ELECTRONIC SUPPLEMENTARY INFORMATION

Esterquat Herbicidal Ionic Liquids (HILs) with two different herbicides: evaluation of activity and phytotoxicity

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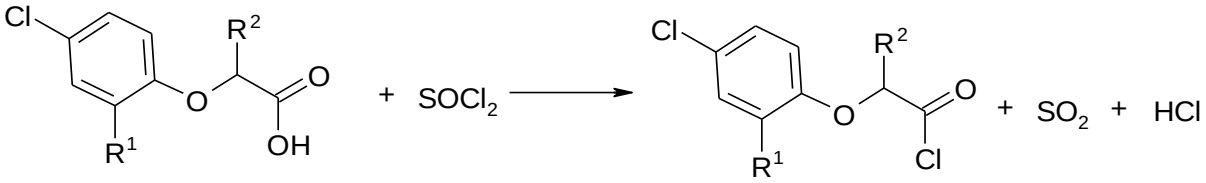
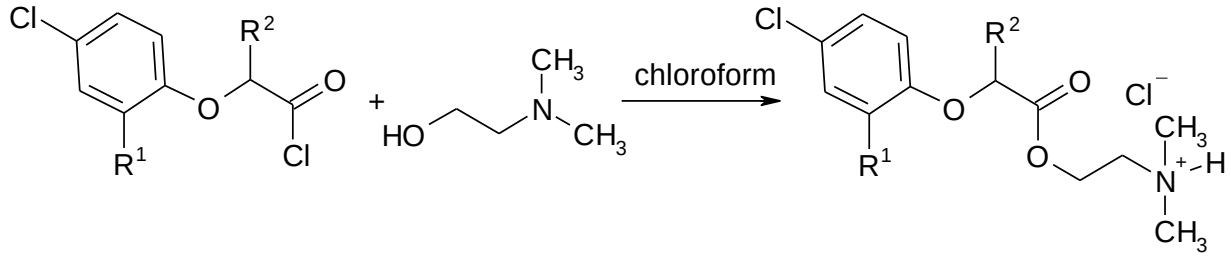


Scheme S1 Synthesis of phenoxy-acid chlorides.

Table S1 Phenoxy-acid chlorides according to Scheme S1

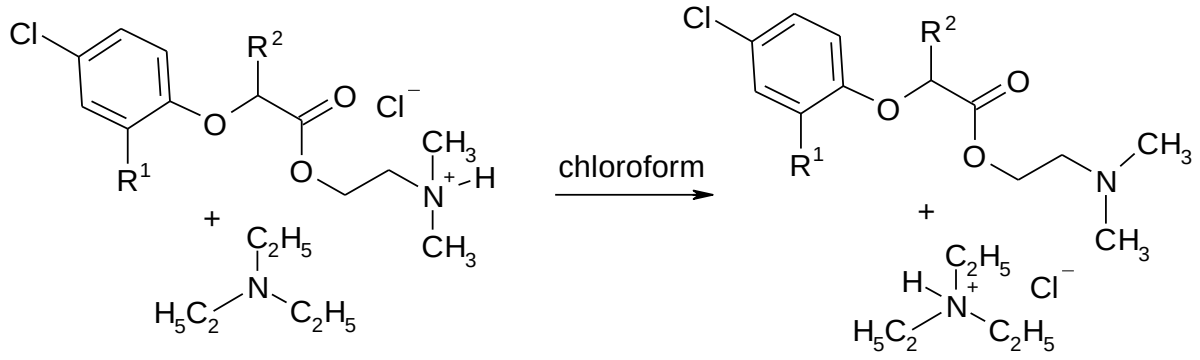
Abbreviation of phenoxy-acid chloride	R^1	R^2	Destillation		Yield [%]
			p [hPa]	T [°C]	
2,4-D-Cl	Cl	H	7 – 8	141	80
MCPA-Cl	CH_3	H	3 – 4	125	94
MCPP-Cl	CH_3	CH_3	29 – 30	149	88
4-CPA-Cl	H	H	22 – 23	144	94



Scheme S2 Synthesis of aminoester hydrochlorides.

Table S2 Aminoester hydrochlorides according to Scheme S2

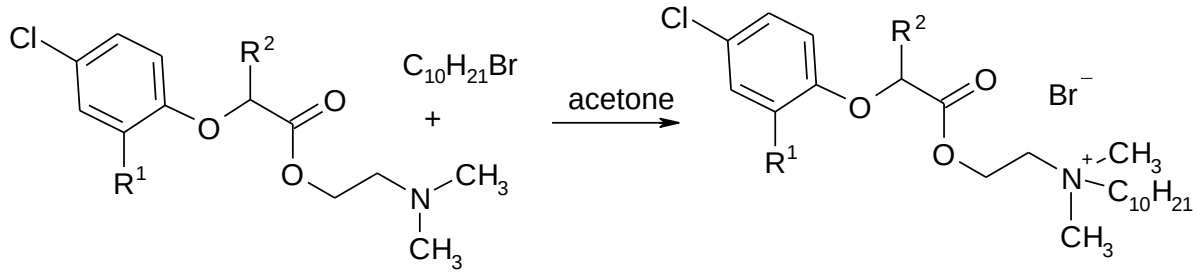
Abbreviation of aminoester hydrochloride	R^1	R^2	Melting point [°C]	Yield [%]
[2,4-D-DAE-H][Cl]	Cl	H	155.5 – 158.3	94
[MCPA-DAE-H][Cl]	CH_3	H	154.0 – 155.8	98
[MCPP-DAE-H][Cl]	CH_3	CH_3	65.7 – 67.2	99
[4-CPA-DAE-H][Cl]	H	H	132.1 – 133.0	90



Scheme S3 Synthesis of aminoesters.

Table S3 Aminoesters according to Scheme S3

Abbreviation of aminoester	R^1	R^2	Yield [%]
2,4-D-DAE	Cl	H	75
MCPA-DAE	CH_3	H	81
MCPP-DAE	CH_3	CH_3	80
4-CPA-DAE	H	H	78



Scheme S4 Synthesis of herbicidal esterquats.

Table S4 Herbicidal esterquats according to Scheme S4

Abbreviation of estrequat	R^1	R^2	Melting point [°C]	Surfactant content [%]	Yield [%]
[2,4-D-DAE-C_{10}][Br]	Cl	H	127.8 – 128.8	97.0	78
[MCPA-DAE-C_{10}][Br]	CH_3	H	126.8 – 127.3	97.5	73
[MCPP-DAE-C_{10}][Br]	CH_3	CH_3	119.6 – 121.0	99.5	71
[4-CPA-DAE-C_{10}][Br]	H	H	100.6 – 101.6	98.0	81

The following abbreviations were used to explain the multiplicities:
s = singlet, d = doublet, dd = doublet of doublets, t = triplet, quart = quartet, q = quintet, m = multiplet

2,4-D-Cl *(2,4-dichlorophenoxy)acethyl chloride* ^{1}H NMR (DMSO–d_6) δ ppm = 4.85 (s, 2H), 7.08 (d, J=8.9 Hz, 1H), 7.34 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.55 (d, J=2.5 Hz, 1H); ^{13}C NMR δ ppm = 65.29, 114.93, 122.40, 124.40, 127.91, 129.42, 152.41, 169.39. Anal. Calcd for $C_8H_5O_2Cl_3$: C 40.12, H 2.11; Found: C 39.75, H 2.01.

MCPA-Cl *(4-chloro-2-methylphenoxy)acethyl chloride* ^{1}H NMR (DMSO–d_6) δ ppm = 2.19 (s, 3H), 4.72 (s, 2H), 6.84 (d, J=8.7 Hz, 1H),7.16 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$= 8.6 Hz, 1H), 7.21 (d, J=2.6 Hz, 1H); ^{13}C NMR δ ppm = 15.93, 65.05, 112.97, 124.41, 126.39, 128.57, 130.14, 154.91, 170.12. Anal. Calcd for $C_9H_8O_2Cl_2$: C 49.34, H 3.69; Found: C 49.02, H 3.77.

MCPP-Cl *(±)-2-(4-chloro-2-methylphenoxy)propionyl chloride* ^{1}H NMR (DMSO–d_6) δ ppm = 1.54 (d, J=6.9 Hz, 3H), 2.19 (s, 3H), 4.83 (quart, J=6.8 Hz, 1H), 6.78 (d, J=8.8 Hz, 1H), 7.15 (dd, $J^{1,2}$=0.5 Hz, $J^{1,3}$=9.0 Hz, 1H), 7.20 (d, J=2.6 Hz, 1H); ^{13}C NMR δ ppm = 15.96, 18.44, 72.19, 113.49, 124.43, 126.39, 128.88, 130.23, 154.69, 172.98. Anal. Calcd for $C_{10}H_{10}O_2Cl_2$: C 51.52, H 4.33; Found: C 51.23, H 4.47.

4-CPA-Cl *(4-chlorophenoxy)acethyl chloride* ^{1}H NMR (DMSO–d_6) δ ppm = 4.71 (s, 2H), 6.95 (d, J=9.0 Hz, 2H), 7.32 (d, J=9.0 Hz, 1H); ^{13}C NMR δ ppm = 64.78, 116.30, 124.88, 129.26, 156.70, 169.88. Anal. Calcd for $C_8H_6O_2Cl_2$: C 46.86, H 2,96; Found: C 47.03, H 3.13.

[2,4-D-DAE-H][Cl] *(2,4-dichlorophenoxy)-2-acetoxyethyldimethylammonium hydrochloride* ^{1}H NMR (DMSO–d_6) δ ppm = 2.78 (s, 6H), 3.49 (t, J=4.9 Hz, 2H), 4.52 (t, J=5.0 Hz, 2H), 5.10 (s, 2H), 7.32 (d, J=9.1 Hz, 1H), 7.33 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.60 (d, J=2.7 Hz, 1H), 11.31 (s, 1H); ^{13}C NMR δ ppm = 42.28, 54.55, 58.94, 65.44, 115.37, 122.22, 125.09, 127.91, 129.35, 152.10, 167.81. Anal. Calcd for $C_{12}H_{16}NO_3Cl_3$: C 43.85, H 4.92, N 4.26; Found: C 44.22, H 4.87, N 4.08.

[MCPADAE-H][Cl] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldimethylammonium hydrochloride* ^{1}H NMR (DMSO–d_6) δ ppm = 2.19 (s, 3H), 2.77 (s, 6H), 3.42 (t, J=5.0 Hz, 2H), 4.50 (t, J=5.0 Hz, 2H), 4.96 (s, 2H), 7.00 (d, J=8.8 Hz, 1H), 7.16 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.24 (d, J=2.7 Hz, 1H), 11.22 (s,

1H); ^{13}C NMR δ ppm = 15.78, 42.29, 54.58, 58.86, 65.08, 113.30, 124.48, 126.33, 128.42, 130.06, 154.58, 168.37. Anal. Calcd for $C_{13}H_{19}NO_3Cl_2$: C 50.65, H 6.23, N 4.55; Found: C 50.24, H 6.00, N 4.66.

[MCPP-DAE-H][Cl] *(±)-(4-chloro-2-methylphenoxy)-2-(2'-propionyloxyethyl)dimethylammonium hydrochloride* ^{1}H NMR (DMSO–d_6) δ ppm = 1.58 (d, *J*=6.7 Hz, 3H), 2.19 (s, 3H), 2.75 (s, 6H), 3.41 (t, *J*=4.8 Hz, 2H), 4.49 (t, *J*=4.7 Hz, 2H), 5.13 (quart, *J*=6.8 Hz, 1H), 6.99 (d, *J*=8.8 Hz, 1H), 7.15 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.24 (d, *J*=2.7 Hz, 1H), 11.43 (s, 1H); ^{13}C NMR δ ppm = 15.78, 18.08, 42.22, 54.46, 59.36, 71.99 114.04, 124.48, 126.39, 128.75, 130.08, 154.23, 170.79. Anal. Calcd for $C_{14}H_{21}NO_3Cl_2$: C 52.18, H 6,58, N 4.35; Found: C 52.41, H 6.23, N 4.20.

[4-CPA-DAE-H][Cl] *(4-chlorophenoxy)-2-acetoxyethyldimethylammonium hydrochloride* ^{1}H NMR (DMSO–d_6) δ ppm = 2.78 (s, 6H), 3.42 (t, *J*=5.0 Hz, 2H), 4.51 (t, *J*=5.0 Hz, 2H), 4.96 (s, 2H), 7.05 (d, *J*=9.1 Hz, 2H), 7.34 (dd, *J*=9.1 Hz, 2H), 11.25 (s, 1H); ^{13}C NMR δ ppm = 42.29, 54.57, 58.82, 64.89, 116.44, 124.94, 129.22, 156.42, 168.30. Anal. Calcd for $C_{12}H_{17}NO_3Cl_2$: C 48.99, H 5.84, N 4.76; Found: C 49.39, H 6.00, N 4.83.

2,4-D-DAE *(2-dimethylamino)ethyl (2,4-dichlorophenoxy)acetate* ^{1}H NMR (DMSO–d_6) δ ppm = 2.19 (s, 6H), 2.53 (t, *J*=5.7 Hz, 2H), 4.23 (t, *J*=5.7 Hz, 2H), 4.96 (s, 2H), 7.12 (d, *J*=9.1 Hz, 1H), 7.35 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.58 (d, *J*=2.6 Hz, 1H); ^{13}C NMR δ ppm = 45.0, 56.9, 62.27, 65.4, 115.1, 122.3, 125.1, 127.9, 129.4, 152.2, 168.0. Anal. Calcd for $C_{12}H_{15}NO_3Cl_2$: C 49.33, H 5.19, N 4.80; Found: C 49.65, H 5.09, N 4.96.

MCPA-DAE *(2-dimethylamino)ethyl (4-chloro-2-methylphenoxy)acetate* ^{1}H NMR (DMSO–d_6) δ ppm = 2.16 (s, 6H), 2.19 (s, 3H), 2.49 (t, *J*=5.7 Hz, 2H), 4.20 (t, *J*=5.7 Hz, 2H), 4.82 (s, 2H), 6.89 (d, *J*=8.8 Hz, 1H), 7.16 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.23 (d, *J*=2.6 Hz, 1H); ^{13}C NMR δ ppm = 15.74, 45.16, 57.03, 62.26, 65.07, 113.08, 124.47, 126.26, 128.50, 130.03, 154.65, 168.58. Anal. Calcd for $C_{13}H_{18}NO_3Cl$: C 57.45, H 6.69, N 5.16; Found: C 57.09, H 6.83, N 5.38.

MCPP-DAE *(2-dimethylamino)ethyl (±)-2-(4-chloro-2-methylphenoxy)propionate* ^{1}H NMR (DMSO–d_6) δ ppm = 1.53 (d, *J*=6.7 Hz, 3H), 2.14 (s, 6H), 2.19 (s, 3H), 2.45 (t, *J*=5.6 Hz, 2H), 4.18 (t, *J*=5.6 Hz, 2H), 4.93 (quart, *J*=6.8 Hz, 1H), 6.83 (d, *J*=8.8 Hz, 1H), 7.13 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.22 (d, *J*=2.6 Hz, 1H); ^{13}C NMR δ ppm = 15.74, 18.25, 45.13, 57.07, 62.38, 72.21, 113.66, 124.52, 126.21, 128.83, 130.08, 154.35, 171.23. Anal. Calcd for $C_{14}H_{20}NO_3Cl$: C 58.83, H 7.07, N 4.90; Found: C 58.49, H 6.98, N 4.99

4-CPA-DAE *(2-dimethylamino)ethyl (4-chlorophenoxy)acetate* ^{1}H NMR (DMSO–d_6) δ ppm = 2.18 (s, 6H), 2.51 (t, *J*=5.7 Hz, 2H), 4.21 (t, *J*=5.7 Hz, 2H), 4.81 (s, 2H), 6.97 (d, *J*=9.1 Hz, 2H), 7.33 (d, *J*=9.1 Hz, 1H); ^{13}C NMR δ ppm = 45.07, 56.96, 62.15, 64.83, 116.33, 124.92, 129.16, 156.47, 168,46. Anal. Calcd for $C_{12}H_{16}NO_3Cl$: C 55.92, H 6.27, N 5.44; Found: C 56.27, H 6.12, N 5.26.

[2,4-D-DAE-C_{10}][Br] *(2,4-dichlorophenoxy)-2-acetoxyethyldecyldimethylammonium bromide* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.68 (q, *J*=3.9 Hz, 2H), 3.14 (s, 6H), 3.37 (t, *J*=8.5 Hz, 2H), 3.76 (t, *J*=4.2 Hz, 2H), 4.59 (t, *J*=2.3 Hz, 2H), 5.01 (s, 2H), 7.26 (d, *J*=9.0 Hz, 1H), 7.37 (dd, $J^{1,2}$=2.5 Hz, $J^{1,3}$=8.9 Hz, 1H), 7.59 (d, *J*=2.5 Hz, 1H); ^{13}C NMR δ ppm = 13.87, 21.75, 22.03, 25.72, 28.50, 28.62, 28.81, 28.86, 31.23, 50.49, 58.46, 61.24, 63.87, 65.52, 115.42, 122.24, 125.18, 127.94, 129.33, 152.01, 167.48. Anal. Calcd for $C_{22}H_{36}NO_3Cl_2Br$: C 51.47, H 7.08, N 2.73; Found: C 51.58, H 7.23, N 2.66.

[MCPA-DAE-C_{10}][Br] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium bromide* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.5 Hz, 3H), 1.25 (m, 14H), 1.67 (q, *J*=4.2 Hz, 2H), 2.20 (s, 3H), 3.13 (s, 6H), 3.40 (t, *J*=8.5 Hz, 2H), 3.75 (t, *J*=4.9 Hz, 2H), 4.58 (t, *J*=4.9 Hz, 2H), 4.89 (s, 2H), 6.98 (d, *J*=8.8 Hz, 1H), 7.18 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.25 (d, *J*=2.6 Hz, 1H); ^{13}C NMR δ ppm = 13.90, 15.71, 21.77, 22.06, 25.74, 28.53, 28.65, 28.84, 28.89, 31.25, 50.48, 58.33, 61.25, 63.83, 65.14, 113.28, 124.54, 126.30, 128.36, 130.02, 154.48, 168.05. Anal. Calcd for $C_{23}H_{39}NO_3ClBr$: C 56.03, H 7.99, N 2.84; Found: C 56.35, H 8.12, N 2.77.

[MCPP-DAE-C_{10}][Br] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethylammonium bromide* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.25 (m, 14H), 1.56 (d, *J*=6.8 Hz, 3H), 1.65 (q, *J*=4.9 Hz, 2H), 2.19 (s, 3H), 3.10 (s, 6H), 3.39 (t, *J*=4.3 Hz, 2H), 3.75 (t, *J*=1.8 Hz, 2H), 4.56 (t, *J*=2.3 Hz, 2H), 5.04 (quart, *J*=6.8 Hz, 1H), 6.93 (d, *J*=8.8 Hz, 1H), 7.17 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.24 (d, *J*=2.3 Hz, 1H); ^{13}C NMR δ ppm = 13.89, 15.72, 18.02, 21.75, 22.04, 25.71, 28.49, 28.61, 28.80, 28.85, 31.22, 50.38, 58.55, 61.40, 63.76, 72.13, 114.03, 124.54, 126.34, 128.75, 130.06, 154.17, 170.51. Anal. Calcd for $C_{24}H_{41}NO_3ClBr$: C 56.85, H 8.17, N 2.76; Found: C 56.52, H 7,99, N 2.57.

[4-CPA-DAE-C_{10}][Br] *(4-chlorophenoxy)-2-acetoxyethyldecyldimethylammonium bromide* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.25 (m, 14H), 1.67 (q, *J*=4.5 Hz, 2H), 3.11 (s, 6H), 3.39 (t, *J*=8.4 Hz, 2H), 3.73 (t, *J*=5.0 Hz, 2H), 4.56 (t, *J*=5.0 Hz, 2H), 4.87 (s, 2H), 7.03 (d, *J*=9.1 Hz, 2H), 7.35 (d, *J*=9.1 Hz, 2H); ^{13}C NMR δ ppm = 13.89, 21.75, 22.04, 25.73, 28.51, 28.62, 28.81, 28.87, 31.23, 50.49, 58.32, 61.23, 63.87, 64.93, 116.42, 125.01, 129.20, 156.32, 167.96. Anal. Calcd for $C_{22}H_{37}NO_3ClBr$: C 55.17, H 7.80, N 2.93; Found: C 55.46, H 7.97, N 2.77.

[2,4-D-DAE-C_{10}][MCPA] *(2,4-dichlorophenoxy)-2-acetoxyethyldecyldimethylammonium (4-chloro-2-methylphenoxy)acetate* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.8 Hz, 3H), 1.24 (m, 14H), 1.65 (q, *J*=5.7 Hz, 2H), 2.17 (s, 3H), 3.06 (s, 6H), 3.31 (t, *J*=8.5 Hz, 2H), 3.38 (t, *J*=5.1 Hz, 2H), 3.82 (t, *J*=2.4 Hz, 2H), 4.49 (s, 2H), 4.53 (s,2H), 6.75 (d, *J*=8.8 Hz, 1H), 6.93 (d, *J*=8.8 Hz, 1H), 7.11 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.18 (d, *J*=2.7 Hz, 1H), 7.29 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.50 (d, *J*=2.6 Hz, 1H); ^{13}C NMR δ ppm = 13.92, 15.87, 21.78, 22.09, 25.80, 28.52, 28.67, 28.84, 28.91, 31.28, 50.75, 54.87, 64.09, 64.65, 66.38, 67.03, 112.78, 114.86, 121.95, 123.47, 123.81, 126.07, 127.65, 128.14, 128.98, 129.70, 153.13, 155.40, 169.79, 170.47. Anal. Calcd for $C_{31}H_{44}NO_6Cl_3$: C 58.81, H 7.02, N 2.21; Found: C 58.44, H 7.17, N 2.03.

[2,4-D-DAE-C_{10}][MCPP] *(2,4-dichlorophenoxy)-2-acetoxyethyldecyldimethylammonium (±)-2-(4-chloro-2-methylphenoxy)propionate* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.46 (d, *J*=6.8 Hz; 3H), 1.65 (q, *J*=5.7 Hz, 2H), 2.16 (s, 3H), 3.05 (s, 6H); 3.30 (t, *J*=8.4 Hz, 2H), 3.38 (t, *J*=5.0 Hz, 2H), 3.82 (t, *J*=2.3 Hz, 2H), 4.53 (s, 2H), 4.62 (quart, *J*=6.8 Hz, 1H), 6.73 (d, *J*=8,8 Hz, 1H), 6.92 (d, *J*=8.8 Hz, 1H), 7.09 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.17 (d, *J*=2.7 Hz, 1H), 7.28 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=9.0 Hz, 1H), 7.50 (d, *J*=2.6 Hz, 1H); ^{13}C NMR δ ppm = 13.92, 15.87, 18.62, 21.78, 22.09, 25.80, 28.52, 28.68, 28.84, 28.91, 31.28, 50.74, 54.88, 64.09, 64.63, 66.98, 73.34, 113.25, 114.85, 121.95, 123.43, 123.83, 126.04, 127.65, 128.31, 128.99, 129.72, 153.12, 155.08, 169.77, 173.58. Anal. Calcd for $C_{32}H_{46}NO_6Cl_3$: C 59.39, H 7.18, N 2.16; Found: C 59.02, H 7.01, N 2.02.

[2,4-D-DAE-C_{10}][4-CPA] *(2,4-dichlorophenoxy)-2-acetoxyethyldecyldimethylammonium (4-chlorophenoxy)acetate* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.3 Hz; 2H), 3.06 (s, 6H), 3.31 (t, *J*=8.4 Hz, 2H), 3.38 (t, *J*=5.0 Hz, 2H), 3.83 (t, *J*=2.3 Hz, 2H), 4.49 (s, 2H), 4.58 (s, 2H), 6.88 (d, *J*=9.1 Hz, 2H), 6.95 (d, *J*=8.8 Hz, 1H), 7.29 (d, *J*=9.1 Hz, 2H), 7.30 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.52 (d, *J*=2.8 Hz, 1H); ^{13}C NMR δ ppm = 13.92, 21.78, 22.09, 25.79, 28.51, 28.66, 28.83, 28.90, 31.28, 50.75, 54.88, 64.10, 64.63, 65.92, 66.75, 114.85, 116.14, 121.99, 123.96, 127.68, 128.97, 153.02, 157.15, 169.80, 170.31. Anal. Calcd for $C_{30}H_{42}NO_6Cl_3$: C 58.20, H 6.85, N 2.26; Found: C 58.57, H 7.03, N 2.01.

[MCPA-DAE-C_{10}][2,4-D] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (2,4-dichlorophenoxy)acetate* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1,64 (q, *J*=5.7 Hz, 2H), 2.17 (s, 3H), 3.05 (s, 6H), 3.30 (t, *J*=8.4 Hz, 2H), 3.38 (t, *J*=5.0 Hz, 2H), 3.83 (t, *J*=2.3 Hz, 2H), 4.51 (s, 2H), 4.55 (s, 2H), 6.75 (d, *J*=8.8 Hz, 1H), 6.94 (d, *J*=8.8 Hz, 1H), 7.12 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.3 Hz, 1H), 7.18 (d, *J*=2.7 Hz, 1H), 7.29 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=9.0 Hz, 1H), 7.50 (d, *J*=2.6 Hz, 1H); ^{13}C NMR δ ppm = 13.91, 15.87, 21.78, 22.09, 25.80, 28.53, 28.68, 28.84, 28.91, 31.28, 50.74, 54.89, 64.11, 64.64, 66.29, 66.93, 112.78, 114.85, 121.97, 123.52, 123.88, 126.07, 127.66, 128.16, 129.00, 129.71, 153.09, 155.36, 169.83, 170.48. Anal. Calcd for $C_{31}H_{44}NO_6Cl_3$: C 58.81, H 7.02, N 2.21; Found: C 58.53, H 6.85, N 2.03.

[MCPA-DAE-C_{10}][MCPP] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (±)-2-(4-chloro-2-methylphenoxy)propionate* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.9 Hz, 3H), 1.25 (m, 14H), 1.44 (d, *J*=6.8 Hz, 3H), 1.65 (q, *J*=4.8 Hz, 2H), 2.15 (s, 3H); 2.16 (s, 3H), 3.04 (s, 6H), 3.29 (t,

J=8.5 Hz, 2H), 3.36 (t, *J*=5.1 Hz, 2H), 3.81 (t, *J*=2.3 Hz, 2H), 4.43 (s, 2H), 4.57 (quart, *J*=6.8 Hz, 1H), 6.71 (d, *J*=8.7 Hz, 1H), 6.72 (d, *J*=8.8 Hz, 1H), 7.08 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=8.2 Hz, 1H), 7,10 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.16 (d, *J*=2.8 Hz, 1H), 7.17 (d, *J*=2.8 Hz, 1H); ^{13}C NMR δ ppm = 13.96, 15.91, 15.93, 18.71, 21.77, 22.11, 25.80, 28.52, 28.68, 28.84, 28.92, 31.29, 50.76, 54.87, 64.07, 64.65, 66.55, 73.57, 112.78, 113.26, 123.28, 123.32, 126.04, 126.06, 128.10, 128.25, 129.68, 129.69, 155.19, 155.49, 170.34, 173.56. Anal. Calcd for $C_{33}H_{49}NO_6Cl_2$: C 63.24, H 7.90, N 2.24; Found: C 63.62, H 8.01, N 2.09.

[MCPA-DAE-C$_{10}$][4-CPA] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (4-chlorophenoxy)acetate* ^{1}H NMR (DMSO–*d*$_6$) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.3 Hz, 2H), 2.17 (s, 3H), 3.05 (s, 6H), 3.30 (t, *J*=8.5 Hz, 2H), 3.38 (t, *J*=5.0 Hz, 2H), 3.82 (t, *J*=2.3 Hz, 2H), 4.45 (s, 2H), 4.49 (s, 3H), 6.75 (d, *J*=8.8 Hz, 1H), 6.87 (d, *J*=9.1 Hz, 2H), 7.11 (dd, $J^{1,2}$=2.3 Hz, $J^{1,3}$=8.3 Hz, 1H), 7.18 (d, *J*=2.7 Hz, 1H), 7.28 (d, *J*=9.1 Hz, 2H); ^{13}C NMR δ ppm = 13.92, 15.88, 21.78, 22.09, 25.80, 28.52, 28.68, 28.84, 28.91, 31.28, 50.75, 54.89, 64.11, 64.66, 66.20, 66.40, 112.78, 116.14, 123.47, 123.92, 126.07, 128.15, 128.94, 129.71, 155.41, 157.27, 170.37, 170.50. Anal. Calcd for $C_{31}H_{45}NO_6Cl_2$: C 62.19, H 7.59, N 2.34; Found: C 62.58, H 7.78, N 2.22.

[MCPP-DAE-C$_{10}$][2,4-D] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethyl-ammonium (2,4-dichlorophenoxy)acetate*^{1}H NMR (DMSO–*d*$_6$) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.46 (d, *J*=6.7 Hz, 3H), 1.65 (q, *J*=3.8 Hz, 2H), 2.16 (s, 3H), 3.05 (s, 6H); 3.30 (t, *J*=8.4 Hz, 2H), 3.37 (t, *J*=5.0 Hz, 2H), 3.82 (t, *J*=2.3 Hz, 2H), 4.53 (s, 2H), 4.62 (quart, *J*=6.8 Hz, 1H), 6.72 (d, *J*=8,8 Hz, 1H), 6.92 (d, *J*=8.8 Hz, 1H), 7.09 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.16 (d, *J*=2.7 Hz, 1H), 7.28 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=9.0 Hz, 1H), 7.50 (d, *J*=2.6 Hz, 1H); ^{13}C NMR δ ppm = 13.91, 15.86, 18.61, 21.78, 22.09, 25.79, 28.52, 28.66, 28.83, 31.28, 50.74, 54.87, 64.10, 64.63, 66.96, 73.33, 113.26, 114.84, 121.94, 123.42, 123.83, 126.02, 127.63, 128.31, 128.98, 129.72, 153.10, 155.07, 169.76, 173.56. Anal. Calcd for $C_{32}H_{46}NO_6Cl_3$: C 59.39, H 7.18, N 2.16; Found: C 59.01, H 7.02, N 2.36.

[MCPP-DAE-C$_{10}$][MCPA] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethyl-ammonium (4-chloro-2-methylphenoxy)acetate* ^{1}H NMR (DMSO–*d*$_6$) δ ppm = 0.85 (t, *J*=6.9 Hz, 3H), 1.24 (m, 14H), 1.43 (d, *J*=6.8 Hz, 3H), 1.64 (q, *J*=5.1 Hz, 2H), 2.16 (s, 3H), 2.16 (s, 3H), 3.04 (s, 6H), 3.30 (t, *J*=8.5 Hz, 2H), 3.37 (t, *J*=5,1 Hz, 2H), 3.81 (t, *J*=5.1 Hz, 2H), 4.44 (s, 2H), 4,57 (quart, *J*=6.8 Hz, 1H), 6.70 (d, *J*=8.8 Hz, 1H), 6.73 (d, *J*=8.8 Hz, 1H), 7.06 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=9.2 Hz, 1H), 7.09 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=9.2 Hz, 1H), 7.15 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=9.1 Hz, 1H), 7.16 (d, *J*=3.0 Hz, 1H); ^{13}C NMR δ ppm = 13.90, 15.87, 15.87, 18.66, 21.75, 22.07, 25.77, 28.49, 28.64, 28.88, 28.92, 31.25, 50.71, 54.84, 64.06, 64.63, 66.52, 73.57, 112.73, 113.21, 123.26, 123.32, 126.01, 128.08, 128.09, 128.21, 129.64, 155.16, 155.45, 170.42, 173.61. Anal. Calcd for $C_{33}H_{49}NO_6Cl_2$: C 63.24, H 7.90, N 2.24; Found: C 63.63, H 8.02, N 2.07.

[MCPP-DAE-C$_{10}$][4-CPA] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethyl-ammonium (4-chlorophenoxy)acetate*^{1}H NMR (DMSO–*d*$_6$) δ ppm = 0.86 (t, *J*=6.9 Hz, 3H), 1.25 (m, 14H), 1.45 (d, *J*=6.6 Hz, 3H), 1.65 (q, *J*=3.9 Hz, 2H), 2.16 (s, 3H), 3.05 (s, 6H), 3,29 (t, *J*=8,5 Hz, 2H), 3.38 (t, *J*=5.1 Hz, 2H), 3.82 (t, *J*=2.3 Hz, 2H), 4.43 (s, 2H), 4.60 (quart, *J*=6.8 Hz, 1H), 6.72 (d, *J*=8.7 Hz, 1H), 6.86 (d, *J*=9.1 Hz, 2H), 7.09 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.16 (d, *J*=2.6 Hz, 1H), 7.27 (d, *J*=9.0 Hz, 1H); ^{13}C NMR δ ppm = 13.94, 15.89, 18.65, 21.77, 22.10, 25.79, 28.52, 28.68, 28.91, 31.29, 50.74, 54.87, 64.05, 64.62, 66.19, 73.40, 113.23, 116.11, 123.36, 123.87, 126.03, 128.27, 128.93, 129.71, 155.10, 157.26, 170.29, 173.58. Anal. Calcd for $C_{32}H_{47}NO_6Cl_2$: C 62.73, H 7.75, N 2.29; Found: C 63.06, H 7.59, N 2.44.

[4-CPA-DAE-C$_{10}$][2,4-D] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (2,4-dichlorophenoxy)acetate*^{1}H NMR (DMSO–*d*$_6$) δ ppm = 0.86 (t, *J*=6.9 Hz, 3H), 1.24 (m, 14H), 1.65 (q, *J*=3.8 Hz; 2H), 3.05 (s, 6H), 3.30 (t, *J*=8.5 Hz, 2H), 3.38 (t, *J*=5.1 Hz, 2H), 3.83 (t, *J*=2.3 Hz, 2H), 4.48 (s, 2H), 4.56 (s, 2H), 6.88 (d, *J*=9.1 Hz, 2H), 6.94 (d, *J*=9.0 Hz, 1H), 7.28 (d, *J*=9.1 Hz, 2H), 7.29 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.9 Hz, 1H), 7.51 (d, *J*=2.6 Hz, 1H); ^{13}C NMR δ ppm = 13.97, 21.81, 22.14, 25.83, 28.57, 28.72, 28.89, 28.95, 31.33, 50.77, 54.91, 64.10, 64.65, 66.04, 66.86, 114.85, 116.15, 121.98, 123.92, 124.02, 127.71, 128.99, 129.05, 153.07, 157.21, 169.91, 170.42. Anal. Calcd for $C_{30}H_{42}NO_6Cl_3$: C 58.20, H 6.85, N 2.26; Found: C 58.58, H 6.66, N 2.09.

[4-CPA-DAE-C_{10}][MCPA] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (4-chloro-2-methylphenoxy)acetate* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.8 Hz, 3H), 1.24 (m, 14H), 1.65 (q, *J*=3.8 Hz, 2H), 2.17 (s, 3H), 3.05 (s, 6H), 3.30 (t, *J*=8.5 Hz, 2H), 3.37 (t, *J*=5.1 Hz, 2H), 3.82 (t, *J*=2.4 Hz, 2H), 4.44 (s, 2H), 4.48 (s,2H), 6.75 (d, *J*=8.7 Hz, 1H), 6.87 (d, *J*=9.1 Hz, 2H), 7.11 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.18 (d, *J*=2.3 Hz, 1H), 7.28 (d, *J*=9.1 Hz, 1H); ^{13}C NMR δ ppm = 13.96, 15.92, 21.80, 22.13, 25.82, 28.55, 28.71, 28.87, 28.94, 31.31, 50.76, 54.90, 64.08, 64.64, 66.19, 66.38, 112.77, 116.14, 123.46, 123.92, 126.10, 128.15, 128.96, 129.73, 155.42, 157.28, 170.40, 170.52. Anal. Calcd for $C_{31}H_{45}NO_6Cl_2$: C 62.19, H 7.59, N 2.34; Found: C 62.58, H 7.76, N 2.18.

[4-CPA-DAE-C_{10}][MCPP] *(4-chlorophenoxy)-2-acetoxyethyldecyldimethylammonium (±)-2-(4-chloro-2-methylphenoxy)propionate* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.45 (d, *J*=6.8 Hz, 3H), 1.64 (q, *J*=3.9 Hz, 2H), 2.16 (s, 3H), 3.04 (s, 6H), 3,30 (t, *J*=8,5 Hz, 2H), 3.37 (t, *J*=3.2 Hz, 2H), 3.82 (t, *J*=2.3 Hz, 2H), 4.42 (s, 2H), 4.59 (quart, *J*=6.8 Hz, 1H), 6.72 (d, *J*=8.8 Hz, 1H), 6.86 (d, *J*=9.1 Hz, 2H), 7.09 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.16 (d, *J*=2.7 Hz, 1H), 7.27 (d, *J*=9.1 Hz, 1H); ^{13}C NMR δ ppm = 13.98, 15.93, 18.72, 21.80, 22.14, 25.87, 28.57, 28.72, 28.88, 29.95, 31.33, 50.75, 54.90, 64.07, 64.64, 66.28, 73.52, 113.22, 116.13, 123.34, 123.87, 126.06, 128.26, 128.95, 129.72, 155.18, 157.32, 170.40, 173.72. Anal. Calcd for $C_{32}H_{47}NO_6Cl_2$: C 62.73, H 7.75, N 2.29; Found: C 62.41, H 7.91, N 2.09.

[MCPA-DAE-C_{10}][Clopyralid] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro)-2-pikolinate* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.3 Hz, 2H), 2.18 (s, 3H), 3.08 (s, 6H), 3.33 (t, *J*=8.5 Hz, 2H), 3.40 (t, *J*=5.1 Hz, 2H), 3.83 (t, *J*=5.1 Hz, 2H), 4.65 (s, 2H), 6.81 (d, *J*=8.7 Hz, 1H), 7.15 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.20 (d, *J*=2.7 Hz, 1H),7.39 (d, *J*=8.4 Hz, 2H), 7.89 (d, *J*=8.4 Hz, 2H); ^{13}C NMR δ ppm = 13.93, 15.81, 21.79, 22.10, 25.80, 28.52, 28.67, 28.84, 28.91, 31.29, 50.77, 54.91, 64.09, 64.59, 65.43, 112.83, 123.38, 123.95, 124.68, 126.19, 128.32, 129.88, 140.29, 147.32, 155.00, 157.82, 166.65, 170.13. Anal. Calcd for $C_{29}H_{41}N_2O_5Cl_3$: C 57.66, H 6.86, N 4.64; Found: C 58.03, H 6.69, N 4.78.

[MCPA-DAE-C_{10}][Dicamba] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro-2-metoxy)benzoate* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.9 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.3 Hz, 2H), 2.18 (s, 3H), 3.06 (s, 6H), 3.31 (t, *J*=8.5 Hz, 2H), 3.39 (t, *J*=5.1 Hz, 2H), 3.81 (s, 3H), 3.82 (t, *J*=5.1 Hz, 2H), 4.61 (s, 2H), 6.79 (d, *J*=8.8 Hz, 1H), 7.13 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.14 (d, *J*=8.6 Hz, 1H),7.19 (d, *J*=2.7 Hz, 1H), 7.31 (d, *J*=8.6 Hz, 1H); ^{13}C NMR δ ppm = 13.95, 15.86, 21.80, 22.12, 25.80, 28.54, 28.69, 28.85, 28.93, 31.30, 50.76, 54.90, 61.25, 64.08, 64.60, 65.62, 112.79, 123.82, 125.34, 125.49, 126.16, 127.65, 128.21, 128.26, 129.85, 137.81, 151.58, 155.10, 165.94, 170.22. Anal. Calcd for $C_{31}H_{44}NO_6Cl_3$: C 58.81, H 7.02, N 2.21; Found: C 58.42, H 6.89, N 2.02.

[4-CPA-DAE-C_{10}][Clopyralid] *(4-chlorophenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro)-2-pikolinate* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.4 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.6 Hz, 2H), 3.07 (s, 6H), 3.32 (t, *J*=8.5 Hz, 2H), 3.39 (t, *J*=5.0 Hz, 2H), 3.83 (t, *J*=5.0 Hz, 2H), 4.62 (s, 2H), 6.92 (d, *J*=9.1 Hz, 2H), 7.31 (d, *J*=9.0 Hz, 2H), 7.38 (d, *J*=8.6 Hz, 1H) 7.89 (d, *J*=8.5 Hz, 1H); ^{13}C NMR δ ppm = 13.95, 21.79, 22.10, 25.80, 28.52, 28.68, 28.84, 28.91, 31.29, 50.78, 54.91, 64.09, 64.61, 65.22, 116.19, 123.30, 124.40, 124.64, 129.09, 140.27, 147.32, 156.85, 158.02, 166.63, 170,04. Anal. Calcd for $C_{28}H_{39}N_2O_5Cl_3$: C 56.90, H 6.68, N 4.75; Found: C 56,51, H 6.49, N 4.87.

[4-CPA-DAE-C_{10}][Dicamba] *(4-chlorophenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro-2-metoxy)benzoate* ^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.9 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.5 Hz, 2H), 3.07 (s, 6H), 3.32 (t, *J*=8.5 Hz, 2H), 3.39 (t, *J*=5.0 Hz, 2H), 3.81 (s, 3H), 3.83 (t, *J*=5.0 Hz, 2H), 4.60 (s, 2H), 6.91 (d, *J*=9.1 Hz, 2H), 7.30 (d, *J*=9.0 Hz, 2H), 7.15 (d, *J*=8.6 Hz, 1H) 7.32 (d, *J*=8.5 Hz, 1H); ^{13}C NMR δ ppm = 13.95, 21.79, 22.11, 25.80, 28.52, 28.68, 28.84, 28.91, 31.29, 50.76, 54.90, 61.27, 64.08, 64.60, 65.38, 116.17, 124.30, 125.36, 125.51, 127.66 128.33, 129.06, 137.58, 151.61, 156.93, 165.91, 170.09. Anal. Calcd for $C_{30}H_{42}NO_6Cl_3$: C 58.20, H 6.85, N 2.26; Found: C 58.58, H 7.01, N 2.08.

2,4-D-Cl *(2,4-dichlorophenoxy)acethyl chloride*

^{1}H NMR (DMSO–d_6) δ ppm = 4.85 (s, 2H), 7.08 (d, J=8.9 Hz, 1H), 7.34 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.55 (d, J=2.5 Hz, 1H).

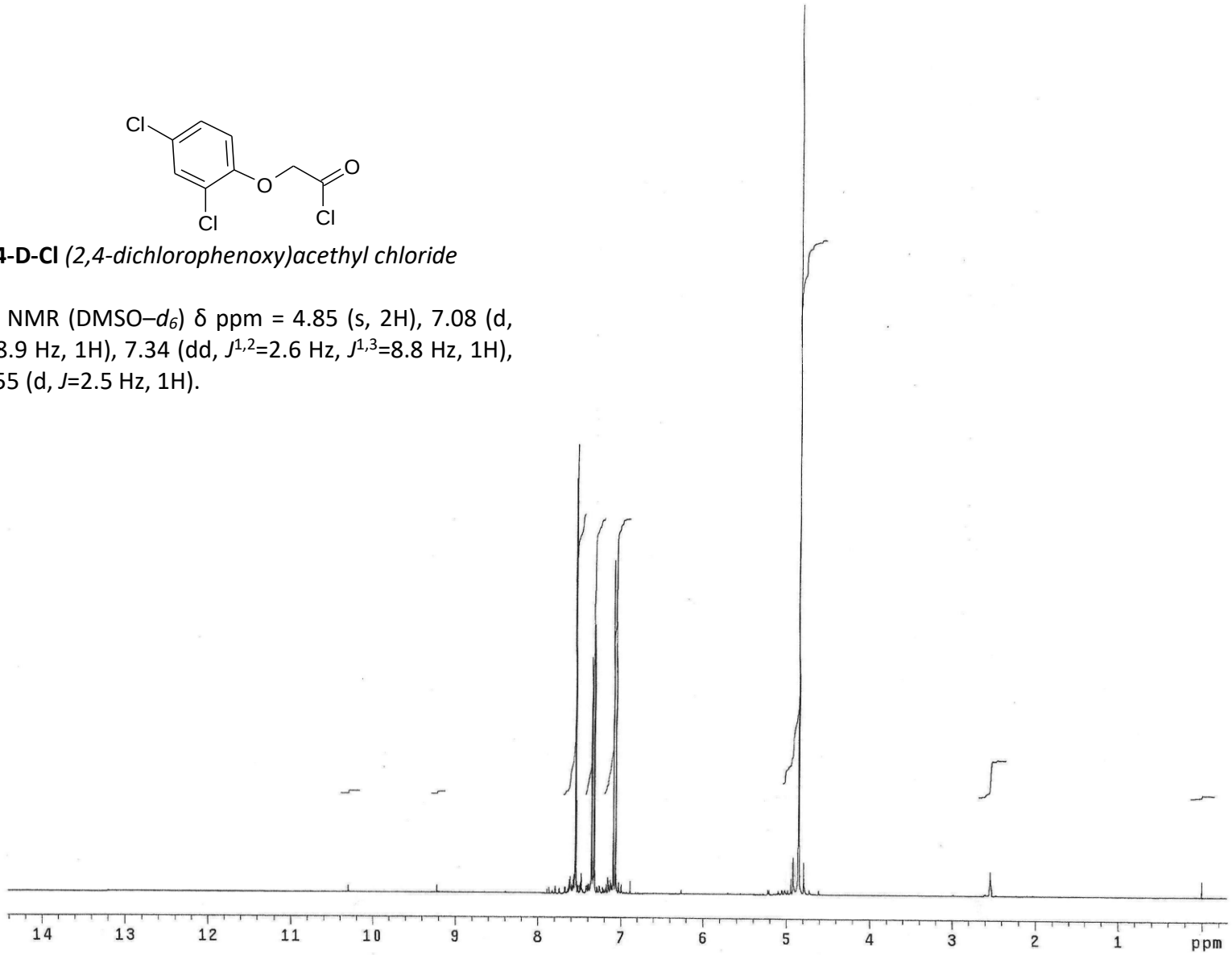
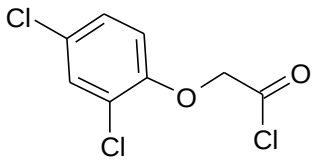


Fig. S1 ^{1}H NMR spectrum of **2,4-D-Cl.**



2,4-D-Cl *(2,4-dichlorophenoxy)acethyl chloride*

^{13}C NMR (DMSO–d_6) δ ppm = 65.29, 114.93, 122.40, 124.40, 127.91, 129.42, 152.41, 169.39.

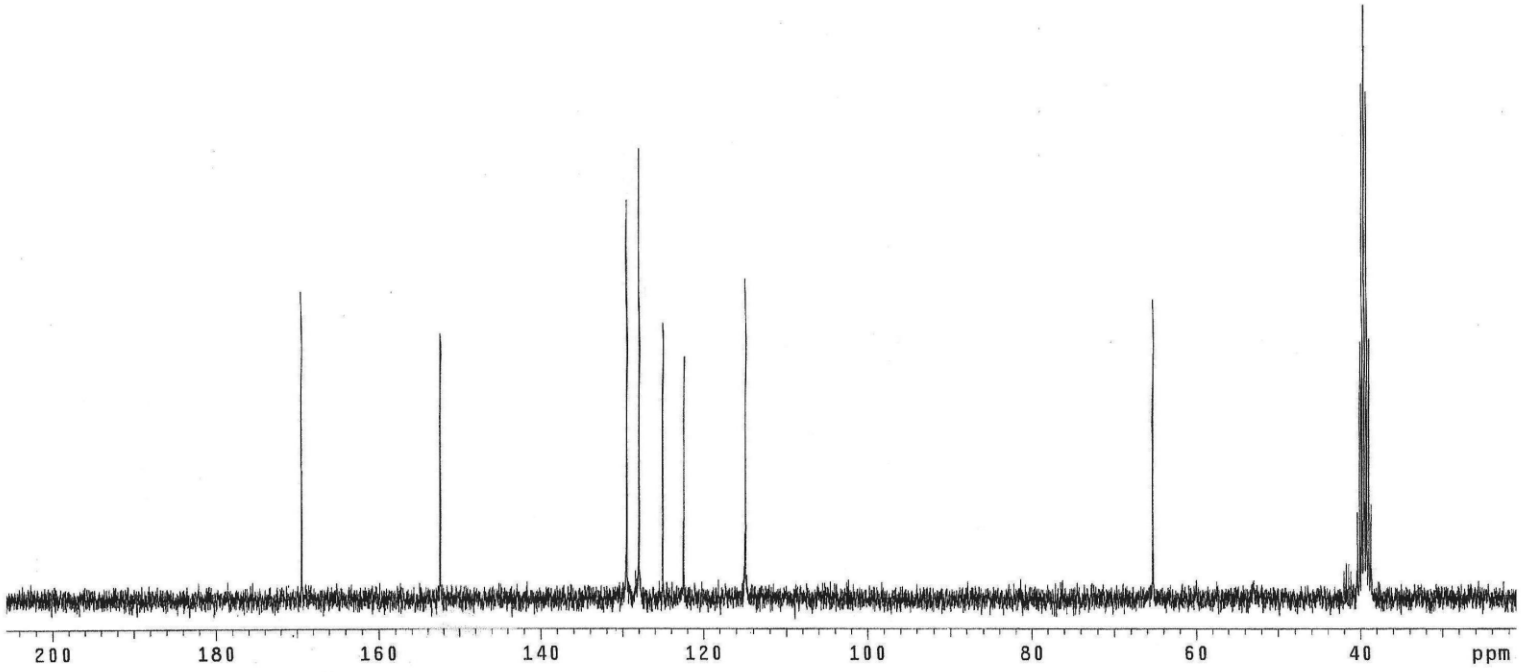


Fig. S2 ^{13}C NMR spectrum of **2,4-D-Cl.**

MCPA-Cl *(4-chloro-2-methylphenoxy)acethyl chloride*

^{1}H NMR (DMSO–d_6) δ ppm = 2.19 (s, 3H), 4.72 (s, 2H), 6.84 (d, J=8.7 Hz, 1H),7.16 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.21 (d, J=2.6 Hz, 1H).

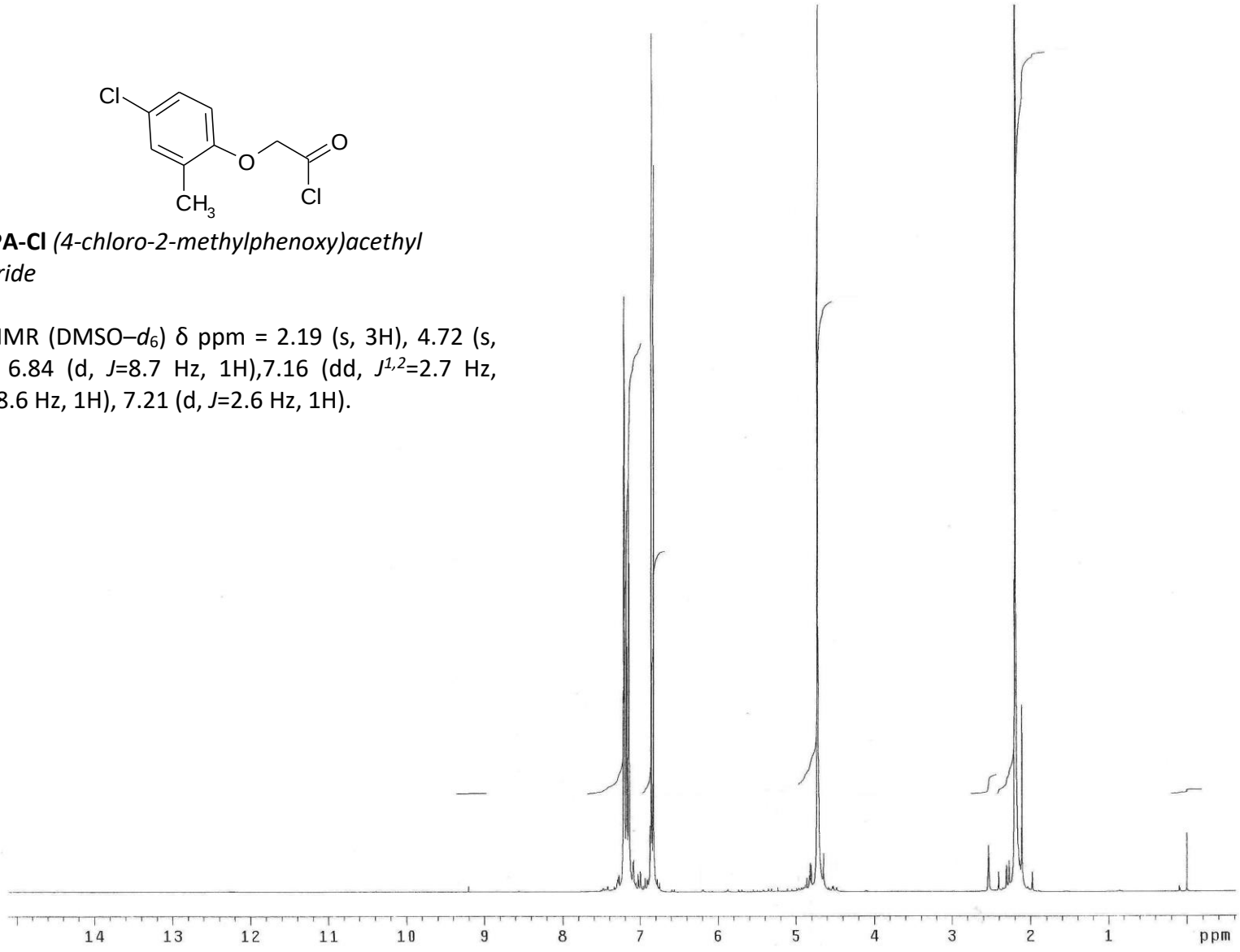
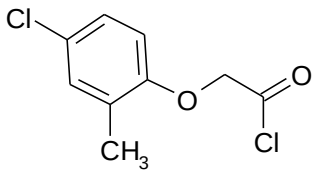


Fig. S3 ^{1}H NMR spectrum of **MCPA-Cl.**



MCPA-Cl *(4-chloro-2-methylphenoxy)acethyl chloride*

^{13}C NMR (DMSO–d_6) δ ppm = 15.93, 65.05, 112.97, 124.41, 126.39, 128.57, 130.14, 154.91, 170.12.

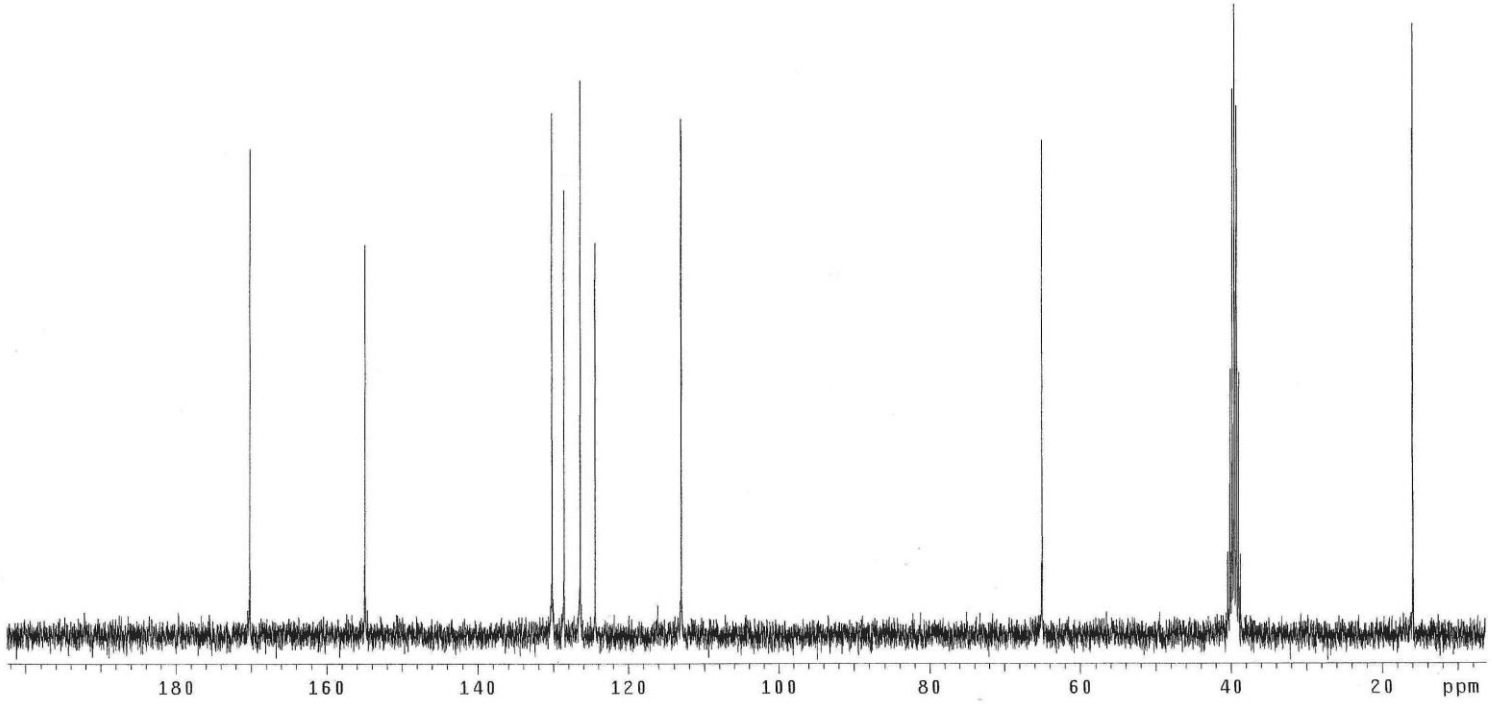


Fig. S4 ^{13}C NMR spectrum of **MCPA-Cl.**

MCPP-Cl *(±)-2-(4-chloro-2-methylphenoxy)propionyl chloride*

^{1}H NMR (DMSO–d_6) δ ppm = 1.54 (d, J=6.9 Hz, 3H), 2.19 (s, 3H), 4.83 (quart, J=6.8 Hz, 1H), 6.78 (d, J=8.8 Hz, 1H), 7.15 (dd, $J^{1,2}$=0.5 Hz, $J^{1,3}$=9.0 Hz, 1H), 7.20 (d, J=2.6 Hz, 1H).

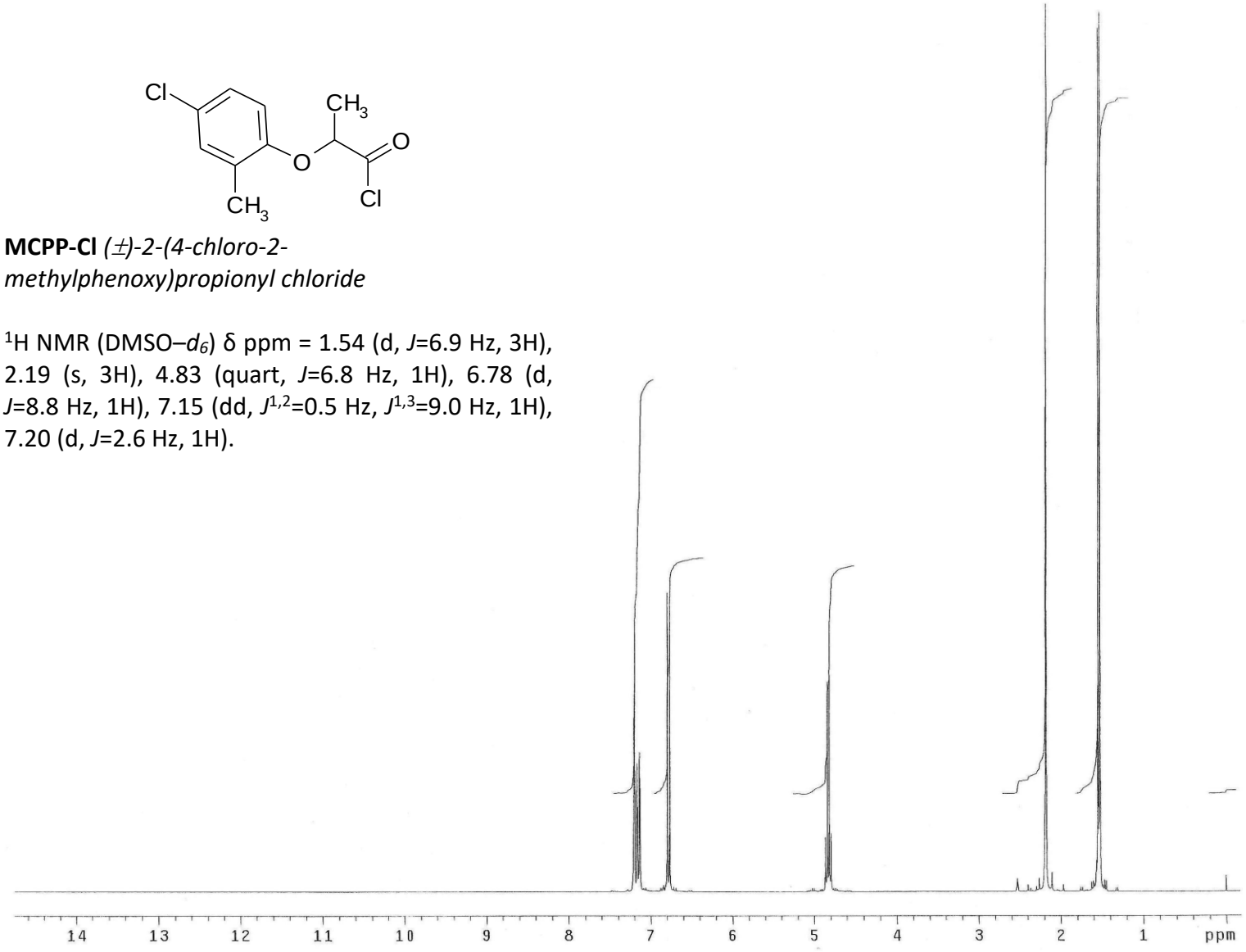
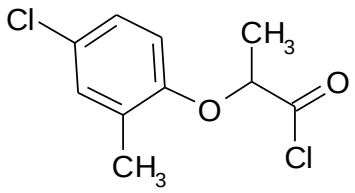


Fig. S5 ^{1}H NMR spectrum of **MCPP-Cl.**



MCPP-Cl *(±)-2-(4-chloro-2-methylphenoxy)propionyl chloride*

^{13}C NMR (DMSO–d_6) δ ppm = 15.96, 18.44, 72.19, 113.49, 124.43, 126.39, 128.88, 130.23, 154.69, 172.98.

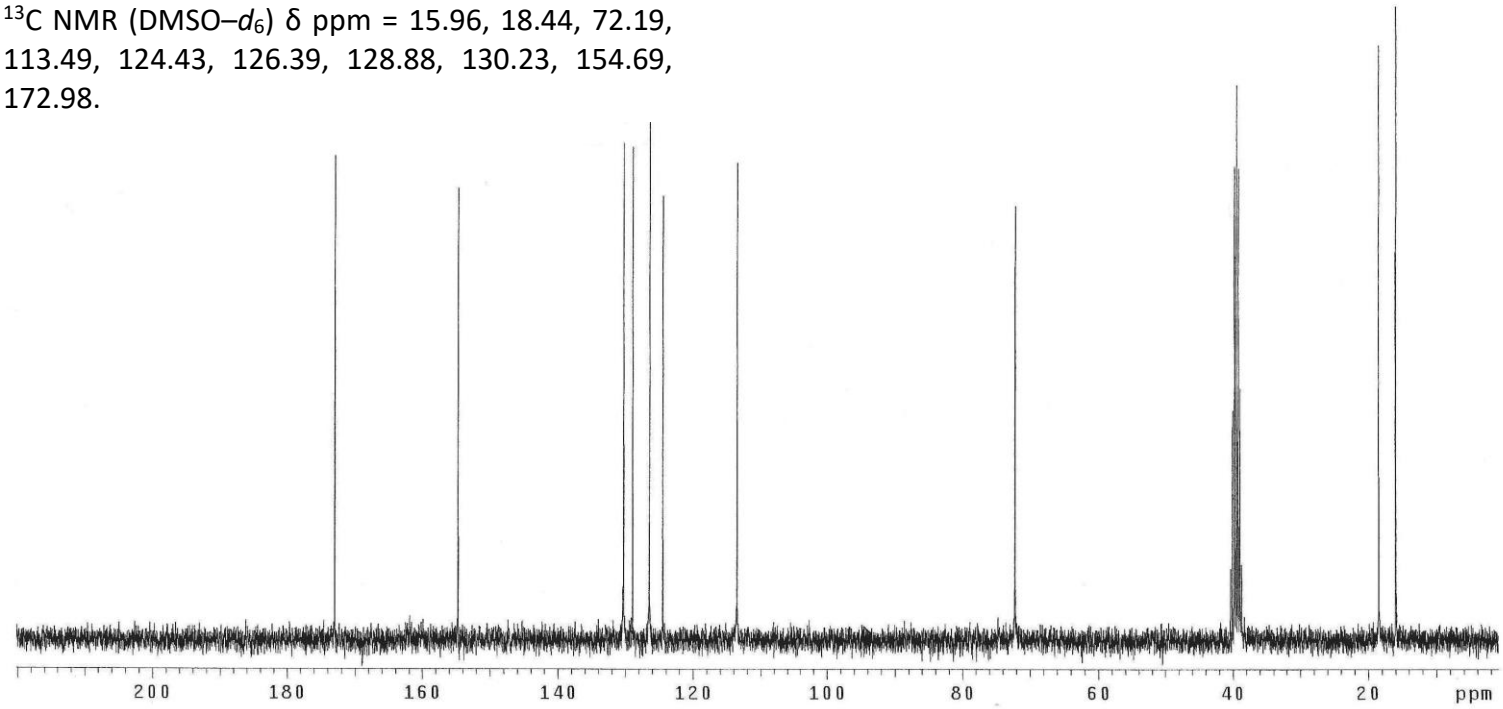


Fig. S6 ^{13}C NMR spectrum of **MCPP-Cl.**

4-CPA-Cl *(4-chlorophenoxy)acethyl chloride*

^{1}H NMR (DMSO–d_6) δ ppm = 4.71 (s, 2H), 6.95 (d, *J*=9.0 Hz, 2H), 7.32 (d, *J*=9.0 Hz, 1H).

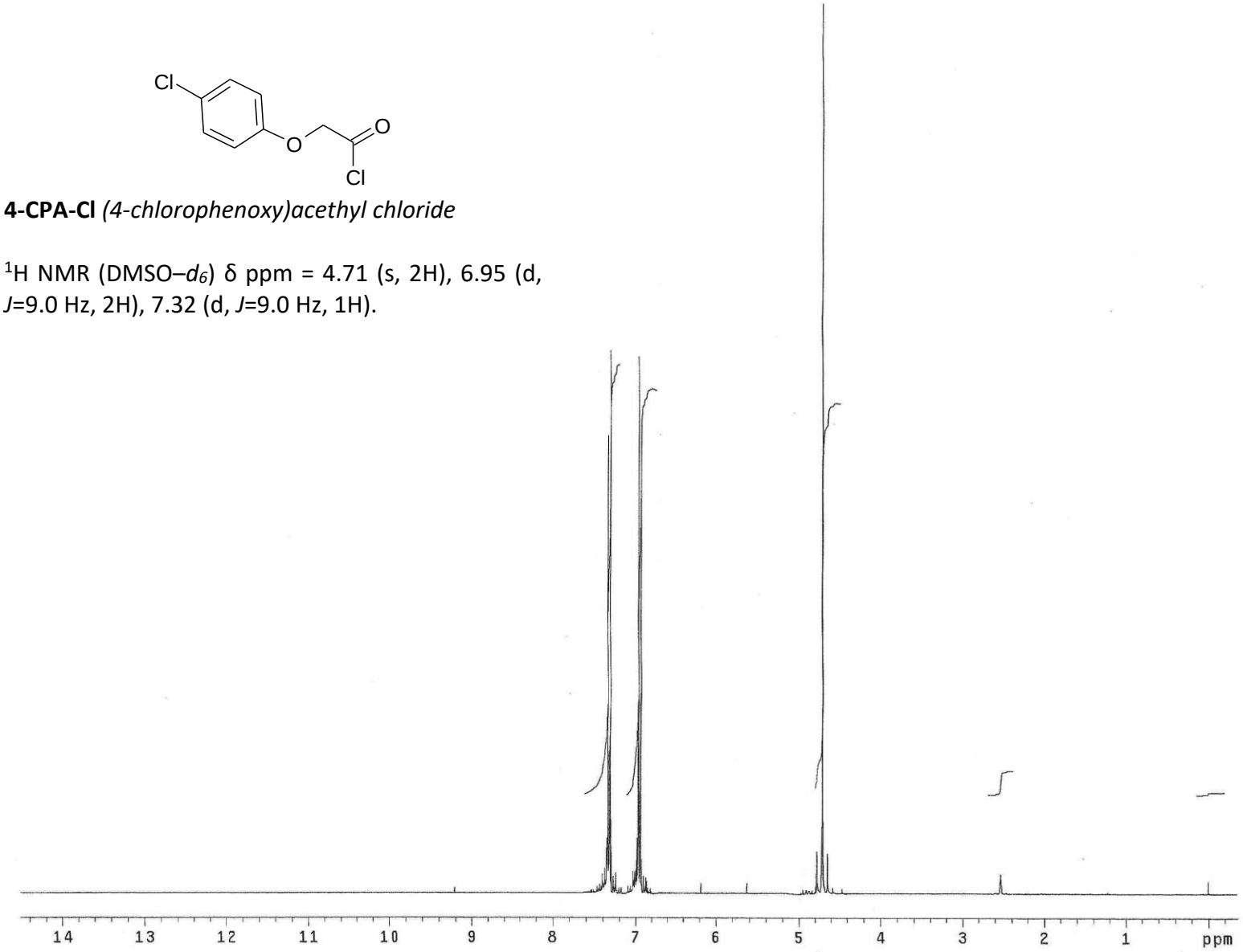
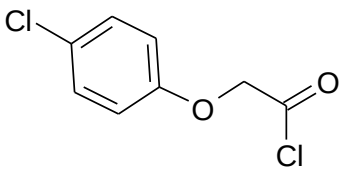


Fig. S7 ^{1}H NMR spectrum of **4-CPA-Cl.**



4-CPA-Cl *(4-chlorophenoxy)acethyl chloride*

^{13}C NMR (DMSO–d_6) δ ppm = 64.78, 116.30, 124.88, 129.26, 156.70, 169.88.

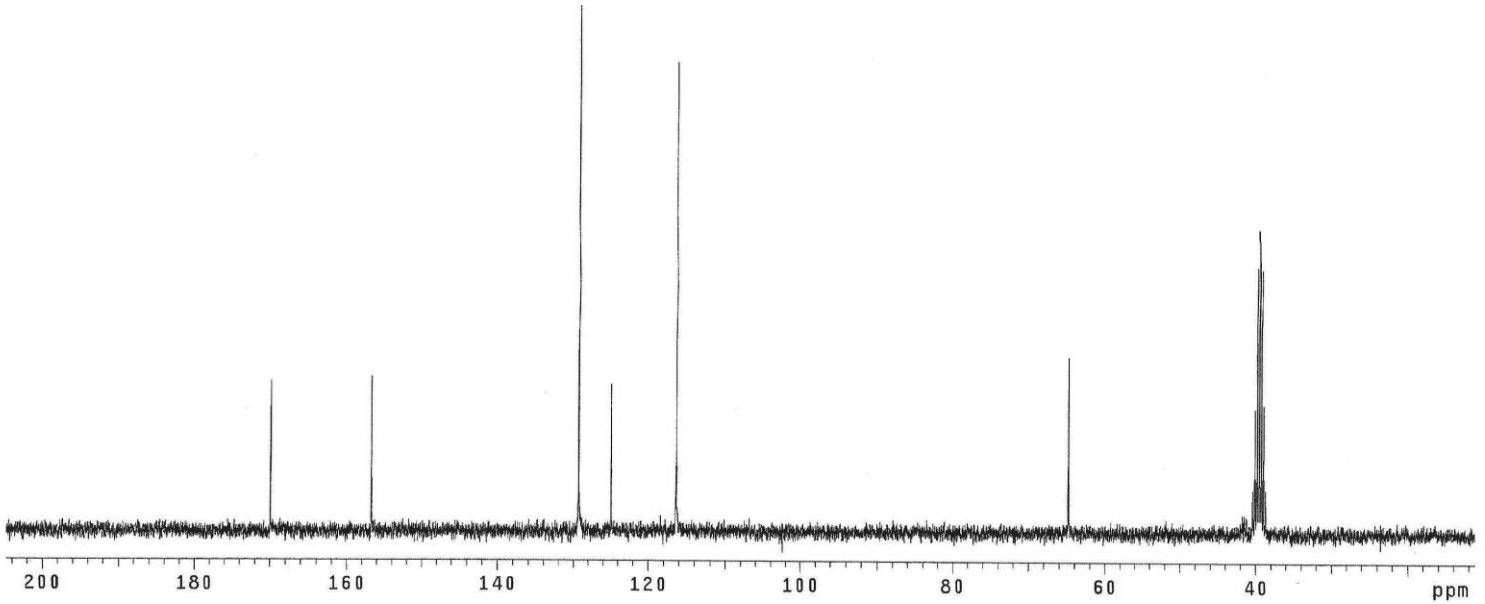


Fig. S8 ^{13}C NMR spectrum of **4-CPA-Cl.**

[2,4-D-DAE-H][Cl] *(2,4-dichlorophenoxy)-2-acetoxyethyldimethylammonium hydrochloride*

^{1}H NMR (DMSO–d_6) δ ppm = 2.78 (s, 6H), 3.42 (H_2O), 3.49 (t, J=4.9 Hz, 2H), 4.52 (t, J=5.0 Hz, 2H), 5.10 (s, 2H), 7.32 (d, J=9.1 Hz, 1H), 7.33 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.60 (d, J=2.7 Hz, 1H), 11.31 (s, 1H).

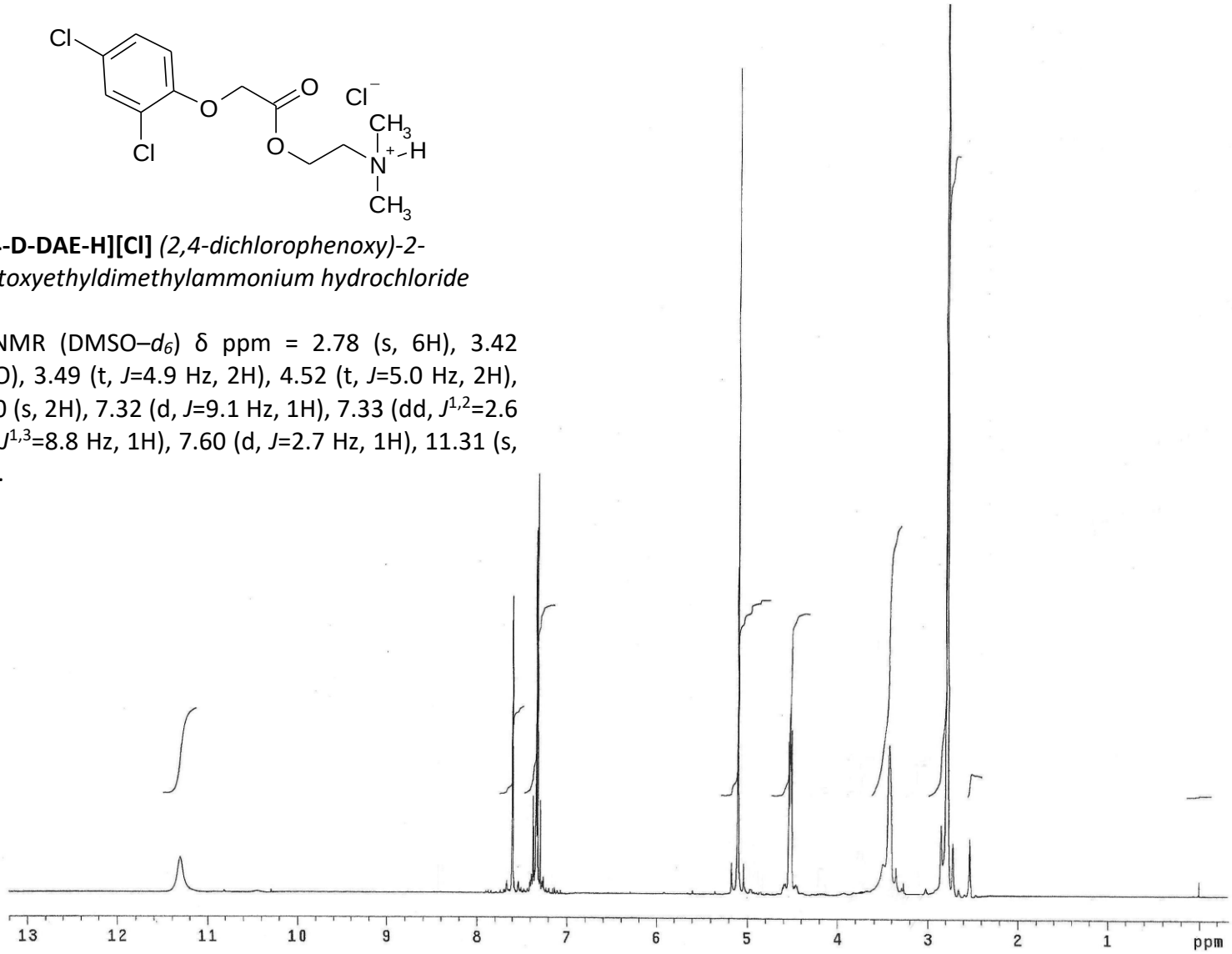
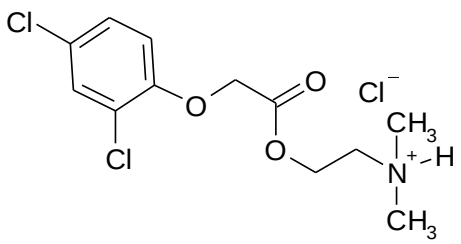


Fig. S9 ^{1}H NMR spectrum of **[2,4-D-DAE-H][Cl].**



[2,4-D-DAE-H][Cl] *(2,4-dichlorophenoxy)-2-acetoxyethyldimethylammonium hydrochloride*

^{13}C NMR (DMSO–d_6) δ ppm = 42.28, 54.55, 58.94, 65.44, 115.37, 122.22, 125.09, 127.91, 129.35, 152.10, 167.81.

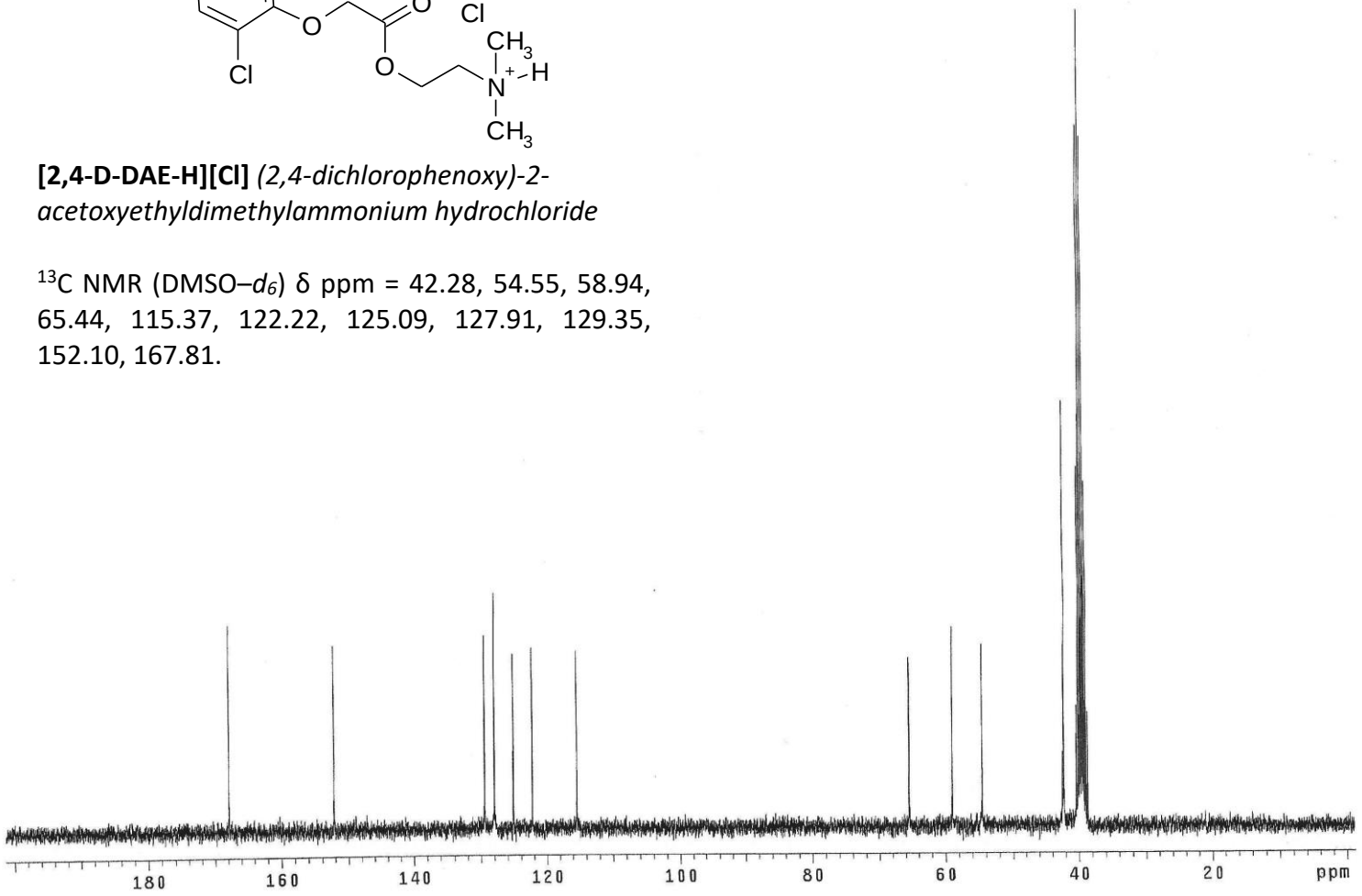


Fig. S10 ^{13}C NMR spectrum of **[2,4-D-DAE-H][Cl].**

[MCPADAE-H][Cl] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldimethylammonium hydrochloride*

^{1}H NMR (DMSO–d_6) δ ppm = 2.19 (s, 3H), 2.77 (s, 6H), 3.42 (t, *J*=5.0 Hz, 2H), 3.42 (H_2O), 4.50 (t, *J*=5.0 Hz, 2H), 4.96 (s, 2H), 7.00 (d, *J*=8.8 Hz, 1H), 7.16 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.24 (d, *J*=2.7 Hz, 1H), 11.22 (s, 1H).

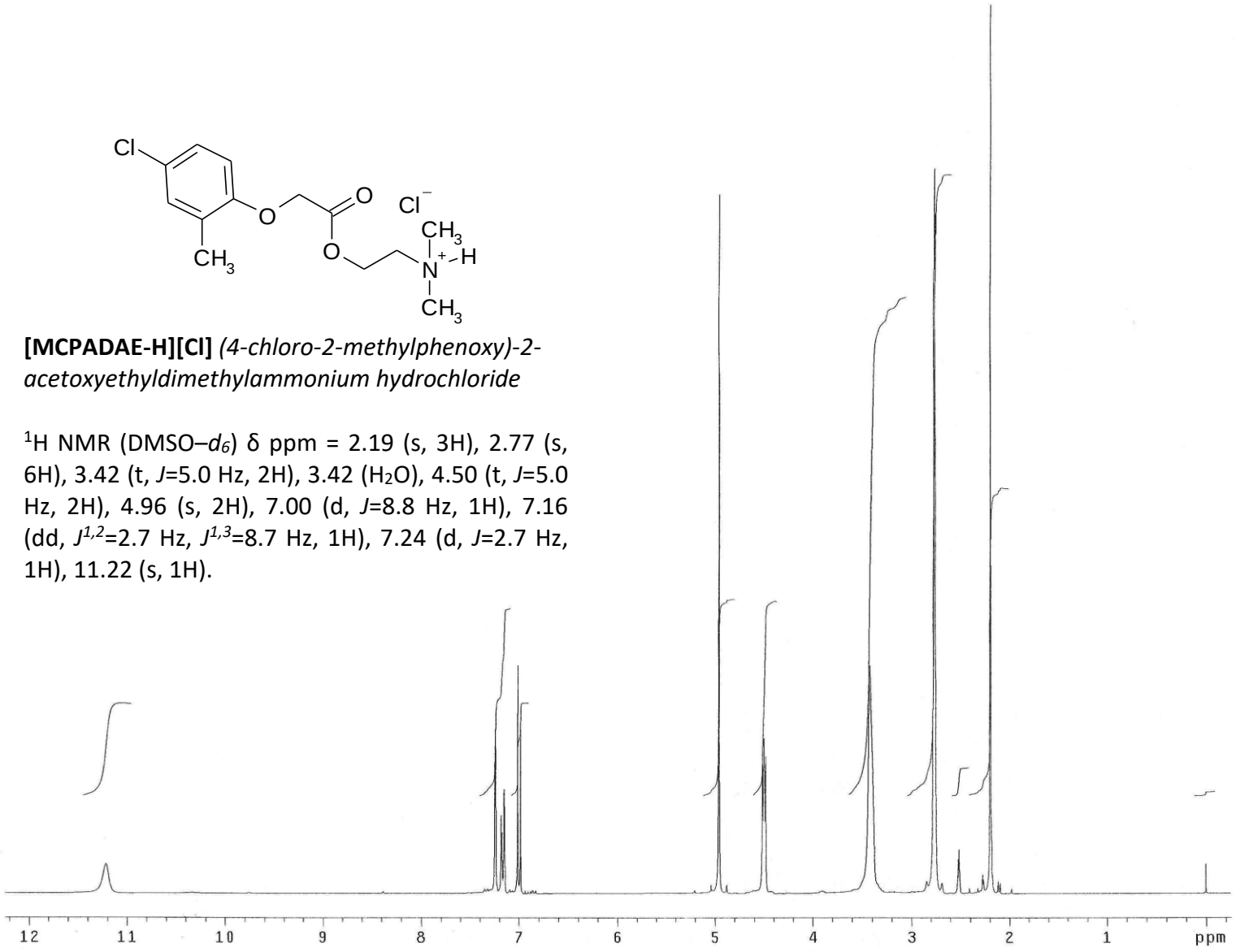


Fig. S11 ^{1}H NMR spectrum of **[MCPA-DAE-H][Cl].**

[MCPADAE-H][Cl] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldimethylammonium hydrochloride*

^{13}C NMR (DMSO–d_6) δ ppm = 15.78, 42.29, 54.58, 58.86, 65.08, 113.30, 124.48, 126.33, 128.42, 130.06, 154.58, 168.37.

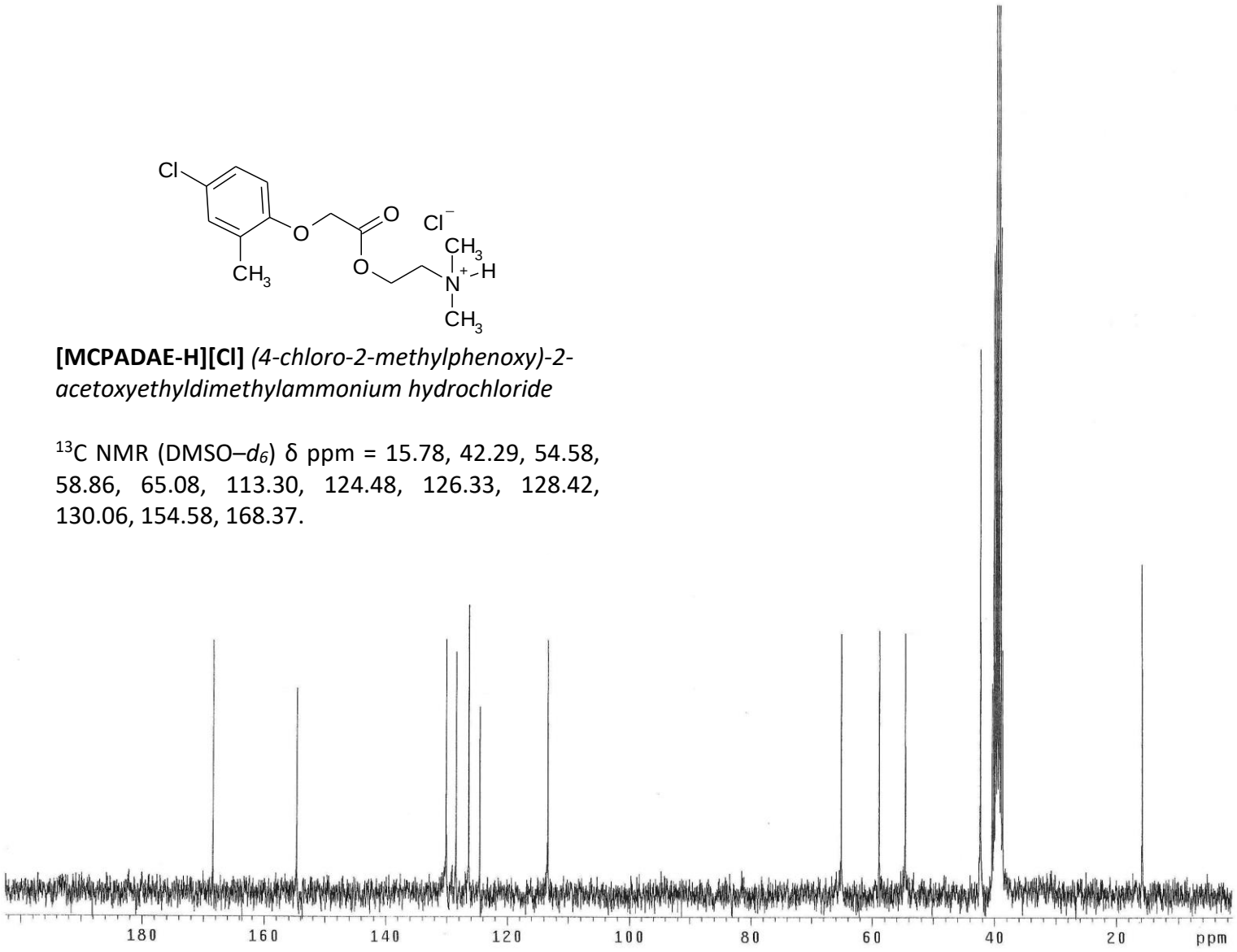


Fig. S12 ^{13}C NMR spectrum of **[MCPA-DAE-H][Cl].**

[MCPP-DAE-H][Cl] *(±)-(4-chloro-2-methylphenoxy)-2-(2'-propionyloxyethyl)dimethylammonium hydrochloride*

^{1}H NMR (DMSO–d_6) δ ppm = 1.58 (d, *J*=6.7 Hz, 3H), 2.19 (s, 3H), 2.75 (s, 6H), 3.41 (t, *J*=4.8 Hz, 2H), 3.42 (H_2O), 4.49 (t, *J*=4.7 Hz, 2H), 5.13 (quart, *J*=6.8 Hz, 1H), 6.99 (d, *J*=8.8 Hz, 1H), 7.15 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.24 (d, *J*=2.7 Hz, 1H), 11.43 (s, 1H).

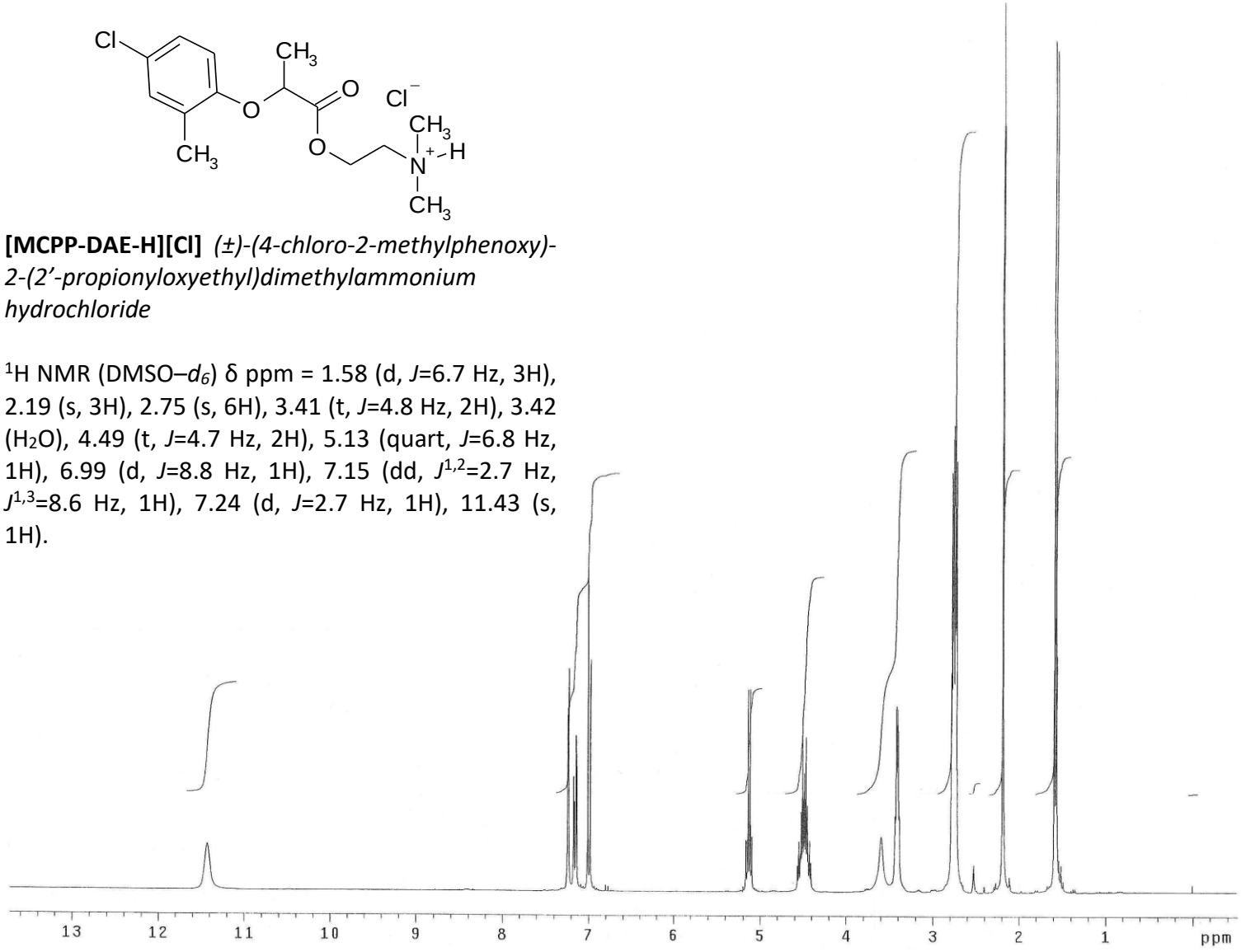
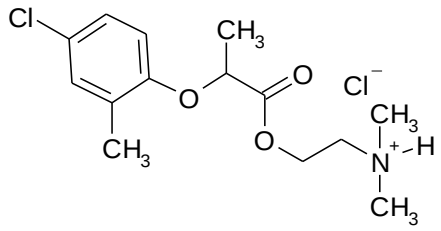


Fig. S13 ^{1}H NMR spectrum of **[MCPP-DAE-H][Cl].**



[MCPP-DAE-H][Cl] *(±)-(4-chloro-2-methylphenoxy)-2-(2'-propionyloxyethyl)dimethylammonium hydrochloride*

^{13}C NMR (DMSO–d_6) δ ppm = 15.78, 18.08, 42.22, 54.46, 59.36, 71.99 114.04, 124.48, 126.39, 128.75, 130.08, 154.23, 170.79.

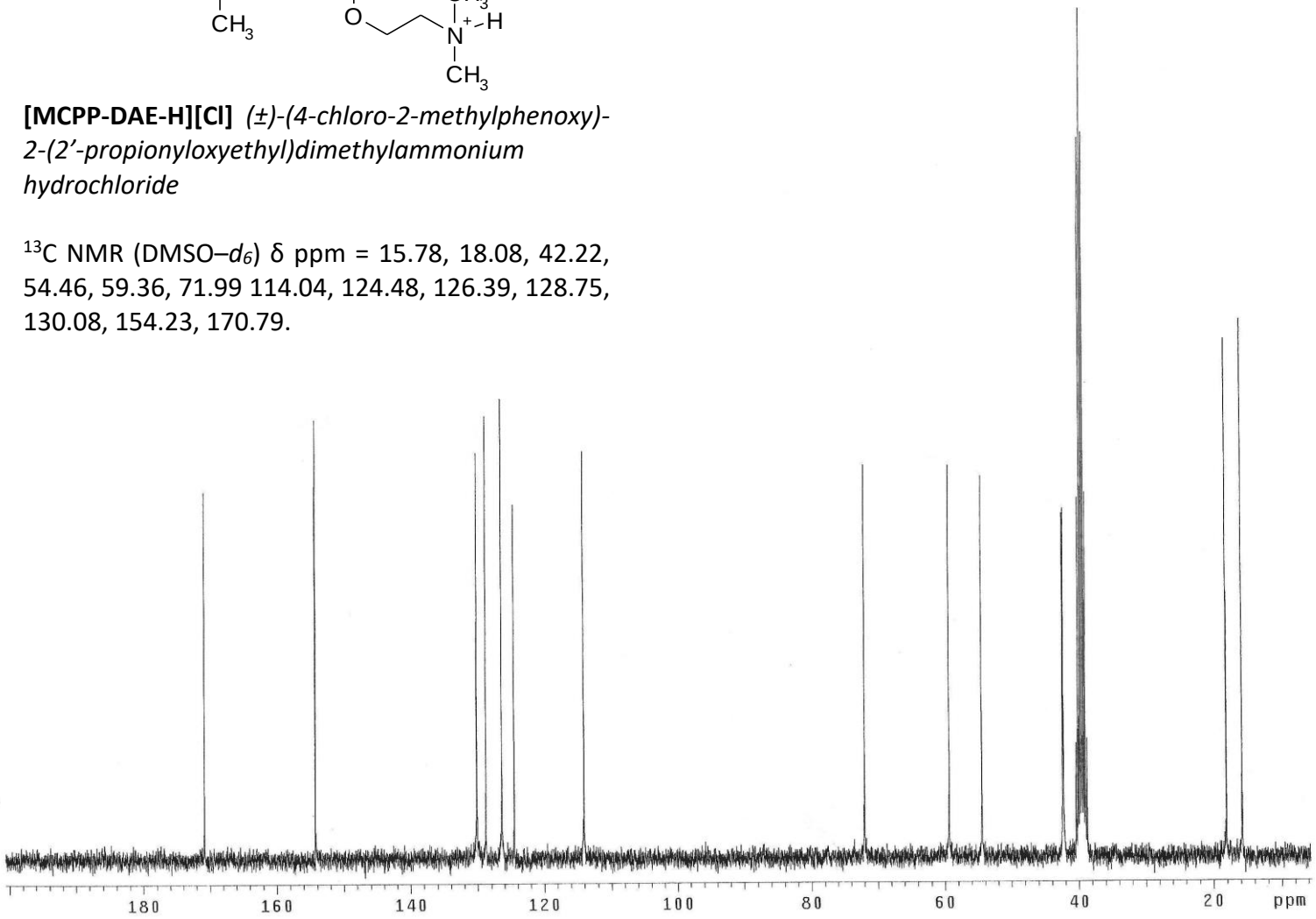


Fig. S14 ^{13}C NMR spectrum of **[MCPP-DAE-H][Cl].**

[4-CPA-DAE-H][Cl] *(4-chlorophenoxy)-2-acetoxyethyldimethylammonium hydrochloride*

^{1}H NMR (DMSO–d_6) δ ppm = 2.78 (s, 6H), 3.42 (t, J=5.0 Hz, 2H), 3.42 (H_2O), 4.51 (t, J=5.0 Hz, 2H), 4.96 (s, 2H), 7.05 (d, J=9.1 Hz, 2H), 7.34 (dd, J=9.1 Hz, 2H), 11.25 (s, 1H).

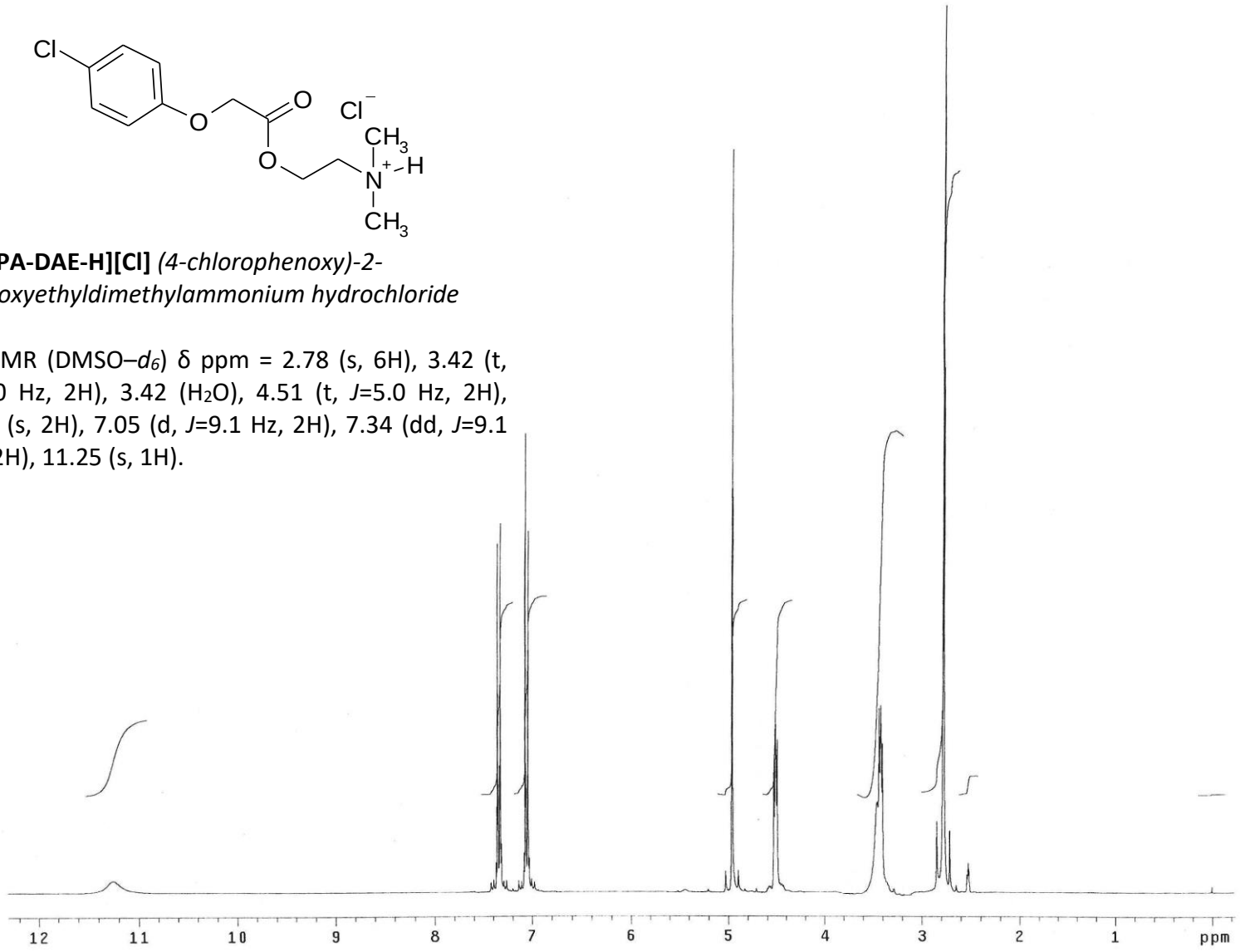
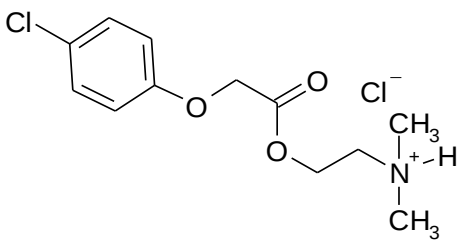


Fig. S15 ^{1}H NMR spectrum of **[4-CPA-DAE-H][Cl].**



[4-CPA-DAE-H][Cl] *(4-chlorophenoxy)-2-acetoxyethyldimethyl-ammonium hydrochloride*

^{13}C NMR (DMSO–d_6) δ ppm = 42.29, 54.57, 58.82, 64.89, 116.44, 124.94, 129.22, 156.42, 168.30.

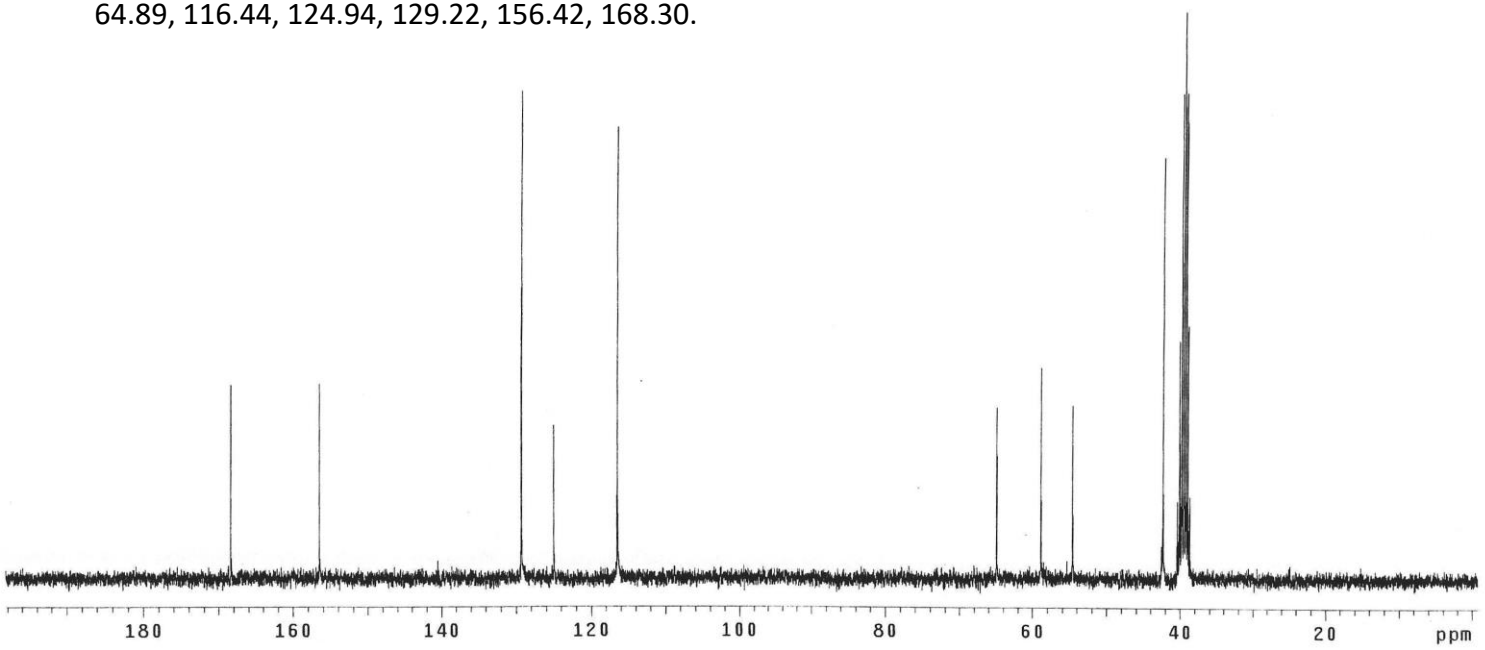


Fig. S16 ^{13}C NMR spectrum of **[4-CPA-DAE-H][Cl].**

2,4-D-DAE *(2-dimethylamino)ethyl (2,4-dichlorophenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 2.19 (s, 6H), 2.53 (t, J=5.7 Hz, 2H), 4.23 (t, J=5.7 Hz, 2H), 4.96 (s, 2H), 7.12 (d, J=9.1 Hz, 1H), 7.35 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.58 (d, J=2.6 Hz, 1H).

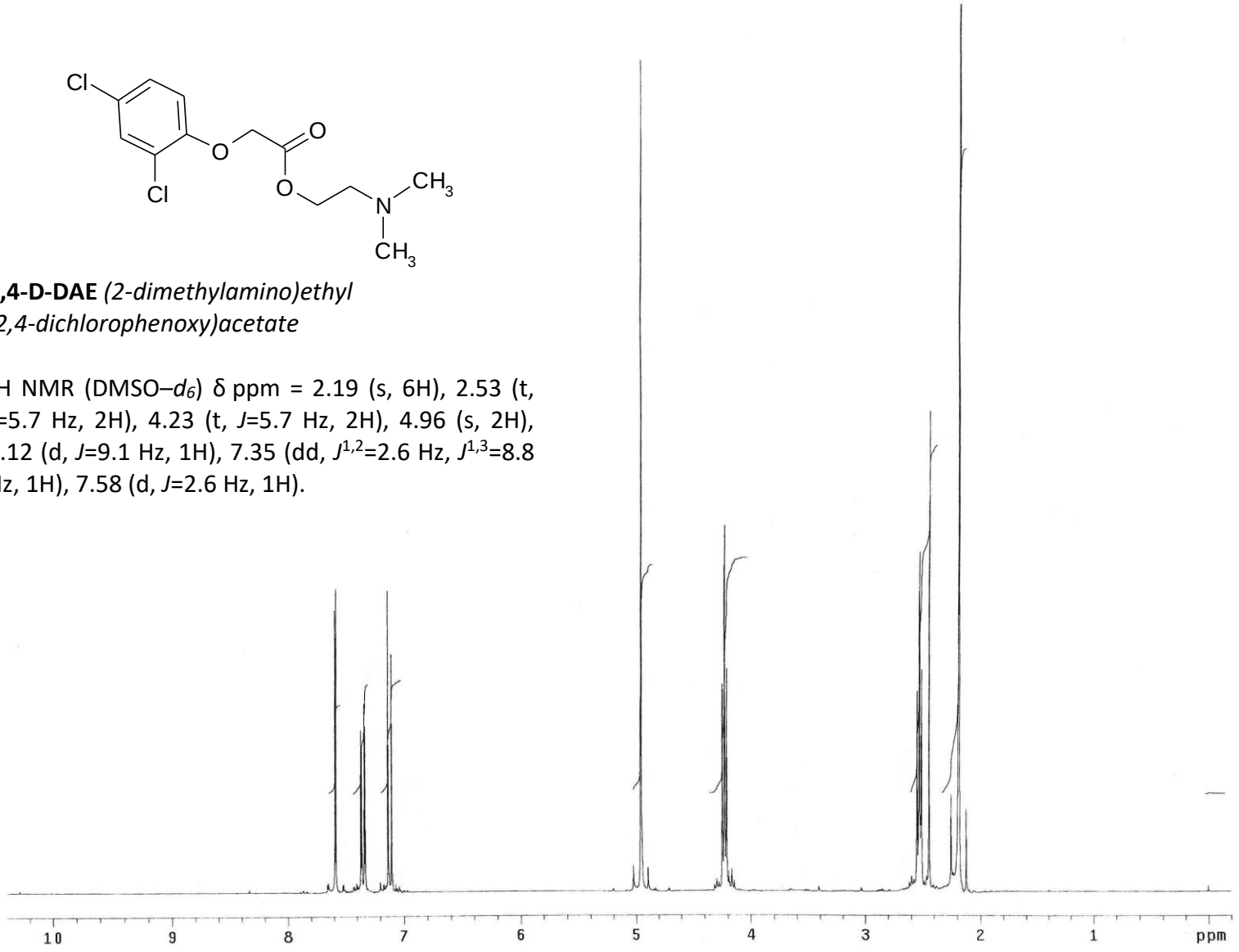


Fig. S17 ^{1}H NMR spectrum of **2,4-D-DAE.**

2,4-D-DAE *(2-dimethylamino)ethyl (2,4-dichlorophenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 45.0, 56.9, 62.27, 65.4, 115.1, 122.3, 125.1, 127.9, 129.4, 152.2, 168.0.

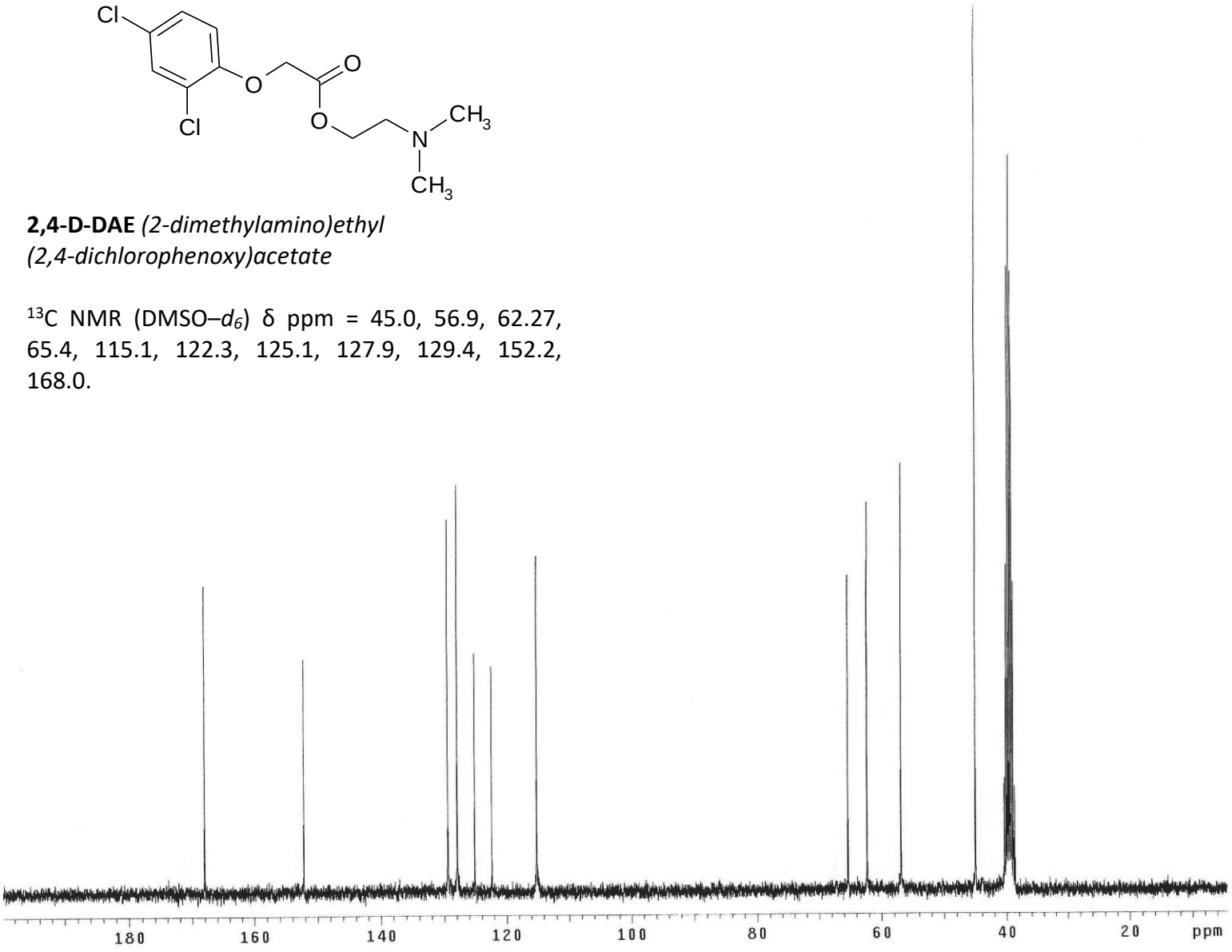
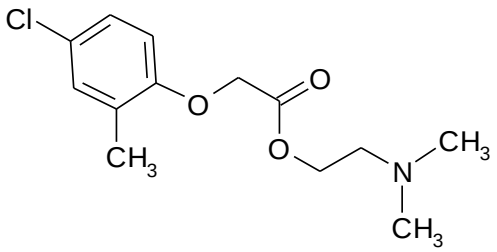


Fig. S18 ^{13}C NMR spectrum of **2,4-D-DAE.**



MCPA-DAE *(2-dimethylamino)ethyl (4-chloro-2-methylphenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 2.16 (s, 6H), 2.19 (s, 3H), 2.49 (t, J=5.7 Hz, 2H), 4.20 (t, J=5.7 Hz, 2H), 4.82 (s, 2H), 6.89 (d, J=8.8 Hz, 1H), 7.16 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.23 (d, J=2.6 Hz, 1H).

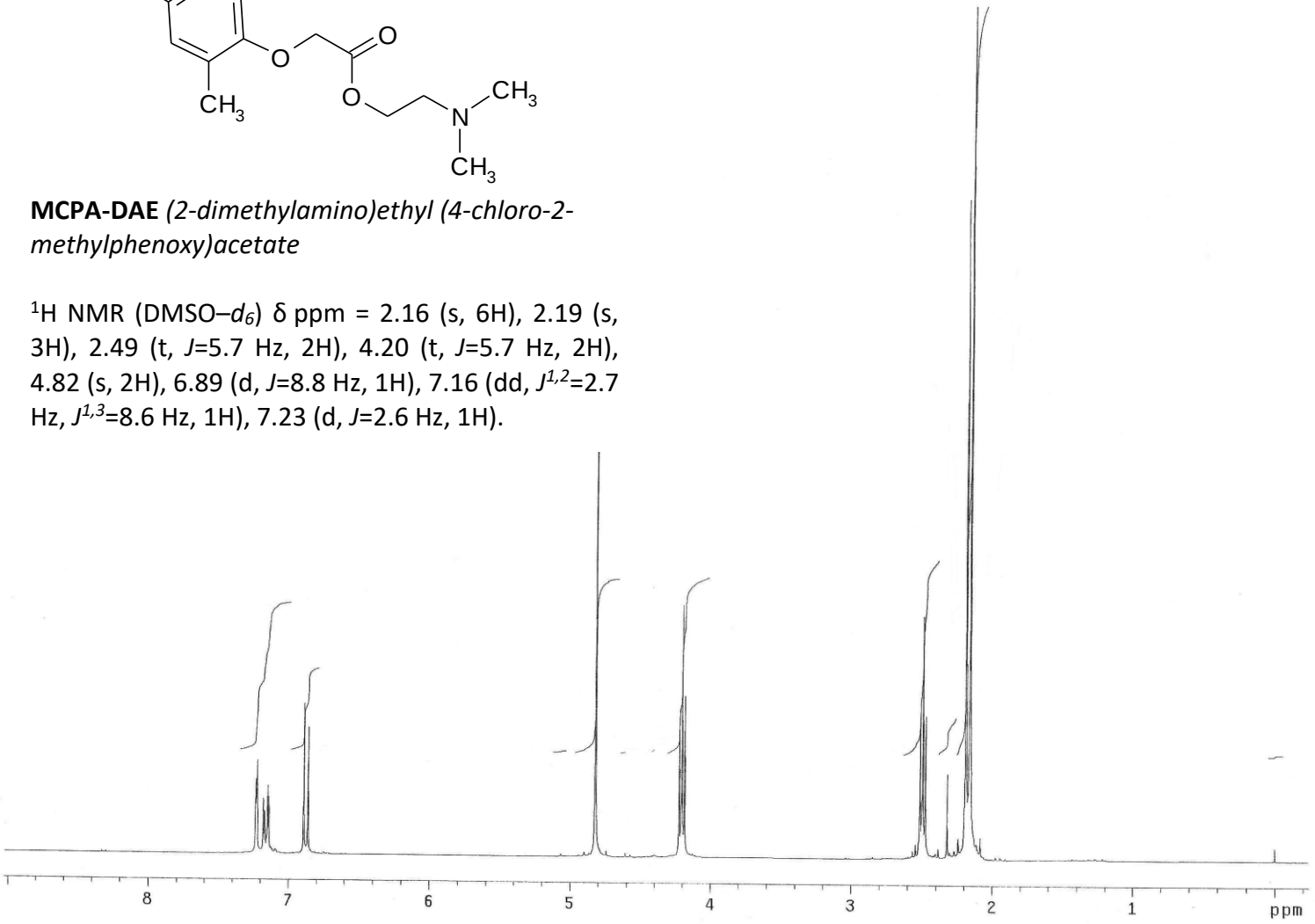
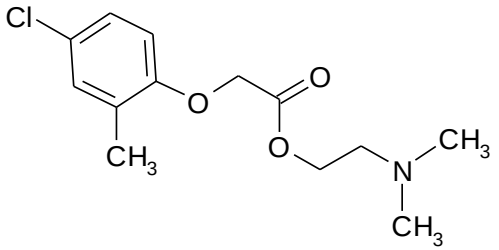


Fig. S19 ^{1}H NMR spectrum of **MCPA-DAE.**



MCPA-DAE *(2-dimethylamino)ethyl (4-chloro-2-methyl-phenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 15.74, 45.16, 57.03, 62.26, 65.07, 113.08, 124.47, 126.26, 128.50, 130.03, 154.65, 168.58.

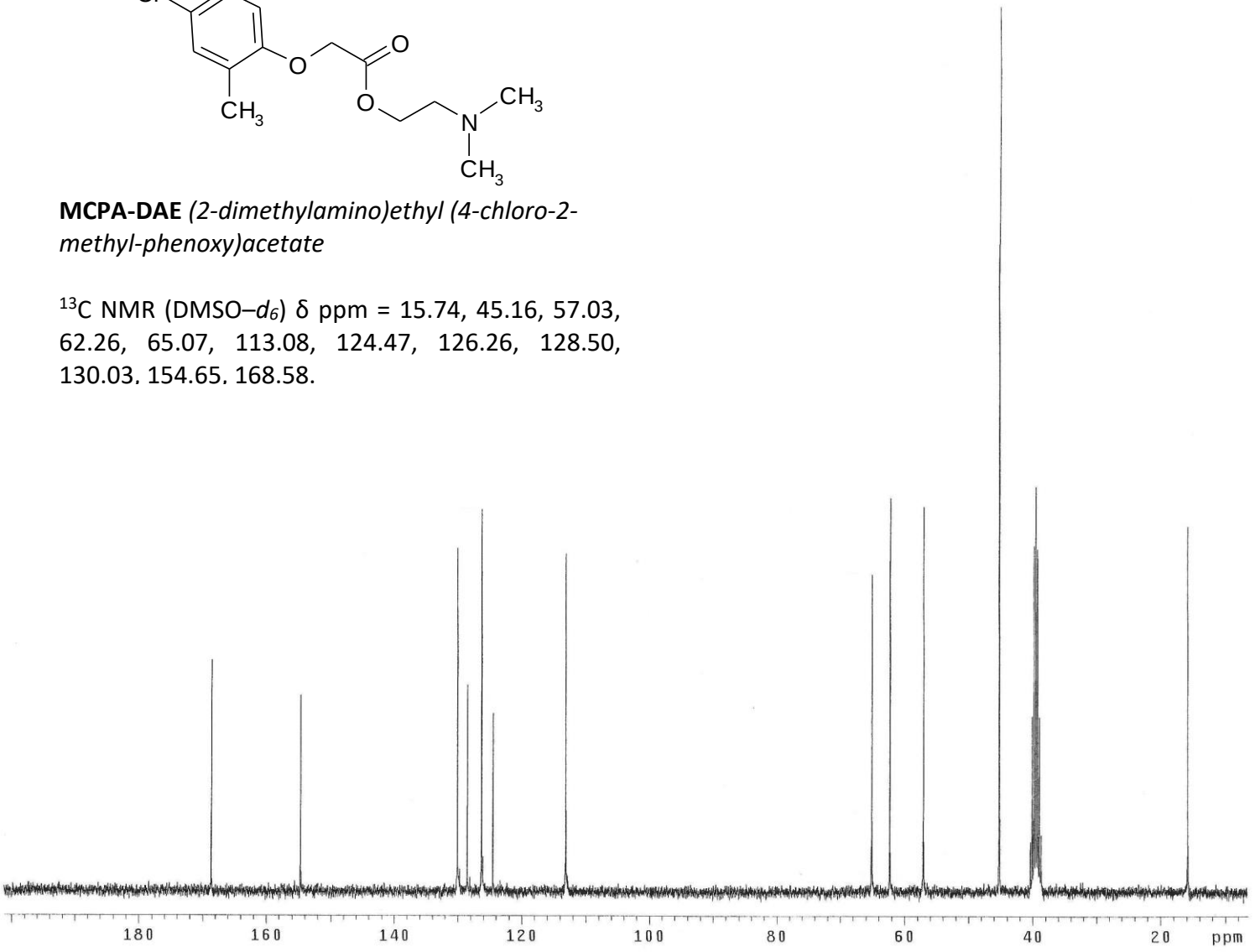


Fig. S20 ^{13}C NMR spectrum of **MCPA-DAE.**

MCPP-DAE *(2-dimethylamino)ethyl (±)-2-(4-chloro-2-methylphenoxy)propionate*

^{1}H NMR (DMSO–d_6) δ ppm = 1.53 (d, *J*=6.7 Hz, 3H), 2.14 (s, 6H), 2.19 (s, 3H), 2.45 (t, *J*=5.6 Hz, 2H), 4.18 (t, *J*=5.6 Hz, 2H), 4.93 (quart, *J*=6.8 Hz, 1H), 6.83 (d, *J*=8.8 Hz, 1H), 7.13 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.22 (d, *J*=2.6 Hz, 1H).

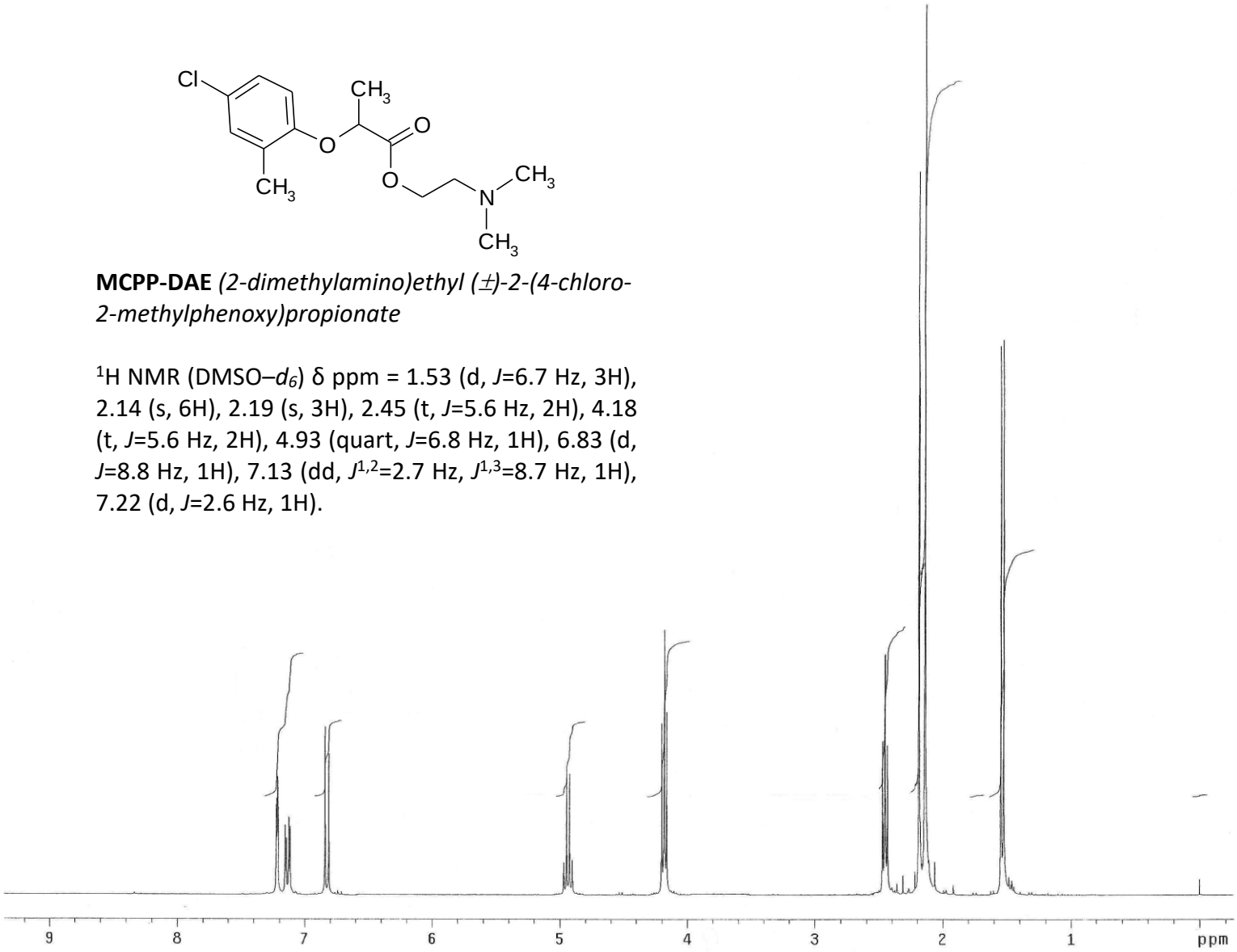
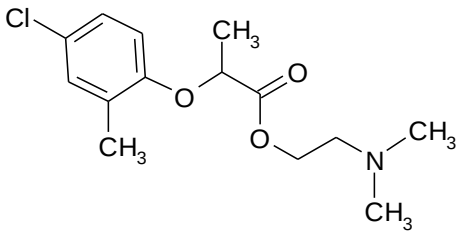


Fig. S21 ^{1}H NMR spectrum of **MCPP-DAE.**



MCPP-DAE *(2-dimethylamino)ethyl (±)-2-(4-chloro-2-methylphenoxy)propionate*

^{13}C NMR (DMSO–d_6) δ ppm = 15.74, 18.25, 45.13, 57.07, 62.38, 72.21, 113.66, 124.52, 126.21, 128.83, 130.08, 154.35, 171.23.

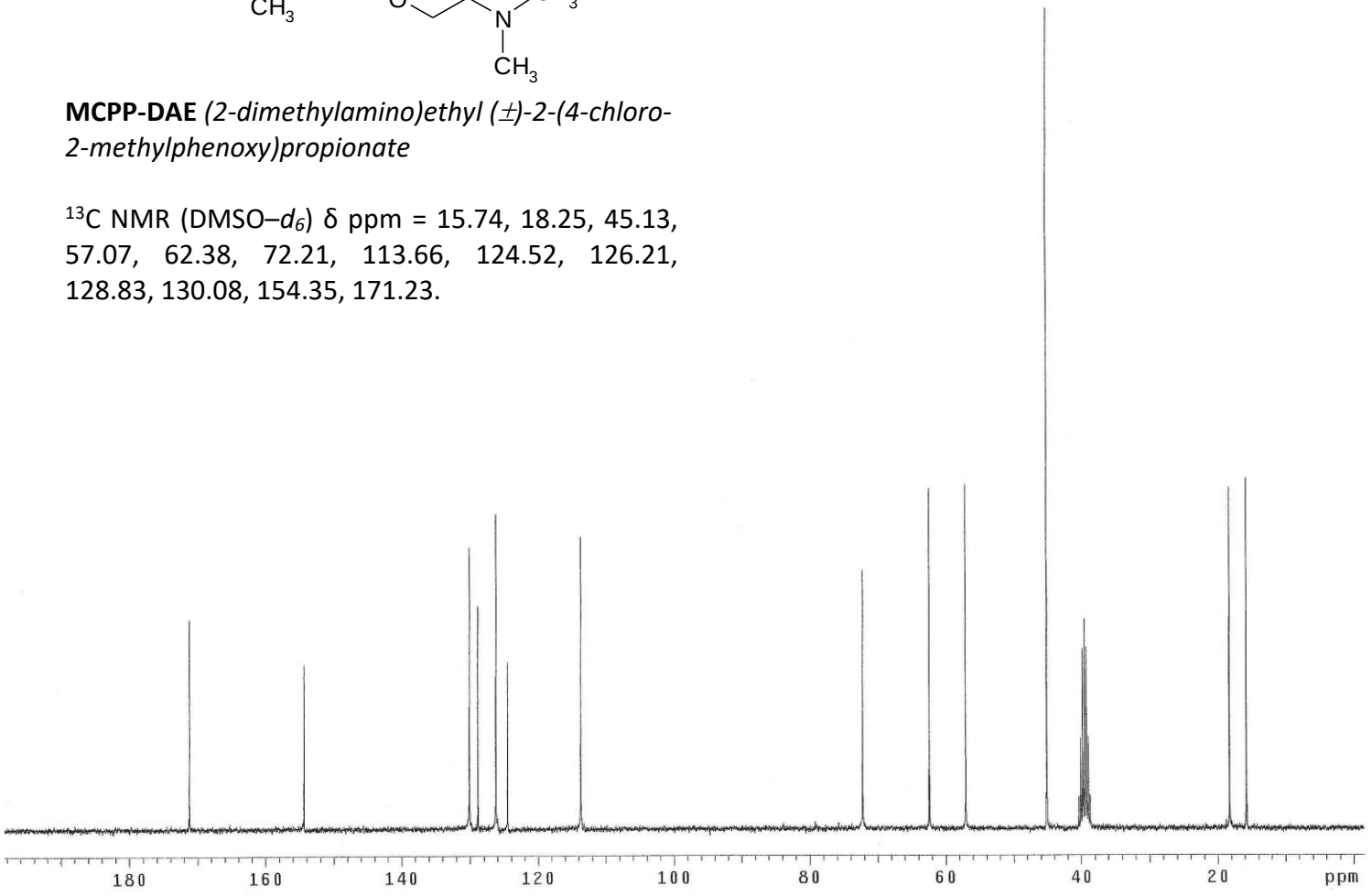


Fig. S22 ^{13}C NMR spectrum of **MCPP-DAE.**

4-CPA-DAE *(2-dimethylamino)ethyl (4-chlorophenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 2.18 (s, 6H), 2.51 (t, *J*=5.7 Hz, 2H), 4.21 (t, *J*=5.7 Hz, 2H), 4.81 (s, 2H), 6.97 (d, *J*=9.1 Hz, 2H), 7.33 (d, *J*=9.1 Hz, 1H).

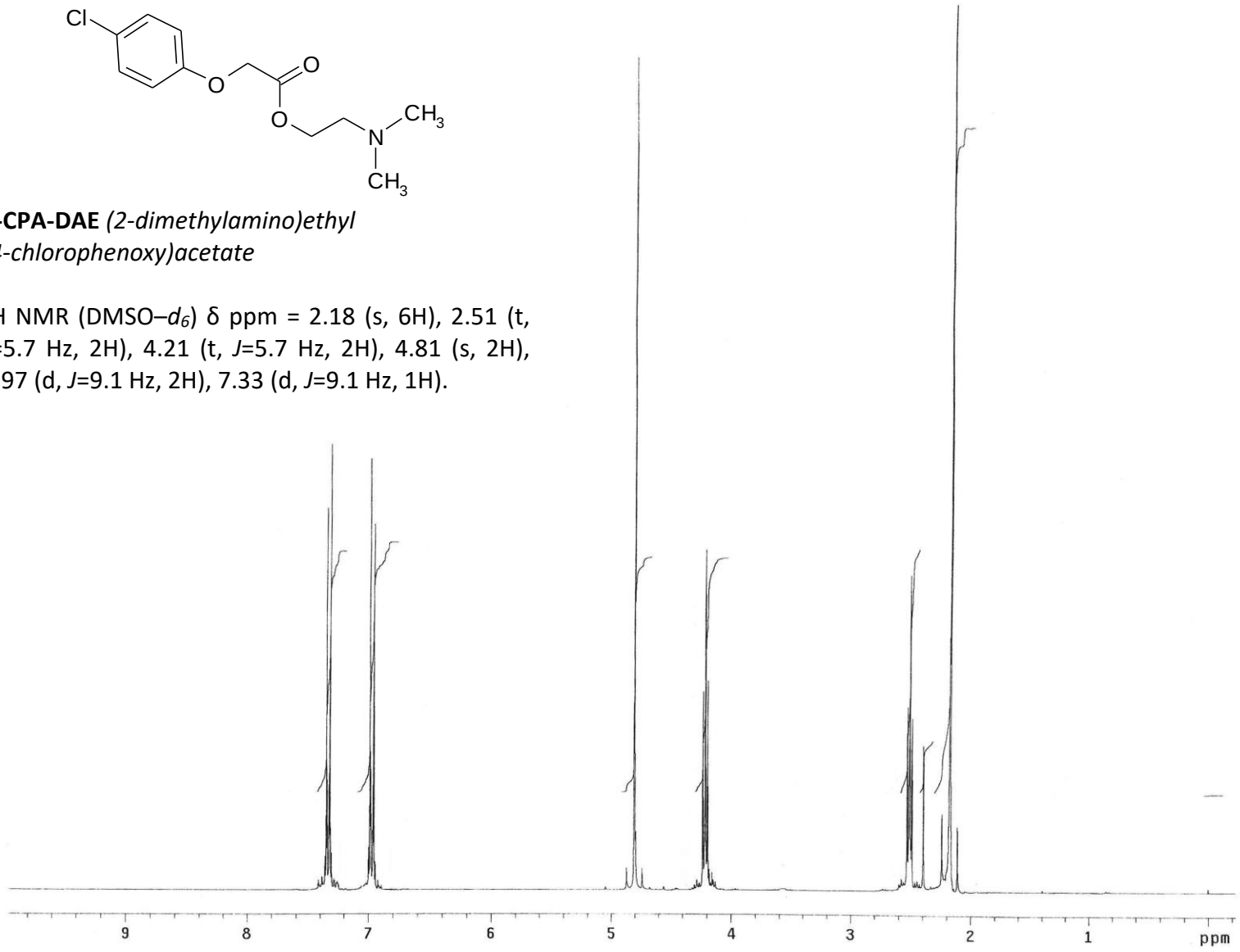
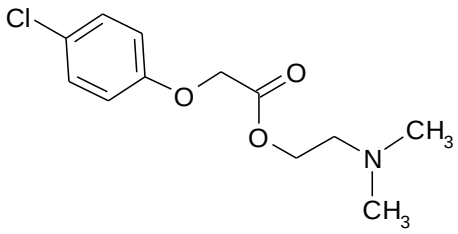


Fig. S23 ^{1}H NMR spectrum of **4-CPA-DAE.**



4-CPA-DAE *(2-dimethylamino)ethyl (4-chlorophenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 45.07, 56.96, 62.15, 64.83, 116.33, 124.92, 129.16, 156.47, 168,46.

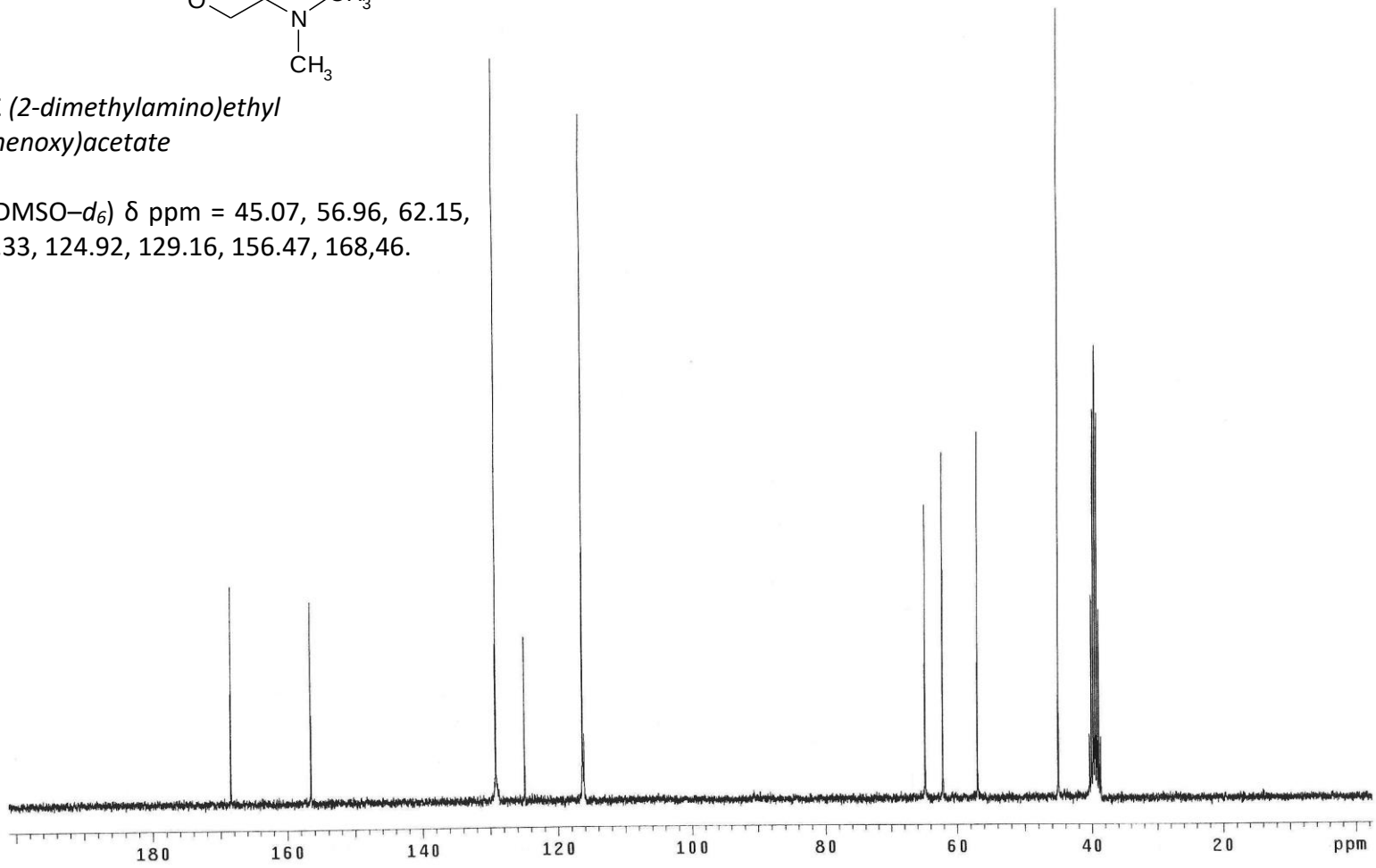


Fig. S24 ^{13}C NMR spectrum of **4-CPA-DAE.**

[2,4-D-DAE-C_{10}][Br] *(2,4-dichlorophenoxy)-2-acetoxyethyldecyldimethylammonium bromide*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.68 (q, *J*=3.9 Hz, 2H), 3.14 (s, 6H), 3.37 (t, *J*=8.5 Hz, 2H), 3.42 (H_2O), 3.76 (t, *J*=4.2 Hz, 2H), 4.59 (t, *J*=2.3 Hz, 2H), 5.01 (s, 2H), 7.26 (d, *J*=9.0 Hz, 1H), 7.37 (dd, $J^{1,2}$=2.5 Hz, $J^{1,3}$=8.9 Hz, 1H), 7.59 (d, *J*=2.5 Hz, 1H).

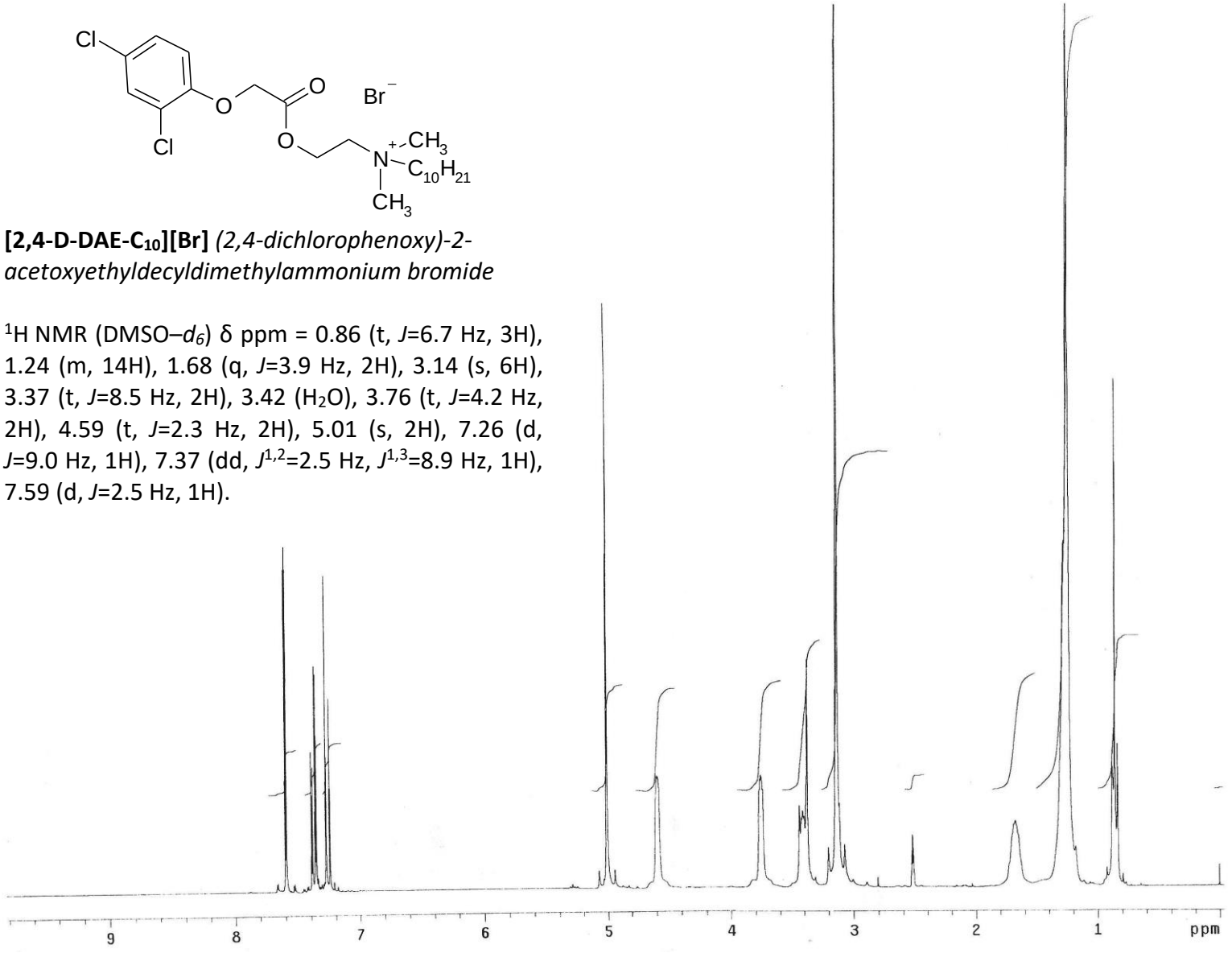


Fig. S25 ^{1}H NMR spectrum of **[2,4-D-DAE-C_{10}][Br].**

[2,4-D-DAE-C_{10}][Br] *(2,4-dichlorophenoxy)-2-acetoxyethyldecyldimethylammonium bromide*

^{13}C NMR (DMSO–d_6) δ ppm = 13.87, 21.75, 22.03, 25.72, 28.50, 28.62, 28.81, 28.86, 31.23, 50.49, 58.46, 61.24, 63.87, 65.52, 115.42, 122.24, 125.18, 127.94, 129.33, 152.01, 167.48.

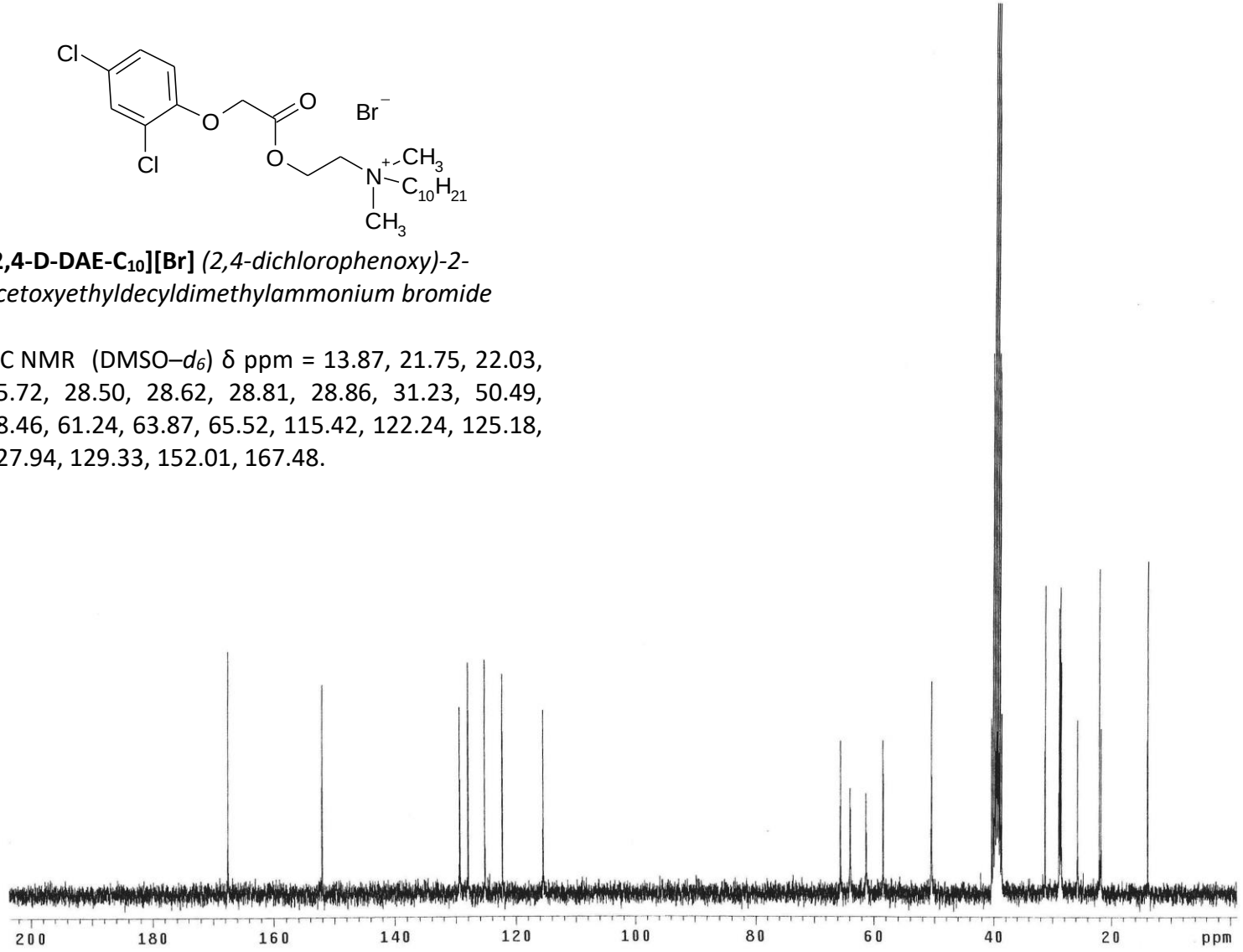
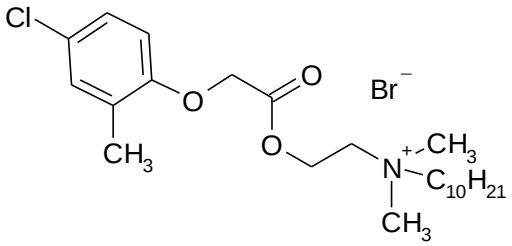


Fig. S26 ^{13}C NMR spectrum of **[2,4-D-DAE-C_{10}][Br].**



[MCPA-DAE-C_{10}][Br] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium bromide*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.5 Hz, 3H), 1.25 (m, 14H), 1.67 (q, *J*=4.2 Hz, 2H), 2.20 (s, 3H), 3.13 (s, 6H), 3.38 (H_2O), 3.40 (t, *J*=8.5 Hz, 2H), 3.75 (t, *J*=4.9 Hz, 2H), 4.58 (t, *J*=4.9 Hz, 2H), 4.89 (s, 2H), 6.98 (d, *J*=8.8 Hz, 1H), 7.18 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.25 (d, *J*=2.6 Hz, 1H).

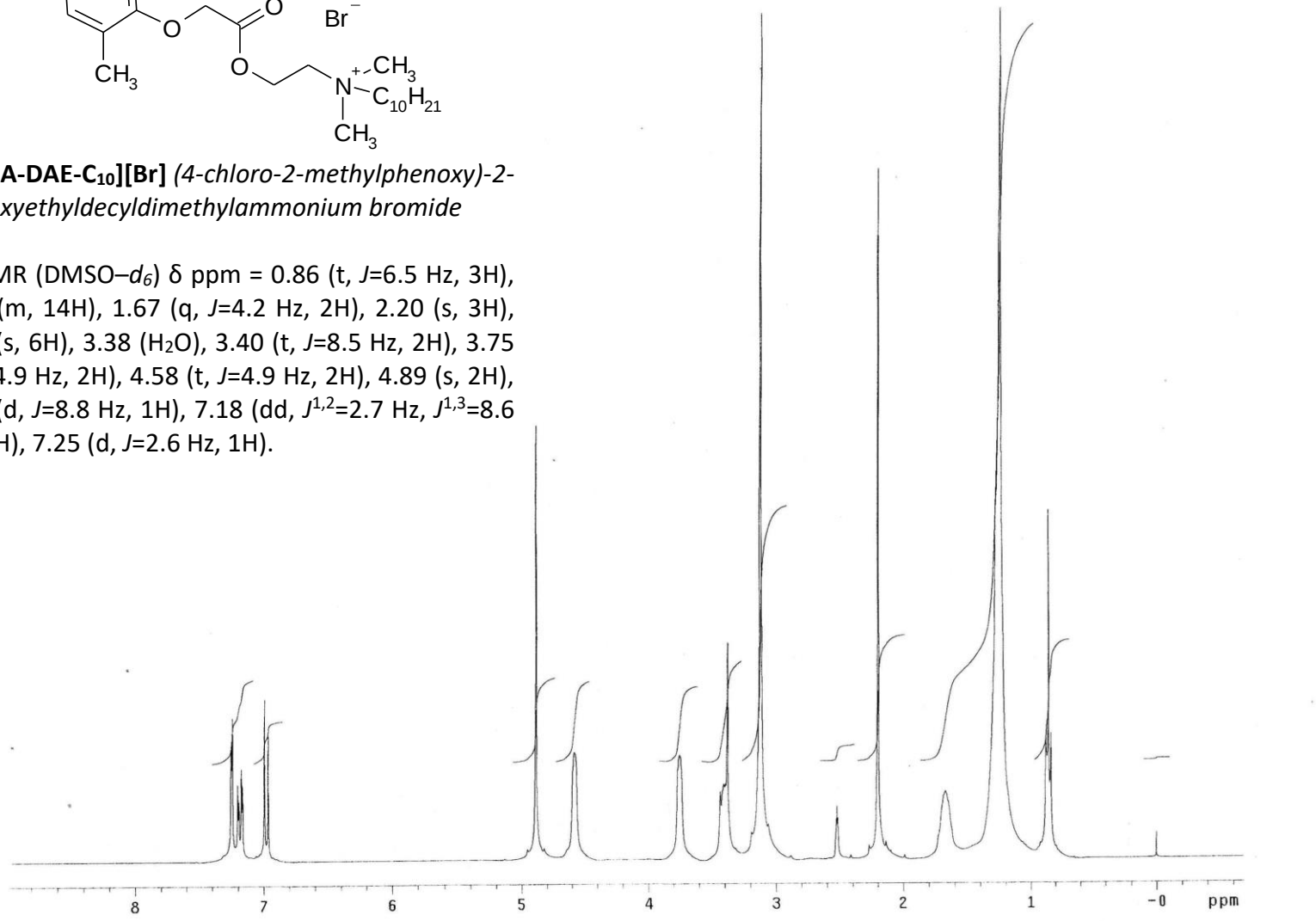
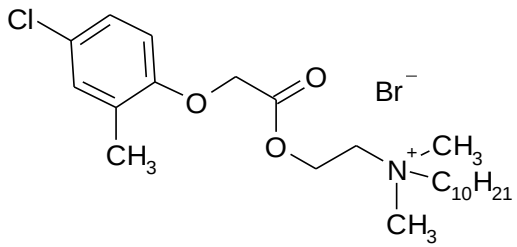


Fig. S27 ^{1}H NMR spectrum of **[MCPA-DAE-C_{10}][Br].**



[MCPA-DAE-C_{10}][Br] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium bromide*

^{13}C NMR (DMSO–d_6) δ ppm = 13.90, 15.71, 21.77, 22.06, 25.74, 28.53, 28.65, 28.84, 28.89, 31.25, 50.48, 58.33, 61.25, 63.83, 65.14, 113.28, 124.54, 126.30, 128.36, 130.02, 154.48, 168.05.

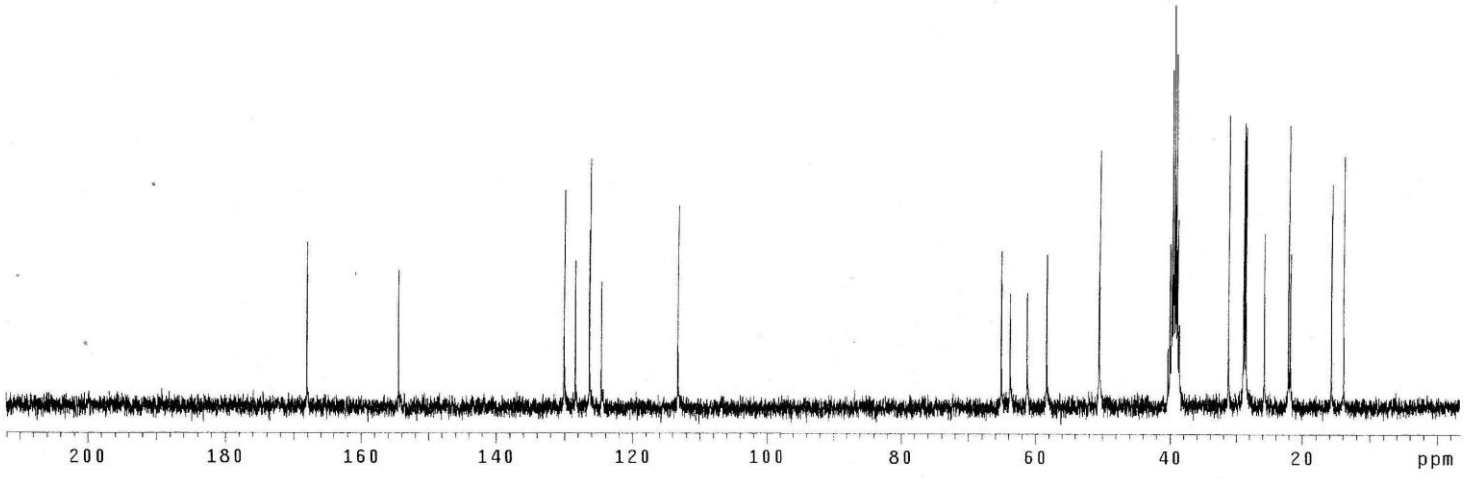


Fig. S28 ^{13}C NMR spectrum of **[MCPA-DAE-C_{10}][Br].**

[MCPP-DAE-C_{10}][Br] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethylammonium bromide*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.25 (m, 14H), 1.56 (d, *J*=6.8 Hz, 3H), 1.65 (q, *J*=4.9 Hz, 2H), 2.19 (s, 3H), 3.10 (s, 6H), 3.37 (H_2O), 3.39 (t, *J*=4.3 Hz, 2H), 3.75 (t, *J*=1.8 Hz, 2H), 4.56 (t, *J*=2.3 Hz, 2H), 5.04 (quart, *J*=6.8 Hz, 1H), 6.93 (d, *J*=8.8 Hz, 1H), 7.17 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.24 (d, *J*=2.3 Hz, 1H).

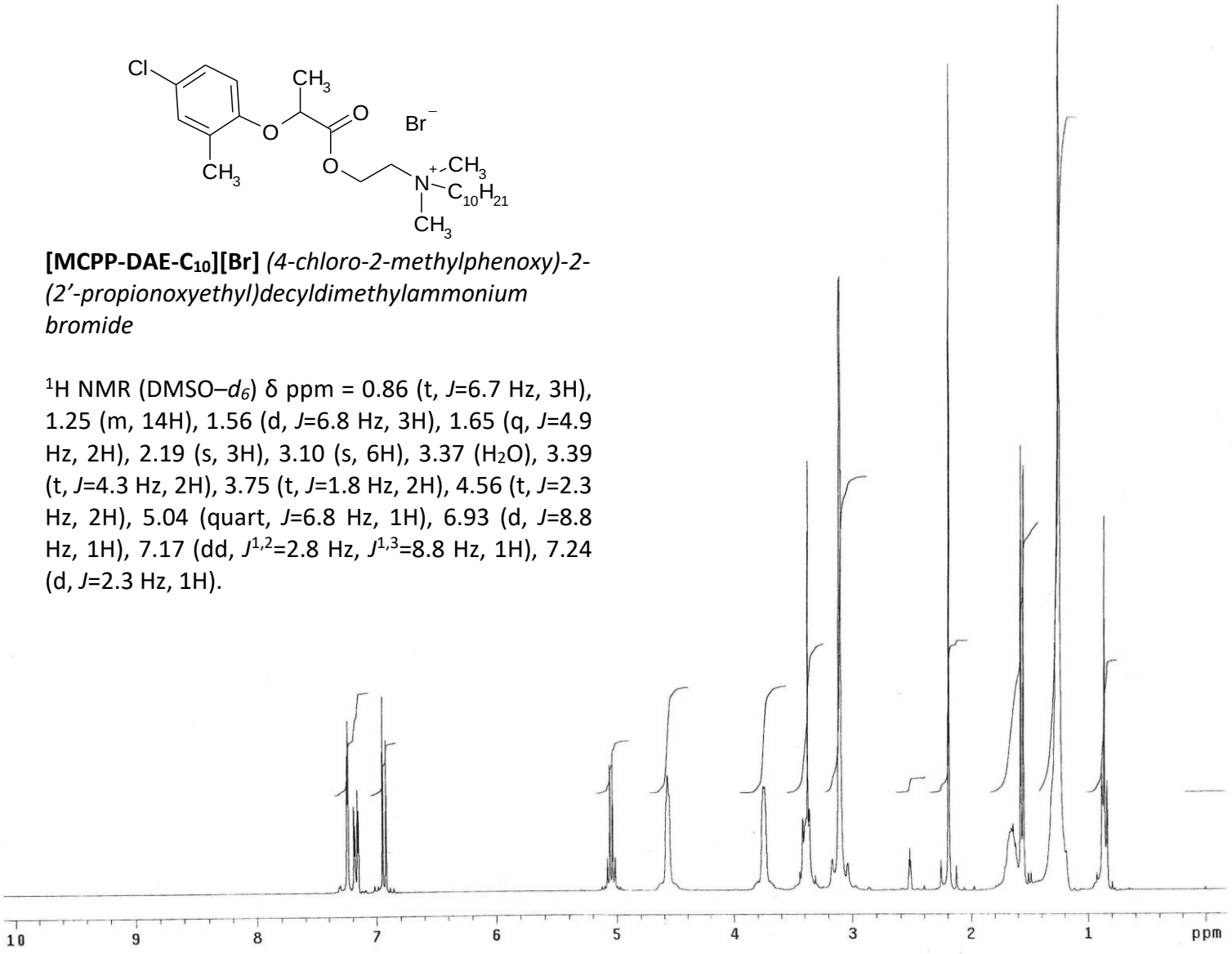
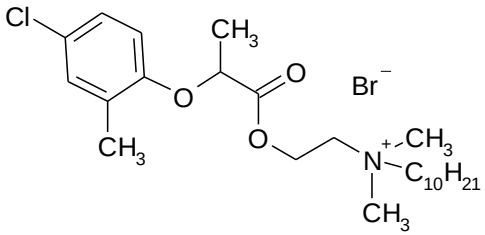


Fig. S29 ^{1}H NMR spectrum of **[MCPP-DAE-C_{10}][Br].**



[MCPP-DAE-C_{10}][Br] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethylammonium bromide*

^{13}C NMR (DMSO–d_6) δ ppm = 13.89, 15.72, 18.02, 21.75, 22.04, 25.71, 28.49, 28.61, 28.80, 28.85, 31.22, 50.38, 58.55, 61.40, 63.76, 72.13, 114.03, 124.54, 126.34, 128.75, 130.06, 154.17, 170.51.

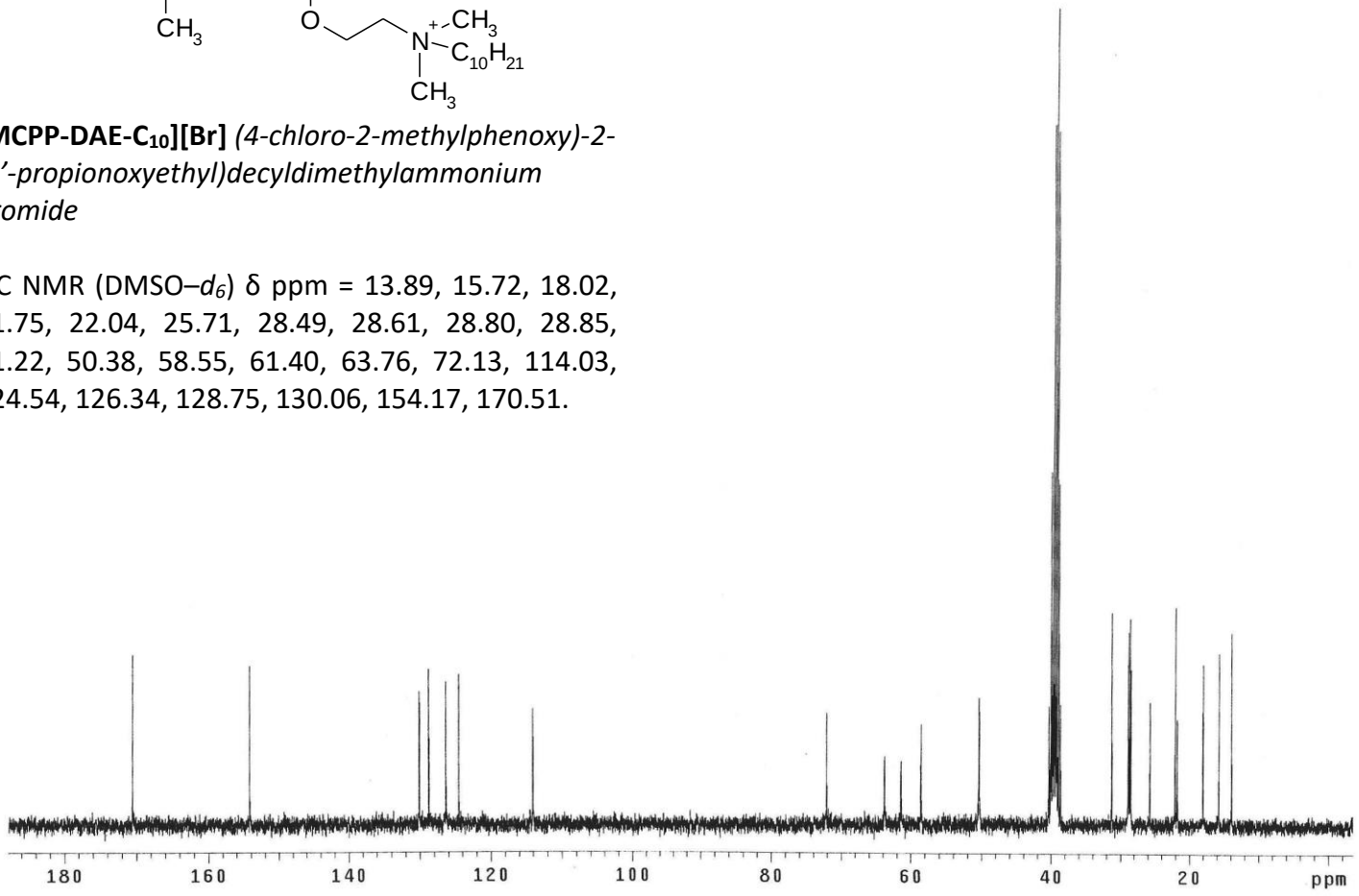
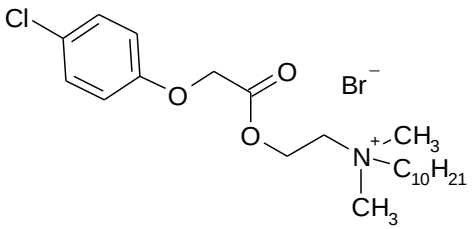


Fig. S30 ^{13}C NMR spectrum of **[MCPP-DAE-C_{10}][Br].**



[4-CPA-DAE-C_{10}][Br] *(4-chlorophenoxy)-2-acetoxyethyldecyldimethylammonium bromide*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.25 (m, 14H), 1.67 (q, *J*=4.5 Hz, 2H), 3.11 (s, 6H), 3.39 (t, *J*=8.4 Hz, 2H), 3.73 (t, *J*=5.0 Hz, 2H), 4.56 (t, *J*=5.0 Hz, 2H), 4.87 (s, 2H), 7.03 (d, *J*=9.1 Hz, 2H), 7.35 (d, *J*=9.1 Hz, 2H).

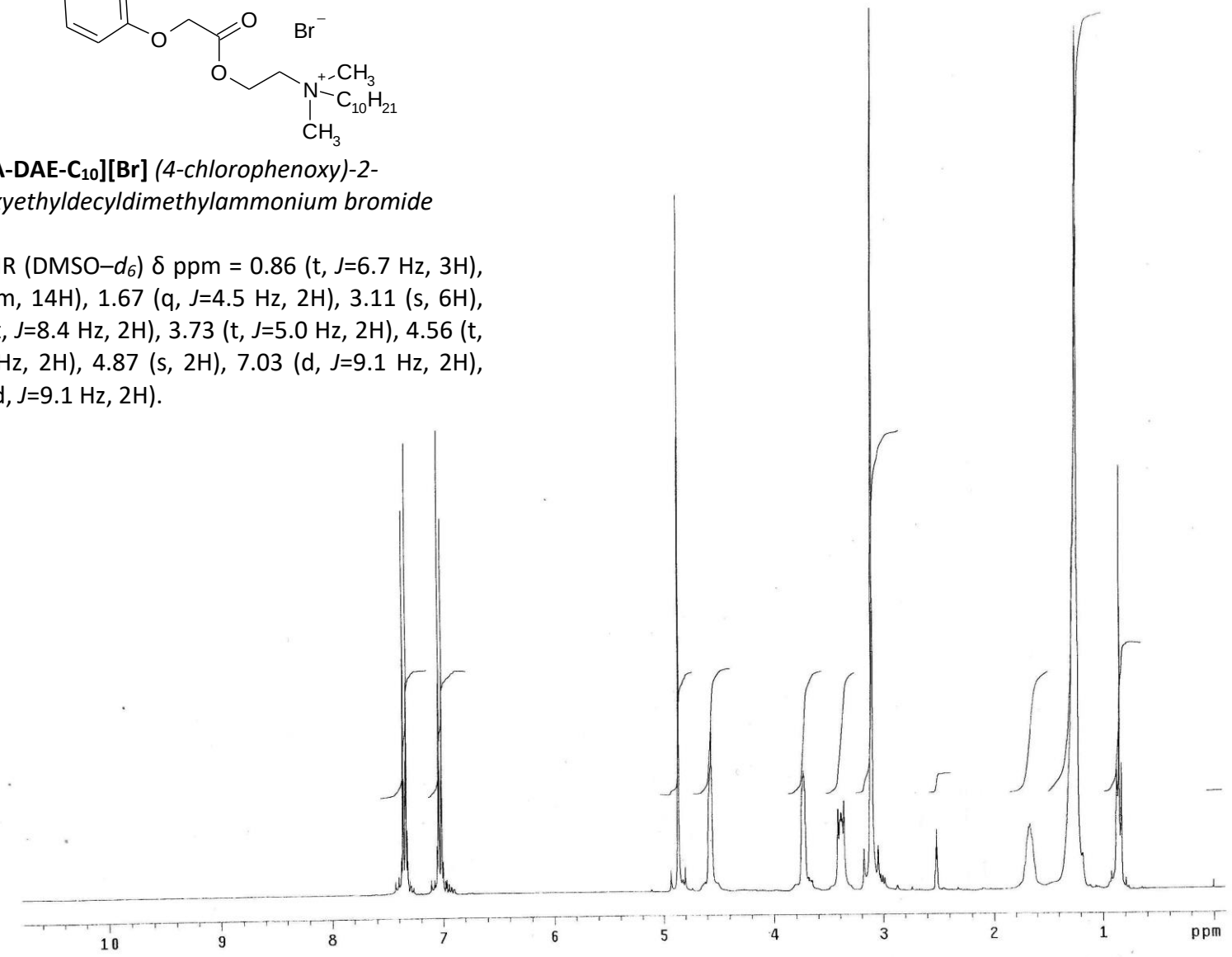


Fig. S31 ^{1}H NMR spectrum of **[4-CPA-DAE-C_{10}][Br].**

[4-CPA-DAE-C_{10}][Br] *(4-chlorophenoxy)-2-acetoxyethyldecyldimethylammonium bromide*

^{13}C NMR (DMSO–d_6) δ ppm = 13.89, 21.75, 22.04, 25.73, 28.51, 28.62, 28.81, 28.87, 31.23, 50.49, 58.32, 61.23, 63.87, 64.93, 116.42, 125.01, 129.20, 156.32, 167.96.

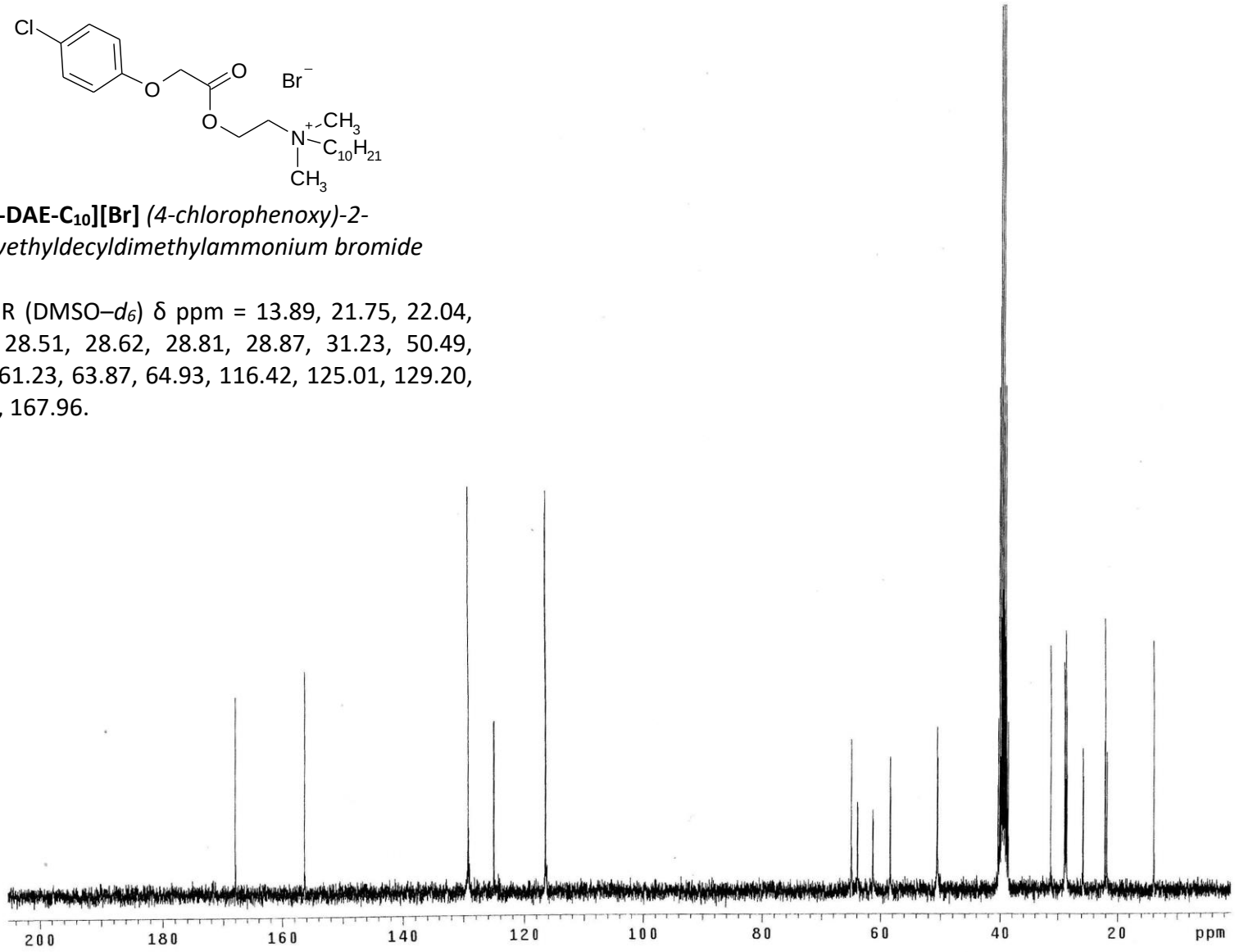


Fig. S32 ^{13}C NMR spectrum of **[4-CPA-DAE-C_{10}][Br].**

[2,4-D-DAE-C_{10}][MCPA] *(2,4-dichlorophenoxy)-2-acetoxyethyldecyldimethylammonium (4-chloro-2-methylphenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.8 Hz, 3H), 1.24 (m, 14H), 1.65 (q, *J*=5.7 Hz, 2H), 2.17 (s, 3H), 3.06 (s, 6H), 3.31 (t, *J*=8.5 Hz, 2H), 3.38 (t, *J*=5.1 Hz, 2H), 3.82 (t, *J*=2.4 Hz, 2H), 4.49 (s, 2H), 4.53 (s,2H), 6.75 (d, *J*=8.8 Hz, 1H), 6.93 (d, *J*=8.8 Hz, 1H), 7.11 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.18 (d, *J*=2.7 Hz, 1H), 7.29 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.50 (d, *J*=2.6 Hz, 1H).

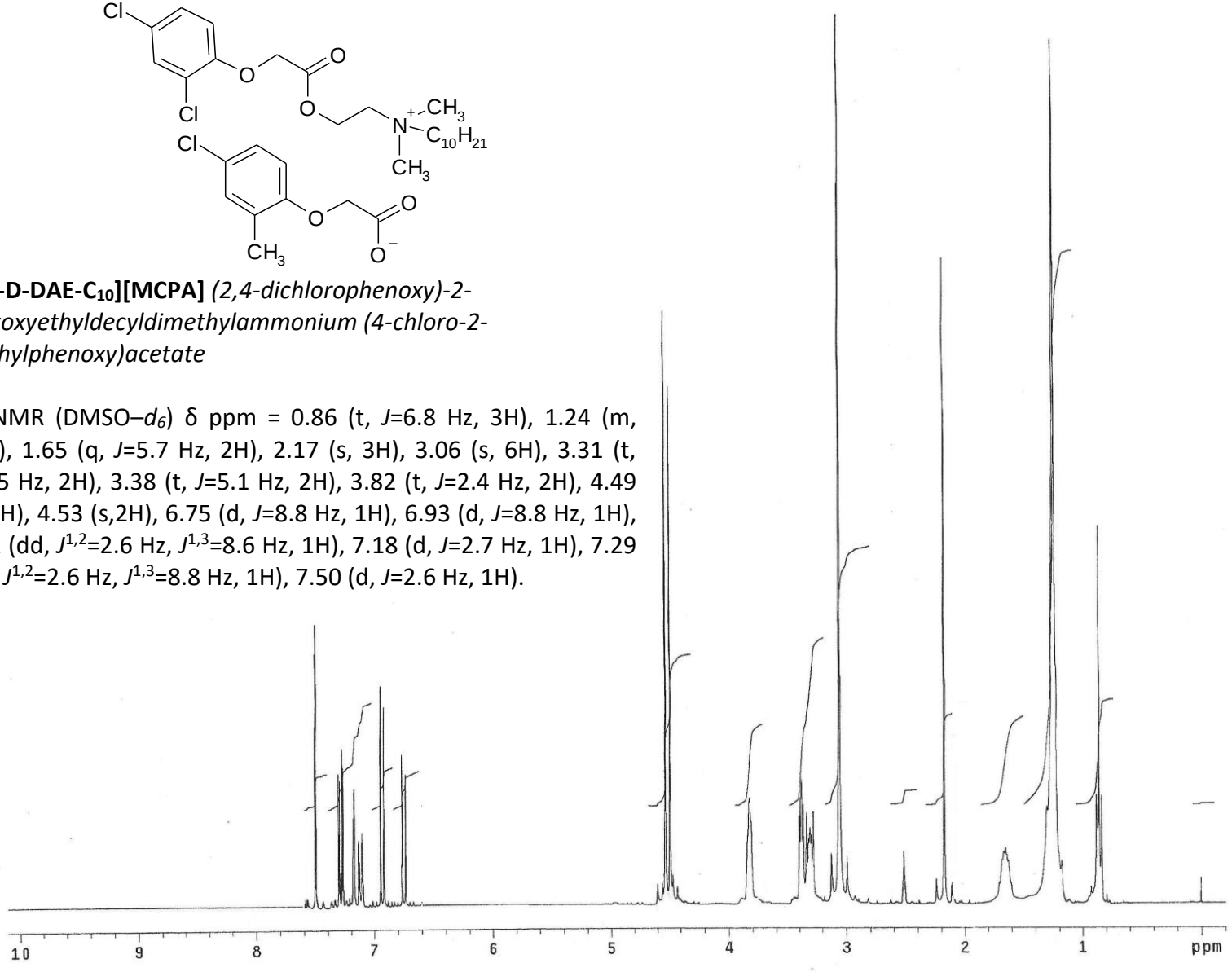
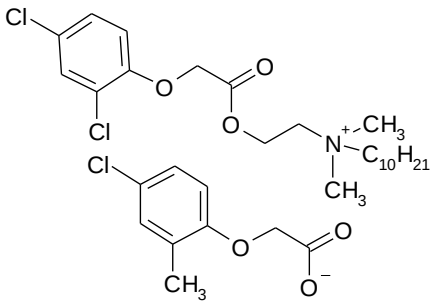


Fig. S33 ^{1}H NMR spectrum of **[2,4-D-DAE-C_{10}][MCPA].**



[2,4-D-DAE-C_{10}][MCPA] *(2,4-dichlorophenoxy)-2-acetoxyethyldecyldimethylammonium (4-chloro-2-methylphenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.92, 15.87, 21.78, 22.09, 25.80, 28.52, 28.67, 28.84, 28.91, 31.28, 50.75, 54.87, 64.09, 64.65, 66.38, 67.03, 112.78, 114.86, 121.95, 123.47, 123.81, 126.07, 127.65, 128.14, 128.98, 129.70, 153.13, 155.40, 169.79, 170.47.

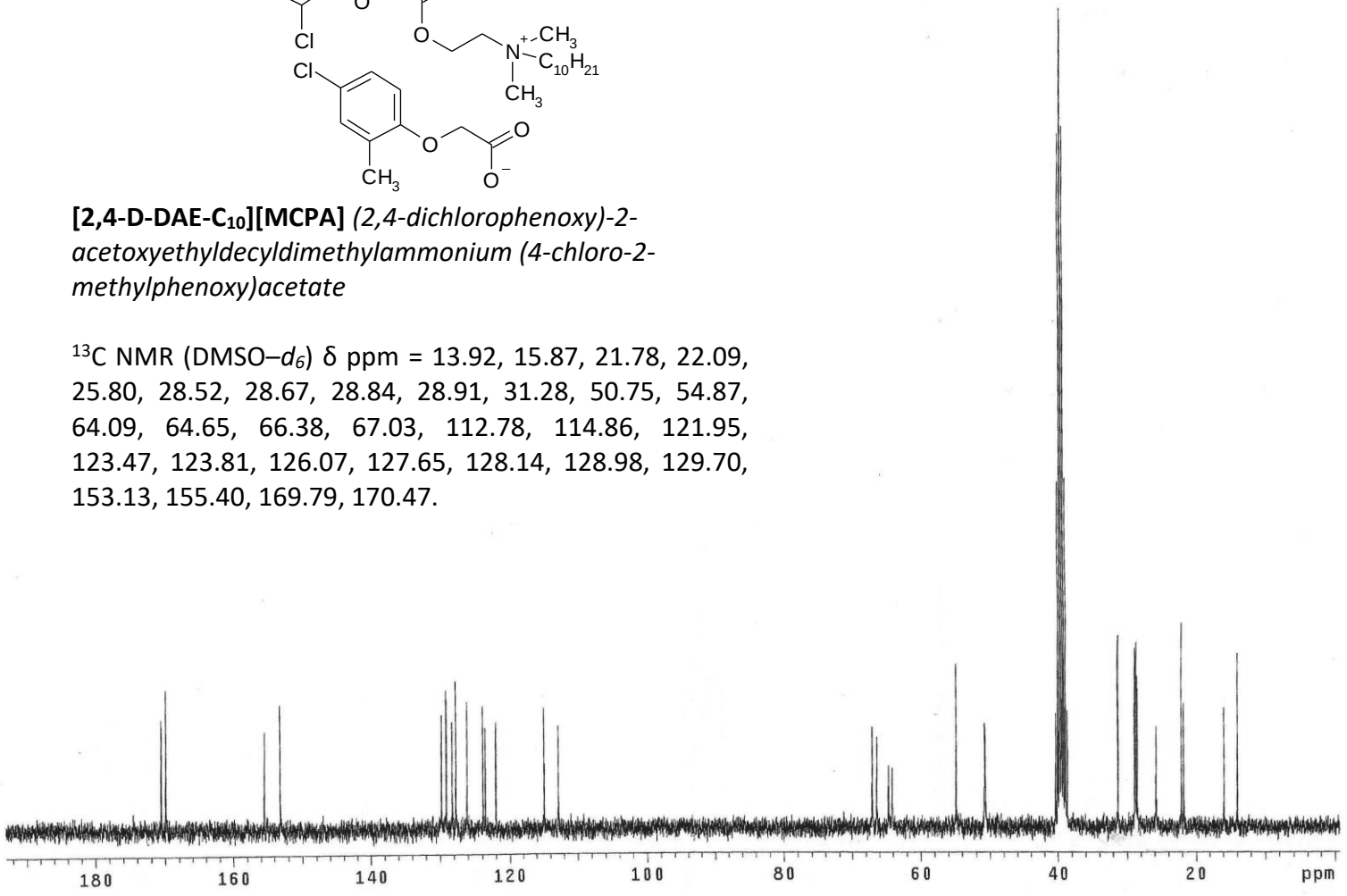
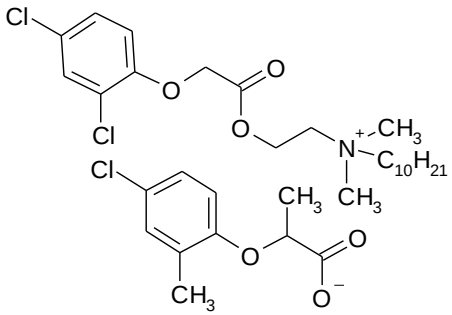


Fig. S34 ^{13}C NMR spectrum of **[2,4-D-DAE-C_{10}][MCPA].**



[2,4-D-DAE-C_{10}][MCPP] *(2,4-dichlorophenoxy)-2-acetoxyethyldecyldimethylammonium (±)-2-(4-chloro-2-methylphenoxy)propionate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.46 (d, *J*=6.8 Hz; 3H), 1.65 (q, *J*=5.7 Hz, 2H), 2.16 (s, 3H), 3.05 (s, 6H); 3.30 (t, *J*=8.4 Hz, 2H), 3.38 (t, *J*=5.0 Hz, 2H), 3.82 (t, *J*=2.3 Hz, 2H), 4.53 (s, 2H), 4.62 (quart, *J*=6.8 Hz, 1H), 6.73 (d, *J*=8,8 Hz, 1H), 6.92 (d, *J*=8.8 Hz, 1H), 7.09 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.17 (d, *J*=2.7 Hz, 1H), 7.28 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=9.0 Hz, 1H), 7.50 (d, *J*=2.6 Hz, 1H).

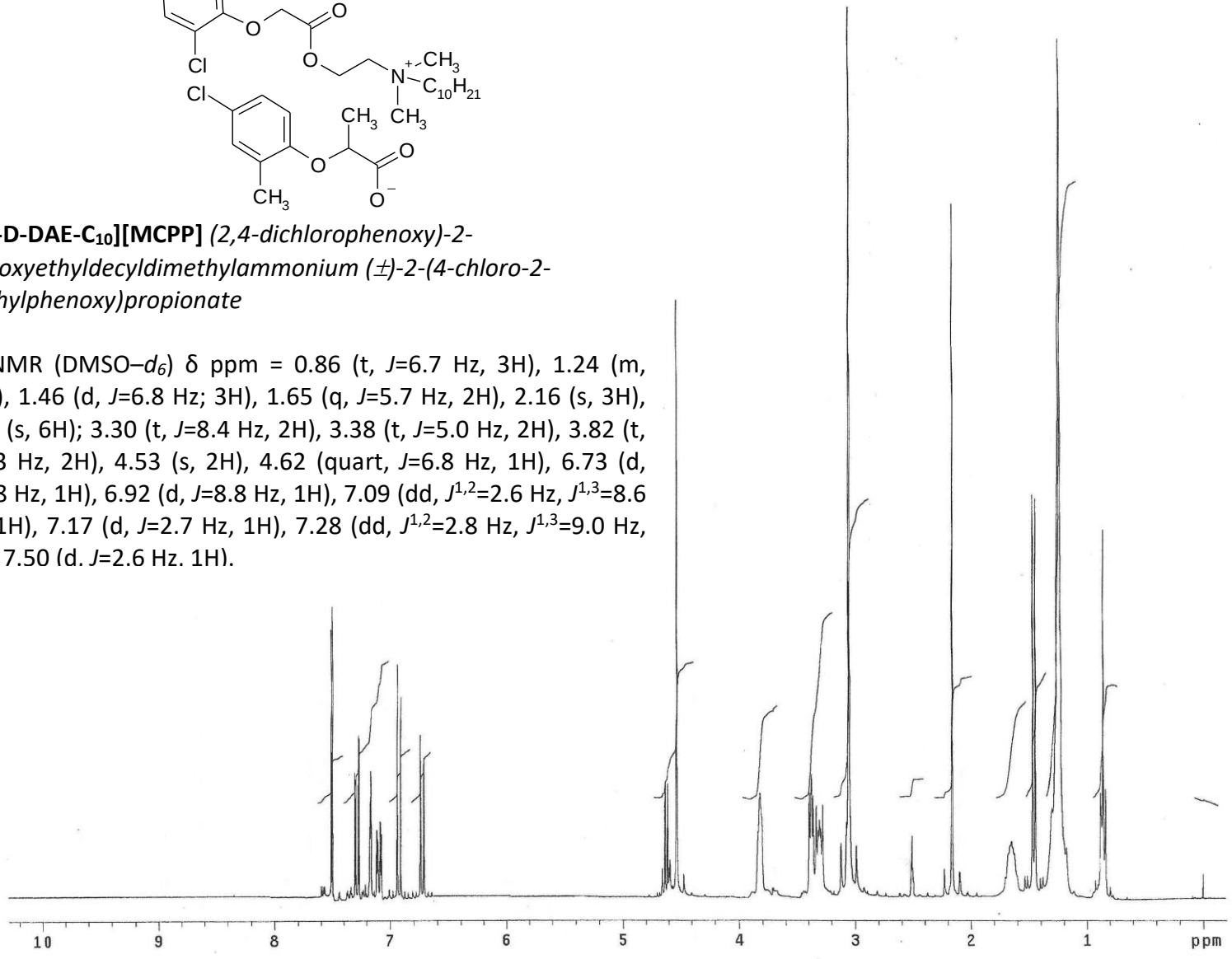


Fig. S35 ^{1}H NMR spectrum of **[2,4-D-DAE-C_{10}][MCPP].**

[2,4-D-DAE-C_{10}][MCPP] *(2,4-dichlorophenoxy)-2-acetoxyethyldecyldimethylammonium (±)-2-(4-chloro-2-methylphenoxy)propionate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.92, 15.87, 18.62, 21.78, 22.09, 25.80, 28.52, 28.68, 28.84, 28.91, 31.28, 50.74, 54.88, 64.09, 64.63, 66.98, 73.34, 113.25, 114.85, 121.95, 123.43, 123.83, 126.04, 127.65, 128.31, 128.99, 129.72, 153.12, 155.08, 169.77, 173.58.

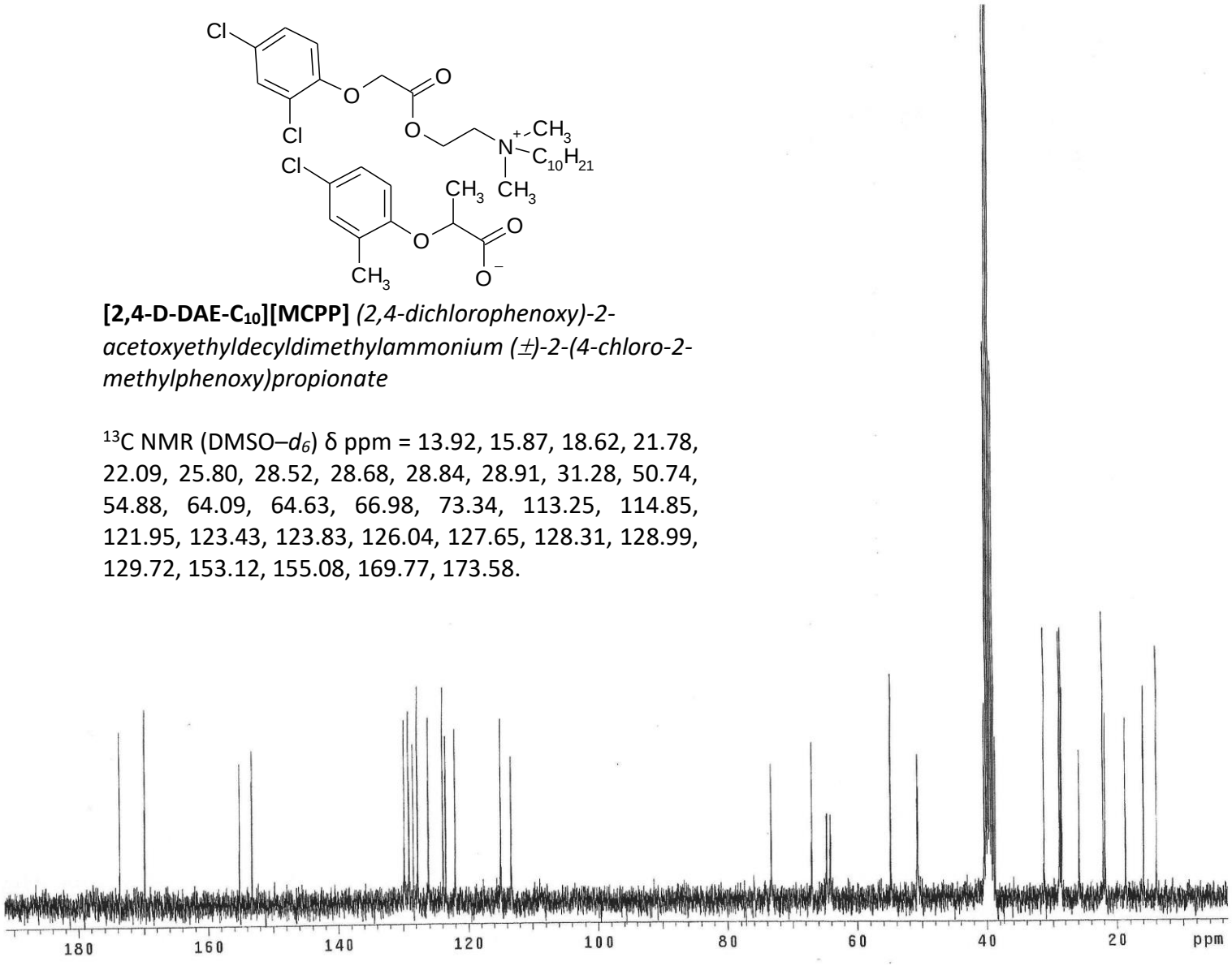


Fig. S36 ^{13}C NMR spectrum of **[2,4-D-DAE-C_{10}][MCPP].**

[2,4-D-DAE-C_{10}][4-CPA] *(2,4-dichlorophenoxy)-2-acetoxyethyldecyldimethylammonium (4-chlorophenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.3 Hz; 2H), 3.06 (s, 6H), 3.31 (t, *J*=8.4 Hz, 2H), 3.38 (t, *J*=5.0 Hz, 2H), 3.83 (t, *J*=2.3 Hz, 2H), 4.49 (s, 2H), 4.58 (s, 2H), 6.88 (d, *J*=9.1 Hz, 2H), 6.95 (d, *J*=8.8 Hz, 1H), 7.29 (d, *J*=9.1 Hz, 2H), 7.30 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.52 (d, *J*=2.8 Hz, 1H).

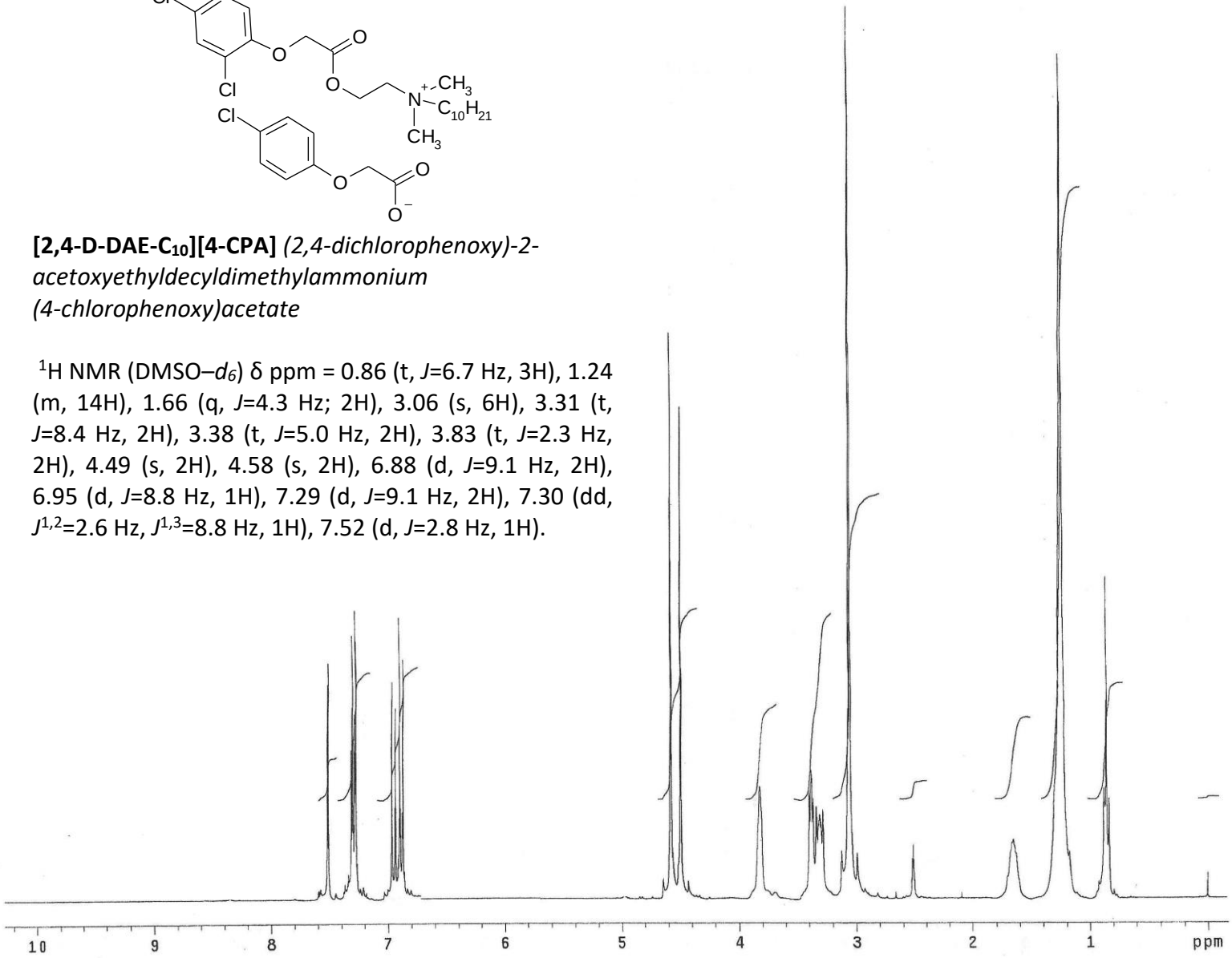
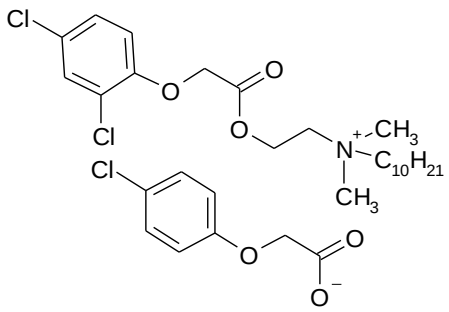


Fig. S37 ^{1}H NMR spectrum of **[2,4-D-DAE-C_{10}][4-CPA].**



[2,4-D-DAE-C_{10}][4-CPA] *(2,4-dichlorophenoxy)-2-acetoxyethyl-decyldimethylammonium (4-chlorophenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.92, 21.78, 22.09, 25.79, 28.51, 28.66, 28.83, 28.90, 31.28, 50.75, 54.88, 64.10, 64.63, 65.92, 66.75, 114.85, 116.14, 121.99, 123.96, 127.68, 128.97, 153.02, 157.15, 169.80, 170.31.

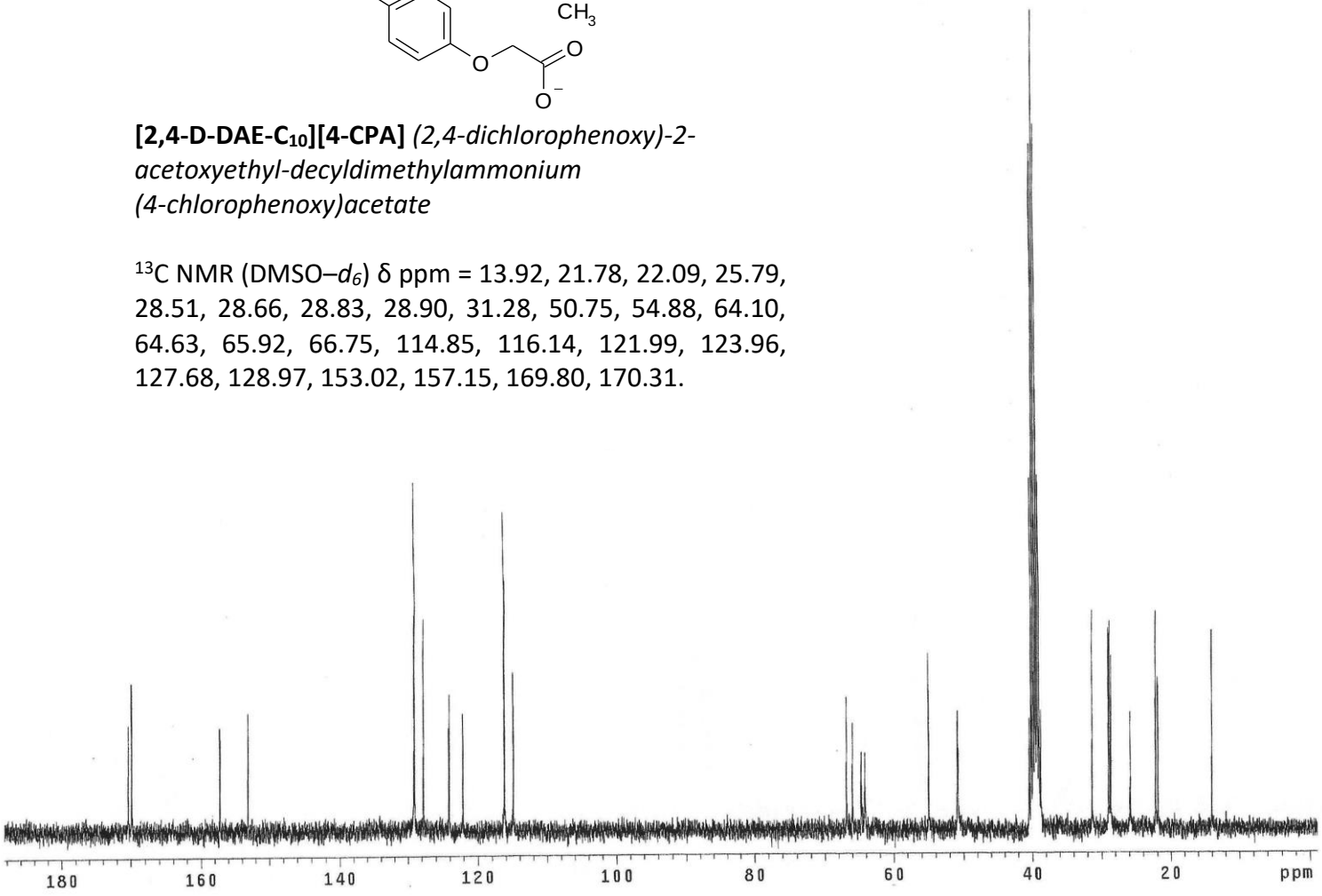
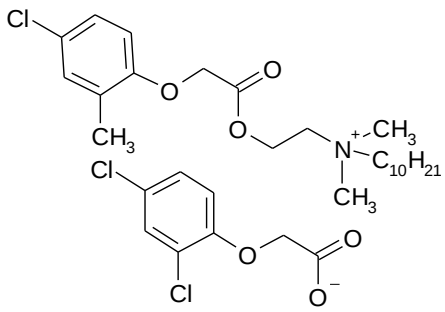


Fig. S38 ^{13}C NMR spectrum of **[2,4-D-DAE-C_{10}][4-CPA].**



[MCPA-DAE-C_{10}][2,4-D] *(4-chloro-2-methylphenoxy)-2-acetoxy-ethyldecyldimethylammonium (2,4-dichlorophenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1,64 (q, *J*=5.7 Hz, 2H), 2.17 (s, 3H), 3.05 (s, 6H), 3.30 (t, *J*=8.4 Hz, 2H), 3.38 (t, *J*=5.0 Hz, 2H), 3.83 (t, *J*=2.3 Hz, 2H), 4.51 (s, 2H), 4.55 (s, 2H), 6.75 (d, *J*=8.8 Hz, 1H), 6.94 (d, *J*=8.8 Hz, 1H), 7.12 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.3 Hz, 1H), 7.18 (d, *J*=2.7 Hz, 1H), 7.29 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=9.0 Hz, 1H), 7.50 (d, *J*=2.6 Hz, 1H).

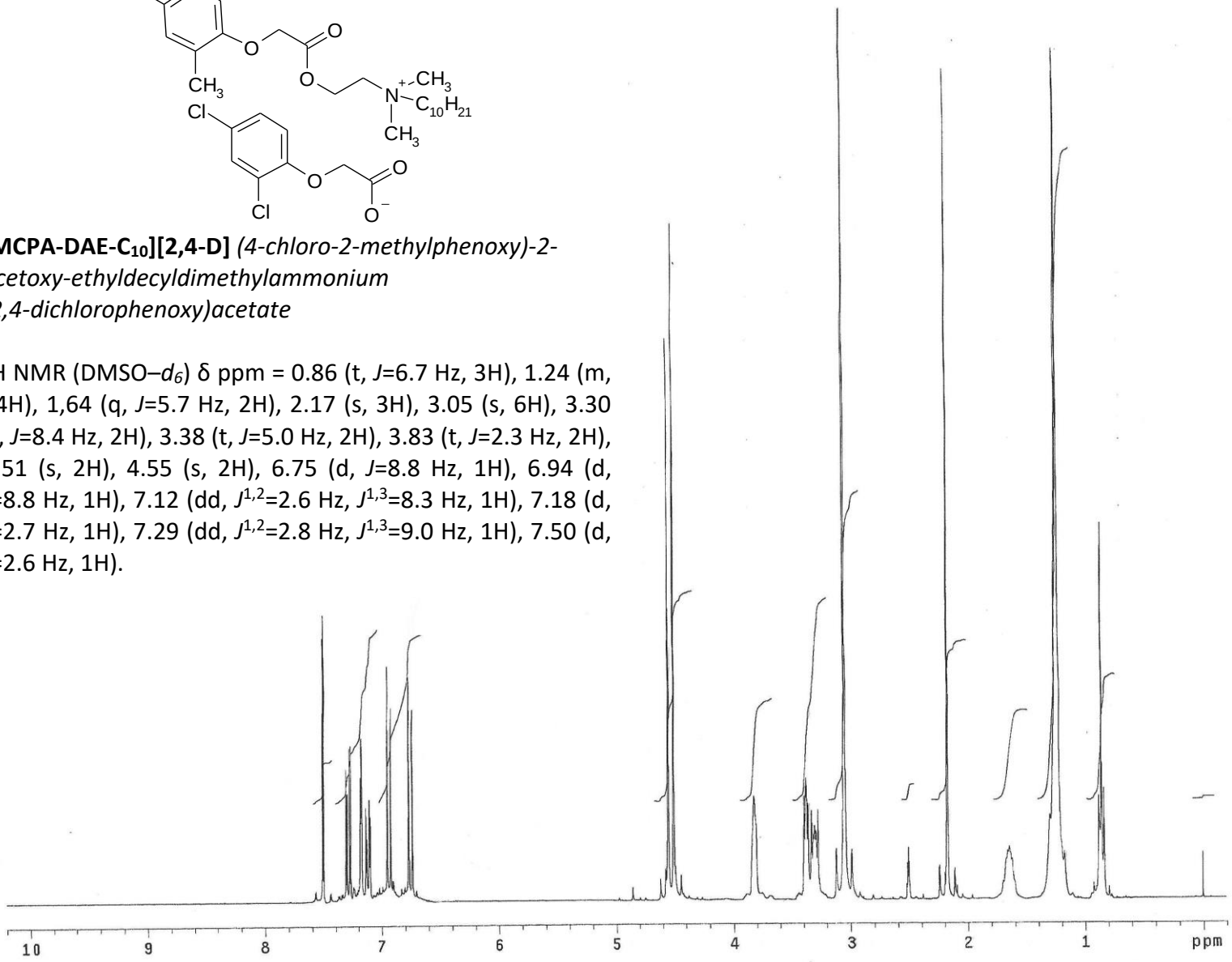


Fig. S39 ^{1}H NMR spectrum of **[MCPA-DAE-C_{10}][2,4-D].**

[MCPA-DAE-C_{10}][2,4-D] *(4-chloro-2-methylphenoxy)-2-acetoxy-ethyldecyldimethylammonium (2,4-dichlorophenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.91, 15.87, 21.78, 22.09, 25.80, 28.53, 28.68, 28.84, 28.91, 31.28, 50.74, 54.89, 64.11, 64.64, 66.29, 66.93, 112.78, 114.85, 121.97, 123.52, 123.88, 126.07, 127.66, 128.16, 129.00, 129.71, 153.09, 155.36, 169.83, 170.48.

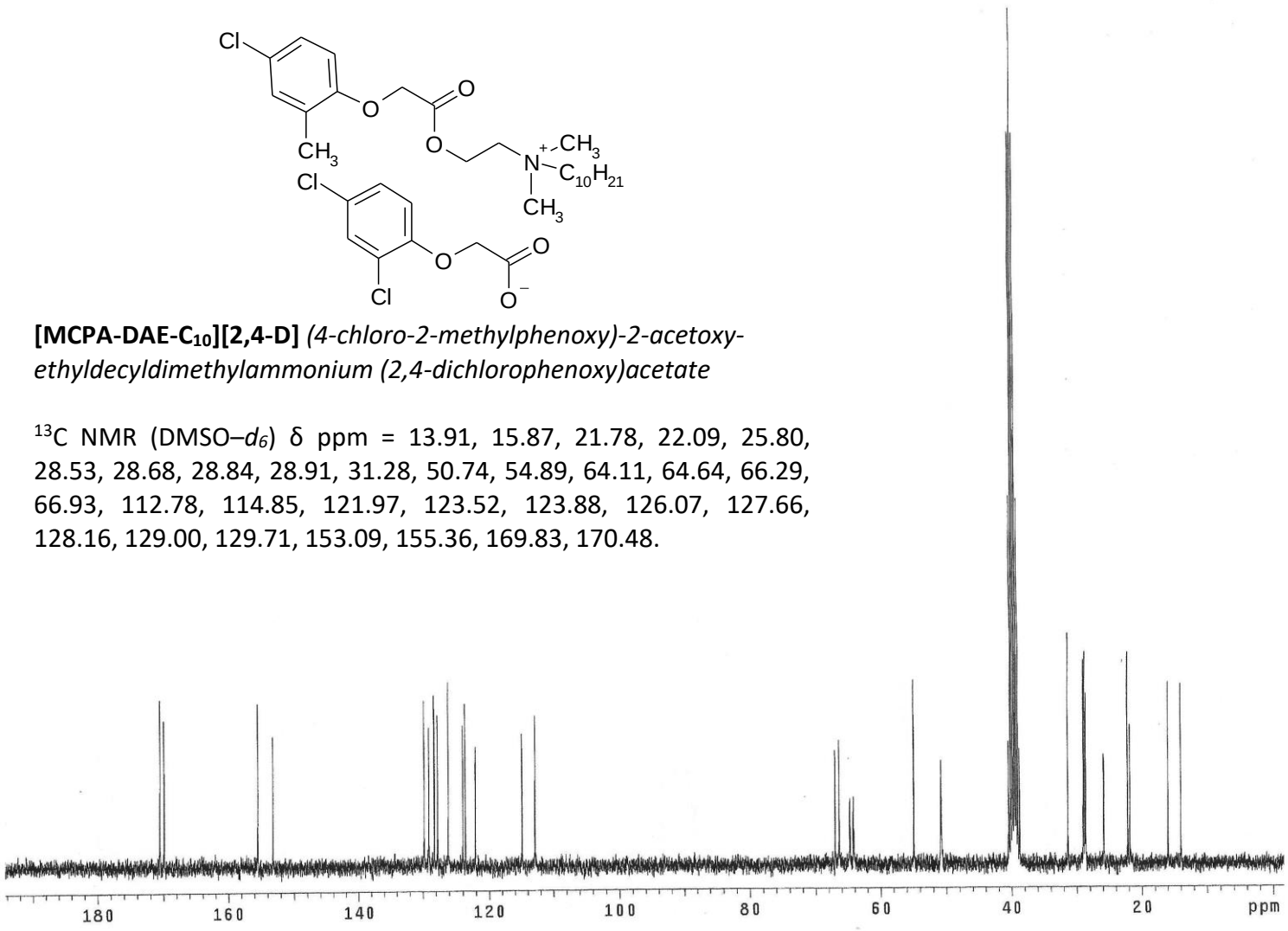
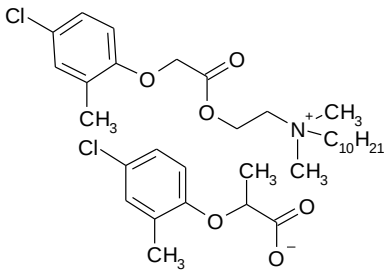


Fig. S40 ^{13}C NMR spectrum of **[MCPA-DAE-C_{10}][2,4-D].**



[MCPA-DAE-C_{10}][MCPP] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (±)-2-(4-chloro-2-methylphenoxy)propionate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.9 Hz, 3H), 1.25 (m, 14H), 1.44 (d, *J*=6.8 Hz, 3H), 1.65 (q, *J*=4.8 Hz, 2H), 2.15 (s, 3H); 2.16 (s, 3H), 3.04 (s, 6H), 3.29 (t, *J*=8.5 Hz, 2H), 3.36 (t, *J*=5.1 Hz, 2H), 3.81 (t, *J*=2.3 Hz, 2H), 4.43 (s, 2H), 4.57 (quart, *J*=6.8 Hz, 1H), 6.71 (d, *J*=8.7 Hz, 1H), 6.72 (d, *J*=8.8 Hz, 1H), 7.08 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=8.2 Hz, 1H), 7,10 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.16 (d, *J*=2.8 Hz, 1H), 7.17 (d, *J*=2.8 Hz, 1H).

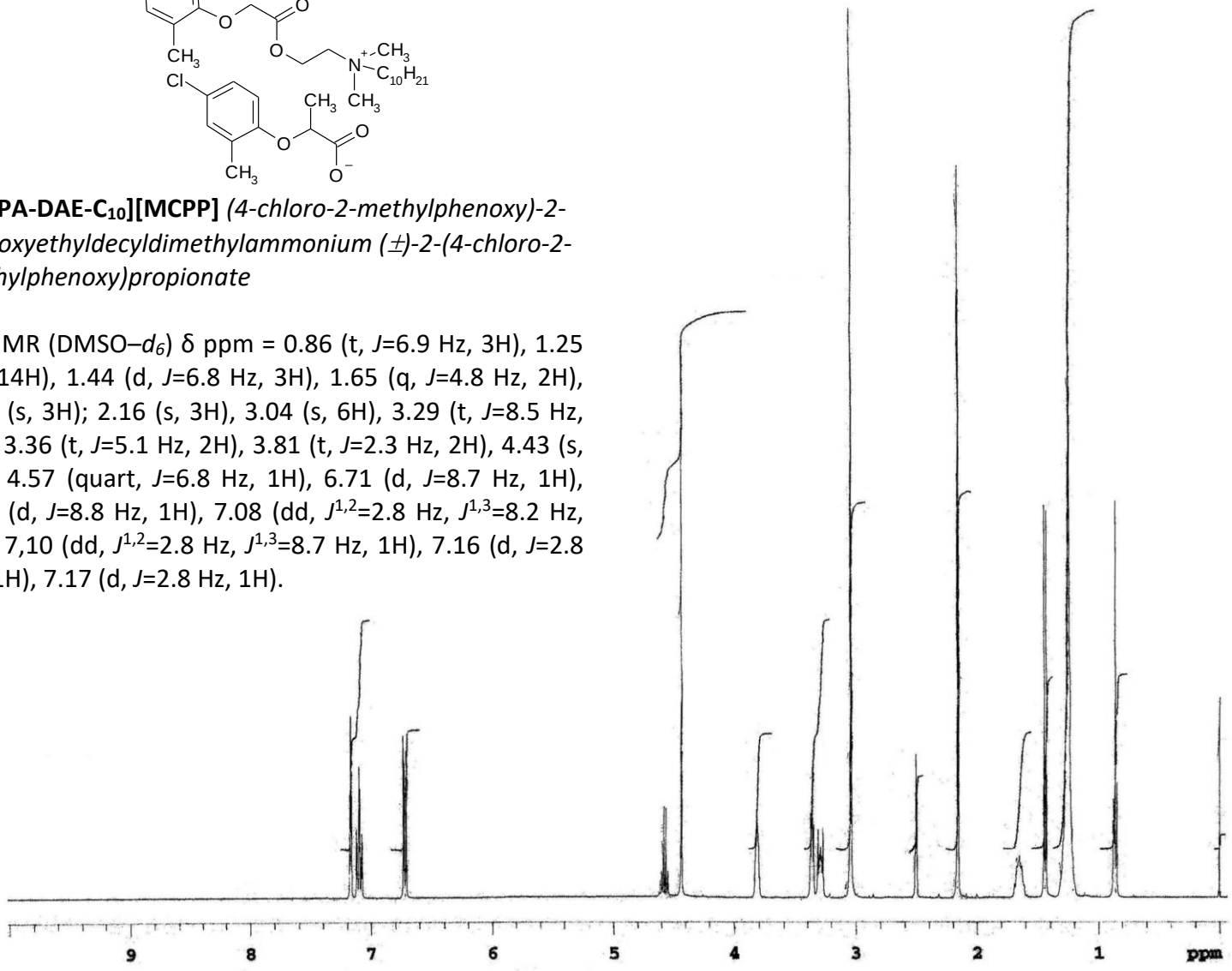


Fig. S41 ^{1}H NMR spectrum of **[MCPA-DAE-C_{10}][MCPP].**

[MCPA-DAE-C_{10}][MCPP] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (±)-2-(4-chloro-2-methylphenoxy)propionate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.96, 15.91, 15.93, 18.71, 21.77, 22.11, 25.80, 28.52, 28.68, 28.84, 28.92, 31.29, 50.76, 54.87, 64.07, 64.65, 66.55, 73.57, 112.78, 113.26, 123.28, 123.32, 126.04, 126.06, 128.10, 128.25, 129.68, 129.69, 155.19, 155.49, 170.34, 173.56.

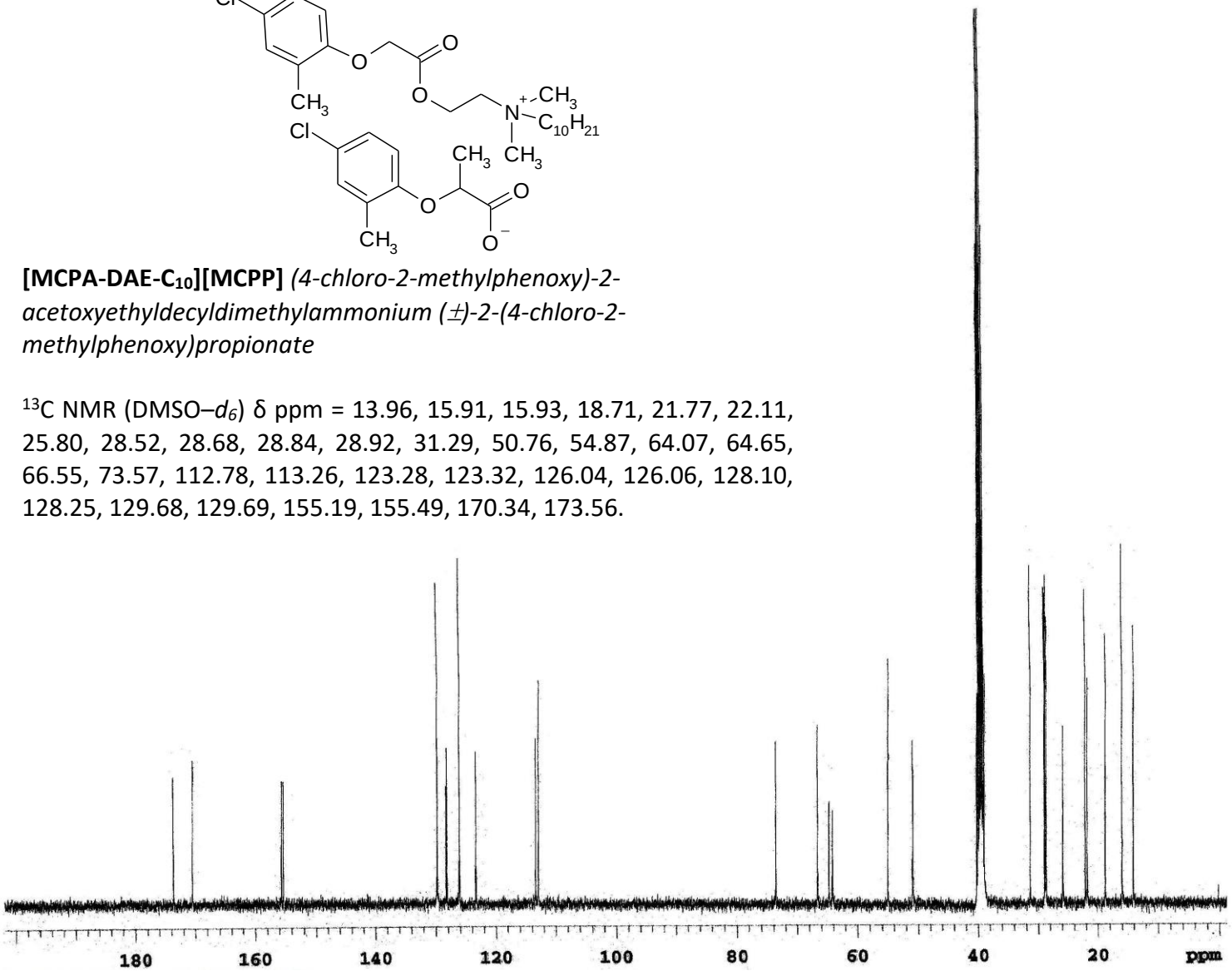
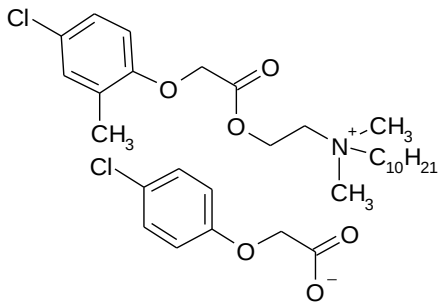


Fig. S42 ^{13}C NMR spectrum of **[MCPA-DAE-C_{10}][MCPP].**



[MCPA-DAE-C_{10}][4-CPA] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (4-chlorophenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.3 Hz, 2H), 2.17 (s, 3H), 3.05 (s, 6H), 3.30 (t, *J*=8.5 Hz, 2H), 3.38 (t, *J*=5.0 Hz, 2H), 3.82 (t, *J*=2.3 Hz, 2H), 4.45 (s, 2H), 4.49 (s, 3H), 6.75 (d, *J*=8.8 Hz, 1H), 6.87 (d, *J*=9.1 Hz, 2H), 7.11 (dd, $J^{1,2}$=2.3 Hz, $J^{1,3}$=8.3 Hz, 1H), 7.18 (d, *J*=2.7 Hz, 1H), 7.28 (d, *J*=9.1 Hz, 2H).

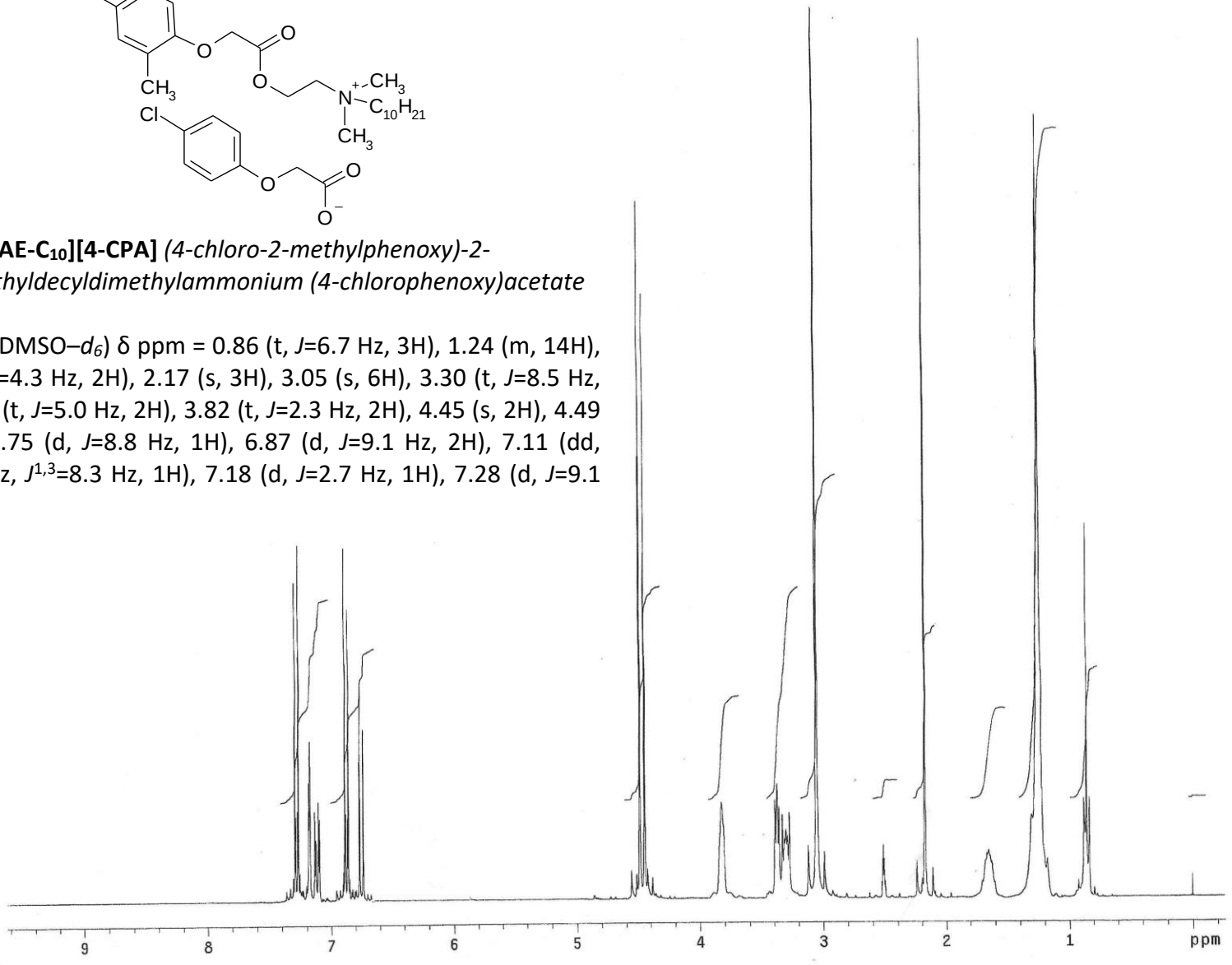


Fig. S43 ^{1}H NMR spectrum of **[MCPA-DAE-C_{10}][4-CPA].**

[MCPA-DAE-C_{10}][4-CPA] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (4-chlorophenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.92, 15.88, 21.78, 22.09, 25.80, 28.52, 28.68, 28.84, 28.91, 31.28, 50.75, 54.89, 64.11, 64.66, 66.20, 66.40, 112.78, 116.14, 123.47, 123.92, 126.07, 128.15, 128.94, 129.71, 155.41, 157.27, 170.37, 170.50.

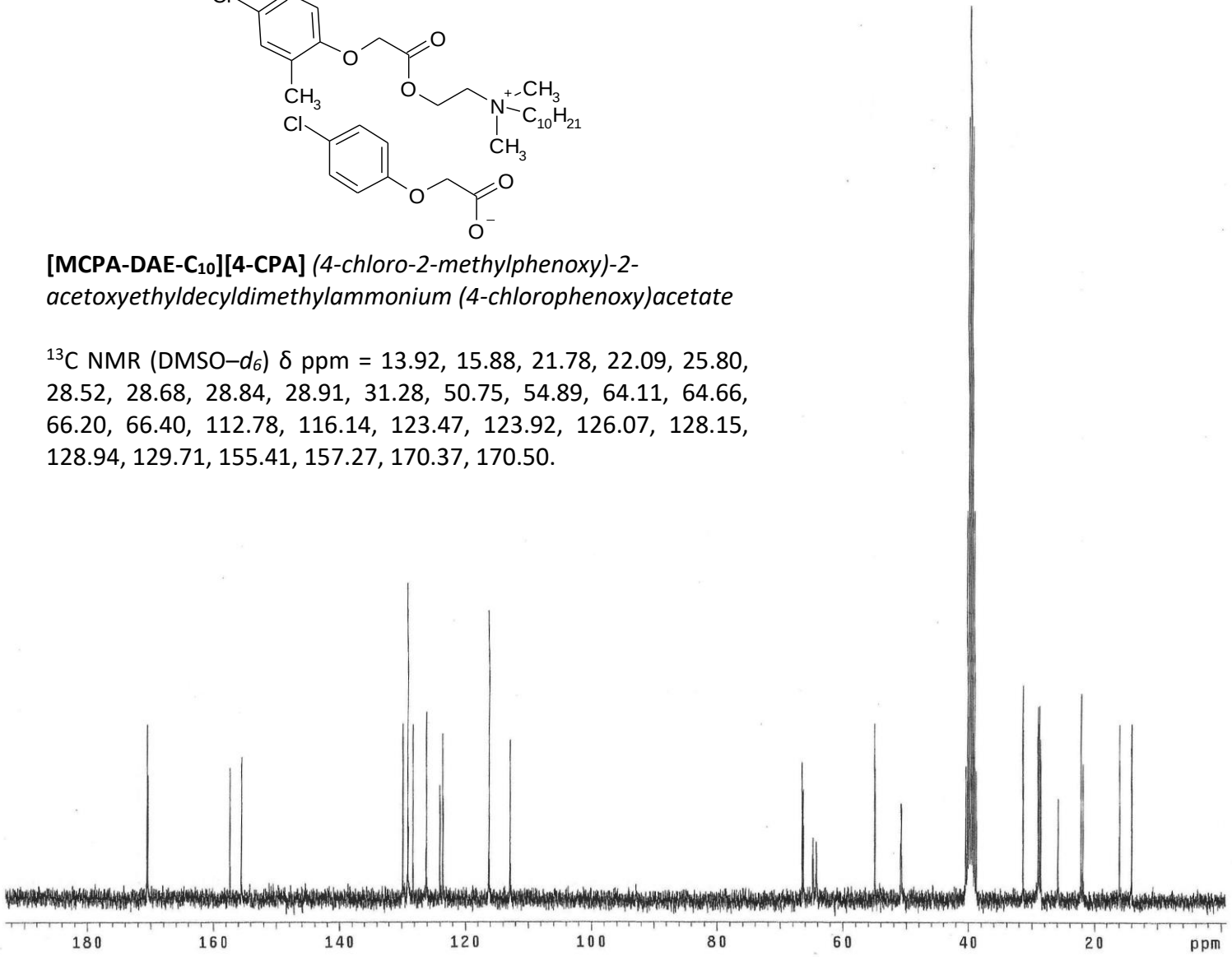
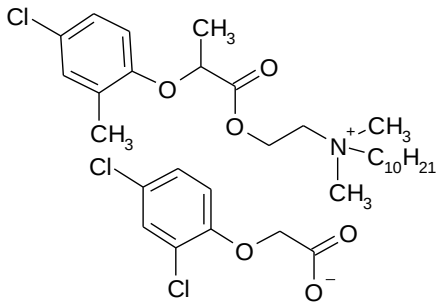


Fig. S44 ^{13}C NMR spectrum of **[MCPA-DAE-C_{10}][4-CPA].**



[MCPP-DAE-C_{10}][2,4-D] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethylammonium (2,4-dichlorophenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.46 (d, *J*=6.7 Hz, 3H), 1.65 (q, *J*=3.8 Hz, 2H), 2.16 (s, 3H), 3.05 (s, 6H); 3.30 (t, *J*=8.4 Hz, 2H), 3.37 (t, *J*=5.0 Hz, 2H), 3.82 (t, *J*=2.3 Hz, 2H), 4.53 (s, 2H), 4.62 (quart, *J*=6.8 Hz, 1H), 6.72 (d, *J*=8,8 Hz, 1H), 6.92 (d, *J*=8.8 Hz, 1H), 7.09 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.16 (d, *J*=2.7 Hz, 1H), 7.28 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=9.0 Hz, 1H), 7.50 (d, *J*=2.6 Hz, 1H).

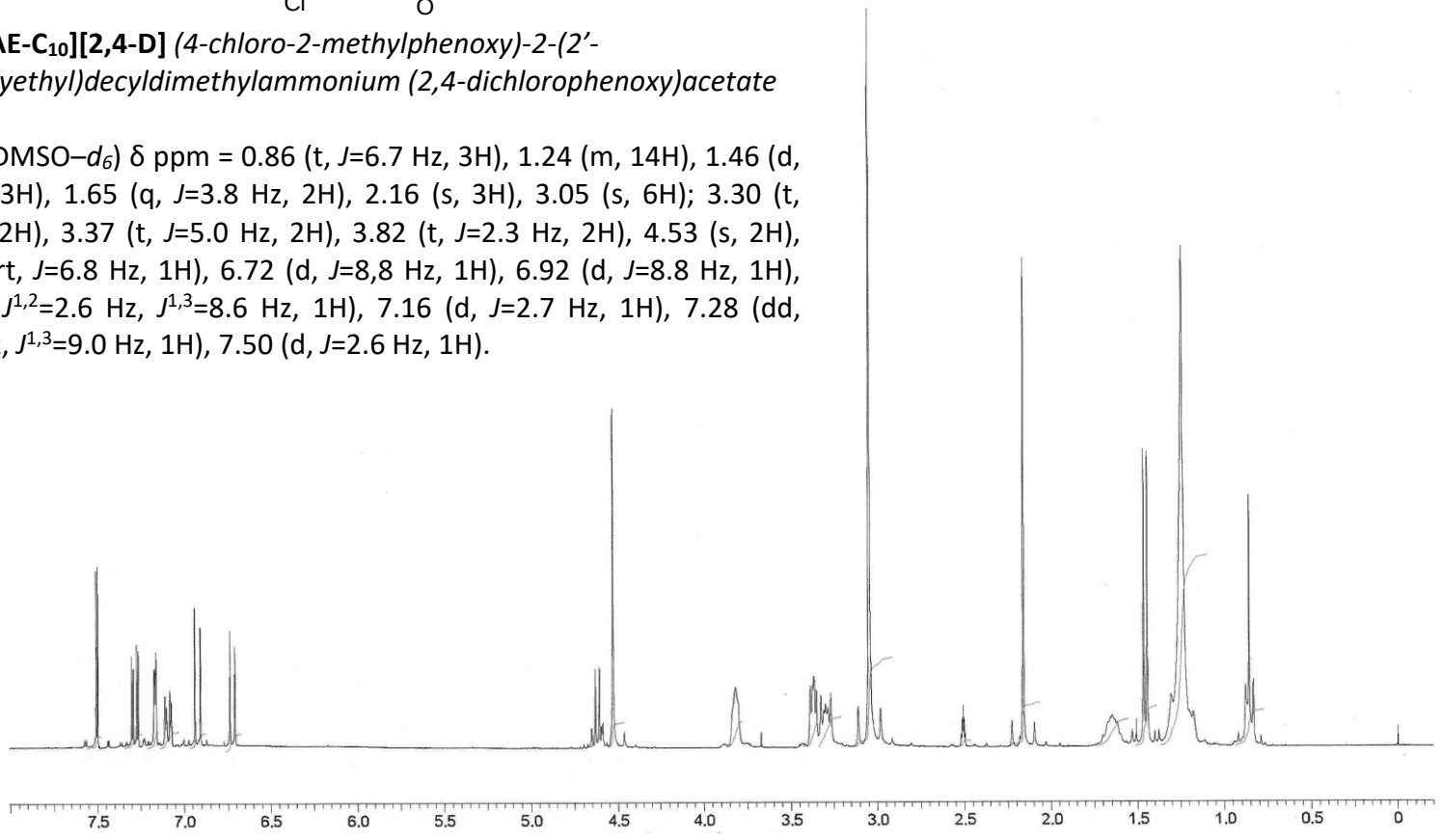
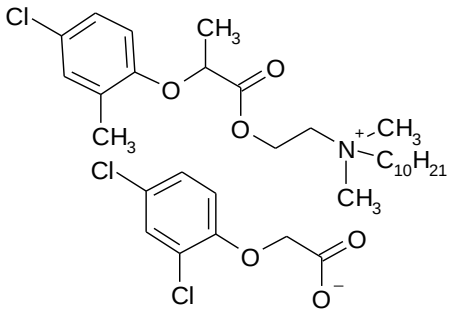


Fig. S45 ^{1}H NMR spectrum of **[MCPP-DAE-C_{10}][2,4-D].**



[MCPP-DAE-C_{10}][2,4-D] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethylammonium (2,4-dichlorophenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.91, 15.86, 18.61, 21.78, 22.09, 25.79, 28.52, 28.66, 28.83, 31.28, 50.74, 54.87, 64.10, 64.63, 66.96, 73.33, 113.26, 114.84, 121.94, 123.42, 123.83, 126.02, 127.63, 128.31, 128.98, 129.72, 153.10, 155.07, 169.76, 173.56.

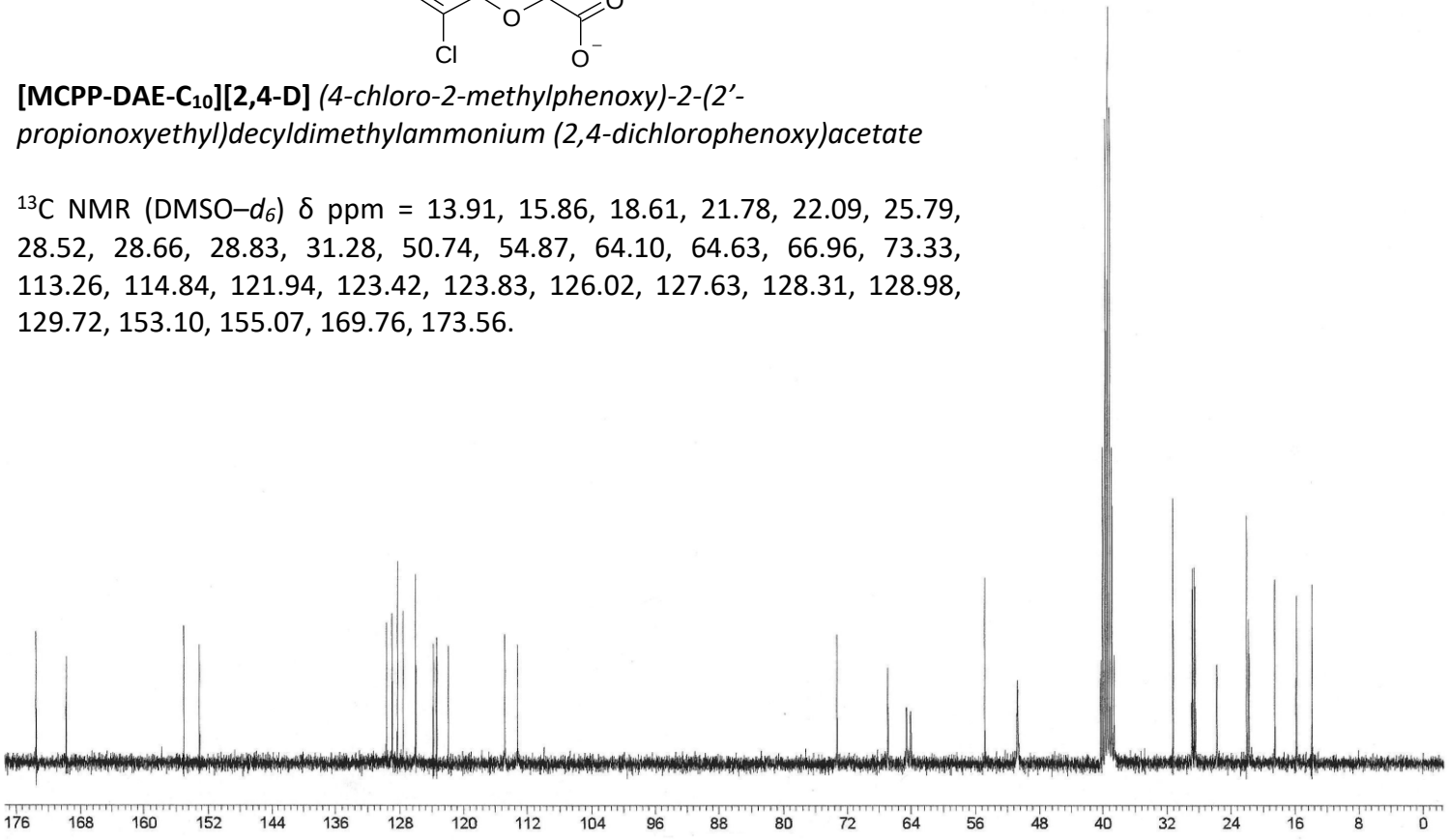
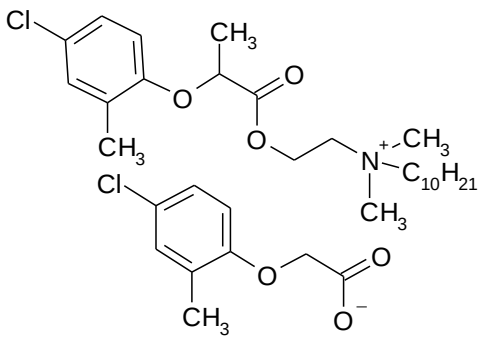


Fig. S46 ^{13}C NMR spectrum of **[MCPP-DAE-C_{10}][2,4-D].**



[MCPP-DAE-C_{10}][MCPA] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethylammonium (4-chloro-2-methylphenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.85 (t, *J*=6.9 Hz, 3H), 1.24 (m, 14H), 1.43 (d, *J*=6.8 Hz, 3H), 1.64 (q, *J*=5.1 Hz, 2H), 2.16 (s, 3H), 2.16 (s, 3H), 3.04 (s, 6H), 3.30 (t, *J*=8.5 Hz, 2H), 3.37 (t, *J*=5,1 Hz, 2H), 3.81 (t, *J*=5.1 Hz, 2H), 4.44 (s, 2H), 4,57 (quart, *J*=6.8 Hz, 1H), 6.70 (d, *J*=8.8 Hz, 1H), 6.73 (d, *J*=8.8 Hz, 1H), 7.06 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=9.2 Hz, 1H), 7.09 (dd, $J^{1,2}$=2.6 Hz, $J^{1,3}$=9.2 Hz, 1H), 7.15 (dd, $J^{1,2}$=2.8 Hz, $J^{1,3}$=9.1 Hz, 1H), 7.16 (d, *J*=3.0 Hz, 1H).

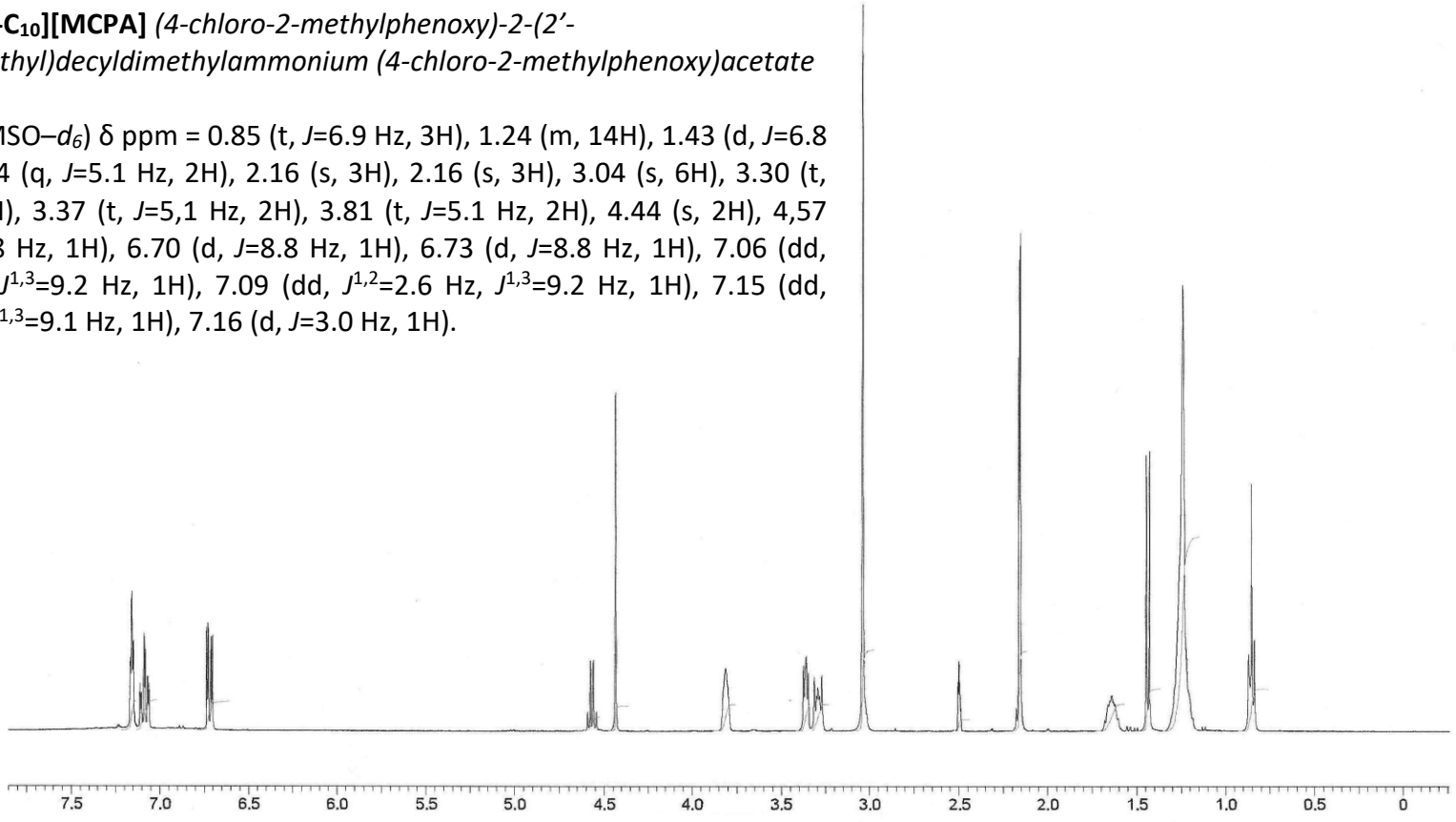
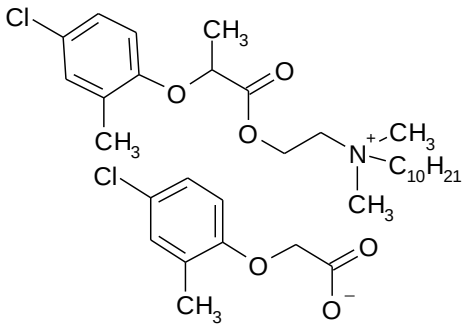


Fig. S47 ^{1}H NMR spectrum of **[MCPP-DAE-C_{10}][MCPA].**



[MCPP-DAE-C_{10}][MCPA] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethylammonium (4-chloro-2-methylphenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.90, 15.87, 15.87, 18.66, 21.75, 22.07, 25.77, 28.49, 28.64, 28.88, 28.92, 31.25, 50.71, 54.84, 64.06, 64.63, 66.52, 73.57, 112.73, 113.21, 123.26, 123.32, 126.01, 128.08, 128.09, 128.21, 129.64, 155.16, 155.45, 170.42, 173.61.

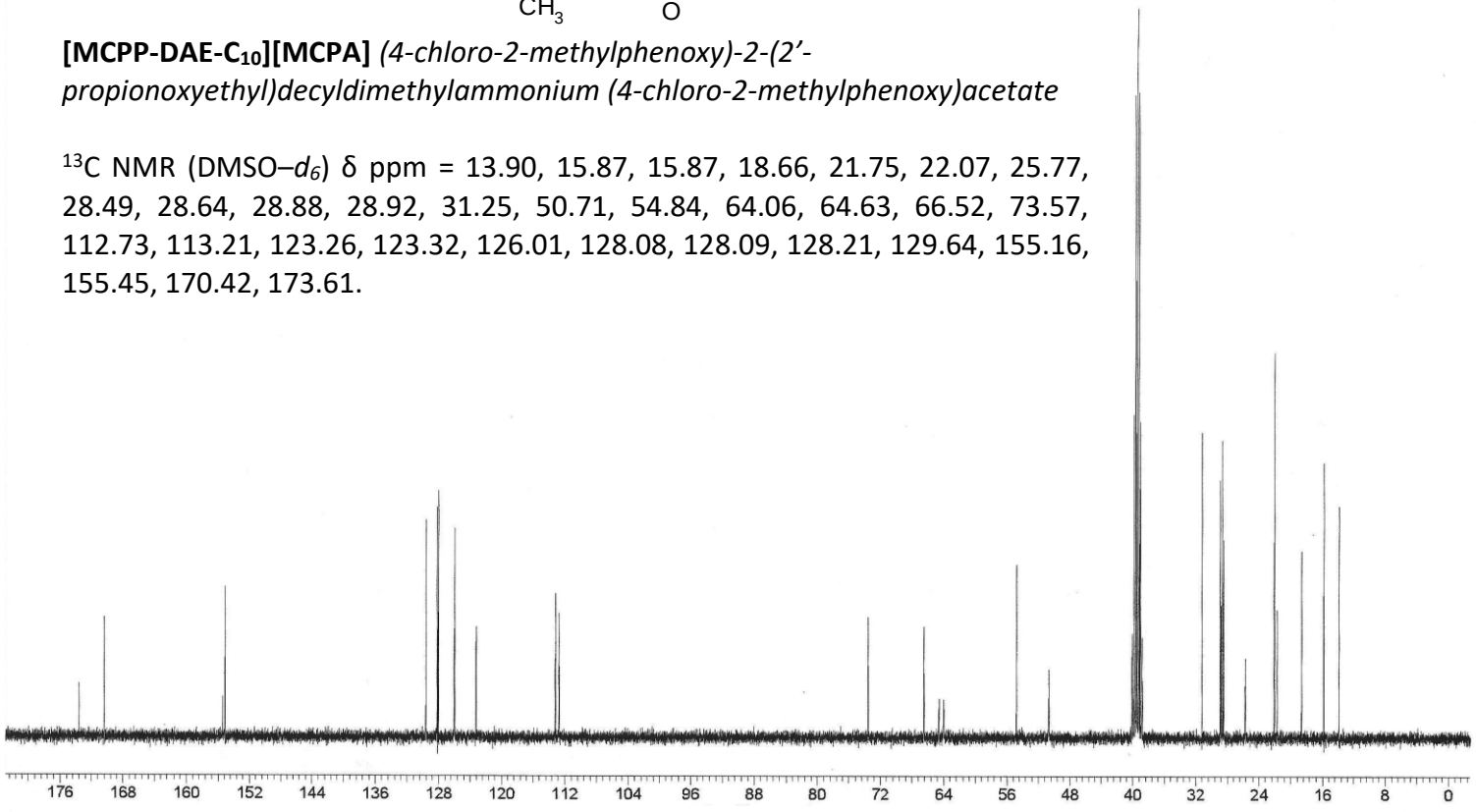
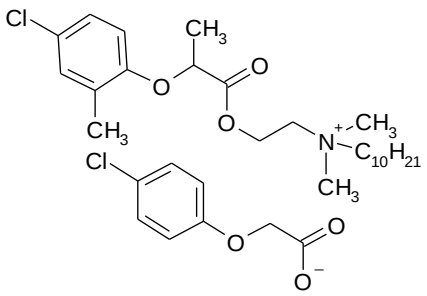


Fig. S48 ^{13}C NMR spectrum of **[MCPP-DAE-C_{10}][MCPA].**



[MCPP-DAE-C_{10}][4-CPA] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethylammonium (4-chlorophenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.9 Hz, 3H), 1.25 (m, 14H), 1.45 (d, *J*=6.6 Hz, 3H), 1.65 (q, *J*=3.9 Hz, 2H), 2.16 (s, 3H), 3.05 (s, 6H), 3,29 (t, *J*=8,5 Hz, 2H), 3.38 (t, *J*=5.1 Hz, 2H), 3.82 (t, *J*=2.3 Hz, 2H), 4.43 (s, 2H), 4.60 (quart, *J*=6.8 Hz, 1H), 6.72 (d, *J*=8.7 Hz, 1H), 6.86 (d, *J*=9.1 Hz, 2H), 7.09 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.16 (d, *J*=2.6 Hz, 1H), 7.27 (d, *J*=9.0 Hz, 1H).

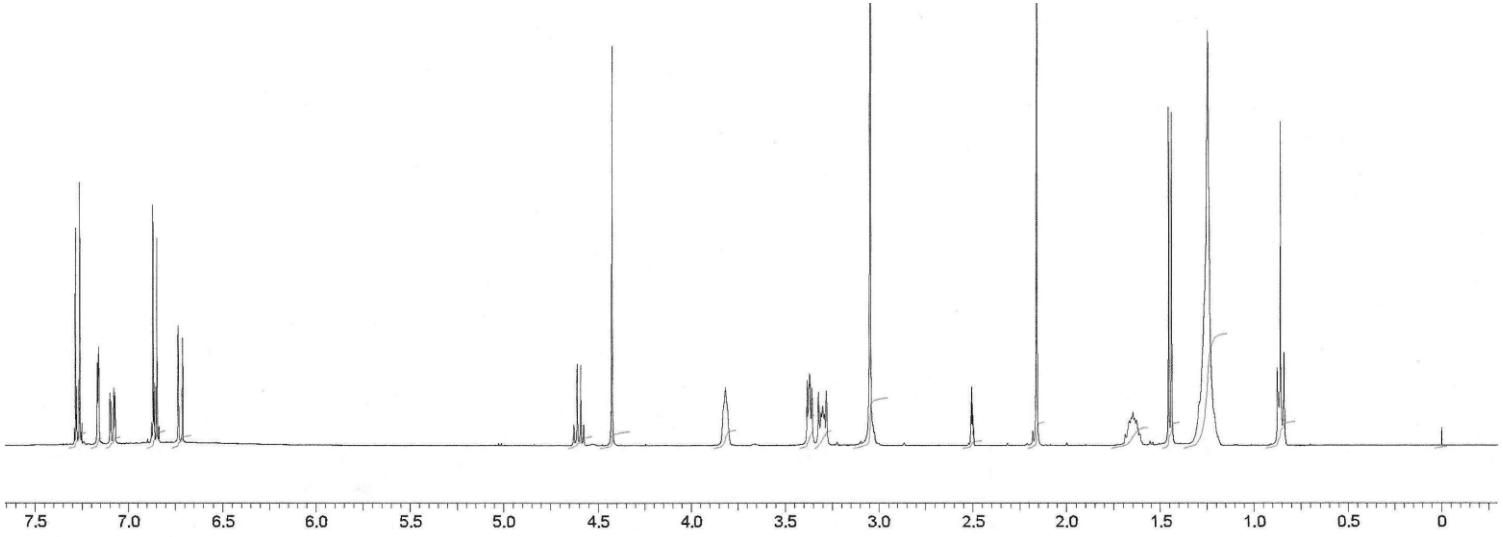
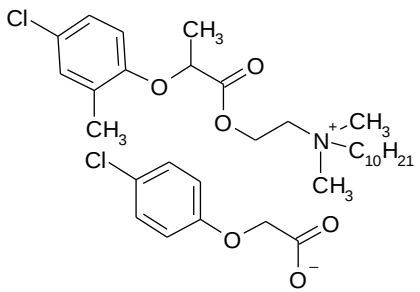


Fig. S49 ^{1}H NMR spectrum of **[MCPP-DAE-C_{10}][4-CPA].**



[MCPP-DAE-C_{10}][4-CPA] *(4-chloro-2-methylphenoxy)-2-(2'-propionoxyethyl)decyldimethylammonium (4-chlorophenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.94, 15.89, 18.65, 21.77, 22.10, 25.79, 28.52, 28.68, 28.91, 31.29, 50.74, 54.87, 64.05, 64.62, 66.19, 73.40, 113.23, 116.11, 123.36, 123.87, 126.03, 128.27, 128.93, 129.71, 155.10, 157.26, 170.29, 173.58.

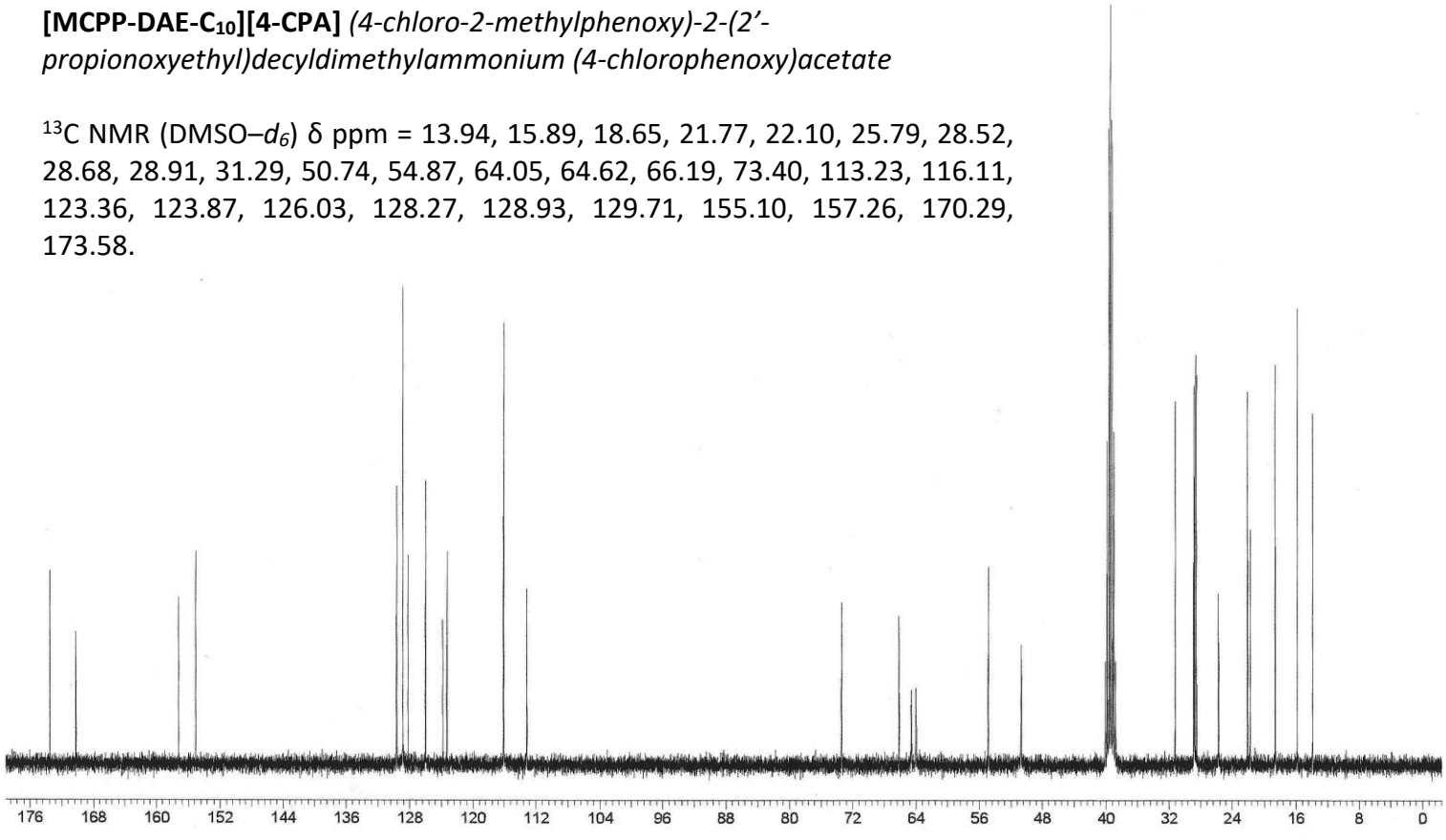
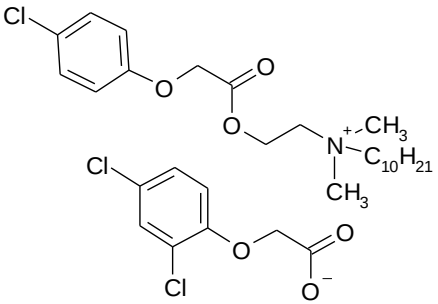


Fig. S50 ^{13}C NMR spectrum of **[MCPP-DAE-C_{10}][4-CPA].**



[4-CPA-DAE-C_{10}][2,4-D] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (2,4-dichlorophenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.9 Hz, 3H), 1.24 (m, 14H), 1.65 (q, *J*=3.8 Hz, 2H), 3.05 (s, 6H), 3.30 (t, *J*=8.5 Hz, 2H), 3.38 (t, *J*=5.1 Hz, 2H), 3.83 (t, *J*=2.3 Hz, 2H), 4.48 (s, 2H), 4.56 (s, 2H), 6.88 (d, *J*=9.1 Hz, 2H), 6.94 (d, *J*=9.0 Hz, 1H), 7.28 (d, *J*=9.1 Hz, 2H), 7.29 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.9 Hz, 1H), 7.51 (d, *J*=2.6 Hz, 1H).

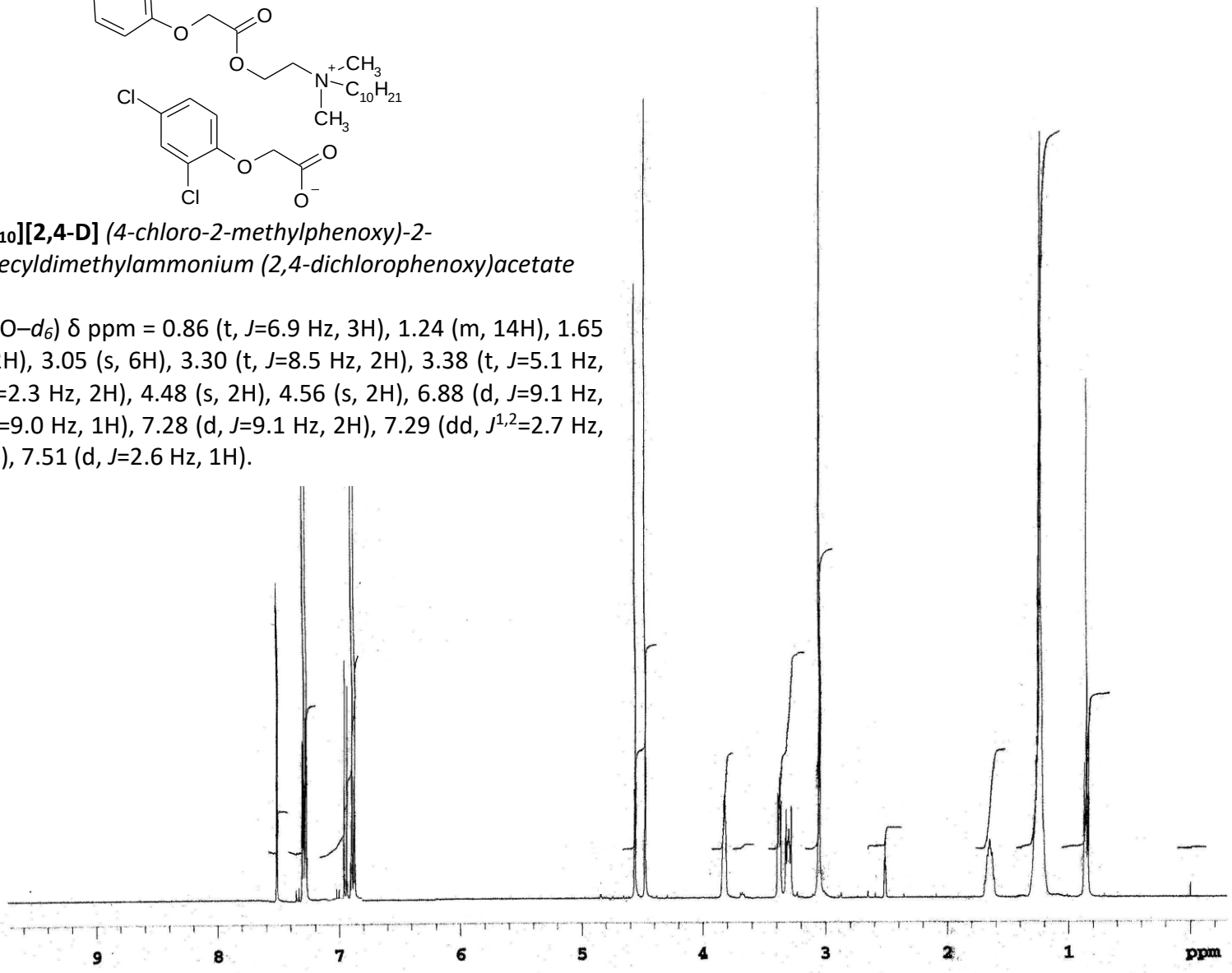
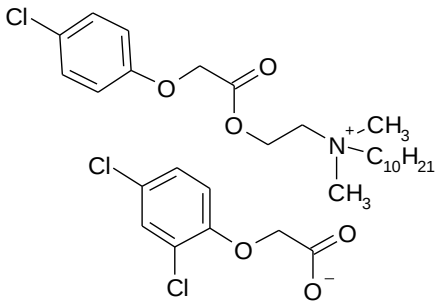


Fig. S51 ^{1}H NMR spectrum of **[4-CPA-DAE-C_{10}][2,4-D].**



[4-CPA-DAE-C_{10}][2,4-D] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (2,4-dichlorophenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.97, 21.81, 22.14, 25.83, 28.57, 28.72, 28.89, 28.95, 31.33, 50.77, 54.91, 64.10, 64.65, 66.04, 66.86, 114.85, 116.15, 121.98, 123.92, 124.02, 127.71, 128.99, 129.05, 153.07, 157.21, 169.91, 170.42.

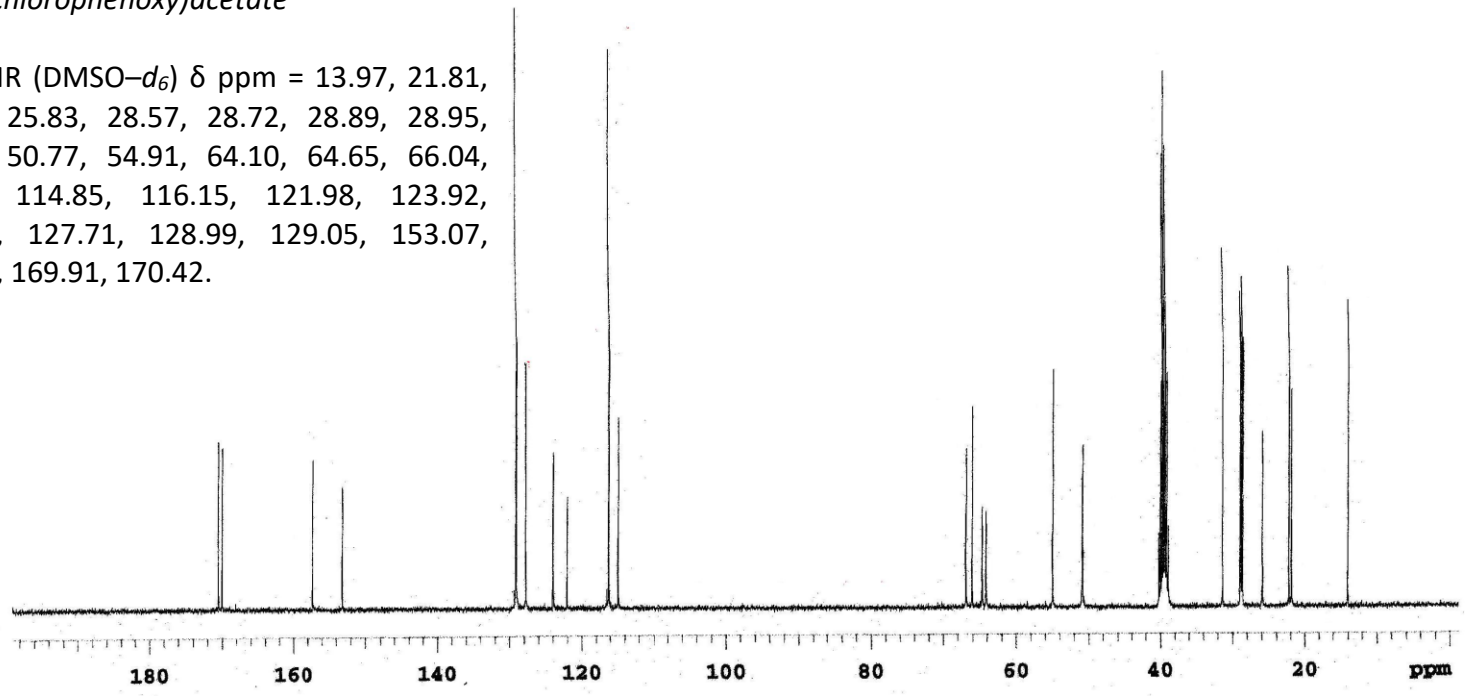


Fig. S52 ^{13}C NMR spectrum of **[4-CPA-DAE-C_{10}][2,4-D].**

[4-CPA-DAE-C_{10}][MCPA] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (4-chloro-2-methyl-phenoxy)acetate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.8 Hz, 3H), 1.24 (m, 14H), 1.65 (q, *J*=3.8 Hz, 2H), 2.17 (s, 3H), 3.05 (s, 6H), 3.30 (t, *J*=8.5 Hz, 2H), 3.37 (t, *J*=5.1 Hz, 2H), 3.82 (t, *J*=2.4 Hz, 2H), 4.44 (s, 2H), 4.48 (s,2H), 6.75 (d, *J*=8.7 Hz, 1H), 6.87 (d, *J*=9.1 Hz, 2H), 7.11 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.18 (d, *J*=2.3 Hz, 1H), 7.28 (d, *J*=9.1 Hz, 1H).

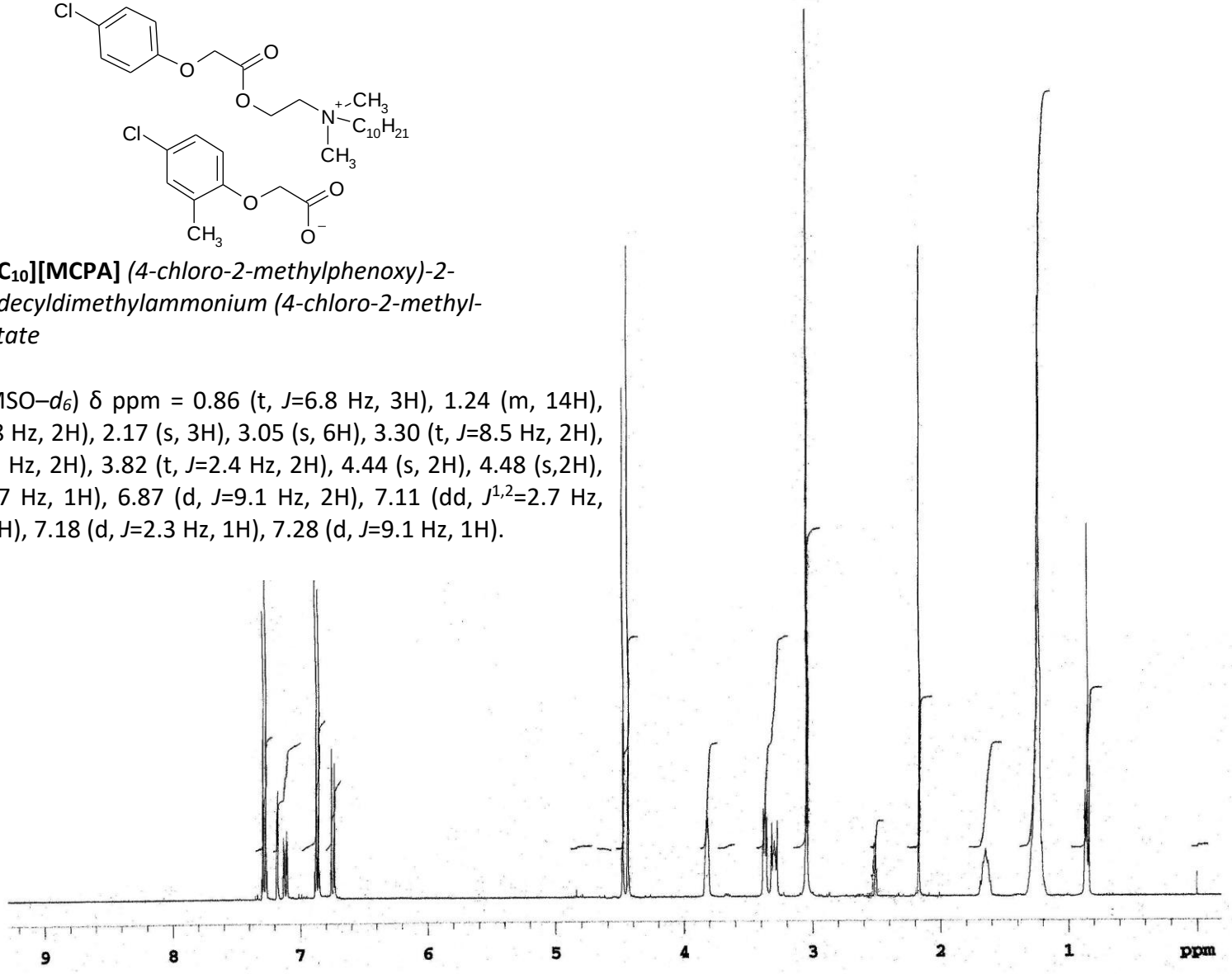
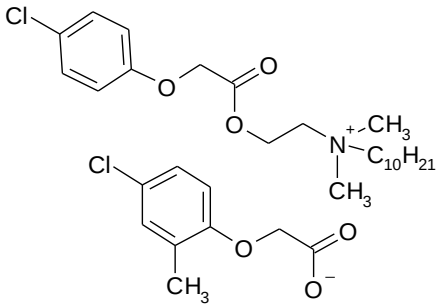


Fig. S53 ^{1}H NMR spectrum of **[4-CPA-DAE-C_{10}][MCPA].**



[4-CPA-DAE-C_{10}][MCPA] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (4-chloro-2-methyl-phenoxy)acetate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.96, 15.92, 21.80, 22.13, 25.82, 28.55, 28.71, 28.87, 28.94, 31.31, 50.76, 54.90, 64.08, 64.64, 66.19, 66.38, 112.77, 116.14, 123.46, 123.92, 126.10, 128.15, 128.96, 129.73, 155.42, 157.28, 170.40, 170.52.

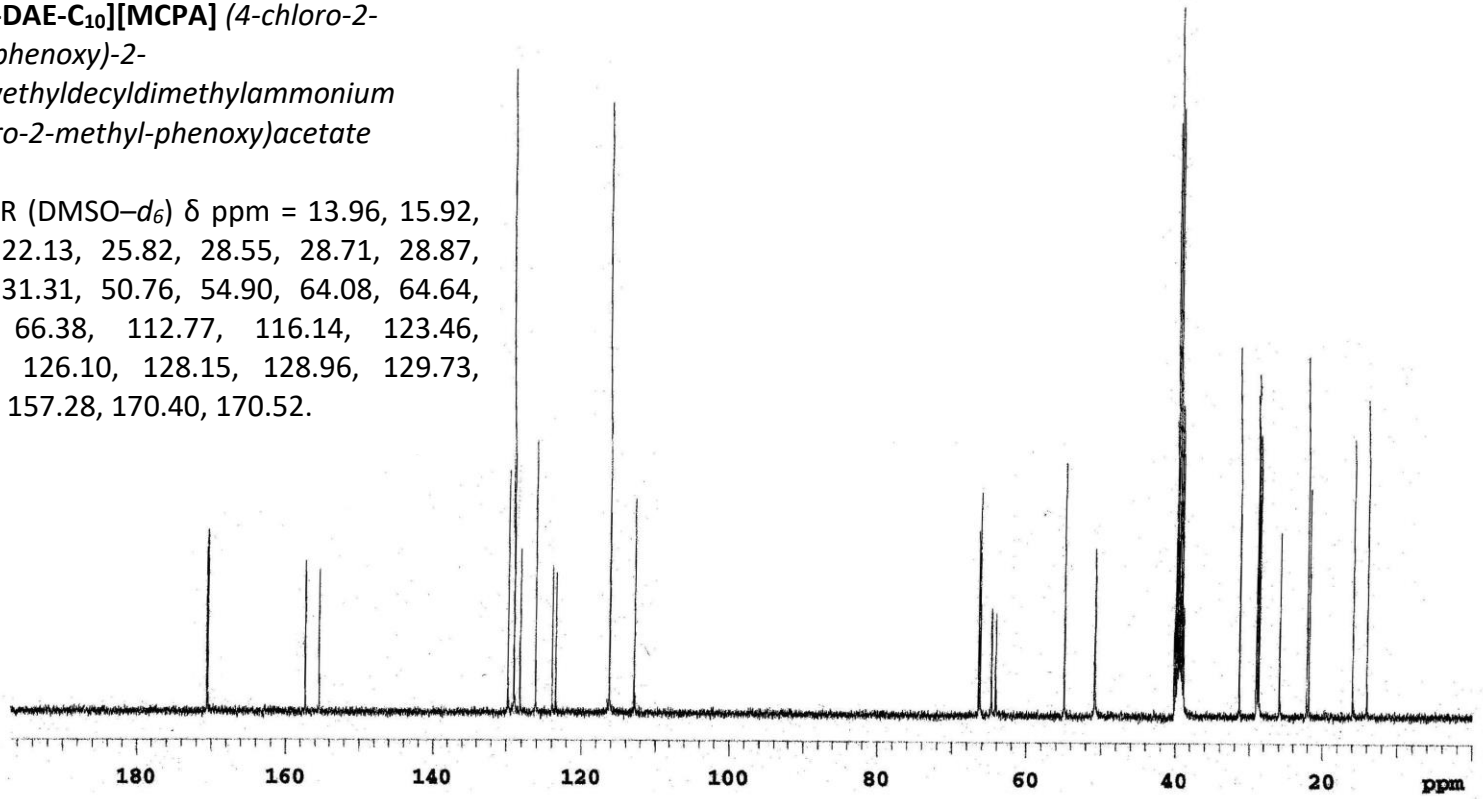


Fig. S54 ^{13}C NMR spectrum of **[4-CPA-DAE-C_{10}][MCPA].**

[4-CPA-DAE-C_{10}][MCPP] *(4-chlorophenoxy)-2-acetoxyethyl-decyldimethylammonium (±)-2-(4-chloro-2-methylphenoxy)propionate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.45 (d, *J*=6.8 Hz, 3H), 1.64 (q, *J*=3.9 Hz, 2H), 2.16 (s, 3H), 3.04 (s, 6H), 3,30 (t, *J*=8,5 Hz, 2H), 3.37 (t, *J*=3.2 Hz, 2H), 3.82 (t, *J*=2.3 Hz, 2H), 4.42 (s, 2H), 4.59 (quart, *J*=6.8 Hz, 1H), 6.72 (d, *J*=8.8 Hz, 1H), 6.86 (d, *J*=9.1 Hz, 2H), 7.09 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.6 Hz, 1H), 7.16 (d, *J*=2.7 Hz, 1H), 7.27 (d, *J*=9.1 Hz, 1H).

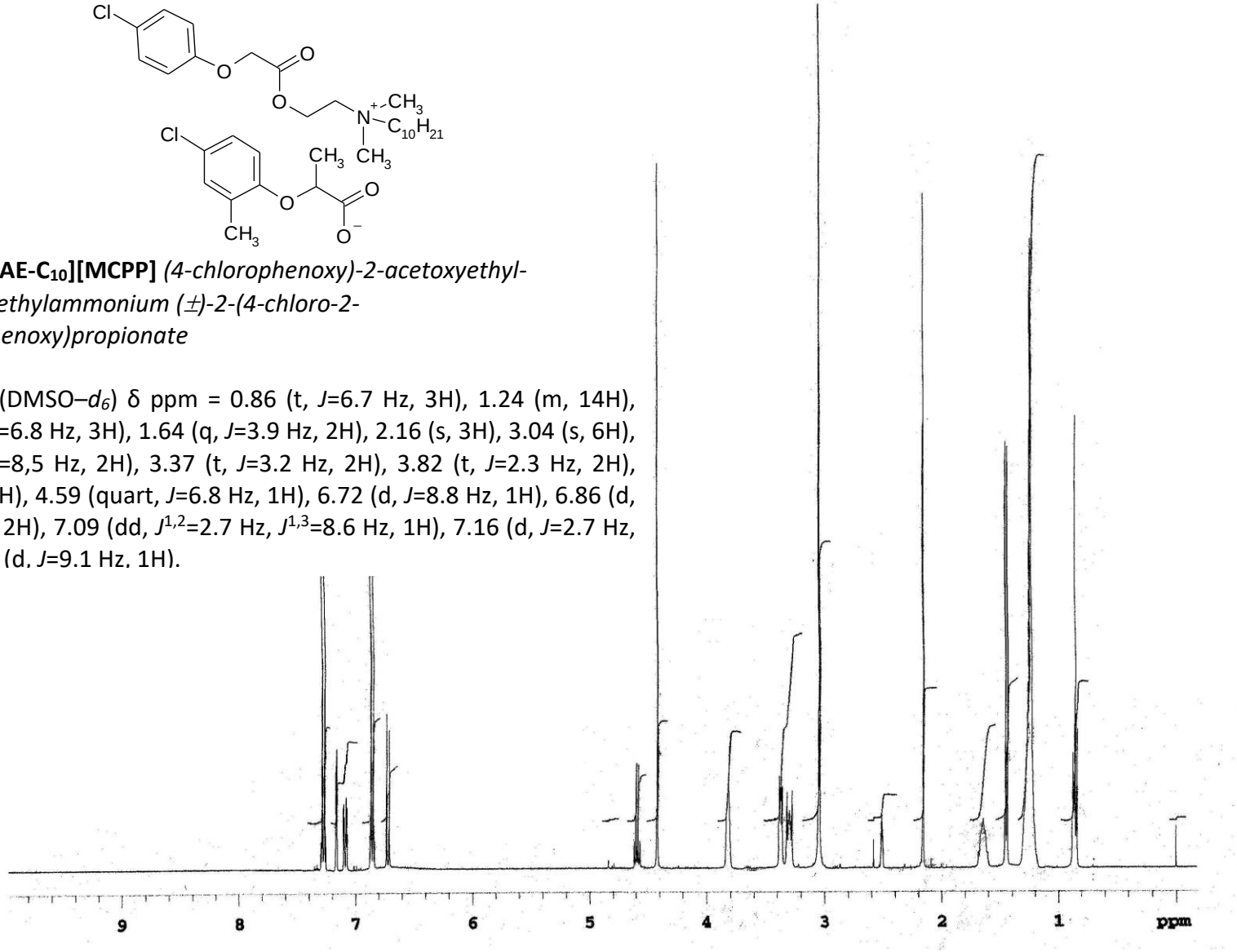
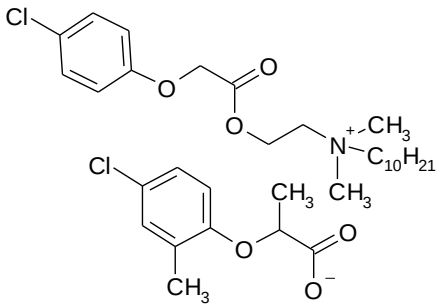


Fig. S55 ^{1}H NMR spectrum of **[4-CPA-DAE-C_{10}][MCPP].**



[4-CPA-DAE-C_{10}][MCPP] *(4-chlorophenoxy)-2-acetoxyethyl-decyldimethylammonium (±)-2-(4-chloro-2-methylphenoxy)propionate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.98, 15.93, 18.72, 21.80, 22.14, 25.87, 28.57, 28.72, 28.88, 29.95, 31.33, 50.75, 54.90, 64.07, 64.64, 66.28, 73.52, 113.22, 116.13, 123.34, 123.87, 126.06, 128.26, 128.95, 129.72, 155.18, 157.32, 170.40, 173.72.

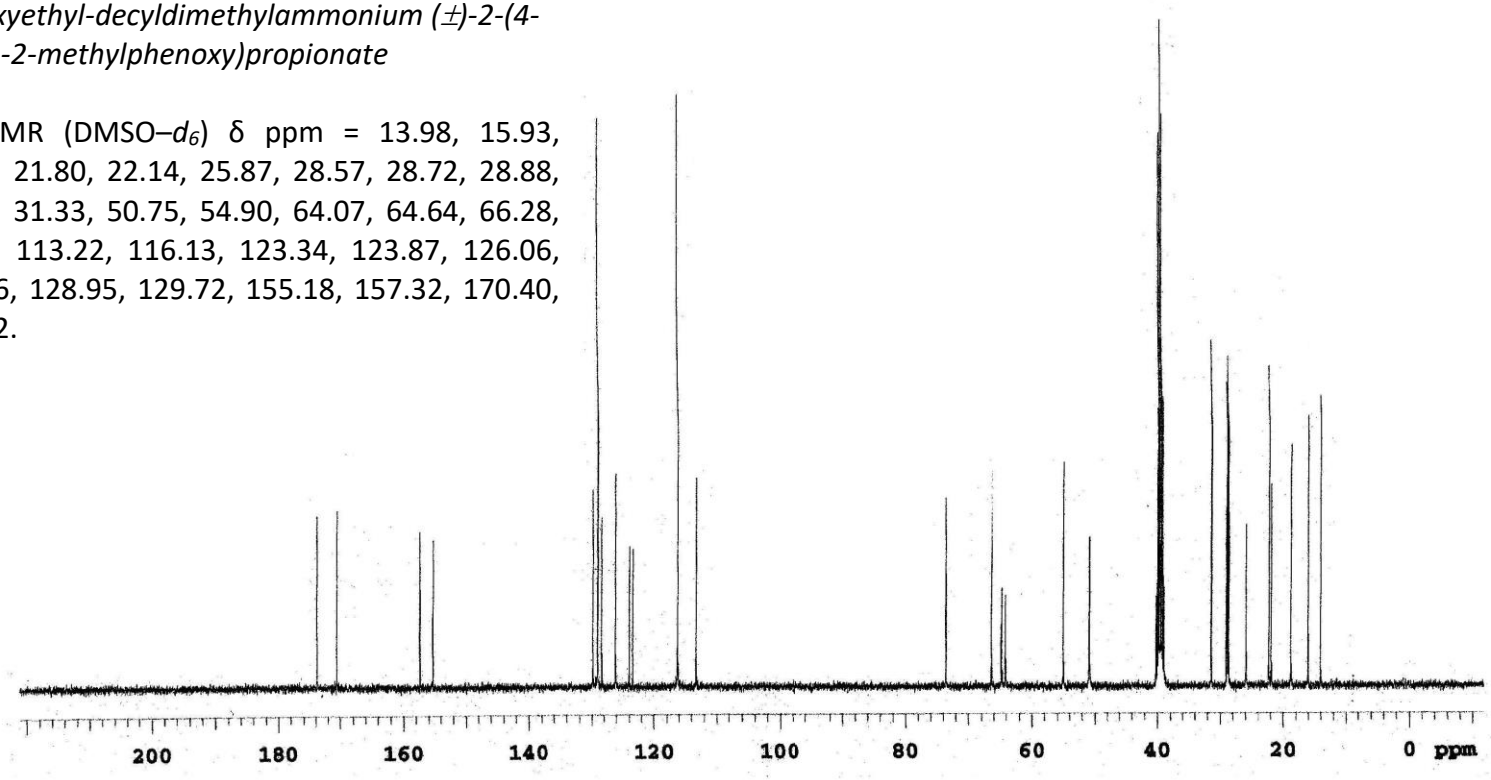


Fig. S56 ^{13}C NMR spectrum of **[4-CPA-DAE-C_{10}][MCPP].**

[MCPA-DAE-C_{10}][Clopyralid] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro)-2-pikolinate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.7 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.3 Hz, 2H), 2.18 (s, 3H), 3.08 (s, 6H), 3.33 (t, *J*=8.5 Hz, 2H), 3.40 (t, *J*=5.1 Hz, 2H), 3.83 (t, *J*=5.1 Hz, 2H), 4.65 (s, 2H), 6.81 (d, *J*=8.7 Hz, 1H), 7.15 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.7 Hz, 1H), 7.20 (d, *J*=2.7 Hz, 1H),7.39 (d, *J*=8.4 Hz, 2H), 7.89 (d, *J*=8.4 Hz, 2H).

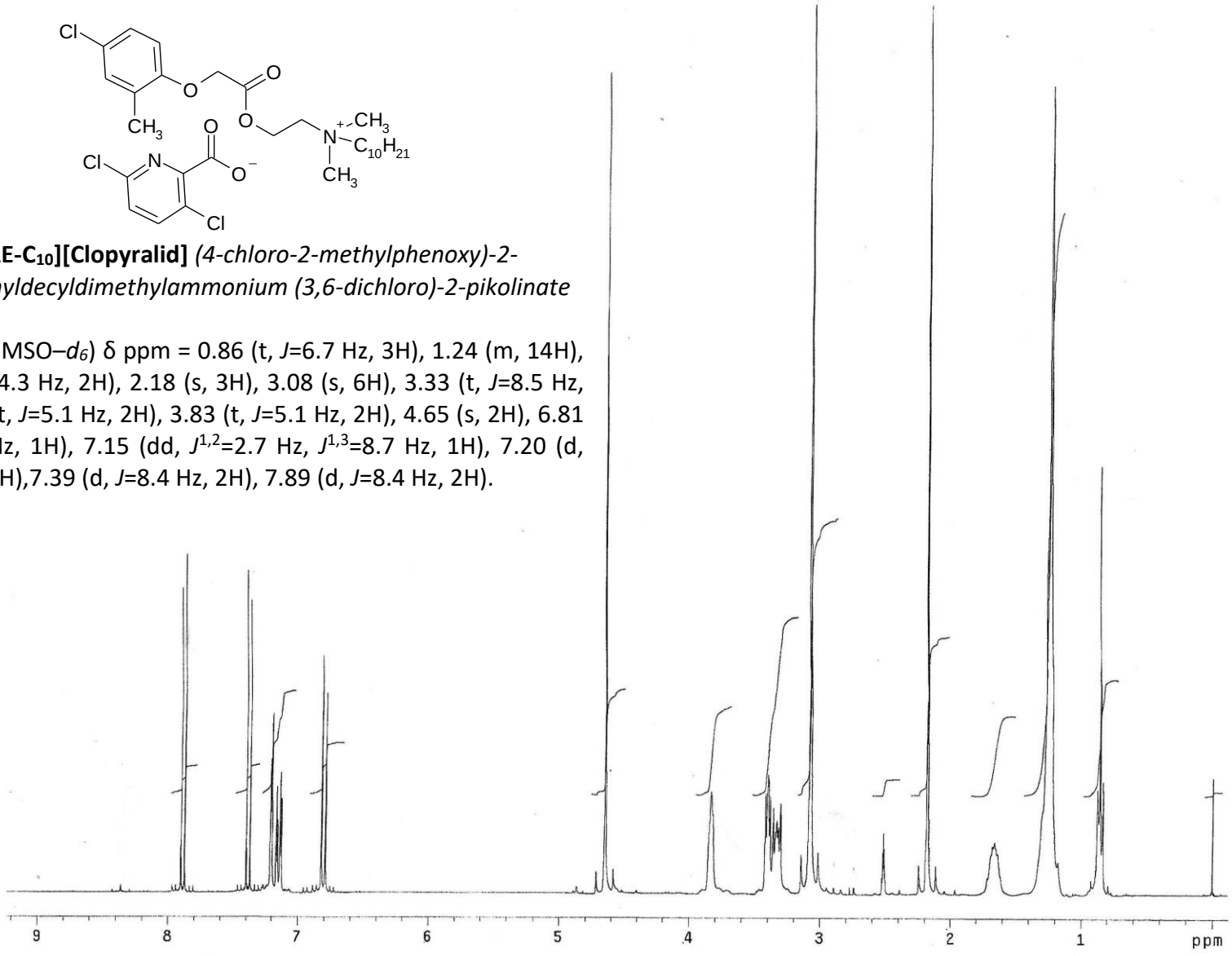


Fig. S57 ^{1}H NMR spectrum of **[MCPA-DAE-C_{10}] [Clopyralid].**

[MCPA-DAE-C_{10}][Clopyralid] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro)-2-pikolinate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.93, 15.81, 21.79, 22.10, 25.80, 28.52, 28.67, 28.84, 28.91, 31.29, 50.77, 54.91, 64.09, 64.59, 65.43, 112.83, 123.38, 123.95, 124.68, 126.19, 128.32, 129.88, 140.29, 147.32, 155.00, 157.82, 166.65, 170.13.

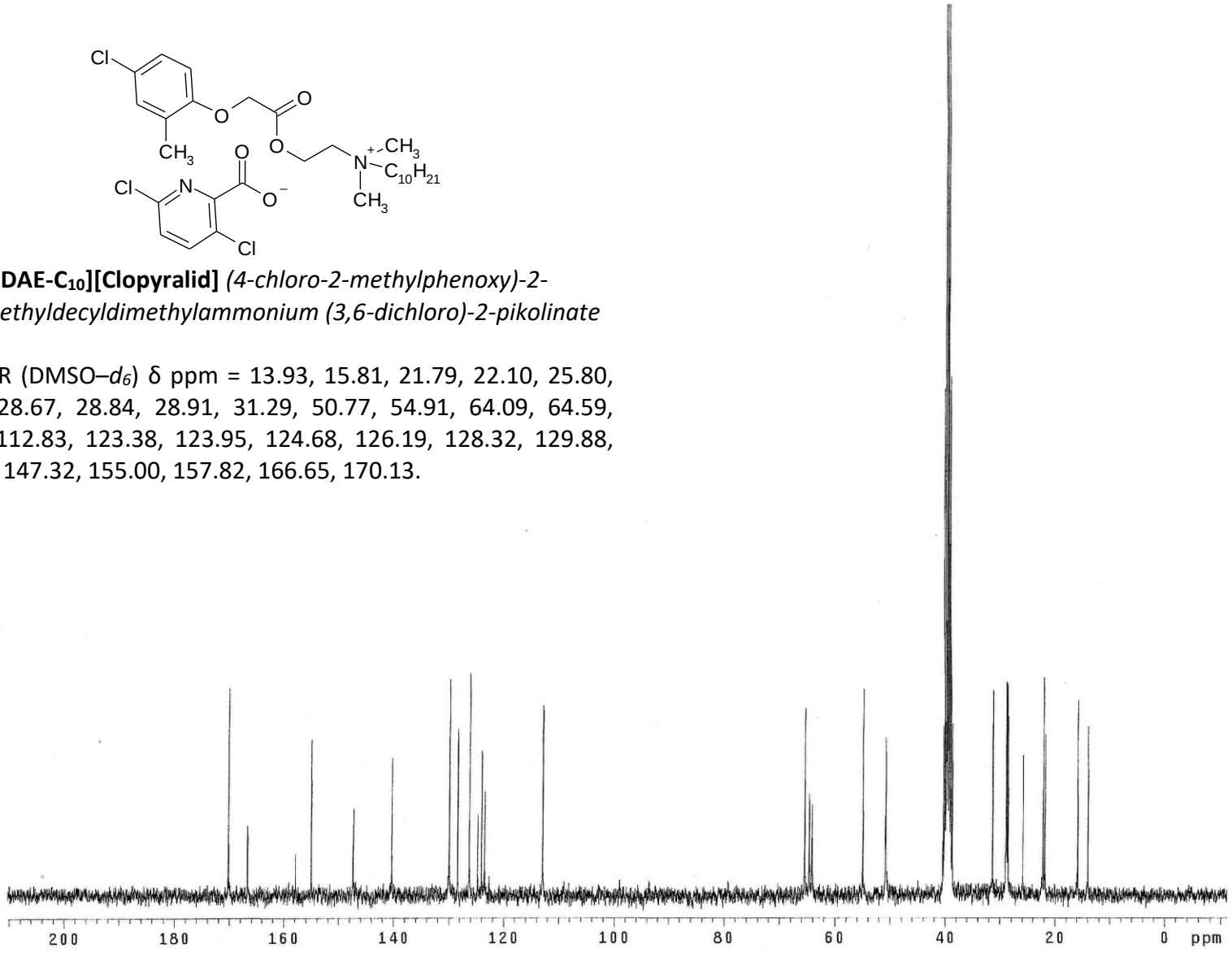


Fig. S58 ^{13}C NMR spectrum of **[MCPA-DAE-C_{10}][Clopyralid].**

[MCPA-DAE-C_{10}][Dicamba] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro-2-metoxy)benzoate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.9 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.3 Hz, 2H), 2.18 (s, 3H), 3.06 (s, 6H), 3.31 (t, *J*=8.5 Hz, 2H), 3.39 (t, *J*=5.1 Hz, 2H), 3.81 (s, 3H), 3.82 (t, *J*=5.1 Hz, 2H), 4.61 (s, 2H), 6.79 (d, *J*=8.8 Hz, 1H), 7.13 (dd, $J^{1,2}$=2.7 Hz, $J^{1,3}$=8.8 Hz, 1H), 7.14 (d, *J*=8.6 Hz, 1H),7.19 (d, *J*=2.7 Hz, 1H), 7.31 (d, *J*=8.6 Hz, 1H).

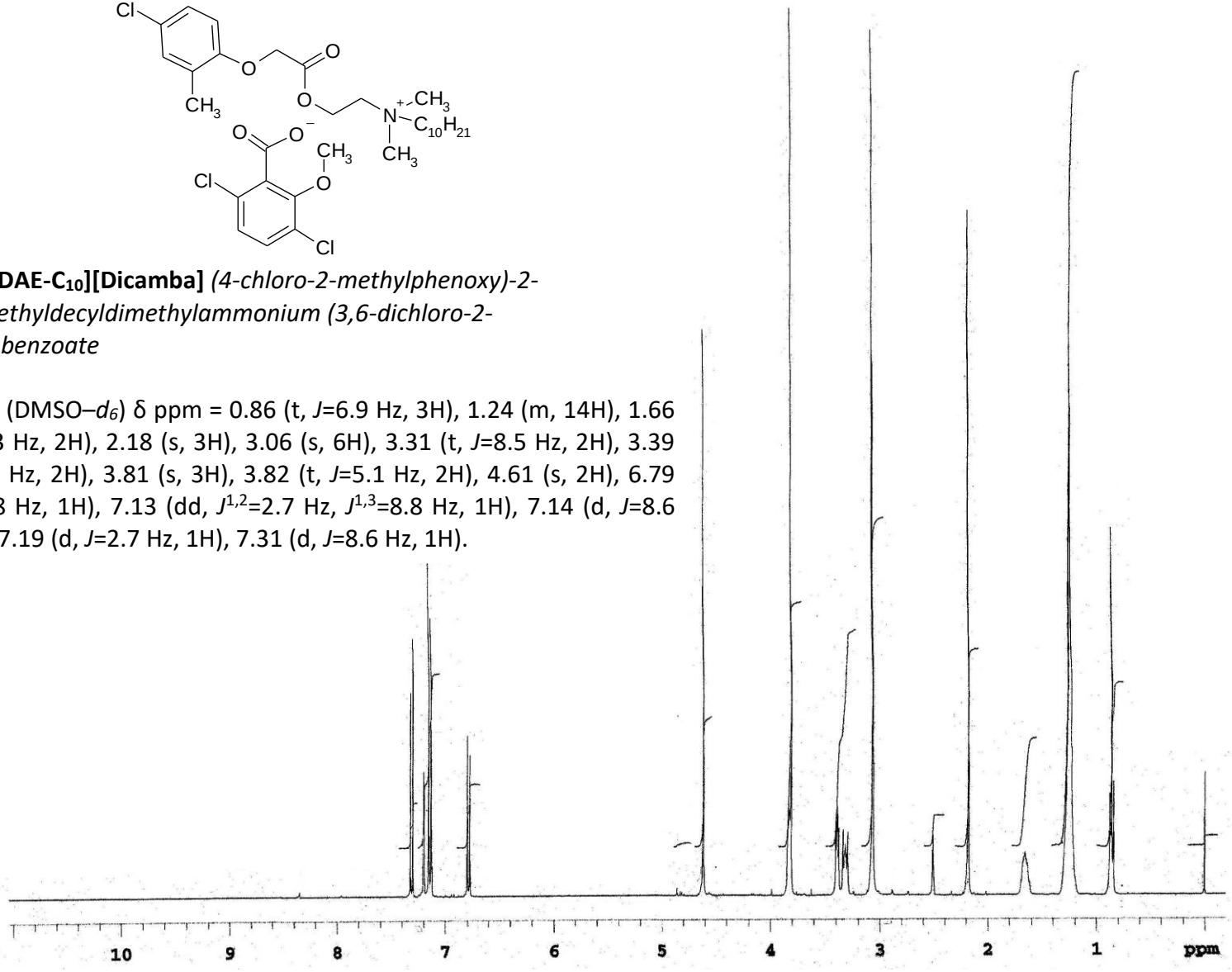
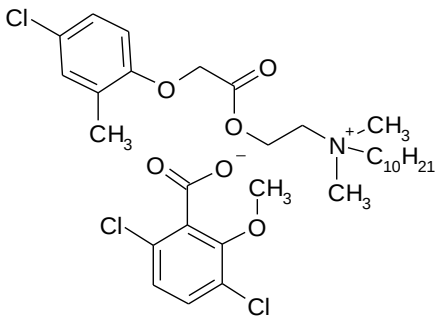


Fig. S59 ^{1}H NMR spectrum of **[MCPA-DAE-C_{10}][Dicamba].**



[MCPA-DAE-C_{10}][Dicamba] *(4-chloro-2-methylphenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro-2-metoxy)benzoate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.95, 15.86, 21.80, 22.12, 25.80, 28.54, 28.69, 28.85, 28.93, 31.30, 50.76, 54.90, 61.25, 64.08, 64.60, 65.62, 112.79, 123.82, 125.34, 125.49, 126.16, 127.65, 128.21, 128.26, 129.85, 137.81, 151.58, 155.10, 165.94, 170.22.

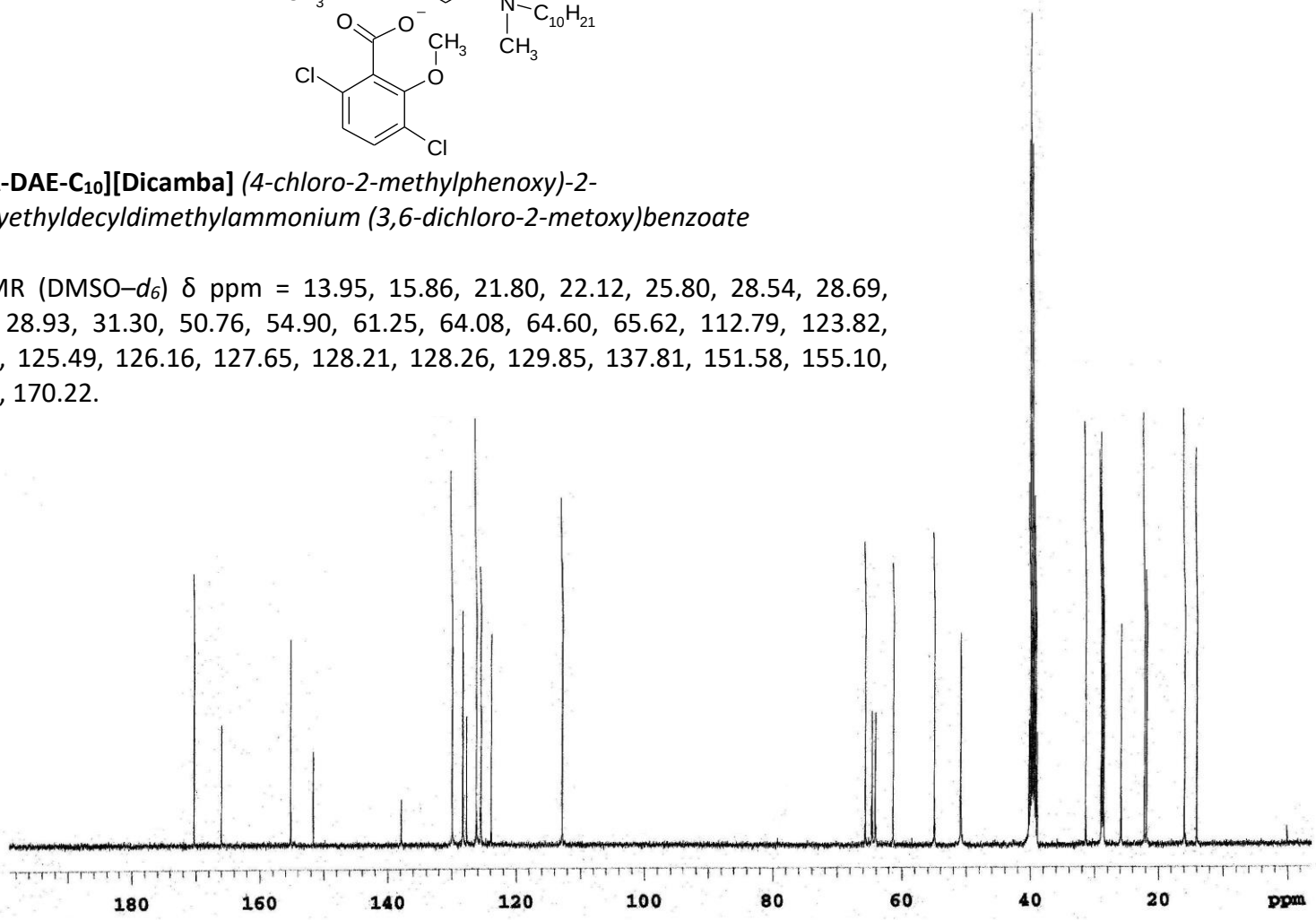


Fig. S60 ^{13}C NMR spectrum of **[MCPA-DAE-C_{10}][Dicamba].**

[4-CPA-DAE-C_{10}][Clopyralid] *(4-chlorophenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro)-2-pikolinate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.4 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.6 Hz, 2H), 3.07 (s, 6H), 3.32 (t, *J*=8.5 Hz, 2H), 3.39 (t, *J*=5.0 Hz, 2H), 3.83 (t, *J*=5.0 Hz, 2H), 4.62 (s, 2H), 6.92 (d, *J*=9.1 Hz, 2H), 7.31 (d, *J*=9.0 Hz, 2H), 7.38 (d, *J*=8.6 Hz, 1H) 7.89 (d, *J*=8.5 Hz, 1H).

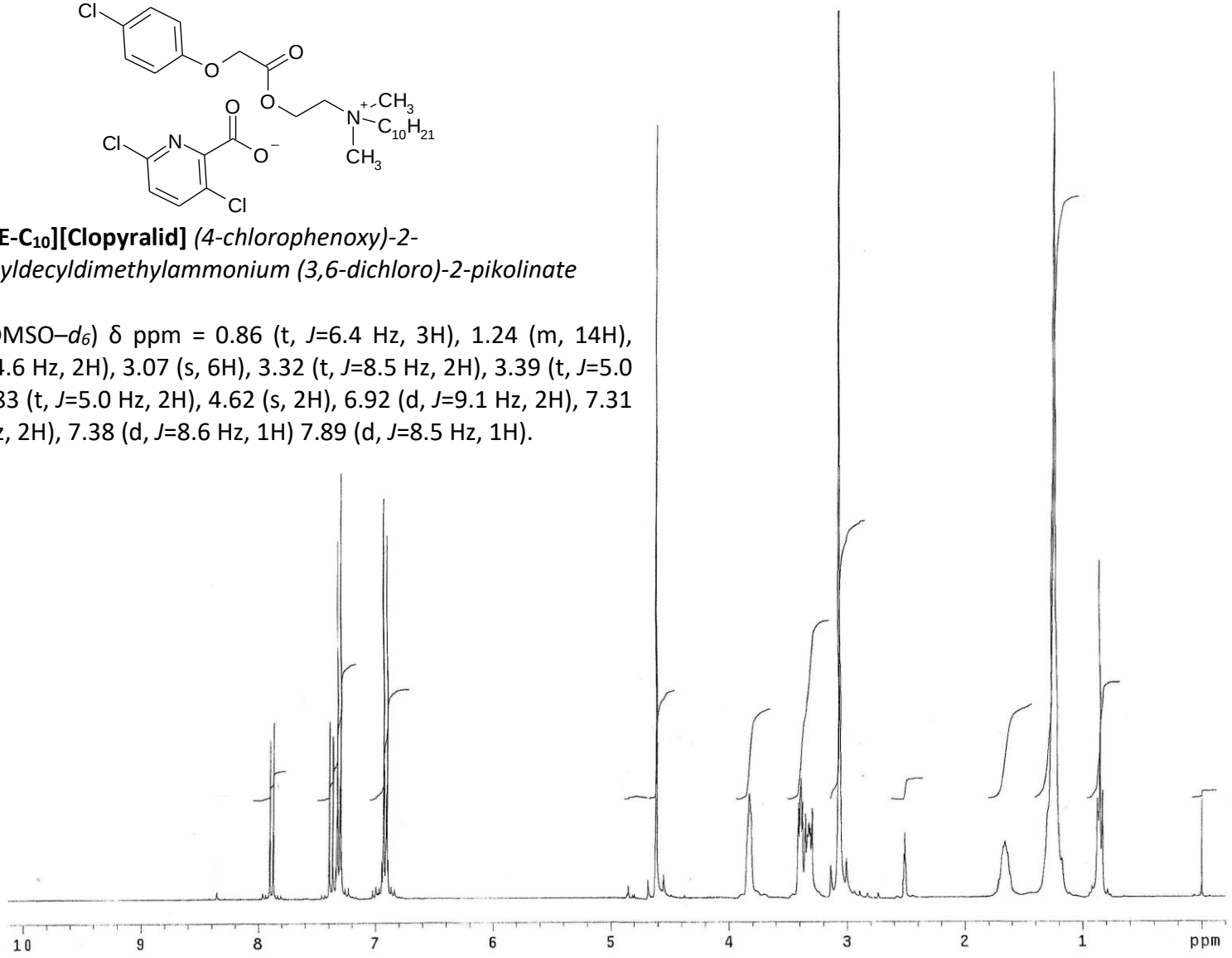
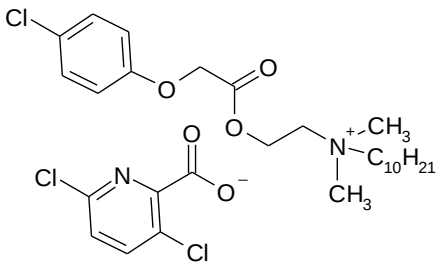


Fig. S61 ^{1}H NMR spectrum of **[4-CPA-DAE-C_{10}][Clopyralid].**



[4-CPA-DAE-C_{10}][Clopyralid] *(4-chlorophenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro)-2-pikolinate*

^{13}C NMR (DMSO–d_6) δ ppm = 13.95, 21.79, 22.10, 25.80, 28.52, 28.68, 28.84, 28.91, 31.29, 50.78, 54.91, 64.09, 64.61, 65.22, 116.19, 123.30, 124.40, 124.64, 129.09, 140.27, 147.32, 156.85, 158.02, 166.63, 170,04.

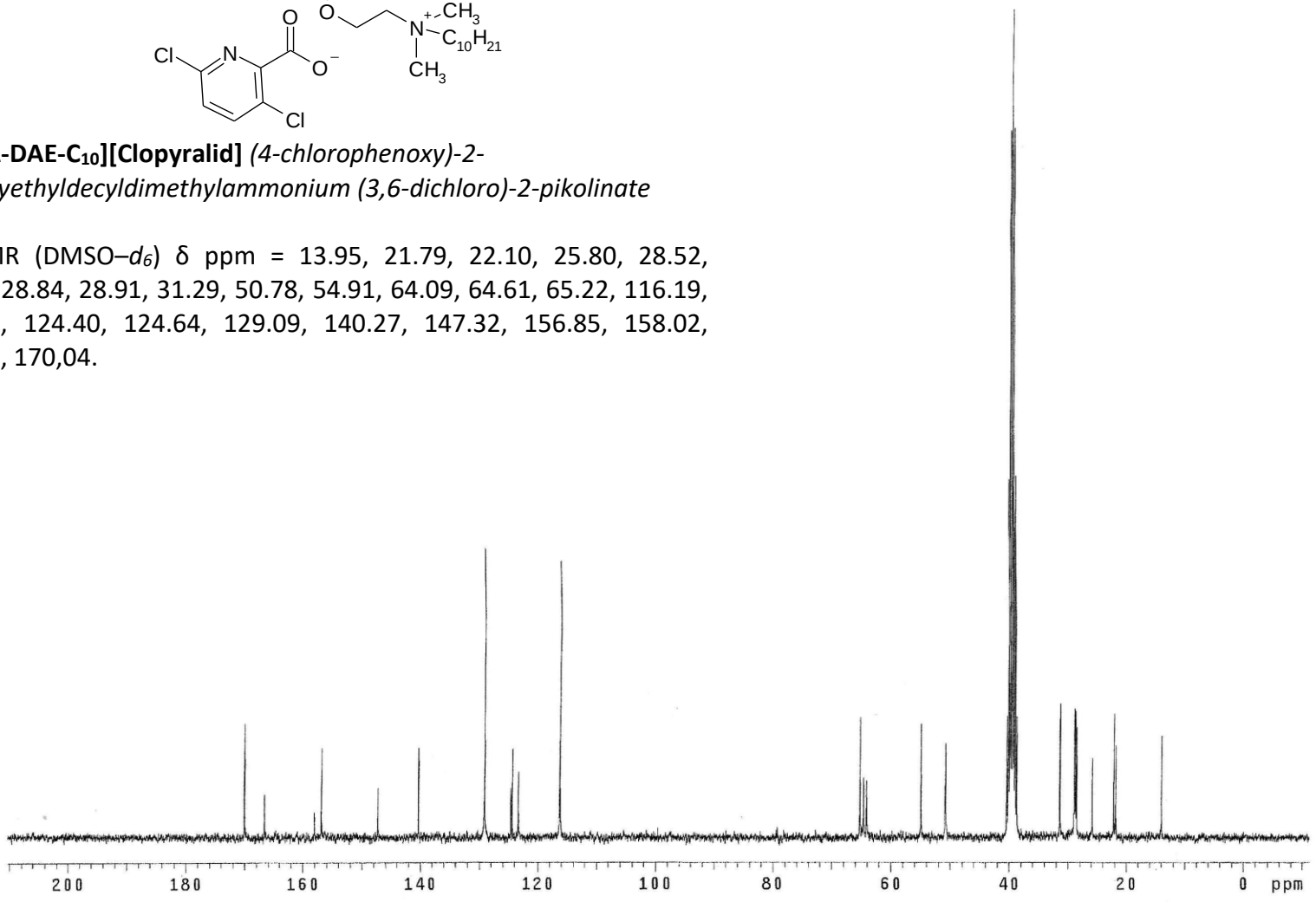
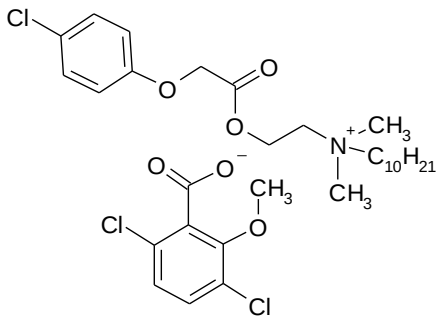


Fig. S62 ^{13}C NMR spectrum of **[4-CPA-DAE-C_{10}][Clopyralid].**



[4-CPA-DAE-C_{10}][Dicamba] *(4-chlorophenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro-2-metoxy)benzoate*

^{1}H NMR (DMSO–d_6) δ ppm = 0.86 (t, *J*=6.9 Hz, 3H), 1.24 (m, 14H), 1.66 (q, *J*=4.5 Hz, 2H), 3.07 (s, 6H), 3.32 (t, *J*=8.5 Hz, 2H), 3.39 (t, *J*=5.0 Hz, 2H), 3.81 (s, 3H), 3.83 (t, *J*=5.0 Hz, 2H), 4.60 (s, 2H), 6.91 (d, *J*=9.1 Hz, 2H), 7.30 (d, *J*=9.0 Hz, 2H), 7.15 (d, *J*=8.6 Hz, 1H) 7.32 (d, *J*=8.5 Hz, 1H).

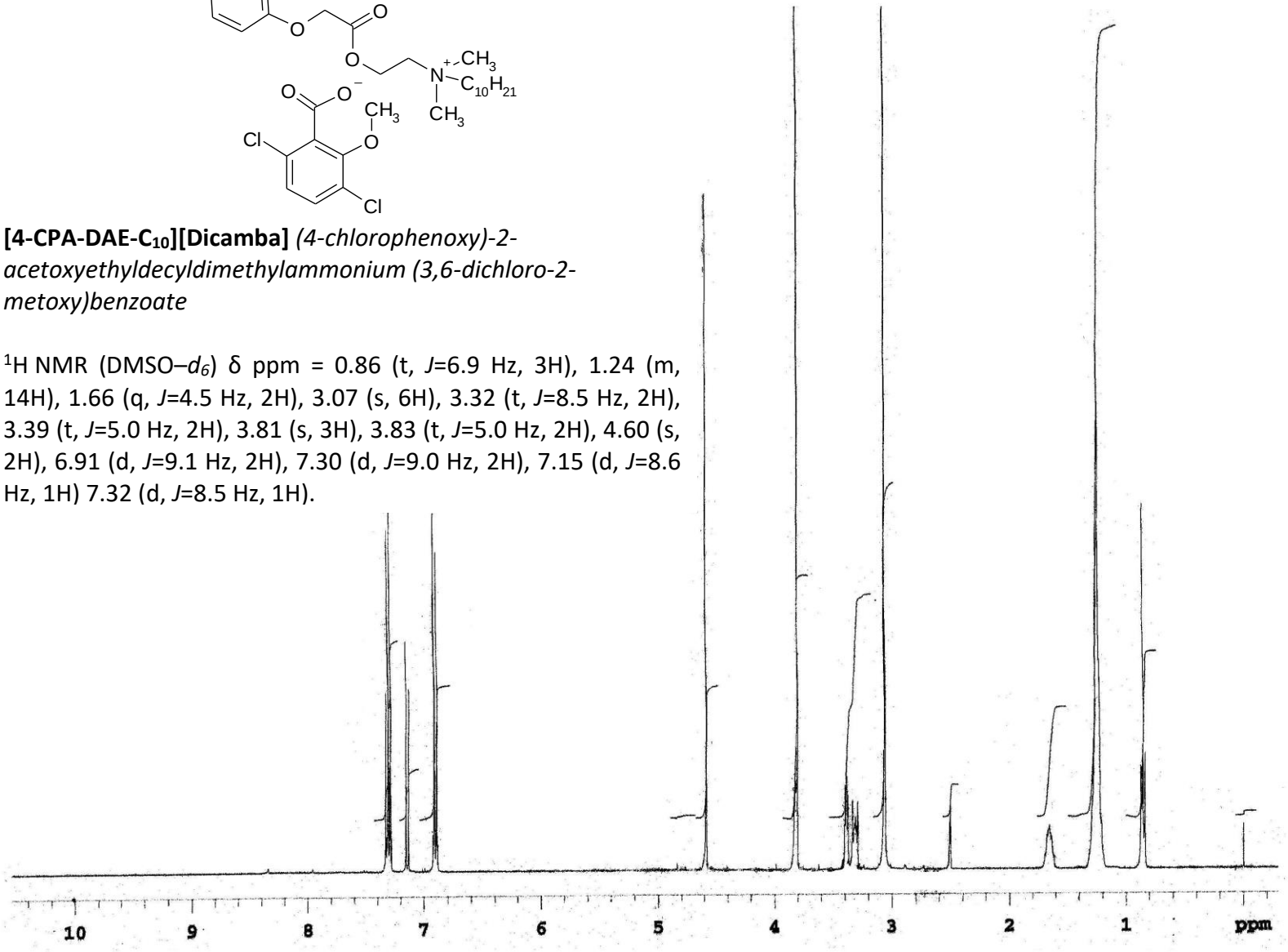
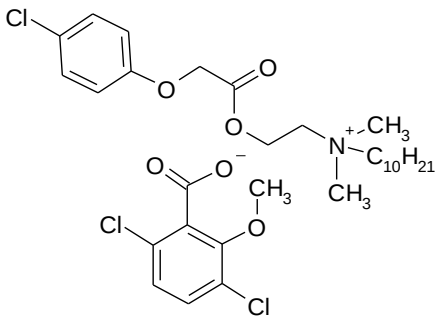


Fig. S63 ^{1}H NMR spectrum of **[4-CPA-DAE-C_{10}][Dicamba].**



[4-CPA-DAE-C_{10}][Dicamba]
(4-chlorophenoxy)-2-acetoxyethyldecyldimethylammonium (3,6-dichloro-2-metoxy)benzoate

^{13}C NMR (DMSO–d_6) δ ppm = 13.95, 21.79, 22.11, 25.80, 28.52, 28.68, 28.84, 28.91, 31.29, 50.76, 54.90, 61.27, 64.08, 64.60, 65.38, 116.17, 124.30, 125.36, 125.51, 127.66 128.33, 129.06, 137.58, 151.61, 156.93, 165.91, 170.09.

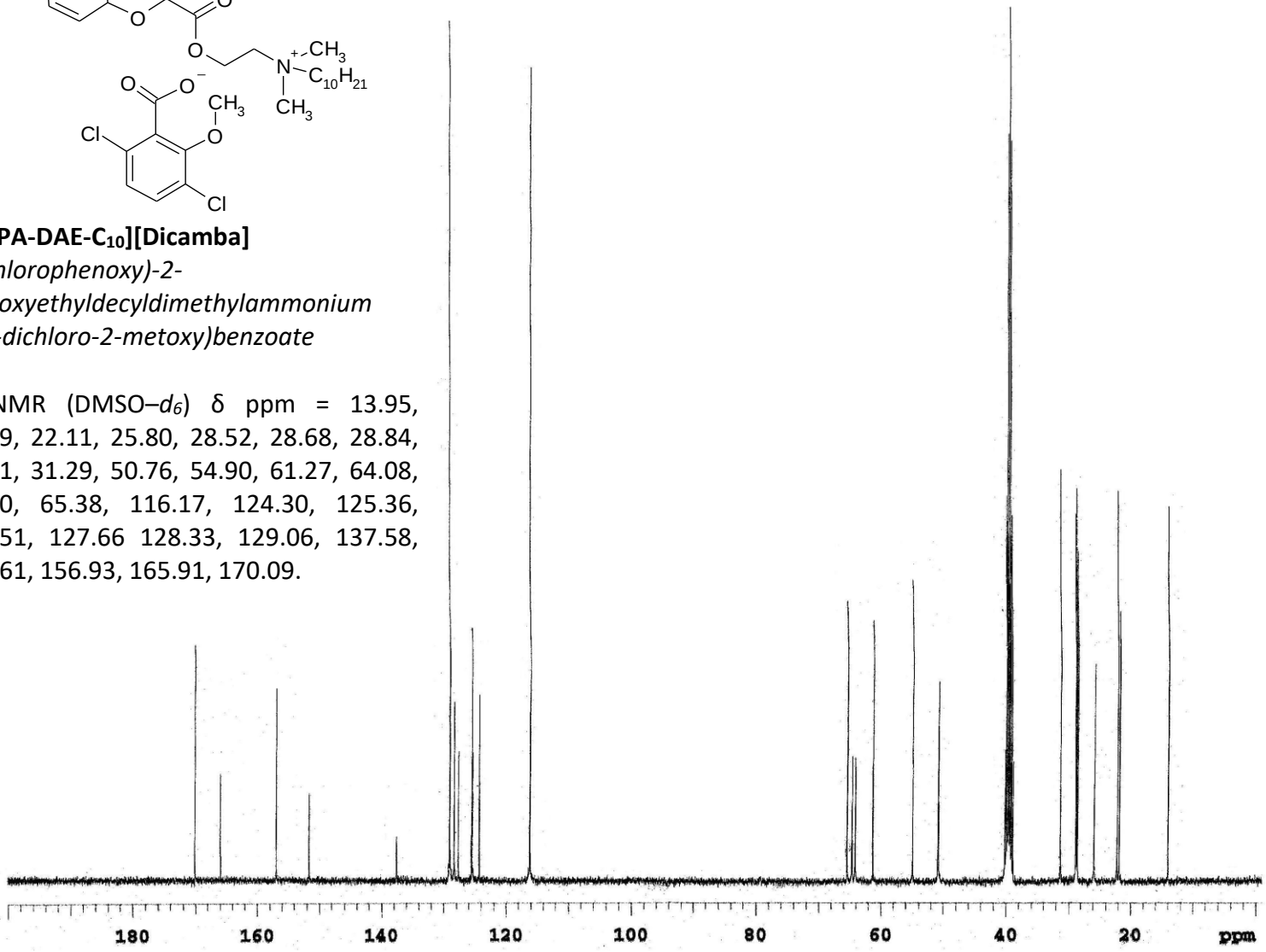


Fig. S64 ^{13}C NMR spectrum of **[4-CPA-DAE-C_{10}][Dicamba].**

Table S5 Germination Index (GI) values for seedlings growing in soil with addition of HILs (mean values of three replicates (±SD))

	Abbreviation of sample	GI [%] ± SD
HILs A and references	2,4-D + MCPA	6.65 ± 1.01
	[2,4-D-DAE-C_{10}][MCPA]	9.31 ± 1.96
	[MCPA-DAE-C_{10}][2,4-D]	7.49 ± 1.46
	2,4-D + MCPP	4.82 ± 2.14
	[2,4-D-DAE-C_{10}][MCPP]	0
	[MCPP-DAE-C_{10}][2,4-D]	4.82 ± 0.41
	2,4-D + 4-CPA	14.81 ± 1.85
	[2,4-D-DAE-C_{10}][4-CPA]	7.98 ± 0.95
	[4-CPA-DAE-C_{10}][2,4-D]	6.32 ± 1.08
	MCPA + MCPP	6.49 ± 1.87
	[MCPA-DAE-C_{10}][MCPP]	10.19 ± 1.40
	[MCPP-DAE-C_{10}][MCPA]	6.99 ± 0.84
	MCPA + 4-CPA	8.98 ± 0.73
	[MCPA-DAE-C_{10}][4-CPA]	5.32 ± 0.66
	[4-CPA-DAE-C_{10}][MCPA]	15.48 ± 0.81
	MCPP + 4-CPA	9.31 ± 1.86
	[MCPP-DAE-C_{10}][4-CPA]	19.46 ± 1.34
	[4-CPA- DAE-C_{10}][MCPP]	23.45 ± 2.73
HILs B and references	MCPA + Clopyralid	4.82 ± 0.90
	[MCPA-DAE-C_{10}][Clopyralid]	3.16 ± 0.11
	MCPA + Dicamba	13.64 ± 1.61
	[MCPA-DAE-C_{10}][Dicamba]	5.99 ± 0.45
	4-CPA + Clopyralid	32.06 ± 1.17
	[4-CPA-DAE-C_{10}][Clopyralid]	32.77 ± 1.59
	4-CPA + Dicamba	25.12 ± 1.56
	[4-CPA-DAE-C_{10}][Dicamba]	22.29 ± 1.51

Table S6 Mutagenic activity expressed by the number of revertants and mutagenic index (*MI*) in strains TA98, TA100, TA1535 and TA1537 of *Salmonella typhimurium* exposed to HILs [2,4-D-DAE-C_{10}][MCPP] and [MCPA-DAE-C_{10}][Clopyralid] with (+S9) or without (-S9) metabolic activation. Data were presented as mean number of revertants (±SD) induced spontaneously in control cultures (*R*s) and in the cultures treated with reference mutagen or HCJ tested (*R*i). $^{a}p<0.05$, $^{b}p<0.01$, $^{c}p<0.001$ significant differences in relation to spontaneous mutations determined in control cultures

Bacteria strain	**Control**	**Mutagen**		**[2,4-D-DAE-C_{10}][MCPP]** (10 µg/plate)		**[MCPA-DAE-C_{10}][Clopyralid]** (10 µg/plate)	
	*R*s	*R*i	*MI*	*R*i	*MI*	*R*i	*MI*
TA98							
-S9	17 ± 3	87 ± 16 ^{b}	5.3	37 ± 7 ^{a}	2.2	28 ± 7	1.6
+S9	107 ± 4	215 ± 4 ^{c}	2.0	129 ± 10 ^{a}	1.2	106 ± 13	1.0
TA100							
-S9	35 ± 9	316 ± 24 ^{c}	9.0	67 ± 12 ^{a}	2.0	43 ± 7	1.2
+S9	128 ± 22	293 ± 10 ^{c}	2.3	193 ± 30 ^{a}	1.5	201 ± 22 ^{a}	1.6
TA1535							
-S9	11 ± 5	395 ± 32 ^{c}	37.0	13 ± 5	1.4	18 ± 11	1.6
+S9	77 ± 11	189 ± 9 ^{c}	2.4	132 ± 5 ^{b}	1.7	102 ± 9 ^{a}	1.3
TA1537							
-S9	6 ±2	129 ± 5 ^{c}	24.5	3 ± 1	0.5	2 ± 2	0.3
+S9	34 ± 3	357 ± 25 ^{c}	10.7	64 ± 4 ^{c}	1.9	56 ± 3 ^{c}	1.6