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APPENDICES

Appendix A Retention Time and Calibration Curve of Monomeric Sugar by HPLC

Fermentable sugars which released from enzymatic hydrolysis process were measured by High Performance Liquid Chromatography (HPLC) with a refractive index detector (Series 200 LC/S/N291N5060508, Perkin Elmer) using an Aminex-HPX 87H column (300 mm x 78 mm, Bio-Rad Lab, USA) and a guard column (30 mm x 4.6 mm, Bio-Rad Lab, USA) under these following conditions: flow rate 0.60 ml/min, mobile phase 0.005 M of H₂SO₄ and column temperature was fixed at 60 °C. The retention times of monomeric sugar which are glucose and xylose are shown in Table A1. Calibration curve of each sugar which is used to examine the sugar concentrations is presented in Figure A1.

Table A1 Retention time of monomeric sugar

Monomeric sugar	Retention time (min)
Glucose	9.19
Xylose	9.82

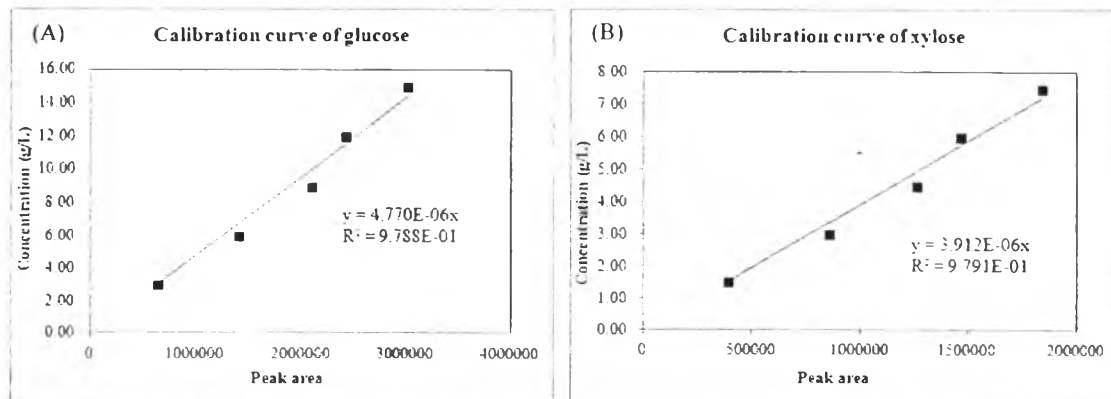


Figure A1 Calibration curve of glucose (A) and xylose (B).

Appendix B Retention Time and Calibration Curve of Acetone-Butanol-Ethanol by GC

In order to produce Acetone-butanol-ethanol, monomeric sugars which derived from chemicals pretreated rice straw were fermented by using *Clostridium Beijerinckii* TISTR1461 and the ABE yield was analyzed by Gas Chromatography. For calculation of acetone-butanol-ethanol concentration, the calibration curve of acetone-butanol-ethanol is required. Figure B1 shows the calibration curve of standard acetone-butanol-ethanol under various concentrations in the range 0.5 g/l to 2 g/l using propanol as an internal standard.

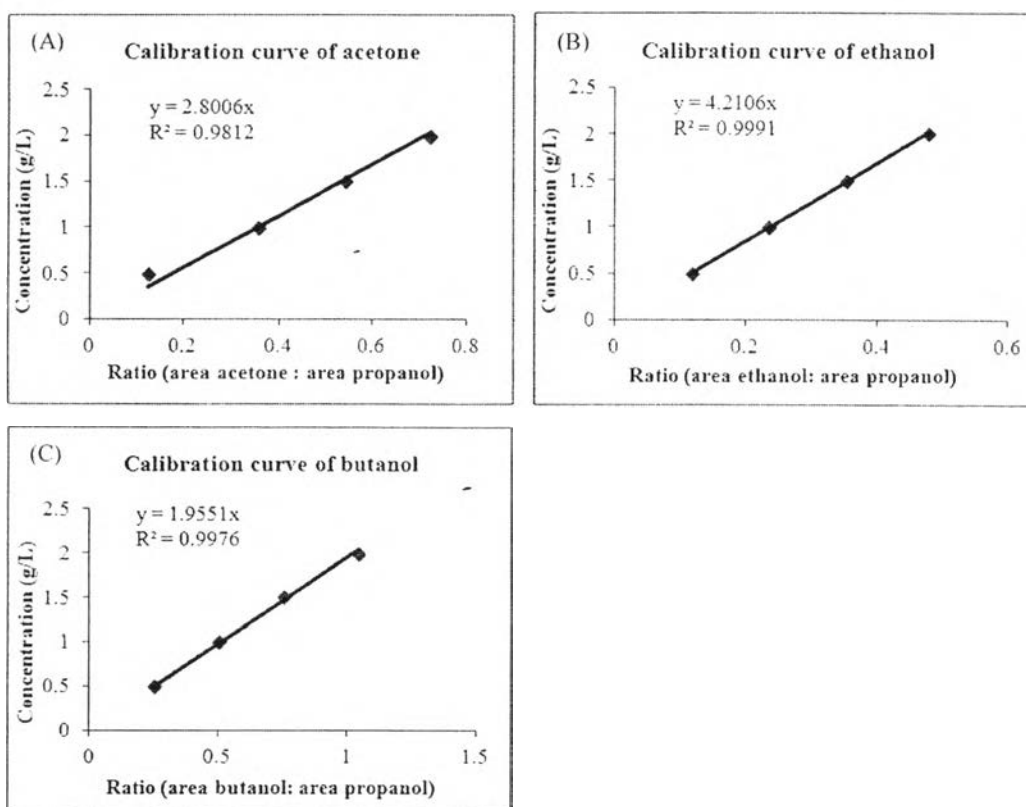


Figure B1 Calibration curve of acetone (A), ethanol (B) and butanol (C).

Appendix C Instrument Control Parameters of GC-MS

For analyzing other components in solution from fermentation process, gas chromatography-mass spectrometry (GC-MS) which is available from faculty of science, Mahidol University is required. Instrument control parameters are presented in Table C1. Moreover, detected components and their peak areas are shown in Table C2.

Table C1 Instrument control parameters

Oven Parameters	Value
Oven temperature (°C)	45 °C hold 3 min Ramp to 250 °C (rate 10°C/min) Ramp to 310 °C (rate 20°C/min) hold 5 min
Run time (min)	31.50

Front inlet parameters	Value/Mode
Front inlet temperature (°C)	280/ Split mode
Front inlet pressure (psi)	3.68
Injection volume (µL)	1
Split ratio	20:1
Split flow (mL/min)	14
Total flow (mL/min)	17.5

Column parameters	Value/Type
Column maximum temperature (°C)	350/HP-5MS
Flow rate (mL/min)	0.7
Carrier gas	Helium

Detector MSD parameters	Value
Scan mode (amu.)	25-350

Table C2 GC-MS analysis of ABE solution from different pretreatment methods of rice straw.

- Untreated rice straw

Retention time (min)	Chemical name	CAS NO.	Peak area	Quality
1.91	Ethanol	64-17-5	1500636	91
2.00	Acetone	67-64-1	11665558	86
3.03	1-Butanol	71-36-3	20178092	96
3.62	Acetic acid	64-19-7	10973554	86
5.77-5.92	Butyric acid	107-92-6	31576976	97

- Ionic liquid pretreated rice straw

Retention time (min)	Chemical name	CAS NO.	Peak area	Quality
2.00	Acetone	67-64-1	11179252	86
3.04	1-Butanol	71-36-3	15909923	96
3.75	Acetic acid	64-19-7	34952362	91
4.09	1-Hydroxy-2-propanone	107-92-6	6716991	83
13.82	Isosorbide	652-67-5	7521757	95

- NaOH pretreated rice straw

Retention time (min)	Chemical name	CAS NO.	Peak area	Quality
1.91	Ethanol	64-17-5	1860536	90
1.99	Acetone	67-64-1	21836029	86
2.28	2-Methylpropanal	78-84-2	2095767	90
3.04	1-Butanol	71-36-3	50489830	96
3.68	Acetic acid	64-19-7	17560147	91
4.07	1-Hydroxy-2-propanone	107-92-6	2692327	78
13.79	Isosorbide	652-67-5	5368148	95

- HNO₃ pretreated rice straw

Retention time (min)	Chemical name	CAS NO.	Peak area	Quality
3.78	Acetic acid	64-19-7	35736057	91
4.11	1-Hydroxy-2-propanone	107-92-6	4073742	80
13.80	Isosorbide	652-67-5	3336757	95

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