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APPENDIX

APPENDIX A

Table A1 The insecticidal activity test of the ethanolic extract at 5% w by v against adult brown planthoppers by Topical application method

Treatments	Concentration (w/v)	%Mortality 24 h.			
		1	2	3	4
Control		0	0		
Acetone		1	1		
Etofenprox	5	6	5		
Achyranthes aspera L.	5	1	2		
Cleoma viscosa L.	5	1	1		
Trigonostemon riediodes (Kurz) Craib	5	1	1		
Senna surattensis (Burm.f.)	5	0	0		
Piper aurantuacum Miq.	5	3	2		
Piper chaba L.f.	5	1	3		
Piper cubeba L.	5	5	3		
Piper longum L	5	0	0		
Piper nigrum L.	5	8	4		
Piper sarmentosum Roxb.	5	10	10		
Mitragyna speciosa Roxb.	5	0	0		
Paederia linearis Hock.f.	5	0	0		
Zingiber montanum (Koenig) Link ex Dietr	5	9	6		
Zingiber zerumbet (L.)Sm	5	1	2		

* Temperature 25 °C Humidity 70% Light Intensity 270 μE 14L/10D Control = no treat

Table A2 Effect of the concentration of the ethanolic extract of the fruits of *P. sarmentosum* against brown planthoppers by Topical application method

Treatments	**Concentration (w/v)**	**%Mortality 24 h.**			
		1	**2**	**3**	**4**
Control		0	1	0	1
Acetone		0	1	0	2
Ethanolic extract	0.30	0	0	4	0
	0.40	3	6	4	6
	0.50	3	6	7	4
	0.60	5	7	6	7
	0.70	6	8	7	6
	0.80	7	8	4	7
	0.90	9	8	7	6
	1.0	10	9	9	9

* Temperature 25 °C Humidity 70% Light Intensity 270 μE 14L/10D Control = no treat

Probit analysis ethanolic extract of the fruits of *P. sarmentosum* against adult brown planthoppers by Topical application method

DATA Information

9 unweighted cases accepted.
0 cases rejected because of missing data.
2 cases are in the control group.
1 cases rejected because no. responses is greater than no. subjects.

MODEL Information

ONLY Normal Sigmoid is requested.

PROBIT ANALYSIS

Parameter estimates converged after 13 iterations.
Optimal solution found.

Parameter Estimates (PROBIT model: (PROBIT(p)) = Intercept + BX):

	Regression Coeff.	Standard Error	Coeff./S.E.
CONC	3.87014	.38826	9.96803

Intercept	Standard Error	Intercept/S.E.
-1.54076	.19900	-7.74256

Pearson Goodness-of-Fit Chi Square = 13.383 DF = 7 P = .063

Since Goodness-of-Fit Chi square is significant, a heterogeneity factor is used in the calculation of confidence limits.

PROBIT ANALYSIS

Observed and Expected Frequencies

Number of CONC	Number of Subject	Observed Responses	Expected Responses	Residual	Prob
0.00	30.0	2.0	1.851	.149	.06169
0.00	30.0	3.0	1.851	1.149	.06169
0.30	30.0	4.0	10.562	-6.562	.35208
0.40	30.0	19.0	15.087	3.913	.50291
0.50	30.0	20.0	19.600	.400	.65332
0.60	30.0	25.0	23.481	1.519	.78269
0.70	30.0	27.0	26.360	.640	.87866
0.80	30.0	26.0	28.202	-2.202	.94007
0.90	30.0	30.0	29.219	.781	.97395

PROBIT ANALYSIS
Confidence Limits for Effective CONC

95% Confidence Limits			
Prob	**Conc**	**Lower**	**Uppper**
.01	-.20299	-.53617	-.02704
.02	-.13255	-.43303	.02767
.03	-.08786	-.36779	.06259
.04	-.05424	-.31885	.08899
.05	-.02690	-.27913	.11056
.06	-.00362	-.24540	.12899
.07	.01679	-.21590	.14523
.08	.03506	-.18954	.15982
.09	.05168	-.16562	.17315
.10	.06698	-.14366	.18546
.15	.13031	-.05332	.23707
.20	.18065	.01756	.27900
.25	.22384	.07748	.31587
.30	.26262	.013036	.34990
.35	.29855	.17835	.38244
.40	.33265	.22278	.41443
.45	.36565	.26452	.44663
.50	.39812	.30421	.47972
.55	.43059	.34235	.51434
.60	.46358	.37943	.55120
.65	.49768	.41597	.59109
.70	.53362	.45262	.63497
.75	.57240	.49030	.68421
.80	.61558	.53033	.74095
.85	.66592	.57502	.80908
.90	.72925	.62906	.89699
.91	.74455	.64183	.91850
.92	.76117	.65561	.94196
.93	.77944	.67065	.96787
.94	.79985	.68733	.99693
.95	.82313	.70622	1.03020
.96	.85047	.72825	1.06946
.97	.88409	.75513	1.11792
.98	.92878	.79058	1.18262
.99	.99922	.84594	1.28512

Table A3 Effect of the concentration of the ethanolic extract of the fruits of *P. sarmentosum* against nymp fifth star brown planthoppers by Parafilm method

Treatments	Concentration (w/v)	%Mortality 24 h.			
		1	2	3	4
Control		2	0	0	0
Acetone		0	0	1	1
Ethanolic extract	0.30	0	1	2	2
	0.40	2	0	3	1
	0.50	2	5	1	3
	0.60	2	2	5	5
	0.70	7	6	6	3
	0.80	6	5	8	6
	0.90	9	8	10	6
	1.0	10	10	9	9

* Temperature 25 °C Humidity 70% Light Intensity 270 μE 14L/10D Control = no treat

Probit analysis ethanolic extract of the fruits of *P. sarmentosum* against nymp fifth star brown planthoppers by Parafilm method

DATA Information

8 unweighted cases accepted.
0 cases rejected because of missing data.
2 cases are in the control group.
2 cases rejected because no. responses is greater than no. subjects.

MODEL Information

ONLY Normal Sigmoid is requested.

PROBIT ANALYSIS

Parameter estimates converged after 12 iterations.
Optimal solution found.

Parameter Estimates (PROBIT model: (PROBIT(p)) = Intercept + BX):

	Regression Coeff.	Standard Error	Coeff./S.E.
CONC	3.17592	.40933	7.75880

Intercept	Standard Error	Intercept/S.E.
-1.81506	.22360	-8.11743

Pearson Goodness-of-Fit Chi Square = 5.543 DF = 6 P = .476

Since Goodness-of-Fit Chi square is NOT significant, no heterogeneity factor is used in the calculation of confidence limits.

PROBIT ANALYSIS

Observed and Expected Frequencies

Number of CONC	Number of Subject	Observed Responses	Expected Responses	Residual	Prob
0.00	30.0	2.0	1.043	.957	.0346
0.00	30.0	2.0	1.043	.957	.0346
0.30	30.0	5.0	5.828	-.828	.19427
0.40	30.0	6.0	8.789	-2.789	.29298
0.50	30.0	11.0	12.305	-1.305	.41017
0.60	30.0	14.0	16.082	-2.082	.53605
0.70	30.0	22.0	19.752	2.248	.65839
0.80	30.0	25.0	22.979	2.021	.76598

PROBIT ANALYSIS
Confidence Limits for Effective CONC

95% Confidence Limits			
Prob	**Conc**	**Lower**	**Upper**
.01	-.16099	-.39279	-.01870
.02	-.07516	-.27933	.05122
.03	-.02070	-.20757	.09579
.04	.02027	-.15372	.12946
.05	.05359	-.11004	.15697
.06	.08196	-.07295	.18047
.07	.10683	-.04052	.20117
.08	.12909	-.01155	.21978
.09	.14934	.01471	.23677
.10	.16799	.03882	.25249
.15	.24517	.13774	.31846
.20	.30651	.21486	.37237
.25	.35913	.27944	.42022
.30	.40639	.33567	.46495
.35	.45018	.38585	.50832
.40	.49174	.43147	.55148
.45	.53194	.47362	.59522
.50	.57151	.51328	.64008
.55	.61107	.55134	.68656
.60	.65128	.58864	.73514
.65	.69283	.62607	.78649
.70	.73662	.66456	.84155
.75	.78388	.70529	.90178
.80	.83651	.74991	.96958
.85	.89785	.80124	1.04930
.90	.97503	.86510	1.15032
.91	.99367	.88043	1.17481
.92	1.01392	.89706	1.20145
.93	1.03619	.91530	1.23077
.94	1.06109	3.93564	1.26357
.95	1.08942	.95879	1.30101
.96	1.12274	.98594	1.34505
.97	1.16371	1.01924	1.39927
.98	1.21817	1.06342	1.47143
.99	1.30400	1.13286	1.58535

Table A4 Effect of the concentration of the ethanolic extract of the fruits of *P. sarmentosum* against adult brown planthoppers by Parafilm method

Treatments	Concentration (w/v)	%Mortality 24 h.			
		1	2	3	4
Control		0	1	1	0
Acetone		0	1	1	5
Ethanolic extract	0.30	1	1	3	0
	0.40	4	1	2	3
	0.50	0	4	3	2
	0.60	4	2	1	7
	0.70	7	6	6	3
	0.80	7	5	8	6
	0.90	9	5	7	10
	1.0	9	8	10	6

* Temperature 25 °C Humidity 70% Light Intensity 270 μE 14L/10D Control = no treat

Probit analysis ethanolic extract of the fruits of *P. sarmentosum* against adult brown planthoppers by Parafilm method

DATA Information

8 unweighted cases accepted.
0 cases rejected because of missing data.
2 cases are in the control group.
2 cases rejected because no. responses is greater than no. subjects.

MODEL Information

ONLY Normal Sigmoid is requested.

PROBIT ANALYSIS

Parameter estimates converged after 9 iterations.
Optimal solution found.

Parameter Estimates (PROBIT model: (PROBIT(p)) = Intercept + BX):

	Regression Coeff.	Standard Error	Coeff./S.E.
CONC	2.46298	.34949	7.04726

Intercept	Standard Error	Intercept/S.E.
-1.34538	.18258	-7.36854

Pearson Goodness-of-Fit Chi Square = 17.085 DF = 6 P = .009

Since Goodness-of-Fit Chi square is significant, a heterogeneity factor is used in the calculation of confidence limits.

PROBIT ANALYSIS

Observed and Expected Frequencies

Number of CONC	Number of Subject	Observed Responses	Expected Responses	Residual	Prob
0.00	30.0	2.0	2.678	-.678	.08925
0.00	30.0	7.0	2.678	4.322	.089925
0.30	30.0	5.0	8.163	-3.163	.27210
0.40	30.0	10.0	10.781	-.781	.35935
0.50	30.0	9.0	13.640	-4.640	.45466
0.60	30.0	14.0	16.580	-2.580	.55267
0.70	30.0	22.0	19.426	2.574	.64755
0.80	30.0	26.0	22.021	3.979	.73402

PROBIT ANALYSIS
Confidence Limits for Effective CONC

95% Confidence Limits			
Prob	**Conc**	**Lower**	**Upper**
.01	-.39829	-1.62918	-.06070
.02	-.28761	-1.36505	.01224
.03	-.21739	-1.19798	.05902
.04	-.16456	-1.07264	.09456
.05	-.12159	-.97096	.12374
.06	-.08502	-.88466	.14882
.07	-.05295	-.80920	.17103
.08	-.02424	-.74184	.19111
.09	.00188	-.68076	.20956
.10	.02591	-.62473	.22673
.15	.12544	-.39525	.30033
.20	.20453	-.21735	.36331
.25	.27239	-.07021	.42283
.30	.33333	.05487	.48334
.35	.38979	.16172	.54845
.40	.44338	.25226	.62110
.45	.49522	.32829	.70295
.50	.54624	.39247	.79414
.55	.59726	.44802	.89398
.60	.64910	.49794	1.00194
.65	.70268	.54475	1.11831
.70	.75915	.59050	1.24453
.75	.82009	.63710	1.38352
.80	.88795	.68672	1.54055
.85	.96704	.74255	1.72561
.90	1.06656	.81080	1.96044
.91	1.09060	.82704	2.01740
.92	1.11671	.84461	2.07936
.93	1.14543	.86384	2.14758
.94	1.17750	.88521	2.22387
.95	1.21407	.90947	2.31099
.96	1.25704	.93784	2.41348
.97	1.30986	.97255	2.53964
.98	1.38009	1.01846	2.70760
.99	1.49076	1.09037	2.97274

Table A5 The results of insecticidal activity of fraction II-V

Treatments	Concentration (w/v)	%Mortality 24 h.			
		1	2	3	4
Control		0	0	0	0
Acetone		0	1	0	2
Hexane extract	0.50	3	8	6	7
Dichloromethane extract	0.50	2	3	1	2
Ethyl acetate extract	0.50	0	0	0	0
Methanol extract	0.50	0	0	0	0

* Temperature 25 °C Humidity 70% Light Intensity 270 μE 14L/10D Control = no treat

Table A6 The results of insecticidal activity of fraction H_1-H_6

Treatments	Concentration (w/v)	%Mortality 24 h.			
		1	2	3	4
Control		0	1	0	0
Acetone		0	2	1	3
H_1	0.50	0	1	2	1
H_2	0.50	3	1	2	2
H_3	0.50	8	7	6	3
H_4	0.50	7	6	5	7
H_5	0.50	0	0	0	0
H_6	0.50	0	0	0	0

* Temperature 25 °C Humidity 70% Light Intensity 270 μE 14L/10D Control = no treat

Table A7 The results of insecticidal activity of fraction $H_{4.1}$-$H_{4.4}$

Treatments	Concentration (w/v)	%Mortality 24 h.			
		1	2	3	4
Control		0	1	1	0
Acetone		0	3	0	1
$H_{4.1}$	0.50	2	3	2	2
$H_{4.2}$	0.50	5	7	5	6
$H_{4.3}$	0.50	3	2	2	2
$H_{4.4}$	0.50	10	9	8	8

* Temperature 25 °C Humidity 70% Light Intensity 270 μE 14L/10D Control = no treat

Table A8 Lethal concentration (LC_{50}) of carbosulfan against adult brown planthoppers by Topical application method

Treatments	Concentration (ppm)	%Mortality 24 h.			
		1	**2**	**3**	**4**
Control		0	1	1	5
Acetone		1	3	0	1
Carbosulfan	1	0	0	0	1
	10	0	0	1	1
	100	1	2	0	2
	1,000	2	3	2	5
	2,000	1	4	4	4
	3,000	8	4	4	2
	4,000	5	8	5	5
	5,000	3	5	8	5

* Temperature 25 ˚C Humidity 70% Light Intensity 270 μE 14L/10D Control = no treat

Probit analysis Lethal concentration (LC_{50}) carbosulfan against adult brown planthoppers by Topical application method

DATA Information

10 unweighted cases accepted.
30 cases rejected because of missing data.
2 cases are in the control group.

MODEL Information

ONLY Normal Sigmoid is requested.

PROBIT ANALYSIS

Parameter estimates converged after 13 iterations.
Optimal solution found.

Parameter Estimates (PROBIT model: (PROBIT(p)) = Intercept + BX):

	Regression Coeff.	Standard Error	Coeff./S.E.
CONC	.00036	.00004	9.26254

Intercept	Standard Error	Intercept/S.E.
-1.03021	.09784	-10.52989

Pearson Goodness-of-Fit Chi Square = 21.447 DF = 8 P = .006

Since Goodness-of-Fit Chi square is significant, a heterogeneity factor is used in the calculation of confidence limits.

PROBIT ANALYSIS

Observed and Expected Frequencies

Number of CONC	Number of Subjects	Observed Responses	Expected Responses	Residual	Prob
5000.00	40.0	26.0	31.190	5.190	.77976
4000.00	40.0	28.0	26.379	1.621	.65948
3000.00	40.0	29.0	20.809	8.191	.52023
2000.00	40.0	13.0	15.138	2.138	.37844
1000.00	40.0	11.0	10.059	.941	.25146
100.00	40.0	8.0	6.403	1.597	.16007
10.00	40.0	6.0	6.092	-.092	.15230
1.00	40.0	2.0	6.062	-4.062	.15154
.00	40.0	10.0	6.058	3.942	.15146
.00	40.0	2.0	6.058	-4.058	.15146

PROBIT ANALYSIS
Confidence Limits for Effective CONC

95% Confidence Limits			
Prob	**Conc**	**Lower**	**Upper**
.01	-3597.24532	-7397.82349	-1927.36404
.02	-2840.68799	-6139.60861	-1370.94061
.03	-2360.67663	-5344.58595	-1014.63345
.04	-1999.58277	-4748.80928	-744.30955
.05	-1705.86078	-4266.03628	-522.57654
.06	-1455.85723	-3856.72282	-332.24473
.07	-1236.65302	-3499.29041	-163.90556
.08	-1040.38180	-3180.61548	-11.81474
.09	-861.88098	-2892.09851	127.81091
.10	-697.57068	-2627.78849	257.60686
.15	-17.28214	-1550.96962	812.49203
.20	523.38963	-725.77424	1284.12330
.25	987.23787	-53.15932	1724.07018
.30	1403.78792	510.72224	2159.30349
.35	1789.78362	990.84123	2605.01333
.40	2156.05579	1406.16242	3068.21316
.45	2510.42836	1773.59698	3550.75786
.50	2859.18248	2108.01901	4052.83898
.55	3207.93660	2421.77667	4575.58447
.60	3562.30917	2724.97930	5122.36110
.65	3928.58134	3026.37393	5699.48749
.70	4314.57704	3334.49541	6317.19484
.75	4731.12709	3659.14734	6991.65779
.80	5194.97533	4013.79878	7749.56814
.85	5735.64710	4420.73772	8639.45584
.90	6415.93564	4925.96902	9765.92859
.91	6580.24594	5047.14965	10038.85394
.92	6758.74676	5178.49028	10335.65592
.93	6955.01799	5322.57331	10662.33863
.94	7174.22219	5483.12026	11027.56328
.95	7424.22574	5665.79817	11444.53063
.96	7717.94773	5879.90885	11934.92595
.97	8079.04159	6142.47314	12538.46224
.98	8559.05295	6490.55951	13341.70570
.99	9315.61028	7037.43157	14609.47194

Table A9 Lethal concentration (LC_{50}) of compound 1 against adult brown planthoppers by Topical application method

Treatments	Concentration (ppm)	%Mortality 24 h.			
		1	**2**	**3**	**4**
Control		0	1	0	1
Acetone		1	2	2	1
Compound 1	1	0	1	1	0
	10	0	2	1	3
	100	1	2	2	3
	1,000	4	3	2	2
	2,000	3	3	3	4
	3,000	5	9	8	7
	4,000	9	4	7	8
	5,000	7	5	8	6

* Temperature 25 °C Humidity 70% Light Intensity 270 μE 14L/10D Control = no treat

Probit analysis Lethal concentration (LC_{50}) of compound 1 against adult brown planthoppers by Topical application method

DATA Information
10 unweighted cases accepted.
0 cases rejected because of missing data.
2 cases are in the control group.
MODEL Information
ONLY Normal Sigmoid is requested.
Parameter estimates converged after 12 iterations.
Optimal solution found.

Parameter Estimates (PROBIT model: (PROBIT(p)) = Intercept + BX):

	Regression Coeff.	Standard Error	Coeff./S.E.
VAR00009	.00030	.00004	7.76754

Intercept	Standard Error	Intercept/S.E.
-1.15841	.10302	-11.24407

Pearson Goodness-of-Fit Chi Square = 12.673 DF = 8 P = .124

Since Goodness-of-Fit Chi square is significant, a heterogeneity factor is used in the calculation of confidence limits.

PROBIT ANALYSIS

Observed and Expected Frequencies

Number of CONC	Number of Subjects	Observed Responses	Expected Responses	Residual	Prob
5000.00	40.0	21.0	25.449	-4.449	.63622
4000.00	40.0	23.0	20.750	2.250	51875
3000.00	40.0	18.0	15.985	2.015	.39962
2000.00	40.0	13.0	11.568	1.432	.28921
1000.00	40.0	12.0	7.828	4.172	.19571
100.00	40.0	5.0	5.184	-.184	.12960
10.00	40.0	2.0	4.959	-2.959	.12396
1.00	40.0	1.0	4.936	-3.936	.12341
.00	40.0	5.0	4.934	.066	.12335
.00	40.0	7.0	4.934	2.066	.12335

PROBIT ANALYSIS
Confidence Limits for Effective CONC

95% Confidence Limits			
Prob	**Conc**	**Lower**	**Upper**
.01	-3875.58078	-7433.12623	-2194.66225
.02	-2971.01275	-6007.91575	-1517.16867
.03	-2397.09334	-5107.41908	-1083.56703
.04	-1965.35612	-4432.74497	-754.65094
.05	-1614.17120	-3886.23552	-484.81718
.06	-1315.25768	-3423.12076	-253.09566
.07	-1053.16899	-3018.98055	-48.00039
.08	-818.49983	-2658.97360	-137.49039
.09	-605.07762	-2333.38553	-308.01067
.10	-408.62213	-2035.50459	-466.79827
.15	404.75611	-828.81127	1150.83476
.20	1051.20335	80.31683	1744.39877
.25	1605.79752	801.09876	2312.79287
.30	2103.84023	1386.45268	2885.15886
.35	2565.35102	1874.71393	3469.69766
.40	3003.27962	2297.48899	4064.90492
.45	3426.98062	2678.64907	4668.65453
.50	3843.96400	3034.94662	5281.65129
.55	4260.94738	3378.27358	5907.61864
.60	4684.64837	3717.83649	6552.96542
.65	5122.57698	4061.82541	7226.95883
.70	5584.08777	4418.83548	7942.74880
.75	6082.13048	4799.52718	8719.77701
.80	6636.72465	5219.39612	9589.08410
.85	7283.17189	5704.93360	10606.23873
.90	8096.55012	6311.69073	11890.21141
.91	8293.00562	6457.71250	12200.85818
.92	8506.42783	6616.15256	12538.52648
.93	8741.09699	6790.15467	12910.02208
.94	9003.18567	6984.25090	13325.16134
.95	9302.09920	7205.34464	13798.90388
.96	9653.28412	7464.76999	14355.82173
.97	10085.02134	7783.27189	15040.91004
.98	10658.94075	8206.04170	15952.23854
.99	11563.50877	8871.21146	17389.77284

Table A10 Lethal concentration (LC_{50}) of compound 2 against adult brown planthoppers by Topical application method

Treatments	**Concentration (ppm)**	**%Mortality 24 h.**			
		1	**2**	**3**	**4**
Control		0	0	1	0
Acetone		0	1	1	0
Compound 2					
	1,000	2	3	3	4
	2,000	3	6	4	5
	3,000	5	3	8	4
	3,800	5	8	5	6

* Temperature 25 °C Humidity 70% Light Intensity 270 μE 14L/10D Control = no treat

Probit analysis Lethal concentration (LC_{50}) of compound 2 against adult brown planthopper by Topical application method

DATA Information

4 unweighted cases accepted.

2 cases rejected because of missing data.

0 cases are in the control group.

MODEL Information

ONLY Normal Sigmoid is requested.

PROBIT ANALYSIS

Parameter estimates converged after 10 iterations.

Optimal solution found.

Parameter Estimates (PROBIT model: (PROBIT(p)) = Intercept + BX):

	Regression Coeff.	Standard Error	Coeff./S.E.
CONC. 00026	.00010	2.69287	

	Intercept	Standard Error	Intercept/S.E.
	-.73588	.25949	-2.83587

Pearson Goodness-of-Fit Chi Square = .311 DF = 2 P = .856

Since Goodness-of-Fit Chi square is NOT significant, no heterogeneity factor is used in the calculation of confidence limits.

PROBIT ANALYSIS

Observed and Expected Frequencies

Number of CONC	Number of Subjects	Observed Responses	Expected Responses	Residual	Prob
3800.00	40	24.0	23.996	0.004	0.59989
3000.00	40	20.0	20.716	-0.716	0.51789
2000.00	40	18.0	16.589	1.411	0.41474
1000.00	40	12.0	12.687	-0.687	0.31717
.00	40	2.0	20.750	2.066	0.39962
.00	40	1.0	11.568	4.172	0.28921

PROBIT ANALYSIS
Confidence Limits for Effective CONC

95% Confidence Limits			
Prob	**Conc**	**Lower**	**Upper**
.01	-6111.38654	-29120.77816	-2448.55341
.02	-5063.92569	-25278.32831	-1835.98699
.03	-4399.34536	-22841.41212	-1446.33818
.04	-3899.40747	-21008.89890	-1152.53667
.05	-3492.74656	-19518.83642	-913.00613
.06	-3146.61426	-18251.02957	-708.65768
.07	-2843.12394	-17139.83640	-529.05864
.08	-2571.38455	-16145.29320	-367.85136
.09	-2324.24846	-15241.17705	-220.85870
.10	-2096.75928	-14409.30875	-85.17962
.15	-1154.89328	-10970.38324	481.79955
.20	-406.32805	-8247.06851	942.25087
.25	235.87426	-5924.38730	1350.95745
.30	812.59179	-3860.62105	1740.06184
.35	1347.00653	-1990.00764	2142.39863
.40	1854.11386	-309.77396	2618.97242
.45	2344.74606	1074.84963	3321.08502
.50	2827.59948	1992.50836	4457.07807
.55	3310.45290	2550.79912	5952.43909
.60	3801.08510	2964.00861	7625.96579
.65	4308.19243	3328.45932	9418.32256
.70	4842.60717	3682.34353	11337.38855
.75	5419.32469	4047.03634	13425.56638
.80	6061.52701	4441.85179	15762.13871
.85	6810.09224	4893.61410	18494.14245
.90	7751.95824	5454.69014	21938.97109
.91	7979.44742	5589.39898	22771.80964
.92	8226.58351	5735.47181	23676.84563
.93	8498.32290	5895.80174	24672.26616
.94	8801.81321	6074.55757	25784.30254
.95	9147.94552	6278.08740	27052.92802
.96	9554.60643	6516.81168	28543.79675
.97	10054.54432	6809.80118	30377.12199
.98	10719.12464	7198.59883	32814.88934
.99	11766.58549	7810.18741	36658.31703

Table A11 The results of validate method

CLUSTERING HISTOGRAM

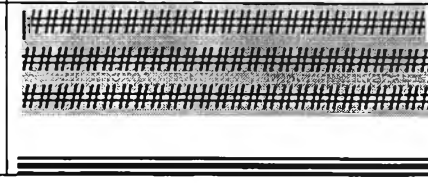
Cluster Rank	Lowest Docking Energy	Run	Mean Docked Energy	Num in Clus	Histogram
1	-13.06	38	-13.03	100	

Table A12 The results of docking of carbosulfan

CLUSTERING HISTOGRAM

Cluster Rank	Lowest Docking Energy	Run	Mean Docked Energy	Num in Clus	Histogram
1	-14.62	93	-13.66	9	#########
2	-14.34	13	-13.49	5	#####
3	-13.87	34	-12.36	19	###################
4	-13.86	42	-12.70	11	###########
5	-13.03	73	-12.99	3	###
6	-12.50	63	-12.50	1	#
7	-12.49	25	-11.65	2	##
8	-12.40	90	-11.28	16	################
9	-11.87	81	-11.55	6	######
10	-11.68	22	-10.69	4	####
11	-11.52	98	-11.41	2	##
12	-11.45	46	-11.45	1	#
13	-11.19	91	-11.19	1	#
14	-9.89	94	-9.58	3	###
15	-9.56	8	-9.56	1	#
16	-9.38	56	-9.22	2	##
17	-9.38	62	-9.38	1	#
18	-9.24	70	-7.66	2	##
19	-9.23	3	-9.23	1	#
20	-8.75	18	-8.65	2	##
21	-8.49	66	-8.49	1	#
22	-8.45	39	-8.45	1	#
23	-8.34	5	-8.34	1	#
24	-8.20	28	-8.11	2	##
25	-7.92	32	-7.92	1	#
26	-7.01	68	-6.87	2	##

Table A13 The results of docking of compound 1

CLUSTERING HISTOGRAM

Cluster Rank	Lowest Docking Energy	Run	Mean Docked Energy	Num in Clus	Histogram
1	-11.01	94	-9.72	7	#######
2	-9.77	8	-8.88	13	#############
3	-9.63	14	-9.10	4	####
4	-9.38	9	-8.96	9	#########
5	-9.26	58	-8.69	9	#########
6	-9.10	20	-8.58	12	############
7	-8.69	69	-8.37	6	######
8	-8.58	31	-8.35	3	###
9	-8.56	27	-8.24	13	#############
10	-8.52	29	-8.15	6	######
11	-8.43	76	-8.43	1	#
12	-8.42	79	-8.33	2	##
13	-8.34	17	-7.99	6	######
14	-8.27	49	-8.27	1	#
15	-8.06	48	-8.06	1	#
16	-8.04	81	-8.04	1	#
17	-8.00	83	-8.00	1	#
18	-7.97	96	-7.97	1	#
19	-7.97	37	-7.97	1	#
20	-7.94	54	-7.89	2	##
21	-7.64	89	-7.64	1	#

Table A14 The results of docking of compound 2

CLUSTERING HISTOGRAM

Cluster Rank	Lowest Docking Energy	Run	Mean Docked Energy	Num in Clus	Histogram
1	-10.48	61	-9.63	20	###################
2	-10.30	71	-9.37	7	#######
3	-10.28	84	-9.53	5	#####
4	-10.08	28	-9.28	5	#####
5	-9.80	72	-9.80	1	#
6	-9.63	96	-8.72	7	#######
7	-9.42	32	-8.86	14	##############
8	-9.21	80	-8.47	3	###
9	-9.18	81	-9.07	4	####
10	-9.13	88	-8.40	7	#######
11	-9.13	48	-8.93	3	###
12	-9.07	39	-8.88	3	###
13	-8.80	99	-8.70	2	##
14	-8.79	10	-8.61	2	##
15	-8.78	70	-8.78	1	#
16	-8.60	9	-8.60	1	#
17	-8.51	19	-8.09	10	##########
18	-8.48	66	-8.48	1	#
19	-8.41	100	-8.41	1	#
20	-8.27	1	-8.27	1	#
21	-7.95	41	-7.95	1	#
22	-7.93	89	-7.93	1	#

APPENDIX B

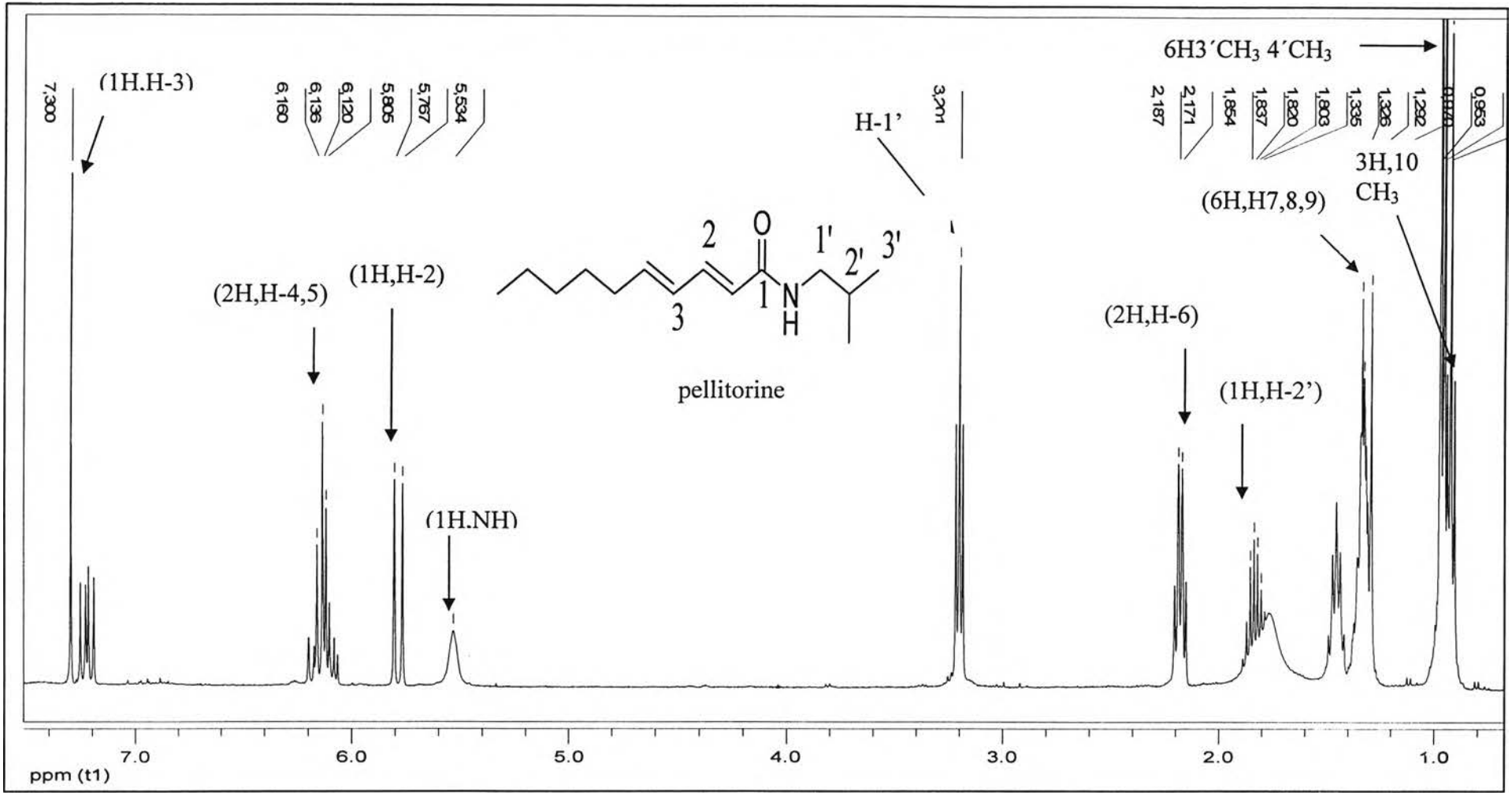


Figure 1 The ^{1}H-NMR ($CDCl_3$) spectrum of compound **1**

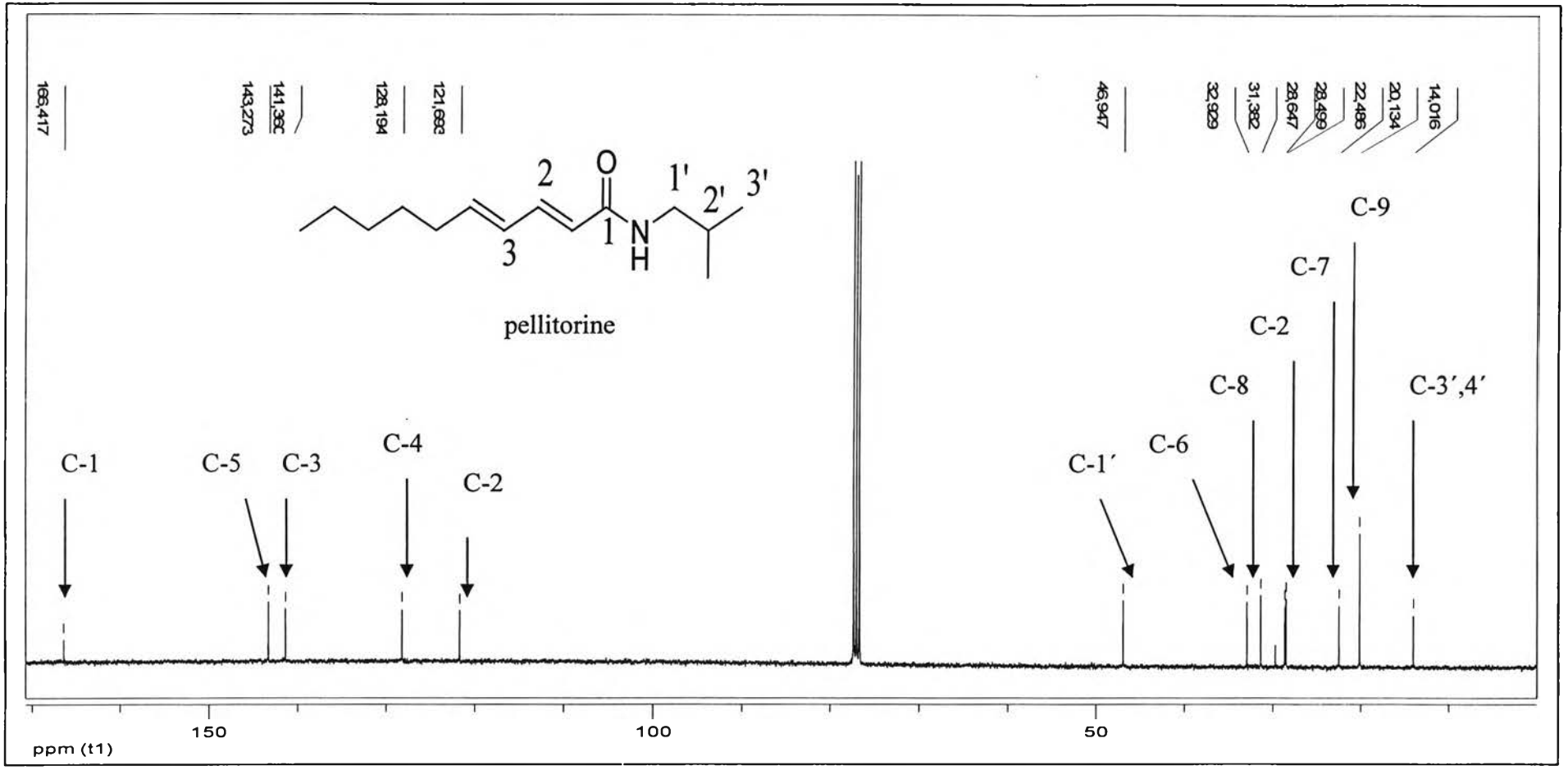


Figure 2 The ^{13}C-NMR ($CDCl_3$) spectrum of compound **1**

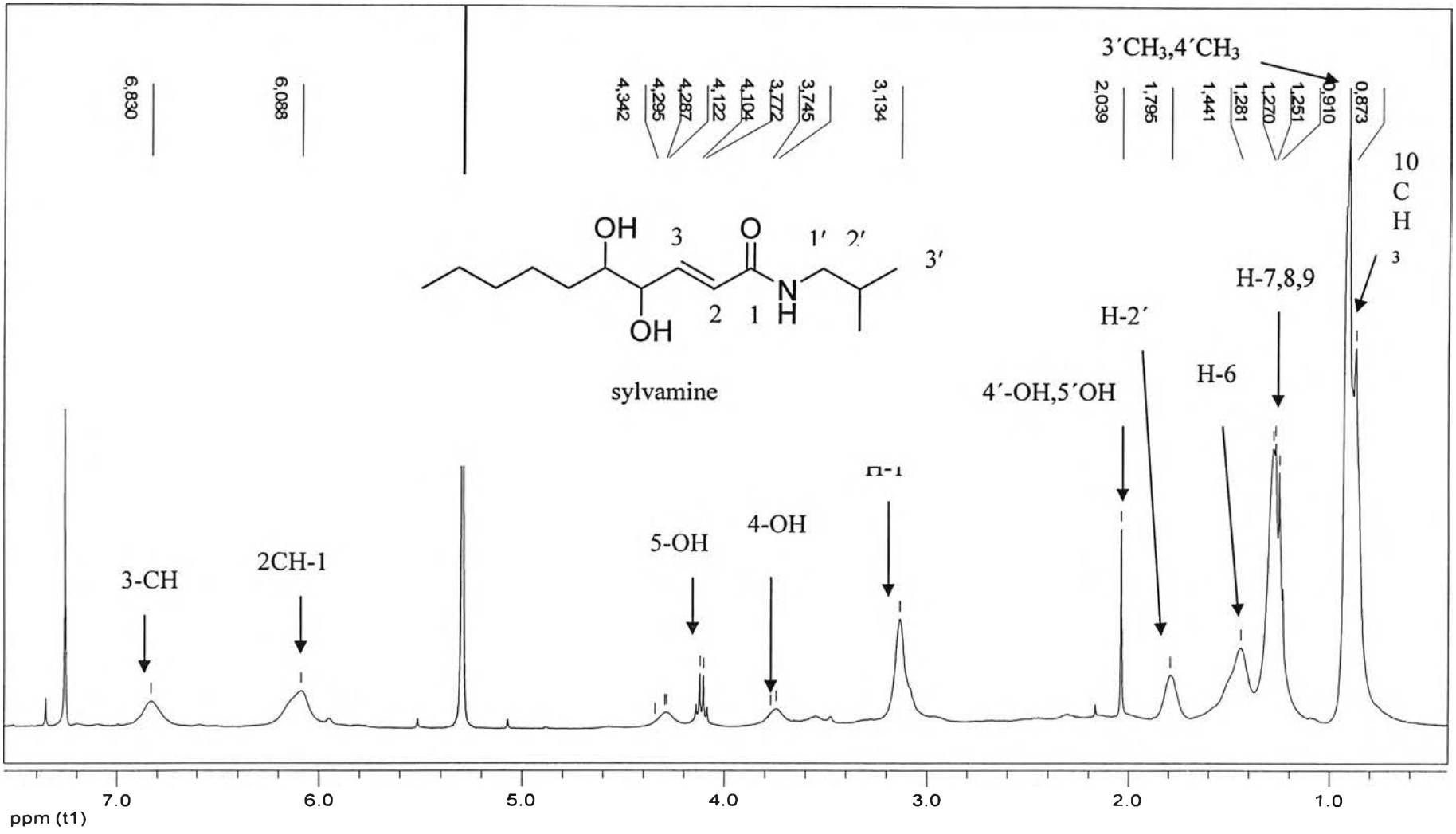


Figure 3 The ^{1}H-NMR ($CDCl_3$) spectrum of compound **2**

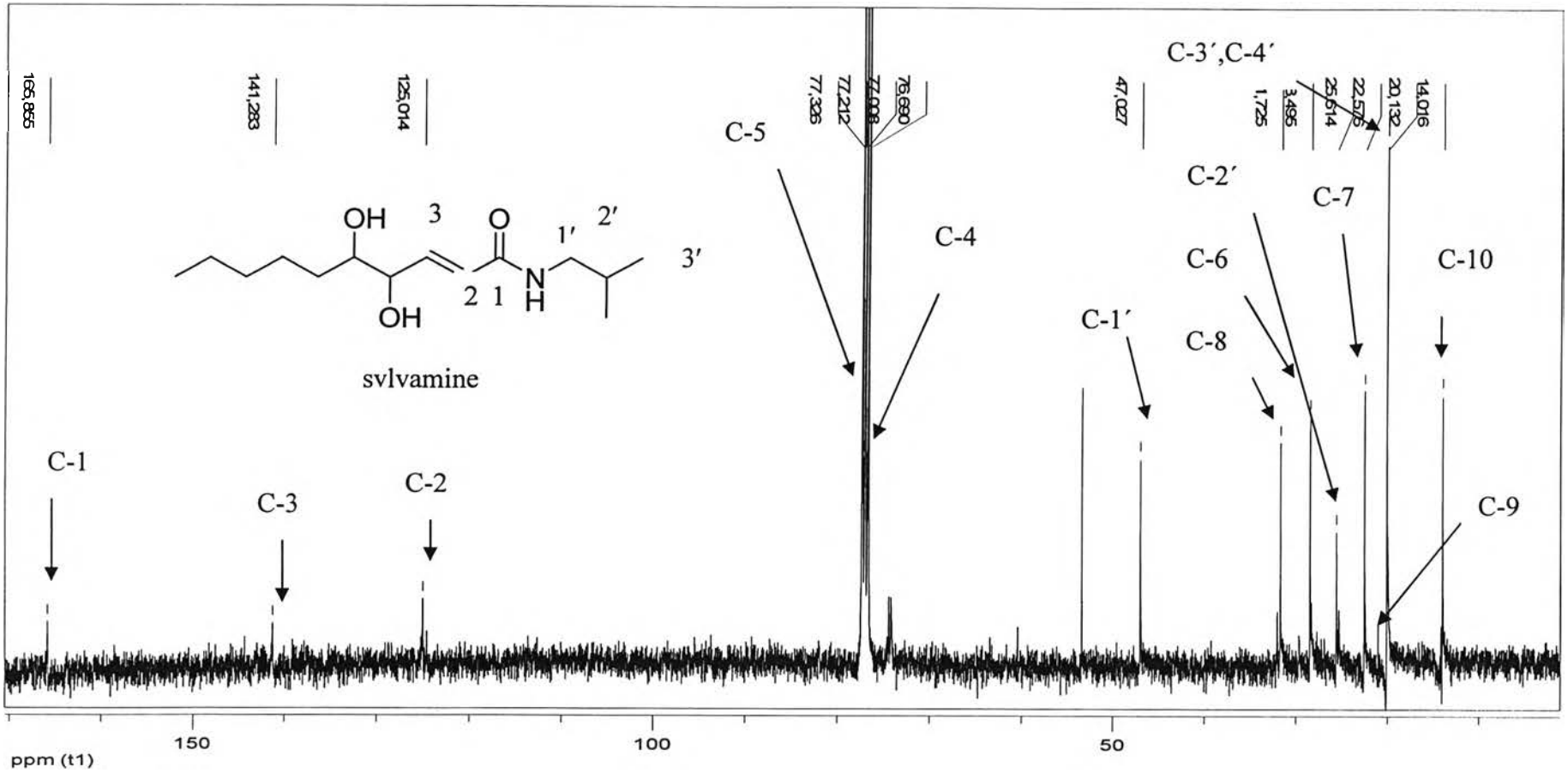


Figure 4 The ^{13}C-NMR ($CDCl_3$) spectrum of compound **2**

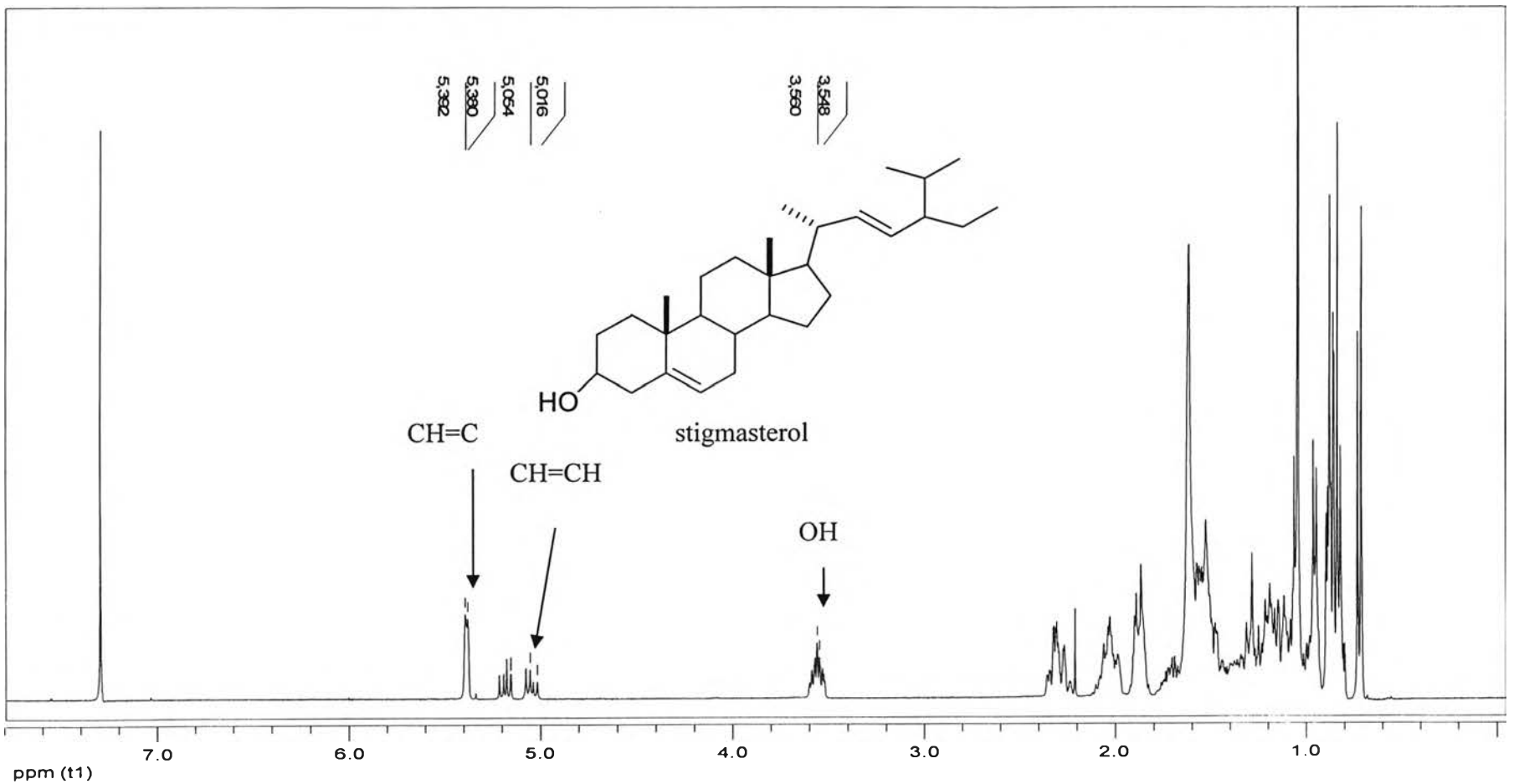


Figure 5 The ^{1}H-NMR ($CDCl_3$) spectrum of compound **3**

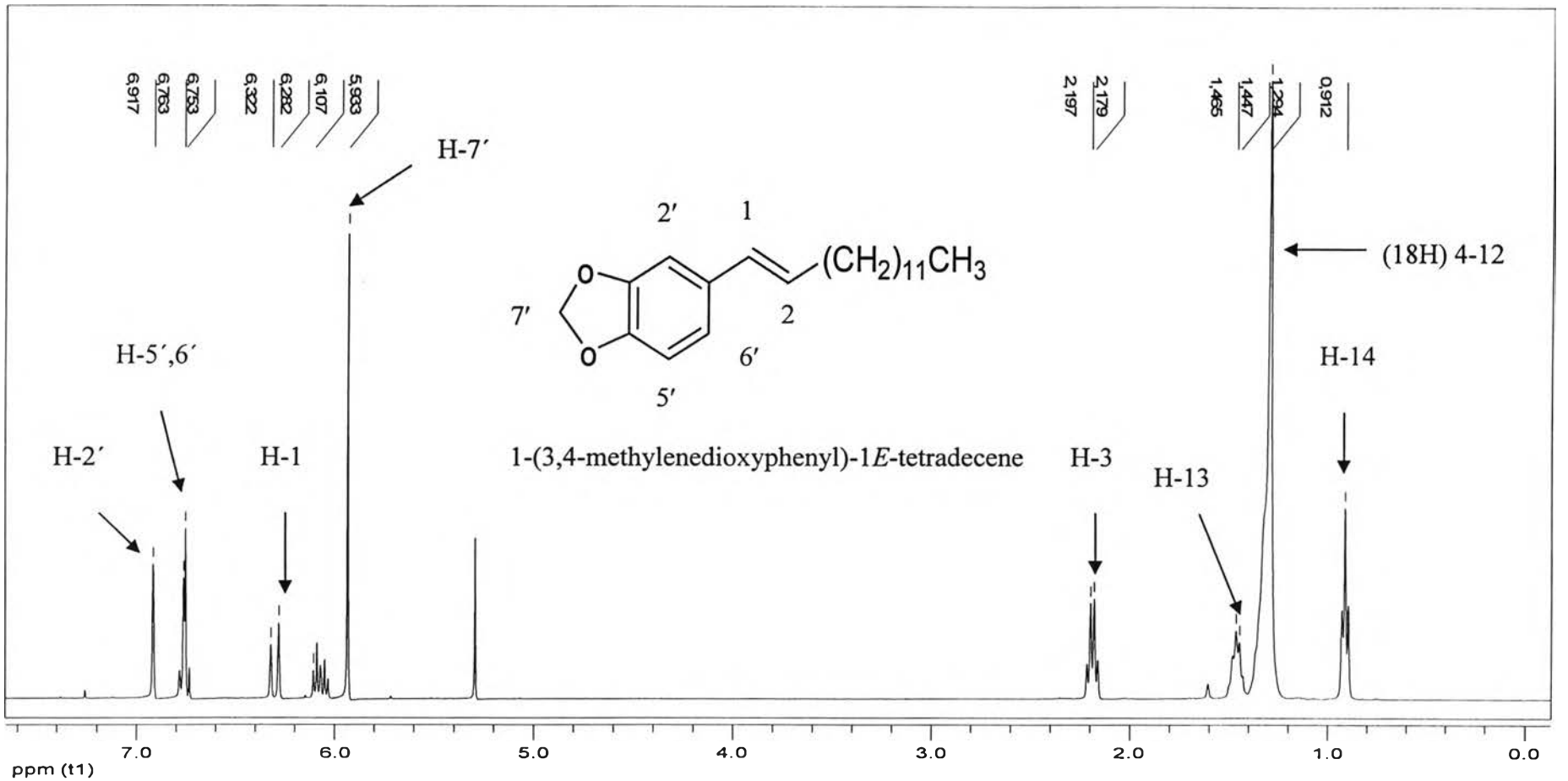


Figure 6 The ^{1}H-NMR ($CDCl_3$) spectrum of compound **4**

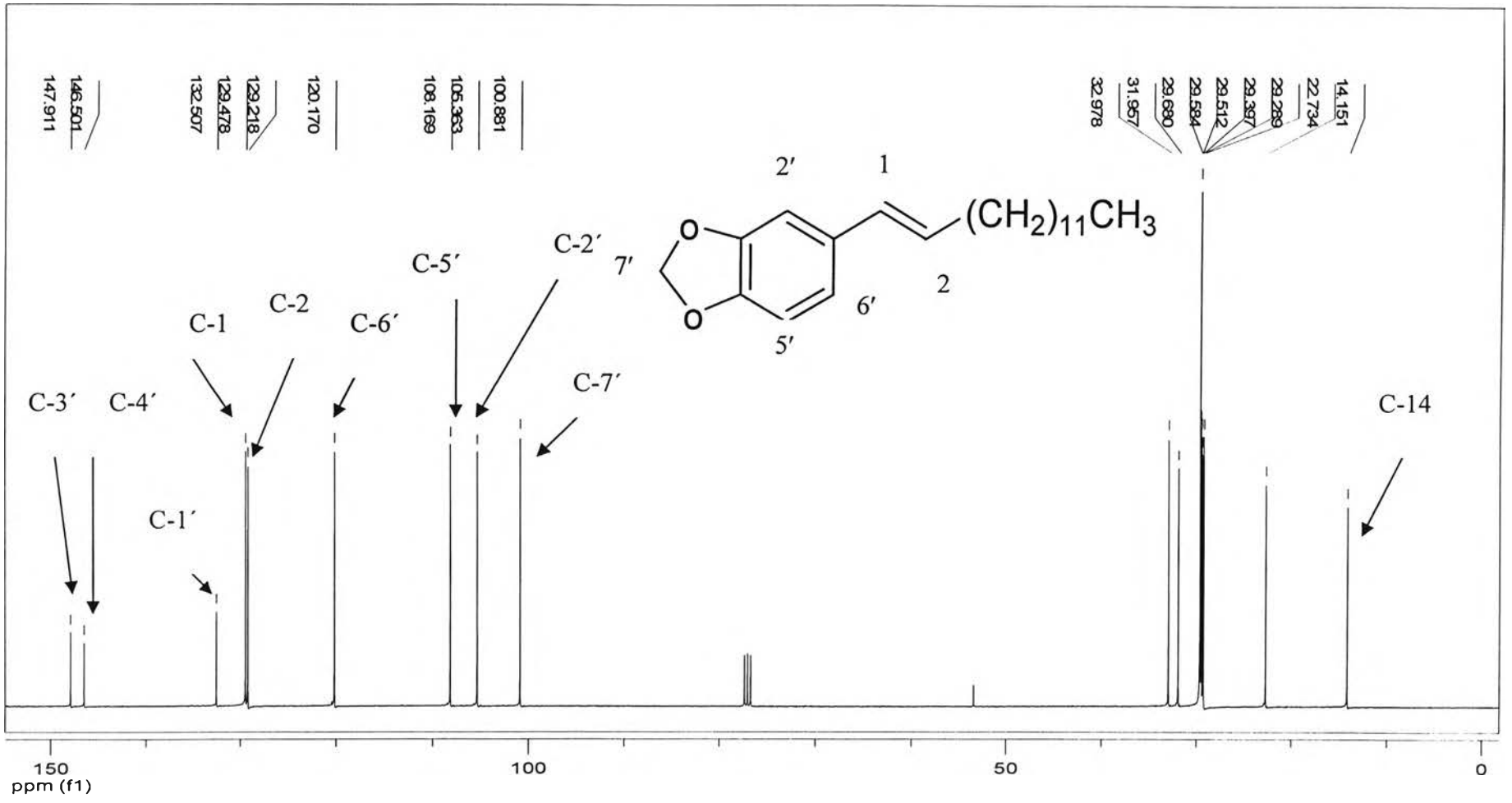


Figure 7 The ^{1}C-NMR ($CDCl_3$) spectrum of compound **4**

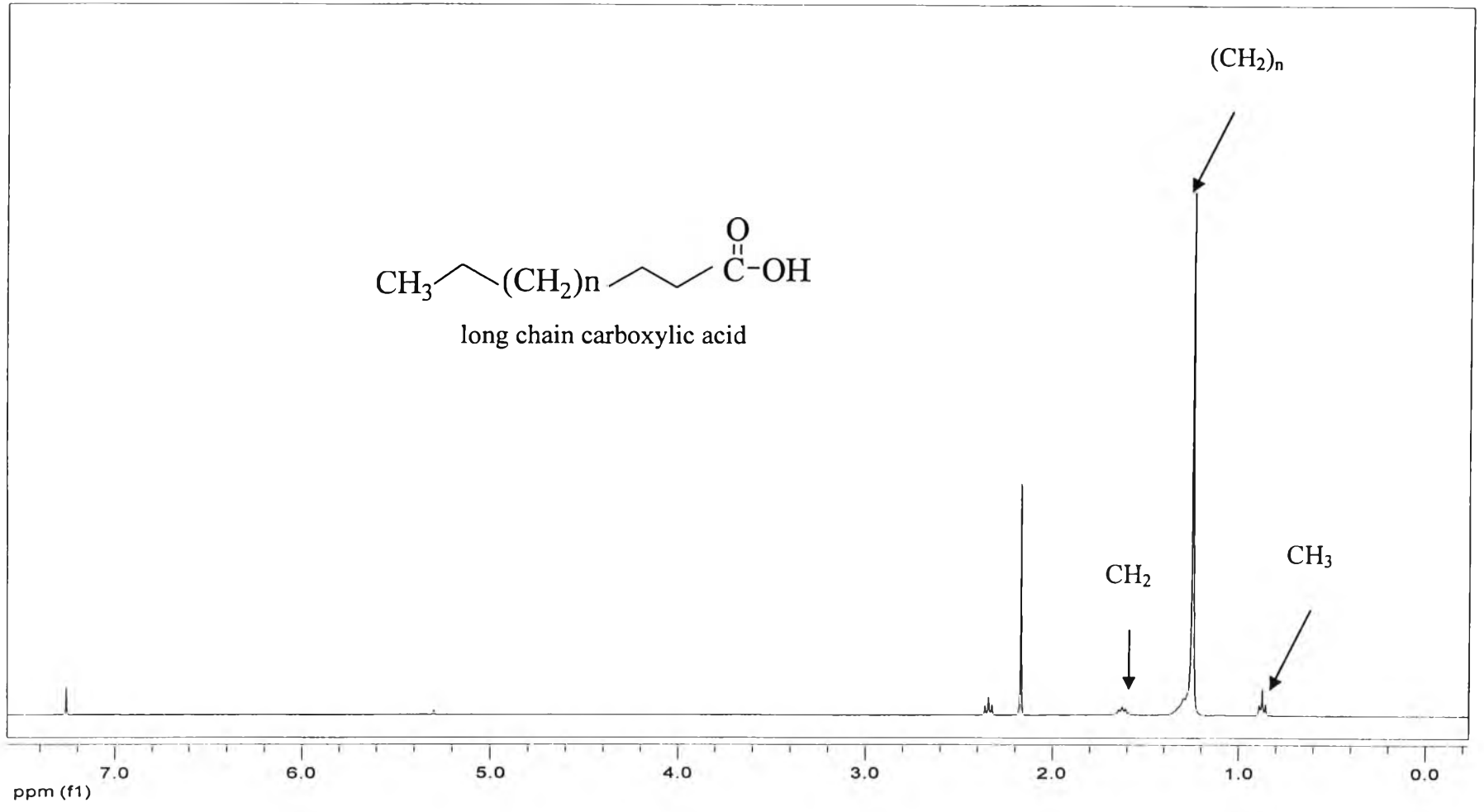


Figure 8 The ^{1}H-NMR ($CDCl_3$) spectrum of compound **5**

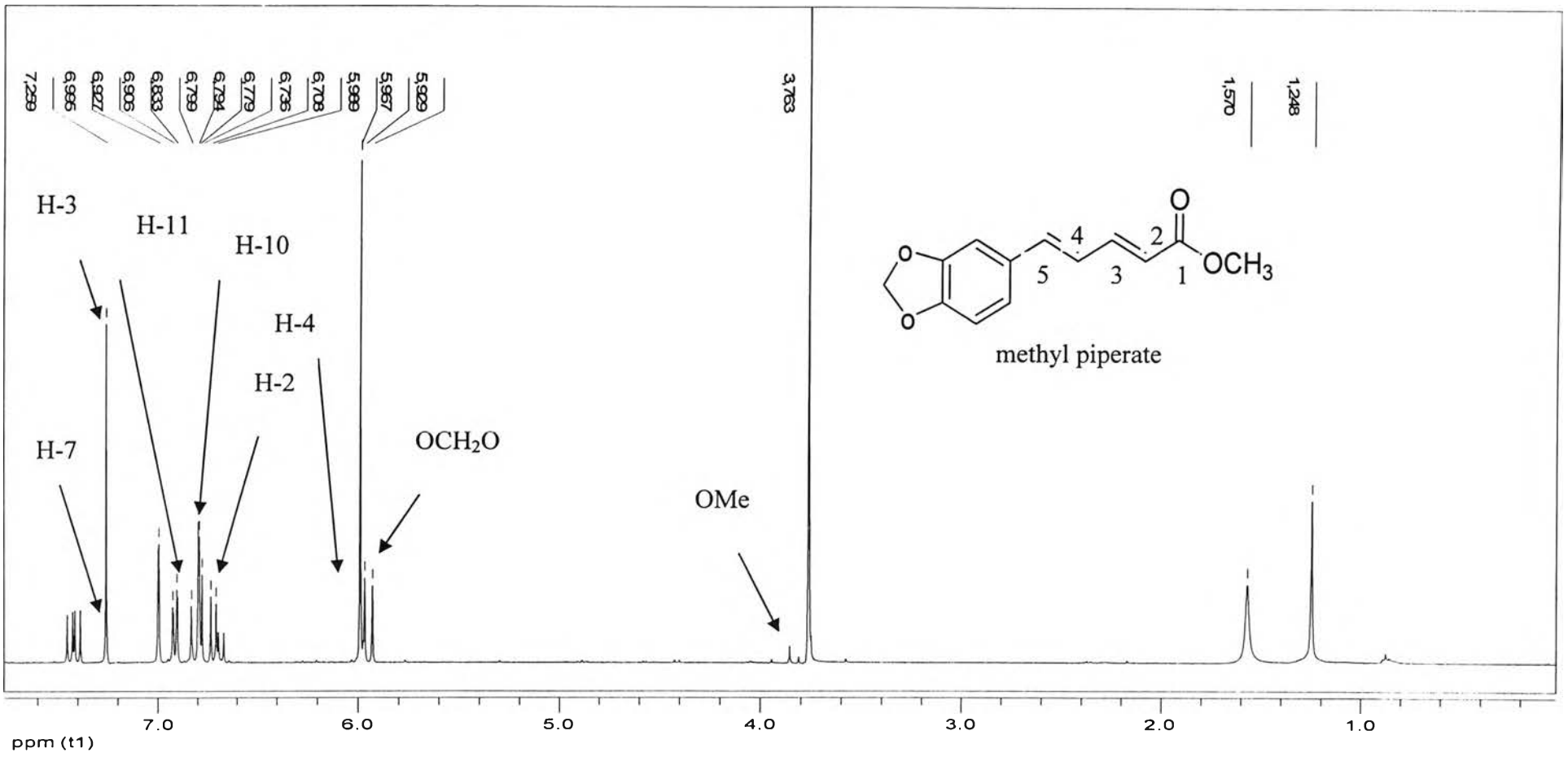


Figure 9 The ^{1}H-NMR ($CDCl_3$) spectrum of compound **6**

VITA

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