

APPENDIX

Appendix A

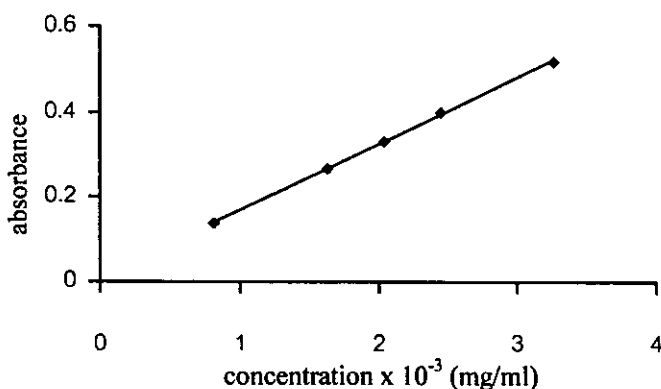


Figure A-1 Standard plot of curcumin using a UV- spectrophotometric method. This data was used to calculate total curcuminoids in turmeric rhizome at different growth stages.

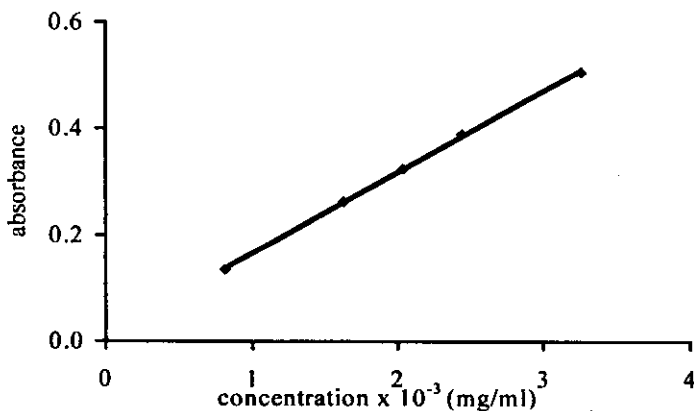


Figure A-2 Standard plot of curcumin using a UV- spectrophotometric method. This data was used to calculate total curcuminoids in zedoary rhizome at different growth stages.

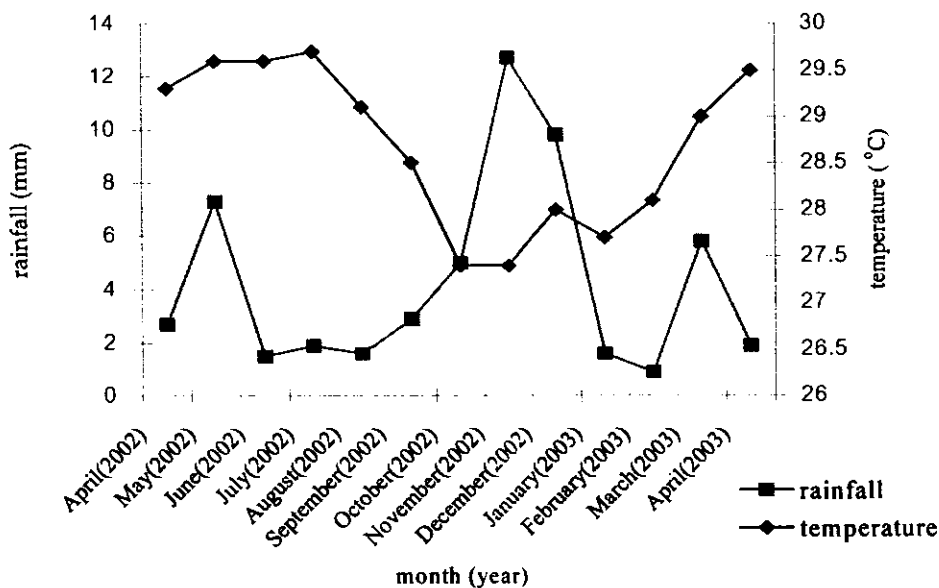


Figure A-3 Monthly mean temperature and rainfall during turmeric cultivation period. (From : the meteorology laboratory located in the Khohong station).

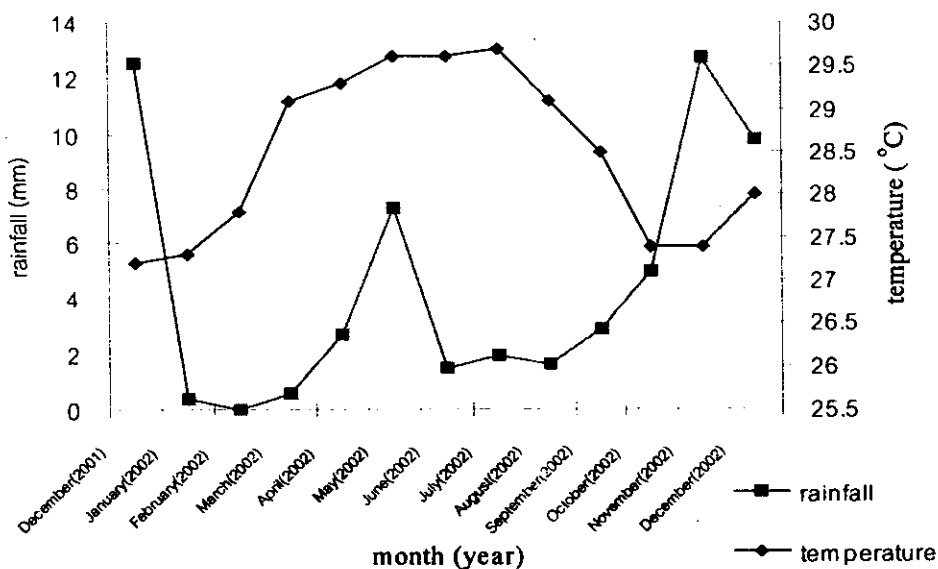


Figure A-4 Monthly mean temperature and rainfall during zedoary cultivation period. (From : the meteorology laboratory located in the Khohong station).

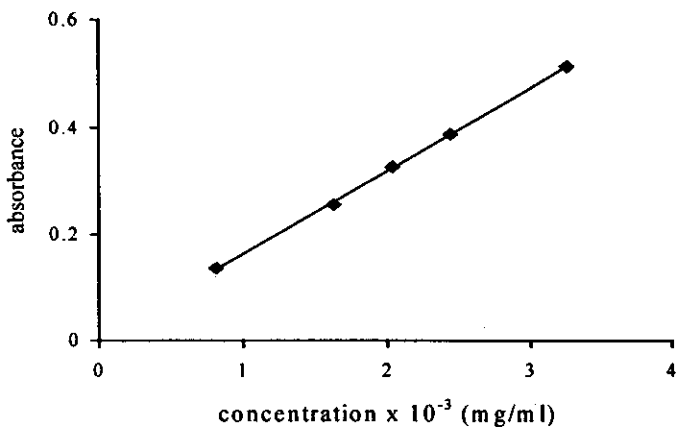


Figure A-5 Standard plot of curcumin using a UV- spectrophotometric method. This data was used to calculate total curcuminoids in turmeric rhizome stored under different conditions at room temperature.

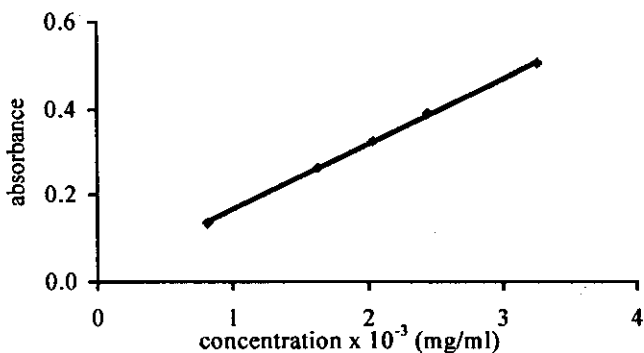


Figure A-6 Standard plot of curcumin using a UV- spectrophotometric method. This data was used to calculate total curcuminoids in zedoary (bulb) rhizome stored under different conditions at room temperature.

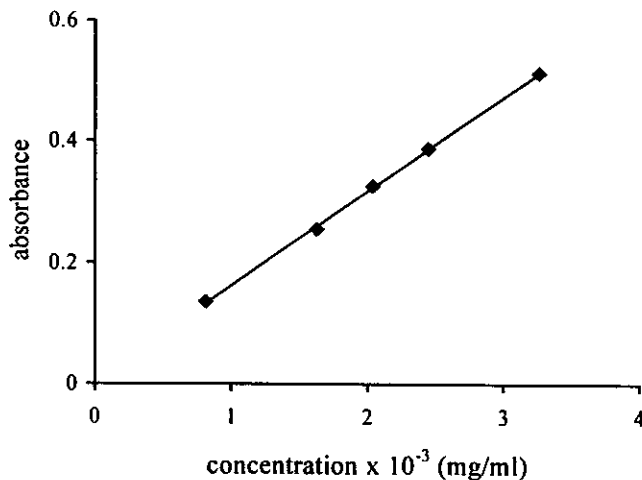


Figure A-7 Standard plot of curcumin using a UV-spectrophotometric method. This data was used to calculate total curcuminoids in zedoary (finger) rhizome stored under different conditions at room temperature.

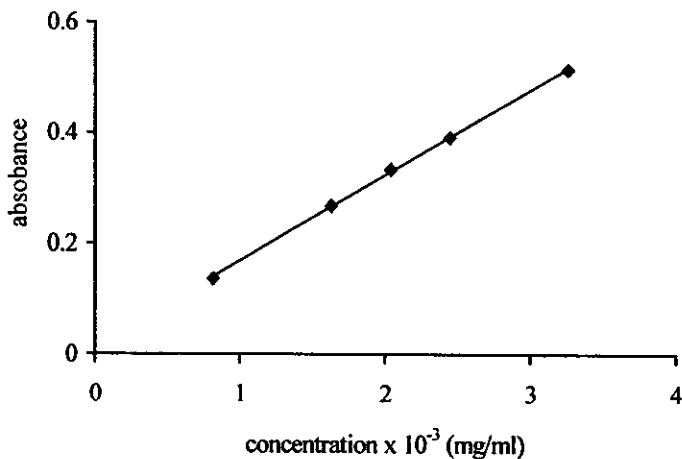


Figure A-8 Standard plot of curcumin using a UV-spectrophotometric method. This data was used to calculate total curcuminoids in turmeric and zedoary rhizomes during storage at different accelerated temperatures.

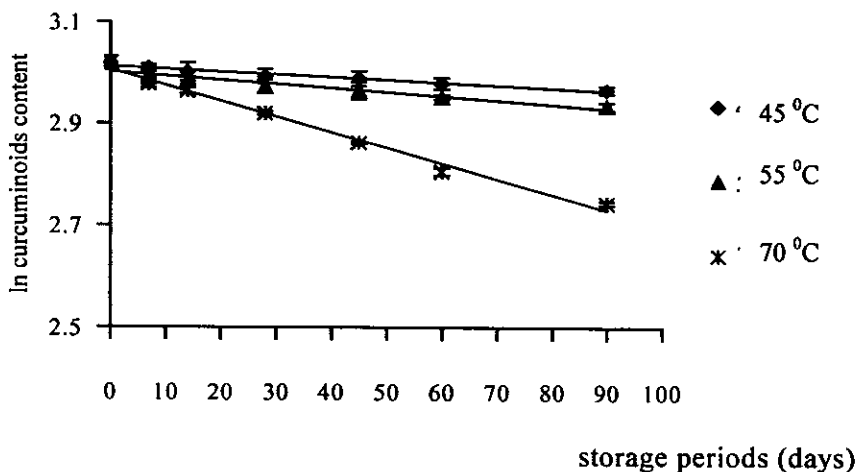


Figure A-9 The first-order plots of degradation of curcuminoids content of powdered turmeric rhizome stored in black polyethylene bags during storage at 45°, 55° and 70 °C. Rate equation for each temperature was expressed as $c = -0.0005t + 3.0119$, $r^2 = 0.954$; $c = -0.0008t + 3.0014$, $r^2 = 0.9004$; $c = -0.0031t + 3.0052$, $r^2 = 0.9883$, respectively.

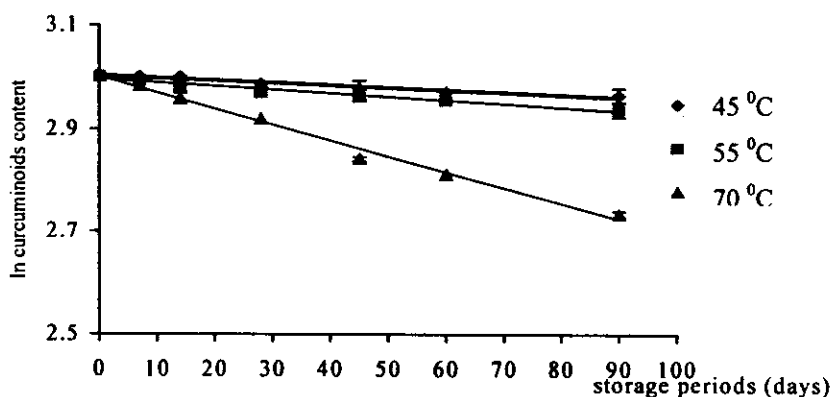


Figure A-10 The first-order plots of degradation of curcuminoids content of sliced turmeric rhizome stored in black polyethylene bags during storage at 45°, 55° and 70 °C. Rate equation for each temperature was expressed as $c = -0.0005t + 3.0026$, $r^2 = 0.9267$; $c = -0.0007t + 2.9961$, $r^2 = 0.9669$; $c = -0.0031t + 3.0008$, $r^2 = 0.9909$, respectively.

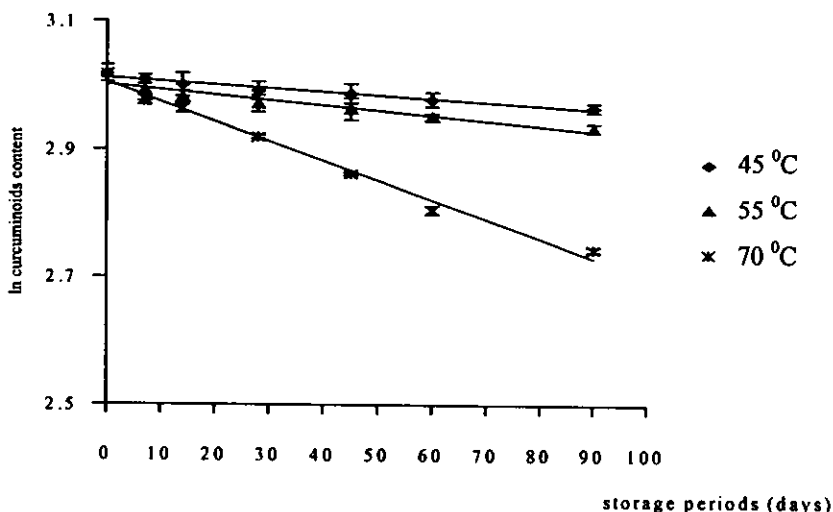


Figure A-11 The first-order plots of degradation of curcuminoids contents of powdered turmeric rhizome stored in paper bags during storage at 45°, 55° and 70 °C. Rate equation for each temperature was expressed as $c = -0.0006t + 3.0136$, $r^2 = 0.9206$; $c = -0.0009t + 3.0029$, $r^2 = 0.8834$; $c = -0.0031t + 3.0054$, $r^2 = 0.9836$, respectively.

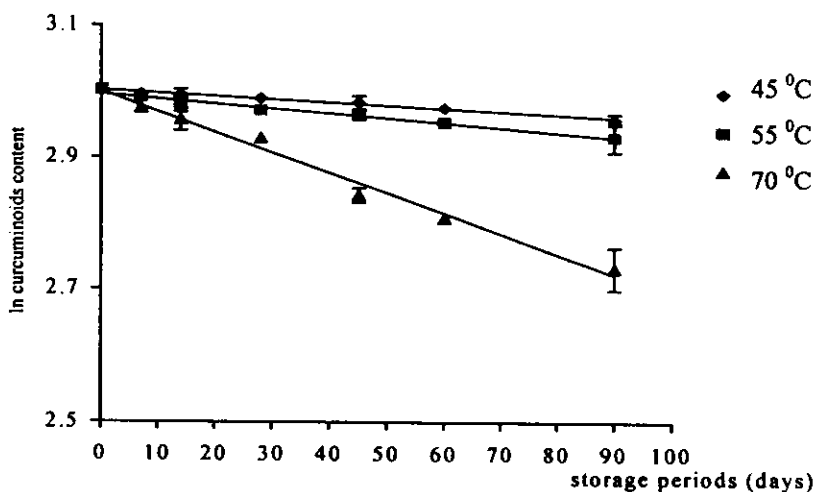


Figure A-12 The first-order plots of degradation of curcuminoids contents of sliced turmeric rhizome stored in paper bags during storage at 45°, 55° and 70 °C. Rate equation for each temperature was expressed as $c = -0.0005t + 3.002$, $r^2 = 0.9834$; $c = -0.0007t + 2.9961$, $r^2 = 0.9693$; $c = -0.0031t + 3.0000$, $r^2 = 0.9867$, respectively.

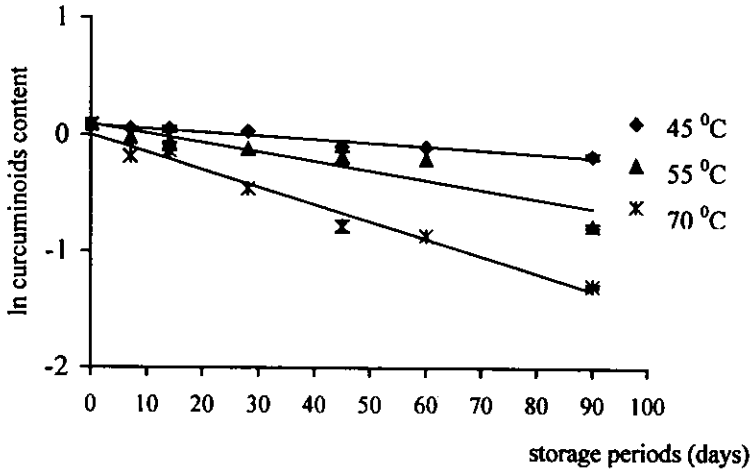


Figure A-13 The first-order plots of degradation of curcuminoids content of powdered zedoary (bulb) rhizome stored in black polyethylene bags during storage at 45^o, 55^o and 70^o C. Rate equation for each temperature was expressed as $c = -0.0031t + 0.0890$, $r^2 = 0.9436$; $c = -0.0080t + 0.0974$, $r^2 = 0.8574$; $c = -0.0149t + 0.0031$, $r^2 = 0.9740$, respectively.

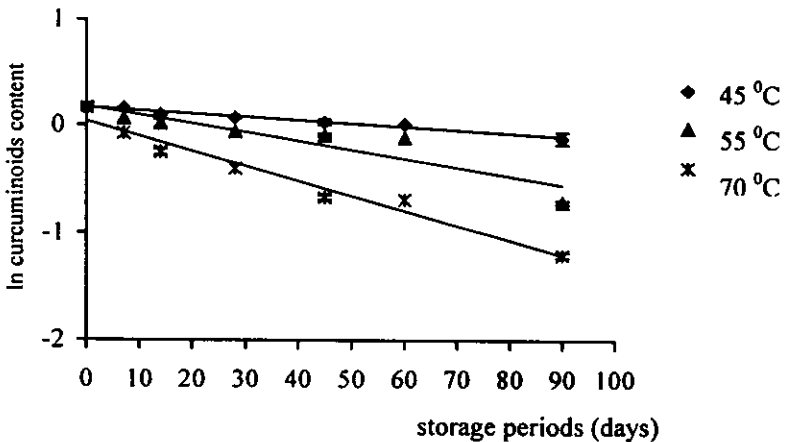


Figure A-14 The first-order plots of degradation of curcuminoids content of sliced zedoary (bulb) rhizome stored in black polyethylene bags during storage at 45^o, 55^o and 70^o C. Rate equation for each temperature was expressed as $c = -0.0030t + 0.1687$, $r^2 = 0.9699$; $c = -0.0081t + 0.1783$, $r^2 = 0.8438$; $c = -0.0138t + 0.0370$, $r^2 = 0.9620$, respectively.

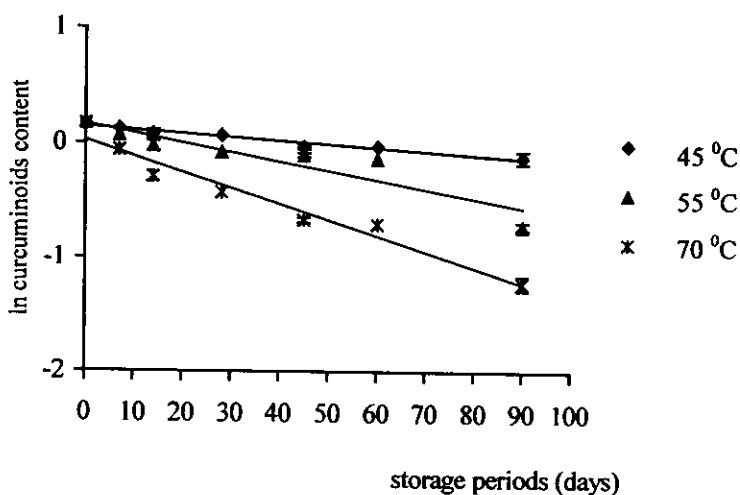


Figure A-15 The first-order plots of degradation of curcuminoids content of powdered zedoary (bulb) rhizome stored in paper bags during storage at 45°, 55° and 70 °C. Rate equation for each temperature was expressed as $c = -0.0035t + 0.0663$, $r^2 = 0.9698$; $c = -0.0104t + 0.0872$, $r^2 = 0.9147$; $c = -0.0145t - 0.0689$, $r^2 = 0.9620$, respectively.

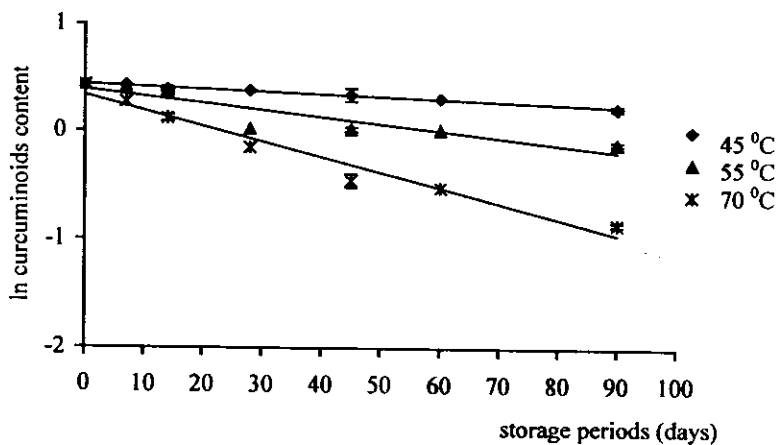


Figure A-16 The first-order plots of degradation of curcuminoids content of sliced zedoary (bulb) rhizome stored in paper bags during storage at 45°, 55° and 70 °C. Rate equation for each temperature was expressed as $c = -0.0030t + 0.1449$, $r^2 = 0.9537$; $c = -0.0081t + 0.1680$, $r^2 = 0.8417$; $c = -0.0139t + 0.0291$, $r^2 = 0.9558$, respectively.

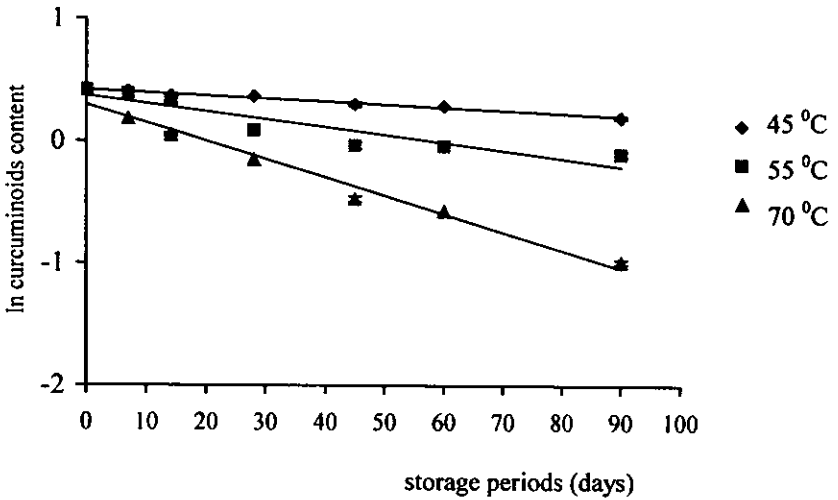


Figure A-17 The first-order plots of degradation of curcuminoids content of powdered zedoary (finger) rhizome stored in black polyethylene bags during storage at 45°, 55° and 70 °C. Rate equation for each temperature was expressed as $c = -0.0025t + 0.4252$, $r^2 = 0.9797$; $c = -0.0065t + 0.3758$, $r^2 = 0.8542$; $c = -0.0150t + 0.3043$, $r^2 = 0.9777$, respectively.

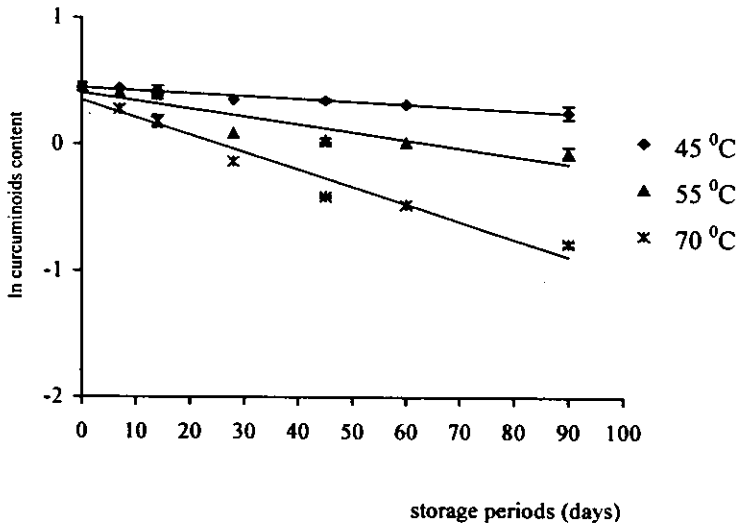


Figure A-18 The first-order plots of degradation of curcuminoids content of sliced zedoary (finger) rhizome stored in black polyethylene bags during storage at 45°, 55° and 70 °C. Rate equation for each temperature was expressed as $c = -0.0022t + 0.4467$, $r^2 = 0.9571$; $c = -0.0062t + 0.4065$, $r^2 = 0.8346$; $c = -0.0137t + 0.3484$, $r^2 = 0.9560$, respectively.

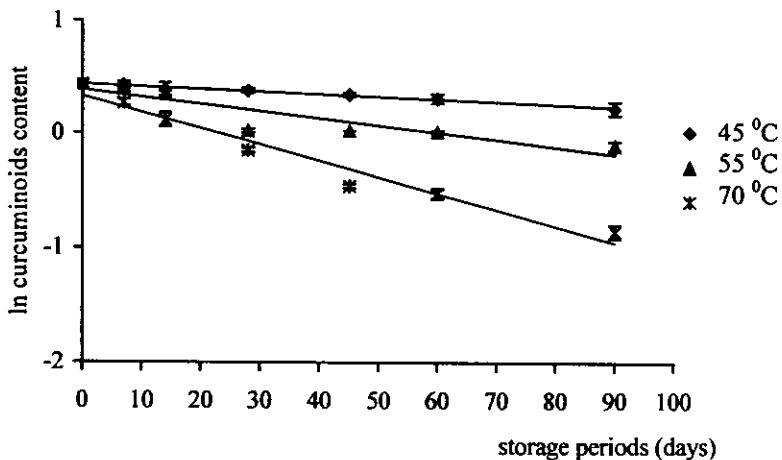


Figure A-19 The first-order plots of degradation of curcuminoids content of powdered zedoary (finger) rhizome stored in paper bags during storage at 45°, 55° and 70 °C. Rate equation for each temperature was expressed as $c = -0.0025t + 0.4167$, $r^2 = 0.9720$; $c = -0.0064t + 0.3634$, $r^2 = 0.8566$; $c = -0.0154t + 0.3111$, $r^2 = 0.9770$, respectively.

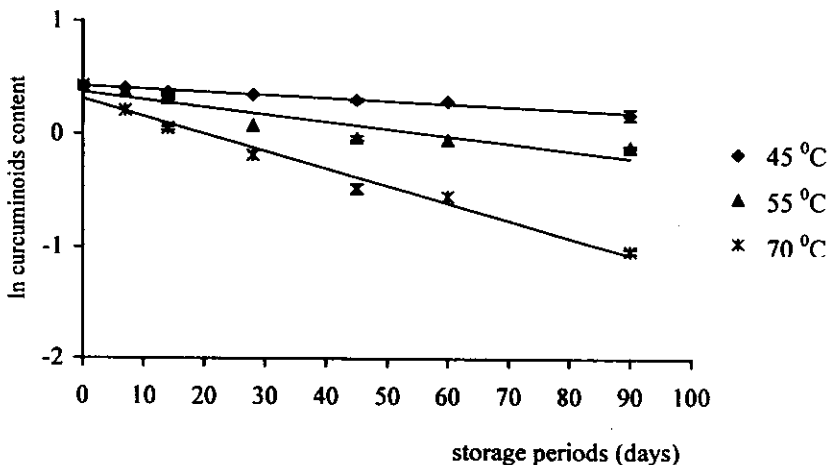


Figure A-20 The first-order plots of degradation of curcuminoids content of sliced zedoary (finger) rhizome stored in paper bags during storage at 45°, 55° and 70 °C. Rate equation for each temperature was expressed as $c = -0.0023t + 0.4346$, $r^2 = 0.9782$; $c = -0.0063t + 0.3820$, $r^2 = 0.8099$; $c = -0.0142t + 0.3286$, $r^2 = 0.9619$, respectively.

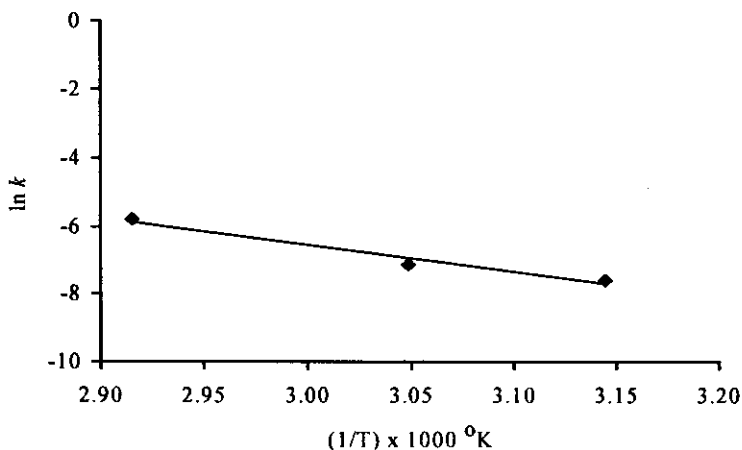


Figure A-21 The Arrhenius plot of curcuminoids content of powdered turmeric rhizome stored in black polyethylene bags during storage at accelerated temperatures. The Arrhenius relation could be expressed as $\ln k = 17.7530 - 8.0983(1/T)$; $r^2 = 0.9684$.

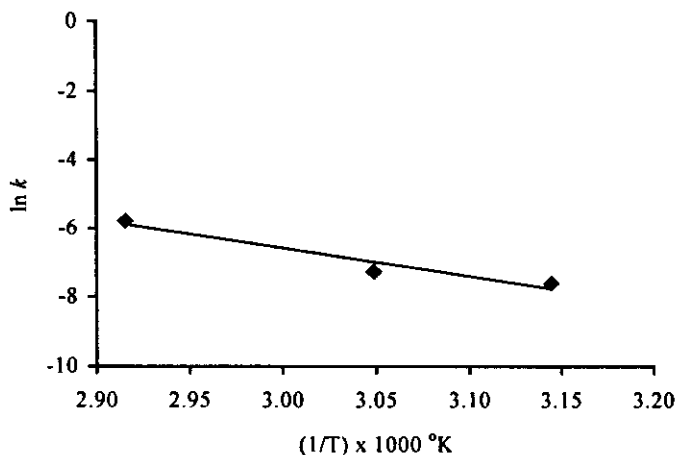


Figure A-22 The Arrhenius plot of curcuminoids content of sliced turmeric rhizome stored in black polyethylene bags during storage at accelerated temperatures. The Arrhenius relation could be expressed as $\ln k = 17.899 - 8.1612(1/T)$; $r^2 = 0.9362$.

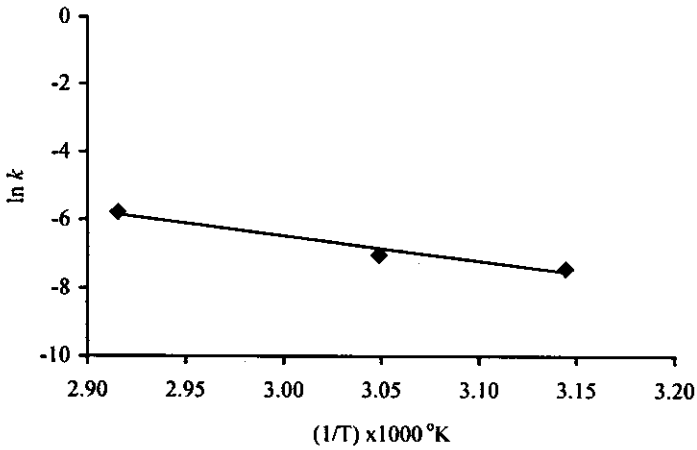


Figure A-23 The Arrhenius plot of curcuminoids content of powdered turmeric rhizome stored in paper bags during storage at accelerated temperatures. The Arrhenius relation could be expressed as $\ln k = 15.421 - 7.2974(1/T)$; $r^2 = 0.9642$.

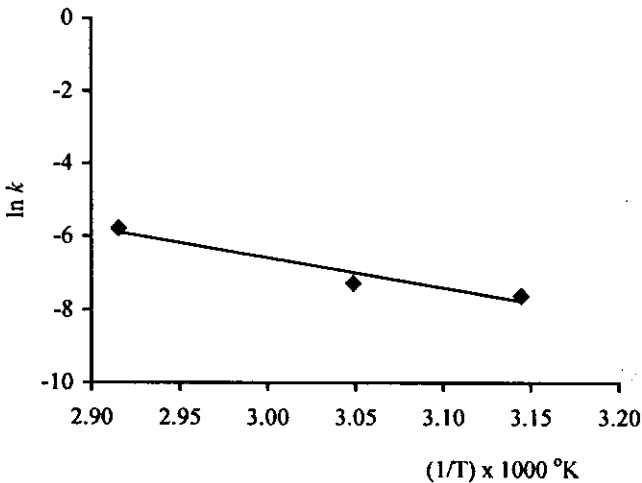


Figure A-24 The Arrhenius plot of curcuminoids content of sliced turmeric rhizome stored in paper bags during storage at accelerated temperatures. The Arrhenius relation could be expressed as $\ln k = 17.899 - 8.1612(1/T)$; $r^2 = 0.9362$.

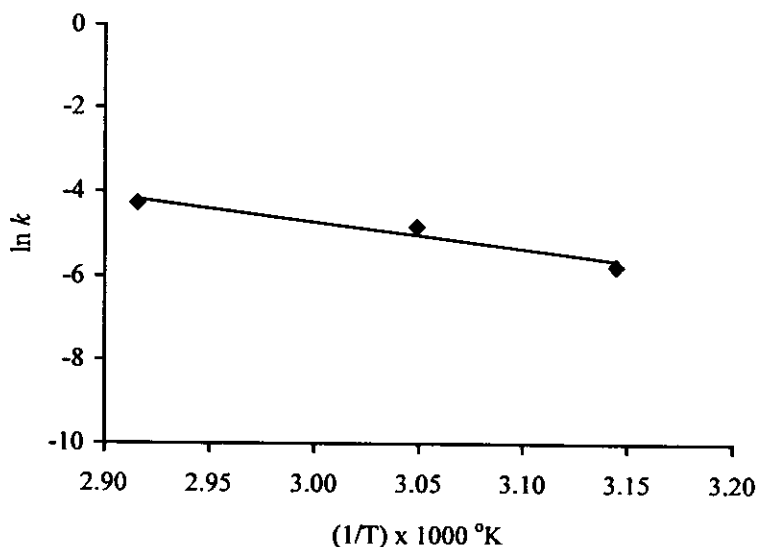


Figure A-25 The Arrhenius plot of curcuminoids content of powdered zedoary (bulb) rhizome stored in black polyethylene bags during storage at accelerated temperatures. The Arrhenius relation could be expressed as $\ln k = 14.2640 - 6.3251(1/T)$; $r^2 = 0.9440$.

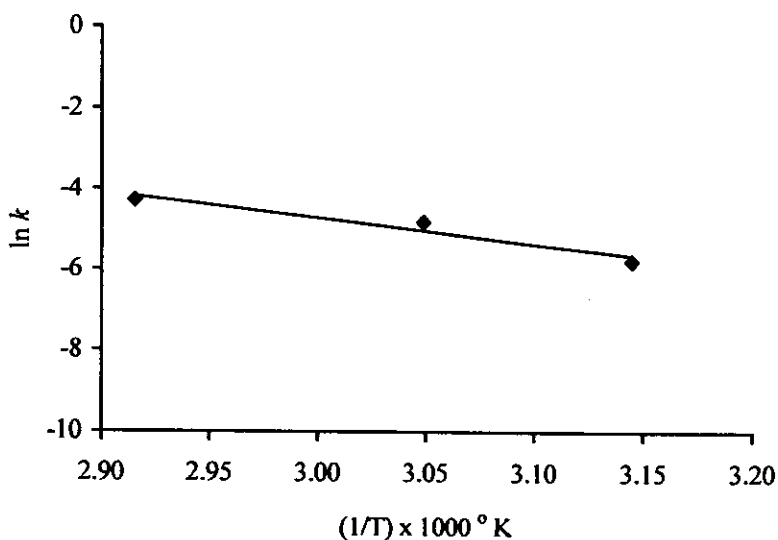


Figure A-26 The Arrhenius plot of curcuminoids content of sliced zedoary (bulb) rhizome stored in black polyethylene bags during storage at accelerated temperature. The Arrhenius relation could be expressed as $\ln k = 14.4450 - 6.3898(1/T)$; $r^2 = 0.9366$.

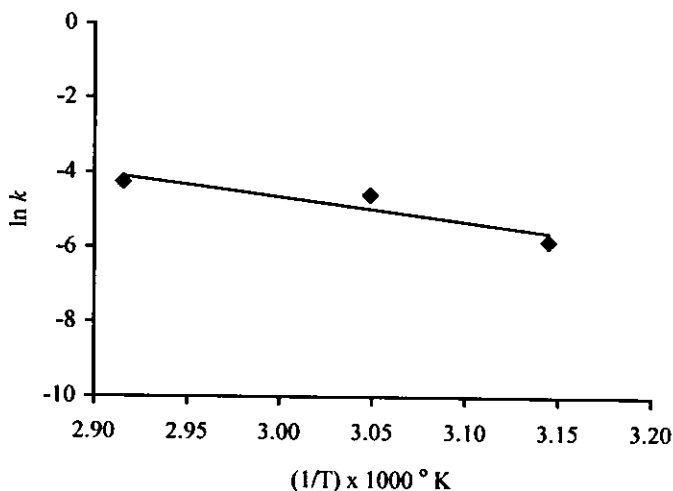


Figure A-27 The Arrhenius plot of curcuminoids content of powdered zedoary (bulb) rhizome stored in paper bags during storage at accelerated temperature. The Arrhenius relation could be expressed as $\ln k = 14.2640 - 6.3251(1/T)$; $r^2 = 0.9440$.

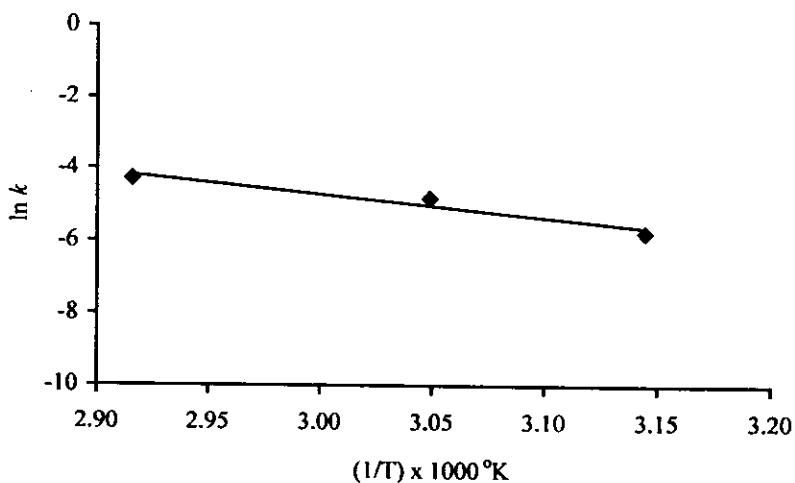


Figure A-28 The Arrhenius plot of curcuminoids content of sliced zedoary (bulb) rhizome stored in paper bags during storage at accelerated temperature. The Arrhenius relation could be expressed as $\ln k = 13.9590 - 6.2269(1/T)$; $r^2 = 0.9392$.

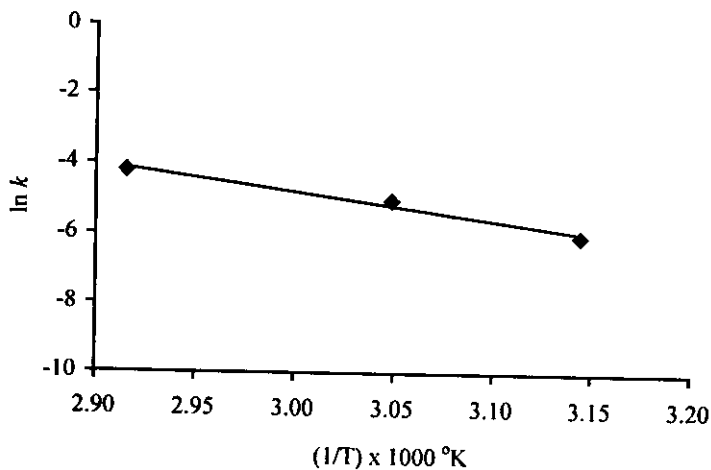


Figure A-29 The Arrhenius plot of curcuminoids content of powdered zedoary (finger) rhizome stored in black polyethylene bags during storage at accelerated temperatures. The Arrhenius relation could be expressed as $\ln k = 18.8590 - 7.8873(1/T)$; $r^2 = 0.9793$.

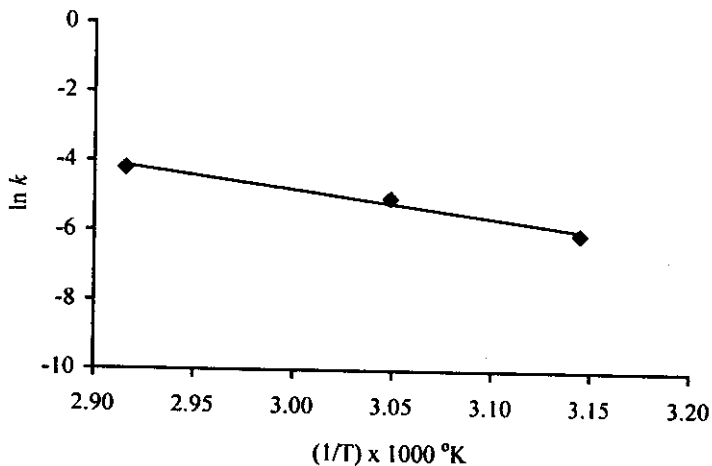


Figure A-30 The Arrhenius plot of curcuminoids content of sliced zedoary (finger) rhizome stored in black polyethylene bags during storage at accelerated temperatures. The Arrhenius relation could be expressed as $\ln k = 18.6760 - 7.8517(1/T)$; $r^2 = 0.9711$.

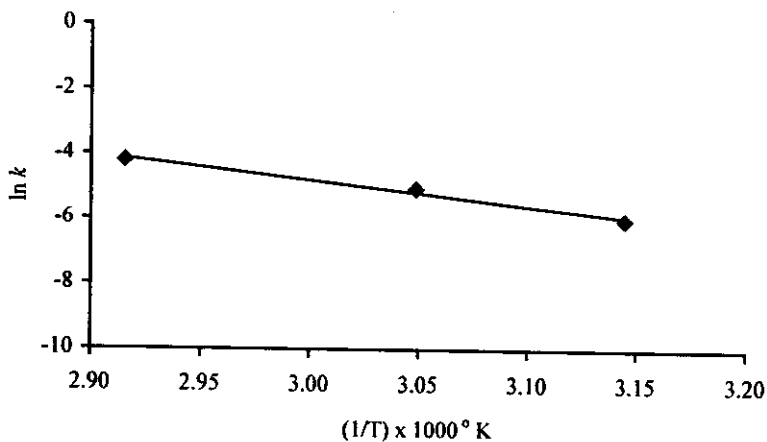


Figure A-31 The Arrhenius plot of curcuminoids content of powdered zedoary (finger) rhizome stored in paper bags during storage at accelerated temperatures. The Arrhenius relation could be expressed as $\ln k = 18.5700 - 7.7880/T$; $r^2 = 0.9861$.

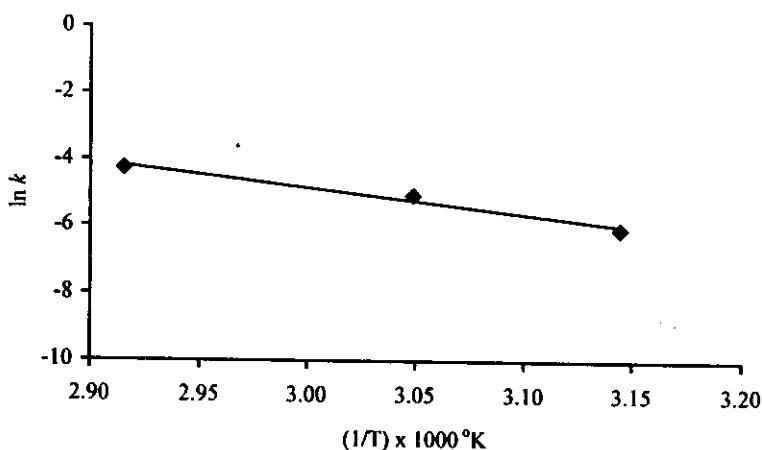


Figure A-32 The Arrhenius plot of curcuminoids content of sliced zedoary (finger) rhizome stored in paper bags during storage at accelerated temperatures. The Arrhenius relation could be expressed as $\ln k = 18.6300 - 7.8259/T$; $r^2 = 0.9759$.

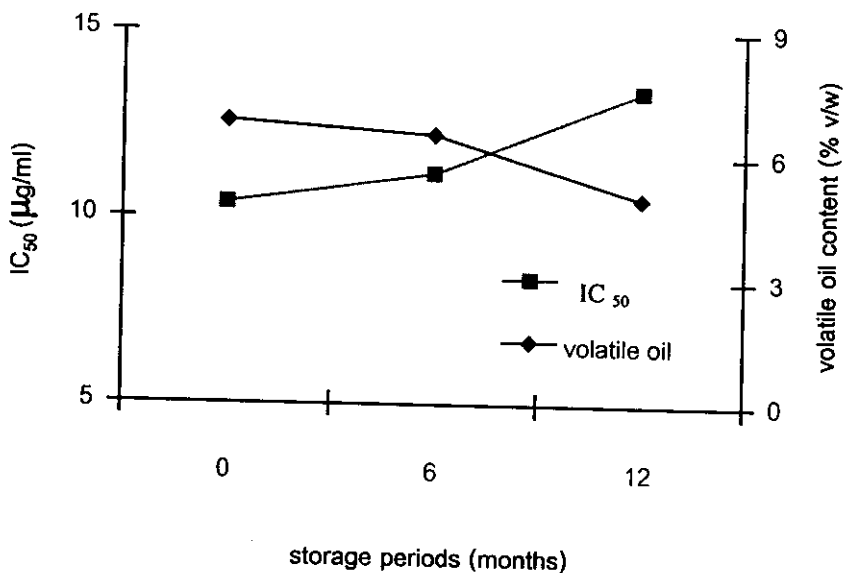


Figure A-33 IC₅₀ in antioxidant study (DPPH method) and volatile oil content of turmeric rhizome during different storage periods.

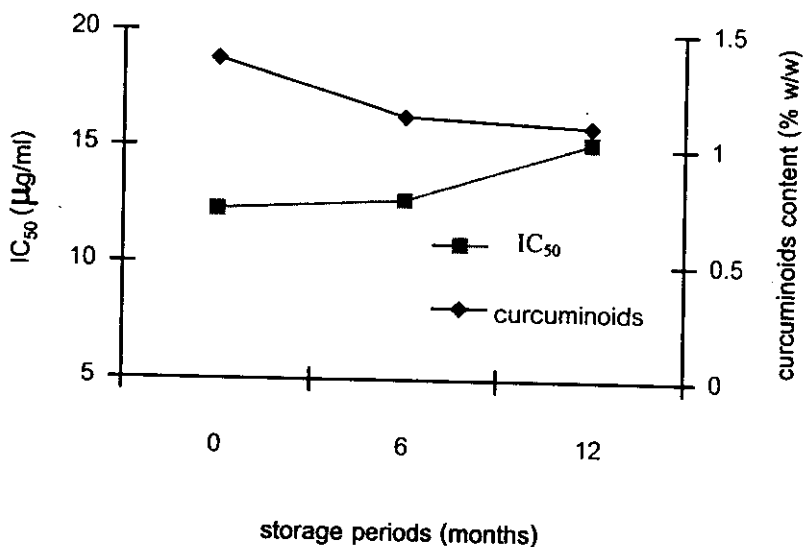


Figure A-34 IC₅₀ in antioxidant study (DPPH method) and curcuminoids content of zedoary (bulb) rhizome during different storage periods.

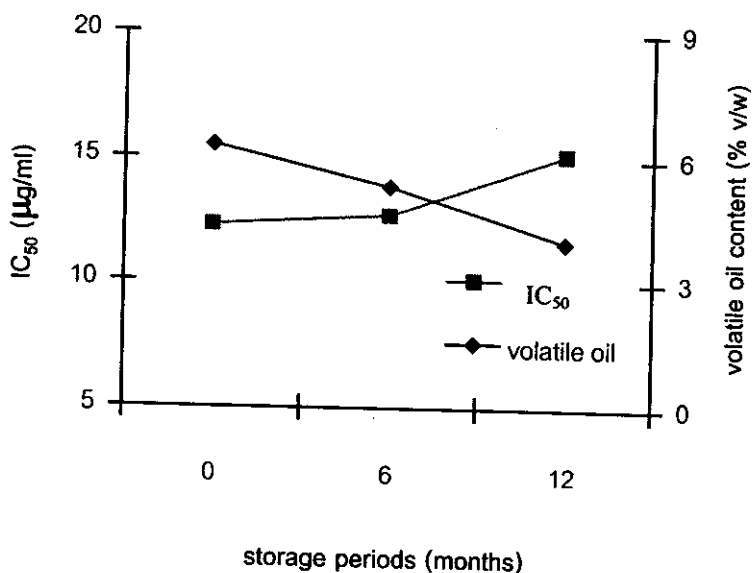


Figure A-35 IC₅₀ in antioxidant study (DPPH method) and volatile oil content of zedoary (bulb) rhizome during different storage periods.

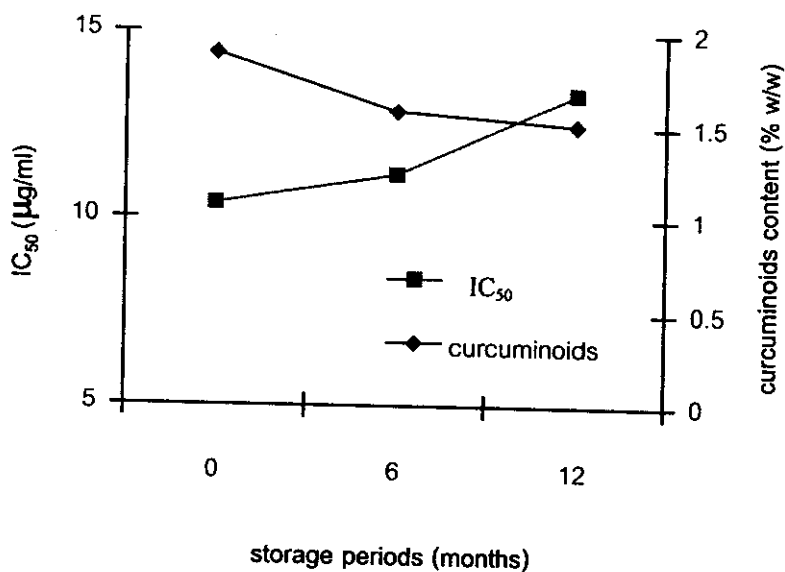


Figure A-36 IC₅₀ in antioxidant study (DPPH method) and curcuminoids content of zedoary (finger) rhizome during different storage periods.

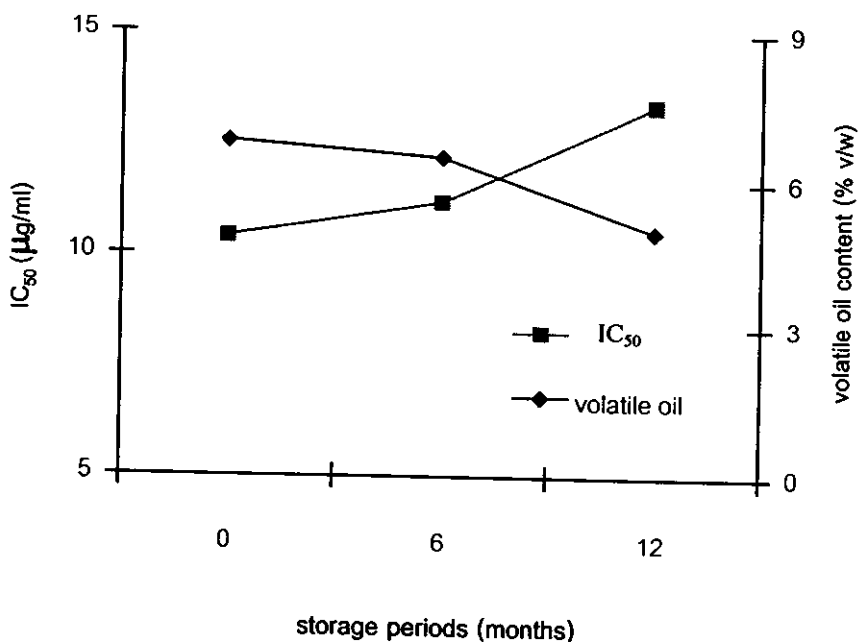


Figure A-37 IC₅₀ in antioxidant study (DPPH method) and volatile oil content of zedoary (finger) rhizome during different storage periods.

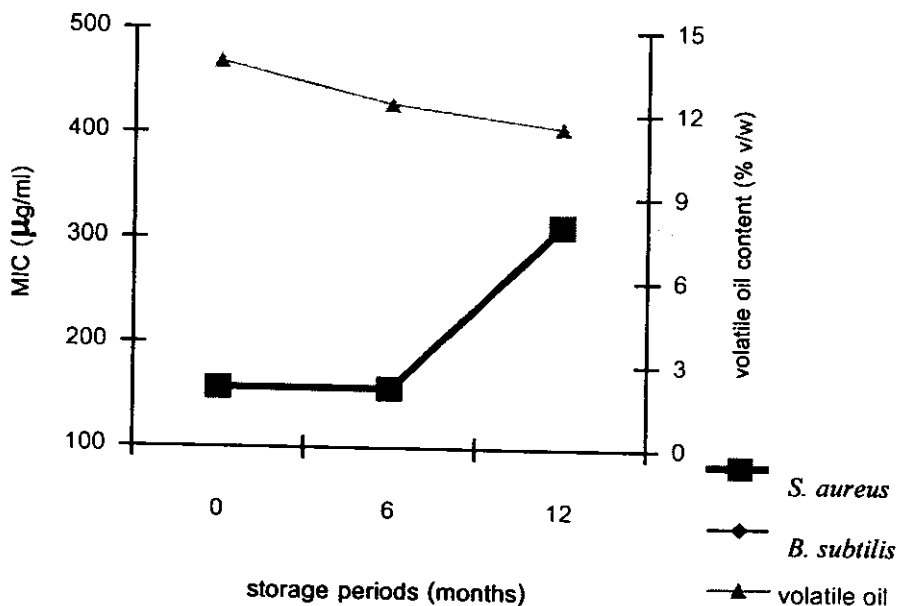


Figure A-38 MIC in antibacterial study (agar-dilution method) and volatile oil content of turmeric rhizome during different storage periods.

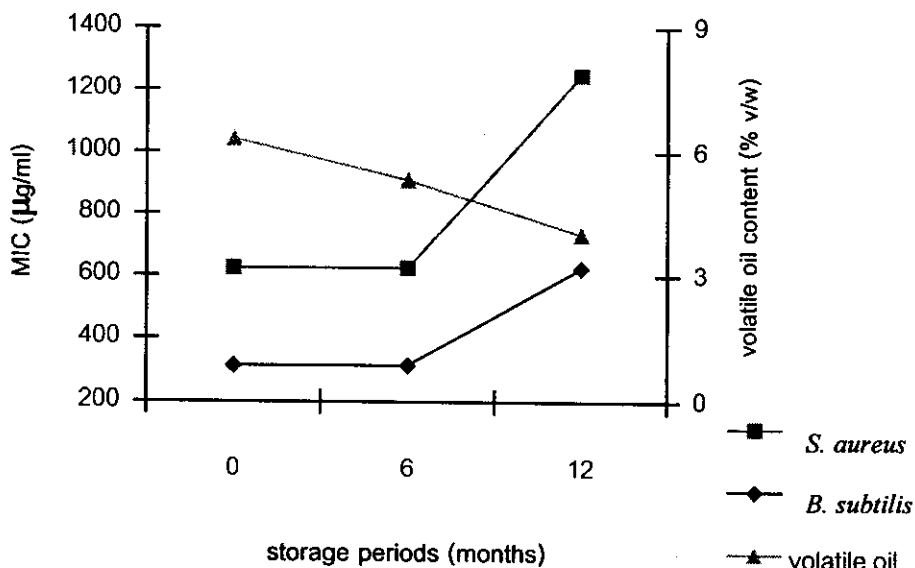


Figure A-39 MIC in antibacterial study (agar-dilution method) and volatile oil content of zedoary (bulb) rhizome during different storage periods.

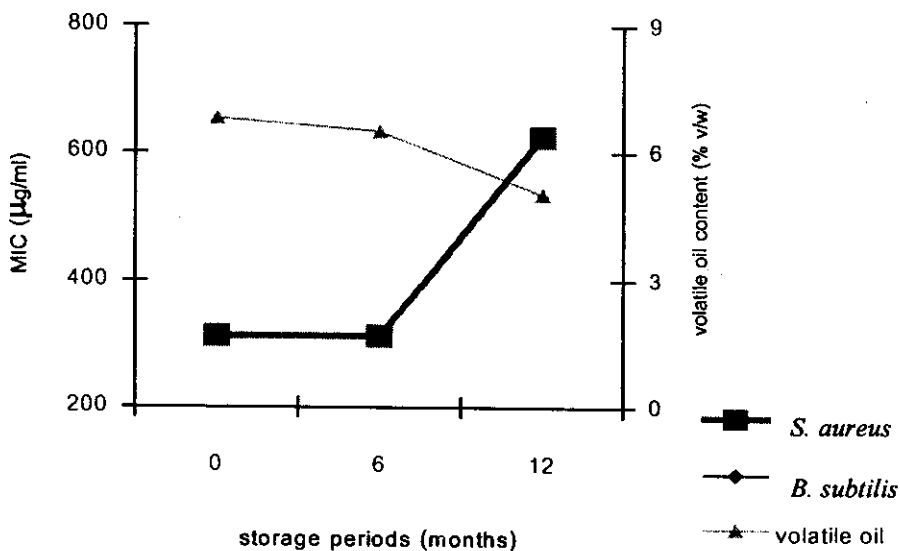


Figure A-40 MIC in antibacterial study (agar-dilution method) and volatile oil content and of zedoary (finger) rhizome during different storage periods.

Table A-1 Analysis of variance of curcuminoids content of turmeric stored under different conditions at room temperature, by forms of preparations, types of storage bags and storage periods.

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Preparations	1.977	1	1.977	7.811	0.007*
Bags	0.529	1	0.529	2.089	0.155
Times	14.525	5	2.905	11.479	0.000*
Preparations - Bags	1.512×10^{-3}	1	1.512×10^{-3}	0.006	0.939
Preparations - Times	0.499	5	9.973×10^{-2}	0.394	0.850
Bags - Times	0.299	5	5.974×10^{-2}	0.236	0.945
Preparations - Bags - Times	0.461	5	9.210×10^{-2}	0.364	0.871
Error	12.148	48			
Total	30632.581	72			

* Significant at $p < 0.05$.

Table A-2 Multiple comparisons between forms of preparations, types of storage bags at different storage periods on curcuminoids content of turmeric rhizome.

Forms of preparations		Mean Difference	Std. Error	P-value	95% Confidence Interval	
Types of storage bags :					Lower Bound	Upper Bound
Storage periods (months)						
Powdered						
	0 - 3	-0.727	0.411	1.000	-1.996	0.542
	0 - 6	-0.123	0.411	1.000	-1.392	1.146
BPB	0 - 9	0.720	0.411	1.000	-0.549	1.989
	0 - 12	0.160	0.411	1.000	-1.109	1.429
	0 - 15	0.217	0.411	1.000	-1.052	1.486

Table A-2 Multiple comparisons between forms of preparations, types of storage bags at different storage periods on curcuminoids content of turmeric rhizome (continued).

Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval		
				Lower Bound	Upper Bound	
Types of storage bags :						
Storage periods (months)						
Powdered						
PB :	0 - 3	-0.407	0.411	1.000	-1.676	0.862
	0 - 6	-1.000x10 ⁻²	0.411	1.000	-1.279	1.259
	0 - 9	0.883	0.411	0.549	-0.386	2.152
	0 - 12	0.330	0.411	1.000	-0.939	1.599
	0 - 15	0.533	0.411	1.000	-0.736	1.802
Sliced						
BPB :	0 - 3	-0.277	0.411	1.000	-1.546	0.992
	0 - 6	0.137	0.411	1.000	-1.132	1.406
	0 - 9	0.890	0.411	0.529	-0.379	2.159
	0 - 12	0.757	0.411	1.000	-0.512	2.026
	0 - 15	0.783	0.411	0.938	-0.486	2.052
Sliced						
PB :	0 - 3	-0.320	0.411	1.000	-1.589	0.949
	0 - 6	0.697	0.411	1.000	-0.572	1.966
	0 - 9	1.410	0.411	0.019*	0.141	2.679
	0 - 12	0.707	0.411	1.000	-0.562	1.976
	0 - 15	0.770	0.411	1.000	-0.499	2.039

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-3 Analysis of variance of curcuminoids content of zedoary (bulb) rhizome stored under different conditions at room temperature, by types of storage bags, forms of preparations and storage periods.

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Preparations	0.242	1	0.242	59.762	0.000*
Bags	3.220×10^{-2}	1	3.220×10^{-2}	7.954	0.007*
Times	0.507	4	0.127	31.287	0.000*
Preparations – Bags	7.350×10^{-4}	1	7.350×10^{-4}	0.182	0.672
Preparations – Times	6.839×10^{-2}	4	1.710×10^{-2}	4.223	0.006*
Bags – Times	1.032×10^{-2}	4	2.581×10^{-3}	0.638	0.639
Preparations – Bags – Times	3.457×10^{-3}	4	8.642×10^{-4}	0.213	0.929
Error	0.162	40	4.048×10^{-3}		
Total	91.480	60			

* Significant at $p < 0.05$.

Table A-4 Comparisons between curcuminoids content of zedoary (bulb) rhizome and forms of preparations.

Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
Sliced - Powdered	0.127	0.016	0.000*	9.380×10^{-2}	0.160

* The mean difference is significant at the 0.05 level.
Adjustment for multiple comparisons: Bonferroni.

Table A-5 Comparisons between curcuminoids content of zedoary (bulb) rhizome and interaction among forms of preparations and storage periods.

Storage periods: Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper bound
0: Sliced-Powdered	8.695×10^{-17}	0.037	1.000	-7.424×10^{-2}	7.424×10^{-2}
3: Sliced-Powdered	0.162	0.037	0.000*	8.742×10^{-2}	0.236
6: Sliced-Powdered	0.197	0.037	0.000*	0.122	0.271
9: Sliced-Powdered	0.152	0.037	0.000*	7.742×10^{-2}	0.226
12: Sliced-Powdered	0.125	0.037	0.002*	5.076×10^{-2}	0.199

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A- 6 Multiple comparisons between curcuminoids content of zedoary (bulb) rhizome and types of storage bags.

Types of storage bags	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
BPB - PB	4.633×10^{-2}	0.016	0.007*	1.313×10^{-2}	7.954×10^{-2}

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-7 Multiple comparisons between forms of preparations, types of storage bags at different storage periods on curcuminoids content of zedoary (bulb) rhizome.

Forms of preparations		Mean Difference	Std. Error	P-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Types of storage bags :						
Storage periods (months)						
Powdered						
BPB :	0 - 3	0.163	0.052	0.031*	8.979×10^{-3}	0.318
	0 - 6	0.250	0.052	0.000*	9.565×10^{-2}	0.404
	0 - 9	0.280	0.052	0.000*	0.126	0.434
	0 - 12	0.287	0.052	0.000*	0.132	0.441
Powdered						
PB :	0 - 3	0.207	0.052	0.003*	5.231×10^{-2}	0.361
	0 - 6	0.303	0.052	0.000*	0.149	0.458
	0 - 9	0.307	0.052	0.000*	0.152	0.461
	0 - 12	0.360	0.052	0.000*	0.206	0.514
Sliced						
BPB :	0 - 3	1.000×10^{-2}	0.052	1.000	-0.144	0.164
	0 - 6	4.333×10^{-2}	0.052	1.000	-0.111	0.198
	0 - 9	9.333×10^{-2}	0.052	0.800	-6.102×10^{-2}	0.248
	0 - 12	0.163	0.052	0.031*	8.979×10^{-3}	0.318
Sliced						
PB :	0 - 3	3.667×10^{-2}	0.052	1.000	-0.118	0.191
	0 - 6	0.117	0.052	0.303	-3.769×10^{-2}	0.271
	0 - 9	0.190	0.052	0.007*	3.565×10^{-2}	0.344
	0 - 12	0.233	0.052	0.001*	7.898×10^{-2}	0.388

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-8 Analysis of variance of curcuminoids content of zedoary (finger) rhizome stored under different conditions at room temperature by forms of preparations, types of storage bags and storage periods.

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Preparations	0.132	1	0.132	35.329	0.000*
Bags	1.093×10^{-2}	1	1.093×10^{-2}	2.936	0.094
Times	0.930	4	0.232	62.388	0.000*
Preparations - Bags	2.817×10^{-4}	1	2.817×10^{-4}	0.076	0.785
Preparations - Times	6.296×10^{-2}	4	1.574×10^{-2}	4.225	0.006*
Bags - Times	8.090×10^{-3}	4	2.023×10^{-3}	0.543	0.705
Preparations - Bags - Times	1.443×10^{-3}	4	3.608×10^{-4}	0.097	0.983
Error	0.149	40	3.725×10^{-3}		
Total	169.732	60			

* Significant at $p < 0.05$.

Table A-9 Comparisons between curcuminoids content of zedoary (finger) rhizome and forms of preparations.

Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
Sliced - Powdered	9.367×10^{-2}	0.016	0.000*	6.182×10^{-2}	0.126

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-10 Comparisons between curcuminoids content of zedoary (finger) rhizome and interaction among forms of preparations and storage periods.

Storage periods: Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
0: Sliced-Powdered	1.518×10^{-17}	0.035	1.000	-7.122×10^{-2}	7.122×10^{-2}
3: Sliced-Powdered	0.185	0.035	0.000*	0.114	0.256
6: Sliced-Powdered	0.145	0.035	0.000*	7.378×10^{-2}	0.216
9: Sliced-Powdered	7.333×10^{-2}	0.035	0.044*	2.116×10^{-3}	0.145
12: Sliced-Powdered	6.500×10^{-2}	0.035	0.073	-6.217×10^{-3}	0.136

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-11 Multiple comparisons between forms of preparations, types of storage bags at different storage periods on curcuminoids content of zedoary (finger) rhizome.

Forms of preparations Types of storage bags :	Storage periods (months)	Mean Difference	Std. Error	P-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Powdered						
BPB :	0 - 3	0.260	0.050	0.000*	0.112	0.408
	0 - 6	0.310	0.050	0.000*	0.162	0.458
	0 - 9	0.313	0.050	0.000*	0.165	0.461
	0 - 12	0.383	0.050	0.000*	0.235	0.531
Powdered						
PB :	0 - 3	0.277	0.050	0.000*	0.129	0.425
	0 - 6	0.343	0.050	0.000*	0.195	0.491
	0 - 9	0.357	0.050	0.000*	0.209	0.505
	0 - 12	0.403	0.050	0.000*	0.255	0.551

Table A-11 Multiple comparisons between forms of preparations, types of storage bags at different storage periods on curcuminoids content of zedoary (finger) rhizome (continued).

Forms of preparations		Mean Difference	Std. Error	P-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Types of storage bags :						
Storage periods (months)						
Sliced						
BPB	0 - 3	8.333×10^{-2}	0.050	1.000	-6.473×10^{-2}	0.231
	0 - 6	0.150	0.050	0.045*	1.937×10^{-3}	0.298
	0 - 9	0.223	0.050	0.001*	7.527×10^{-2}	0.371
	0 - 12	0.320	0.050	0.000*	0.172	0.468
Sliced						
PB	0 - 3	8.333×10^{-2}	0.050	1.000	-6.473×10^{-2}	0.231
	0 - 6	0.213	0.050	0.001*	6.527×10^{-2}	0.361
	0 - 9	0.300	0.050	0.000*	0.152	0.448
	0 - 12	0.337	0.050	0.000*	0.189	0.485

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-12 Analysis of variance of volatile oil content of turmeric during different storage conditions at room temperature, by types of storage bags, forms of preparations and storage periods.

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Preparations	43.245	1	43.245	583.450	0.000*
Bags	1.145	1	1.145	15.449	0.000*
Times	34.272	5	6.854	92.478	0.000*
Preparations – Bags	0.358	1	0.358	4.836	0.033*
Preparations – Times	12.429	5	2.486	33.538	0.000*
Bags – Times	0.705	5	0.141	1.903	0.111
Preparations – Bags – Times	0.256	5	5.129×10^{-2}	0.692	0.632
Error	3.558	48	7.412×10^{-2}		
Total	11542.823				

* Significant at $p < 0.05$.

Table A-13 Comparisons between volatile oil content of turmeric rhizome and forms of preparations.

Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
Sliced - Powdered	1.550	0.064	0.000*	1.421	1.679

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-14 Comparisons between volatile oil content of turmeric rhizome and types of storage bags.

Types of storage bags	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
BPB - PB	0.252	0.064	0.000*	0.123	0.381

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-15 Comparisons between volatile oil content of turmeric rhizome and interaction among storage periods and forms of preparations.

Storage periods: Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
0: Sliced-Powdered	3.608×10^{-16}	0.157	1.000	-0.316	0.316
3: Sliced-Powdered	1.138	0.157	0.000*	0.822	1.454
6: Sliced-Powdered	1.587	0.157	0.000*	1.271	1.903
9: Sliced-Powdered	1.997	0.157	0.000*	1.681	2.313
12: Sliced-Powdered	1.917	0.157	0.000*	1.601	2.233
15: Sliced-Powdered	2.662	0.157	0.000*	2.346	2.978

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-16 Comparisons between volatile oil content of turmeric rhizome and interaction among forms of preparations and types of storage bags.

Forms of preparations:	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
Types of storage bags					
Powdered: BPB-PB	0.394	0.091	0.000*	0.211	0.576
Sliced: BPB-PB	0.111	0.091	0.227	-7.135x10 ⁻²	0.294

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-17 Multiple comparisons between forms of preparations, types of storage bags at different storage periods on volatile oil content of turmeric rhizome.

Forms of preparations	Types of storage bags :	Storage periods (months)	Mean Difference	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
		Powdered					
	BPB :	0 - 3	1.453	0.222	0.000*	0.767	2.140
		0 - 6	1.510	0.222	0.000*	0.823	2.197
		0 - 9	2.173	0.222	0.000*	1.487	2.860
		0 - 12	2.343	0.222	0.000*	1.657	3.030
		0 - 15	3.337	0.222	0.000*	2.650	4.023
		Powdered					
	PB :	0 - 3	1.500	0.222	0.001*	0.813	2.187
		0 - 6	2.337	0.222	0.000*	1.650	3.023
		0 - 9	2.833	0.222	0.000*	2.147	3.520
		0 - 12	2.670	0.222	0.000*	1.983	3.357
		0 - 15	3.837	0.222	0.000*	3.150	4.523

Table A-17 Multiple comparisons between forms of preparations, types of storage bags at different storage periods on volatile oil content of turmeric rhizome (continued).

Forms of preparations		Mean Difference	Std. Error	P-value	95% Confidence Interval	
Types of storage bags :					Lower Bound	Upper Bound
Storage periods (months)						
Sliced						
BPB :	0 - 3	0.337	0.222	1.000	-0.350	1.023
	0 - 6	0.170	0.222	1.000	-0.517	0.857
	0 - 9	0.507	0.222	0.407	-0.180	1.193
	0 - 12	0.507	0.222	0.407	-0.180	1.193
	0 - 15	0.843	0.222	0.006*	0.157	1.530
Sliced						
PB :	0 - 3	0.340	0.222	1.000	-0.347	1.027
	0 - 6	0.503	0.222	0.422	-0.183	1.190
	0 - 9	0.507	0.222	0.407	-0.180	1.193
	0 - 12	0.673	0.222	0.059	-1.337x10 ⁻²	1.360
	0 - 15	1.007	0.222	0.001*	0.320	1.693

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-18 Analysis of variance of volatile oil content of zedoary (bulb) rhizome stored under different conditions at room temperature, by forms of preparations, types of storage bags and storage periods.

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Preparations	9.204	1	9.204	148.239	0.000*
Bags	0.504	1	0.504	8.120	0.007*
Times	21.016	4	5.254	84.618	0.000*
Preparations – Bags	4.167×10^{-3}	1	4.167×10^{-3}	0.067	0.797
Preparations – Times	7.817	4	1.954	31.473	0.000*
Bags – Times	0.435	4	0.109	1.752	0.158
Preparations – Bags – Times	1.672×10^{-2}	4	4.179×10^{-3}	0.067	0.991
Error	2.484	40	6.209×10^{-2}		
Total	2052.232	60			

* Significant at $p < 0.05$.

Table A-19 Comparisons between volatile oil content of zedoary (bulb) rhizome and forms of preparations.

Forms of Preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
Sliced - Powdered	0.783	0.064	0.000*	0.653	0.913

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-20 Comparisons between volatile oil content of zedoary (bulb) rhizome and interaction among forms of preparations and storage periods.

Forms of preparations	Storage periods:	Mean Difference	Std. Error	P-value	95% Confidence Interval	
					Lower Bound	Upper Bound
	0: Sliced-Powdered	9.021×10^{-16}	0.144	1.000	-0.291	0.291
	3: Sliced-Powdered	7.355×10^{-16}	0.144	1.000	-0.291	0.291
	6: Sliced-Powdered	0.998	0.144	0.000*	0.708	1.289
	9: Sliced-Powdered	1.002	0.144	0.000*	0.711	1.292
	12: Sliced-Powdered	1.917	0.144	0.000*	1.626	2.207

* The mean difference is significant at the 0.05 level.
Adjustment for multiple comparisons: Bonferroni.

Table A-21 Multiple comparisons between volatile oil content of zedoary (bulb) rhizome and types of storage bags.

Types of storage bags	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
BPB - PB	0.183	0.064	0.007*	5.330×10^{-2}	0.313

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.
Adjustment for multiple comparisons: Bonferroni.

Table A-22 Multiple comparisons between forms of preparations, types of storage bags at different storage periods on volatile oil content of zedoary (bulb) rhizome.

Forms of preparations		Mean Difference	Std. Error	P-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Types of storage bags :						
Storage periods (months)						
Powdered						
BPB :	0 - 3	-0.173	0.203	1.000	-0.778	0.431
	0 - 6	0.990	0.203	0.000*	0.386	1.594
	0 - 9	0.990	0.203	0.000*	0.386	1.594
	0 - 12	2.323	0.203	0.000*	1.719	2.928
Powdered						
PB :	0 - 3	0.157	0.203	1.000	-0.448	0.761
	0 - 6	0.990	0.203	0.000*	0.386	1.594
	0 - 9	1.160	0.203	0.000*	0.556	1.764
	0 - 12	2.823	0.203	0.000*	2.219	3.428
Sliced						
BPB :	0 - 3	-0.177	0.203	1.000	-0.781	0.428
	0 - 6	-6.667×10^{-3}	0.203	1.000	-0.611	0.598
	0 - 9	-1.000×10^{-2}	0.203	1.000	-0.614	0.594
	0 - 12	0.490	0.203	0.207	-0.114	1.094
Sliced						
PB :	0 - 3	0.160	0.203	1.000	-0.444	0.764
	0 - 6	-1.000×10^{-2}	0.203	1.000	-0.614	0.594
	0 - 9	0.157	0.203	1.000	-0.448	0.761
	0 - 12	0.823	0.203	0.002*	0.219	1.428

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-23 Analysis of variance of volatile oil content of zedoary (finger) rhizome stored under different conditions at room temperature, by forms of preparations, types of storage bags and storage periods.

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Preparations	8.423	1	8.423	189.582	0.000*
Bags	0.933	1	0.933	20.990	0.000*
Time	11.579	4	2.895	65.157	0.000*
Preparations – Bags	3.750×10^{-2}	1	3.750×10^{-2}	0.844	0.364
Preparations – Times	4.963	4	1.241	27.930	0.000*
Bags – Times	0.458	4	0.115	2.579	0.052
Preparations – Bags – Times	0.110	4	2.750×10^{-2}	0.619	0.651
Error	1.777	40	4.443×10^{-2}		
Total	2476.417	60			

* Significant at $p < 0.05$.

Table A-24 Comparisons between volatile oil content of zedoary (finger) rhizome and forms of preparations.

Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
Sliced - Powdered	0.749	0.054	0.000*	0.639	0.859

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-25 Comparisons between volatile oil content of zedoary (finger) rhizome and interaction among forms of preparations and storage periods.

Storage periods: Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
0: Sliced-Powdered	2.498x10 ⁻¹⁶	0.122	1.000	-0.246	0.246
3: Sliced-Powdered	0.415	0.122	0.001*	0.169	0.661
6: Sliced-Powdered	0.582	0.122	0.000*	0.336	0.828
9: Sliced-Powdered	1.083	0.122	0.000*	0.837	1.329
12: Sliced-Powdered	1.667	0.122	0.000*	1.421	1.913

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-26 Multiple comparisons between volatile oil content of zedoary (finger) rhizome and types of storage bags.

Types of storage bags	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
BPB - PB	0.249	0.054	0.000*	0.139	0.359

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-27 Multiple comparisons between types of storage bags, forms of preparations at different storage periods on volatile oil content of zedoary (finger) rhizome.

Forms of preparations		Mean Difference	Std. Error	P-value	95% Confidence Interval		
					Lower Bound	Upper Bound	
Types of storage bags :							
Storage periods (months)							
Powdered							
BPB	:	0 - 3	0.320	0.172	0.703	-0.191	0.831
		0 - 6	0.317	0.172	0.732	-0.195	0.828
		0 - 9	0.817	0.172	0.000*	0.305	1.328
		0 - 12	1.817	0.172	0.000*	1.305	2.328
Powdered							
PB	:	0 - 3	0.317	0.172	0.732	-0.195	0.828
		0 - 6	0.817	0.172	0.000*	0.305	1.328
		0 - 9	1.317	0.172	0.000*	0.805	1.828
		0 - 12	2.317	0.172	0.000*	1.805	2.828
Sliced							
BPB	:	0 - 3	-0.180	0.172	1.000	-0.691	0.331
		0 - 6	-0.180	0.172	1.000	-0.691	0.331
		0 - 9	-0.183	0.172	1.000	-0.695	0.328
		0 - 12	0.317	0.172	0.732	-0.195	0.828
Sliced							
PB	:	0 - 3	-1.333×10^{-2}	0.172	1.000	-0.525	0.498
		0 - 6	0.150	0.172	1.000	-0.361	0.661
		0 - 9	0.150	0.172	1.000	-0.361	0.661
		0 - 12	0.483	0.172	0.077	-2.800×10^{-2}	0.995

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-28 Analysis of variance of moisture content of turmeric rhizome stored under different conditions at room temperature, by types of storage bags, forms of preparations and storage periods.

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Preparations	5.200	1	5.200	87.366	0.000*
Bags	5.473	1	5.473	91.939	0.000*
Times	50.152	5	10.030	168.511	0.000*
Preparations – Bags	0.431	1	0.431	7.239	0.010*
Preparations – Times	1.563	5	0.313	5.252	0.001*
Bags – Times	2.625	5	0.525	8.819	0.000*
Preparations – Bags – Times	0.173	5	3.465×10^{-2}	0.582	0.713
Error	2.857	48	5.952×10^{-2}		
Total	3059.083	72			

* Significant at $p < 0.05$.

Table A-29 Multiple comparisons between moisture content of turmeric rhizome and forms of preparations.

Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
Powdered-Sliced	0.537	0.058	0.000*	0.422	0.653

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-30 Multiple comparisons between moisture content of turmeric rhizome and interaction among storage periods and forms of preparations.

Storage periods (months) : Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
0 : Powdered - Sliced	1.221×10^{-15}	0.141	1.000	-0.283	0.283
3 : Powdered - Sliced	1.007	0.141	0.000*	0.723	1.290
6 : Powdered - Sliced	0.517	0.141	0.001*	0.233	0.800
9 : Powdered - Sliced	0.568	0.141	0.000*	0.285	0.852
12 : Powdered - Sliced	0.633	0.141	0.000*	0.350	0.917
15 : Powdered - Sliced	0.500	0.141	0.001*	0.217	0.783

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-31 Multiple comparisons between moisture content of turmeric rhizome and types of storage bags.

Types of storage bags	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
PB - BPB	0.551	0.058	0.000*	0.436	0.667

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-32 Multiple comparisons between moisture content of turmeric rhizome and interaction among types of storage bags and forms of preparations.

Types of storage bags: Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
BPB : Powdered - Sliced	0.383	0.081	0.000*	0.219	0.546
PB : Powdered - Sliced	0.692	0.081	0.000*	0.529	0.856

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-33 Multiple comparisons between moisture content of turmeric rhizome and interaction among storage periods and types of storage bags.

Storage periods (months): Types of storage bags	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
0 : PB - BPB	1.277×10^{-15}	0.141	1.000	-0.283	0.283
3 : PB - BPB	0.260	0.141	0.071	-2.322×10^{-2}	0.543
6 : PB - BPB	0.283	0.141	0.050	1.177×10^{-4}	0.567
9 : PB - BPB	0.965	0.141	0.000*	0.682	1.248
12 : PB - BPB	0.900	0.141	0.000*	0.617	1.183
15 : PB - BPB	0.900	0.141	0.000*	0.617	1.183

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-34 Multiple comparisons between forms of preparations, types of storage bags at different storage periods on moisture content of turmeric rhizome.

Forms of preparations		Mean	Std.	P-value	95% Confidence Interval	
		Difference	Error		Lower Bound	Upper Bound
Types of storage bags :					Lower Bound	Upper Bound
Storage periods (months)						
Powdered						
BPB :	0 - 3	-0.797	0.199	0.003*	-1.412	-0.181
	0 - 6	-0.833	0.199	0.002*	-1.449	-0.218
	0 - 9	-1.667	0.199	0.000*	-2.282	-1.051
	0 - 12	-1.800	0.199	0.000*	-2.415	-1.185
	0 - 15	-1.867	0.199	0.000*	-2.482	-1.251
Powdered						
PB :	0 - 3	-1.267	0.199	0.000*	-1.882	-0.651
	0 - 6	-1.333	0.199	0.000*	-1.949	-0.718
	0 - 9	-2.733	0.199	0.000*	-3.349	-2.118
	0 - 12	-2.800	0.199	0.000*	-3.415	-2.185
	0 - 15	-3.067	0.199	0.000*	-3.682	-2.451
Sliced						
BPB :	0 - 3	-2.109×10^{-15}	0.199	1.000	-0.615	0.615
	0 - 6	-0.533	0.199	0.152	-1.149	8.206×10^{-2}
	0 - 9	-1.200	0.199	0.000*	-1.815	-0.585
	0 - 12	-1.267	0.199	0.000*	-1.882	-0.651
	0 - 15	-1.667	0.199	0.000*	-2.282	-1.051
Sliced						
PB :	0 - 3	-5.000×10^{-2}	0.199	1.000	-0.665	0.565
	0 - 6	-0.600	0.199	0.062	-1.215	1.539×10^{-2}
	0 - 9	-2.063	0.199	0.000*	-2.679	-1.448
	0 - 12	-2.067	0.199	0.000*	-2.682	-1.451
	0 - 15	-2.267	0.199	0.000*	-2.882	-1.651

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-35 Analysis of variance of moisture content of zedoary (bulb) rhizome stored under different conditions at room temperature, by forms of preparations, types of storage bags and storage periods.

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Preparations	1.432	1	1.432	14.539	0.000*
Bags	51.245	1	51.245	520.201	0.000*
Times	293.315	4	73.329	744.380	0.000*
Preparations – Bags	2.604×10^{-2}	1	2.604×10^{-2}	0.264	0.610
Preparations – Times	0.504	4	0.126	1.279	0.294
Bags – Times	28.540	4	7.135	72.430	0.000*
Preparations – Bags – Times	0.144	4	3.596×10^{-2}	0.365	0.832
Error	3.940	40	9.851×10^{-2}		
Total	6569.229	60			

* Significant at $p < 0.05$.

Table A-36 Multiple comparisons between moisture content of zedoary (bulb) rhizome and forms of preparations.

Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
Powdered - Sliced	0.309	0.081	0.000*	0.145	0.473

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-37 Multiple comparisons between moisture content of zedoary (bulb) rhizome and types of storage bags.

Types of storage bags	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
PB - BPB	1.848	0.081	0.000*	1.685	2.012

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-38 Multiple comparisons between moisture content of zedoary (bulb) rhizome and interaction among storage periods and types of storage bags.

Storage periods (months): Types of storage bags	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
0: PB - BPB	6.800×10^{-16}	0.181	1.000	-0.366	0.366
3: PB - BPB	0.392	0.181	0.037*	2.543×10^{-2}	0.758
6: PB - BPB	3.418	0.181	0.000*	3.052	3.785
9: PB - BPB	2.665	0.181	0.000*	2.299	3.031
12: PB - BPB	2.767	0.181	0.000*	2.400	3.133

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-39 Multiple comparisons between forms of preparations, types of storage bags at different storage periods on moisture content of zedoary (bulb) rhizome.

Forms of preparations		Mean Difference	Std. Error	P-value	95% Confidence Interval	
Types of storage bags :					Lower Bound	Upper Bound
Storage periods (months)						
Powdered						
BPB :	0 - 3	-0.367	0.256	1.000	-1.128	0.395
	0 - 6	-2.567	0.256	0.000*	-3.328	-1.805
	0 - 9	-3.633	0.256	0.000*	-4.395	-2.872
	0 - 12	-3.767	0.256	0.000*	-4.528	-3.005
Powdered						
PB :	0 - 3	-0.683	0.256	0.110	-1.445	7.808×10^{-2}
	0 - 6	-5.967	0.256	0.000*	-6.728	-5.205
	0 - 9	-6.500	0.256	0.000*	-7.261	-5.739
	0 - 12	-6.633	0.256	0.000*	-7.395	-5.872
Sliced						
BPB :	0 - 3	6.667×10^{-2}	0.256	1.000	-0.695	0.828
	0 - 6	-2.330	0.256	0.000*	-3.091	-1.569
	0 - 9	-3.367	0.256	0.000*	-4.128	-2.605
	0 - 12	-3.367	0.256	0.000*	-4.128	-2.605
Sliced						
PB :	0 - 3	-0.400	0.256	1.000	-1.161	0.361
	0 - 6	-5.767	0.256	0.000*	-6.528	-5.005
	0 - 9	-5.830	0.256	0.000*	-6.591	-5.069
	0 - 12	-6.033	0.256	0.000*	-6.795	-5.272

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-40 Analysis of variance of moisture content of zedoary (finger) rhizome stored under different conditions at room temperature, by forms of preparations, types of storage bags and storage periods.

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Preparations	6.273	1	6.273	103.680	0.000*
Bags	81.201	1	81.201	1342.160	0.000*
Times	318.937	4	79.734	1317.923	0.000*
Preparations – Bags	0.241	1	0.241	3.978	0.097
Preparations – Times	3.597	4	0.899	14.865	0.000*
Bags – Times	46.963	4	11.741	194.061	0.000*
Preparations – Bags – Times	2.736	4	0.684	11.306	0.000*
Error	2.420	40	6.050x10 ⁻²		
Total	5794.090	60			

* Significant at $p < 0.05$.

Table A-41 Multiple comparisons between moisture content of zedoary (finger) rhizome and forms of preparations.

Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
Powdered -Sliced	0.663	0.065	0.000*	0.532	0.794

* The mean difference is significant at the 0.05 level.
Adjustment for multiple comparisons: Bonferroni.

Table A-42 Multiple comparisons between moisture content of zedoary (finger) rhizome and interaction among storage periods and forms of preparations.

Storage periods (months): Forms of preparations	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
0: Powdered – Sliced	2.220×10^{-16}	0.145	1.000	-0.293	0.293
3: Powdered – Sliced	0.217	0.145	0.143	-7.621×10^{-2}	0.510
6: Powdered – Sliced	0.833	0.145	0.000*	0.540	1.126
9: Powdered – Sliced	1.067	0.145	0.000*	0.774	1.360
12: Powdered – Sliced	1.200	0.145	0.000*	0.907	1.493

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-43 Multiple comparisons between moisture content of zedoary (finger) rhizome and types of storage bags.

Type of storage bags	Mean Difference	Std. Error	P-value	95% Confidence Interval	
				Lower Bound	Upper Bound
PB - BPB	2.343	0.065	0.000*	2.212	2.474

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-44 Multiple comparisons between moisture content of zedoary (finger) rhizome and interaction among storage periods and types of storage bags.

Storage periods (months):		Mean Difference	Std. Error	P-value	95% Confidence Interval	
Types of storage bags					Lower Bound	Upper Bound
0:	PB - BPB	8.882×10^{-16}	0.145	1.000	-0.293	0.293
3:	PB - BPB	0.417	0.145	0.006*	0.124	0.710
6:	PB - BPB	3.633	0.145	0.000*	3.340	3.926
9:	PB - BPB	3.933	0.145	0.000*	3.640	4.226
12:	PB - BPB	3.733	0.145	0.000*	3.440	4.026

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-45 Multiple comparisons between types of storage bags, forms of preparations at different storage periods on moisture content of zedoary (finger) rhizome.

Forms of preparations		Mean Difference	Std. Error	P-value	95% Confidence Interval	
Types of storage bags :					Lower Bound	Upper Bound
Storage periods (months)						
Powdered						
BPB :	0 - 3	-0.383	0.205	0.687	-0.992	0.226
	0 - 6	-3.583	0.205	0.000*	-4.192	-2.974
	0 - 9	-3.583	0.205	0.000*	-4.192	-2.974
	0 - 12	-3.650	0.205	0.000*	-4.259	-3.041
Powdered						
PB :	0 - 3	-1.117	0.205	0.000*	-1.726	-0.508
	0 - 6	-6.583	0.205	0.000*	-7.192	-5.974
	0 - 9	-7.783	0.205	0.000*	-8.392	-7.174
	0 - 12	-7.983	0.205	0.000*	-8.592	-7.374

Table A-45 Multiple comparisons between types of storage bags, forms of preparations at different storage times on moisture content of zedoary (finger) rhizome (continued).

Forms of preparations		Mean Difference	Std. Error	P-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Types of storage bags :						
Storage periods (months)						
Sliced						
BPB	: 0 - 3	-0.483	0.205	0.233	-1.092	0.126
	: 0 - 6	-2.117	0.205	0.000*	-2.726	-1.508
	: 0 - 9	-2.783	0.205	0.000*	-3.392	-2.174
	: 0 - 12	-3.050	0.205	0.000*	-3.659	-2.441
Sliced						
PB	: 0 - 3	-0.583	0.205	0.069	-1.192	2.558x10 ⁻²
	: 0 - 6	-6.383	0.205	0.000*	-6.992	-5.774
	: 0 - 9	-6.450	0.205	0.000*	-7.059	-5.841
	: 0 - 12	-6.183	0.205	0.000*	-6.792	-5.574

BPB = black polyethylene bag

PB = paper bag

* The mean difference is significant at the 0.05 level.

Adjustment for multiple comparisons: Bonferroni.

Table A-46 Effect of turmeric rhizome extract on the growth of bacteria.

Storage periods (months)	Concentrations (mg/disc)	Clear zone (mm) (mean \pm S.D.*)		
		<i>S. aureus</i> ATCC 25923	<i>B. subtilis</i>	<i>E. coli</i> ATCC 25922
0	1.3	7.83 \pm 0.29	7.83 \pm 0.29	0.00 \pm 0.00
	2.5	9.00 \pm 0.00	8.33 \pm 0.29	0.00 \pm 0.00
	5.0	9.23 \pm 0.64	8.83 \pm 0.29	0.00 \pm 0.00
	10.0	10.00 \pm 0.00	9.83 \pm 0.29	0.00 \pm 0.00
6	1.3	7.83 \pm 0.29	7.67 \pm 0.29	0.00 \pm 0.00
	2.5	8.83 \pm 0.29	8.67 \pm 0.29	0.00 \pm 0.00
	5.0	9.00 \pm 0.00	8.83 \pm 0.29	0.00 \pm 0.00
	10.0	10.00 \pm 0.00	9.67 \pm 0.29	0.00 \pm 0.00
12	1.3	7.10 \pm 0.29	7.00 \pm 0.00	0.00 \pm 0.00
	2.5	7.83 \pm 0.29	7.83 \pm 0.29	0.00 \pm 0.00
	5.0	8.67 \pm 0.29	8.67 \pm 0.29	0.00 \pm 0.00
	10.0	9.67 \pm 0.58	9.33 \pm 0.29	0.00 \pm 0.00
DMSO	-	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00
Tetracycline	30 μ g/disc	26.50 \pm 0.00	19.83 \pm 0.29	22.83 \pm 0.29

* n = 3

Table A-47 Effect of zedoary (bulb) rhizome extract on the growth of bacteria.

Storage periods (months)	Concentrations (mg/disc)	Clear zone (mm) (mean \pm S.D.*)		
		<i>S. aureus</i> ATCC 25923	<i>B. subtilis</i>	<i>E. coli</i> ATCC 25922
0	1.3	6.50 \pm 0.00	6.17 \pm 0.29	0.00 \pm 0.00
	2.5	7.83 \pm 0.29	6.67 \pm 0.29	0.00 \pm 0.00
	5.0	8.83 \pm 0.29	7.50 \pm 0.00	0.00 \pm 0.00
	10.0	10.00 \pm 0.00	7.50 \pm 0.00	0.00 \pm 0.00
6	1.3	6.33 \pm 0.29	6.17 \pm 0.29	0.00 \pm 0.00
	2.5	7.50 \pm 0.00	6.50 \pm 0.00	0.00 \pm 0.00
	5.0	8.67 \pm 0.29	7.17 \pm 0.29	0.00 \pm 0.00
	10.0	9.83 \pm 0.29	7.50 \pm 0.50	0.00 \pm 0.00
12	1.3	6.00 \pm 0.0	6.00 \pm 0.00	0.00 \pm 0.00
	2.5	6.50 \pm 0.00	6.50 \pm 0.00	0.00 \pm 0.00
	5.0	7.50 \pm 0.00	6.83 \pm 0.29	0.00 \pm 0.00
	10.0	9.17 \pm 0.29	7.33 \pm 0.29	0.00 \pm 0.00
DMSO	-	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00
Tetracycline	30 μ g/disc	26.50 \pm 0.00	19.83 \pm 0.29	22.83 \pm 0.29

* n = 3

Table A-48 Effect of zedoary (finger) rhizome extract on the growth of bacteria.

Storage periods (months)	Concentrations (mg/disc)	Clear zone (mm)		
		(mean \pm S.D.*)		
		<i>S. aureus</i> ATCC 25923	<i>B. subtilis</i>	<i>E. coli</i> ATCC 25922
0	1.3	6.50 \pm 0.00	6.00 \pm 0.00	0.00 \pm 0.00
	2.5	7.83 \pm 0.29	6.50 \pm 0.00	0.00 \pm 0.00
	5.0	8.50 \pm 0.00	7.00 \pm 0.50	0.00 \pm 0.00
	10.0	10.33 \pm 0.29	7.50 \pm 0.00	0.00 \pm 0.00
6	1.3	6.50 \pm 0.50	6.00 \pm 0.00	0.00 \pm 0.00
	2.5	7.67 \pm 0.29	6.50 \pm 0.50	0.00 \pm 0.00
	5.0	8.33 \pm 0.29	7.00 \pm 0.50	0.00 \pm 0.00
	10.0	10.33 \pm 0.29	7.50 \pm 0.00	0.00 \pm 0.00
12	1.3	6.17 \pm 0.29	6.00 \pm 0.00	0.00 \pm 0.00
	2.5	7.33 \pm 0.29	6.17 \pm 0.29	0.00 \pm 0.00
	5.0	8.00 \pm 0.00	6.50 \pm 0.50	0.00 \pm 0.00
	10.0	9.83 \pm 0.29	7.33 \pm 0.29	0.00 \pm 0.00
DMSO	-	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00
Tetracycline	30 μ g/disc	26.50 \pm 0.00	19.83 \pm 0.29	22.83 \pm 0.29

* n = 3

Appendix B

Reagents for determination of antibacterial activity.

1. 0.85% NaCl

NaCl	8.5	g
Distilled water	1,000	ml

Method: dissolved NaCl 8.5 g in distilled water, then autoclaved at 15 pound/inch² at 121 °C for 15 minutes.

2. 0.1 M Phosphate buffer pH 4.5

KH ₂ PO ₄	13.61	g
Distilled water	1,000	ml

Method: dissolved KH₂PO₄ 13.61 g in distilled water, then adjusted pH to 4.5.

3. 0.5 McFarland standard

1.175 % w/v BaCl ₂ .2H ₂ O	0.5	ml
1 % v/v H ₂ SO ₄	99.5	ml

Method: added 0.5 ml of BaCl₂.2H₂O (1.175% w/v) to 99.5 ml of H₂SO₄ (1 % v/v) in steriled tube and agitated on a vortex mixer just before use. This turbidity standard were equilibrated to 1x10⁸ cfu/ml of inoculum.

Media for determination of antibacterial activity.**1. Muller Hinton Agar (MHA)**

MHA	34	g
Distilled water	1,000	ml

Method: dissolved MHA 34 g in distilled water and bring volume to 1,000 ml and mixing thoroughly. Gently heat and bring to boiling, then autoclaved at 15 pound/inch² at 121 °C for 15 minutes. Pour into sterilized Petri dishes or leave in tubes.

2. Tryptic Soy Agar (TSA)

TSA	20	g
Distilled water	1,000	ml

Method: dissolved TSA 20 g in distilled water and bring volume to 1,000 ml and mixing thoroughly. Gently heat and bring to boiling, then autoclaved at 15 pound/inch² at 121 °C for 15 minutes. Pour into sterilized Petri dishes.