

APPENDIX

APPENDIX I: ANTIMICROBIAL ACTIVITY

Appendix I (a) Agar preparation

i. Muller Hinton Agar (MHA) preparation (Oxoid)

15.2 g of Muller hinton agar powder was dissolved with 400ml of distilled water. The agar was sterilized by autoclaved at 121⁰C for 15 minutes.

ii. Sabouroud Dextrose Agar (SDA) preparation (Oxoid)

13 g of Saboroud dextrose agar powder was dissolved with 200ml of distilled water. The agar was sterilized by autoclaved at 121⁰C for 15 minutes.

iii. Brain Heart Infusion Agar (BHIA) preparation (Oxoid)

10.4 g of Brain heart infusion agar powder was dissolved with 200ml of distilled water. The agar was sterilized by autoclaved at 121⁰C for 15 minutes.

iv. Yeast Peptone Agar (YPA) preparation

The items needed to prepare yeast peptone agar were:-

Glucose monohydrous 8g

Peptone bacteriological 8g

Yeast extract 4g

Agar bacteriological 8g

All items were dissolved with 400ml distilled water and pH was adjusted at 6.8.

The agar was sterilized by autoclaved at 121⁰C for 15 minutes.

Appendix I (b) Broth preparation

i. Muller Hinton Broth (MHB) preparation (Oxoid)

1.05 g of Muller hinton broth powder was dissolved with 50ml of distilled water. The broth was sterilized by autoclaved at 121⁰C for 15 minutes.

ii. Sabouroud Dextrose Broth (SDB) preparation (Oxoid)

1.5 g of Sabouroud dextrose broth powder was dissolved with 50ml of distilled water. The broth was sterilized by autoclaved at 121⁰C for 15 minutes.

iii. Brain Heart Infusion Broth (BHIB) preparation (Oxoid)

1.85 g of Brain heart infusion broth powder was dissolved with 50ml of distilled water. The broth was sterilized by autoclaved at 121⁰C for 15 minutes.

iv. Yeast Peptone Agar (YPB) preparation

The items needed to prepare yeast peptone broth were:-

Glucose monohydrous 1g

Peptone bacteriological (Oxoid) 1g

Yeast extracts (Oxoid) 0.5g

All items were dissolved with 50ml distilled water and pH was adjusted at 6.8.

The broth was sterilized by autoclaved at 121⁰C for 15 minutes.

Appendix I (c): The disc diffusion assay of *Alpinia* species against 12 microorganisms

Microorganism	Plant	Part	Extract	Diameter of Inhibition (mm)			
<i>Bacillus cerees</i>	<i>A. pahangensis</i>	Rhizome	Hexane	14.5	16	17	15.83±1.25
			DCM	16.5	16	17	16.50±0.5
			Methanol	10.5	12	10	10.83±1.04
		Leaf	Hexane	9.5	14	11	11.50±2.29
			DCM	12	10	12.5	11.5±1.32
			Methanol	na	na	na	na
	<i>A. mutica</i>	Rhizome	Hexane	na	na	na	na
			DCM	8.5	8	8	8.16±0.28
			Methanol	na	na	na	na
		Leaf	Hexane	na	na	na	na
			DCM	8	8	8	8
			Methanol	na	na	na	na
	Control	Streptomycin		23.5	22.5	25	23.67±1.25
		Nystatin		na	na	na	na
		DMSO		na	na	na	na
		Broth		na	na	na	na
<i>Bacillus subtilis</i>	<i>A. pahangensis</i>	Rhizome	Hexane	16	16	17	16.33±0.57
			DCM	16	16	16	16.00±0
			Methanol	13.5	11.5	11.5	12.17±1.15
		Leaf	Hexane	11	10.5	9	10.16±1.04
			DCM	11	11	10.5	10.83±0.28
			Methanol	na	na	na	na
	<i>A. mutica</i>	Rhizome	Hexane	na	na	na	na
			DCM	8	8	9	8.33±0.58
			Methanol		7	9	8.00±1.41
		Leaf	Hexane	na	na	na	na
			DCM	8	8	8	na
			Methanol	na	na	na	na
	Control	Streptomycin		27	28	27	27.33±0.58
		Nystatin		na	na	na	na
		DMSO		na	na	na	na
		Broth		na	na	na	na

Key

na : no activity observed

Appendix I (c): The disc diffusion assay of *Alpinia* species against 12 microorganisms-cont'

Microorganism	Plant	Part	Extract	Diameter of Inhibition (mm)				
<i>Staphylococcus aerues</i>	<i>A. pahangensis</i>	Rhizome	Hexane	11	13.5	13.5	12.67±1.44	
			DCM	12	11.5	14	12.5±1.32	
			Methanol	8	9	9	8.67±0.58	
		Leaf	Hexane	9	10	9	9.33±0.58	
			DCM	9	9	9	9.00±0	
			Methanol	na	na	na	na	
	<i>A. mutica</i>	Rhizome	Hexane	na	na	na	na	
			DCM	9	8	8	8.33±0.58	
			Methanol	na	na	na	na	
		Leaf	Hexane	na	na	na	na	
			DCM	na	na	na	na	
			Methanol	na	na	na	na	
	Control	Streptomycin		28	27	29	28.00±1.00	
		Nystatin		na	na	na	Na	
DMSO			na	na	na	Na		
Broth			na	na	na	Na		
<i>Escherichia coli</i>	<i>A. pahangensis</i>	Rhizome	Hexane	11.5	12	12	11.83±0.28	
			DCM	10.5	11	12	11.17±0.76	
			Methanol	7.5	7	8	7.5±0.5	
		Leaf	Hexane	8	9	9	8.67±0.58	
			DCM	9	9	9.5	9.17±0.29	
			Methanol	na	na	na	Na	
	<i>A. mutica</i>	Rhizome	Hexane	na	na	na	Na	
			DCM	na	na	na	Na	
			Methanol	na	na	na	Na	
		Leaf	Hexane	na	na	na	Na	
			DCM	na	na	na	Na	
			Methanol	na	na	na	Na	
	Control	Streptomycin		34	33	31.5	32.83±1.25	
		Nystatin		na	na	na	Na	
		DMSO		na	na	na	Na	
		Broth		na	na	na	Na	
	<i>Proteus vulgaris</i>	<i>A. pahangensis</i>	Rhizome	Hexane	14	15	14	14.33±0.58
				DCM	13.5	15.5	14.5	14.5±1.00
Methanol				12	11	11	11.33±0.58	
Leaf			Hexane	12.5	12	12.5	12.33±0.29	
			DCM	10.5	9.5	12	10.67±1.26	
			Methanol	na	na	na	Na	
<i>A. mutica</i>		Rhizome	Hexane	na	na	na	Na	
			DCM	11	12	9.5	10.83±1.26	
			Methanol	9	11		10.00±1.41	

Key

na : no activity observed

Appendix I (c): The disc diffusion assay of *Alpinia* species against 12 microorganisms-cont'

Microorganism	Plant	Part	Extract	Diameter of Inhibition (mm)				
<i>Proteus vulgaris</i>	<i>A. mutica</i>	Leaf	Hexane	na	11	9.5	10.25±1.06	
			DCM	9	9	11	9.67±1.15	
			Methanol	na	na	na	Na	
	Control		Streptomycin		29	29	29.5	29.17±0.29
			Nystatin		na	na	na	Na
			DMSO		na	na	na	Na
			Broth		na	na	na	Na
<i>Pseudomonas aeruginosa</i>	<i>A. pahangensis</i>	Rhizome	Hexane	11	11.5	11	11.17±0.29	
			DCM	11	11.5	12	11.50±0.50	
			Methanol	8	7	9	8.00±1.00	
		Leaf	Hexane	9	8	8	8.33±0.58	
			DCM	9	9	9	9.00±0	
			Methanol	na	na	na	Na	
	<i>A. mutica</i>	Rhizome	Hexane	na	na	na	Na	
			DCM	7	7	7	7.00±0	
			Methanol	na	na	na	Na	
		Leaf	Hexane	na	na	na	Na	
			DCM	7	8	7	7.33±0.58	
			Methanol	na	na	na	Na	
	Control		Streptomycin		30.5	29	29.5	29.67±0.76
			Nystatin		na	na	na	Na
			DMSO		na	na	na	Na
Broth				na	na	na	Na	
<i>Streptococcus mutans</i>	<i>A. pahangensis</i>	Rhizome	Hexane	na	na	na	Na	
			DCM	na	na	na	Na	
			Methanol	na	na	na	Na	
		Leaf	Hexane	na	na	na	Na	
			DCM	na	na	na	Na	
			Methanol	na	na	na	Na	
	<i>A. mutica</i>	Rhizome	Hexane	na	na	na	Na	
			DCM	na	na	na	Na	
			Methanol	na	na	na	Na	
		Leaf	Hexane	na	na	na	Na	
			DCM	na	na	na	Na	
			Methanol	na	na	na	Na	
	Control		Streptomycin		20	21.5	20	20.5±0.87
			Nystatin		na	na	na	Na
			DMSO		na	na	na	Na
Broth				na	na	na	Na	

Key

na : no activity observed

Appendix I (c): The disc diffusion assay of *Alpinia* species against 12 microorganisms-cont'

Microorganism	Plant	Part	Extract	Diameter of Inhibition (mm)			
<i>Streptococcus mitis</i>	<i>A.pahangensis</i>	Rhizome	Hexane	14.5	15	14	14.5±0.5
			DCM	14	15	13.5	14.17±0.76
			Methanol	8	10.5	10	9.5±1.32
		Leaf	Hexane	8.5	9	8	8.50±0.50
			DCM	9	10	10	9.67±0.58
			Methanol	na	na	na	Na
	<i>A.mutica</i>	Rhizome	Hexane	na	na	na	Na
			DCM	na	na	na	Na
			Methanol	na	na	na	Na
		Leaf	Hexane	na	na	na	Na
			DCM	na	na	na	Na
			Methanol	na	na	na	Na
	Control	Streptomycin		22	22.5	23.5	22.67±0.76
		Nystatin		na	na	na	Na
		DMSO		na	na	na	na
		Broth		na	na	na	na
<i>Streptococcus sanguis</i>	<i>A.pahangensis</i>	Rhizome	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
		Leaf	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
	<i>A.mutica</i>	Rhizome	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
		Leaf	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
	Control	Streptomycin		23.5	22	23.5	23±0.87
		Nystatin		na	na	na	na
		DMSO		na	na	na	na
		Broth		na	na	na	na

Key

na : no activity observed

Appendix I (c): The disc diffusion assay of *Alpinia* species against 12 microorganisms-cont'

Microorganism	Plant	Part	Extract	Diameter of Inhibition (mm)			
<i>Candida albicans</i>	<i>A.pahangensis</i>	Rhizome	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
		Leaf	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
	<i>A.mutica</i>	Rhizome	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
		Leaf	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
	Control	Streptomycin		na	na	na	na
		Nystatin		18.5	21	19.5	19.67±1.25
		DMSO		na	na	na	na
		Broth		na	na	na	na
<i>Candida parapsilosis</i>	<i>A.pahangensis</i>	Rhizome	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
		Leaf	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
	<i>A.mutica</i>	Rhizome	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
		Leaf	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
	Control	Streptomycin		na	na	na	na
		Nystatin		24	23.5	25.5	24.33±1.04
		DMSO		na	na	na	na
		Broth		na	na	na	na

Key

na : no activity observed

Appendix I (c): The disc diffusion assay of *Alpinia* species against 12 microorganisms-cont'

Microorganism	Plant	Part	Extract	Diameter of Inhibition (mm)			
<i>Schizosaccharomyces pombe</i>	<i>A.pahangensis</i>	Rhizome	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
		Leaf	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
	<i>A.mutica</i>	Rhizome	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
		Leaf	Hexane	na	na	na	na
			DCM	na	na	na	na
			Methanol	na	na	na	na
	Control	Streptomycin		na	na	na	na
		Nystatin		28	27	26.5	27.17±0.76
		DMSO		na	na	na	na
		Broth		na	na	na	na

Key

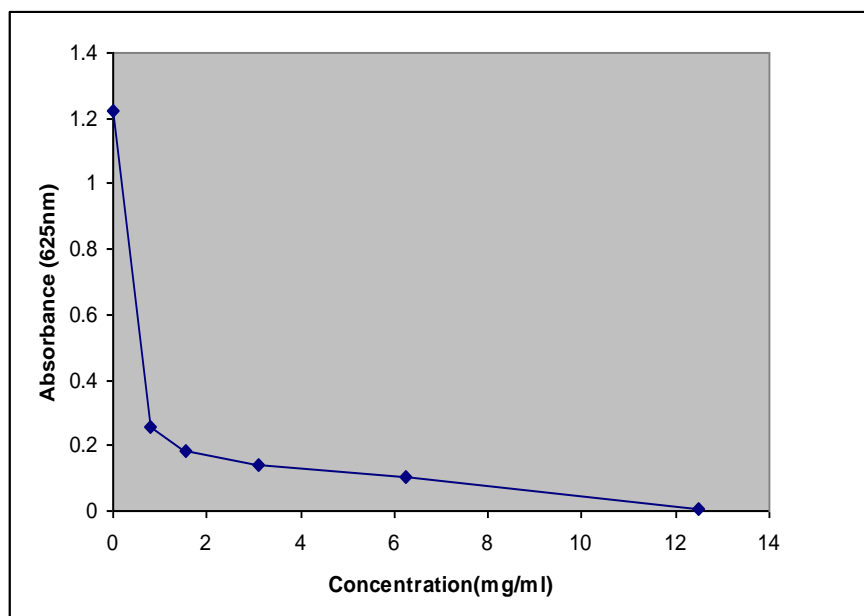
na : no activity observed

Appendix I (d): Result of minimum inhibitory concentration (MIC)

Data of MIC of *A. pahangensis* rhizome hexane extract by spectrophotometer method for *B. cereus*

Concentration (µg/ml)	Absorbance	Colonies formed
0	1.223 ± 0.038	Crowded
0.78	0.259 ± 0.020	Crowded
1.56	0.185 ± 0.002	Crowded
3.12	0.14 ± 0	Few
6.25	0.106 ± 0.006	Few
12.5	0.004 ± 0.003	No

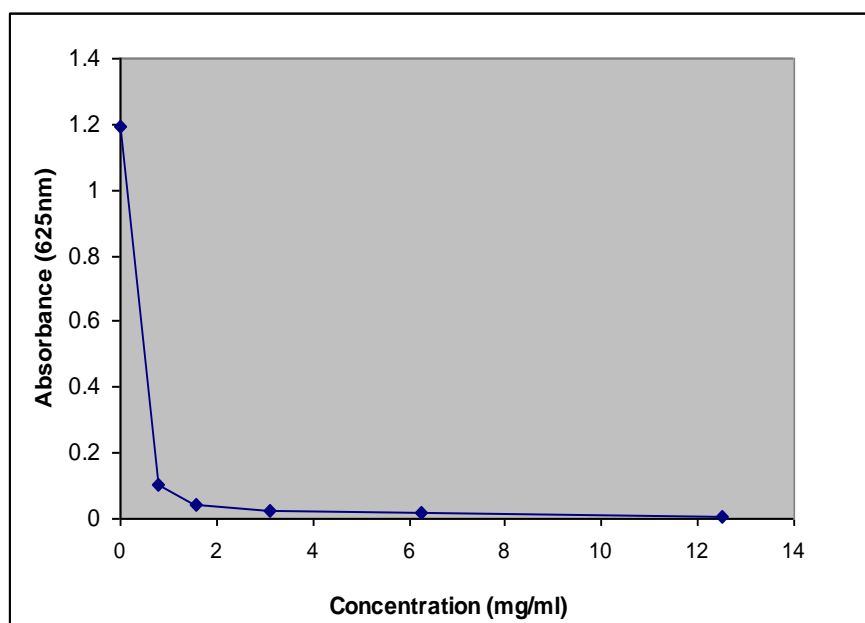
The effect of concentrations of *A. pahangensis* rhizome hexane extract against *B. cereus*



Data of MIC of *A. pahangensis* rhizome dichloromethane extract by spectrophotometer method for *B. cereus*

Concentration (µg/ml)	Absorbance	Colonies formed
0	1.194 ± 0.08	Crowded
0.78	0.102 ± 0.006	Crowded
1.56	0.044 ± 0.008	Crowded
3.12	0.023 ± 0.003	No
6.25	0.017 ± 0.003	No
12.5	0.009 ± 0.003	No

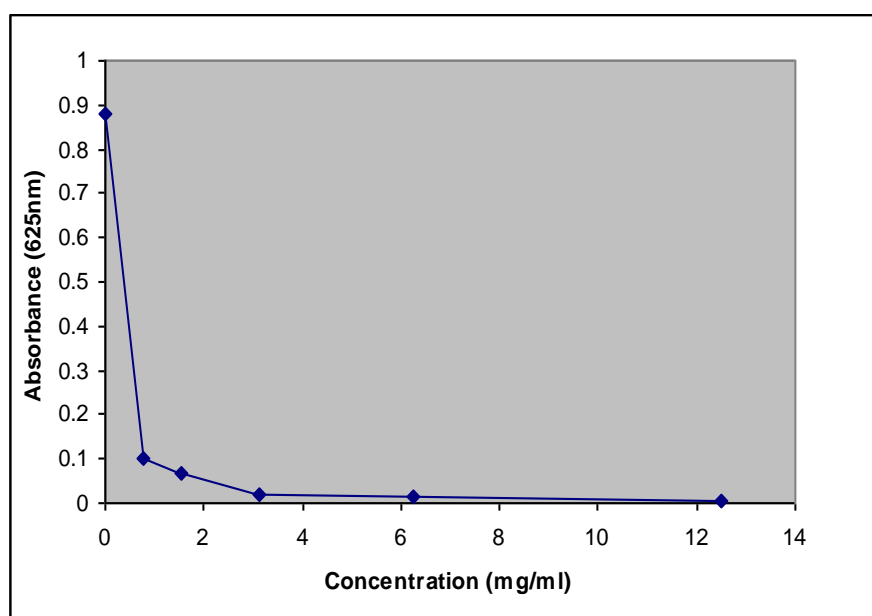
The effect of concentrations of *A. pahangensis* rhizome dichloromethane extract against *B. cereus*



Data of MIC of *A. pahangensis* rhizome hexane extract by spectrophotometer method for *B. subtilis*

Concentration (mg/ml)	Absorbance	Colonies formed
0	0.879 ± 0.018	Crowded
0.78	0.102 ± 0.008	Crowded
1.56	0.067 ± 0.006	Crowded
3.12	0.021 ± 0.002	No
6.25	0.012 ± 0.003	No
12.5	0.007 ± 0.003	No

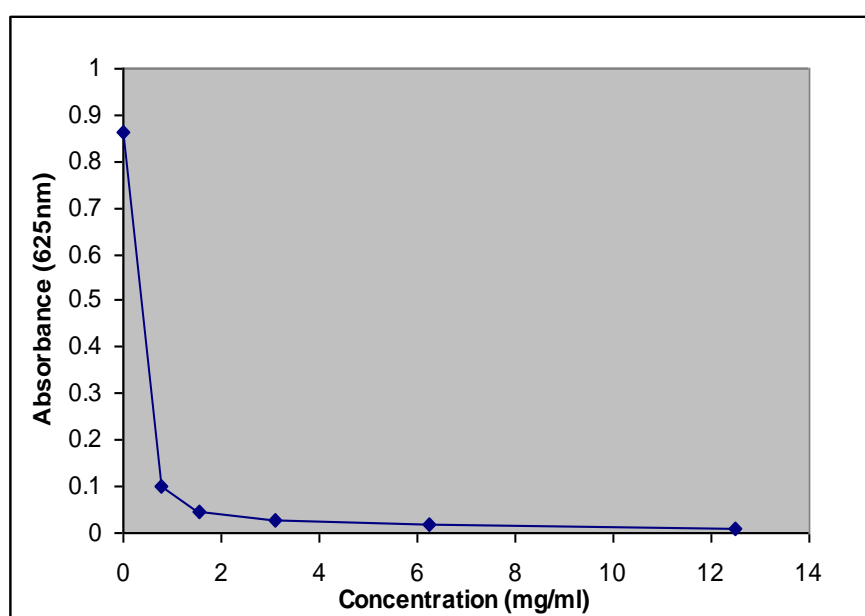
The effect of concentrations of *A. pahangensis* rhizome hexane extract against *B. subtilis*



Data of MIC of *A. pahangensis* rhizome dichloromethane extract by spectrophotometer method for *B. subtilis*

Concentration (mg/ml)	Absorbance	Colonies formed
0	0.865 ± 0.007	Crowded
0.78	0.099 ± 0.006	Crowded
1.56	0.045 ± 0.008	Few
3.12	0.003 ± 0.004	No
6.25	0.018 ± 0.001	No
12.5	0.007 ± 0.002	No

The effect of concentrations of *A. pahangensis* rhizome dichloromethane extract against *B. subtilis*



APPENDIX II: ANTIOXIDANT ACTIVITY

Appendix II (a): Reaction mixture of extracts, DPPH and methanol

Stock solution (extract): 20 mg/ml, DPPH: 8 mg/ml

Concentration of Crude extracts (mg/ml)	Volume of Methanol (μ l)	Volume of Crude extracts (μ l)	Volume of DPPH Solution(μ l)
5	725	250	25.0
4	775	200	25.0
3	825	150	25.0
2	875	100	25.0
1	925	50	25.0
0.75	937.5	37.5	25.0
0.5	950	25	25.0
0.25	962.5	12.5	25.0
0.1	970	5	25.0
0.05	972.5	2.5	25.0
Control	975	-	25.0

Appendix II (b) Reaction mixtures of ascorbic acid, DPPH and methanol

Concentration of Ascorbic acid (μ g/ml)	Volume of Methanol (μ l)	Volume of Ascorbic acid (μ l)	Volume of DPPH Solution(μ l)
200.00	475.00	500.00	25.0
100.00	725.00	250.00	25.0
50.00	850.00	125.00	25.0
25.00	912.50	62.50	25.0
12.50	943.75	31.25	25.0
6.25	959.38	15.63	25.0
3.12	967.19	7.81	25.0
1.56	971.09	3.91	25.0
Control	975.00	-	25.0

Appendix II (c): Absorbance of various concentrations of extracts of *Alpinia pahangensis* and *Alpinia mutica*

Absorbance and percentages inhibition of *Alpinia mutica* and *Alpinia pahangensis* extracts at concentration 5 mg/ml

Sample (mg/ml)	Absorbance			Ac-As			Inhibition (%)				
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
APH(L)	0.822	0.714	0.655	2.283	2.803	2.583	73.53	79.7	79.77	77.67	3.58
C	3.105	3.517	3.238								
APH(R)	1.087	1.124	1.212	1.3	1.476	1.897	54.46	56.77	61.02	57.42	3.32
C	2.387	2.6	3.109								
APD(L)	1.359	1.355	1.367	2.026	1.89	2.451	59.85	58.24	64.2	60.76	3.08
C	3.385	3.245	3.818								
APD(R)	0.672	0.67	0.655	2.973	3.194	2.243	81.56	82.66	77.4	80.54	2.78
C	3.645	3.864	2.898								
APM (L)	1.327	1.314	1.281	1.867	1.901	2.121	58.45	59.13	62.35	59.98	2.08
C	3.194	3.215	3.402								
APM (R)	0.56	0.543	0.558	2.108	3.16	2.267	79.01	85.34	80.25	81.53	3.35
C	2.668	3.703	2.825								
AMH(L)	0.654	0.661	0.666	2.334	2.421	2.498	78.11	78.55	78.95	78.54	0.42
C	2.988	3.082	3.164								
AMH(R)	1.332	1.319	1.295	1.646	1.549	1.692	55.27	54.01	56.65	55.31	1.32
C	2.978	2.868	2.987								
AMD(L)	1.861	1.879	1.823	1.701	1.595	1.642	47.75	45.91	47.39	47.02	0.97
C	3.562	3.474	3.465								

Absorbance and percentages inhibition of *Alpinia mutica* and *Alpinia pahangensis* extracts at concentration 5 mg/ml-cont'

Sample (mg/ml)	Absorbance			Ac-As			Inhibition (%)				
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
AMD(R)	0.653	0.697	0.665	2.3	2.244	2.293	77.89	76.3	77.52	77.24	0.83
C	2.953	2.941	2.958								
AMM (L)	1.533	1.562	1.548	1.371	1.358	1.389	47.21	46.51	47.29	47	0.43
C	2.904	2.92	2.937								
AMM (R)	0.467	0.479	0.474	2.476	2.457	2.419	84.13	83.69	83.62	83.81	0.28
C	2.943	2.936	2.893								
AA	0.19	0.194	0.191	2.589	3.055	3.014	93.16	94.03	94.04	93.74	0.5
C	2.779	3.249	3.205								

Key

APH : *Alpinia pahangensis* (hexane extract)

APD : *Alpinia pahangensis* (dichloromethane extract)

APM : *Alpinia pahangensis* (methanol extract)

(L) : Leaf part

(R) : Rhizome part

Rep : Replicate

As : Absorbance of sample

AMH : *Alpinia mutica* (hexane extract)

AMD : *Alpinia mutica* (dichloromethane extract)

AMM : *Alpinia mutica* (methanol extract)

C : Control

AA : Ascorbic acid

Ac : Absorbance of control

Absorbance and percentages inhibition of various concentration of *Alpinia mutica* leaf hexane extracts

Sample (mg/ml)	Absorbance			Ac-As			Inhibition (%)				
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
5	0.449	0.446	0.432	1.577	1.911	1.717	77.84	81.08	79.9	79.6	1.64
4	0.566	0.533	0.521	1.46	1.824	1.628	72.06	77.39	75.76	75.07	2.73
3	0.642	0.667	0.643	1.384	1.69	1.506	68.31	71.7	70.08	70.03	1.7
2	0.771	0.768	0.722	1.255	1.589	1.427	61.94	67.42	66.4	65.25	2.91
1	1.508	1.494	1.488	0.518	0.863	0.661	25.57	36.61	30.76	30.98	5.53
0.75	1.608	1.545	1.676	0.418	0.812	0.473	20.63	34.45	22.01	25.7	7.61
0.5	1.712	1.785	1.736	0.314	0.572	0.413	15.5	24.27	19.22	19.66	4.4
0.25	1.839	1.854	1.805	0.187	0.503	0.344	9.23	21.34	16.01	15.53	6.07
0.1	1.919	1.901	1.971	0.107	0.456	0.178	5.281	19.35	8.283	10.97	7.41
0.05	1.991	1.949	1.988	0.035	0.408	0.161	1.728	17.31	7.492	8.843	7.88
Control	2.026	2.357	2.149								

Key

Rep : Replicate

Ac : Absorbance of control

As : Absorbance of sample

Absorbance and percentages inhibition of various concentrations of *Alpinia pahangensis* leaf dichloromethane extracts

Sample (mg/ml)	Absorbance			Ac-As			Inhibition (%)				
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
5	1.061	1.047	1.055	2.238	2.656	2.462	67.84	71.73	70	69.86	1.95
4	1.29	1.347	1.742	2.009	2.356	1.775	60.9	63.62	50.47	58.33	6.94
3	1.667	1.629	1.506	1.632	2.074	2.011	49.47	56.01	57.18	54.22	4.15
2	1.158	1.888	1.692	2.141	1.815	1.825	64.9	49.01	51.89	55.27	8.46
1	2.127	2.311	2.175	1.172	1.392	1.342	35.53	37.59	38.16	37.09	1.39
0.75	2.516	2.611	2.433	0.783	1.092	1.084	23.73	29.49	30.82	28.02	3.77
0.5	2.783	2.817	2.868	0.516	0.886	0.649	15.64	23.93	18.45	19.34	4.21
0.25	2.409	2.753	3.127	0.89	0.95	0.39	26.98	25.65	11.09	21.24	8.82
0.1	3.154	3.475	3.475	0.145	0.228	0.042	4.395	6.157	1.194	3.916	2.52
0.05	2.985	3.369	3.419	0.314	0.334	0.098	9.518	9.02	2.786	7.108	3.75
Control	3.299	3.703	3.517								

Key

Rep : Replicate

Ac : Absorbance of control

As : Absorbance of sample

Absorbance and percentages inhibition of various concentrations of *Alpinia pahangensis* leaf methanol extracts

Sample (mg/ml)	Absorbance			Ac-As			Inhibition (%)				
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
5	0.756	0.78	0.779	1.651	1.673	1.723	68.59	68.2	68.86	68.55	0.33
4	0.964	1.032	0.983	1.443	1.421	1.519	59.95	57.93	60.71	59.53	1.44
3	1.066	1.094	1.075	1.341	1.359	1.427	55.71	55.4	57.03	56.05	0.87
2	1.097	1.044	1.078	1.31	1.409	1.424	54.42	57.44	56.91	56.26	1.61
1	1.396	1.308	1.381	1.011	1.145	1.121	42	46.68	44.8	44.49	2.35
0.75	1.479	1.633	1.738	0.928	0.82	0.764	38.55	33.43	30.54	34.17	4.06
0.5	1.798	1.758	1.887	0.609	0.695	0.615	25.3	28.33	24.58	26.07	1.99
0.25	2.068	2.138	2.041	0.339	0.315	0.461	14.08	12.84	18.43	15.12	2.93
0.1	2.188	2.201	2.217	0.219	0.252	0.285	9.098	10.27	11.39	10.25	1.15
0.05	2.18	2.231	2.369	0.227	0.222	0.133	9.431	9.05	5.316	7.932	2.27
Control	2.407	2.453	2.502								

Key

Rep : Replicate

Ac : Absorbance of control

As : Absorbance of sample

Absorbance and percentages inhibition of various concentration of *Alpinia mutica* rhizome hexane extracts

Sample (mg/ml)				Absorbance							
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
5	1.322	1.335	1.284	1.852	1.857	1.91	58.3	58.18	59.8	58.8	0.89
4	1.584	1.5	1.521	1.59	1.692	1.673	50.1	53.01	52.38	51.8	1.53
3	1.733	1.737	1.765	1.441	1.455	1.429	45.4	45.58	44.74	45.2	0.44
2	2.129	2.117	2.16	1.045	1.075	1.034	32.9	33.68	32.37	33	0.66
1	2.221	2.297	2.243	0.953	0.895	0.951	30	28.04	29.77	29.3	1.08
0.75	2.415	2.409	2.415	0.759	0.783	0.779	23.9	24.53	24.39	24.3	0.32
0.5	2.456	2.463	2.469	0.253	0.268	0.725	7.97	8.396	22.7	13	8.38
0.25	2.878	2.653	2.791	0.296	0.539	0.183	9.33	16.89	5.729	10.6	5.69
0.1	2.917	2.924	2.921	0.15	0.268	0.731	4.73	8.396	22.89	12	9.6
0.05	3.024	3.011	3.009	0.383	0.181	0.185	12.1	5.67	5.792	7.84	3.66
Control	3.174	3.192	3.194								

Key

Rep : Replicate

Ac : Absorbance of control

As : Absorbance of sample

Absorbance and percentages concentration of various concentration of *Alpinia mutica* rhizome dichloromethane extracts

Sample (mg/ml)	Absorbance			Ac-As			Inhibition (%)				
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
5	0.689	0.686	0.659	2.098	2.274	2.295	75.28	76.82	77.69	76.6	1.22
4	0.76	0.791	0.75	2.027	2.169	2.204	72.73	73.28	74.61	73.5	0.97
3	0.972	0.974	0.996	1.815	1.986	1.958	65.12	67.09	66.28	66.2	0.99
2	1.299	1.291	1.295	1.488	1.669	1.659	53.39	56.39	56.16	55.3	1.67
1	2.063	2.16	2.021	0.724	0.8	0.933	25.98	27.03	31.58	28.2	2.98
0.75	1.975	2.027	1.914	0.812	0.933	1.04	29.14	31.52	35.21	32	3.06
0.5	2.243	2.174	2.086	0.544	0.786	0.868	19.52	26.55	29.38	25.2	5.08
0.25	2.613	2.498	2.399	0.174	0.462	0.555	6.243	15.61	18.79	13.5	6.52
0.1	2.665	2.509	2.127	0.122	0.451	0.827	4.377	15.24	28	15.9	11.8
0.05	2.579	2.763	2.3	0.208	0.197	0.654	7.463	6.655	22.14	12.1	8.72
Control	2.787	2.96	2.954								

Key

Rep : Replicate

Ac : Absorbance of control

As : Absorbance of sample

Absorbance and percentages inhibition of various concentration of *Alpinia mutica* rhizome methanol extracts

Sample (mg/ml)	Absorbance			Ac-As			Inhibition (%)				
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
5	0.357	0.312	0.293	2.215	2.686	2.616	86.12	89.59	89.93	88.5	2.11
4	0.514	0.425	0.559	2.058	2.573	2.35	80.02	85.82	80.78	82.2	3.16
3	0.705	0.72	0.756	1.867	2.278	2.153	72.59	75.98	74.01	74.2	1.7
2	1.241	1.42	1.408	1.331	1.578	1.501	51.75	52.64	51.6	52	0.56
1	1.823	2.024	2.189	0.749	0.974	0.72	29.12	32.49	24.75	28.8	3.88
0.75	2.246	2.18	2.102	0.326	0.818	0.807	12.67	27.28	27.74	22.6	8.57
0.5	2.231	2.582	2.175	0.341	0.416	0.734	13.26	13.88	25.23	17.5	6.74
0.25	2.474	2.355	2.246	0.098	0.643	0.663	3.81	21.45	22.79	16	10.6
0.1	2.511	2.587	2.572	0.061	0.411	0.337	2.372	13.71	11.58	9.22	6.03
0.05	2.524	2.799	2.352	0.048	0.199	0.557	1.866	6.638	19.15	9.22	8.92
Control	2.572	2.998	2.909								

Key

Rep : Replicate

Ac : Absorbance of control

As : Absorbance of sample

Absorbance and percentages inhibition of various concentration of *Alpinia pahangensis* rhizome hexane extracts

Sample (mg/ml)	Absorbance			Ac-As			Inhibition (%)				
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
5	0.974	0.725	0.961	1.809	2.449	2.043	65	77.16	68.01	70.1	6.33
4	1.026	1.102	1.104	1.757	2.072	1.9	63.13	65.28	63.25	63.9	1.21
3	1.371	1.323	1.351	1.412	1.851	1.653	50.74	58.32	55.03	54.7	3.8
2	1.77	1.685	1.812	1.013	1.489	1.192	36.4	46.91	39.68	41	5.38
1	1.853	1.856	1.76	0.93	1.318	1.244	33.42	41.52	41.41	38.8	4.65
0.75	1.865	1.956	1.865	0.918	1.218	1.139	32.99	38.37	37.92	36.4	2.99
0.5	2.143	2.207	2.133	0.64	0.967	0.871	23	30.47	28.99	27.5	3.96
0.25	2.462	2.312	2.291	0.321	0.862	0.713	11.53	27.16	23.74	20.8	8.21
0.1	2.251	2.219	2.381	0.532	0.955	0.623	19.12	30.09	20.74	23.3	5.92
0.05	2.054	2.579	2.415	0.729	0.595	0.589	26.19	18.75	19.61	21.5	4.07
Control	2.783	3.174	3.004								

Key

Rep : Replicate

Ac : Absorbance of control

As : Absorbance of sample

Absorbance and percentages inhibition of various concentration of *Alpinia pahangensis* rhizome dichloromethane extracts

Sample (mg/ml)	Absorbance			Ac-As			Inhibition (%)				
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
5	0.543	0.52	0.521	2	2.556	2.663	78.65	83.09	83.64	81.8	2.74
4	0.535	0.54	0.533	2.008	2.536	2.651	78.96	82.44	83.26	81.6	2.28
3	0.651	0.633	0.686	1.892	2.443	2.498	74.4	79.42	78.45	77.4	2.66
2	1.051	1.008	1.055	1.492	2.068	2.129	58.67	67.23	66.87	64.3	4.84
1	1.686	1.753	1.636	0.857	1.323	1.548	33.7	43.01	48.62	41.8	7.54
0.75	1.882	1.717	1.919	0.661	1.359	1.265	25.99	44.18	39.73	36.6	9.48
0.5	1.952	1.983	2.063	0.591	1.093	1.121	23.24	35.53	35.21	31.3	7.01
0.25	2.221	2.34	2.235	0.322	0.736	0.949	12.66	23.93	29.81	22.1	8.71
0.1	2.234	2.384	2.278	0.309	0.692	0.906	12.15	22.5	28.45	21	8.25
0.05	2.171	2.503	2.389	0.372	0.573	0.795	14.63	18.63	24.97	19.4	5.21
Control	2.543	3.076	3.184								

Key

Rep : Replicate

Ac : Absorbance of control

As : Absorbance of sample

Absorbance and percentages inhibition of various concentration of *Alpinia pahangensis* rhizome methanol extracts

Sample (mg/ml)	Absorbance			Ac-As			Inhibition (%)				
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
5	0.52	0.509	0.507	2.148	3.196	2.318	80.51	86.26	82.05	82.9	2.98
4	0.56	0.534	0.558	2.108	3.171	2.267	79.01	85.59	80.25	81.6	3.49
3	0.769	0.767	0.706	1.899	2.938	2.119	71.18	79.3	75.01	75.2	4.06
2	0.985	0.957	0.972	1.683	2.748	1.853	63.08	74.17	65.59	67.6	5.81
1	1.419	1.358	1.326	1.249	2.347	1.499	46.81	63.35	53.06	54.4	8.35
0.75	1.428	1.57	1.643	1.24	2.135	1.182	46.48	57.62	41.84	48.6	8.11
0.5	1.676	1.763	1.829	0.992	1.942	0.996	37.18	52.42	35.26	41.6	9.4
0.25	2.076	2.196	2.031	0.592	1.509	0.794	22.19	40.73	28.11	30.3	9.47
0.1	2.109	2.259	2.092	0.559	1.446	0.733	20.95	39.03	25.95	28.6	9.33
0.05	2.275	2.588	2.312	0.393	1.117	0.513	14.73	30.15	18.16	21	8.1
Control	2.668	3.705	2.825								

Key

Rep : Replicate

Ac : Absorbance of control

As : Absorbance of sample

Absorbance and percentages inhibition of various concentration of Ascorbic acid

Sample (µg/ml)	Absorbance			Ac-As			Inhibition (%)				
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Min	SD
200	0.196	0.199	0.194	3.019	3.05	3.011	93.9	93.88	93.95	93.91	0.04
139	0.225	0.201	0.224	2.99	3.048	2.981	93	93.81	93.01	92.92	0.47
50	1.603	1.458	1.552	1.612	1.791	1.653	50.14	55.12	51.58	49.81	2.57
25	2.422	2.572	2.559	0.793	0.677	0.646	24.67	20.84	20.16	18.15	2.43
12.5	2.574	2.848	2.622	0.641	0.401	0.583	19.94	12.34	18.19	12.86	3.98
6.25	2.858	3.018	2.972	0.357	0.231	0.233	11.1	7.11	7.27	4.09	2.26
3.12	2.982	3.118	2.958	0.233	0.131	0.247	7.247	4.03	7.70	3.31	2
1.56	2.96	3.227	3.004	0.255	0.022	0.201	7.932	0.67	0.68	0.39	4.19
0											
Control	3.215	3.249	3.205								

Key

Rep : Replicate

Ac : Absorbance of control

As : Absorbance of sample

Appendix II (d): Determination of IC₅₀ value of *Alpinia pahangensis* and *Alpinia mutica* extracts and Ascorbic acid

Sample (mg/ml)		R ₂	IC ₅₀ (y = 50) (mg/ml)
AA	$y = 0.5106x + 6.5122$	0.9203	0.085
APH(L)	$y = 10.64x + 24.091$	0.9526	2.41
APH(R)	$y = 9.8612x + 23.378$	0.9611	2.66
APD(L)	$y = 12.056x + 15.364$	0.8584	2.88
APD(R)	$y = 14.015x + 24.4$	0.9133	1.85
APM (L)	$y = 11.355x + 18.937$	0.8156	3.45
APM (R)	$y = 12.047x + 33.142$	0.8697	1.71
AMH(L)	$y = 15.469x + 14.409$	0.9046	2.49
AMH(R)	$y = 8.9847x + 14.604$	0.9542	3.94
AMD(R)	$y = 13.961x + 16.597$	0.9354	2.39
AMM(R)	$y = 17.455x + 10.959$	0.9686	2.25