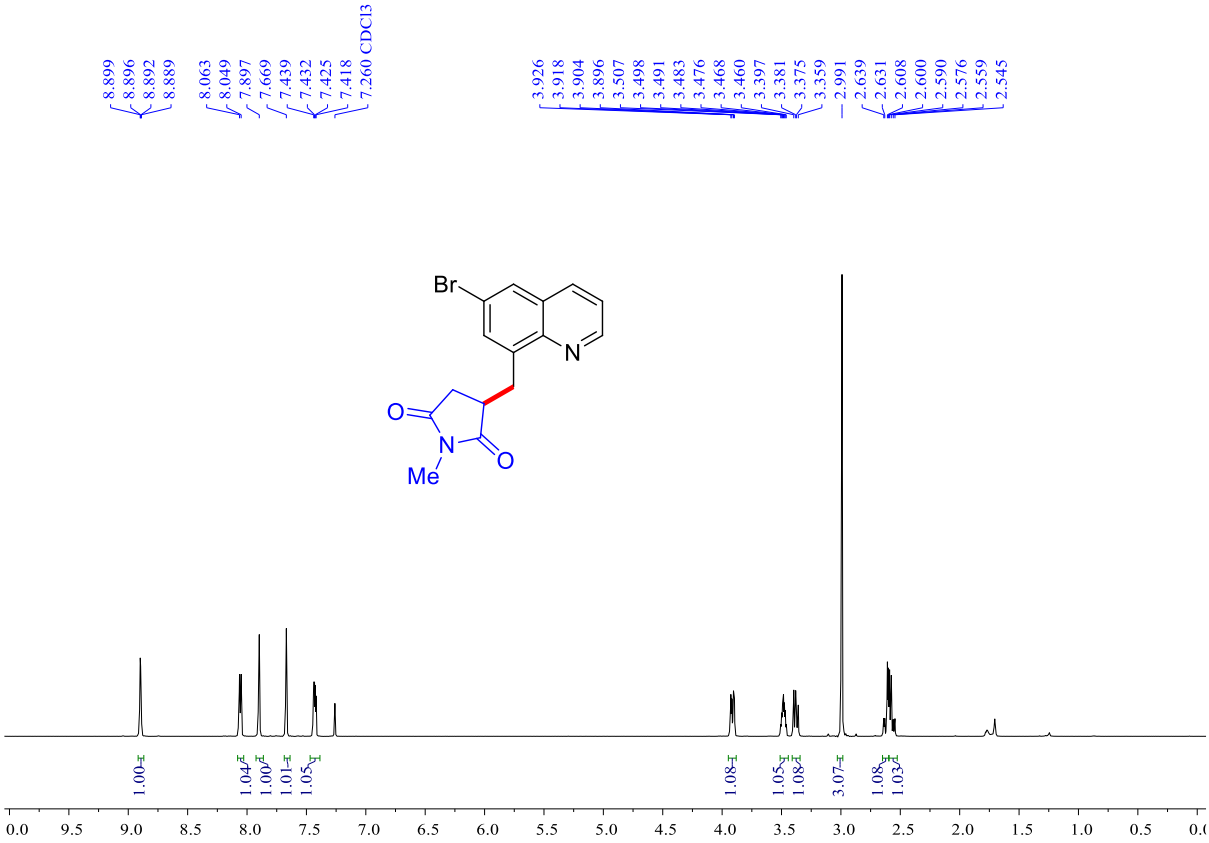


^{13}C NMR

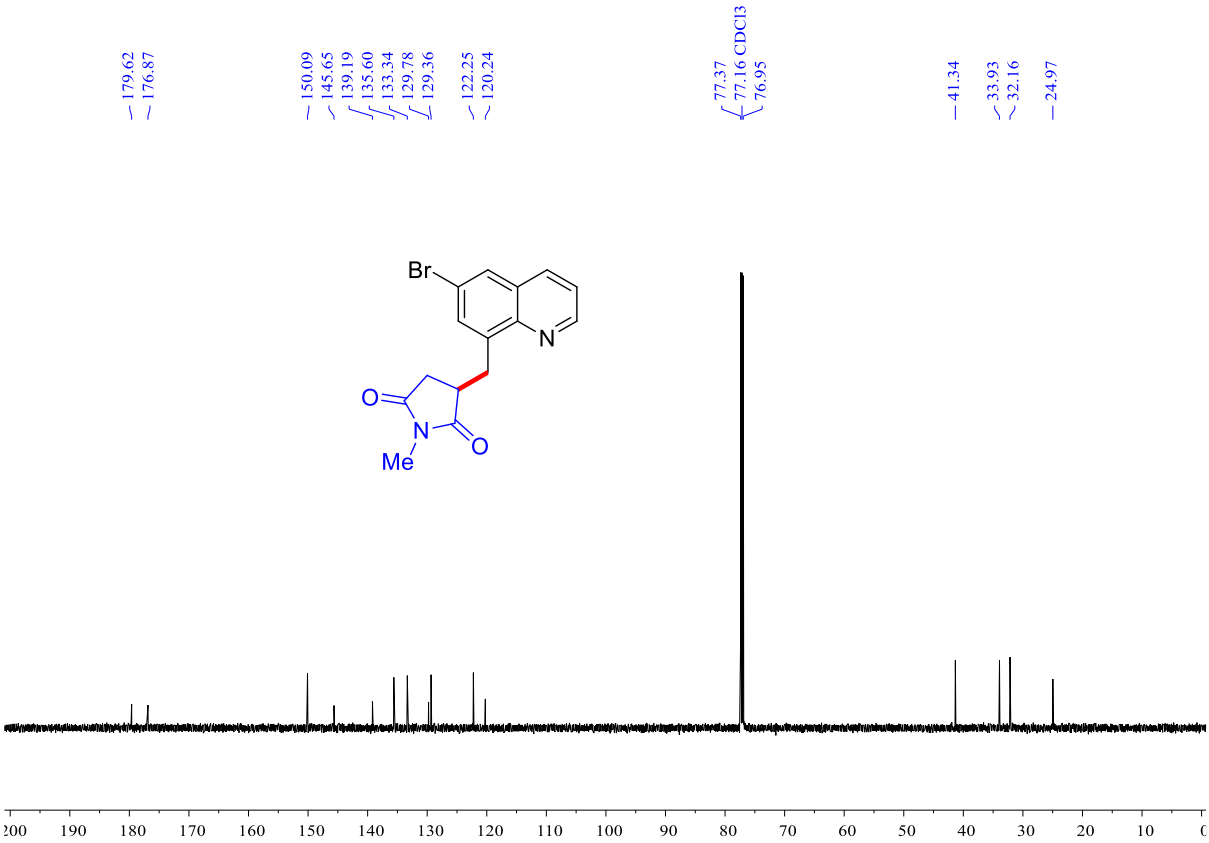


***3-((6-Bromoquinolin-8-yl)methyl)-1-methylpyrrolidine-2,5-dione (Table 2, entry 3la)*:**

^{1}H NMR

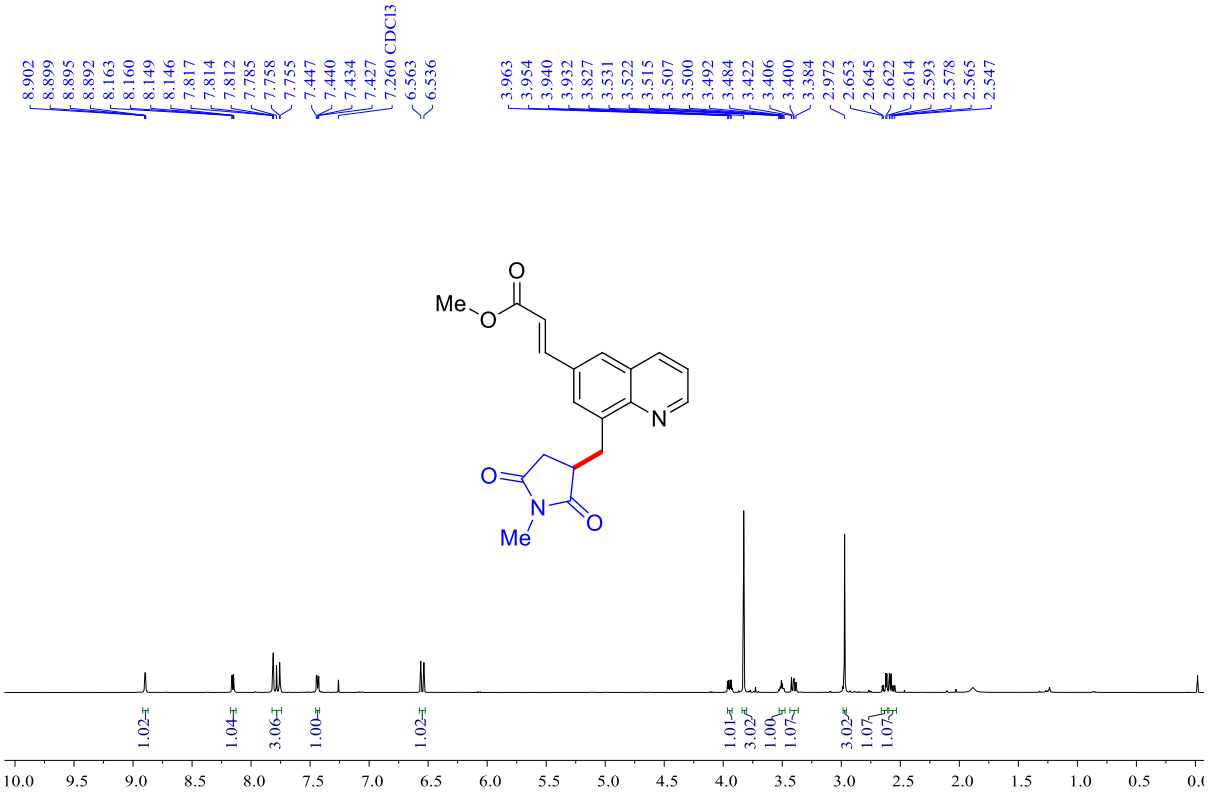


^{13}C NMR

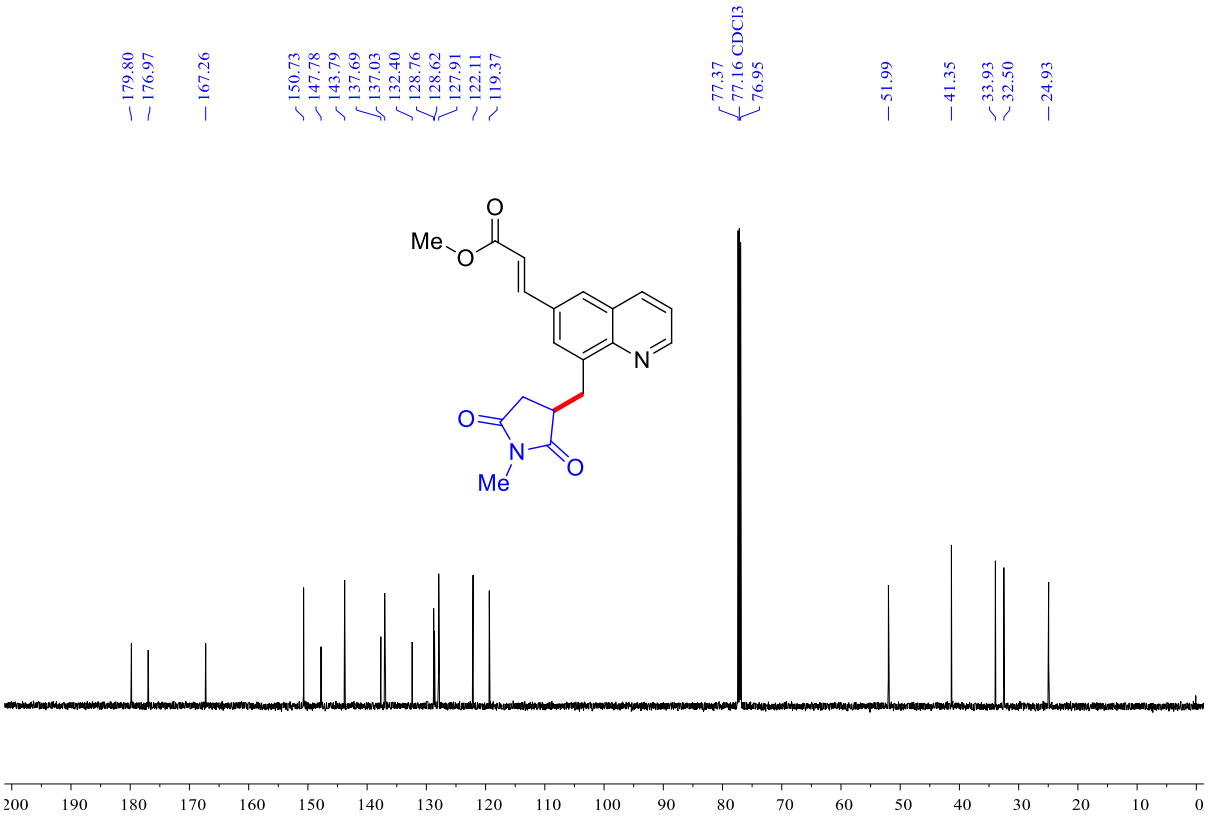


***(E)-Methyl 3-(8-((1-methyl-2,5-dioxopyrrolidin-3-yl)methyl)quinolin-6-yl)acrylate (Table 2, entry 3ma)*:**

^{1}H NMR

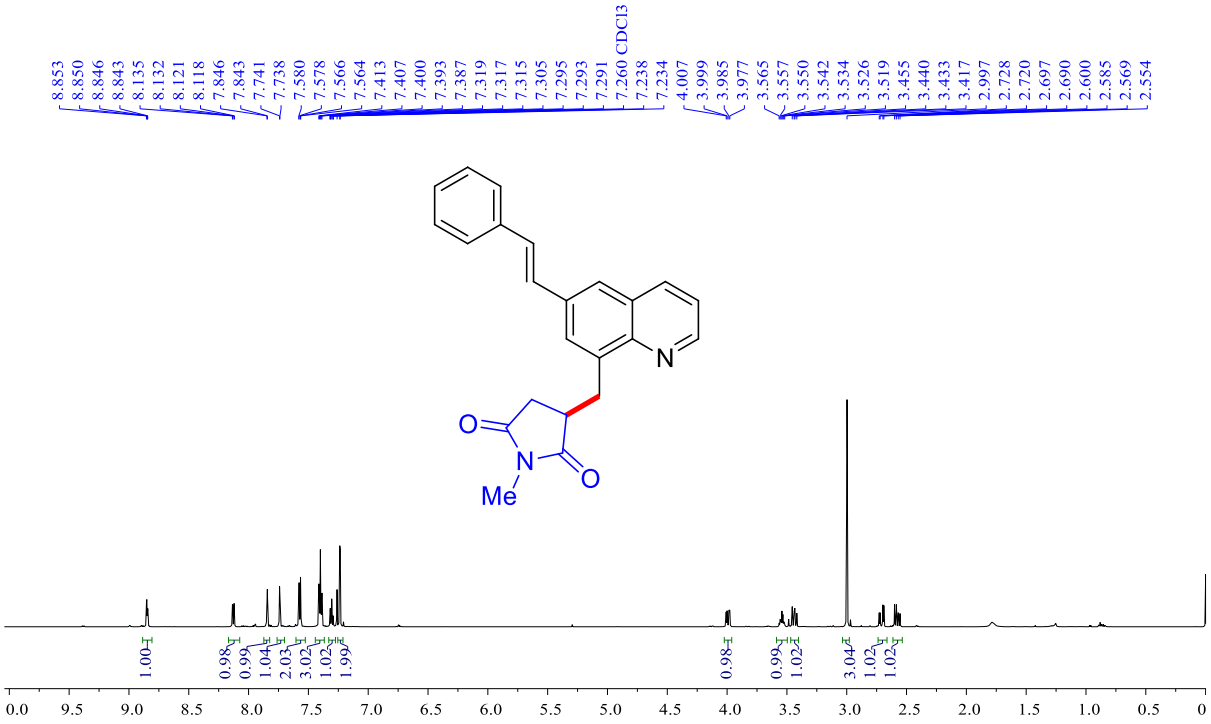


^{13}C NMR

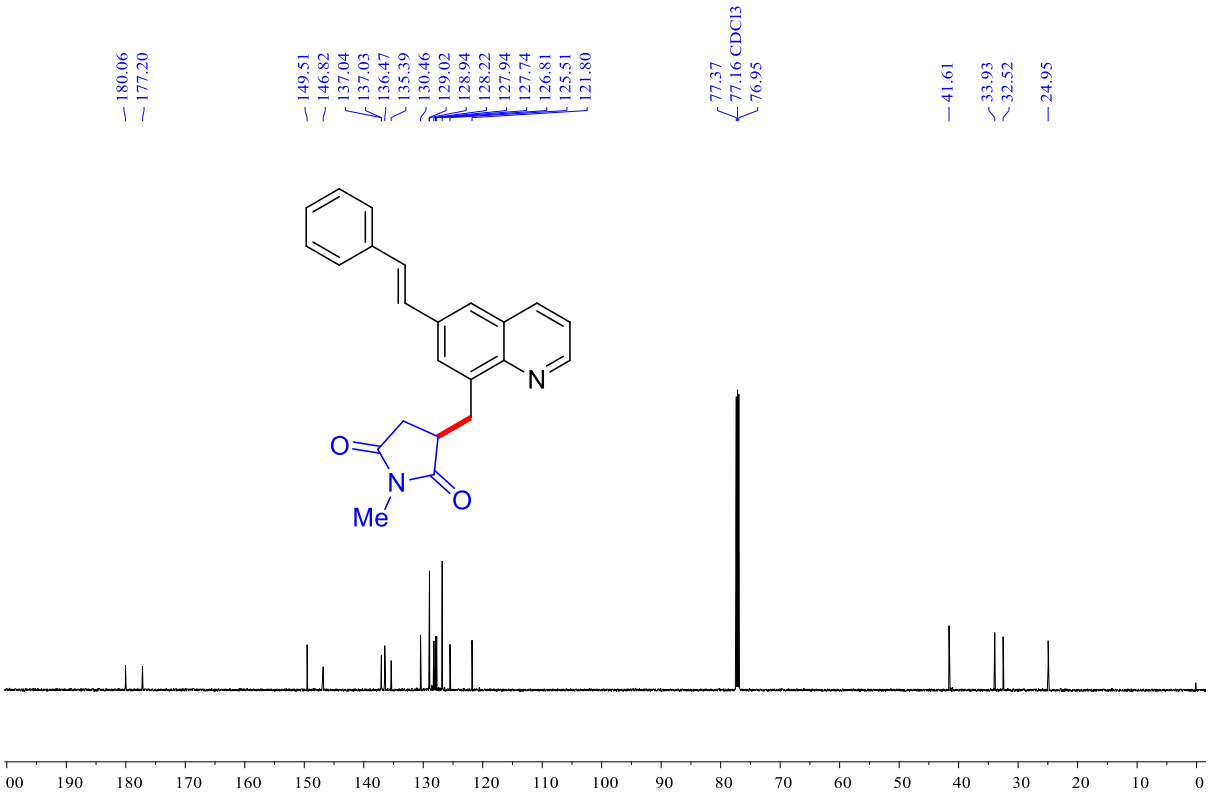


(*E*)-1-methyl-3-((6-styrylquinolin-8-yl)methyl)pyrrolidine-2,5-dione *(Table 2, entry 3na)*:

^{1}H NMR

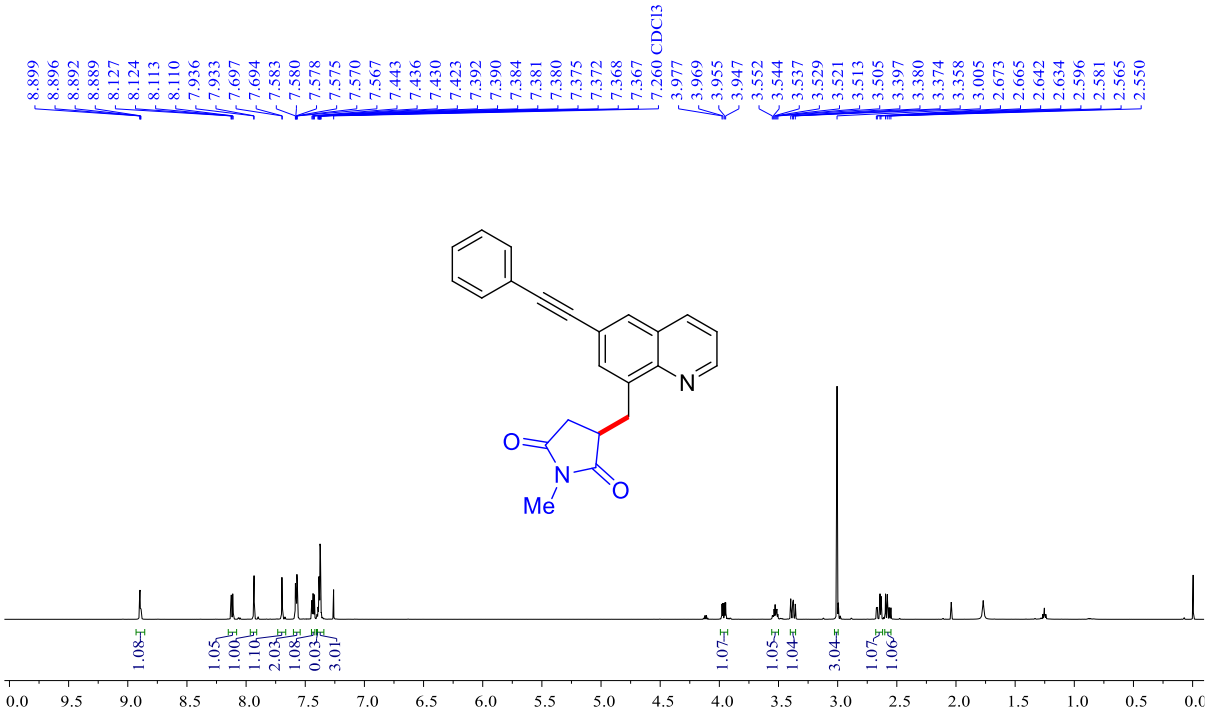


^{13}C NMR

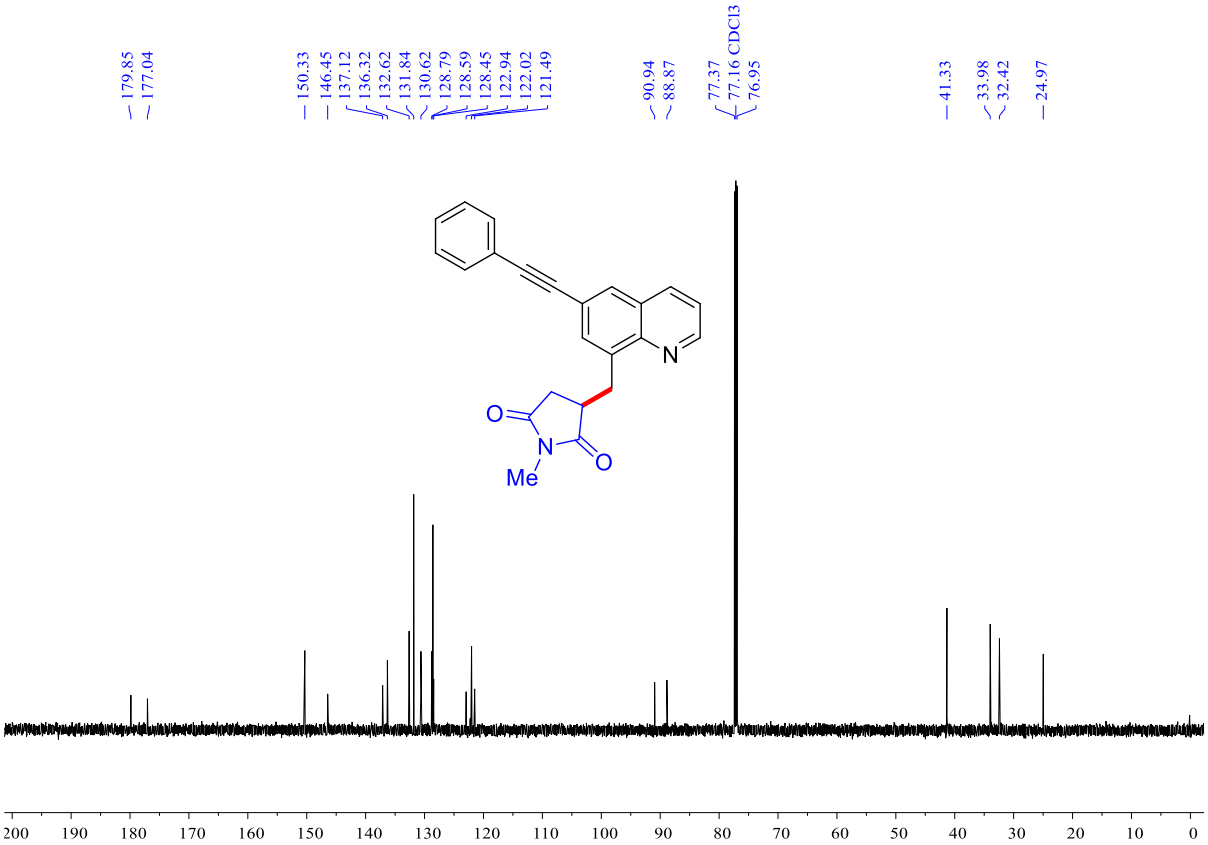


***1-Methyl-3-((6-(phenylethynyl)quinolin-8-yl)methyl)pyrrolidine-2,5-dione (Table 2, entry 3oa)*:**

^{1}H NMR

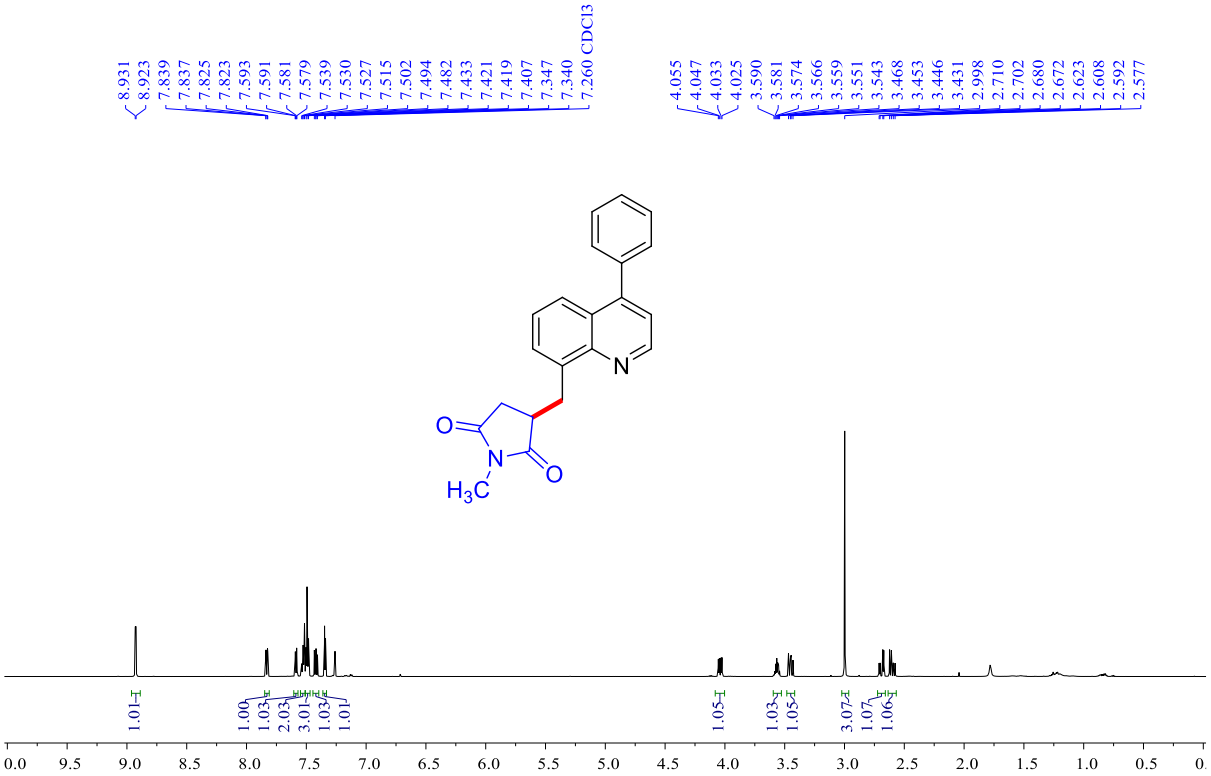


^{13}C NMR

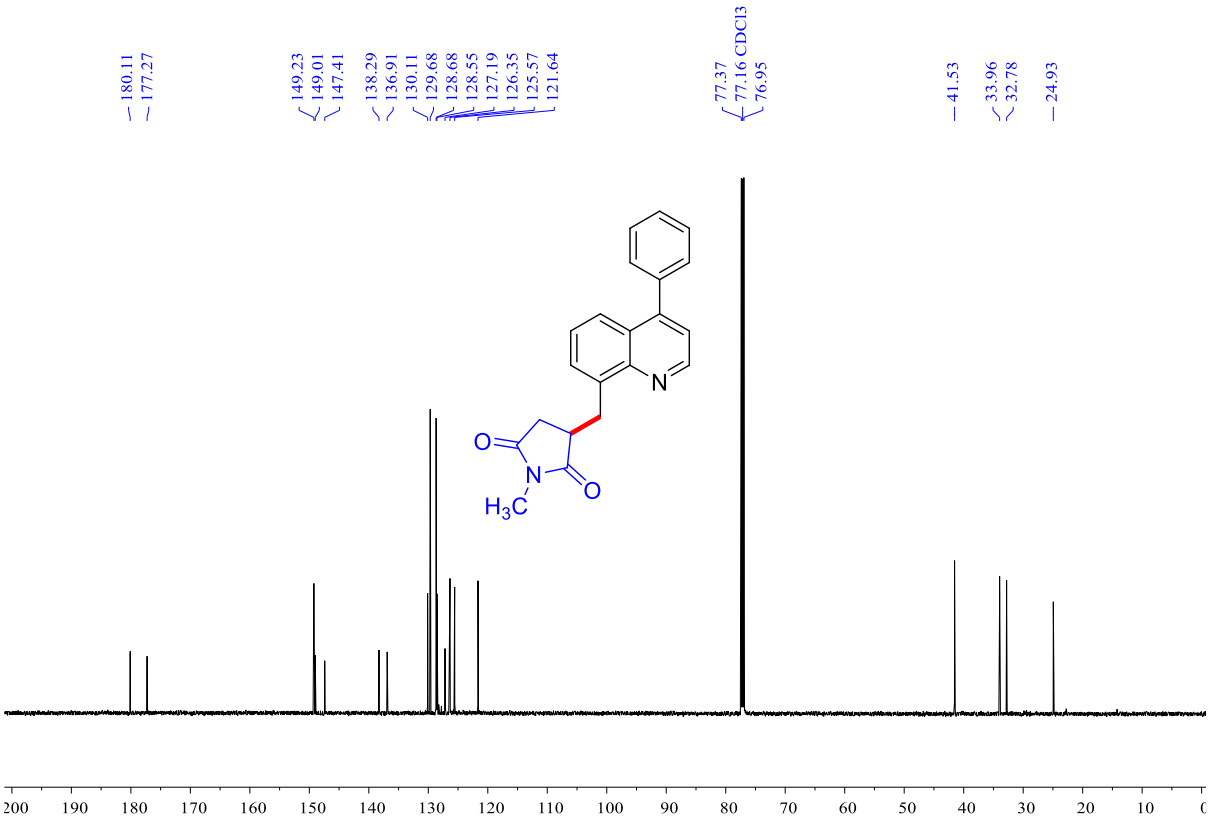


***1-Methyl-3-((4-phenylquinolin-8-yl)methyl)pyrrolidine-2,5-dione (Table 2, entry 3pa)*:**

^{1}H NMR

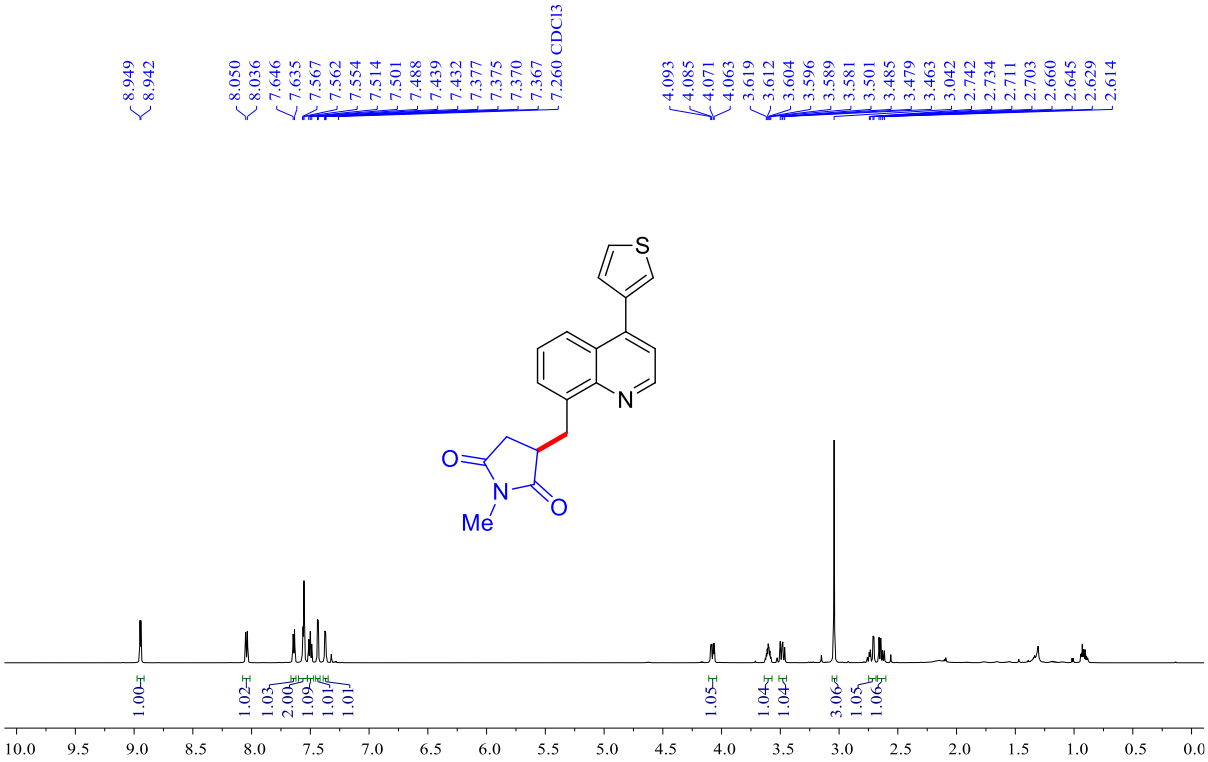


^{13}C NMR

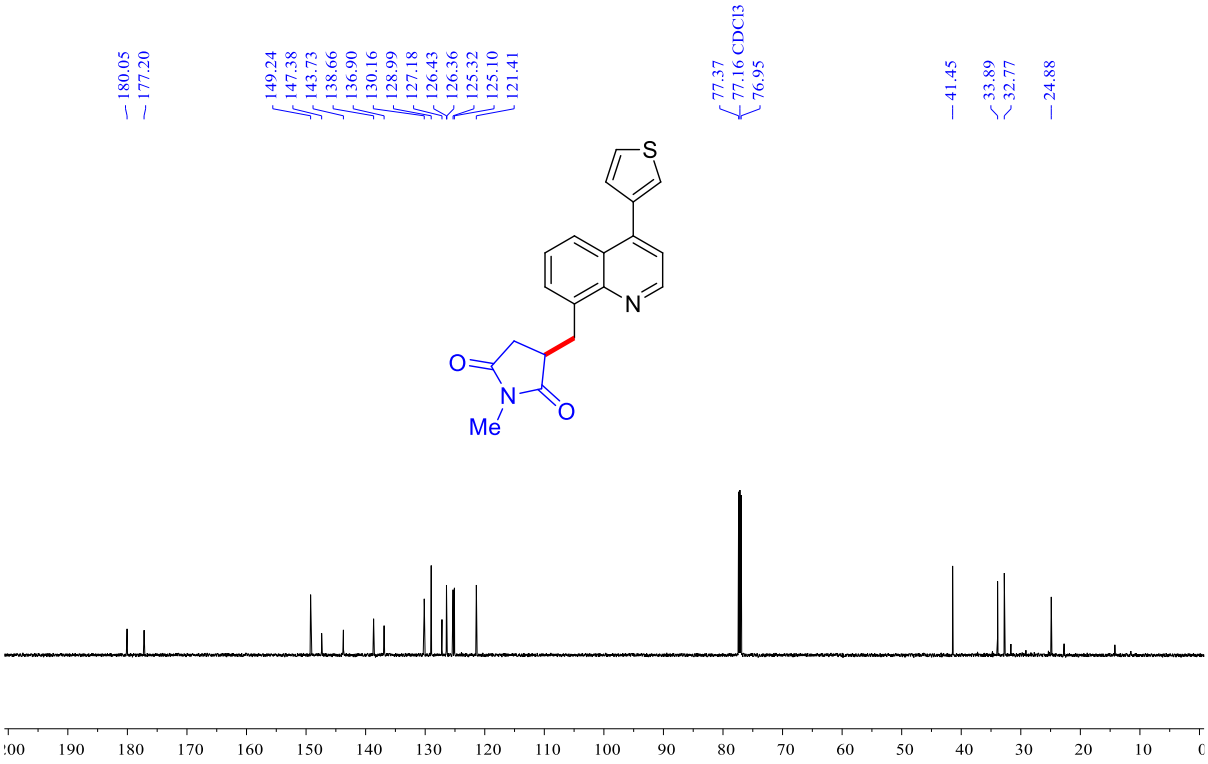


***1-methyl-3-((4-(thiophen-3-yl)quinolin-8-yl)methyl)pyrrolidine-2,5-dione (Table 2, entry 3qa)*:**

^{1}H NMR

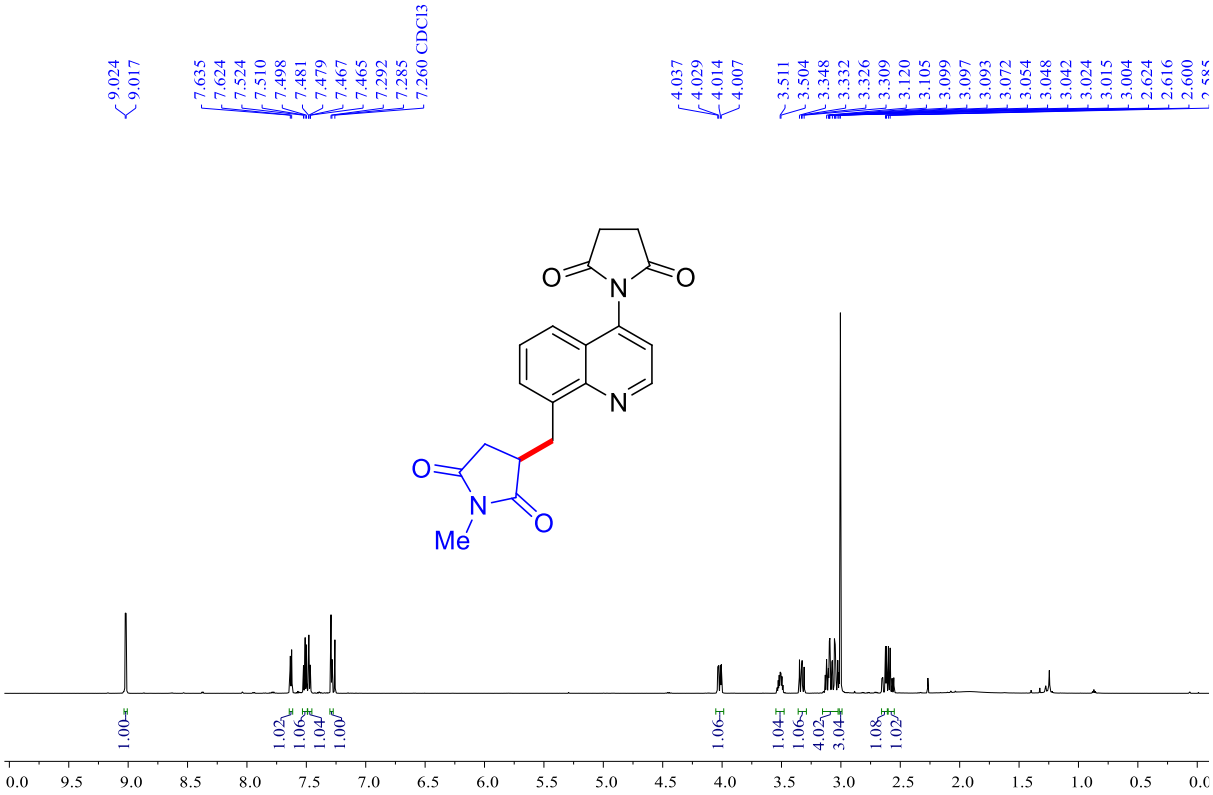


^{13}C NMR

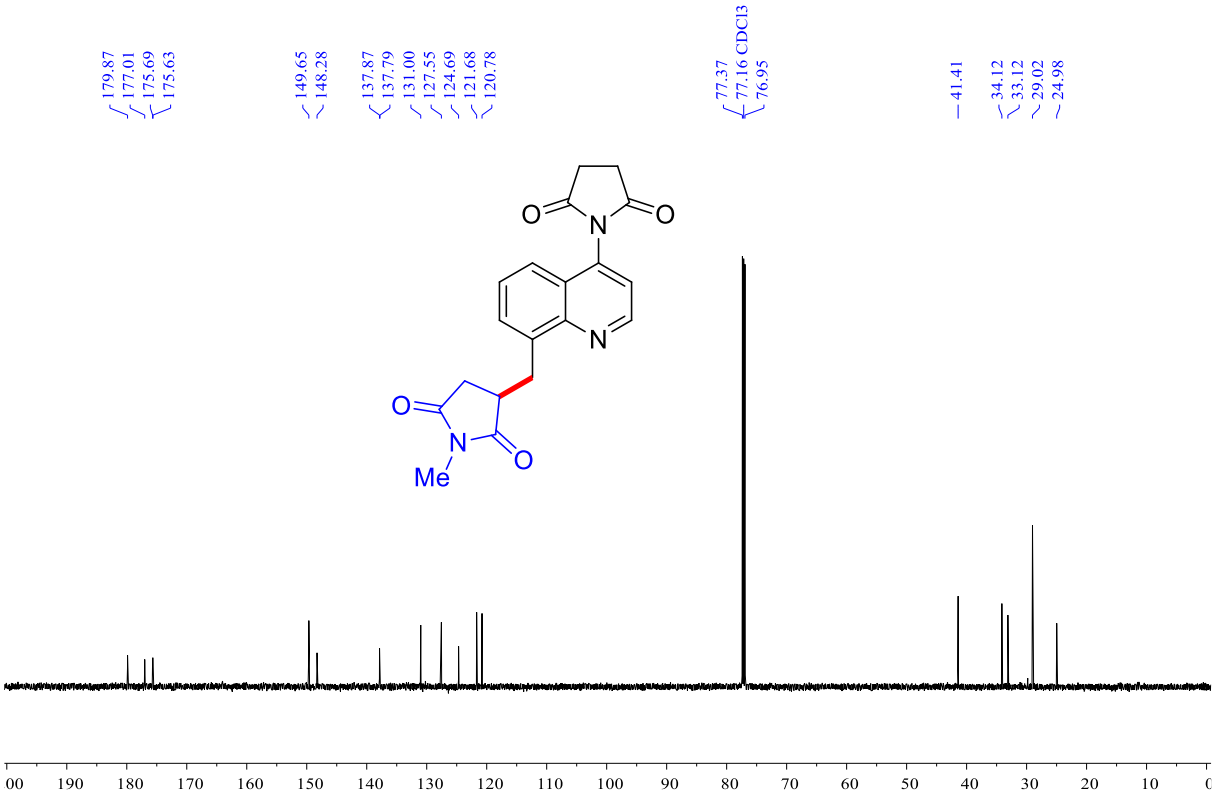


***3-((4-(2,5-Dioxopyrrolidin-1-yl)quinolin-8-yl)methyl)-1-methylpyrrolidine-2,5-dione (Table 2, entry 3ra)*:**

^{1}H NMR

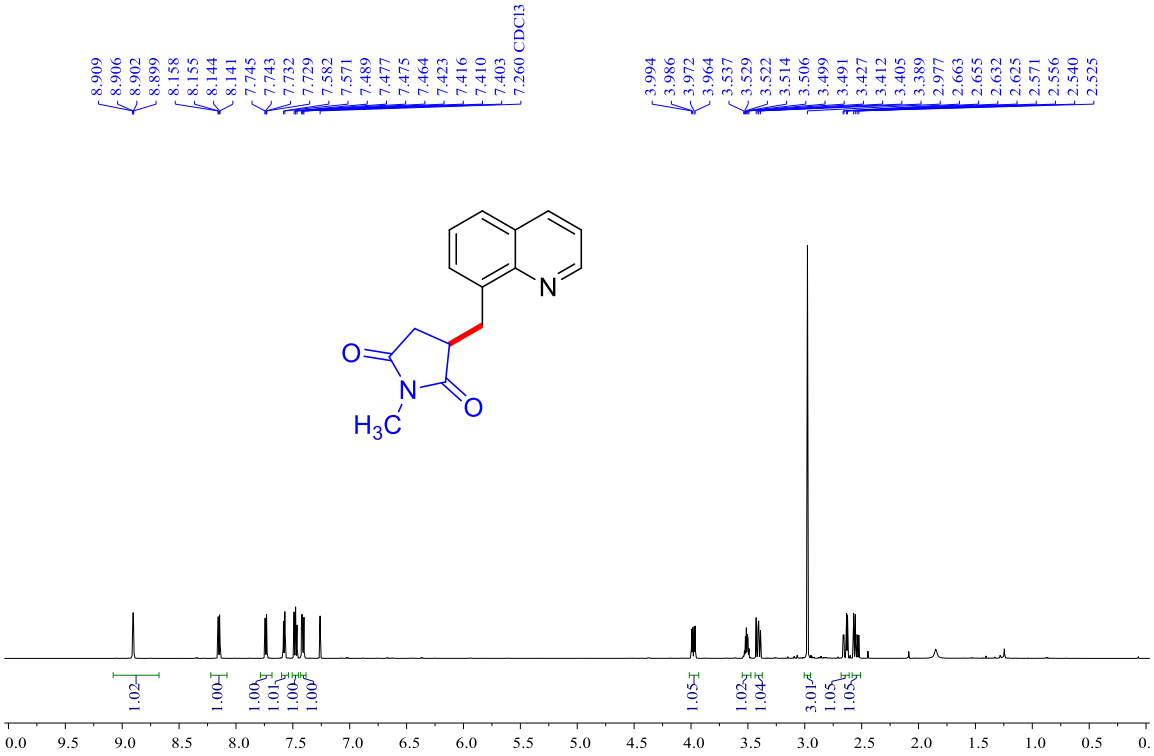


^{13}C NMR

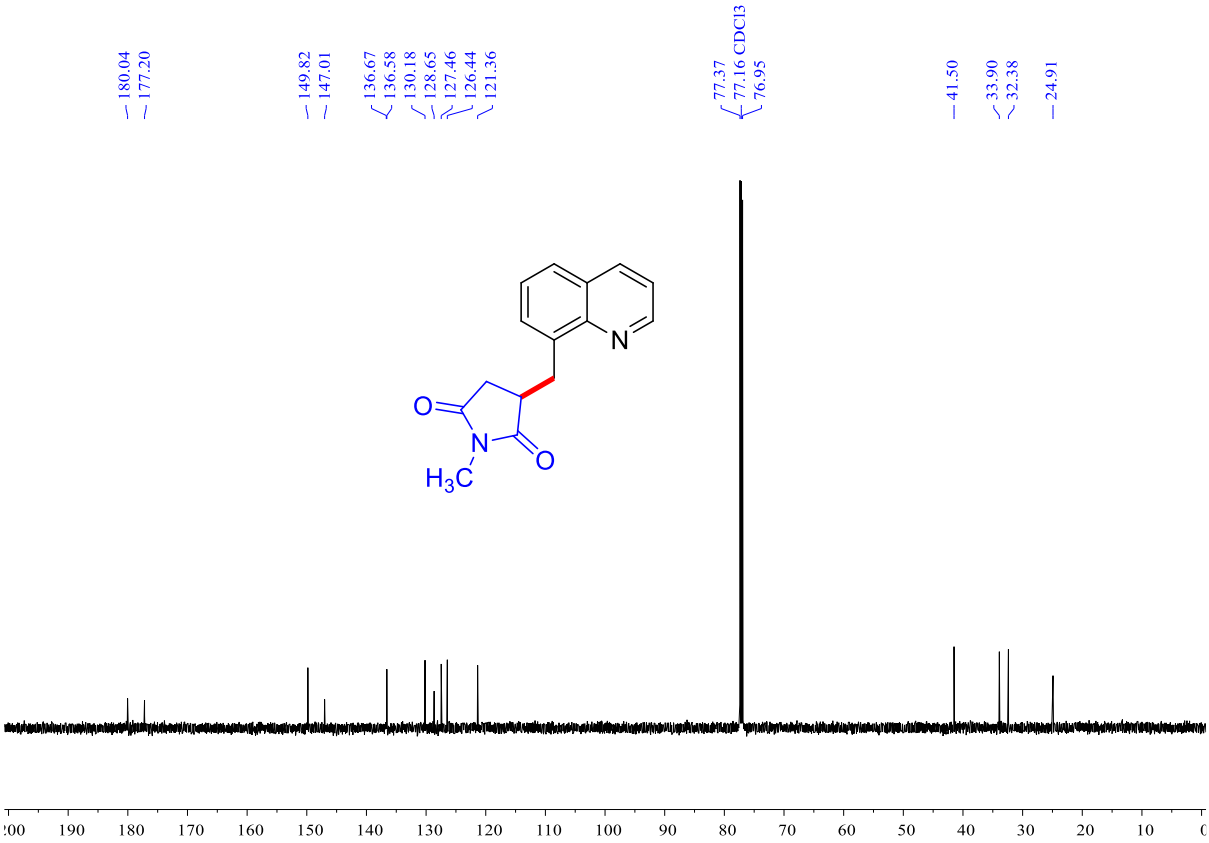


***1-Methyl-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3aa)*:**

^{1}H NMR

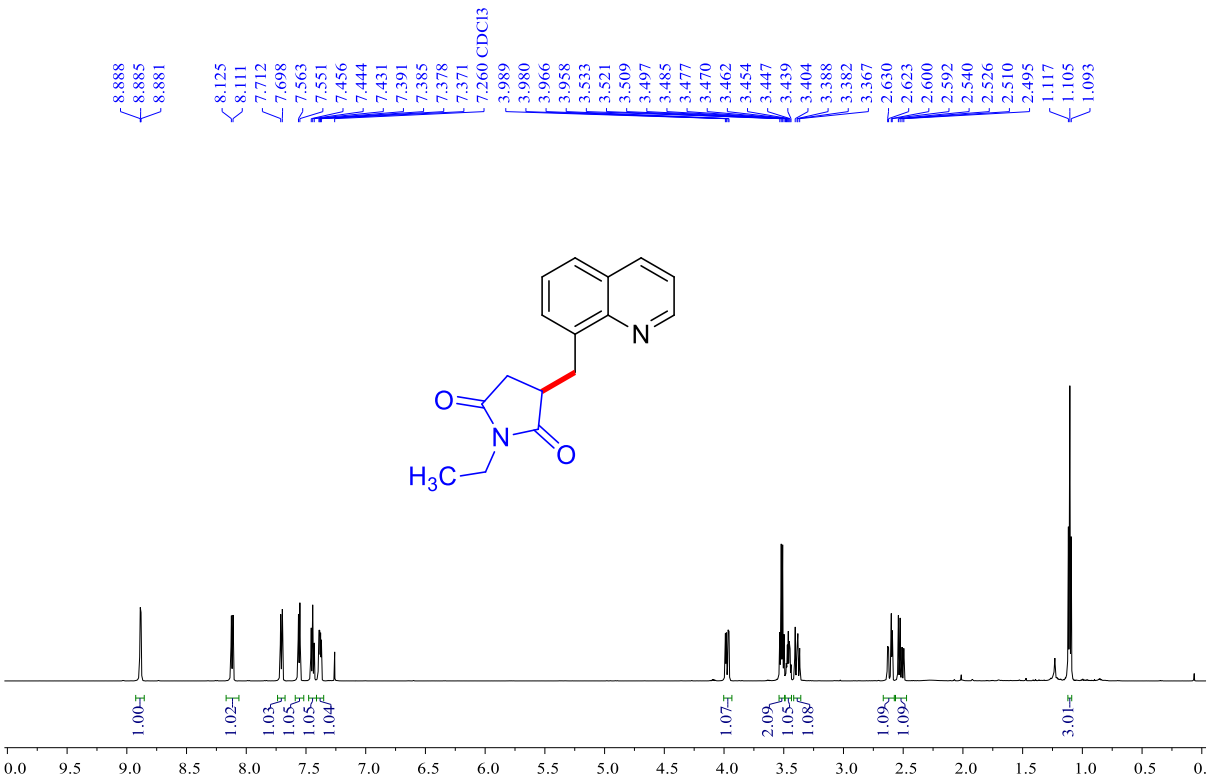


^{13}C NMR

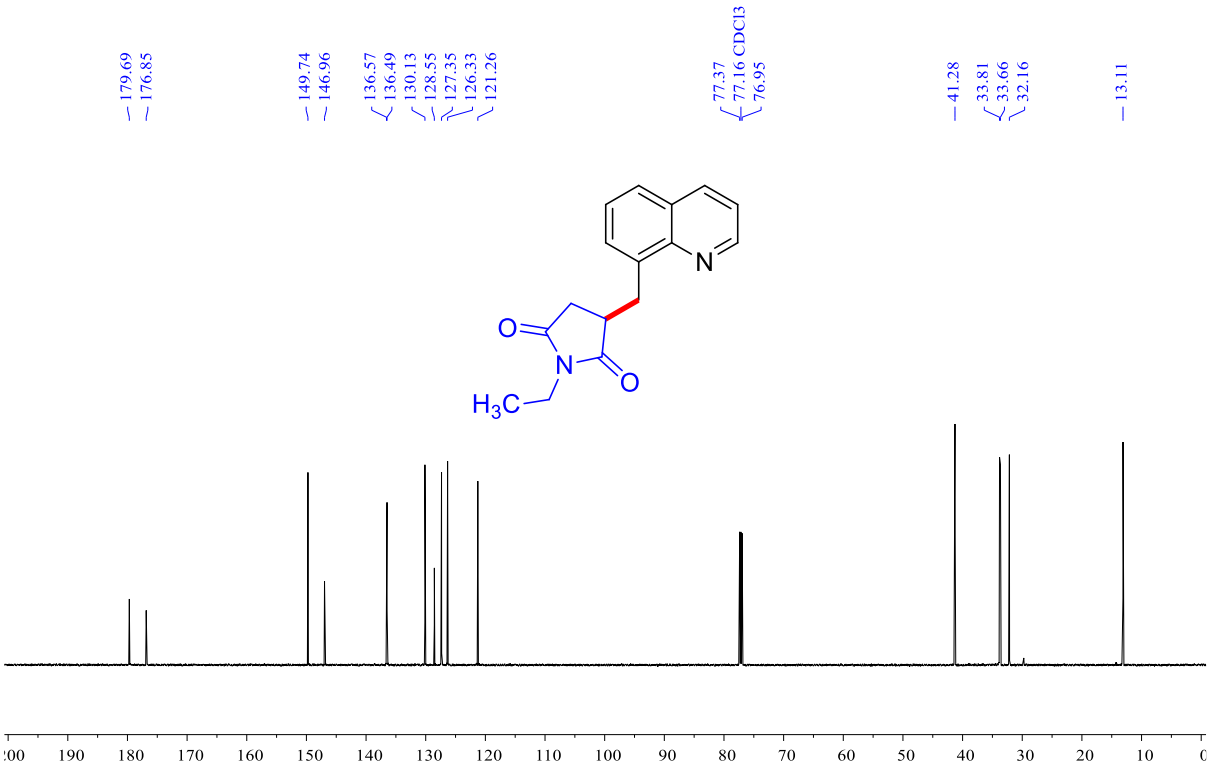


***1-Ethyl-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3ab)*:**

^{1}H NMR

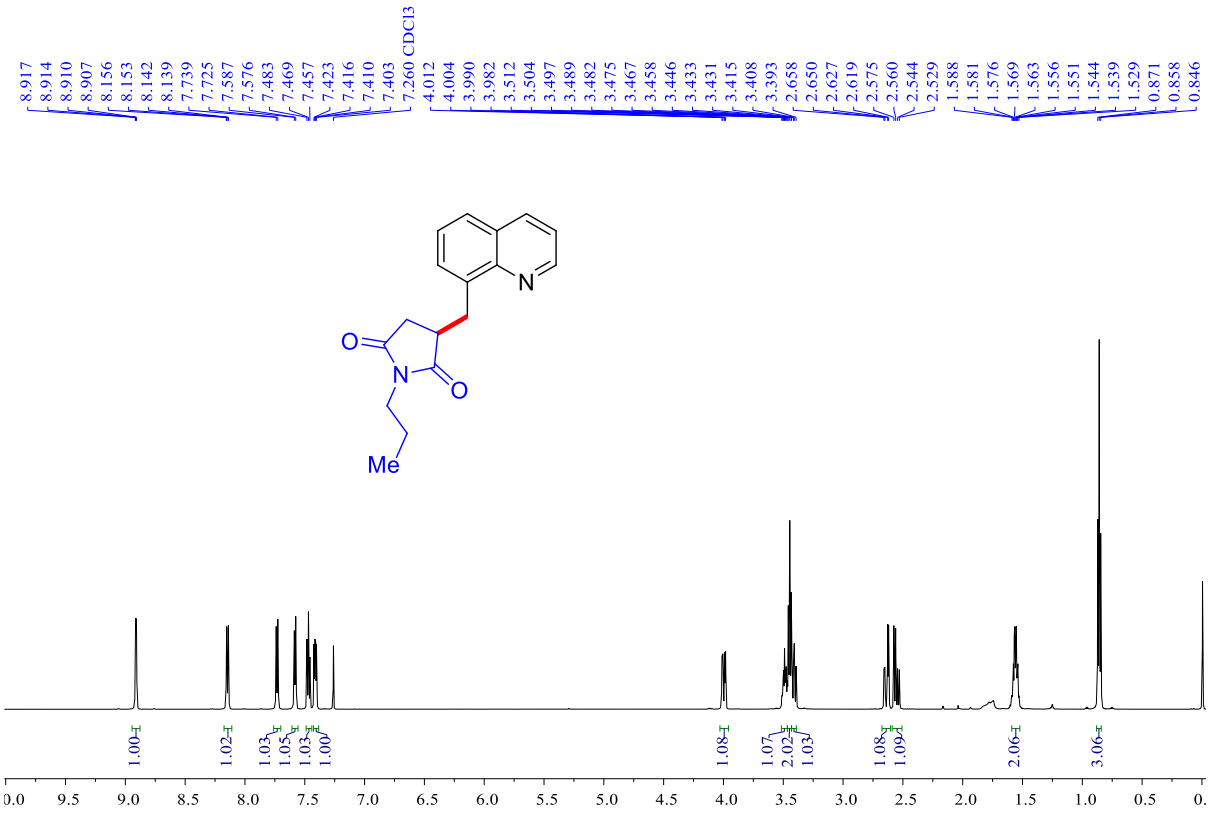


^{13}C NMR

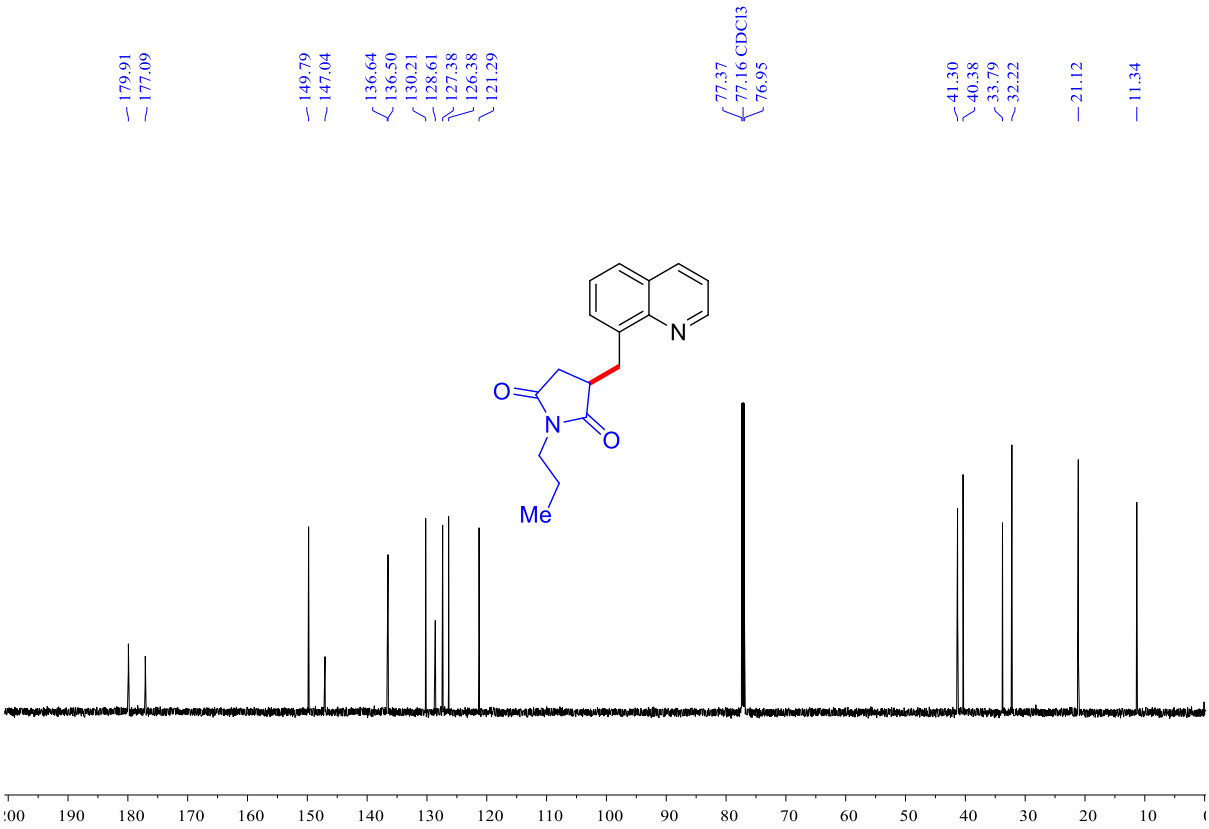


***1-Propyl-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3ac)*:**

^{1}H NMR

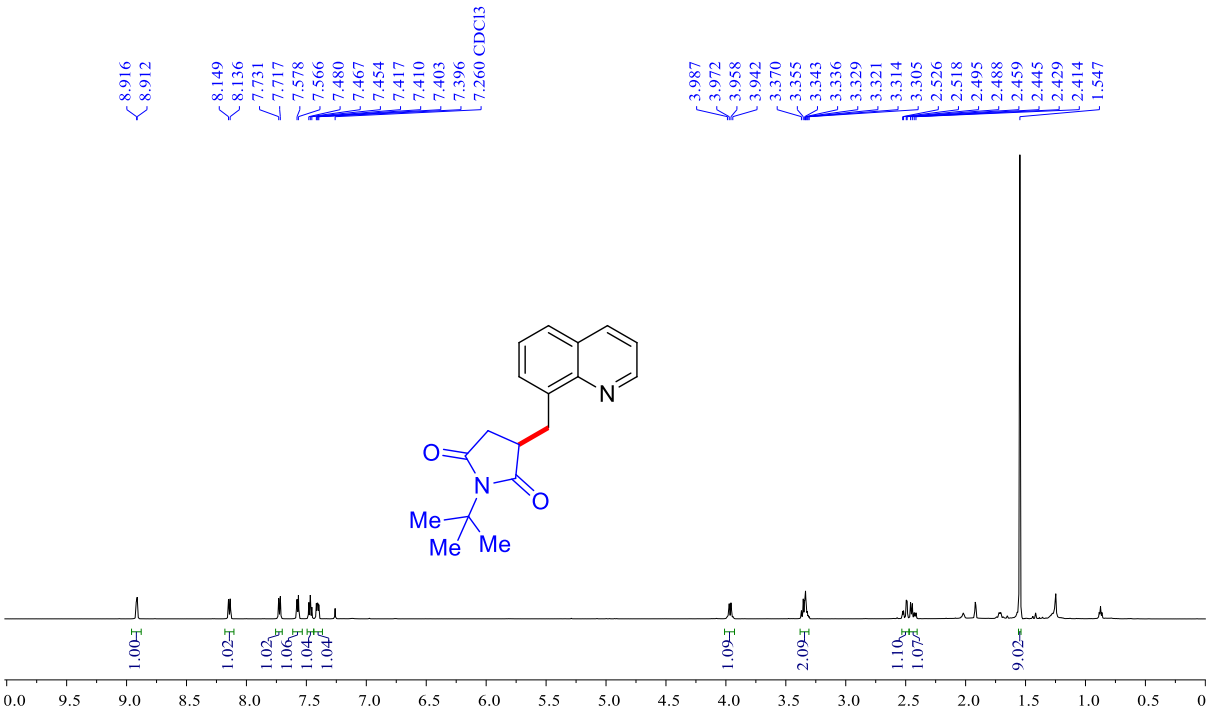


^{13}C NMR

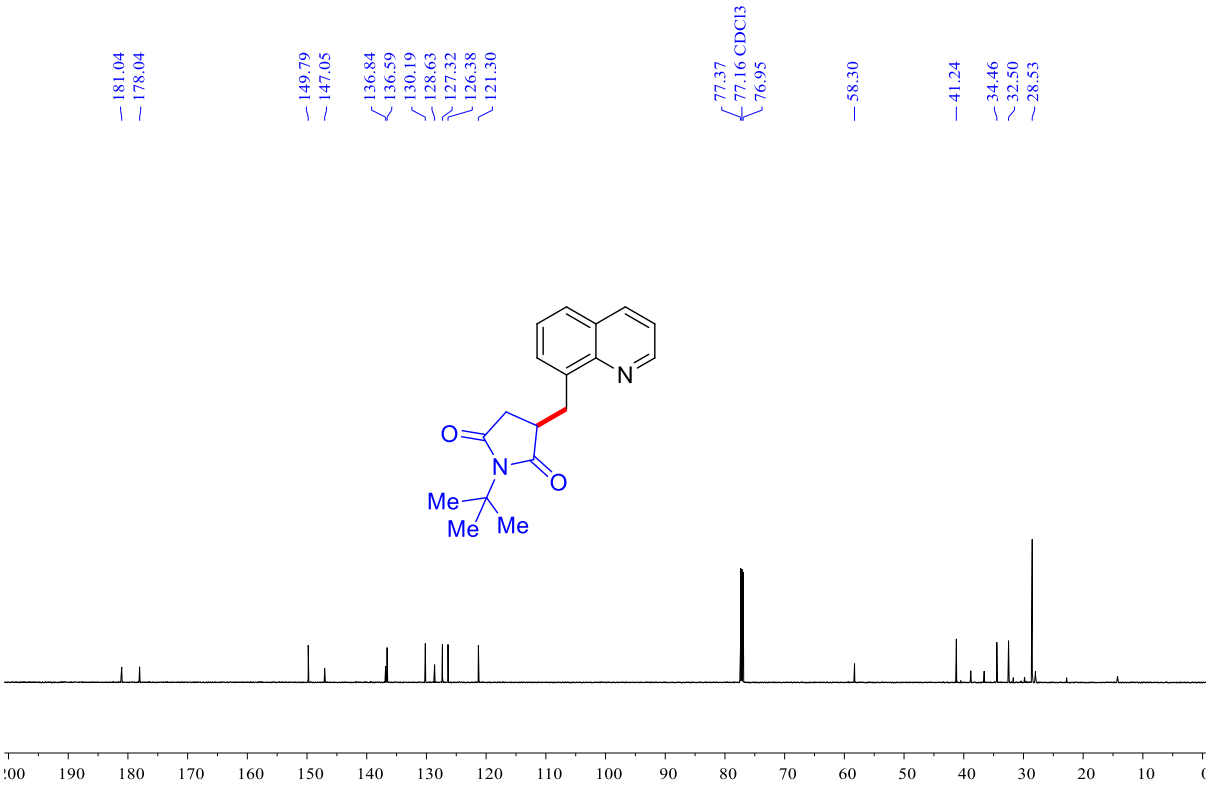


***1-(tert-Butyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3ad)*:**

^{1}H NMR

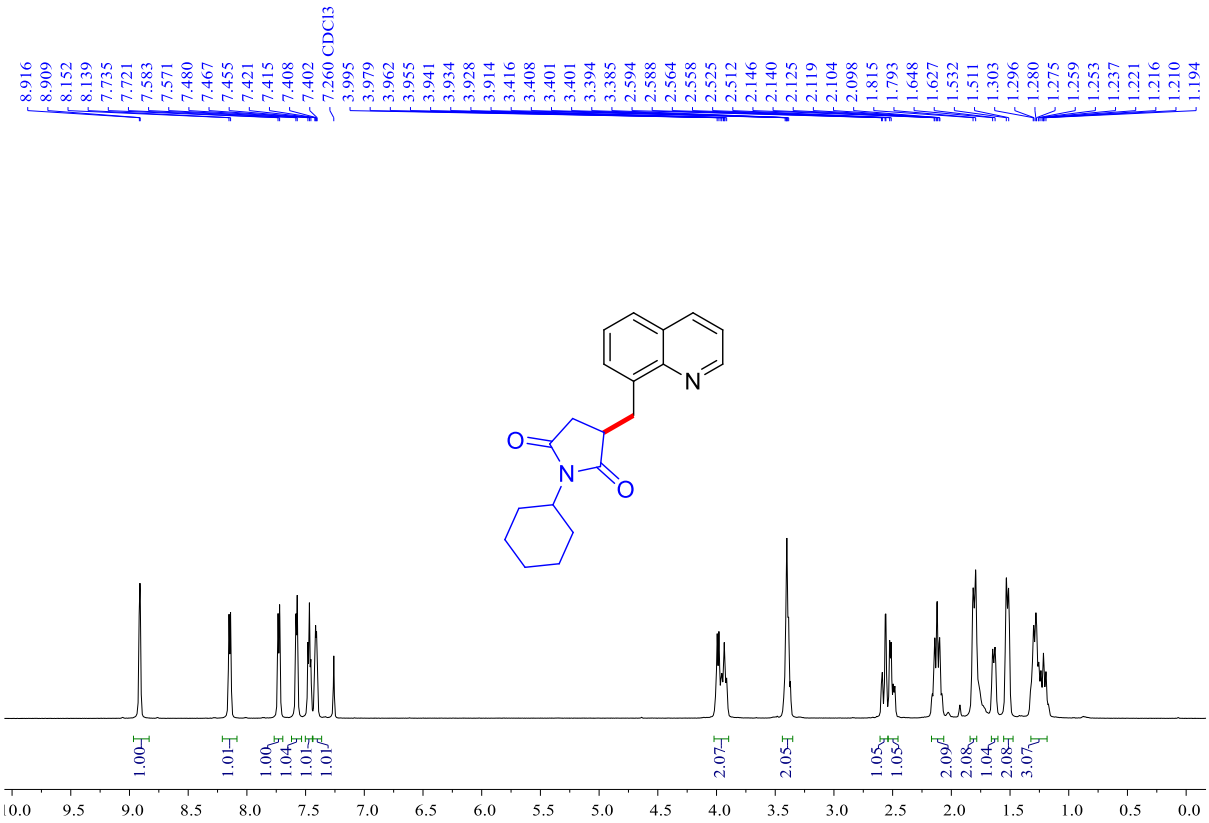


^{13}C NMR

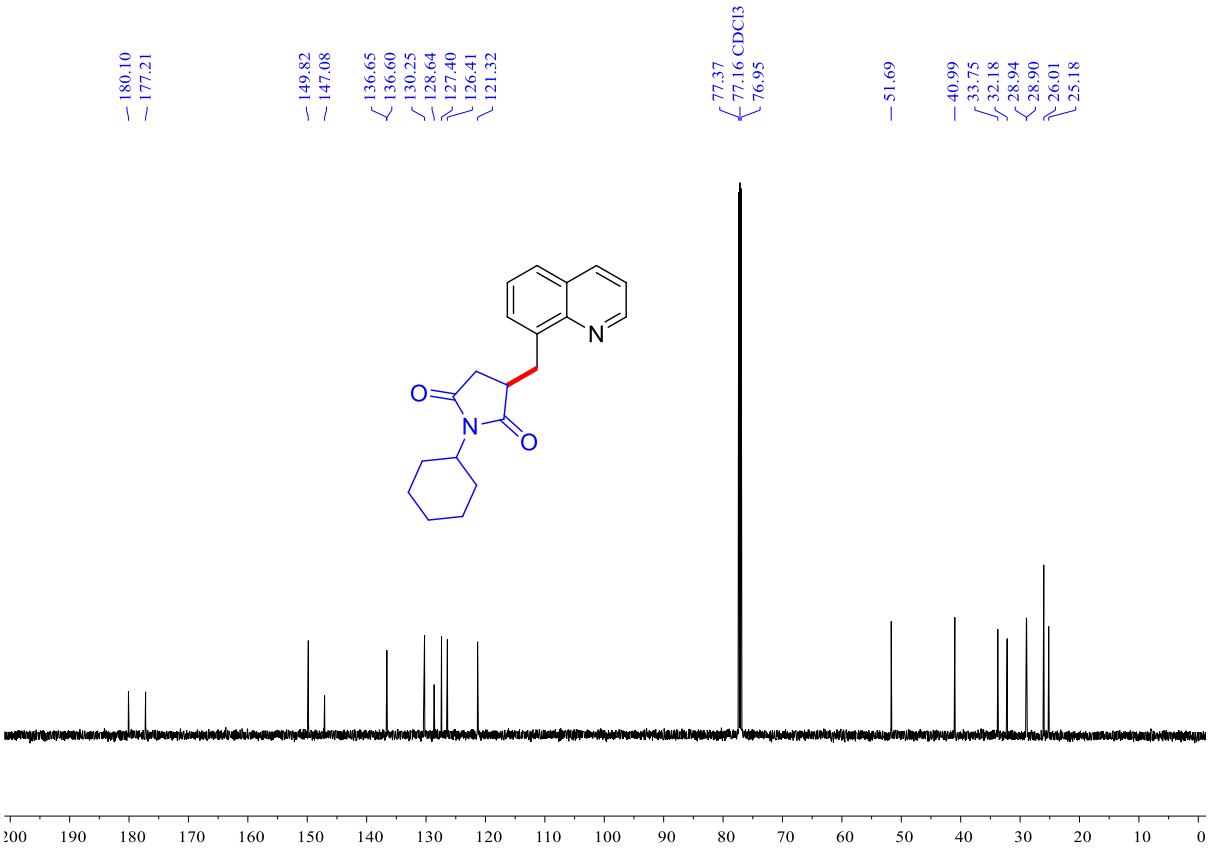


***1-Cyclohexyl-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3ae)*:**

^{1}H NMR

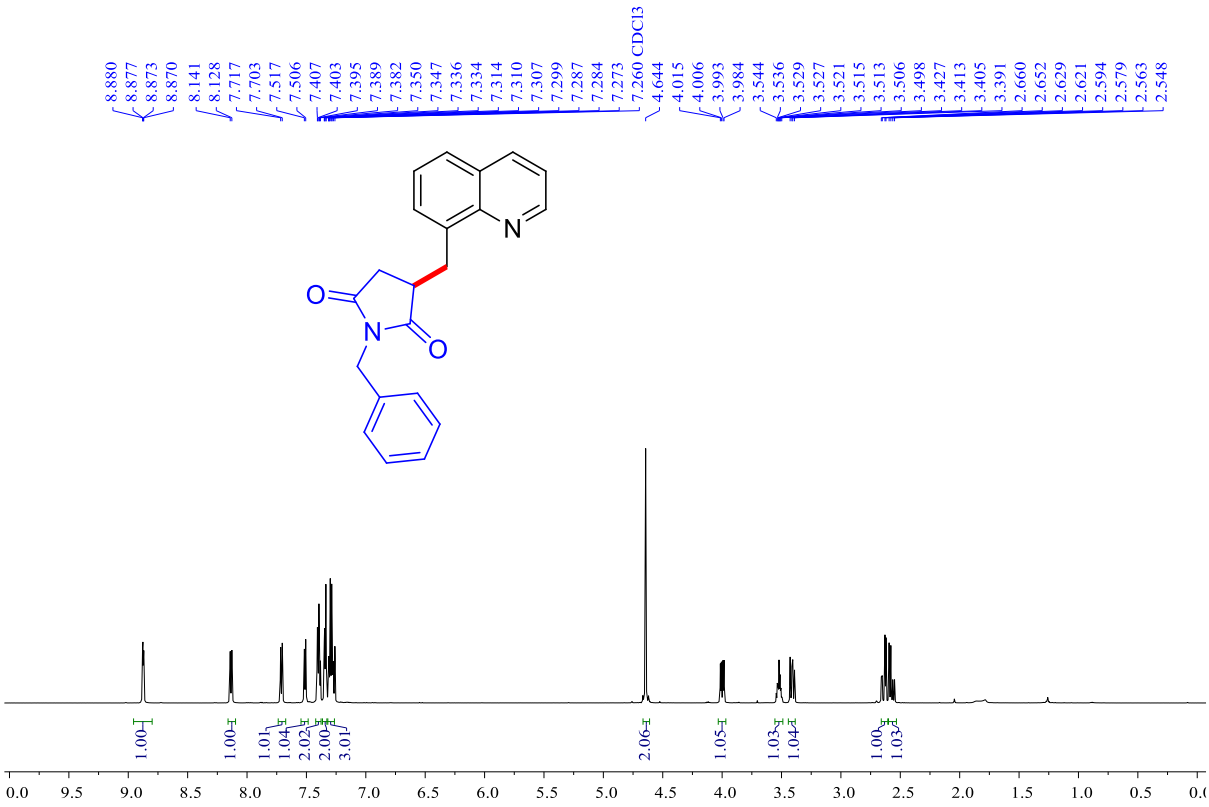


^{13}C NMR

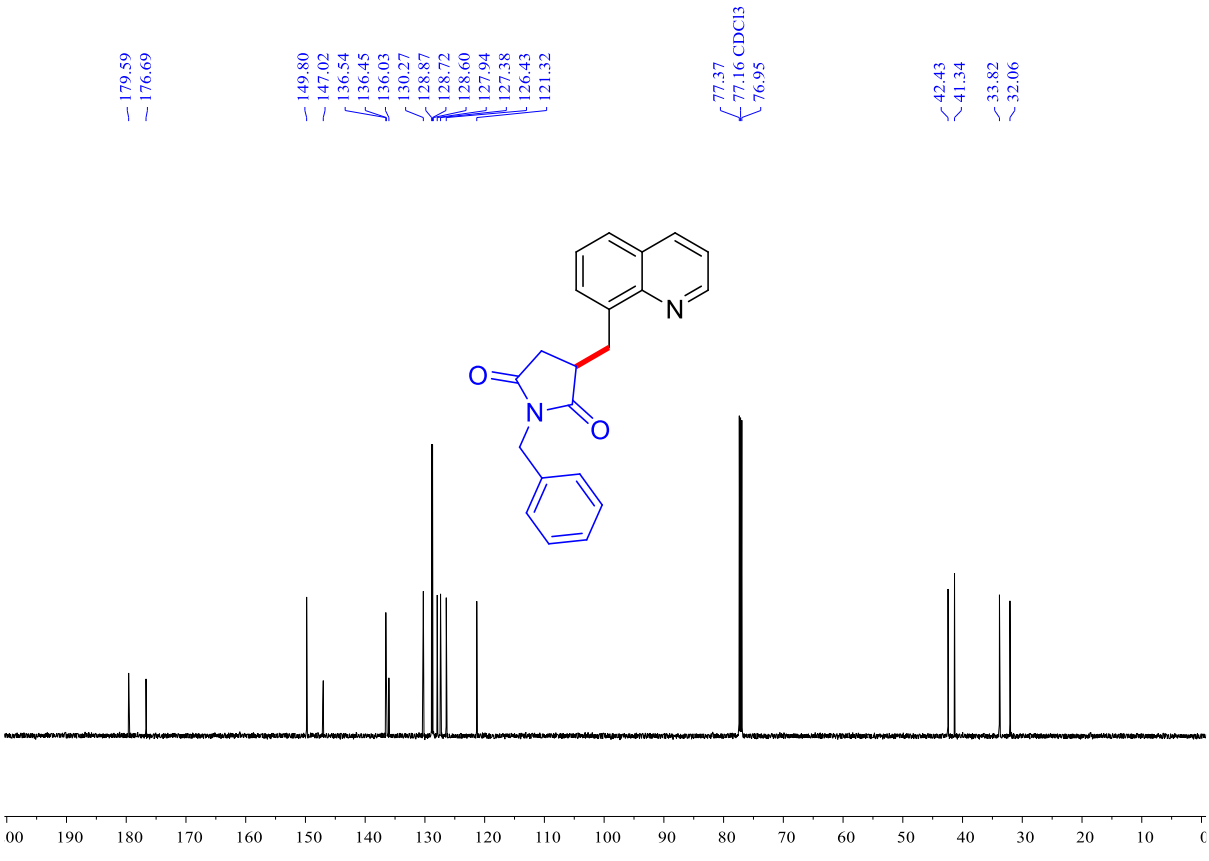


***1-Benzyl-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3af)*:**

^{1}H NMR

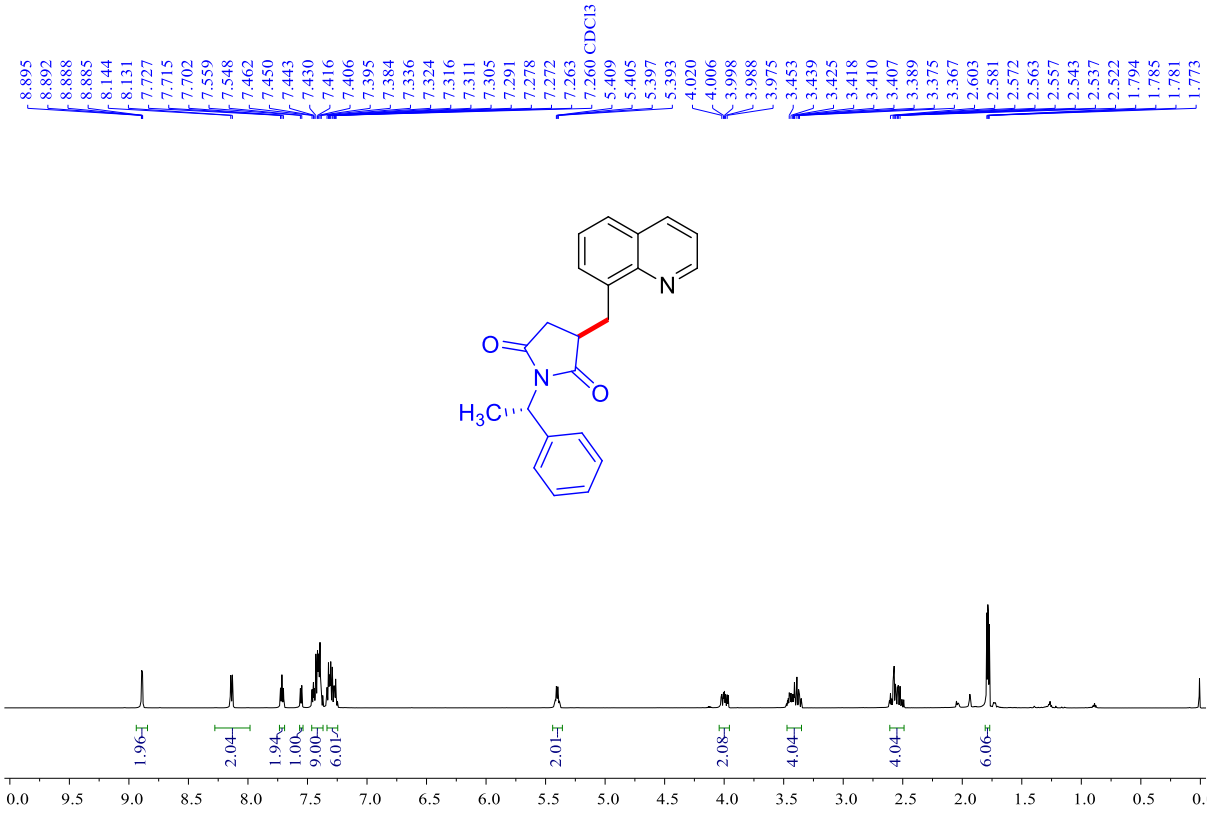


^{13}C NMR

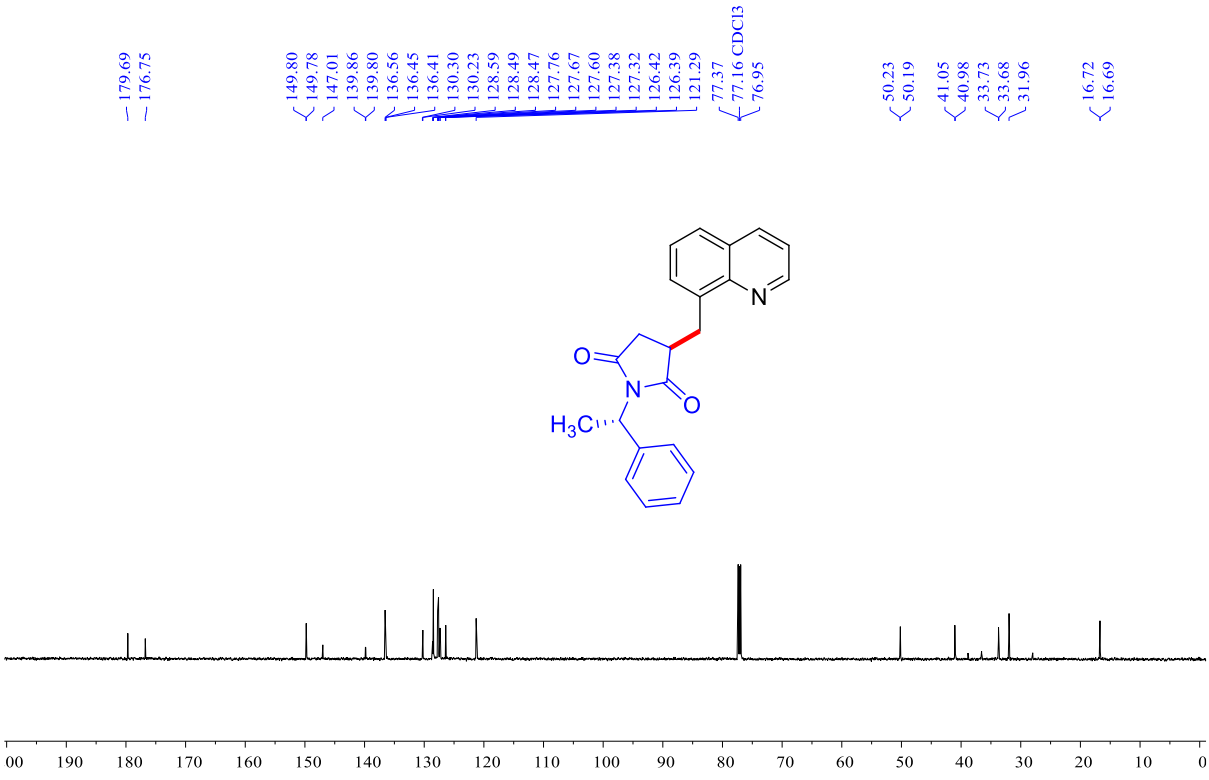


***1-Phenylethyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3ag)*:**

^{1}H NMR

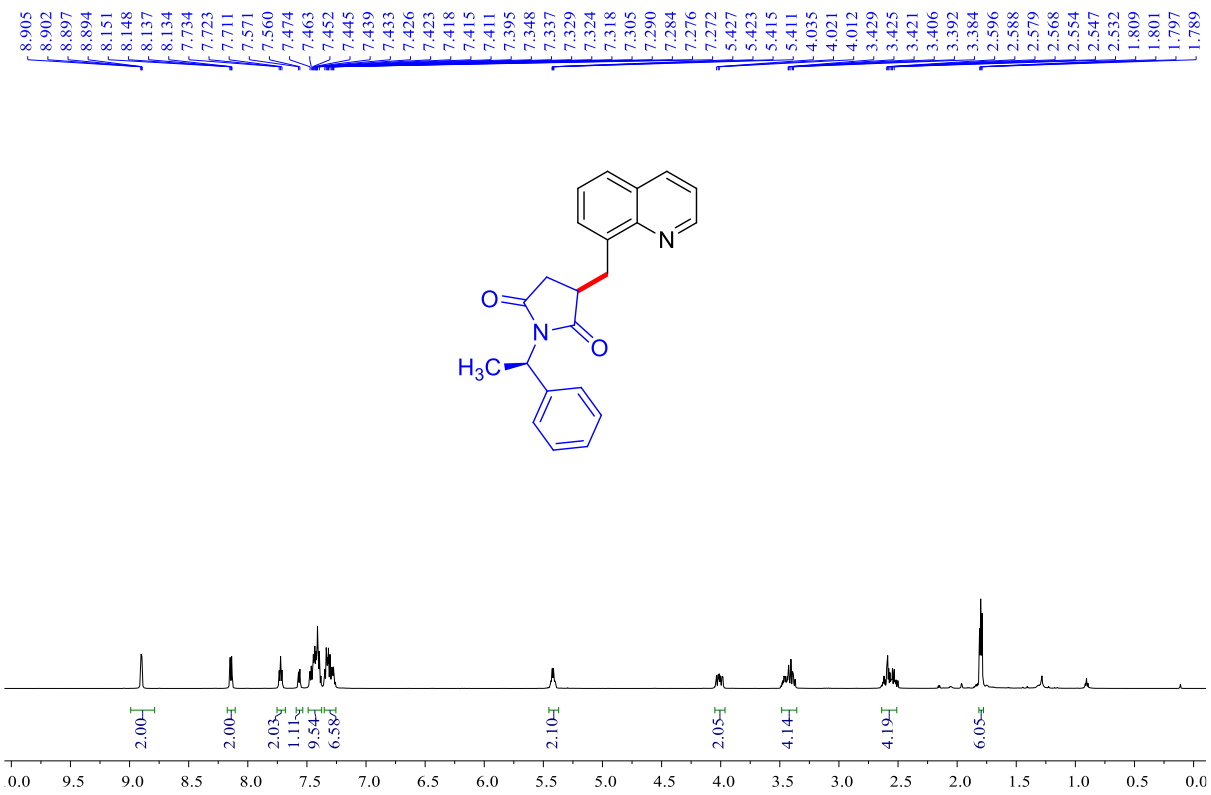


^{13}C NMR

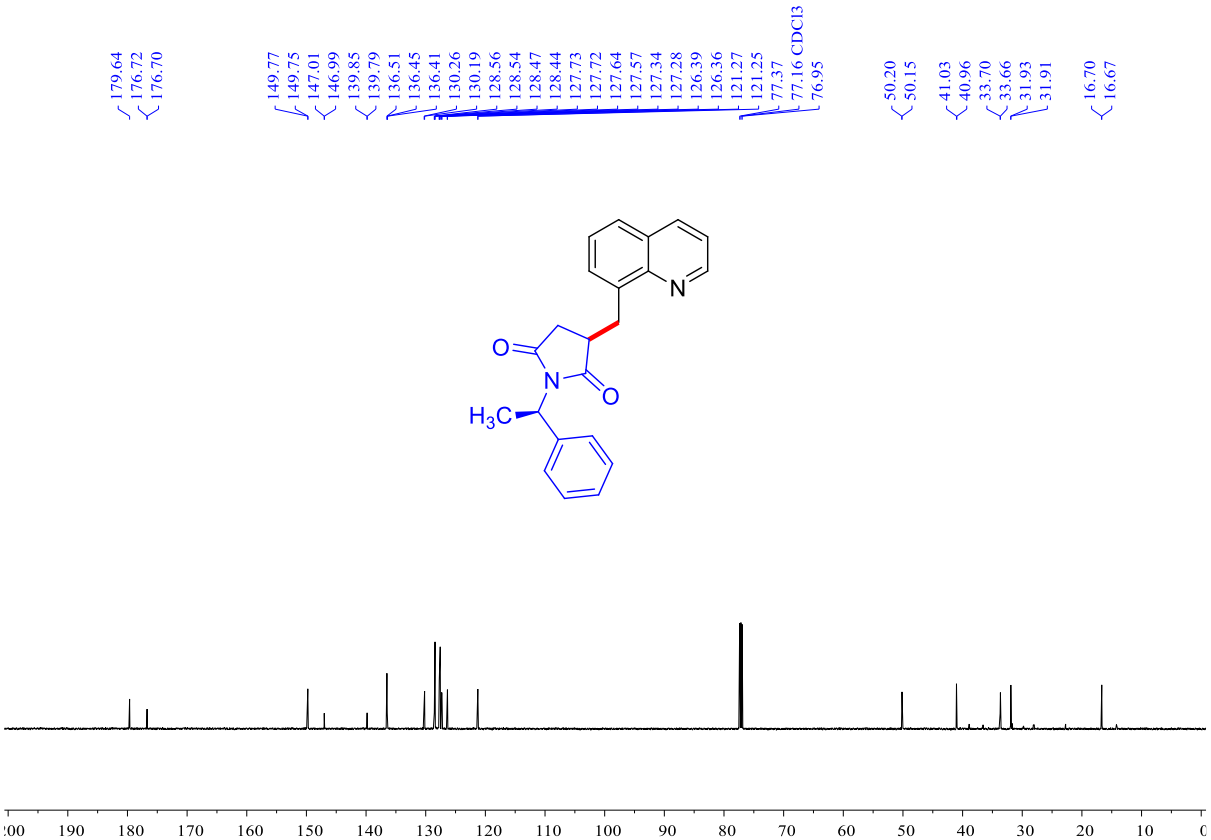


***1-(1-Phenylethyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3ah)*:**

^{1}H NMR

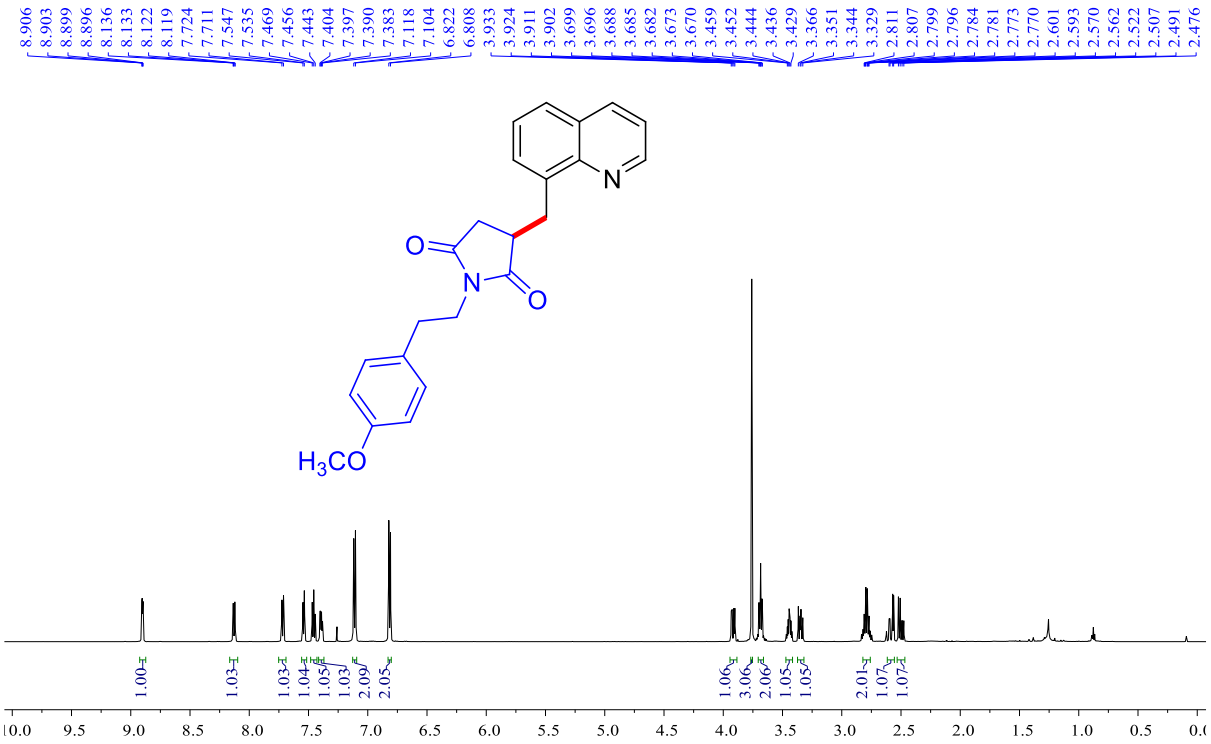


^{13}C NMR

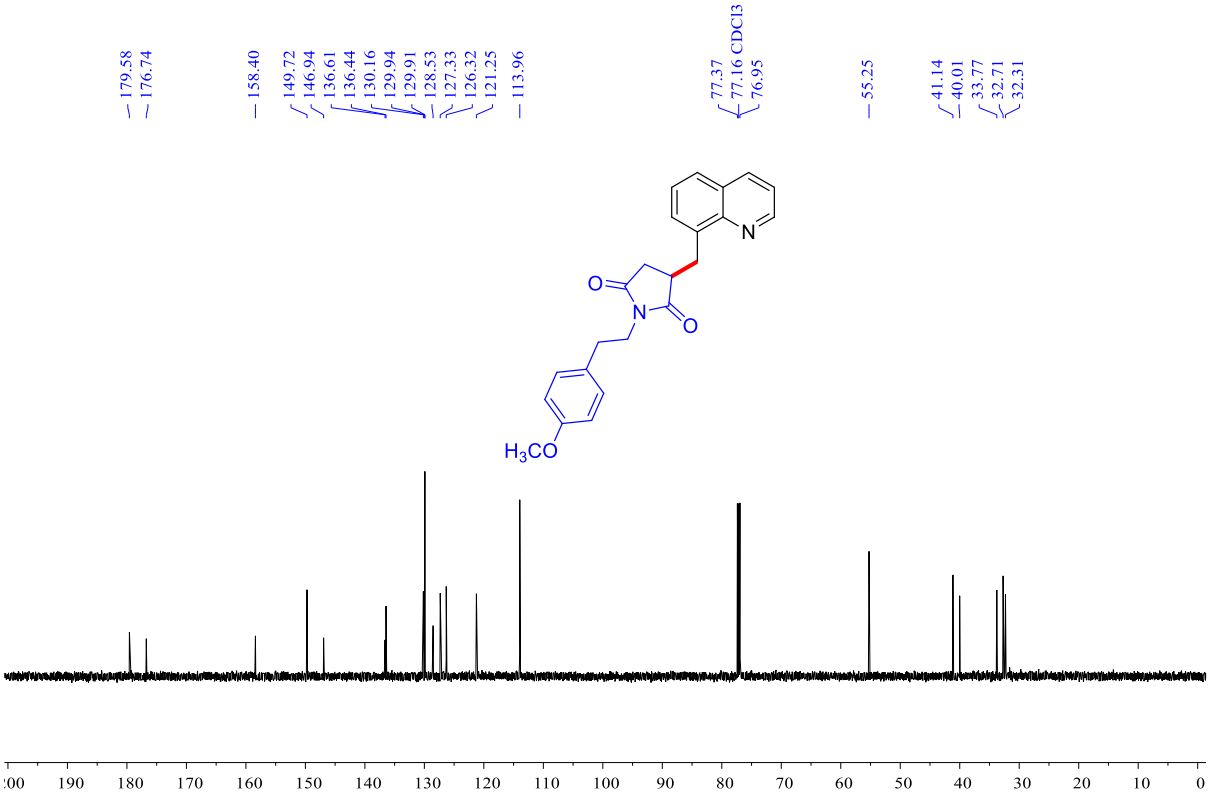


***1-(4-Methoxyphenethyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3ai)*:**

^{1}H NMR

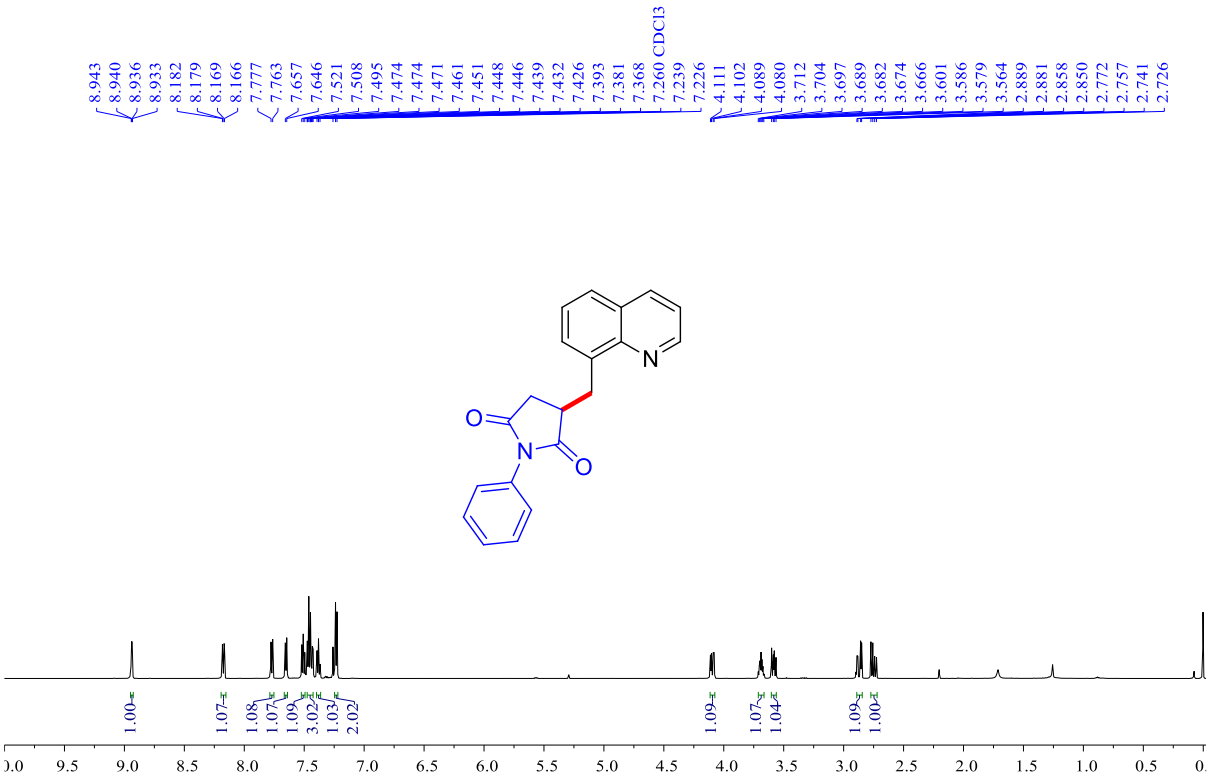


^{13}C NMR

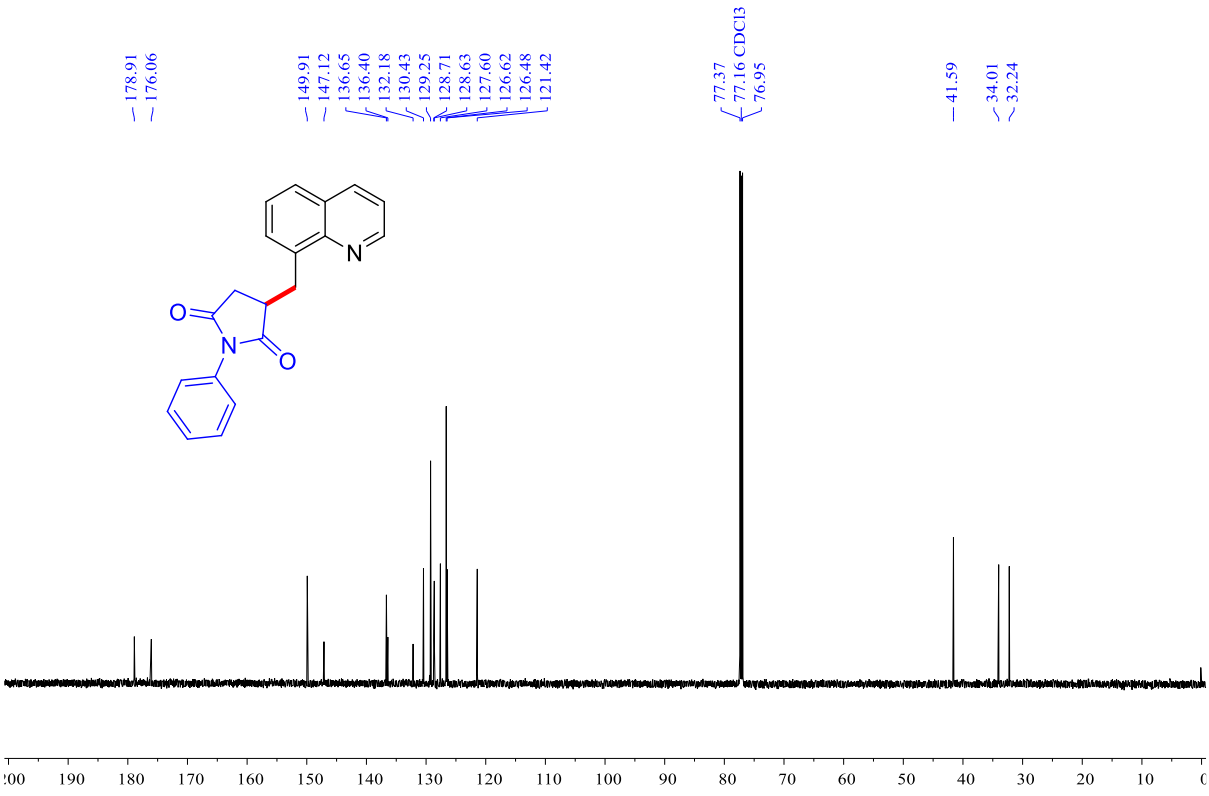


***1-Phenyl-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3aj)*:**

^{1}H NMR

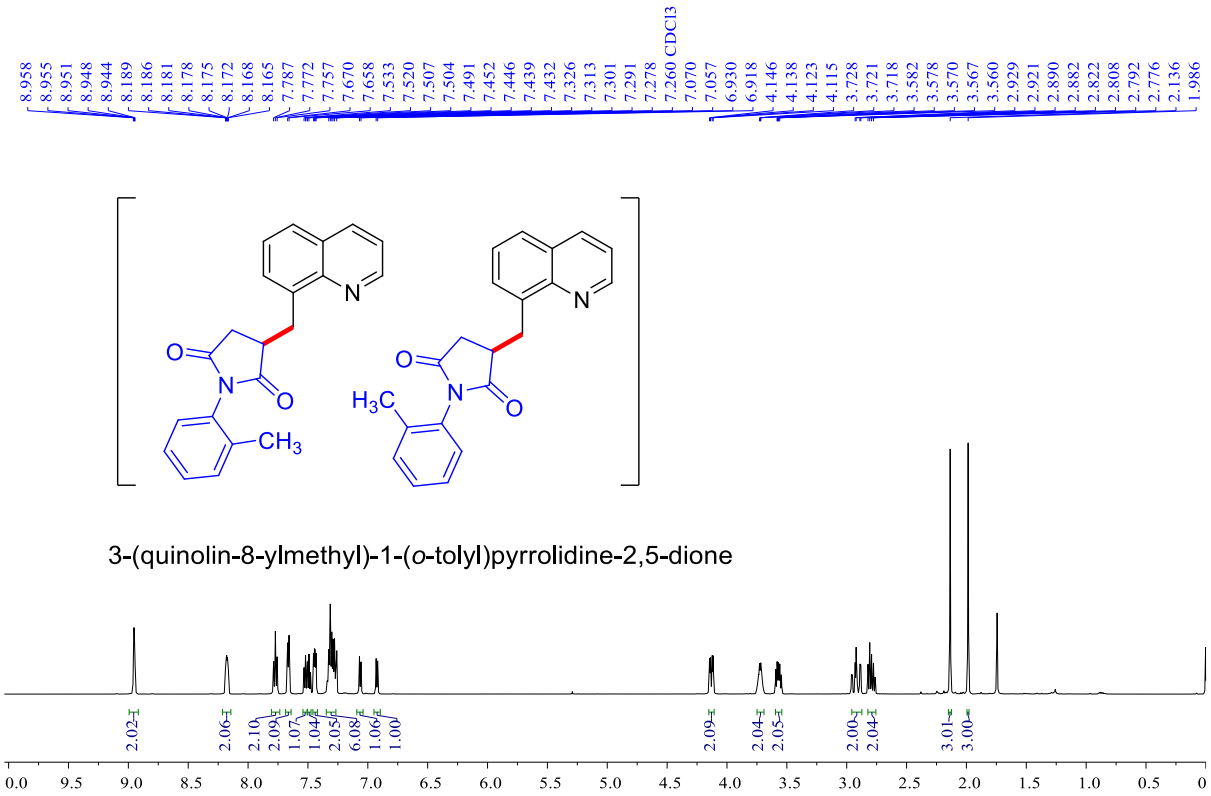


^{13}C NMR

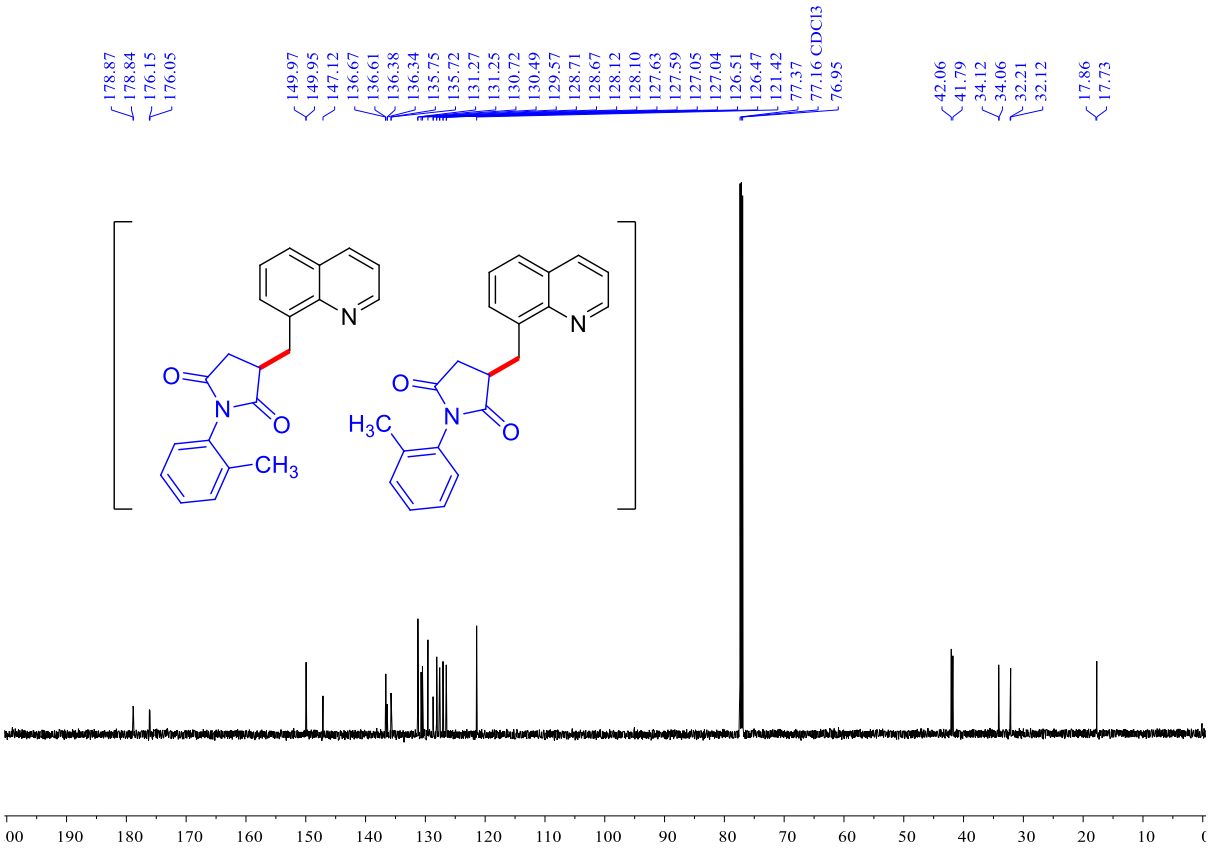


***3-(Quinolin-8-ylmethyl)-1-(o-tolyl)pyrrolidine-2,5-dione (Table 3, entry 3ak)*:**

^{1}H NMR

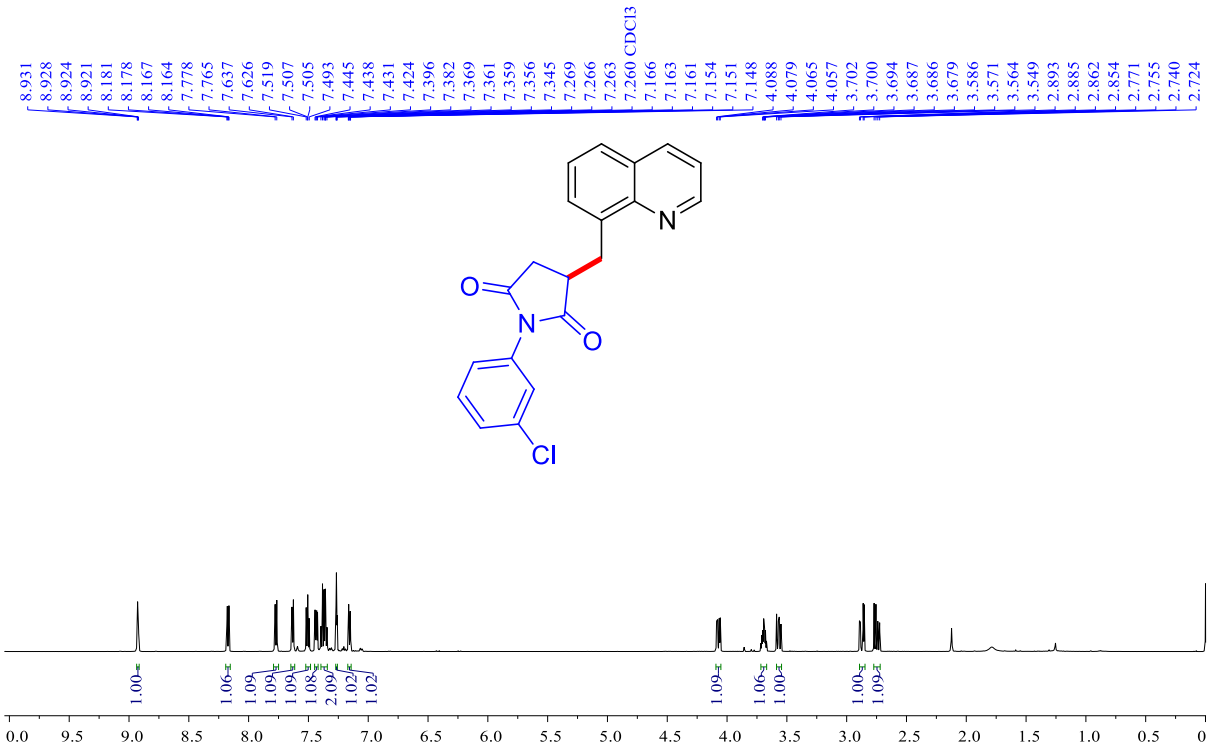


^{13}C NMR

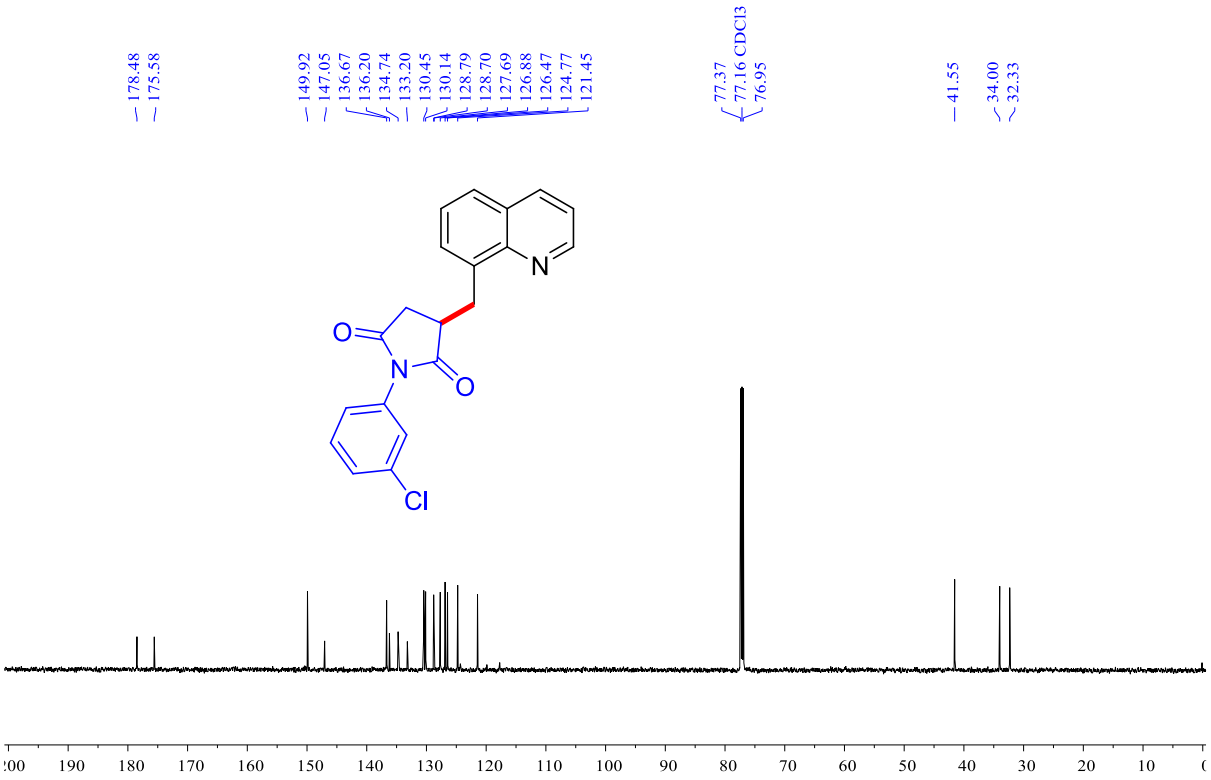


***1-(3-Chlorophenyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3al)*:**

^{1}H NMR

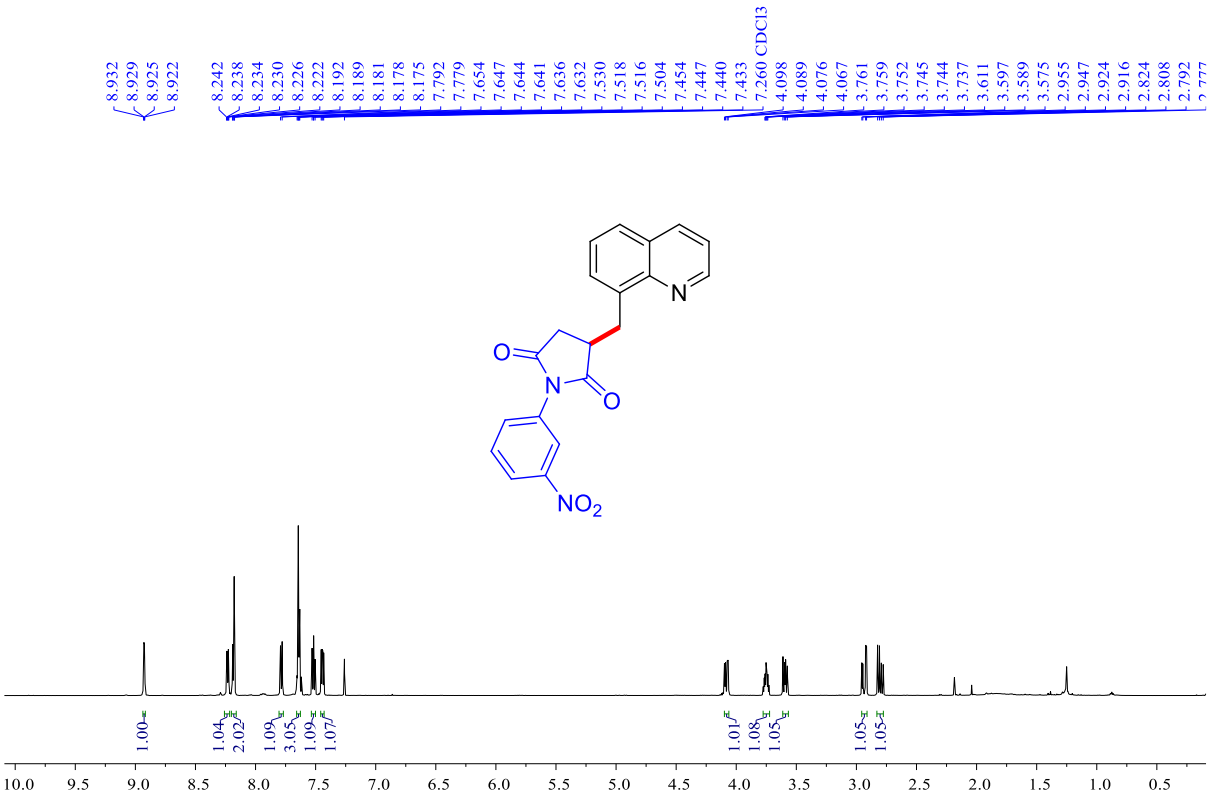


^{13}C NMR

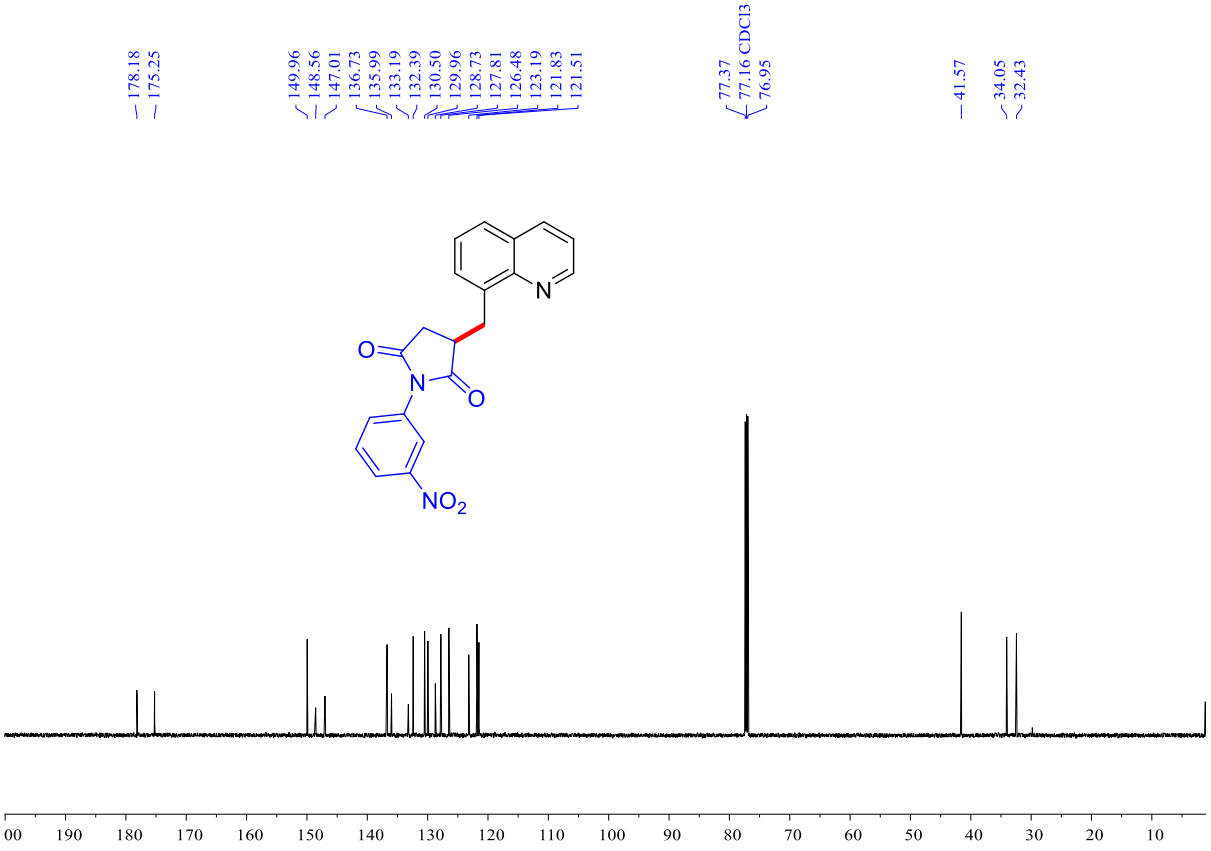


1-(3-Nitrophenyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione *(Table 3, entry 3am)*:

^{1}H NMR

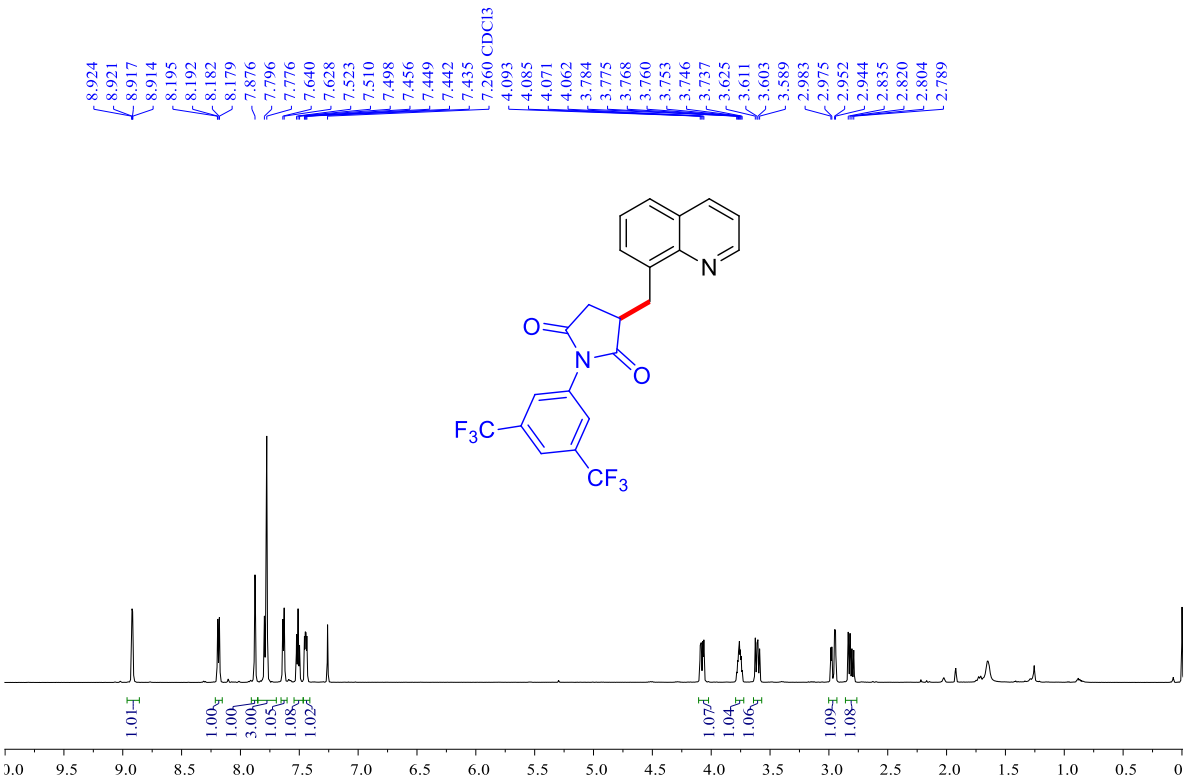


^{13}C NMR

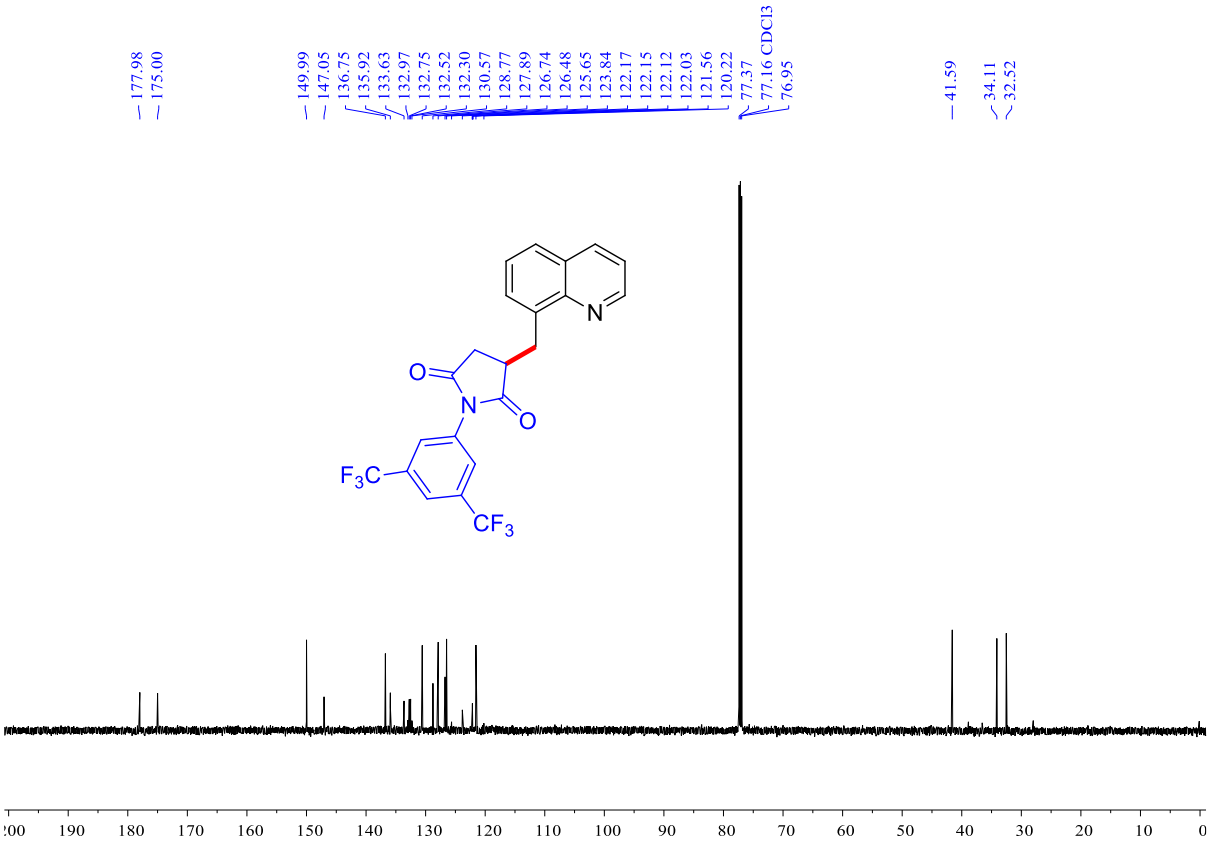


***1-(3,5-Bis(trifluoromethyl)phenyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3an)*:**

^{1}H NMR

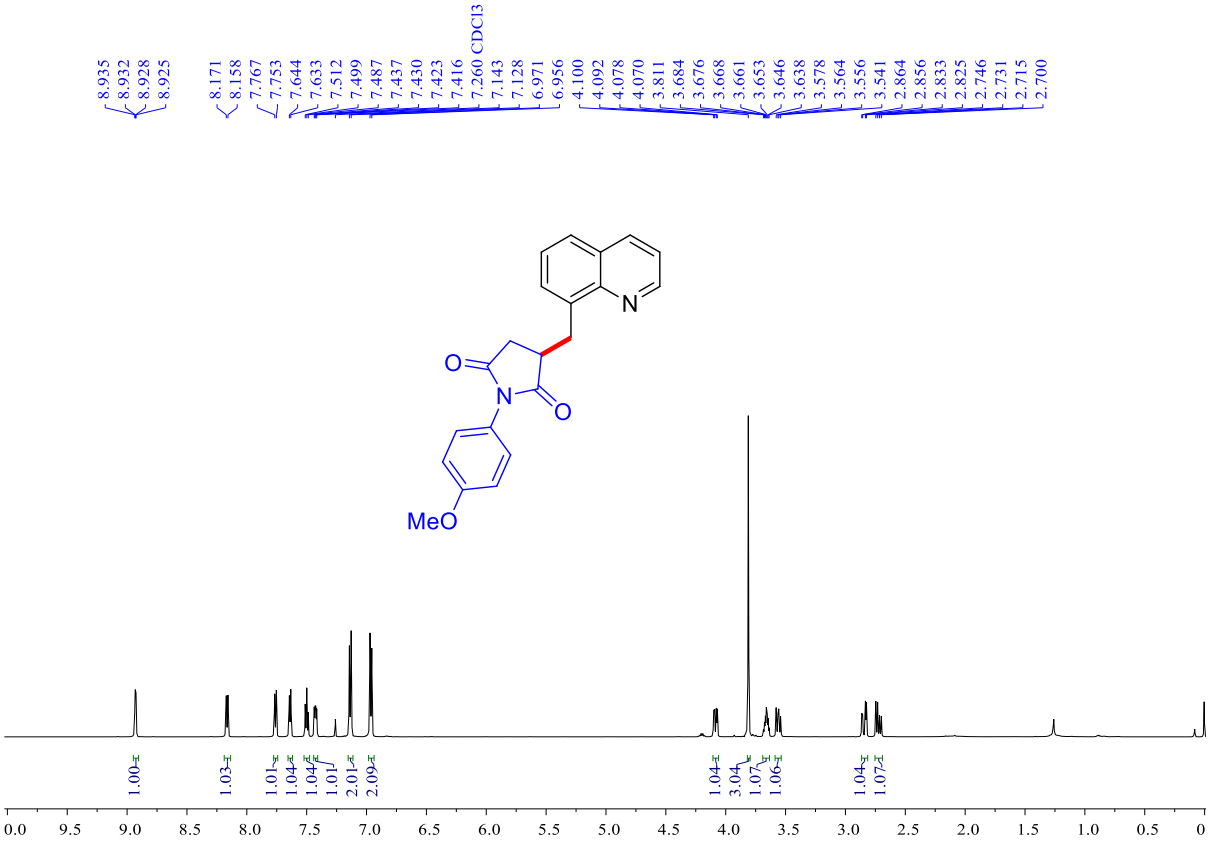


^{13}C NMR

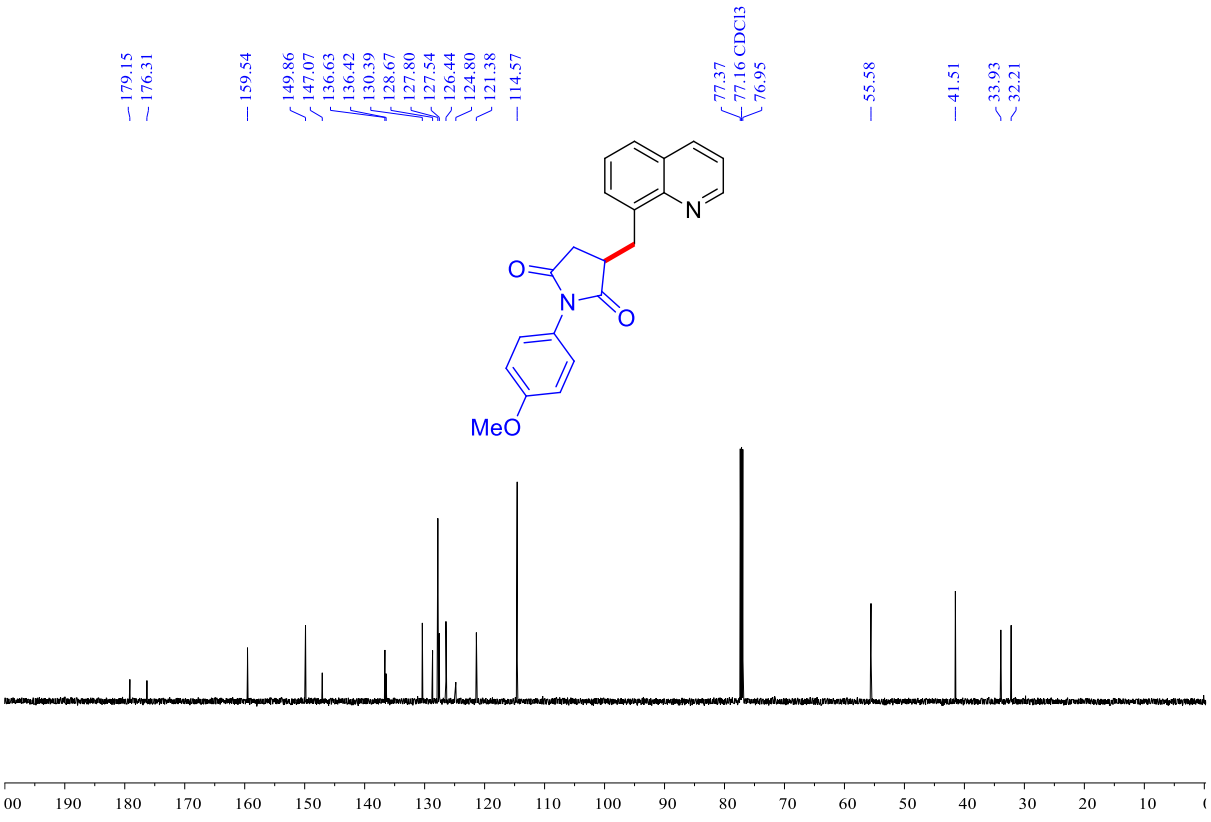


***1-(4-Methoxyphenyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3ao)*:**

^{1}H NMR

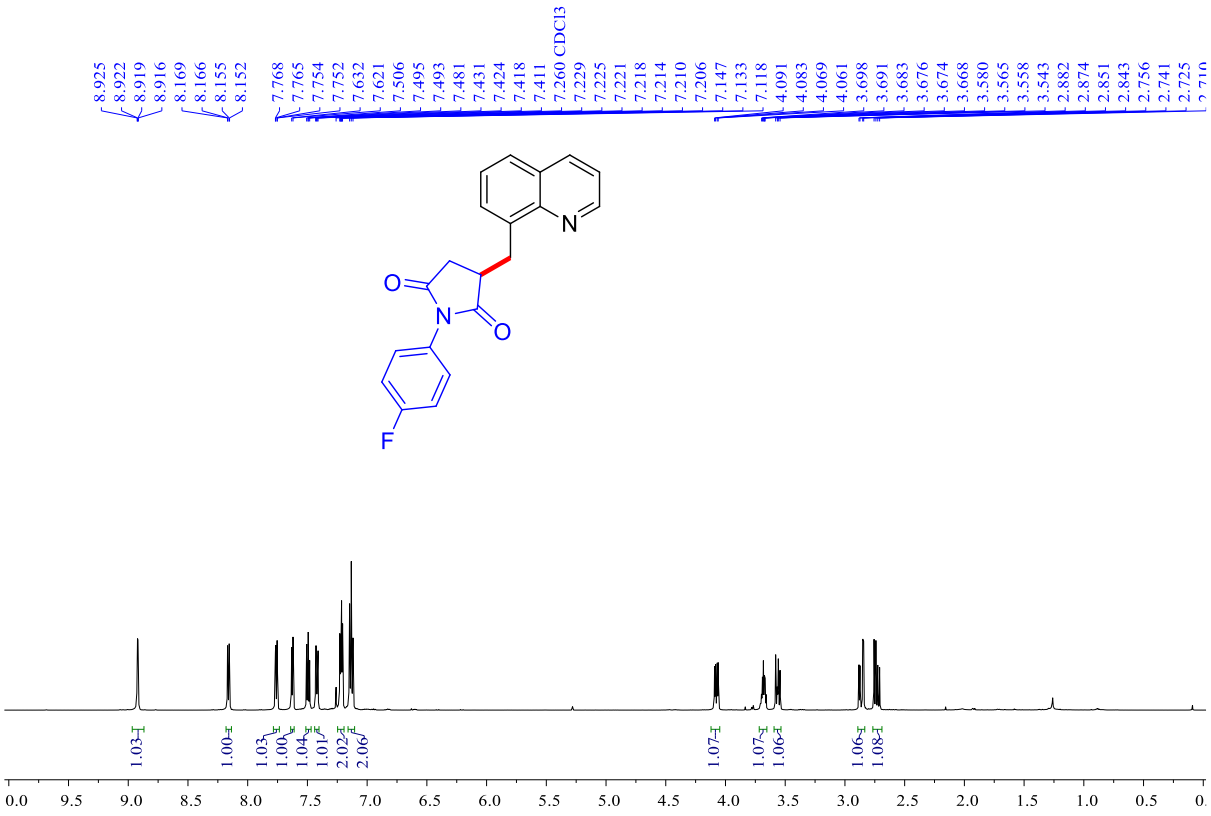


^{13}C NMR

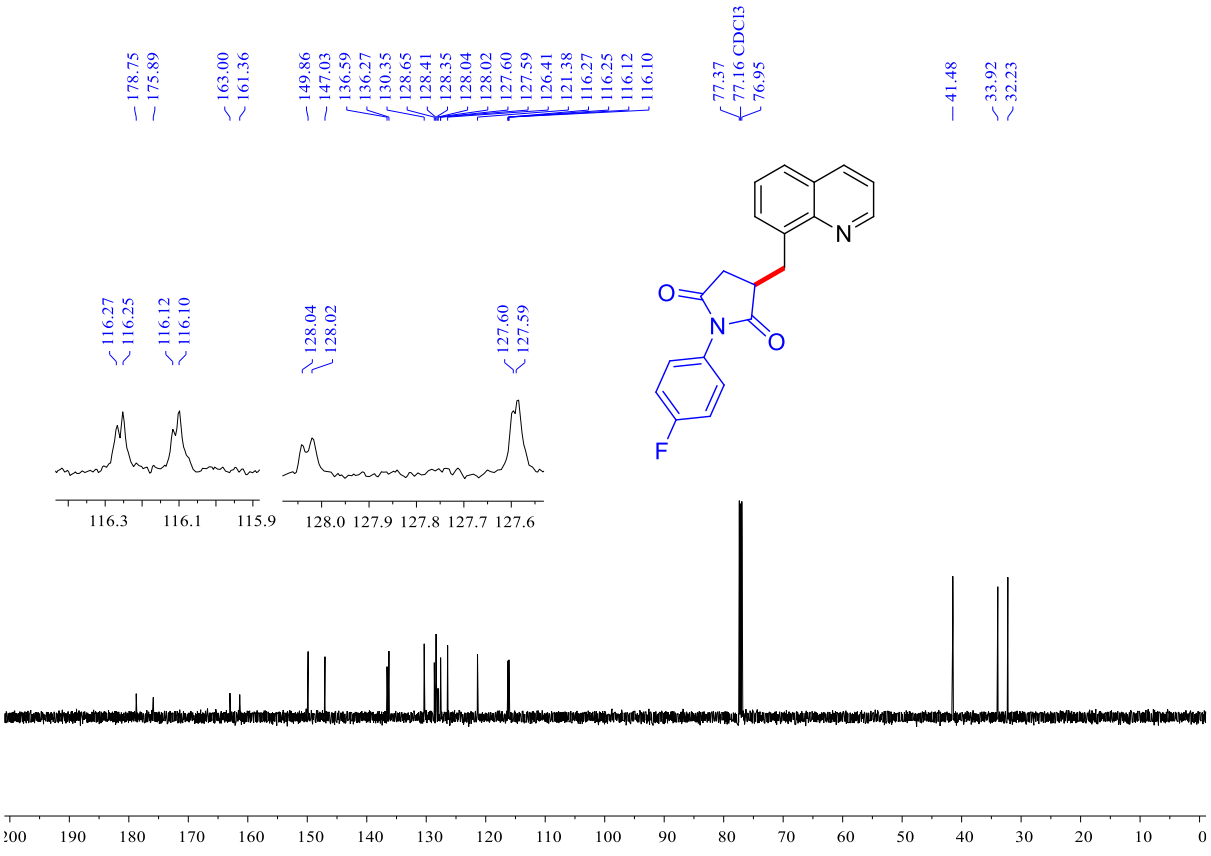


***1-(4-Fluorophenyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3ap)*:**

^{1}H NMR

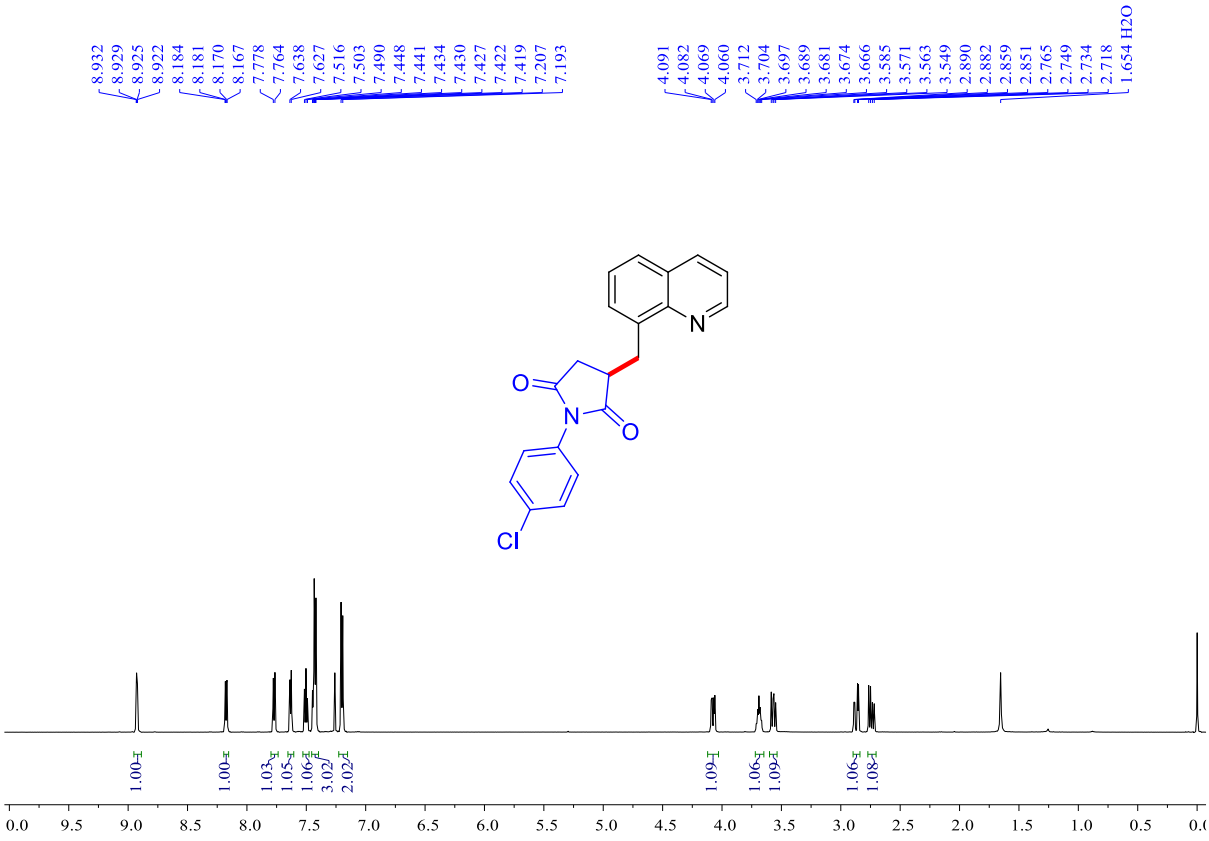


^{13}C NMR

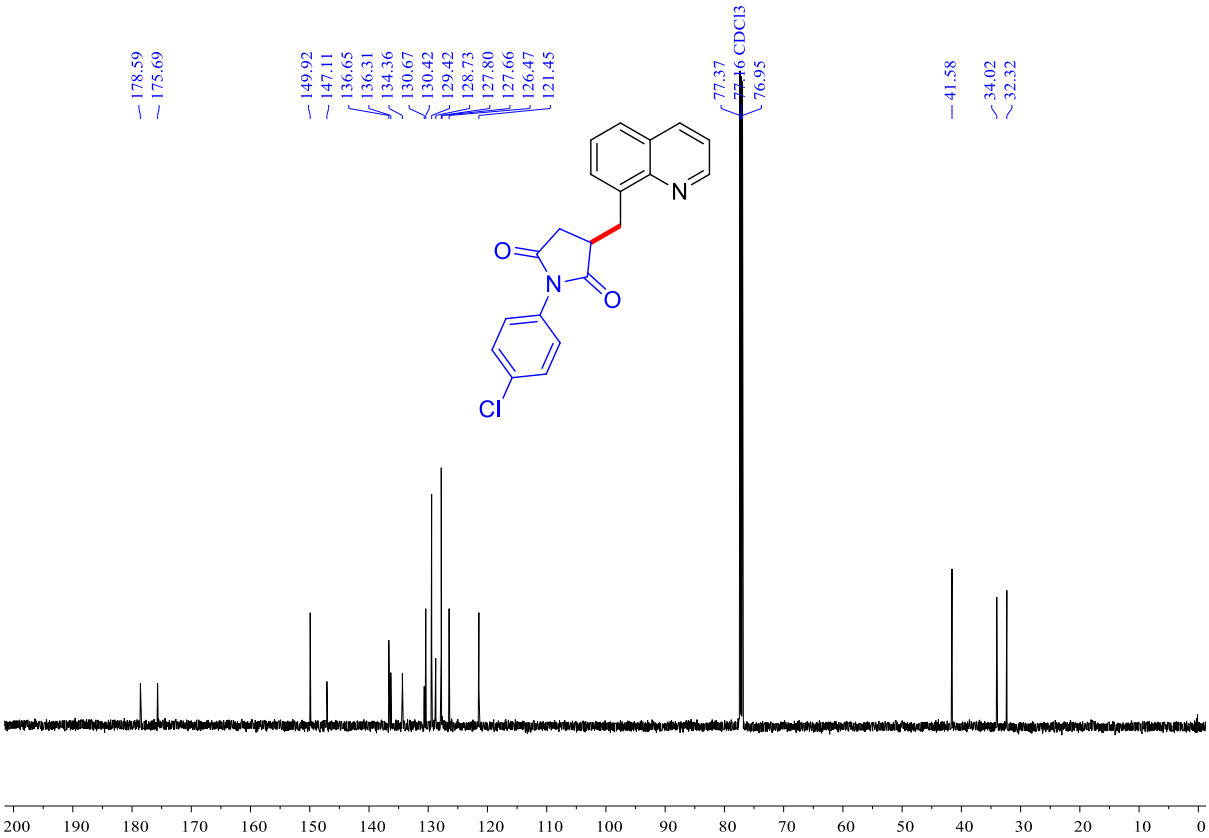


1-(4-Chlorophenyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione *(Table 3, entry 3aq)*:

^{1}H NMR

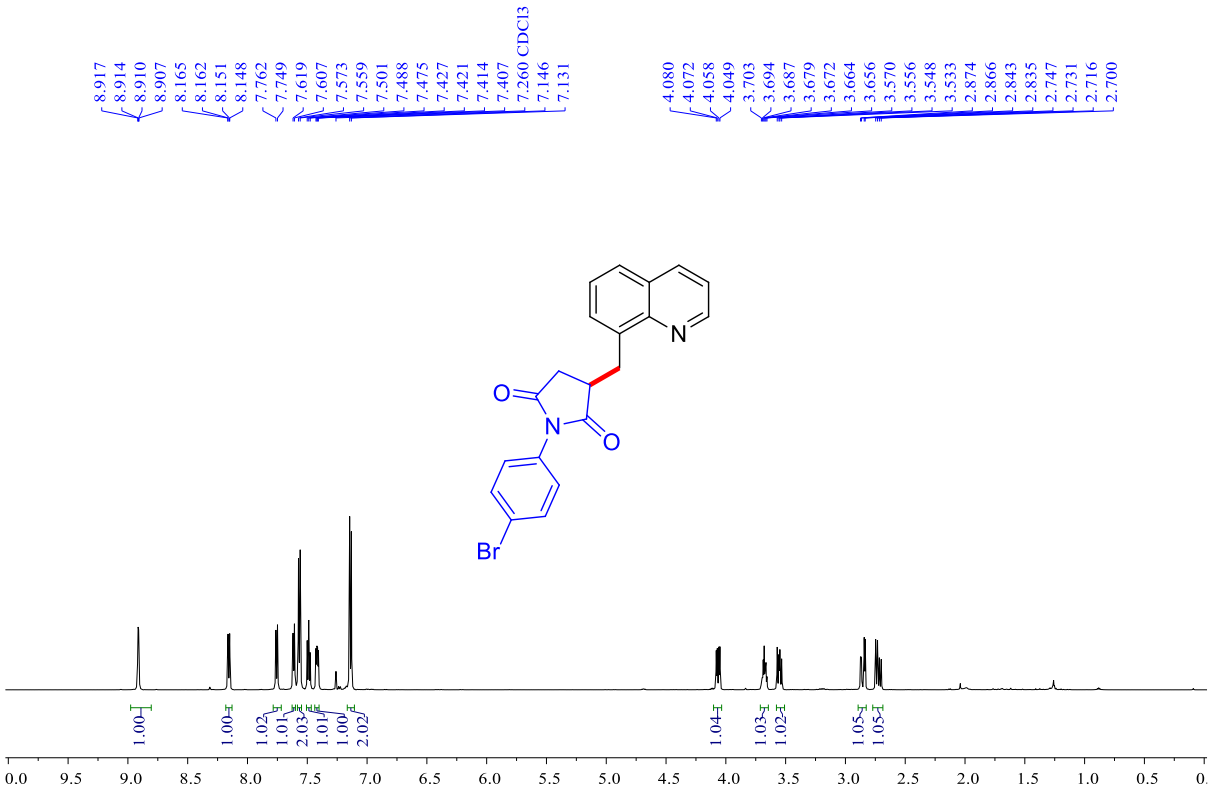


^{13}C NMR

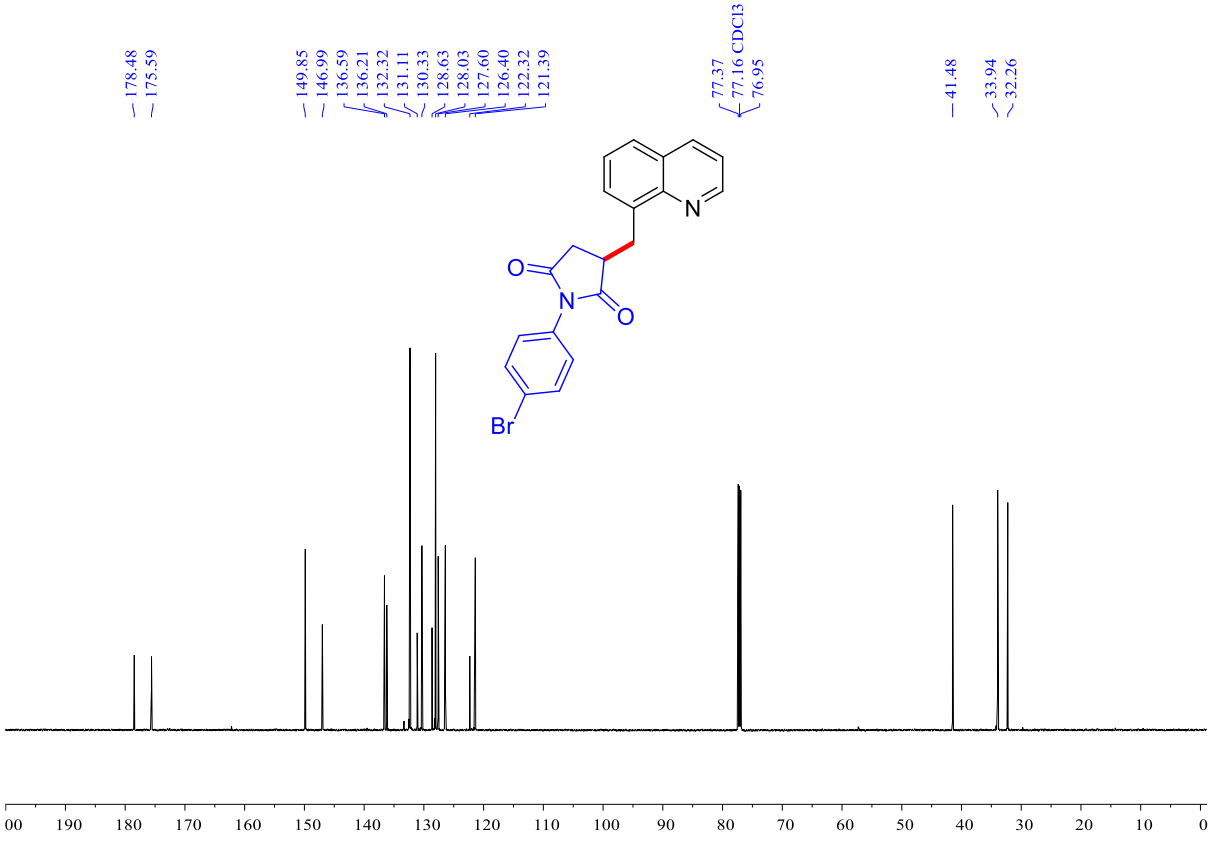


1-(4-Bromophenyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione *(Table 3, entry 3ar)*:

^{1}H NMR

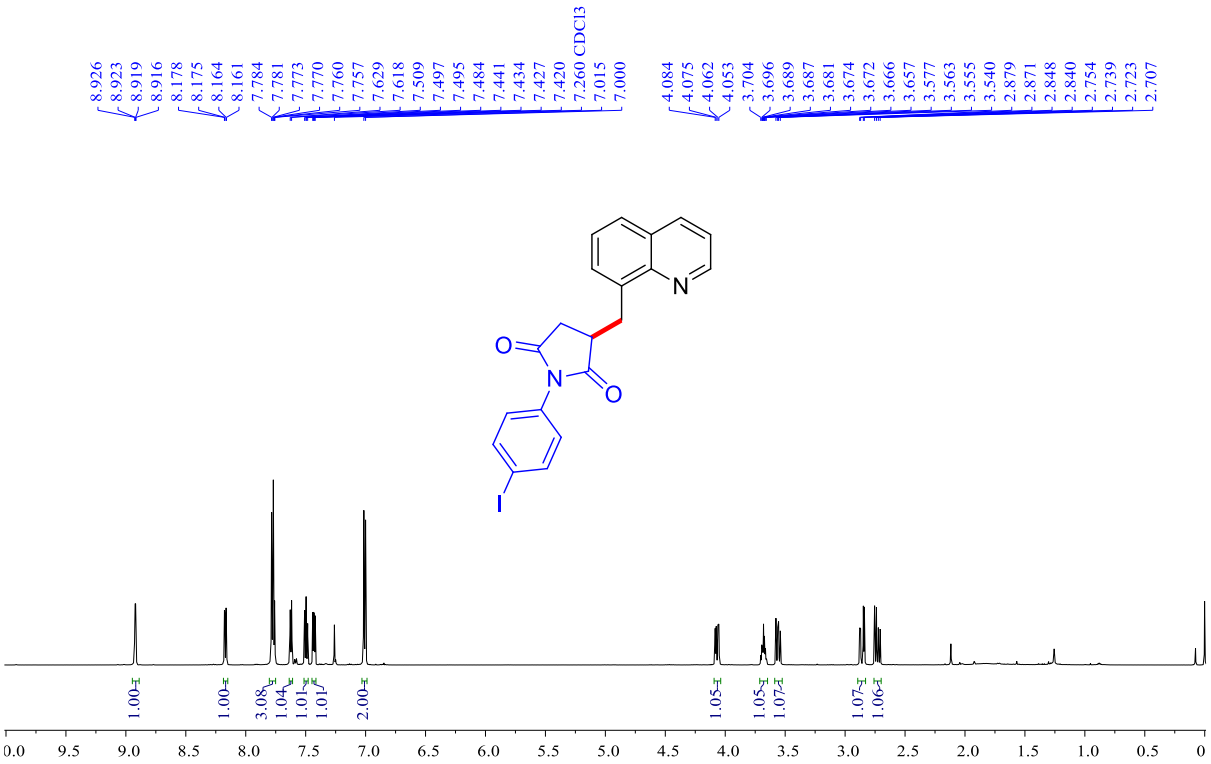


^{13}C NMR

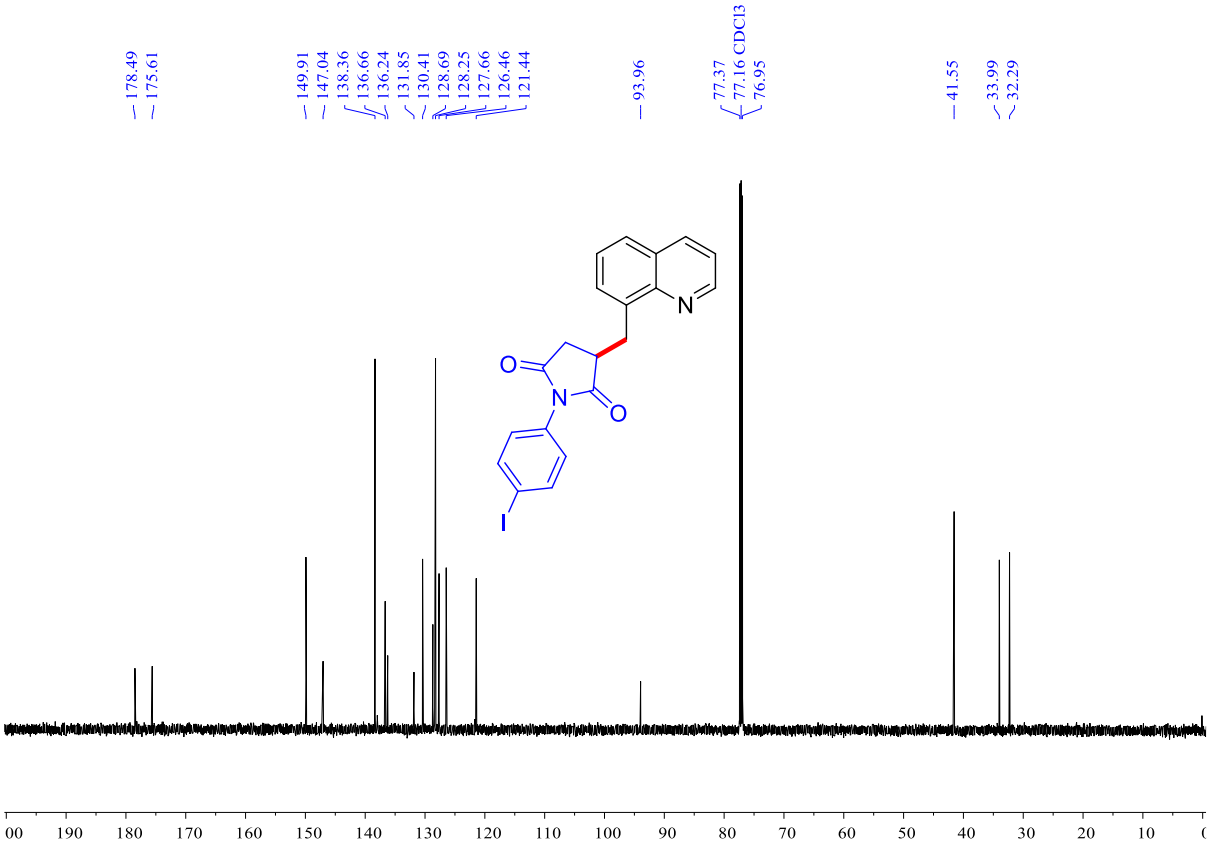


***1-(4-Iodophenyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3as)*:**

^{1}H NMR

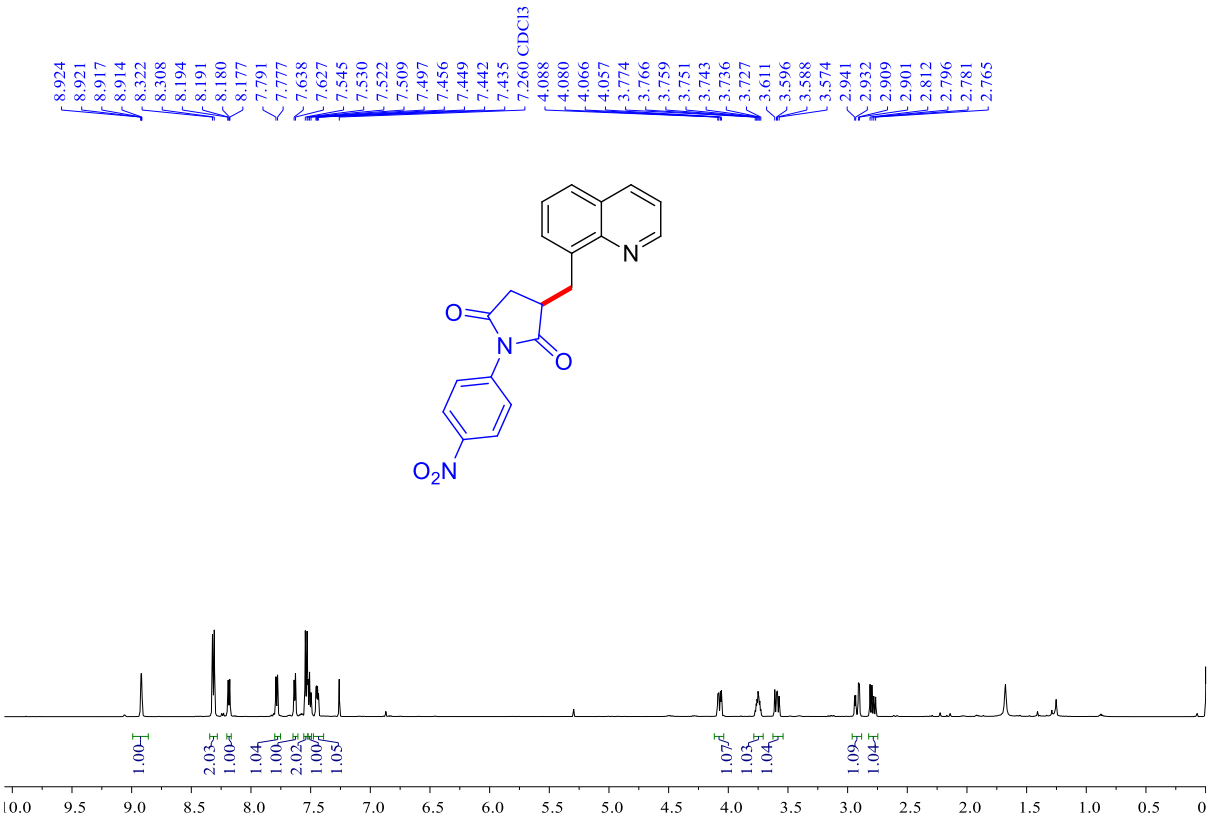


^{13}C NMR

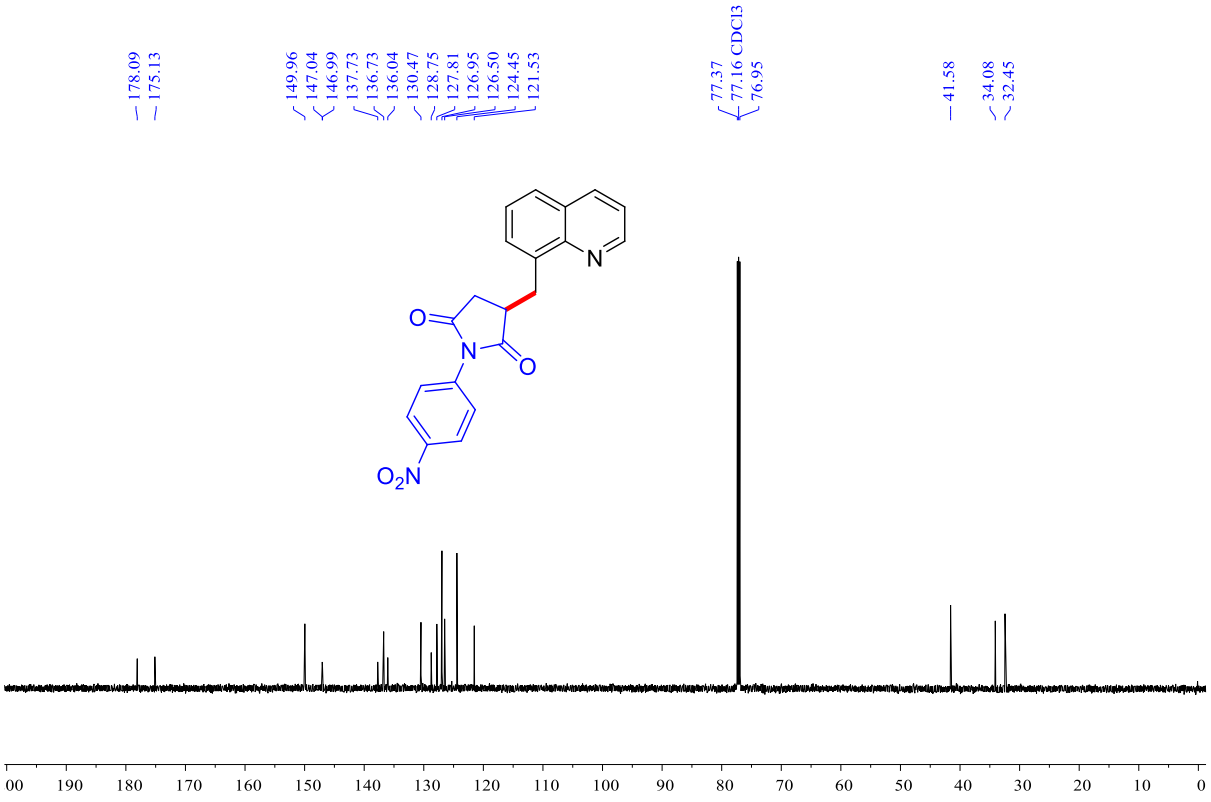


1-(4-Nitrophenyl)-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione *(Table 3, entry 3at)*:

^{1}H NMR

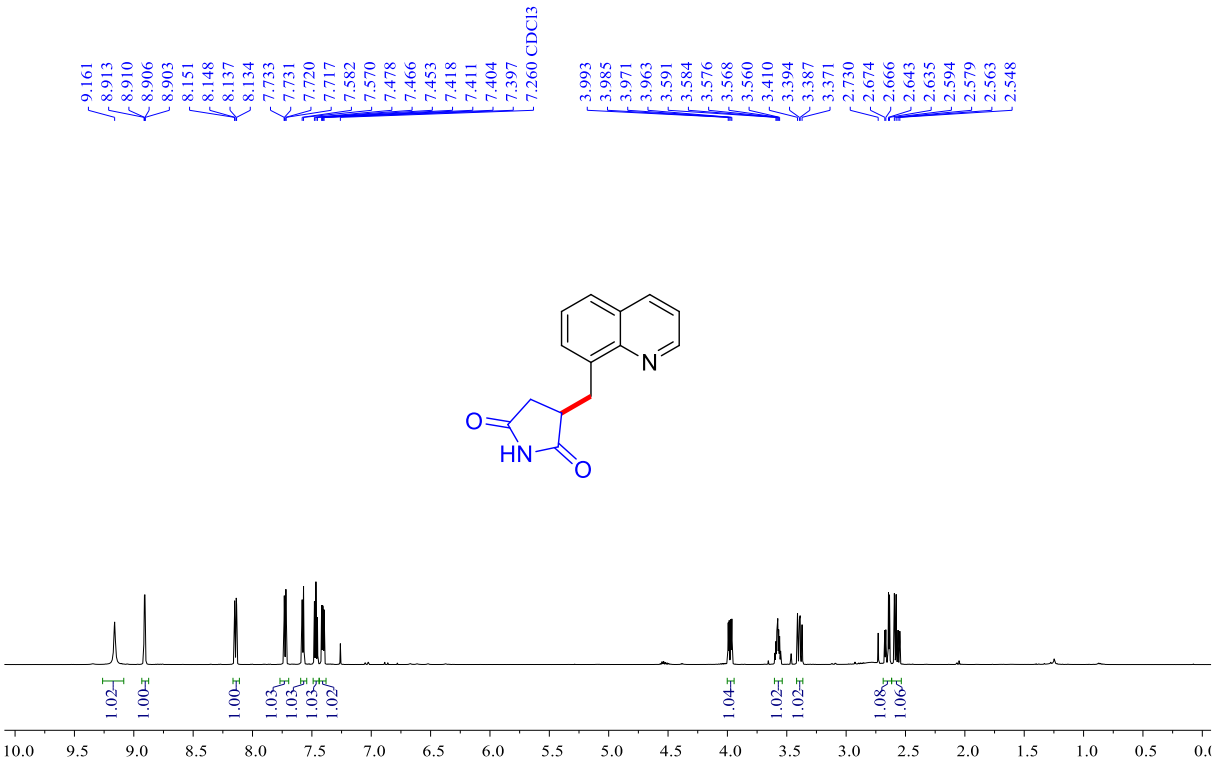


^{13}C NMR

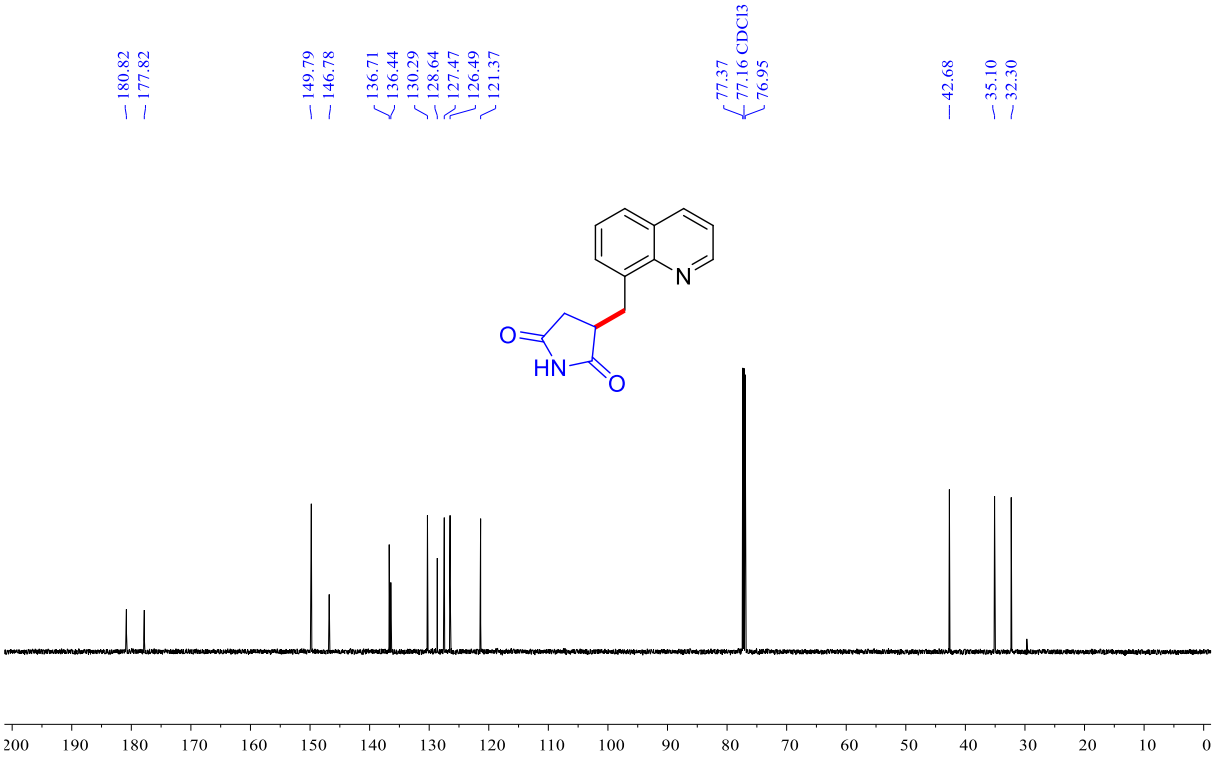


***3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (Table 3, entry 3au)*:**

^{1}H NMR

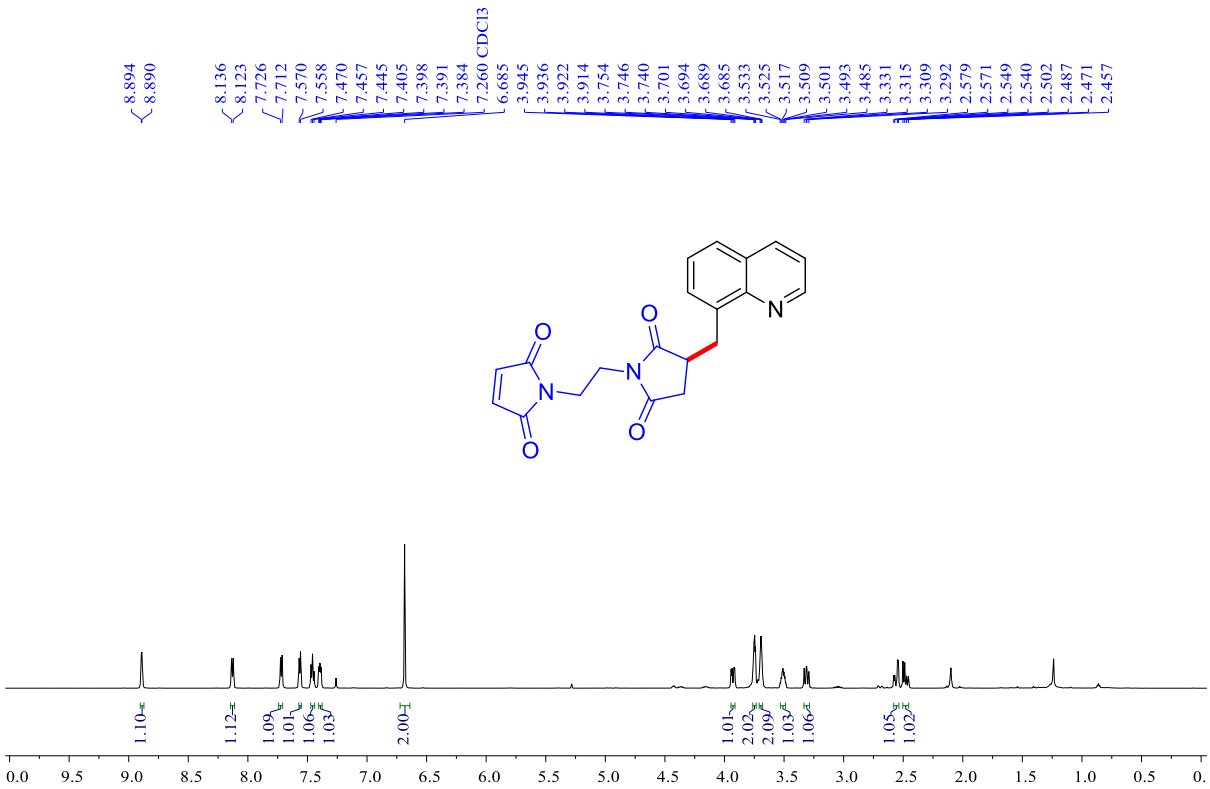


^{13}C NMR

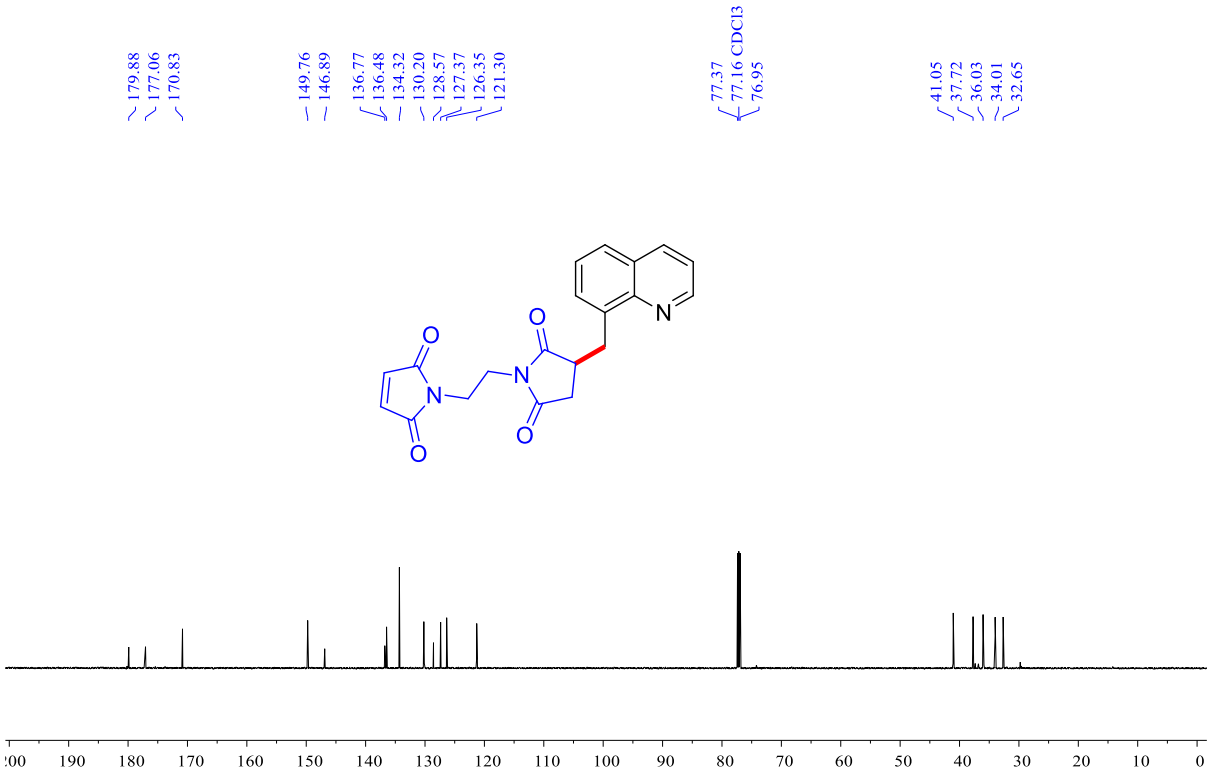


***1-(2-(2,5-Dioxo-3-(quinolin-8-ylmethyl)pyrrolidin-1-yl)ethyl)-1H-pyrrole-2,5-dione (Table 3, entry 3av$_1$)*:**

^{1}H NMR

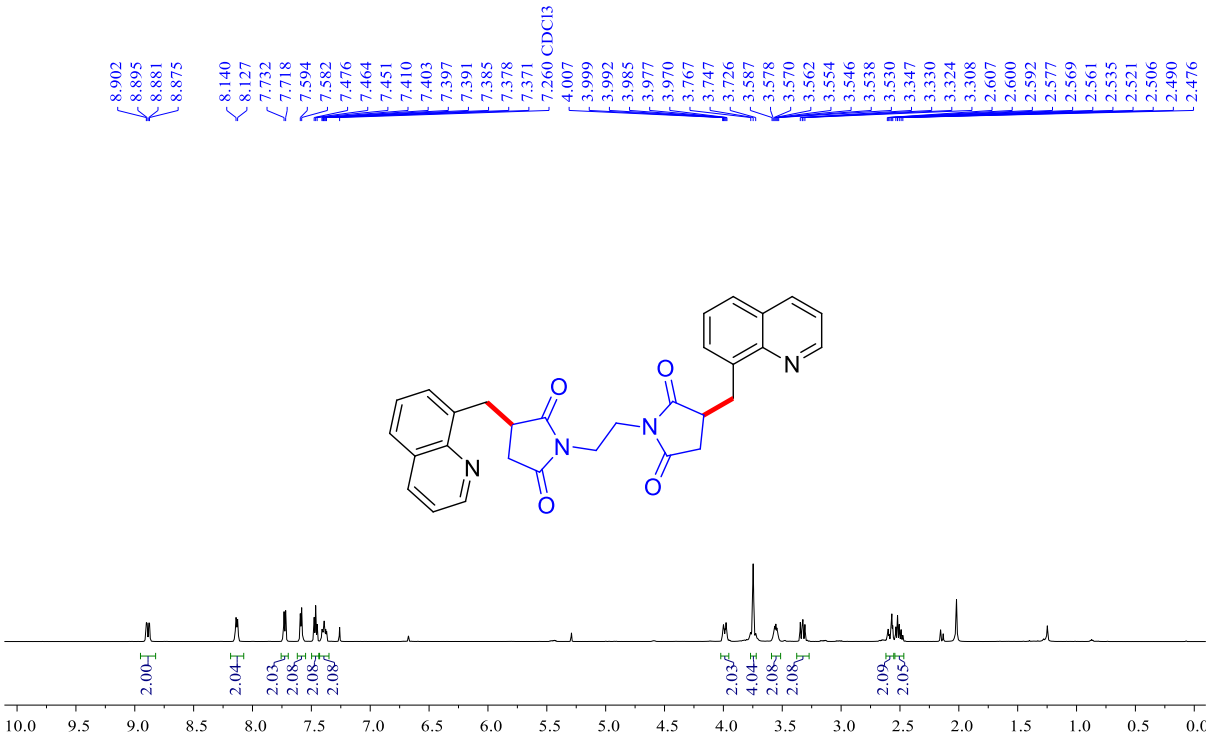


^{13}C NMR

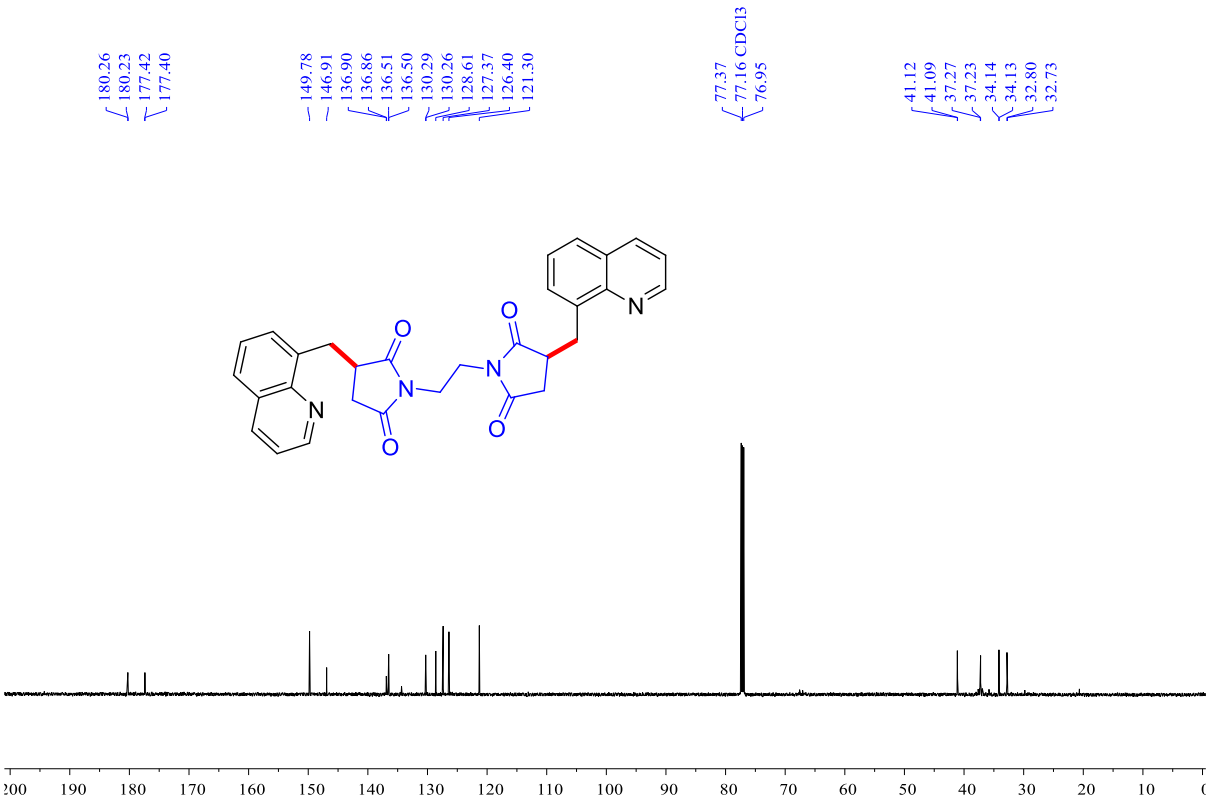


***1,1'-(ethane-1,2-diyl)bis(3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione) (Table 3, entry 3av$_2$)*:**

^{1}H NMR

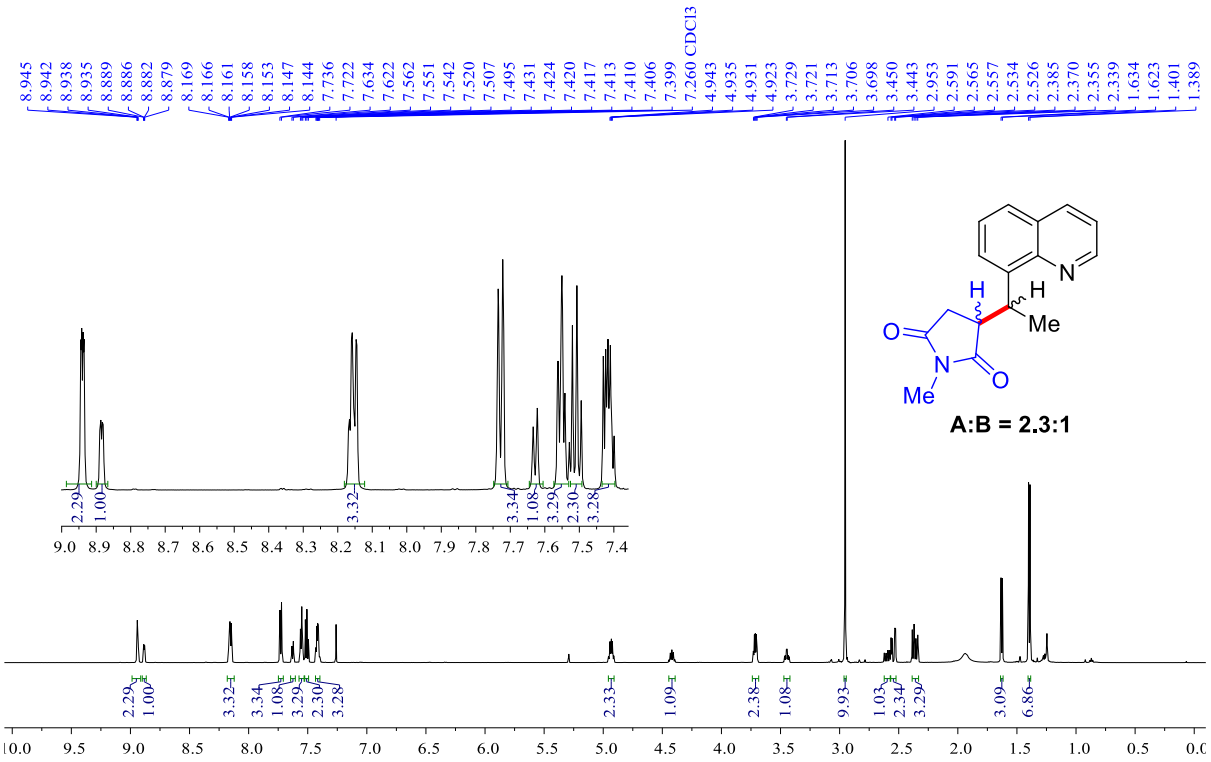


^{13}C NMR

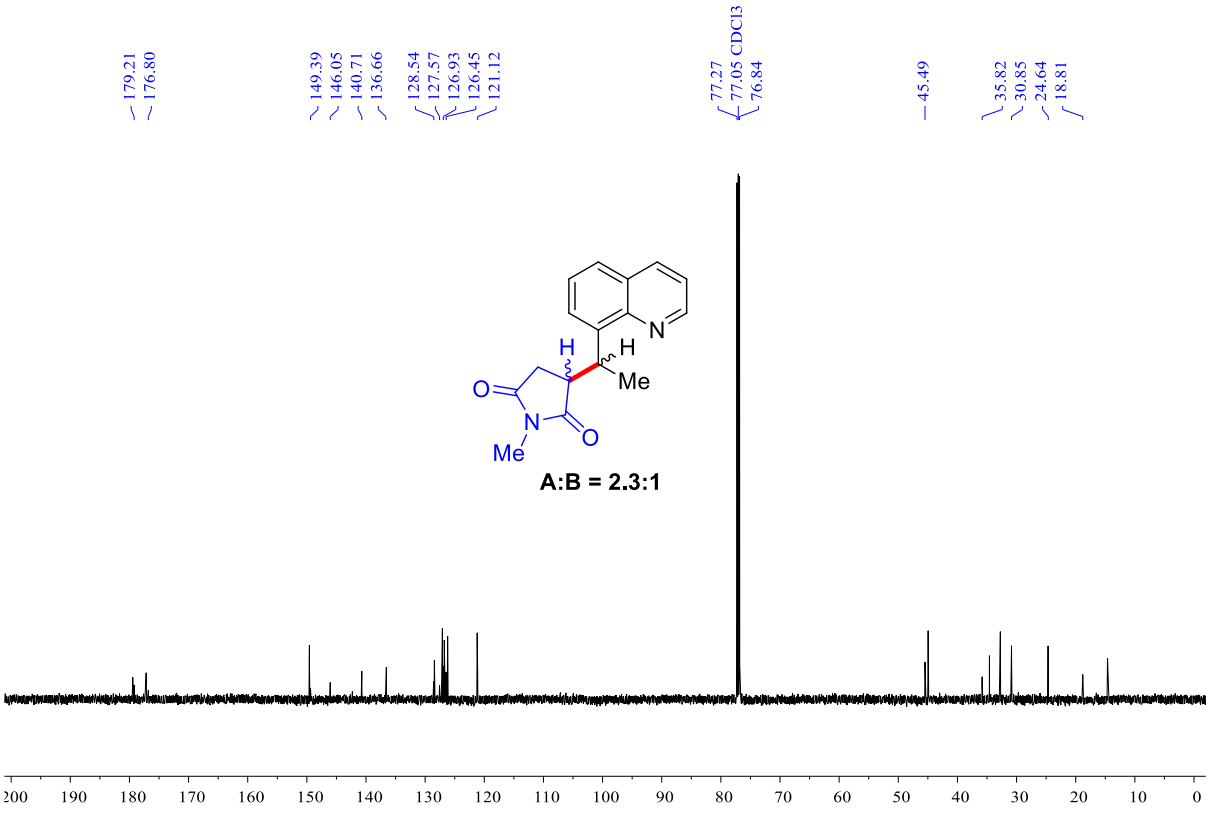


***1-methyl-3-(1-(quinolin-8-yl)ethyl)pyrrolidine-2,5-dione (Table 2, entry 3sa)*:**

^{1}H NMR

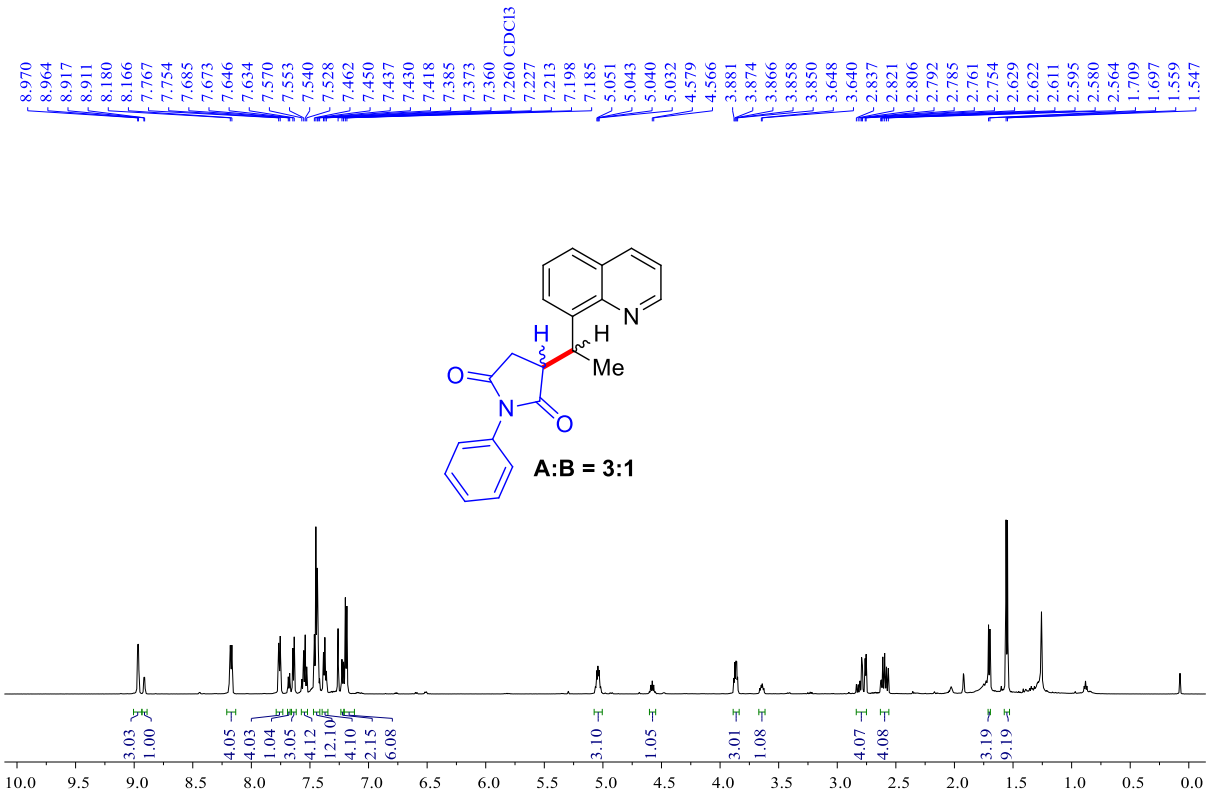


^{13}C NMR

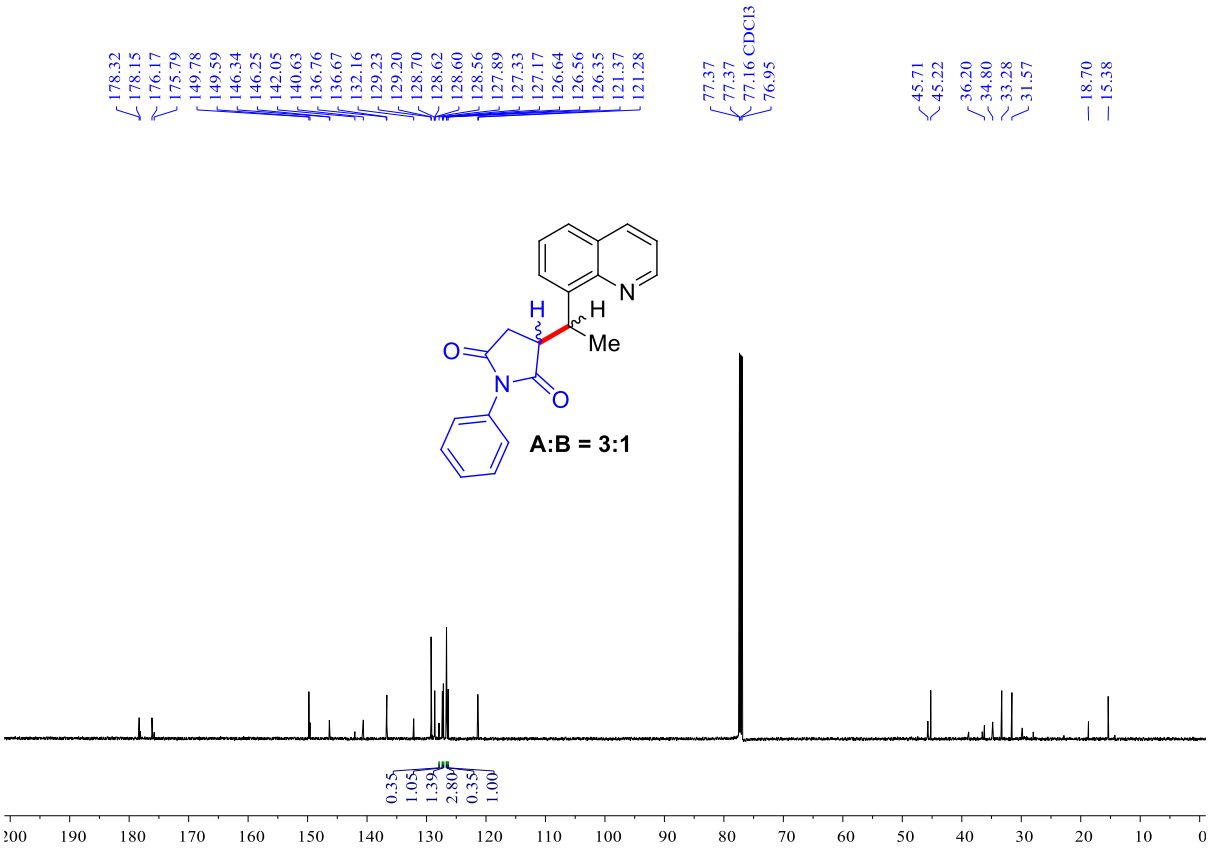


1-phenyl-3-(1-(quinolin-8-yl)ethyl)pyrrolidine-2,5-dione (Table 4, entry 5aj)

^{1}H NMR

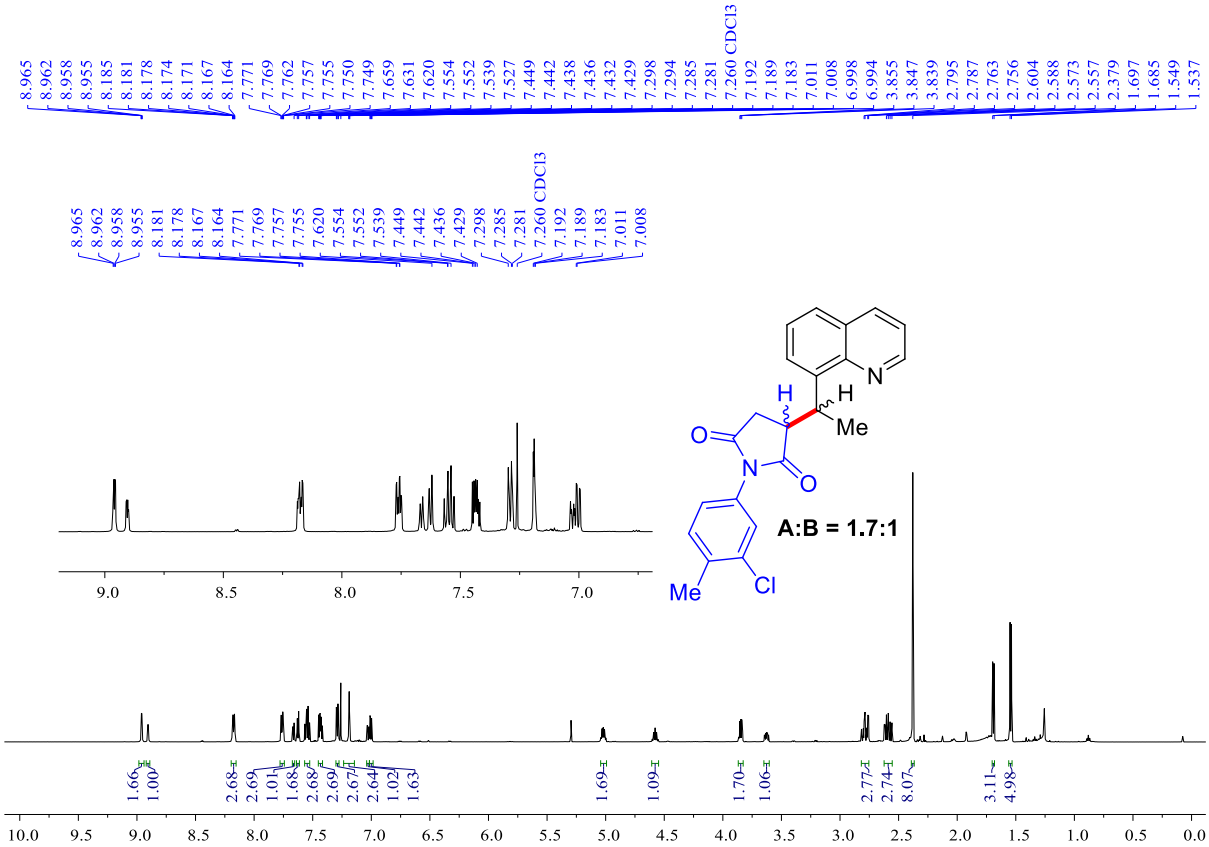


^{13}C NMR



1-(3-Chloro-4-methylphenyl)-3-(1-(quinolin-8-yl)ethyl)pyrrolidine-2,5-dione (Table 4, entry 5ay):

^{1}H NMR



^{13}C NMR