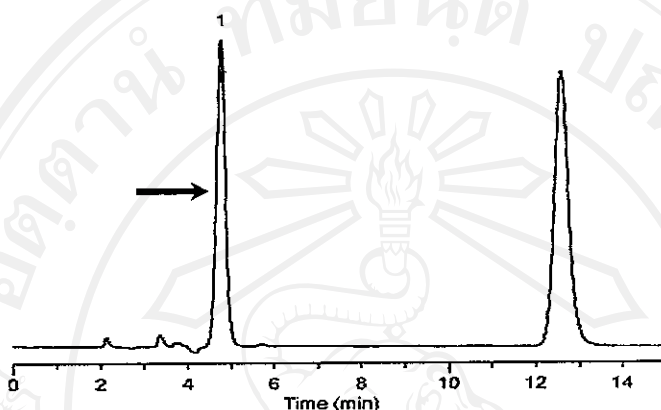
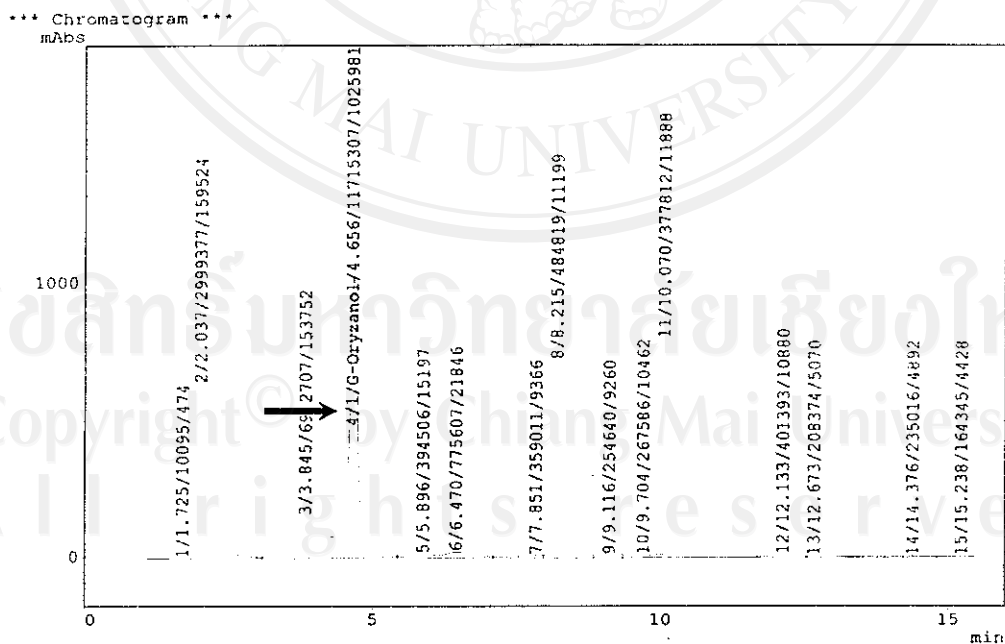


APPENDIX



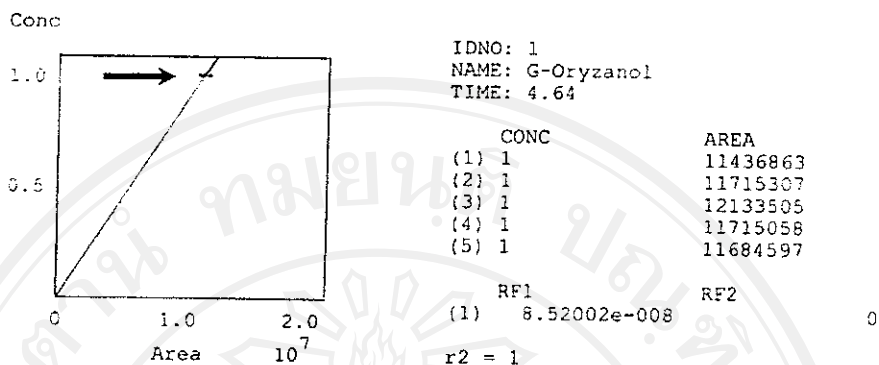
No.	Peak Name	R.Time	Area
1	gamma-oryzanol	4.753	39553

Index figure 1. Standard curve of pure γ -oryzanol on reverse phase HPLC (GL Science Inc, 1998).



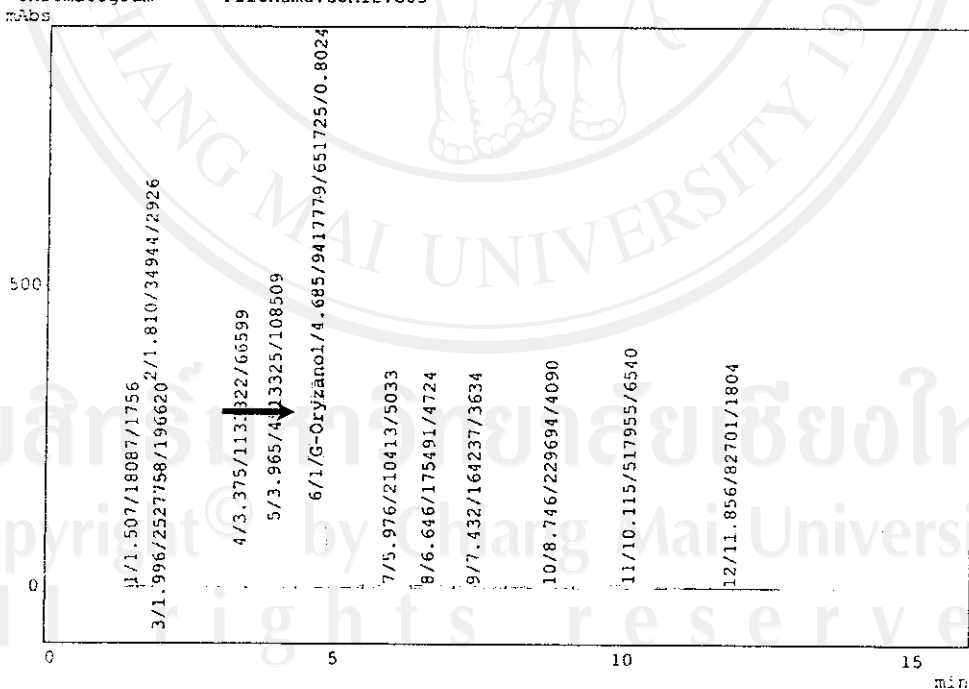
Index figure 2. Standard curve of pure γ -oryzanol on reverse phase HPLC from this experiment.

** Calibration Curve Graph **



Index figure 3. Calibration curve graph of γ -oryzanol on reverse phase HPLC from this experiment.

*** Chromatogram *** Filename:GOM12.C03



Index figure 4. Sample curve of γ -oryzanol on reverse phase HPLC from this experiment.

Appendix table 1. ANOVA of average daily feed intake in experiments I at 42 days of experimental periods

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.708	0.236	0.274	0.844
Within Groups	340	293.122	0.862		
Total	343	293.830			

S.D. = 0.926 S.E. = 0.050

Appendix table 2. ANOVA of total weight gain in experiment I at 42 days of experimental periods

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	50.000	16.667	1.167	0.343
Within Groups	24	342.857	14.286		
Total	27	392.857			

S.D. = 0.089 S.E. = 0.017

Appendix table 3. ANOVA of average daily gain in experiment I at 42 days of experimental periods

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.027	0.009	1.167	0.343
Within Groups	24	0.185	0.008		
Total	27	0.212			

S.D. = 3.814 S.E. = 0.721

Appendix table 4. ANOVA of average daily fed intake in experiment II at 42 days of experimental periods

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	1.635	0.545	1.326	0.266
Within Groups	340	139.725	0.411		
Total	343	141.360			

S.D. = 0.642 S.E. = 0.035

Appendix table 5. ANOVA of average daily gain in experiment II at 42 days of experimental periods

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.015	0.005	1.174	0.338
Within Groups	27	0.118	0.004		
Total	30	0.133			
S.D. = 0.067		S.E. = 0.012			

Appendix table 6. ANOVA of Total weight gain in experiment II at 42 days of experimental periods

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	30.149	10.050	1.207	.327
Within Groups	26	216.518	8.328		
Total	29	246.667			
S.D. = 2.916		S.E. = 0.532			

Appendix table 7. ANOVA of Log₂ BSA IgA titer on day 1 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.000	0.000		
Within Groups	58	0.000	0.000		
Total	61	0.000			
S.D. = 0.000		S.E. = 0.000			

Appendix table 8. ANOVA of Log₂ BSA IgA titer on day 10 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.004	0.001	4.140	0.10
Within Groups	58	0.018	0.0003		
Total	61	0.021			
S.D. = 0.087		S.E. = 0.002			

Appendix table 9. ANOVA of Log_2 BSA IgA titer on day 14 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.134	0.045	0.639	0.593
Within Groups	58	4.066	0.070		
Total	61	4.201			

S.D. = 0.262

S.E. = 0.033

Appendix table 10. ANOVA of Log_2 BSA IgA titer on day 21 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.230	0.077	9.885	0.000
Within Groups	54	0.418	0.008		
Total	57	0.648			

S.D. = 0.107

S.E. = 0.014

Appendix table 11. ANOVA of Log_2 BSA IgA titer on day 28 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.323	0.108	0.899	0.448
Within Groups	54	6.473	0.120		
Total	57	6.796			

S.D. = 0.345

S.E. = 0.045

Appendix table 12. ANOVA of Log_2 BSA IgA titer on day 42 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.779	0.260	6.190	0.001
Within Groups	52	2.180	0.42		
Total	55	2.959			

S.D. = 0.232

S.E. = 0.310

Appendix table 13. ANOVA of Log_2 BSA IgM titer on day 1 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.000	0.000		
Within Groups	58	0.000	0.000		
Total	61	0.000			

S.D. = 0.000 S.E. = 0.000

Appendix table 14. ANOVA of Log_2 BSA IgM titer on day 10 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.154	0.51	16.833	0.000
Within Groups	58	0.177	0.003		
Total	61	0.331			

S.D. = 0.074 S.E. = 0.009

Appendix table 15. ANOVA of Log_2 BSA IgM titer on day 14 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.053	0.018	4.901	0.004
Within Groups	58	0.209	0.004		
Total	61	0.262			

S.D. = 0.065 S.E. = 0.008

Appendix table 16. ANOVA of Log_2 BSA IgM titer on day 21 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.249	0.083	47.220	0.000
Within Groups	54	0.095	0.002		
Total	57	0.345			

S.D. = 0.078 S.E. = 0.010

Appendix table 17. ANOVA of Log_2 BSA IgM titer on day 28 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.005	0.002	1.854	0.148
Within Groups	54	0.049	0.001		
Total	57	0.054			

S.D. = 0.031 S.E. = 0.004

Appendix table 18. ANOVA of Log_2 BSA IgM titer on day 42 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.043	0.014	11.004	0.000
Within Groups	52	0.068	0.001		
Total	55	0.111			

S.D. = 0.045 S.E. = 0.006

Appendix table 19. ANOVA of Log_2 BSA IgG titer on day 1 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.000	0.000		
Within Groups	52	0.000	0.000		
Total	55	0.000			

S.D. = 0.000 S.E. = 0.000

Appendix table 20. ANOVA of Log_2 BSA IgG titer on day 10 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.001	0.0002	12.393	0.000
Within Groups	58	0.001	0.00001		
Total	61	0.001			

S.D. = 0.005 S.E. = 0.001

Appendix table 21. ANOVA of Log_2 BSA IgG titer on day 14 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.001	0.0005	2.010	0.123
Within Groups	58	0.013	0.0002		
Total	61	0.015			
S.D. = 0.016		S.E. = 0.002			

Appendix table 22. ANOVA of Log_2 BSA IgG titer on day 21 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.022	0.007	3.166	0.32
Within Groups	54	0.127	0.002		
Total	57	0.150			
S.D. = 0.051		S.E. = 0.007			

Appendix table 23. ANOVA of Log_2 BSA IgG titer on day 28 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.020	0.007	1.755	0.167
Within Groups	54	0.206	0.004		
Total	57	0.226			
S.D. = 0.063		S.E. = 0.083			

Appendix table 24. ANOVA of Log_2 BSA IgG titer on day 42 in experiment I

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.047	0.016	3.362	0.025
Within Groups	52	0.242	0.005		
Total	55	0.288			
S.D. = 0.072		S.E. = 0.010			

Appendix table 25. ANOVA of Log_2 BSA IgA titer on day 1 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.000	0.000	.	.
Within Groups	60	0.000	0.000		
Total	63	0.000			

S.D. = 0.000 S.E. = 0.000

Appendix table 26. ANOVA of Log_2 BSA IgA titer on day 10 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.000	0.000	.	.
Within Groups	60	0.000	0.000		
Total	63	0.000			

S.D. = 0.000 S.E. = 0.000

Appendix table 27. ANOVA of Log_2 BSA IgA titer on day 14 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.006	0.002	0.923	0.435
Within Groups	58	0.131	0.002		
Total	61	0.137			

S.D. = 0.047 S.E. = 0.006

Appendix table 28. ANOVA of Log_2 BSA IgA titer on day 21 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.001	0.0004	0.822	0.487
Within Groups	58	0.028	0.0005		
Total	61	0.029			

S.D. = 0.027 S.E. = 0.003

Appendix table 29. ANOVA of Log_2 BSA IgA titer on day 28 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.033	0.011	1.345	0.269
Within Groups	58	0.478	0.008		
Total	61	0.512			

S.D. = 0.092

S.E. = 0.012

Appendix table 30. ANOVA of Log_2 BSA IgA titer on day 42 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.001	0.0002	0.468	0.706
Within Groups	58	0.031	0.001		
Total	61	0.032			

S.D. = 0.023

S.E. = 0.003

Appendix table 31. ANOVA of Log_2 BSA IgM titer on day 1 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.000	0.000		
Within Groups	60	0.000	0.000		
Total	63	0.000			

S.D. = 0.000

S.E. = 0.000

Appendix table 32. ANOVA of Log_2 BSA IgM titer on day 10 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.033	0.011	7.368	0.00
Within Groups	60	0.091	0.002		
Total	63	0.124			

S.D. = 0.044

S.E. = 0.006

Appendix table 33. ANOVA of Log_2 BSA IgM titer on day 14 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.005	0.002	3.795	0.015
Within Groups	58	0.027	0.0005		
Total	61	0.32			
S.D. = 0.023		S.E. = 0.003			

Appendix table 34. ANOVA of Log_2 BSA IgM titer on day 21 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.054	0.018	7.583	0.000
Within Groups	58	0.138	0.002		
Total	61	0.192			
S.D. = 0.056		S.E. = 0.007			

Appendix table 35. ANOVA of Log_2 BSA IgM titer on day 28 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.028	0.009	15.121	0.000
Within Groups	58	0.036	0.001		
Total	61	0.064			
S.D. = 0.032		S.E. = 0.004			

Appendix table 36. ANOVA of Log_2 BSA IgM titer on day 42 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.010	0.003	3.201	0.030
Within Groups	58	0.061	0.001		
Total	61	0.072			
S.D. = 0.034		S.E. = 0.004			

Appendix table 37. ANOVA of Log_2 BSA IgG titer on day 1 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.000	0.000		
Within Groups	60	0.000	0.000		
Total	63	0.000			
S.D. = 0.000		S.E. = 0.000			

Appendix table 38. ANOVA of Log_2 BSA IgG titer on day 10 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.019	0.006	2.044	0.117
Within Groups	60	0.184	0.003		
Total	63	0.203			
S.D. = 0.057		S.E. = 0.007			

Appendix table 39. ANOVA of Log_2 BSA IgG titer on day 14 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.193	0.064	0.854	0.470
Within Groups	60	4.381	0.076		
Total	63	4.575			
S.D. = 0.274		S.E. = 0.035			

Appendix table 40. ANOVA of Log_2 BSA IgG titer on day 21 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.367	0.122	9.942	0.000
Within Groups	60	0.714	0.012		
Total	63	1.080			
S.D. = 0.133		S.E. = 0.017			

Appendix table 41. ANOVA of Log_2 BSA IgG titer on day 28 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.752	0.251	8.043	0.000
Within Groups	60	1.808	0.031		
Total	63	2.560			

S.D. = 0.205 S.E. = 0.026

Appendix table 42. ANOVA of Log_2 BSA IgA titer on day 42 in experiment II

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.397	0.132	2.985	0.038
Within Groups	60	2.573	0.044		
Total	63	2.970			

S.D. = 0.221 S.E. = 0.028

Appendix table 43. ANOVA of area under BSA IgA titer curve in experiments I at 42 days

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	1.648	0.549	1.428	0.047
Within Groups	52	20.003	0.385		
Total	55	21.651			

S.D. = 0.627 S.E. = 0.084

Appendix table 44. ANOVA of area under BSA IgM titer curve in experiments I at 42 days

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.445	0.152	33.687	0.000
Within Groups	52	0.234	0.005		
Total	55	0.689			

S.D. = 0.112 S.E. = 0.015

Appendix table 45. ANOVA of area under BSA IgG titer curve in experiments I at 42 days

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.679	0.226	1.556	0.211
Within Groups	52	7.560	0.145		
Total	55	8.239			

S.D. = 0.387 S.E. = 0.052

Appendix table 46. ANOVA of area under BSA IgA titer curve in experiments II at 42 days

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.031	0.010	2.000	0.124
Within Groups	58	0.300	0.005		
Total	61	0.331			

S.D. = 0.074 S.E. = 0.009

Appendix table 47. ANOVA of area under BSA IgM titer curve in experiments II at 42 days

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	0.229	0.076	16.206	0.000
Within Groups	58	0.274	0.005		
Total	61	0.503			

S.D. = 0.091 S.E. = 0.012

Appendix table 48. ANOVA of area under BSA IgG titer curve in experiments II at 42 days

SOV	df	SS	MS	F-value	Pr>F
Between Groups	3	3.751	1.25	0.274	0.844
Within Groups	58	15.463	0.267		
Total	61	19.214			

S.D. = 0.561 S.E. = 0.071

VITA

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EXPERIENCES

2001 Assistant of teacher in seminar of bachelor' degree student control: Effect of Ractopamine to commercial swine production

2003 Analysis sucrose by using HPLC in the honey for Nestle (Thailand) Company

PUBLISHING

1. Tawatchai Teltathum and Puntipa Pongpichan. 2004. Effect of γ -oryzanol on immune response in male mice, *J. Agriculture*. Chiang Mai University. In press.

2. Puntipa Pongpichan, Tawatchai Teltathum and Dumnun Karladee. 2004. γ -oryzanol quantity in plant products, *J. Agriculture*. Chiang Mai University. In press.
3. Tawatchai Teltathum. 2004. The effect of rice bran storage time on amount of γ -oryzanol. Special problem. Department of Animal science, Chiang Mai University.

PRESENTATION

1. Poster presentation: Karladee D., P. Pongpiachan, T. Teltathum and A. Gavilo. 2003. Accumulation of gamma oryzanol in purple rice grain. The 2nd International conference on Medicinal Mushroom and the International conference on Biodiversity and Bioactive Compound. 17-19 July. PEACH, Pattaya, Thailand.
2. Poster presentation: Karladee D., P. Pongpiachan, T. Teltathum and A. Gavilo. 2003. Accumulation of gamma oryzanol in purple rice grain. 2nd National Technical Seminar on Postharvest/Post Production Technology. 21-22 August at Jalearn Princess Konkaen Hotel.

ASSITANT TRAINING COURSE

1. Linear programming for feed formulation for the bachelor' degree student in 2000-2003
2. BRILL programming for feed formulation for the bachelor' degree student in 2000-2003