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APPENDICES

APPENDIX A

Experimental data

Table A1 The content of main component by DTG/TGA technique

Types of main components	Durian peel (g)	Pineapple peel (g)
Moisture	0.0829	0.0694
Hemicelluloses	0.0125	0.0950
Cellulose	0.3303	0.2116
Lignin	0.3516	0.4211

Weight of durian peel = 0.7971 g and pineapple peel = 0.7773 g, (n=3)

Table A2 The content of main component via TAPPI T203 test method

Types of main components	Durian peel (g)	Pineapple peel (g)
Moisture	0.0820	0.0679
Hemicelluloses	0.0121	0.0943
Cellulose	0.3288	0.2044
Lignin	0.3516	0.4121

Weight of durian peel = 0.7745 g and pineapple peel = 0.7787 g, (n=3)

Table A3 The content of total reducing sugars via an electrical autoclave

Types	Durian peel (g)	Absorbance (AU)	Pineapple peel (g)	Absorbance (AU)
Sample 1	3.2001	0.2085	2.8982	0.2019
Sample 2	5.9921	0.2690	5.9161	0.2673
Sample 3	8.2098	0.3170	8.2104	0.3170

10 g of each sample weighed from durian and pineapple peels, (n=3)

Sample 1 = Lignin + Hemicelluloses + Cellulose, Sample 2 = Hemicelluloses + Cellulose and Sample 3 = Cellulose

Table A4 The content of total reducing sugars via a hot plate

Types	Durian peel (g)	Absorbance (AU)	Pineapple peel (g)	Absorbance (AU)
Sample 1	1.0667	0.1621	0.9660	0.1599
Sample 2	1.9973	0.1823	1.9720	0.1818
Sample 3	2.7366	0.1983	2.7368	0.1984

10 g of each sample weighed from durian and pineapple peels, (n=3)
Sample 1 = Lignin + Hemicelluloses + Cellulose, Sample 2 = Hemicelluloses + Cellulose and Sample 3 = Cellulose

Table A5 The content of obtained cellulosic ethanol from batch fermentation
Retention time (t_R) of standard ethanol = 1.485 min
Retention time (t_R) of 2-propanol = 1.521 min

Types	Durian peel (g)	Peak area of standard ethanol/Peak area of 2-propanol	Pineapple peel (g)	Peak area of standard ethanol/Peak area of 2-propanol
Sample 1	1.3028	0.1467	1.0030	0.1148
Sample 2	4.9178	0.5299	3.3790	0.3648
Sample 3	6.6329	0.7143	6.5270	0.7031

10 g of each sample weighed from durian and pineapple peels, (n=3)
Sample 1 = Lignin + Hemicelluloses + Cellulose, Sample 2 = Hemicelluloses + Cellulose and Sample 3 = Cellulose

APPENDIX B

Calculations

1. Percentage recovery

The percentage recovery can be obtained via the following equation:

$$\%Recovery = \frac{C_f - C_i}{C_s} \times 100$$

Where:

C_f = Concentration of glucose found in sample after spiking glucose standard (mg L^{-1})

C_i = Initial concentration of glucose found in real sample (mg L^{-1})

C_s= Spiked concentration of glucose standard which added into real sample (mg L^{-1})

For example; the calibration equation for the determination of glucose is

$$Y = 2.168X + 0.139, R^2 = 0.993$$

If glucose was spiked at 0.09 mg L^{-1} (C_s = 0.09 mg L^{-1}) and then was analyzed by spectrophotometry, giving absorbance of 0.3172, the C_f can be calculated as follow:

$$0.3172 = 2.168X + 0.139$$

$$X = 0.082, \text{ then } C_f = 0.082 \text{ mg } L^{-1}$$

The recovery can be calculated as follow:

$$\%Recovery = \frac{0.082 - 0.00}{0.09} \times 100$$

$$= 91.33\%$$

Therefore, percent recovery is 91.33%.

2. Standard deviation; SD

The SD can be calculated via the following equation:

$$SD = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

$\bar{x}$ = Mean of the analytical results (n)

3. Relative standard deviation; RSD

The %RSD can be calculated via the following equation:

$$\%RSD = \frac{SD}{\bar{x}} \times 100$$

APPENDIX C

Standard curve of glucose and ethanol

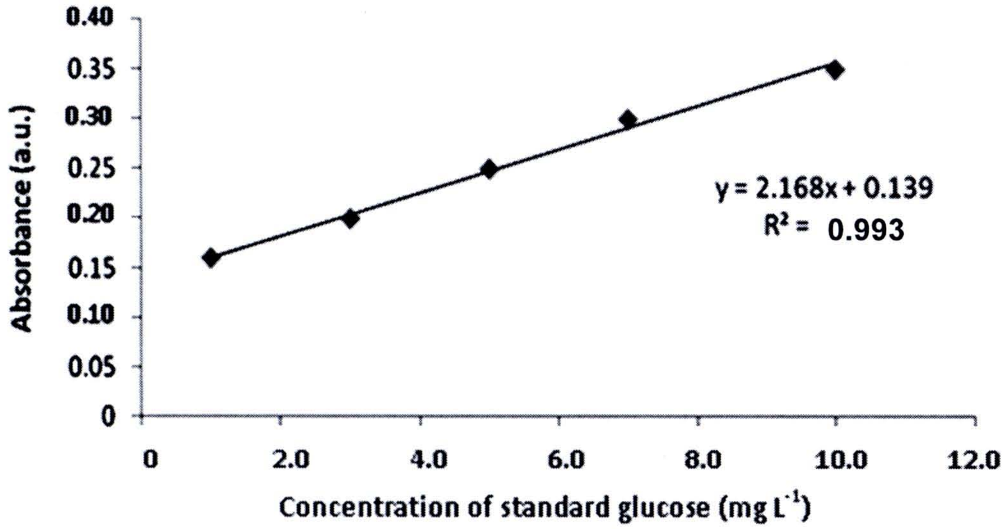

Figure C1 The standard curve of glucose

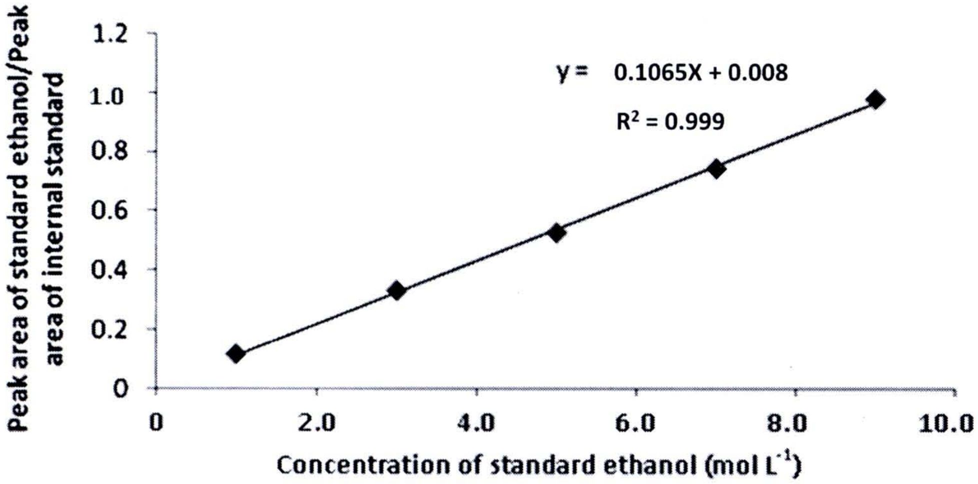

Figure C2 The standard curve of ethanol

APPENDIX D

UV-Vis spectrum of standard glucose

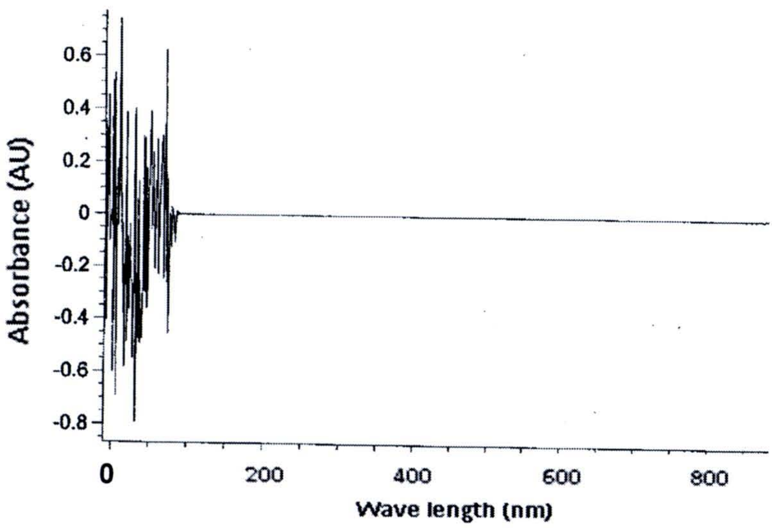

Figure D1 UV-Vis spectrum of DI water (blank)

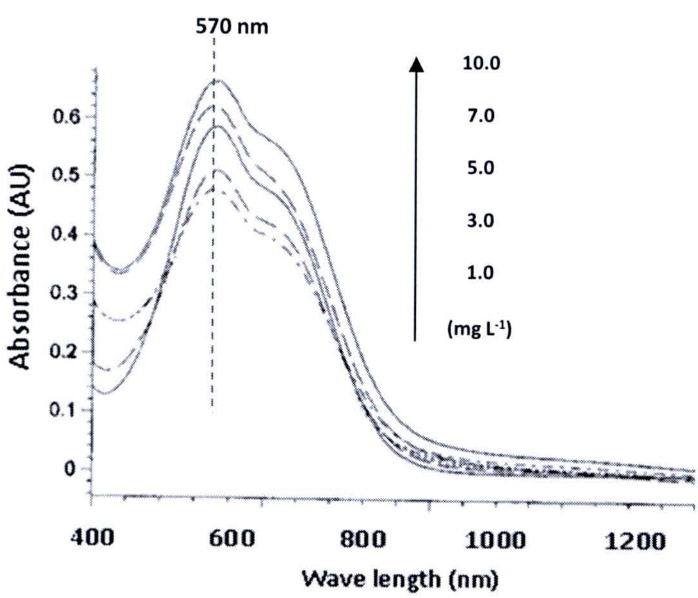

Figure D2 UV-Vis spectrum of standard glucose using DNS method

APPENDIX E

RESEARCH CONTRIBUTION

RESEARCH CONTRIBUTION

During study, five articles have been made and contributed. The details showed as follow;

1. Chalerm Ruangviriyachai and Patiwat Chaiyamate. **Cellulosic Ethanol from Durian Peel**. Oral presentation at BIT's 3rd World Congress of Industrial Biotechnology; 2010 July 25th - 27th; Dalian Municipal Party Committee Hotel, Dalian, China.

2. Patiwat Chaiyamate, Chatchanun Niwaswong, Narong Kosaikanon, Saksit Chanthai and Chalerm Ruangviriyachai. **Pineapple Peel Waste for Bioethanol Production**. Oral presentation at 14th International Biotechnology Symposium and Exhibition (IBS 2010); 2010 September 14th - 18th; Palacongressi, Rimini. Italy.

3. Patiwat Chaiyamate and Chalerm Ruangviriyachai. **Biosurfactant: The main point is interesting**. 2010, KKU Science Journal, Vol 38 (2), 162-170.

4. Patiwat Chaiyamate and Chalerm Ruangviriyachai. **A Study on Cellulosic Ethanol Production using *Saccharomyces cerevisiae***. Poster presentation at the 36th Congress on Science and Technology of Thailand (STT36); 2010 October 26th - 28th; Bangkok International Trade and Exhibition Centre (BITEC), Bangkok, Thailand.

5. Patiwat Chaiyamate and Chalerm Ruangviriyachai. **Preparation of Cellulose from Durian Peel for Bioethanol Production using modified TAPPI T203**. Poster presentation at Pure and Applied Chemistry International Conference 2011 (PACCON 2011); 2011 January 5th - 7th; Bangkok, Thailand.

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