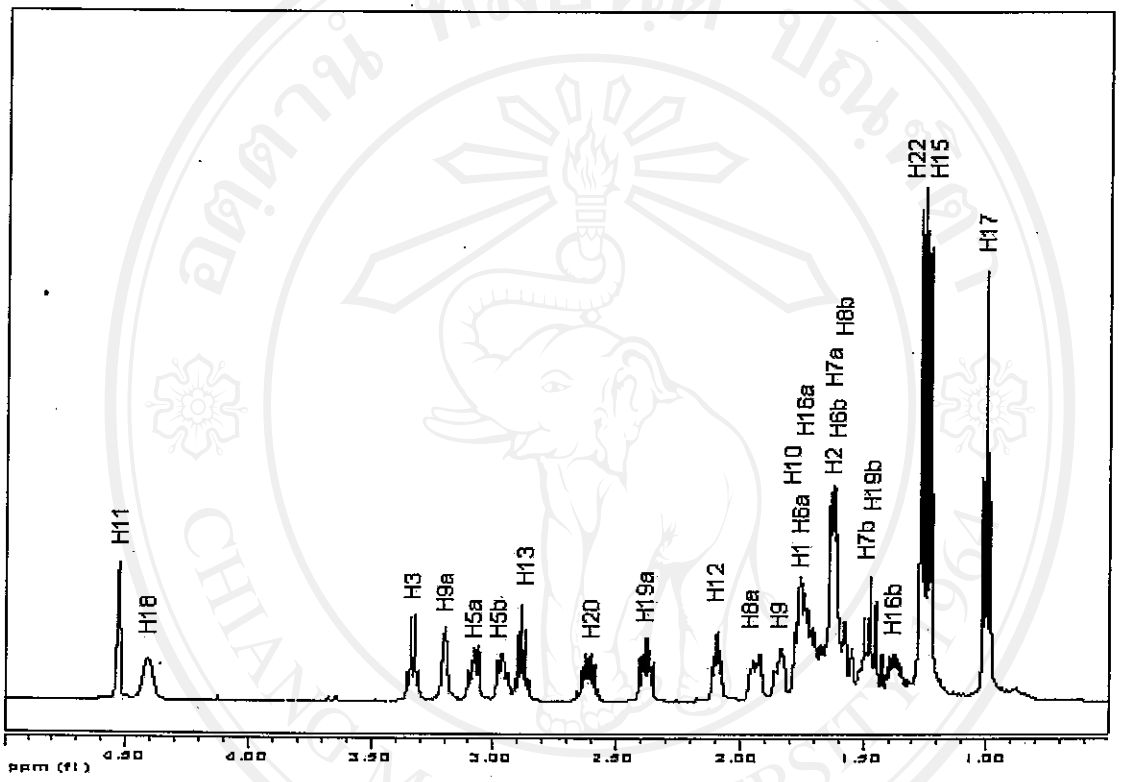
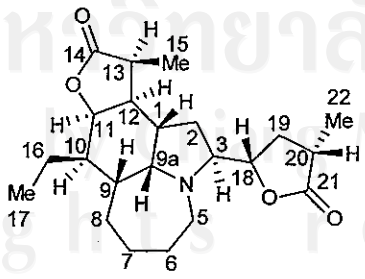
APPENDICES



Appendix 1 ^{1}H NMR spectrum of neotuberostemonine (**13**) from unknown 1 ($CDCl_3$, TMS , δ 0 as reference)



Neotuberostemonine (**13**)

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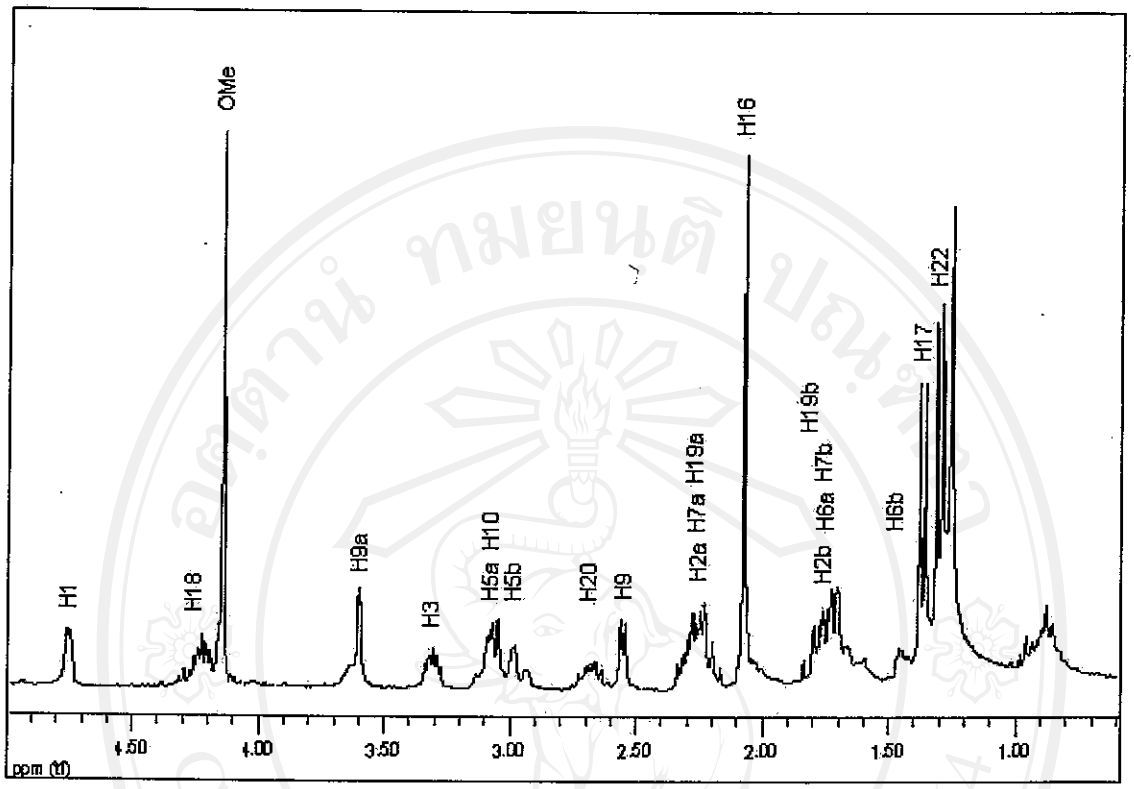
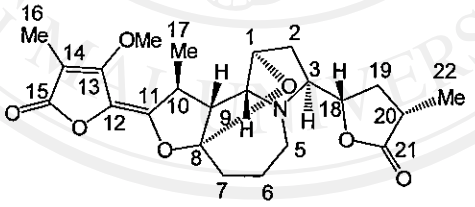


Appendix 2 ^{1}H NMR spectrum of oxyprotostemonine (**21**) from *S. curtisii* ($CDCl_3$, TMS , δ 0 as reference)



Oxyprotostemonine (**21**)

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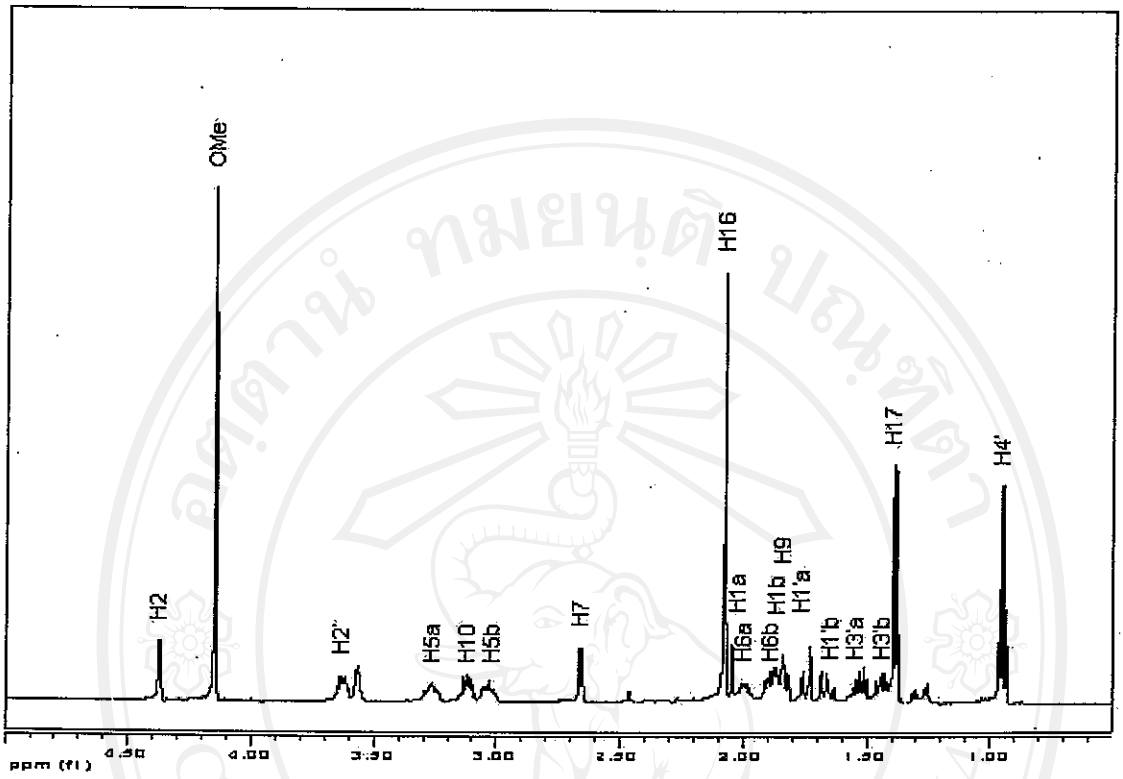
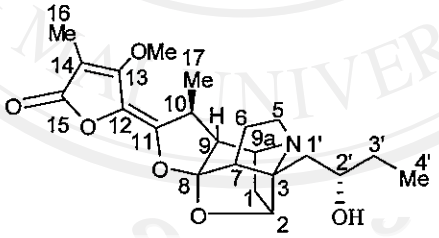


Appendix 3 ^{1}H NMR spectrum of (2′*S*)-hydroxystemofoline (**51**) from unknown 1 ($CDCl_3$, TMS , δ 0 as reference)



(2′*S*)-Hydroxystemofoline (**51**)

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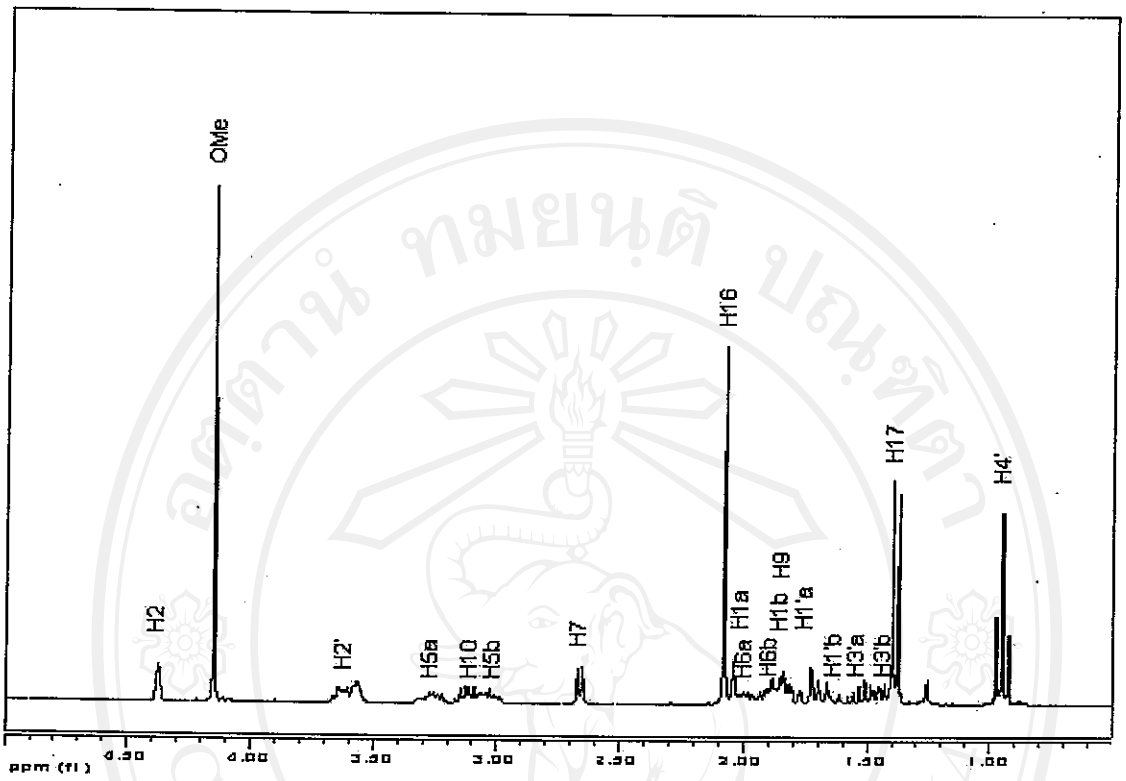
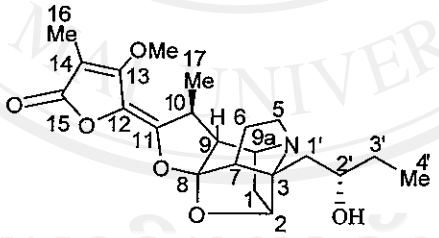


Appendix 4 ^{1}H NMR spectrum of (2′*S*)-hydroxystemofoline (**51**) from unknown 2 ($CDCl_3$, TMS , δ 0 as reference)



(2′*S*)-Hydroxystemofoline (**51**)

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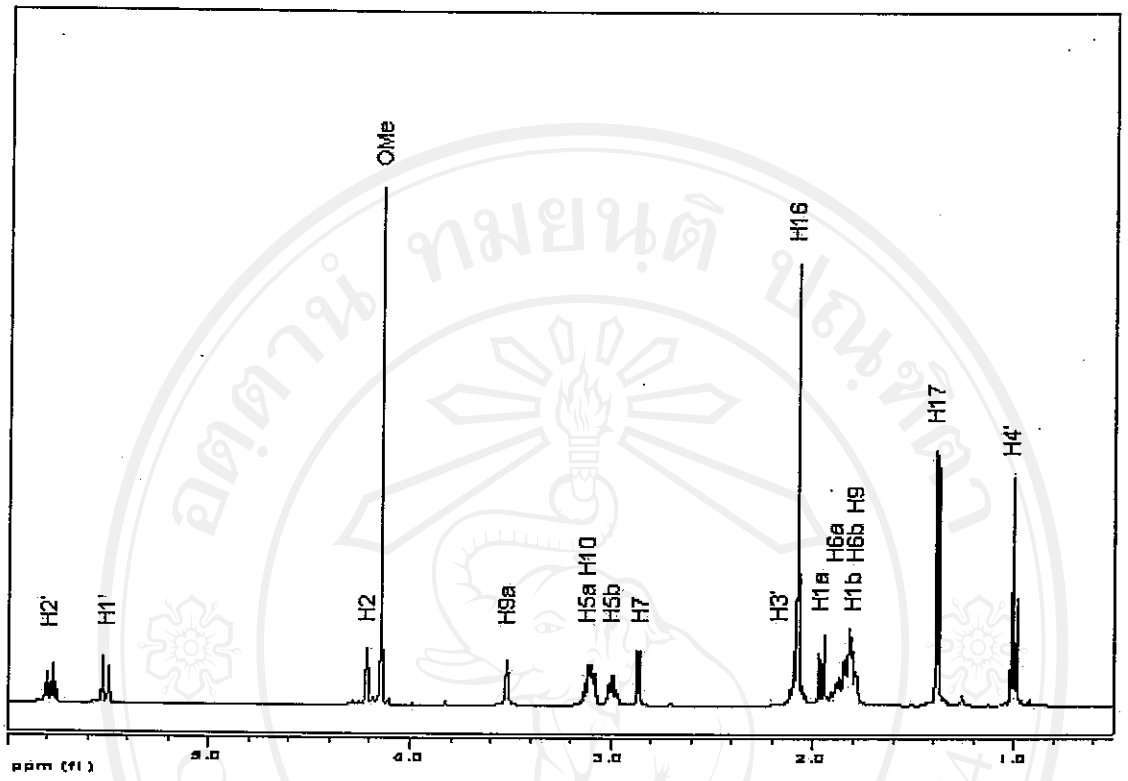
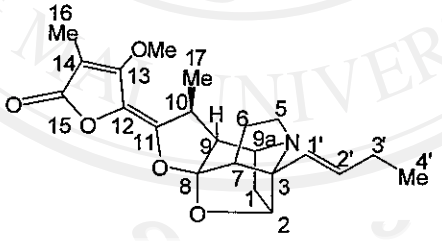


Appendix 5 ^{1}H NMR spectrum of (11*Z*)- 1′,2′-didehydrostemofoline (**52**) from unknown 2 ($CDCl_3$, TMS , δ 0 as reference)



(11Z)-1',2'-Didehydrostemofoline (**52**)

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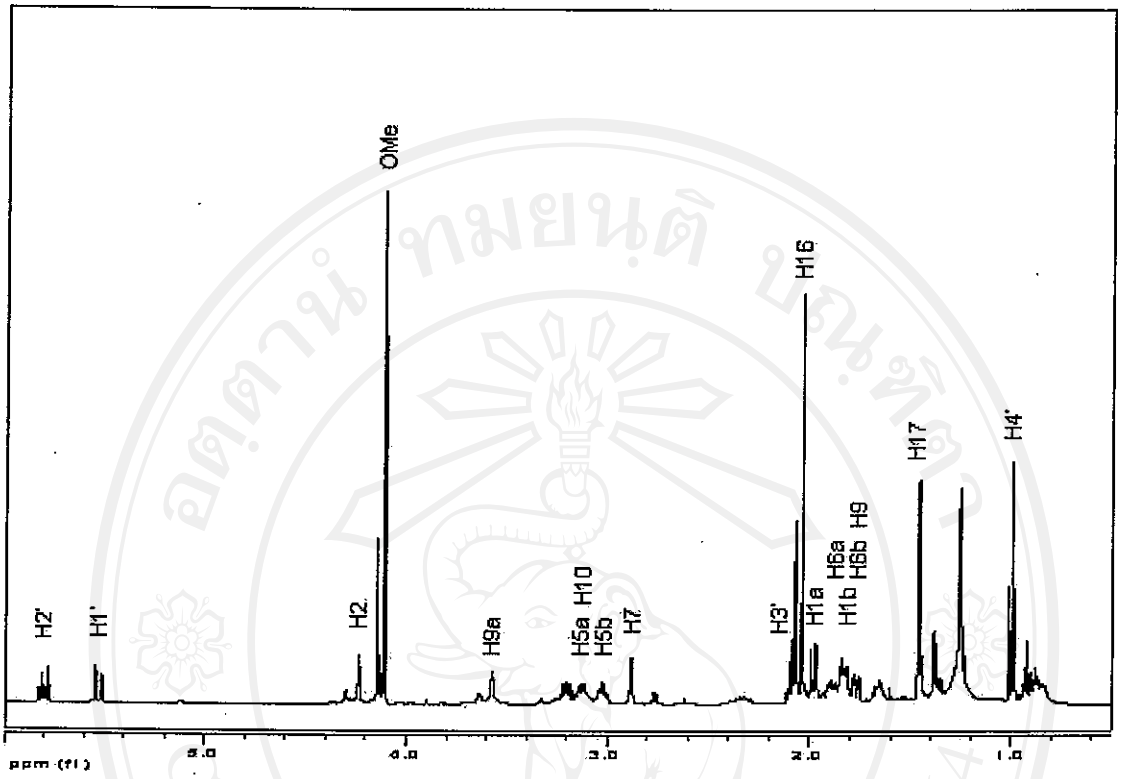
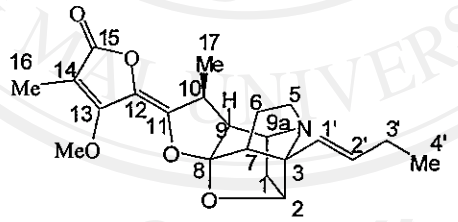


Appendix 6 ^{1}H NMR spectrum of (11*E*)- 1′,2′-didehydrostemofoline (**53**) from unknown 2 ($CDCl_3$, TMS , δ 0 as reference)



(11*E*)-1',2'-Didehydrostemofoline (**53**)

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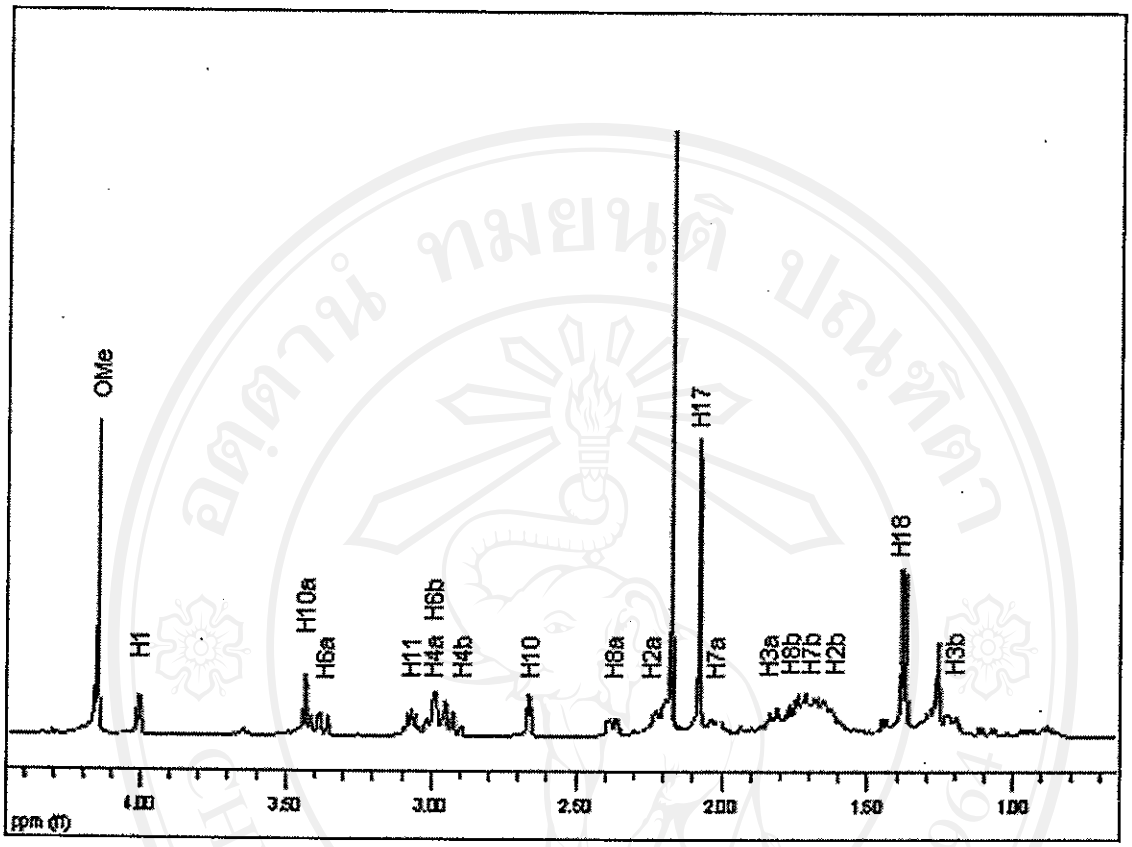
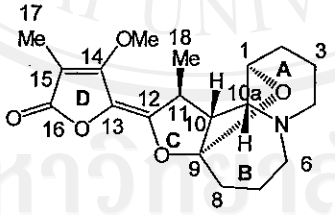


Appendix 7 ^{1}H NMR spectrum of stemocurtisine (**58**) from *S. curtisii* ($CDCl_3$, TMS , δ 0 as reference)



Stemocurtisine (**58**)

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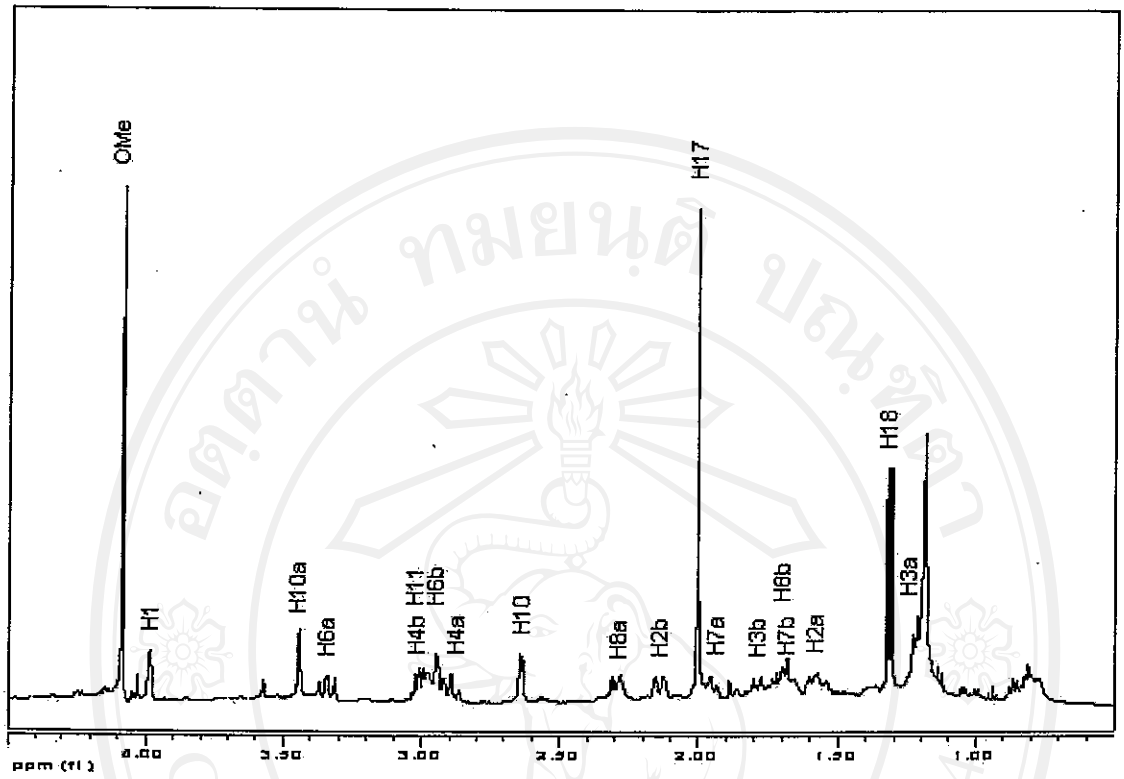
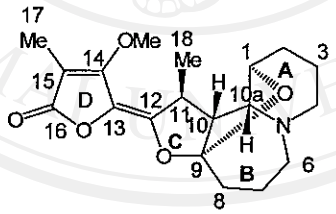


Appendix 8 ^{1}H NMR spectrum of stemocurtisine (**58**) from unknown 1

($CDCl_3$, TMS , δ 0 as reference)



Stemocurtisine (**58**)

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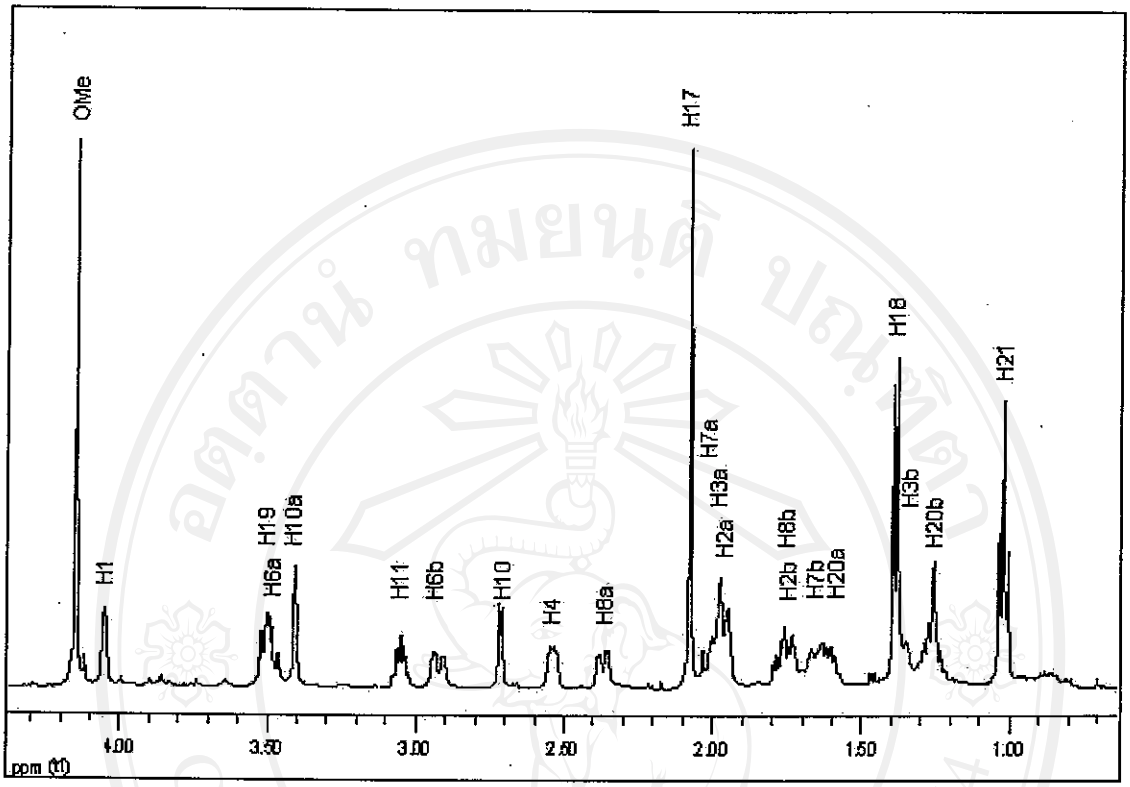
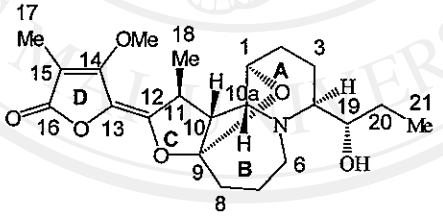


Appendix 9 ^{1}H NMR spectrum of stemocurtisinol (**63**) from *S. curtisii* ($CDCl_3$, TMS , δ 0 as reference)



Stemocurtisinol (**63**)

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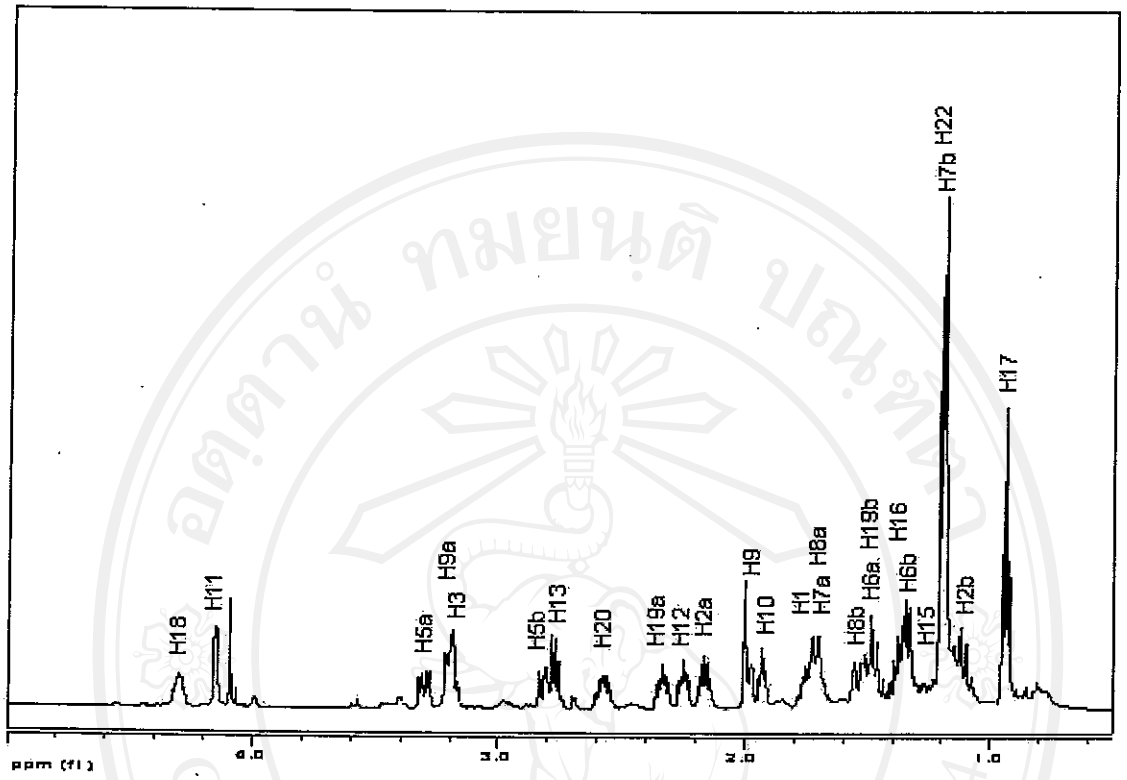
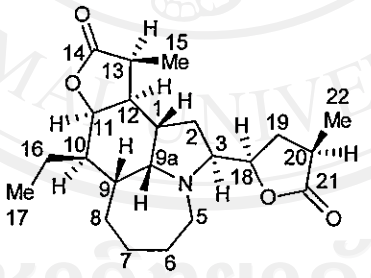


Appendix 10 ^{1}H NMR spectrum of tuberostemonine L (**69**) from unknown 1 ($CDCl_3$, TMS , δ 0 as reference)



Tuberostemonine L (**69**)

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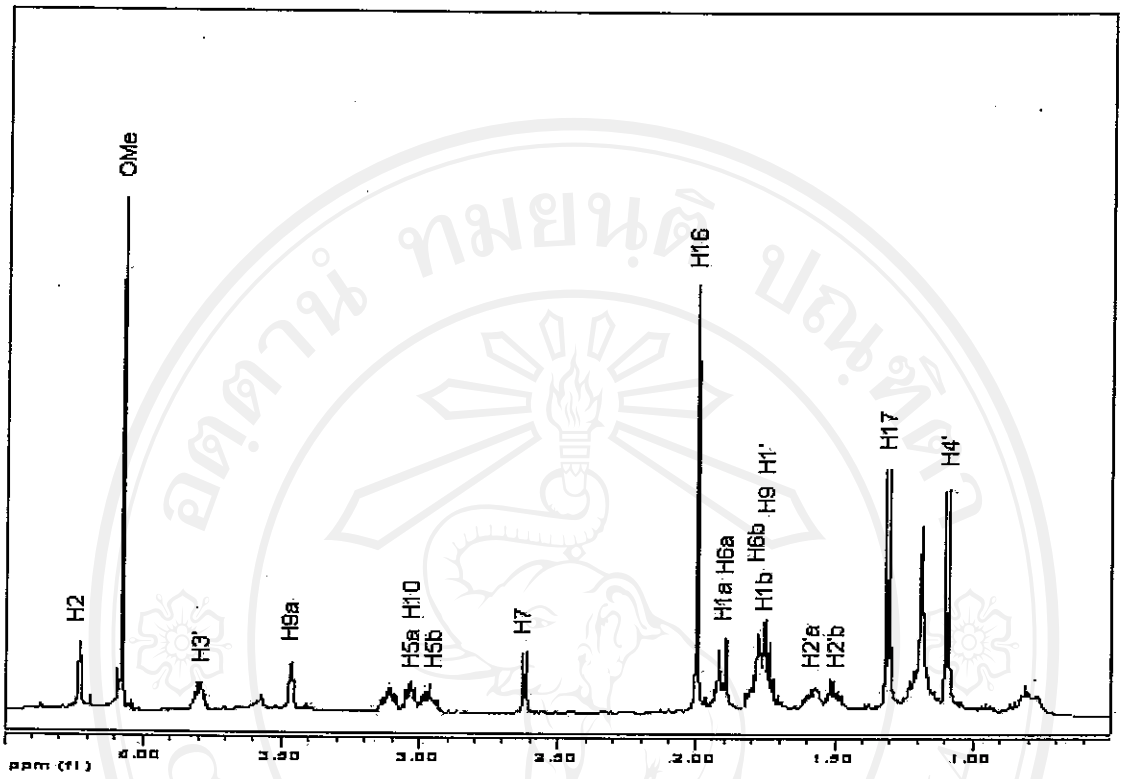
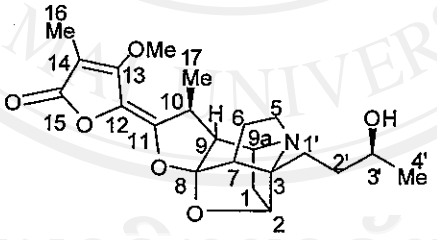


Appendix 11 ^{1}H NMR spectrum of (3′*S*)-hydroxystemofoline (**70**) from unknown 1 ($CDCl_3$, TMS , δ 0 as reference)



(3'*S*)-Hydroxystemofoline (**70**)

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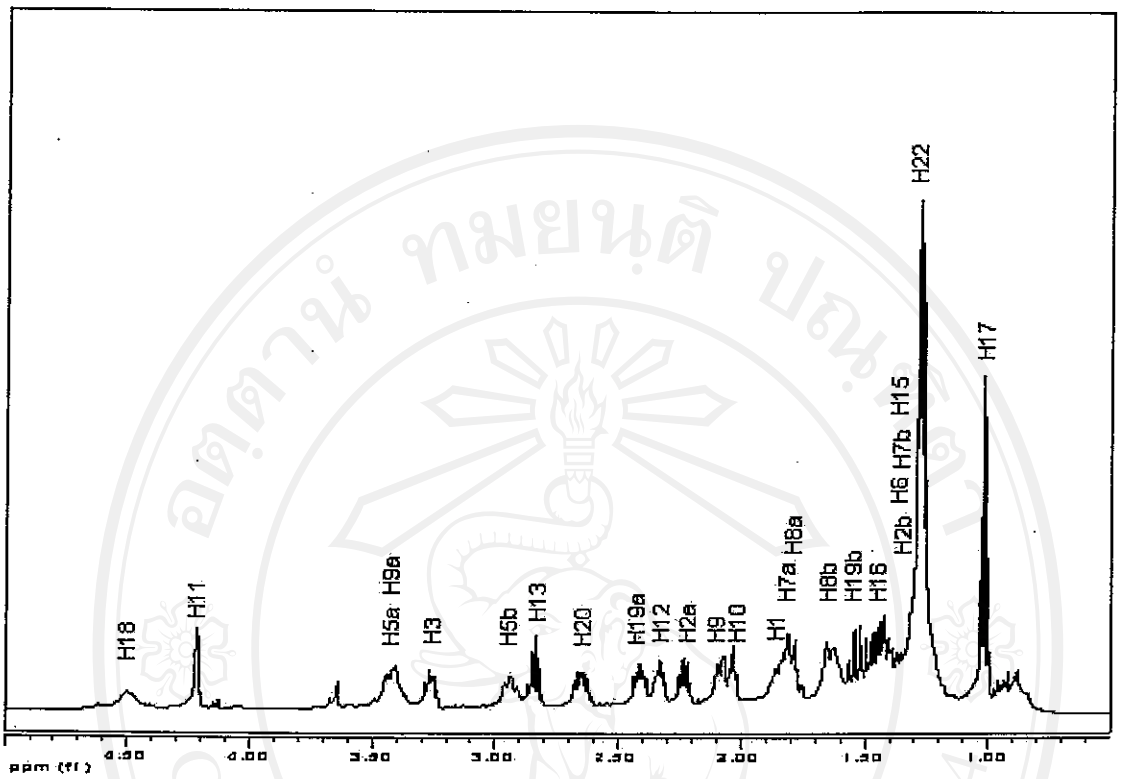
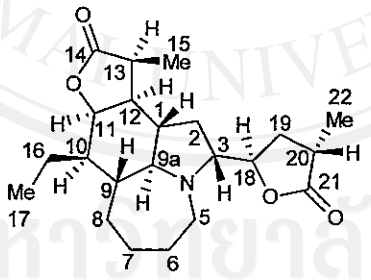


Appendix 12 ^{1}H NMR spectrum of tuberostemonine M (**71**) from unknown 1 ($CDCl_3$, TMS , δ 0 as reference)



Tuberostemonine M (**71**)

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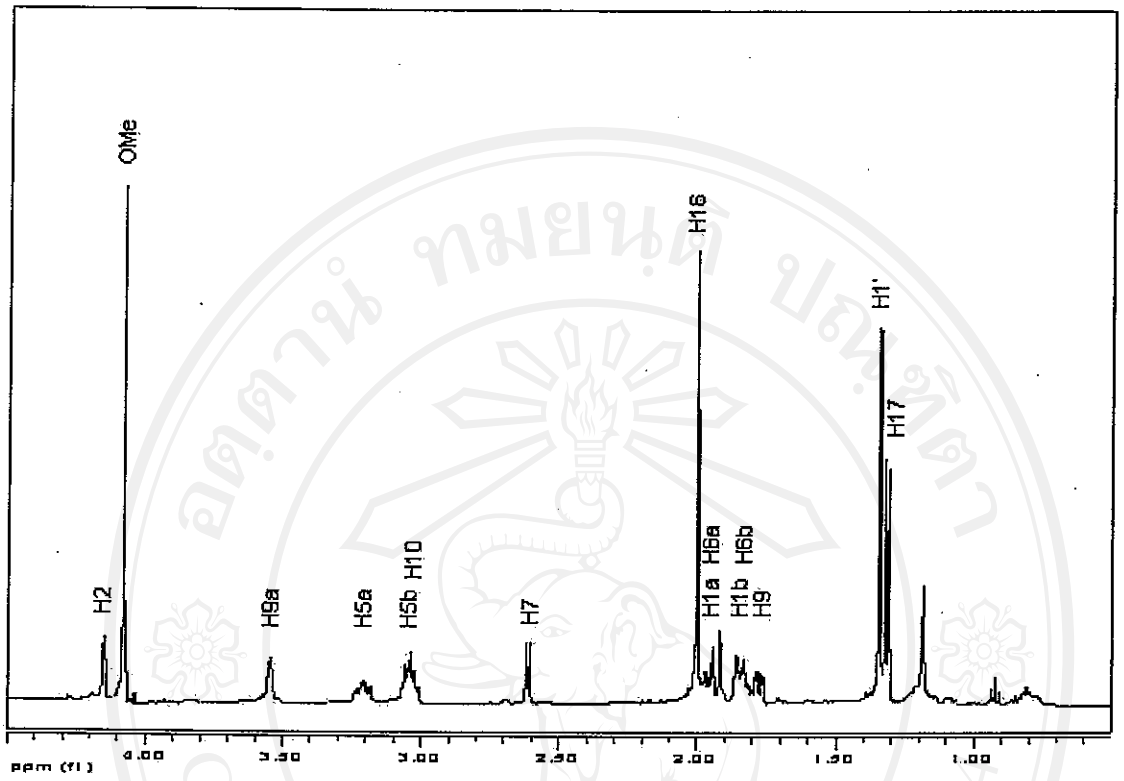
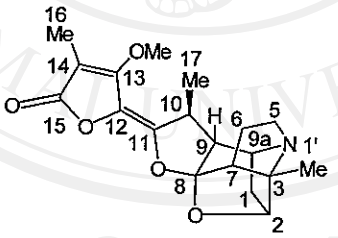


Appendix 13 ^{1}H NMR spectrum of methylstemofoline (**72**) from unknown 2 ($CDCl_3$, TMS , δ 0 as reference)



Methylstemofoline (**72**)

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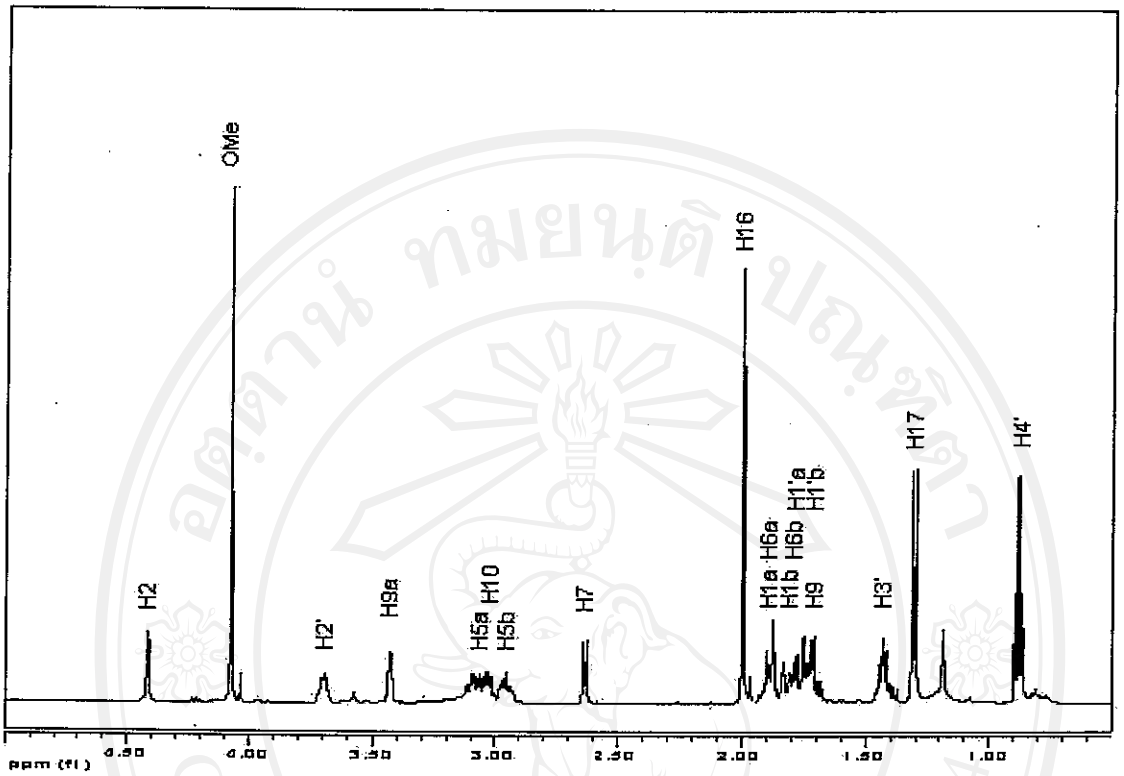
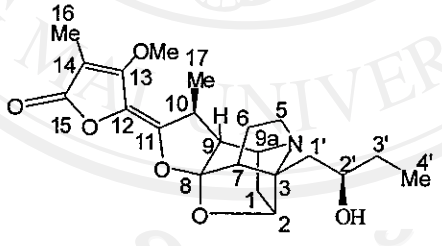


Appendix 14 ^{1}H NMR spectrum of (2′*R*)-hydroxystemofoline (**73**) from unknown 2 ($CDCl_3$, TMS , δ 0 as reference)



(2*R*')-Hydroxystemofoline (**73**)

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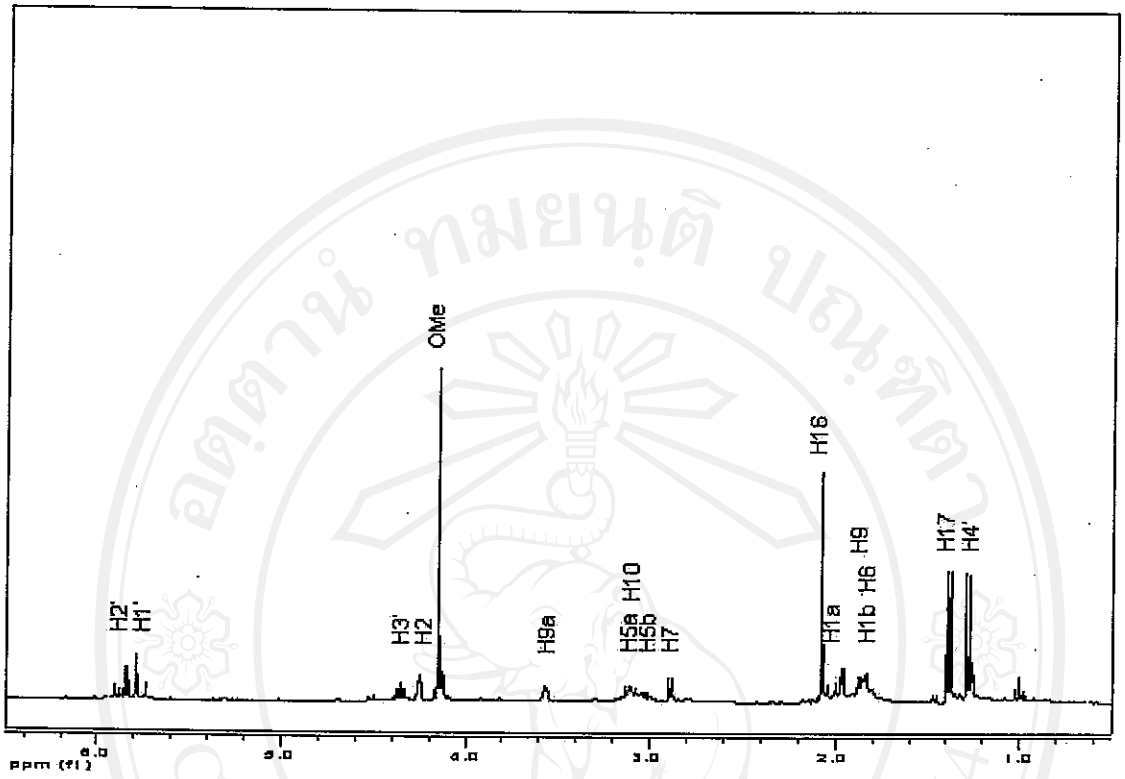
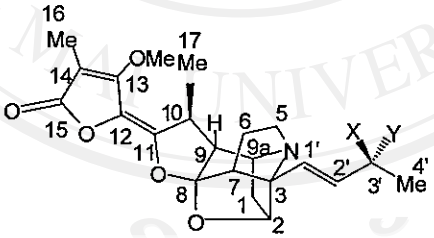


Appendix 15 ^{1}H NMR spectrum of 3′-stemofolenol (**74&75**) from unknown 2 ($CDCl_3$, TMS , δ 0 as reference)



(3'*R*)-Stemofolenol (**74**); X=OH, Y=H
(3'*S*)-Stemofolenol (**75**); X=H, Y=OH

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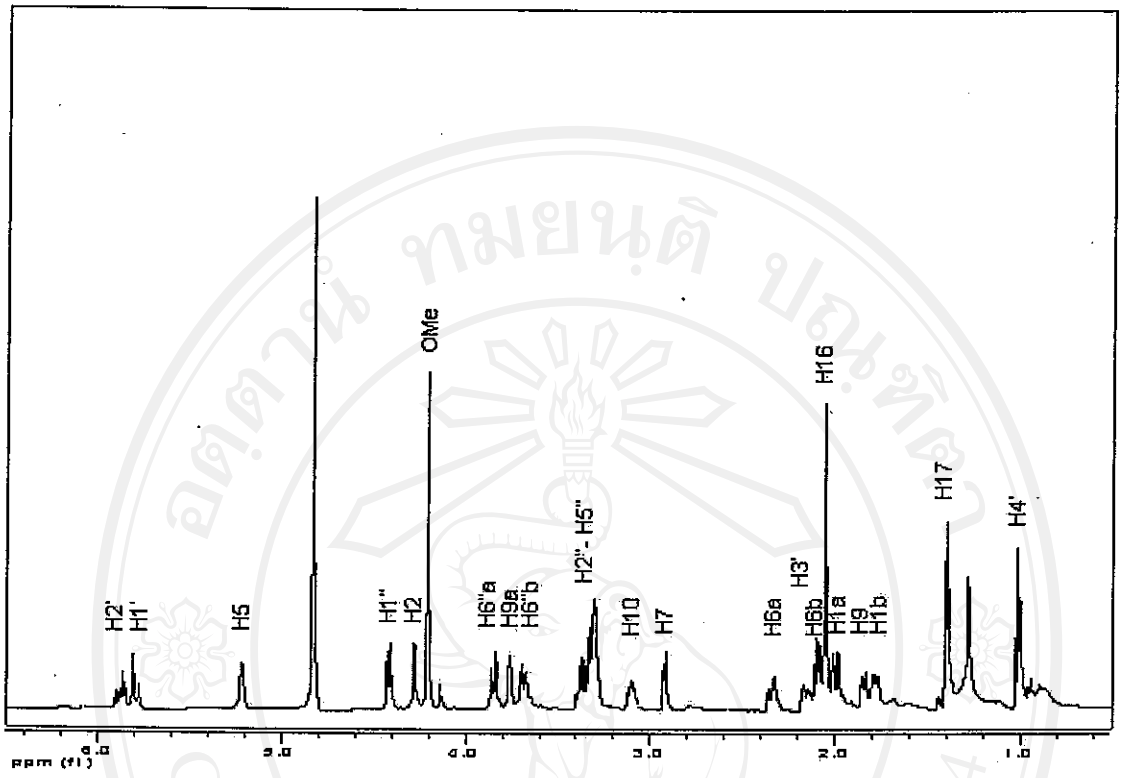
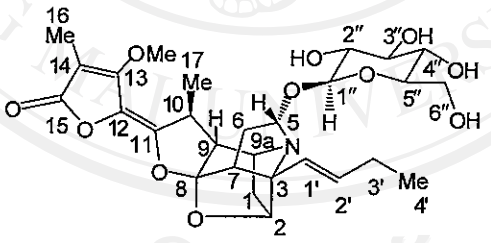


Appendix 16 ^{1}H NMR spectrum of stemofolinoside (**76**) from unknown 2 (CD_3OD, TMS , δ 0 as reference)



Stemofolinoside (**76**)

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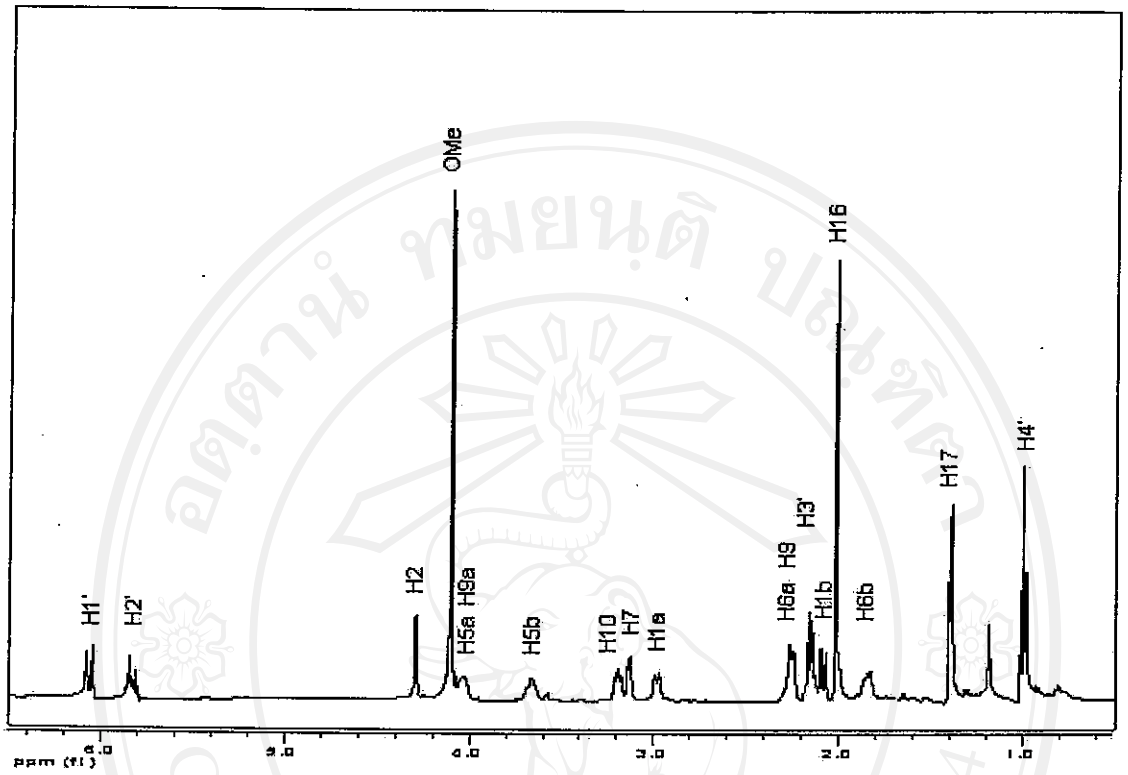
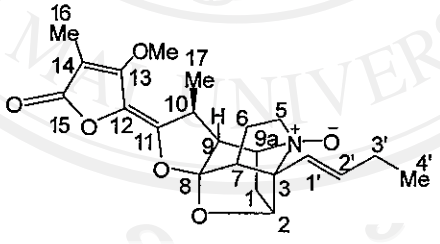


Appendix 17 ^{1}H NMR spectrum of 1′,2′-didehydrostemofoline-*N*-oxide (77) from unknown 2 ($CDCl_3$, TMS , δ 0 as reference)



1',2'-Didehydrostemofoline-N-oxide (77)

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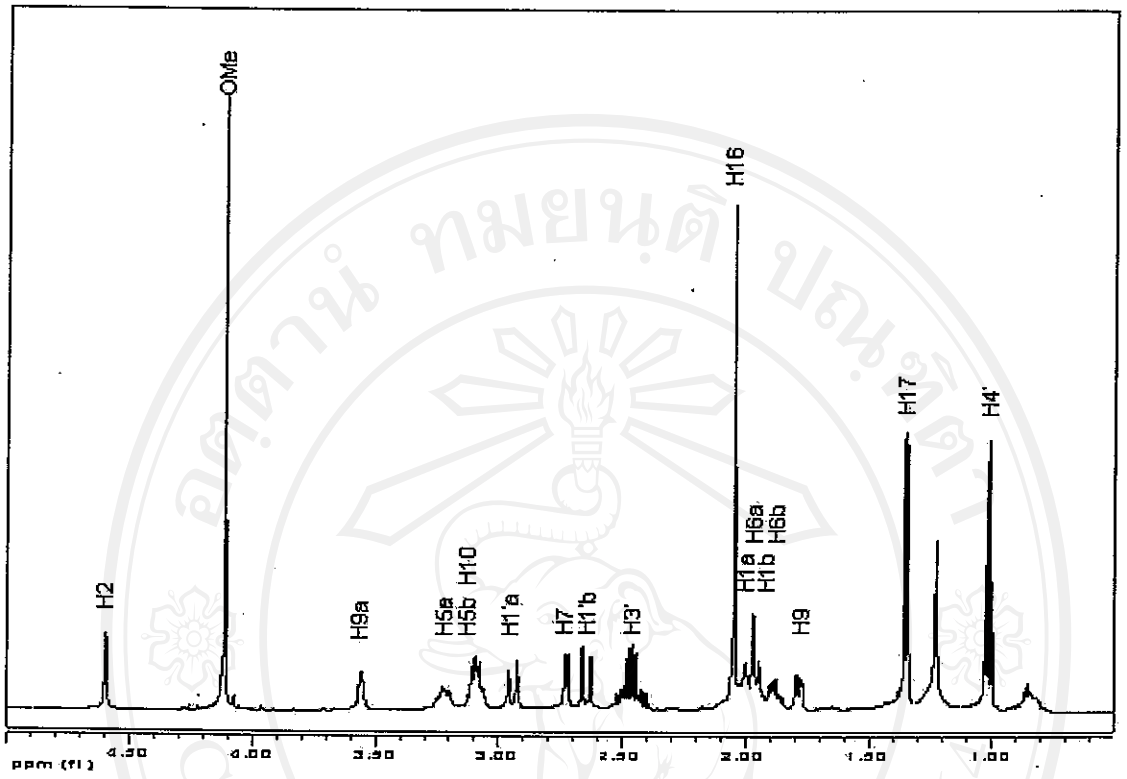
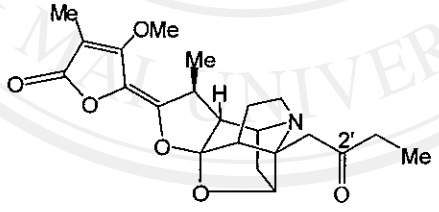


Appendix 18 ^{1}H NMR spectrum of ketone (**78**)

($CDCl_3$, TMS , δ 0 as reference)



Ketone (**78**)

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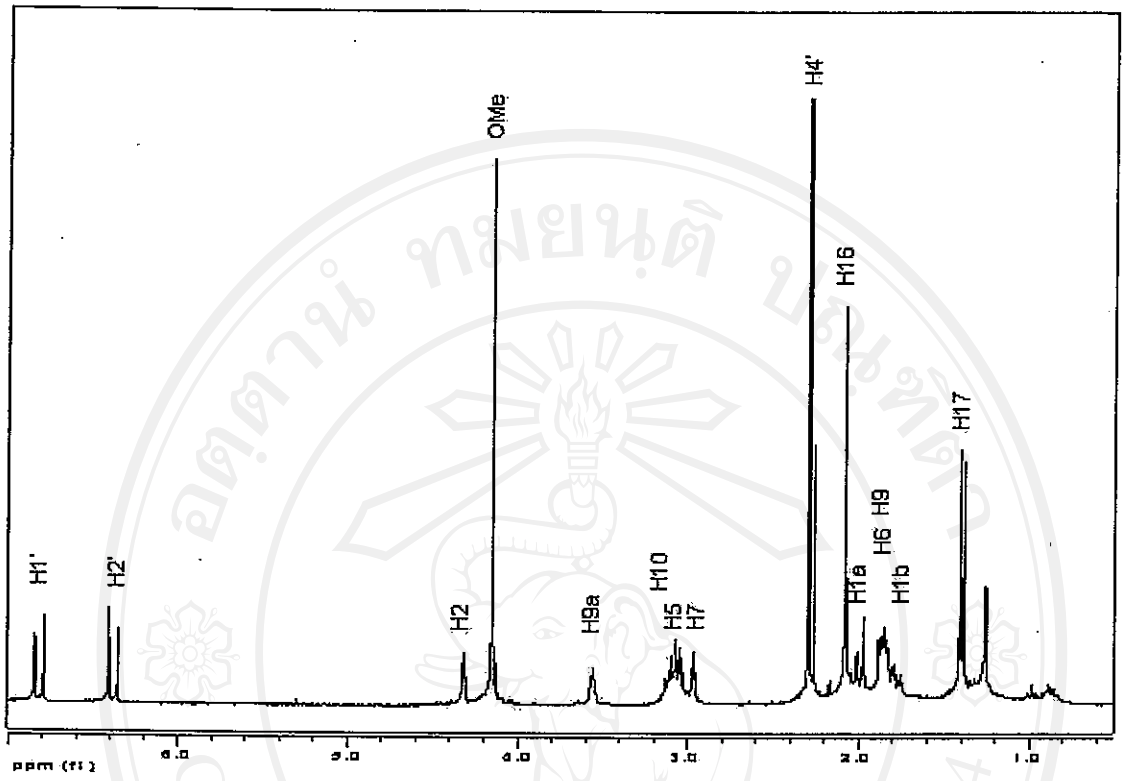
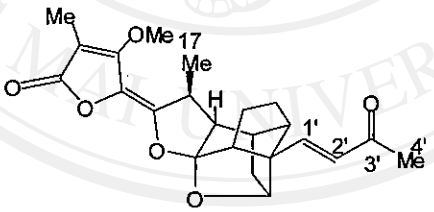


Appendix 19 ^{1}H NMR spectrum of ketone (**79**)

($CDCl_3$, TMS , δ 0 as reference)



Ketone (**79**)

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Appendix 20 SPSS ANOVA table from the efficiency testing of bioinsecticidal formulation produced in pilot scale considered on the results of vegetable height

Tests of Between-Subjects Effects

Dependent Variable: height

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1872.495(a)	5	374.499	6.540	.000
Intercept	252237.308	1	252237.308	4404.939	.000
treatment	226.912	2	113.456	1.981	.139
block	1661.118	3	553.706	9.670	.000
Error	19870.045	347	57.262		
Total	274386.930	353			
Corrected Total	21742.540	352			

a R Squared = .086 (Adjusted R Squared = .073)

Appendix 21 SPSS ANOVA table from the efficiency testing of bioinsecticidal formulation produced in pilot scale considered on the results of vegetable weight

Tests of Between-Subjects Effects

Dependent Variable: weight

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	28725.169(a)	5	5745.034	5.449	.000
Intercept	632305.900	1	632305.900	599.713	.000
treatment	3560.110	2	1780.055	1.688	.186
block	25503.346	3	8501.115	8.063	.000
Error	365858.425	347	1054.347		
Total	1030839.060	353			
Corrected Total	394583.594	352			

a R Squared = .073 (Adjusted R Squared = .059)

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Appendix 22 SPSS ANOVA table and LSD table from the efficiency testing of bioinsecticidal formulation produced in pilot scale considered on the results of the number of leaves.

Tests of Between-Subjects Effects

Dependent Variable: leave

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	62.730(a)	5	12.546	5.346	.000
Intercept	13432.872	1	13432.872	5723.624	.000
treatment	38.614	2	19.307	8.226	.000
block	24.007	3	8.002	3.410	.018
Error	814.380	347	2.347		
Total	14340.000	353			
Corrected Total	877.110	352			

a R Squared = .072 (Adjusted R Squared = .058)

Multiple Comparisons

Dependent Variable: leave
LSD

(I) treatment	(J) treatment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	.8091(*)	.19991	.000	.4159	1.2023
	3.00	.4561(*)	.19861	.022	.0654	.8467
2.00	1.00	-.8091(*)	.19991	.000	-1.2023	-.4159
	3.00	-.3530	.20074	.080	-.7478	.0418
3.00	1.00	-.4561(*)	.19861	.022	-.8467	-.0654
	2.00	.3530	.20074	.080	-.0418	.7478

Based on observed means.
* The mean difference is significant at the .05 level.

Treatment 1 = Bioinsecticidal formulation

Treatment 2 = Control (water)

Treatment 3 = Chemical pesticide (methomyl)

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Appendix 23 SPSS ANOVA table from the efficiency testing of bioinsecticidal formulation produced in pilot scale considered on the results of the number of leaf eating beetles.

Tests of Between-Subjects Effects

Dependent Variable: Leaf eating beetle, *Phyllotreta chontanica*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3.881(a)	5	.776	1.534	.178
Intercept	20.069	1	20.069	39.679	.000
treatment	.606	2	.303	.599	.550
block	3.275	3	1.092	2.158	.093
Error	179.050	354	.506		
Total	203.000	360			
Corrected Total	182.931	359			

a R Squared = .021 (Adjusted R Squared = .007)

Appendix 24 SPSS ANOVA table from the efficiency testing of bioinsecticidal formulation produced in pilot scale considered on the results of the number of diamondback moths.

Tests of Between-Subjects Effects

Dependent Variable: Diamondback moth, *Plutella xylostella*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.314(a)	5	.063	.160	.977
Intercept	9.669	1	9.669	24.623	.000
treatment	.172	2	.086	.219	.803
block	.142	3	.047	.120	.948
Error	139.017	354	.393		
Total	149.000	360			
Corrected Total	139.331	359			

a R Squared = .002 (Adjusted R Squared = -.012)

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Appendix 25 SPSS ANOVA table and LSD table from the efficiency testing of bioinsecticidal formulation produced in pilot scale considered on the results of the number of green aphids.

Tests of Between-Subjects Effects

Dependent Variable: Green aphid, *Lipaphis erysimi*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	17938.786(a)	5	3587.757	3.595	.003
Intercept	40005.625	1	40005.625	40.086	.000
treatment	10285.267	2	5142.633	5.153	.006
block	7653.519	3	2551.173	2.556	.055
Error	353294.589	354	998.007		
Total	411239.000	360			
Corrected Total	371233.375	359			

a R Squared = .048 (Adjusted R Squared = .035)

Multiple Comparisons

Dependent Variable: Green aphid, *Lipaphis erysimi*
LSD

(I) treatment	(J) treatment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	-2.2167	4.07841	.587	-10.2376	5.8043
	3.00	10.0667(*)	4.07841	.014	2.0457	18.0876
2.00	1.00	2.2167	4.07841	.587	-5.8043	10.2376
	3.00	12.2833(*)	4.07841	.003	4.2624	20.3043
3.00	1.00	-10.0667(*)	4.07841	.014	-18.0876	-2.0457
	2.00	-12.2833(*)	4.07841	.003	-20.3043	-4.2624

Based on observed means.
* The mean difference is significant at the .05 level.

Treatment 1 = Bioinsecticidal formulation

Treatment 2 = Control (water)

Treatment 3 = Chemical pesticide (methomyl)

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Appendix 26 SPSS ANOVA table from the efficiency testing of bioinsecticidal formulation produced in pilot scale considered on the results of the number of cabbage loopers.

Tests of Between-Subjects Effects

Dependent Variable: Cabbage looper, *Trichoplusia ni*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.239(a)	5	.048	.792	.556
Intercept	.400	1	.400	6.629	.010
treatment	.217	2	.108	1.795	.168
block	.022	3	.007	.123	.947
Error	21.361	354	.060		
Total	22.000	360			
Corrected Total	21.600	359			

a R Squared = .011 (Adjusted R Squared = -.003)

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Appendix 27 SPSS ANOVA table and LSD table from the efficiency testing of bioinsecticidal formulation produced in pilot scale considered on the results of the number of common cutworms.

Tests of Between-Subjects Effects

Dependent Variable: Common cutworm, *Spodoptera litura*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.628(a)	5	.326	2.259	.048
Intercept	1.344	1	1.344	9.327	.002
treatment	1.172	2	.586	4.066	.018
block	.456	3	.152	1.053	.369
Error	51.028	354	.144		
Total	54.000	360			
Corrected Total	52.656	359			

a R Squared = .031 (Adjusted R Squared = .017)

Multiple Comparisons

Dependent Variable: Common cutworm, *Spodoptera litura*
LSD

(I) treatment	(J) treatment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	-.1250(*)	.04901	.011	-.2214	-.0286
	3.00	-.0083	.04901	.865	-.1047	.0881
2.00	1.00	.1250(*)	.04901	.011	.0286	.2214
	3.00	.1167(*)	.04901	.018	.0203	.2131
3.00	1.00	.0083	.04901	.865	-.0881	.1047
	2.00	-.1167(*)	.04901	.018	-.2131	-.0203

Based on observed means.
* The mean difference is significant at the .05 level.

Treatment 1 = Bioinsecticidal formulation

Treatment 2 = Control (water)

Treatment 3 = Chemical pesticide (methomyl)

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Appendix 28 SPSS ANOVA table and LSD table from the efficiency testing of bioinsecticidal formulation produced in pilot scale considered on the results of the number of predators.

Tests of Between-Subjects Effects

Dependent Variable: Predators

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	57.392(a)	5	11.478	1.628	.152
Intercept	35.469	1	35.469	5.030	.026
treatment	42.539	2	21.269	3.016	.050
block	14.853	3	4.951	.702	.551
Error	2496.139	354	7.051		
Total	2589.000	360			
Corrected Total	2553.531	359			

a R Squared = .022 (Adjusted R Squared = .009)

Multiple Comparisons

Dependent Variable: Predators
LSD

(I) treatment	(J) treatment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	.7333(*)	.34281	.033	.0591	1.4075
	3.00	.7250(*)	.34281	.035	.0508	1.3992
2.00	1.00	-.7333(*)	.34281	.033	-1.4075	-.0591
	3.00	-.0083	.34281	.981	-.6825	.6659
3.00	1.00	-.7250(*)	.34281	.035	-1.3992	-.0508
	2.00	.0083	.34281	.981	-.6659	.6825

Based on observed means.
* The mean difference is significant at the .05 level.

Treatment 1 = Bioinsecticidal formulation

Treatment 2 = Control (water)

Treatment 3 = Chemical pesticide (methomyl)

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Appendix 29 SPSS Nonparametric test from the efficiency testing of bioinsecticidal formulation produced in pilot scale considered on the results of total quality.

Friedman Test

Ranks

	Mean Rank
bioinsecticide	2.04
Control	1.82
Methomyl	2.14

Test Statistics(a)

N	120
Chi-Square	9.761
df	2
Asymp. Sig.	.008

a Friedman Test

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
Control - bioinsecticide	Negative Ranks	47(a)	38.66	1817.00
	Positive Ranks	27(b)	35.48	958.00
	Ties	46(c)		
	Total	120		
Methomyl - bioinsecticide	Negative Ranks	27(d)	32.54	878.50
	Positive Ranks	37(e)	32.47	1201.50
	Ties	56(f)		
	Total	120		
Methomyl - Control	Negative Ranks	31(g)	39.76	1232.50
	Positive Ranks	55(h)	45.61	2508.50
	Ties	34(i)		
	Total	120		

a Control < bioinsecticide
b Control > bioinsecticide
c Control = bioinsecticide
d Methomyl < bioinsecticide
e Methomyl > bioinsecticide
f Methomyl = bioinsecticide
g Methomyl < Control
h Methomyl > Control
i Methomyl = Control

Test Statistics(c)

	Control - bioinsecticide	Methomyl - bioinsecticide	Methomyl - Control
Z	-2.475(a)	-1.132(b)	-2.876(b)
Asymp. Sig. (2-tailed)	.013	.258	.004

a Based on positive ranks.
b Based on negative ranks.
c Wilcoxon Signed Ranks Test

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