REFERENCES

ภาษาไทย

ปศุสัตว์กรม., กองอาหารสัตว์. 2545. หญ้ากินนีสีม่วง. โรงพิมพ์ชุมนุมสหกรณ์การเกษตรแห่งประเทศไทย จำกัด : กองปศุสัตว์สัมพันธ์ กรมปศุสัตว์ กระทรวงเกษตรและสหกรณ์.

ภาษาอังกฤษ

Abbi, M., Kuhad, R.C. and Singh, A. 1996. Bioconversion of pentose sugars to ethanol by free and immobilized cells of *Candida shehatae* (NCL-3501): Fermentation behavior. Process Biochemistry 31 : 555–560.

Abedinifar, S., Karimi, K., Khanahmadi, M. and Taherzadeh, M. J. 2009. Ethanol production by *Mucor indicus* and *Rhizopus oryzae* from rice straw by separate hydrolysis and fermentation. Biomass and bioenergy 33 : 828-833.

Ballesteros, I., Ballesteros, M. and Manzanares, P. 2008. Dilute sulfuric acid pretreatment of cardoon for etanol production. Biochemical Engineering Journal 42 : 84-91.

Béguin, P. 1990. Molecular biology of cellulose degradation. Annual Review of Microbiology 44 : 219-248.

Cameron, A. G. and Lemcke, B. 2008. Guinea Grass. Northern Territory Government E29 : 1-3.

Chang, V. S. and Holtzapple, M. T. 2000. Fundamental factors affecting enzymatic reactivity. Applied Biochemistry and Biotechnology 86 : 5-37.

Chang, V. S., Kaar, W. E., Burr, B. and Holtzapple, M. T. 2001. Simultaneous saccharification and fermentation of lime-treated biomass. Biotechnology Letters 23 : 1327-1333.

Chen, M., Xia, L. and Xue, P. 2007. Enzymatic hydrolysis of corncob and ethanol production from cellulosic hydrolysate. International Biodeterioration and Biodegradation 59 : 85-89.

Delgenes, J. P., Moletta, R. and Navarro, J. M. 1996. Effects of lignocellulose degradation products on ethanol fermentations of glucose and xylose by *Saccharomyces cerevisiae*, *Zymomonas mobilis*, *Pichia stipitis*, and *Candida shehatae*. Enzyme and Microbial Technology 19 : 220-225.

du Preez, J.C., Bosch, M. and Prior, B.A. 1986. The fermentation of hexose and pentose sugars by *Candida shehatae* and *Pichia stipitis*. Applied Microbiology and Biotechnology 23 : 228–233.

Eklund, R. and Zacchi, G. 1995. Simultaneous saccharification and fermentation of steam-pretreated willow. Enzyme and Microbial Technology 17 : 255-259.

Gandi, J., Holtzapple, M. T., Ferrer, A., Byers, F. M., Turner, N. D., Nagwani, M. and Chang, S. 1997. Lime treatment of agricultural residues to improve rumen digestibility. Animal Feed Science and Technology 68 : 195-211.

Ghosh, P., Pamment, N.B. and Martin, W.R.B. 1982. Simultaneous saccharification and fermentation of cellulose: effect of β-D-glucosidase activity and ethanol inhibition of cellulases. Enzyme and Microbial Technology 4 : 425-430.

Gossett, J. M., Stuckey, D. C., Owen, W. F. and Mccarty, P. L. 1982. Heat treatment and anaerobic digestion of refuse. Journal of the Environmental Engineering Divison 108 : 437-454.

Gupta, R., Sharma, K. K. and Kuhad, R. C. 2009. Separate hydrolysis and fermentation (SHF) of *Prosopis juliflora*, a wood substrate, for the production of cellulosic ethanol by *Saccharomyces cerevisiae* and *Pichia stipitis*–NCIM 3498. Bioresource Technology 100 : 1214-1220.

Grohmann, K., Torget, R. and Himmel, M.1968. Dilute acid pretreatment of biomass at high solid concentrations. Biotechnology and Bioengineering 17 : 135-151.

Hatakka, A. I. 1983. Pretreatment of wheat straw by white-rot fungi for enzymic saccharificationof cellulose. European Journal of Applied Microbiology and Biotechnology 18 : 350-357.

Hemmatinejad, N., Vahabzadeh, F. and Koredestani, S.S. 2002. Effect of Surfactant on enzymatic hydrolysis of cellulosic fabric. Iranian Polymer Journal 11 : 333–338.

Hendriks, A. T. W. M. and Zeeman, G. (2009). Pretreatments to enhance the digestibility of lignocelluloses biomass. Bioresource Technology 100 : 10-18.

Higuchi, T. 1990. Lignin Biochemistry. Wood Science Technology 24 : 23-63.

Himmel, M. E., Adney, W. S., Baker, J. O., Nieves, R. A. and Thomas, S. R. 1996. Cellulase : structure, function, and applications. In Wyman, C. E. (ed.) Handbook on Bioethanol : Production and Utilization. pp. 143-147. Washington,DC : Taylor & Francis.

Ho, N. W. Y., Chen, Z. D. and Brainard, A. 1998. Genetically engineered *Saccharomyces* yeast capable of effective cofermentation of glucose and xylose. Applied and Environmental Microbiology 64 : 1852–1859.

Hsu, T. A. 1996. Pretreatment of biomass. In Wyman, C. E. (ed.) Handbook on Bioethanol : Production and Utilization. pp. 179-189. Washington,DC : Taylor & Francis.

Hwang, S. S., Lee, S. J. and Kim, H. K. 2008. Biodegradation and saccharification of wood chips of *Pinus strobus* and *Liriodendron tulipifera* by white rot fungi. Journal Microbiology and Biotechnology 18 : 1819-1825.

Kapoor, M., Nair, L.M. and Kuhad, R.C. 2008. Cost-effective xylanase production from free and immobilized Bacillus pumilus strain MK001 and its application in saccharification of Prosopis julflora . Biochemical Engineering Journal 38 : 88–97.

Karimi, K., Emtiazi, G. and Taherzadeh, M. J. 2006. Ethanol production from dilute-acid pretreated rice straw by simultaneous saccharification and fermentation with *Mucor indicus*, *Rhizopus oryzae*, and *Saccharomyces cerevisiae*. Enzyme and microbial technology 40 : 138-144.

Kaya, F., Jr Heitmann, J. A. and Joyce, T. W. 1995. Influence of surfactants on the enzymatic hydrolysis of xylan and cellulose. TAPPI journal 78 : 150-157.

Keller, F. A., Hamilton, J. E. and Nguyen, Q. A. 2003. Microbial pretreatment of biomass potential for reducing severity of thermo-chemical biomass pretreatment. Applied Biochemistry and Biotechnology 105 : 27-41.

Kim, S. and Holtzapple, M. T. 2005. Lime pretreatment and enzymatic hydrolysis of corn stover. Bioresource Technology 96: 1994-2006.

Mamma, D., Christakopoulos, P., Koullas, D., Kekos, D., Macris, B.J. and Koukios, E. 1995. An alternative approach to the bioconversion of sweet sorghum carbohydrates to ethanol. Biomass and Bioenergy 8 : 99–103.

Margeot, A., Hahn-Hagerdal, B., Edlund, M., Slade, R. and Monot, F. 2009. New improvements for lignocellulosic ethanol. Biotechnology journal DOI 10.101 6/j.copbio.2009.05 .009.

McMillan, J. D. 1994. Pretreatment of lignocellulosic biomass. In Himmel, M. E., Baker, J. O. and Overend, R. P. (ed.), Enzymatic Conversion of Biomass for Fuels Production. pp. 292-324. Washington, DC: ACS Symp Ser. ACS .

McMillan, J. D., Newman, M. M., Templeton, D. W. and Mohagheghi, A. 1999. Simultaneous saccharification and cofermentation of dilute-acid pretreated yellow poplar hardwood to ethanol using xylose-fermenting *Zymomonas mobilis*. Applied Biochemistry and Biotechnology 77-79 : 649-665.

Mosier, N. S., Hendrickson, R., Brewer, M., Ho, N., Sedlak, M., Dreshel, R., Welch, G., Dien, B. S., Aden, A. and Ladisch, M. R. 2005. Industrial scale-up of pH- controlled liquid hot water pretreatment of corn fiber for fuel ethanol production. Applied Biochemistry and Biotecnology 125 : 77-97.

Mtui, G. Y. S. 2009. Recent advances in pretreatment of lignocellulosic wastes and production of value added products. African Journal of Biotechnology 8 : 1398-1415.

Negro, M. J., Manzanares, P. and Oliva, J. M. 2003. Changes in various physical/Chemicals parameters of *Pinus pinaster* wood after steam explosion pretreatment. Biomass and Bioenergy 25 : 301-308.

Nigam, J. N. 2001. Ethanol production from wheat straw hemicellulose hydrolysate by *Pichia stipitis*. Journal of Biotechnology 87 : 17–27.

Ohgren, K., Bura, R., Lesnicki, G., Saddler, J. and Zacchi, G. 2007. A comparison between simultaneous saccharification and fermentation and separate hydrolysis and fermentation using steam-pretreated corn stover. Process Biochemistry 42 : 834-839.

Olsson, L. and Hahn-Hagerdal, B. 1996. Fermentation of lignocellulosic hydrolysates for ethanol production. Enzyme and Microbial Technology 18 : 312-331.

Olsson, L., Soerensen, H. R., Dam, B. P., Christensen, H., Krogh, K. M. and Meyer, A. S. 2006. Separate and simultaneous enzymatic hydrolysis and fermentation of wheat hemicellulose with recombinant xylose utilizing *Saccharomyces cerevisiae*. Applied Biochemistry and Biotechnology 129-132 : 117-129.

Onsoy, T., Thanonkeo, P., Thanonkeo, S. and Yamada, M. 2007. Ethanol production from Jerusalem artichoke by Zymomonas mobilis in batch fermentation. KMITL Science and Technology Journal 7 : 55-60.

Palmqvist, E. and Hahn-Hagerdal, B. 2000. Fermentation of lignocellulosic hydrolysates. I : inhibition and detoxification. Bioresource Technolology 74 : 17-24.

Palmqvist, E., HahnHagerdal, B. 2000. Fermentation of lignocellulosic hydrolysates. П : inhibitors and mechanisms of inhibition. Bioresource Technolology 74 : 17-24.

Philippidis, G. P., Smith, T. K. and Wyman, C. E. 1993. Study of the enzymatic hydrolysis of cellulose for production of fuel ethanol by the simultaneous saccharification and fermentation process. Biotechnology and Bioengineering 41 : 846-853.

Philippidis, G. P. and Smith, T. K. 1995. Limiting factors in the simultaneous saccharification and fermentation process for conversion of cellulosic biomass to fuel ethanol. Applied Biochemistry and Biotechnology 51-52 : 117-124.

Philippidis, G. P. 1996. Cellulose Bioconversion Technology. In Wyman, C. E. (ed.), Handbook on Bioethanol : Production and Utilization. pp. 253-285. Washington,DC : Taylor & Francis.

Playne, M. J. 1984. Increased digestibility of bagasse by pretreatment with alkalis and steam explosion. Biotechnology and Bioengineering 26 : 426-433.

Ramos, L. P. 2003. The chemistry involved in the steam treatment of lignocellulosic materials. Quimica Nova 26 : 863-871.

Ria, T. 2001. Guinea grass. [online]. Avialable from:http://www.naturia.per.sg/buloh/plants/ guinea_grass/htm [27, Feb 2010]

Saha, B. C., Iten, L. B., Cotta, M. A. and Wu, Y. V. 2005. Dilute acid pretreatment, enzymatic saccharification, and fermentation of rice hulls to ethanol. Biotechnology Progress 21 : 816-822.

Saha, B. C. and Cotta, M. A. 2008. Lime pretreatment, enzymatic saccharification and fermentation of rice hulls to ethanol. Biomass and bioenergy 32 : 971-977.

Shakhashiri, B. Z. 2009. Chemical of the week: ethanol. [online]. Available from : http://scifun.org [25, Feb 2010]

Scalbert, A., Monties, B., Lallemand, J. Y., Guittet, Y. and Romndo, C. 1985. Ether linkage between phenolic acids and lignin fractions from wheat straw. Phytochemistry 24 : 1359-1362.

Shi, J., Sharma-Shivappa, R. R., Chinn, M. and Howell, N. 2009. Effect of microbial pretreatment on enzymatic hydrolysis and fermentation of cotton stalks for ethanol production. Biomass and bioenergy 33 : 88-96.

Sodersrtom, J., Pilcher, L., Galbe, M. and Zacchi, G. 2003. Combined use of H_2SO_4 and SO_2 impregnation of steam pretreatment of spruce in ethanol production. Applied Biochemistry and Biotechnology 105-198 : 127-140.

Somogyi, M. 1952. Note on sugar determination. Journal of Biological Chemistry 195 : 19-23.

Sun, Y. and Cheng, J. 2002. Hydrolysis of lignocellulosic materials for ethanol production: A review. Bioresource Technology 83 : 1-11.

Taherzadeh, M. J. and Karimi, K. 2007. Enzyme-based hydrolysis processes for ethanol from lignocellulosic materials. BioResources 2 : 707-738.

Taniguchi, M., Suzuki, H. Watanabe, D. Sakai, K., Hoshino, K. and Tanaka, T. 2005. Evaluation of pretreatment with *Pleurotus ostreatus* for enzymatic hydrolysis of rice straw. Journal of Bioscience and Bioengineering 100 : 637-643.

Teymouri, F., Perez, L. L., Alizade, H. and Dale, B. E. 2005 Optimizatio n of the ammonia fiber explosion (AFEX) treatment parameters for enzymatic hydrolysis of corn stover. Bioresource Technology 96 : 2014–2018.

Thompson, D. N., Chen, H-C. and Grethlein, H. E. 1992. Comparison of pretreatment methods on the basis of available surface area. Bioresource Technology 39 : 155-163.

Torget, R. and Hsu, T. 1994. Two-temperature dilute-acid prehydrolysis of hardwood xylan using a percolation process. Applied Biochemistry and Biotechnology 45/46 : 5-21.

Wade, L. G. 1995. Organic Chemistry. 3rd ed. Princeton, NJ : Prentice Hall.

Walker, G. M. 1998. Yeast Metabolism. Yeast Physiology and Biotechnology. pp 203–264, England : John Wileys & Sons.

Wingren, A., Galbe, M. and Zacchi, G. 2003. Techno-economic evaluation of producing ethanol from softwood : Comparison of SSF and SHF and identification of bottlenecks. Biotechnology Progress 19 : 1109-1117.

Wyman, C. E. 1996. Handbook on Bioethanol : Production and Utilization. Washington DC : Taylor & Francis.

Yang, C., Shen, Z., Yu, G. and Wang, J. 2008. Effect and after effect of radiation pretreatment on enzymatic hydrolysis of wheat straw. Bioresource Technology 99 : 6240-6245.

Yu, J., Zhang, J., He, J., Liu, Z. and Yu, Z. 2009. Combination of mild physical or chemical pretreatment with biological pretreatment for enzymatic hydrolysis of rice hull. Bioresource Technology 100 : 903-908.

Zhao, X., Peng, F., Cheng, K. and Liu, D. 2009. Enhancement of the enzymatic digestibility of sugarcane bagasse by alkali-peracetic acid pretreatment. Enzyme and Microbial Technology 44 : 17-23.

Zhao, J. and Xia, L. 2009. Simultaneous saccharification and fermentation of alkaline-pretreated corn stover to ethanol using a recombinant yeast strain. Fuel Processing Technology 90 : 1193-1197.

Zheng, Y., Pan, Z. and Zhang, R. 2009. Overview of biomass pretreatment for cellulosic ethanol production. International Journal of Agricultural and Biological Engineering 3 : 51-68

Zhu, S., Yu, Z., Wu, Y., Zhang, X., Li, H. and Gao, M. 2005a. Enhancing enzymatic hydrolysis of rice straw by microwave pretreatment. Chemical Engineering Communications 192 : 1559-1566.

Zhu, S., Wu, Y., Ziniu, Z., Liao, J. and Zhang, Y. 2005b. Pretreatment by microwave/alkali of rice straw and its enzymic hydrolysis. Process Biochemistry 40 : 3082-3086.

Zhu, S., Wu, Y., Yu, Z., Zhang, X., Li, H. and Gao, M. 2006. The effect of microwave irradiation on enzymatic hydrolysis of rice straw. Bioresource Technology 97 : 1964-1968.

APPENDICES

APPENDIX A

Culture media

1. Yeast Peptone Dextrose (YPD) Agar

Yeast extract	10	g
Bacto peptone	20	g
Glucose	20	g
Agar	18	g
Distilled water	1000	ml

Adjusted pH 4.5

Sterile by autoclaving at 121°c, 115 lb/inc^2 for 15 min.

APPENDIX B

Reagents and Buffers

1. Determination of reducing sugar

The reducing sugar was measured by the method of Somogyi (1952) using glucose as authentic sugar.

1.1 Somogyi-Nelson Reagent

A. Alkaline Copper Reagent :

- Potassium sodium tartate (Rochelle salts) 40 g in 300 ml distilled water
- Disodium hydrogen phosphate dodecahydrate 71 g in 300 ml distilled water
- 10% Copper (II) sulfate 80 ml

  (8 g Copper (II) sulfate in 80 ml distilled water)
- 1N Sodium hydroxide 100 ml

  (4 g Sodium hydroxide in 100 ml distilled water)
- Sodium sulfate 180 g

Dissolve the solutions above and make up volume to 1000 ml.

B. Nelson Reagent

- Ammonium molybdate 53.2 g in 500 ml distilled water
- Sulfuric acid (conc.) 21 ml

  Sulfuric acid (conc.) is added into the ammonium molybdate.
- Sodium arsenate 6 g in 50 ml distilled water

Dissolve the solutions above and make up volume to 1000 ml.

1.2 Procedure

- Put proper dilution of sample (1 ml) in a test tube

- Add Alkaline Copper solution (1 ml) and place in boiling water for 15 minutes. Immediately cool in ice water.

- After addition of 1 ml Nelson solution, incubate at room temperature for 30 minutes and dilute by adding 5 ml of distilled water.

- Absorbance of samples was measured at 520 nm. Concentrations of the samples were compared to the standard curve for determination of values. Distilled water was used instead of sample as a blank.

1.3 Preparation of standard curve of glucose

Glucose standard solutions (1 mg/ml) are prepared in distilled water. Standards of 0, 20, 40, 60, 80, 100, 120, 150, 180 and 200 μg/ml were prepared from glucose solution. The reactions were carried out with the same procedure as described previously. Absorbances were plotted against concentrations of standards.

1.4 Calculation of reducing sugar

Formula Reducing sugar (g/l) $= \frac{A_{520} \text{ x dilution}}{\text{Slope}}$

2. 0.1 M Citrate buffer pH 4.5

Citric acid monohydrate (0.1 M)	21.01	g/l
Trisodium citrate dehydrate (0.1 M)	29.41	g/l

Mix 0.1 M citric acid (47 ml) with 0.1 M trisodium citrate (53 ml). Adjust pH to 4.5.

3. 0.1 M Citrate buffer pH 5.0

Citric acid monohydrate (0.1 M)	21.01	g/l
Trisodium citrate dehydrate (0.1 M)	29.41	g/l

Mix 0.1 M citric acid (35 ml) with 0.1 M trisodium citrate (65 ml). Adjust pH to 5.0.

4. 0.1 M Citrate buffer pH 5.5

Citric acid monohydrate (0.1 M)	21.01	g/l
Trisodium citrate dehydrate (0.1 M)	29.41	g/l

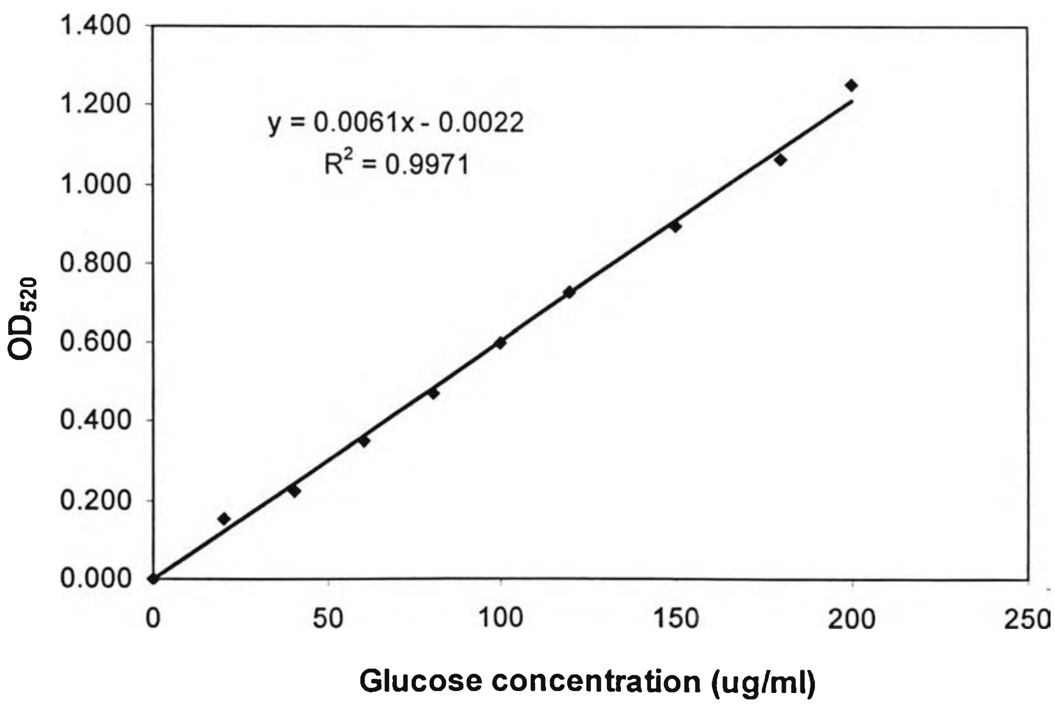
Mix 0.1 M citric acid (23.25 ml) with 0.1 M trisodium citrate (76.75 ml). Adjust pH to 5.5

APPENDIX C

Standard curve

C.1 Standard curve of glucose

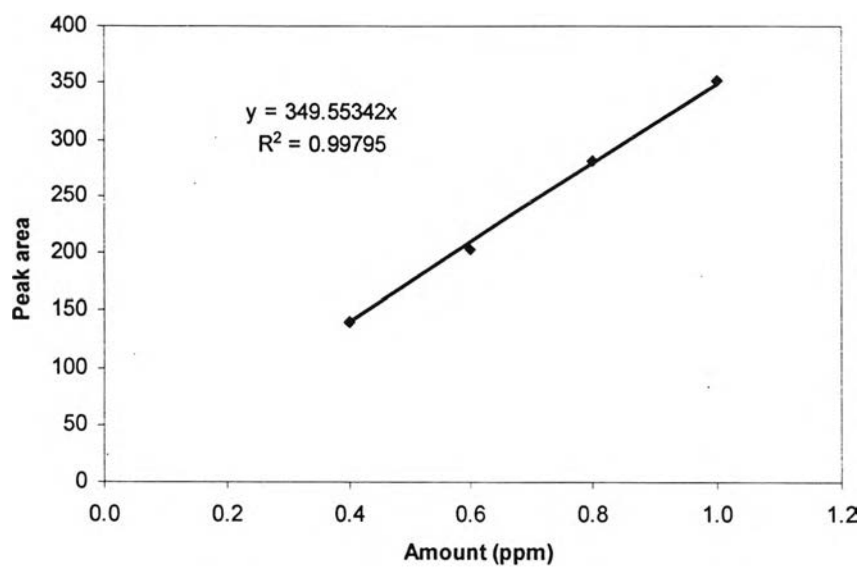
Glucose (ug/ml)	OD $_{520}$	OD $_{520}$	OD $_{520}$	Avg OD $_{520}$
0	0.000	0.000	0.000	0.000
20	0.116	0.183	0.159	0.153
40	0.228	0.219	0.224	0.224
60	0.352	0.353	0.353	0.353
80	0.473	0.473	0.476	0.474
100	0.610	0.624	0.568	0.601
120	0.727	0.727	0.802	0.727
150	0.865	0.890	0.929	0.895
180	1.058	1.065	1.045	1.062
200	1.248	1.258	1.420	1.253



C.2 Sugar and byproducts in $Ca(OH)_2$ pretreatment hydrolysate

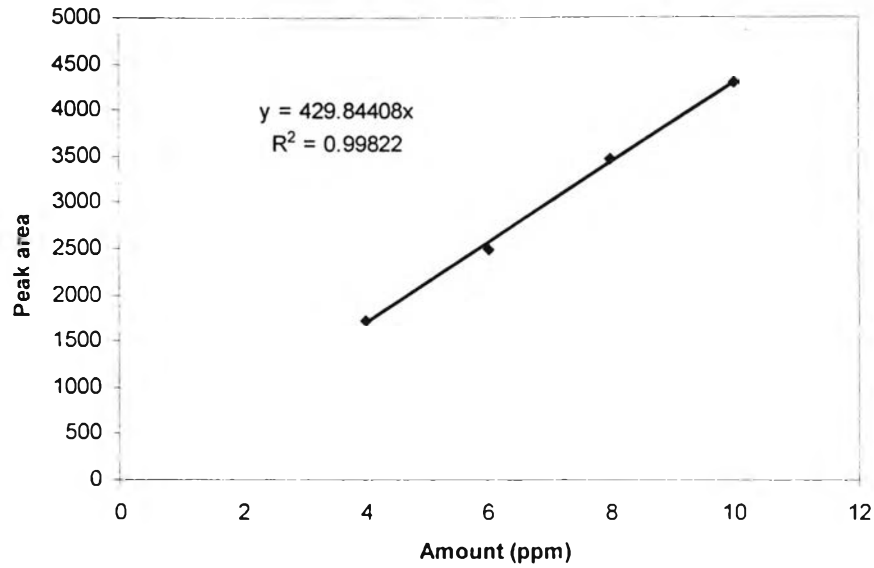
C.2.1 Standard curve of hydroxymethyl furfural

Retention time (min)	Amount (ppm)	Area	Name
5.025	0.4	139.94321	Hydroxymethyl furfural (HMF)
	0.6	203.15800	
	0.8	281.57150	
	1.0	351.90610	



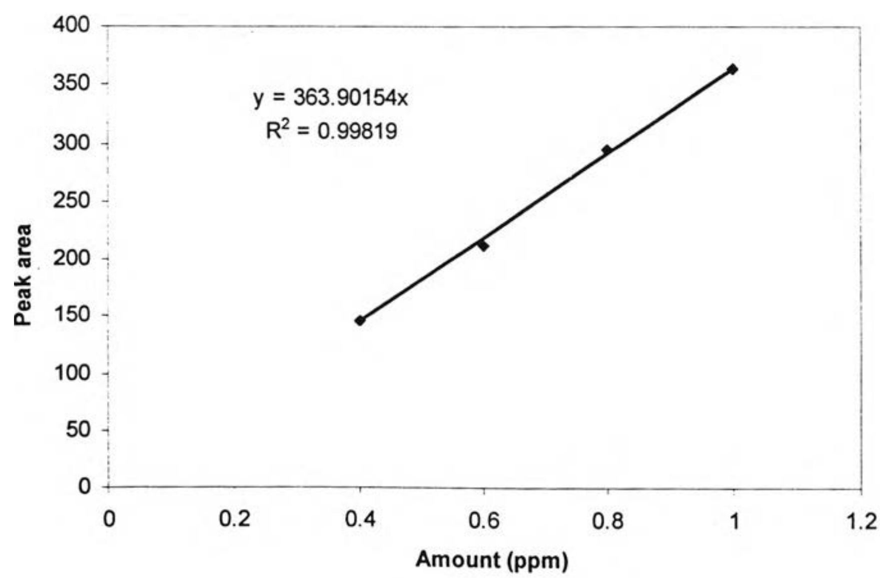
C.2.2 Standard curve of furfural

Retention time (min)	Amount (ppm)	Area	Name
6.552	4	1723.07947	Furfural
	6	2509.15210	
	8	3481.65259	
	10	4304.58691	



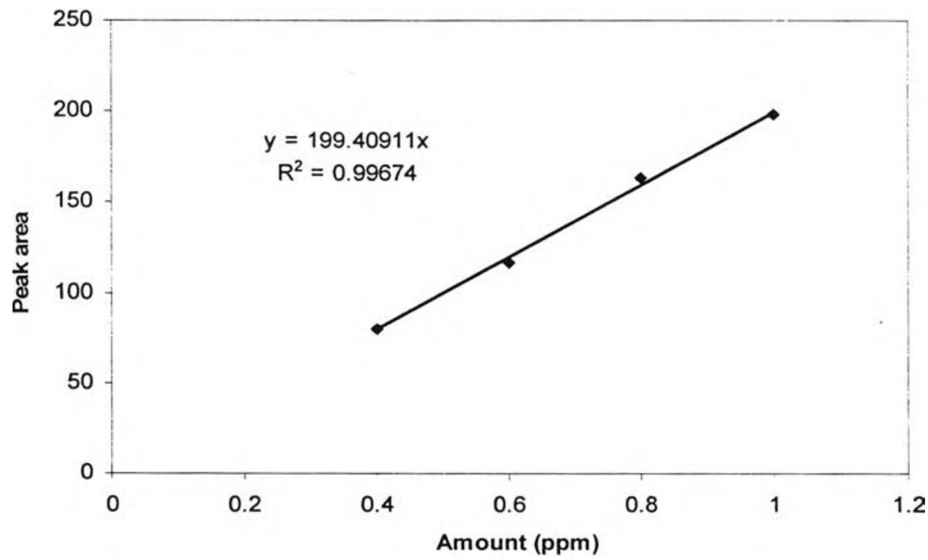
C.2.3 Standard curve of 4-hydrobenzaldehyde

Retention time (min)	Amount (ppm)	Area	Name
11.027	0.4	146.22147	4-Hydrobenzaldehyde
	0.6	212.34325	
	0.8	294.66772	
	1.0	364.39862	



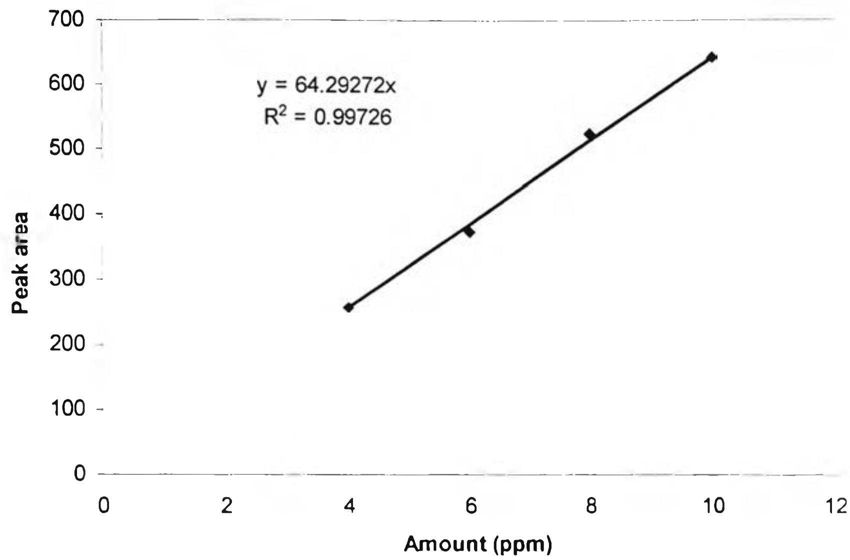
C.2.4 Standard curve of vanillin

Retention time (min)	Amount (ppm)	Area	Name
12.706	0.4	79.47014	Vanillin
	0.6	116.40575	
	0.8	163.40186	
	1.0	198.37068	



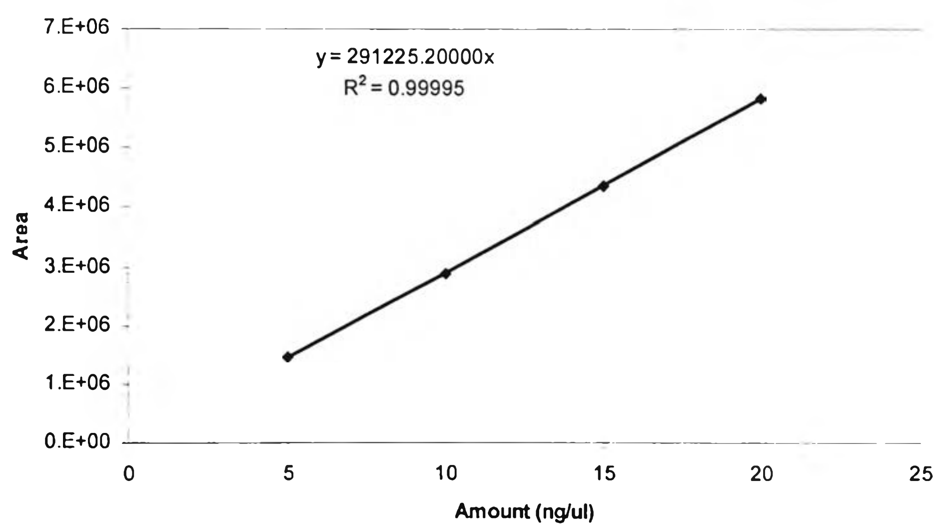
C.2.5 Standard curve of syringaldehyde

Retention time (min)	Amount (ppm)	Area	Name
13.475	4	257.13474	Syringaldehyde
	6	373.95203	
	8	524.03467	
	10	642.26984	



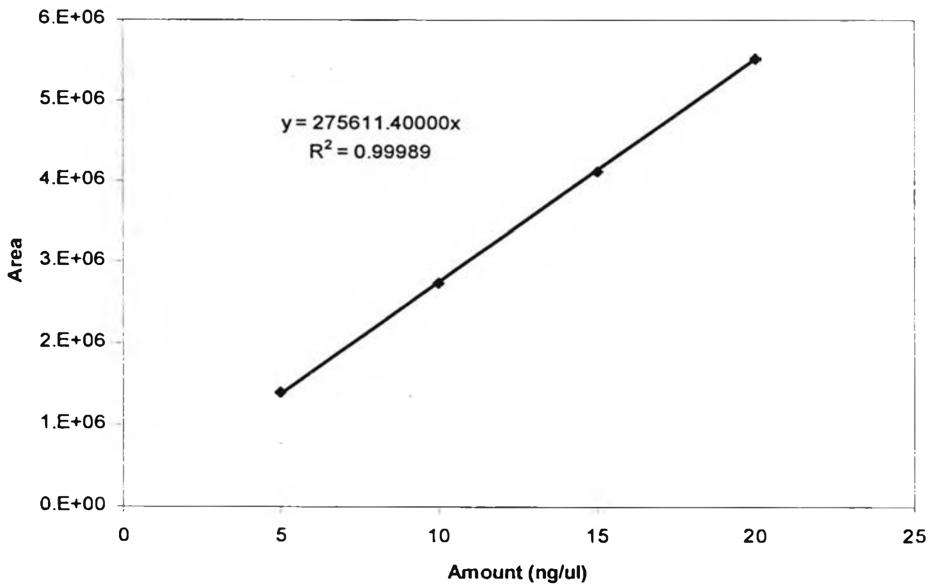
C.2.6 Standard curve of glucose

Retention time (min)	Amount (ng/ul)	Area	Name
12.327	5	1.46854e6	Glucose
	10	2.89263e6	
	15	4.37194e6	
	20	5.82854e6	



C.2.7 Standard curve of xylose

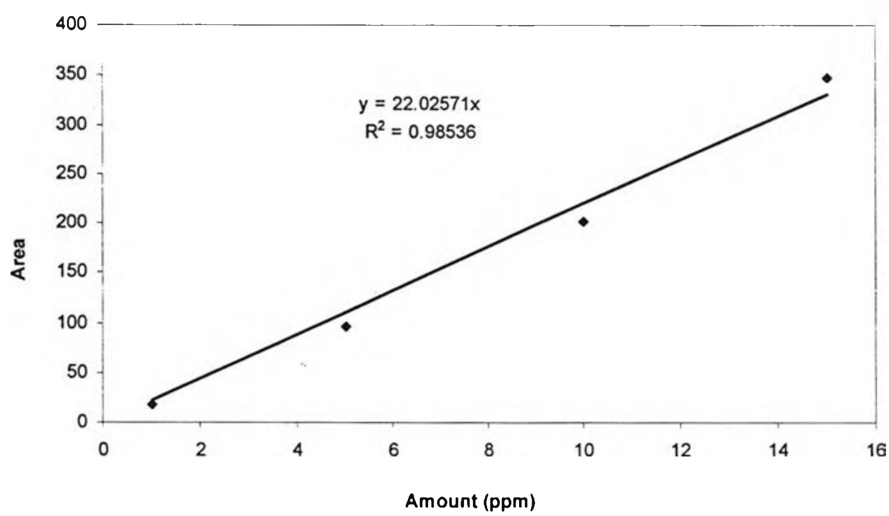
Retention time (min)	Amount (ng/ul)	Area	Name
13.479	5	1.39733e6	xylose
	10	2.73649e6	
	15	4.12452e6	
	20	5.52446e6	



C.3 Sugar and byproducts in $Ca(OH)_2$ pretreatment hydrolysate

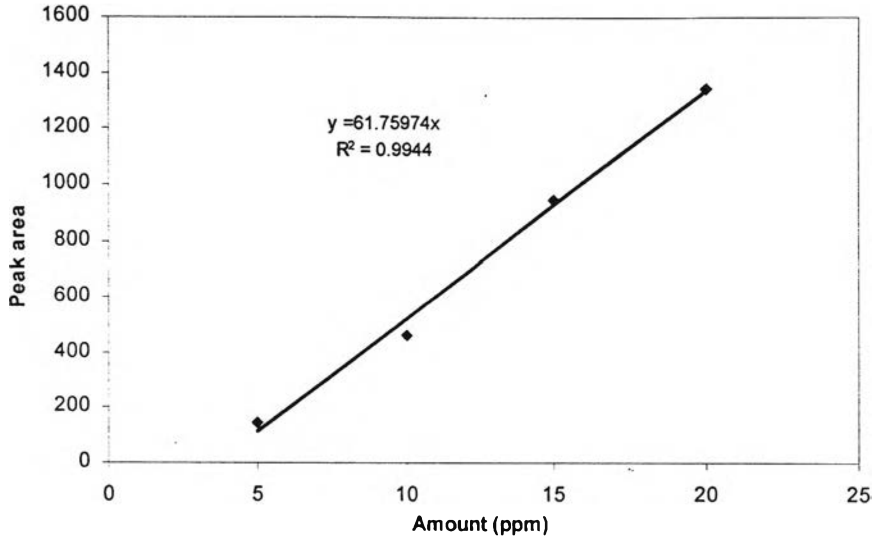
C.3.1 Standard curve of hydroxymethyl furfural

Retention time (min)	Amount (ppm)	Area	Name
5.062	1	17.74108	Hydroxymethyl furfural (HMF)
	5	95.89160	
	10	201.22179	
	15	348.10709	



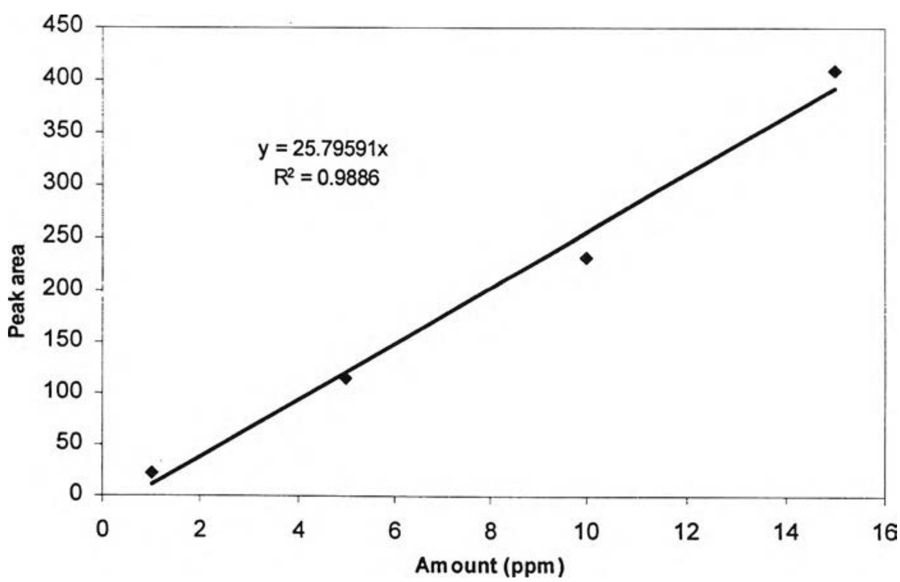
C.3.2 Standard curve of furfural

Retention time (min)	Amount (ppm)	Area	Name
6.748	5	147.05643	Furfural
	10	463.12479	
	15	940.23602	
	20	1342.48657	



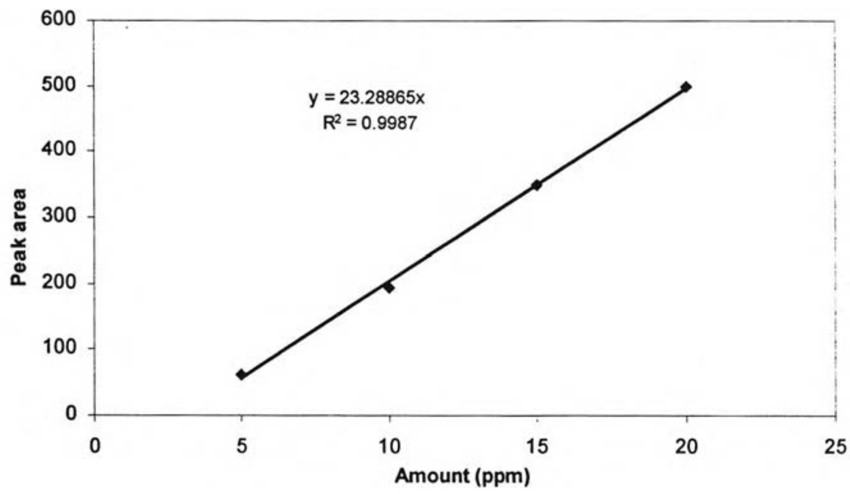
C.3.3 **Standard curve of 4-hydrobenzaldehyde**

Retention time (min)	Amount (ppm)	Area	Name
10.980	1	21.66099	4-Hydrobenzaldehyde
	5	115.07211	
	10	232.68480	
	15	408.69968	



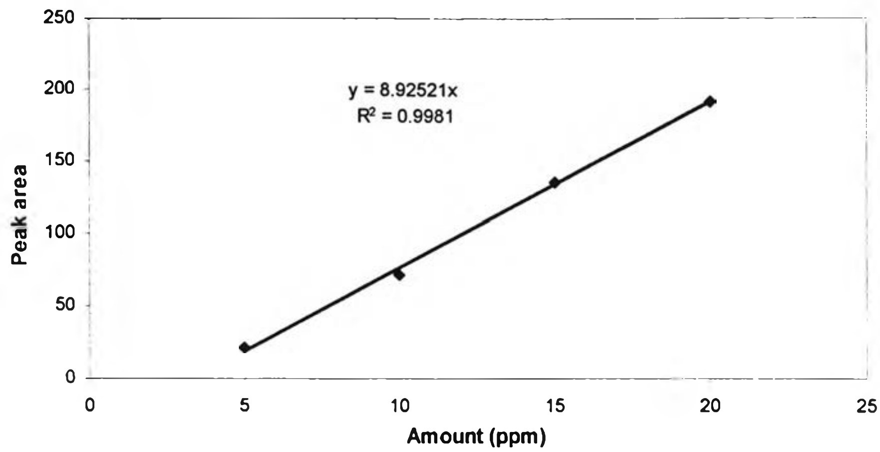
C.3.4 Standard curve of vanillin

Retention time (min)	Amount (ppm)	Area	Name
12.669	5	62.0791	Vanillin
	10	193.06236	
	15	349.78372	
	20	498.93567	



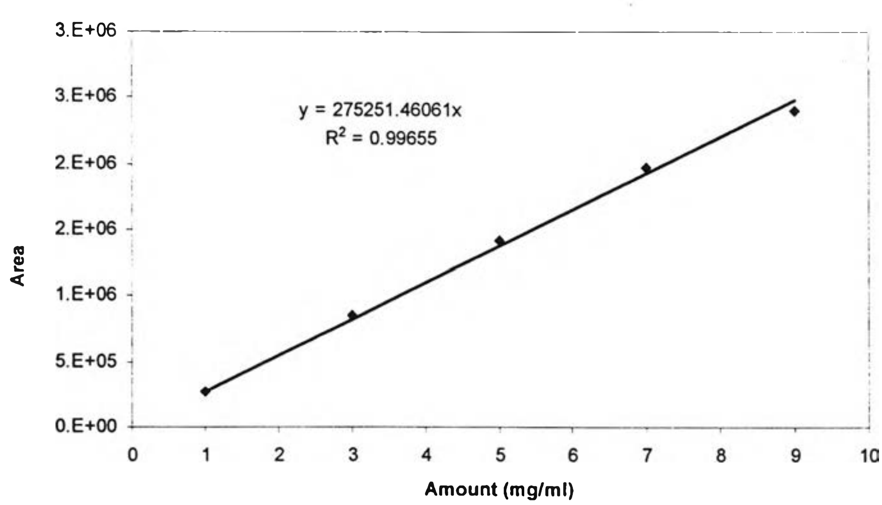
C.3.5 Standard curve of syringaldehyde

Retention time (min)	Amount (ppm)	Area	Name
13.434	5	21.69074	Syringaldehyde
	10	71.85046	
	15	135.55247	
	20	191.68312	



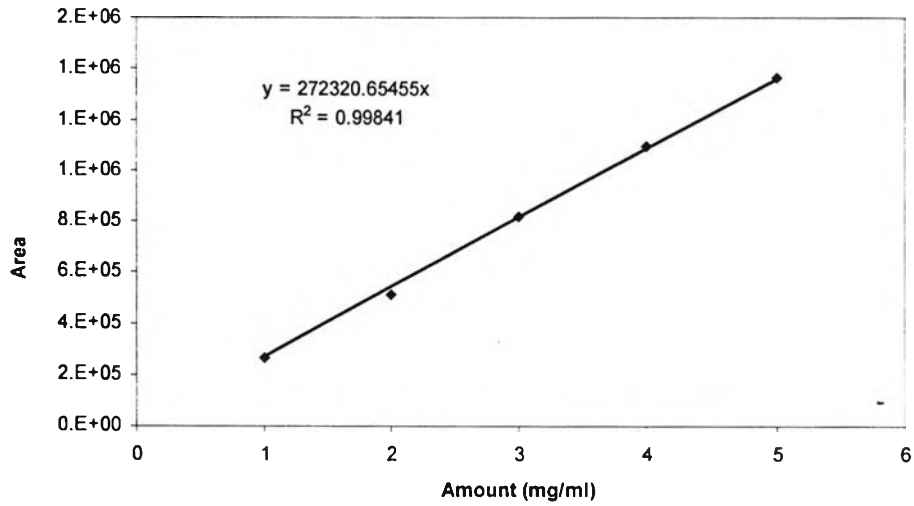
C.3.6 Standard curve of glucose

Retention time (min)	Amount (mg/ml)	Area	Name
12.398	1	2.66802e5	Glucose
	3	8.56643e5	
	5	1.41855e6	
	7	1.97500e6	
	9	2.40689e6	



C.3.7 Standard curve of xylose

Retention time (min)	Amount (mg/ml)	Area	Name
13.525	1	2.66839e5	Xylose
	2	5.11453e5	
	3	8.20077e5	
	4	1.09644e6	
	5	1.36838e6	



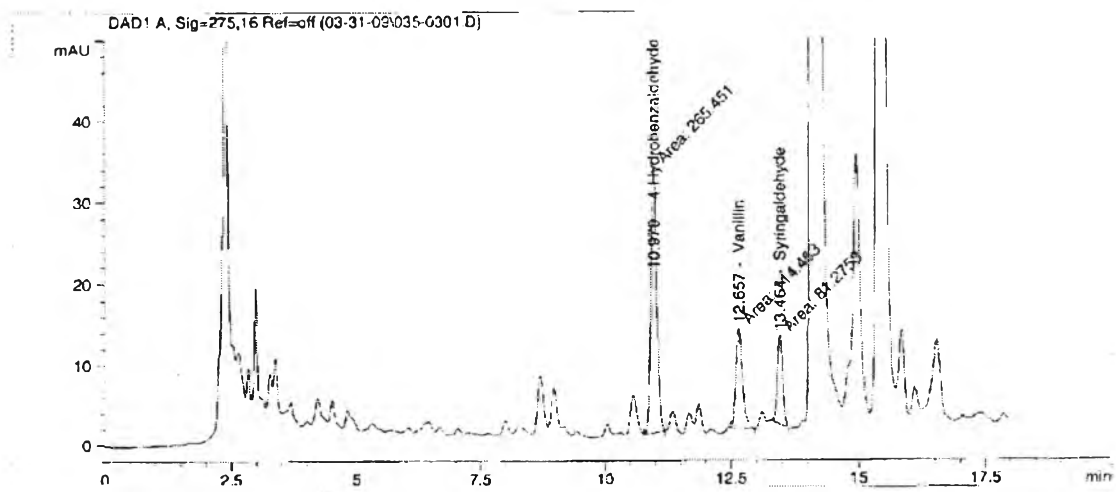
APPENDIX D

Sugar and byproducts in hydrolysate

D.1 Sugar and byproducts in $Ca(OH)_2$ pretreatment hydrolysate

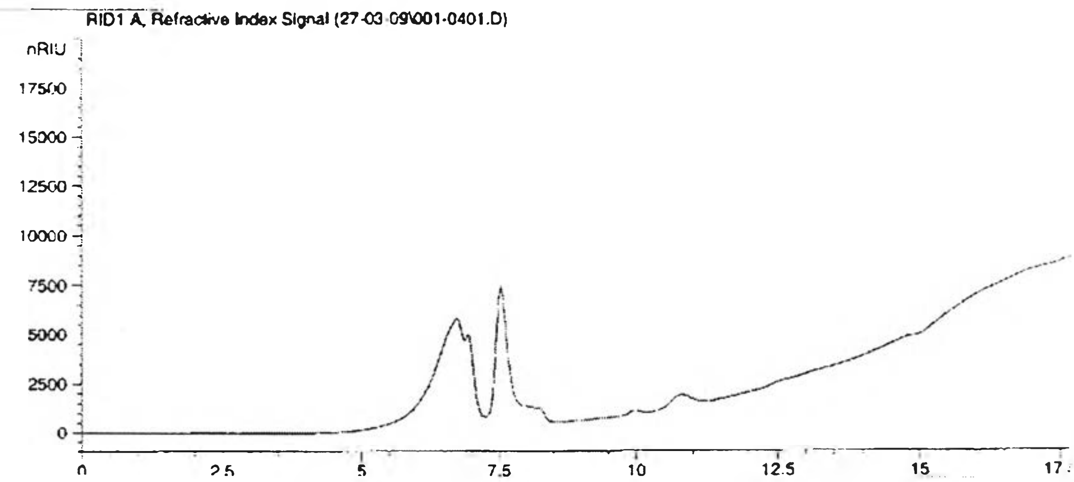
Sample 1: Reducing sugar 0.056 mg/ml

- Inhibitors



Retention time (min)	Area	Name	Amount (ppm)	Amount (mg/ml)
5.025	-	Hydroxymethyl furfural (HMF)	-	-
6.552	-	Furfural	-	-
10.979	265.45142	4-Hydrobenzaldehyde	7.29459e-1	0.00073
12.657	114.46322	Vanillin	5.74012e-1	0.00057
13.464	81.27534	Syringaldehyde	1.26415	0.00126

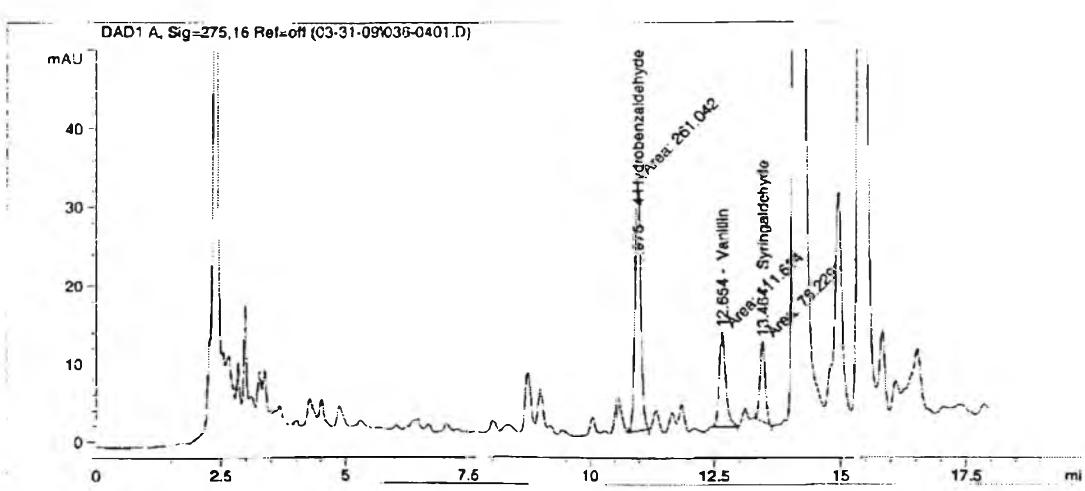
- Sugar



Retention time (min)	Area	Name	Amount (ng/ul)	Amount (mg/ml)
12.327	-	Glucose	-	-
13.479	-	Xylose	-	-

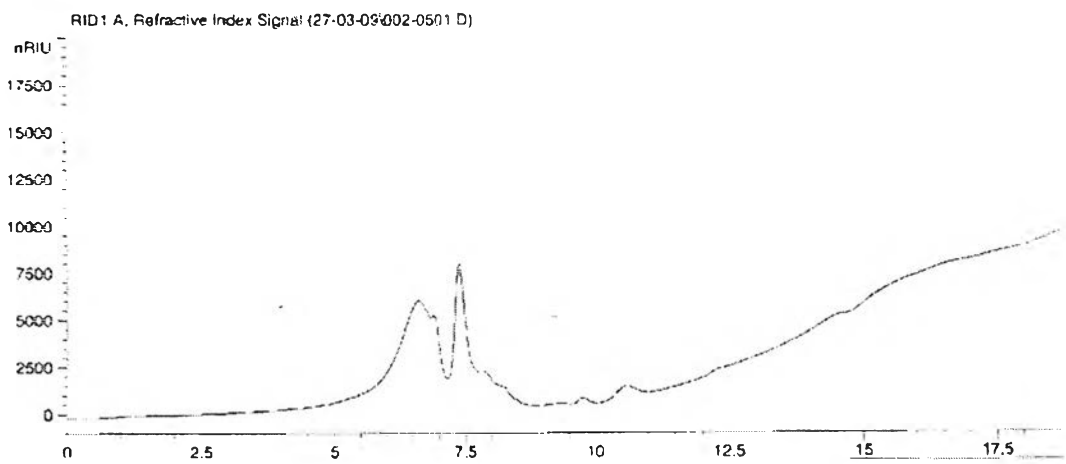
Sample 2: Reducing sugar 0.054 mg/ml

- Inhibitors



Retention time (min)	Area	Name	Amount (ppm)	Amount (mg/ml)
5.025	-	Hydroxymethyl furfural (HMF)	-	-
6.552	-	Furfural	-	-
10.975	261.04178	4-Hydrobenzaldehyde	7.17342e-1	0.000717
12.654	111.61407	Vanillin	5.59724e-1	0.000560
13.464	76.22906	Syringaldehyde	1.18566	0.001180

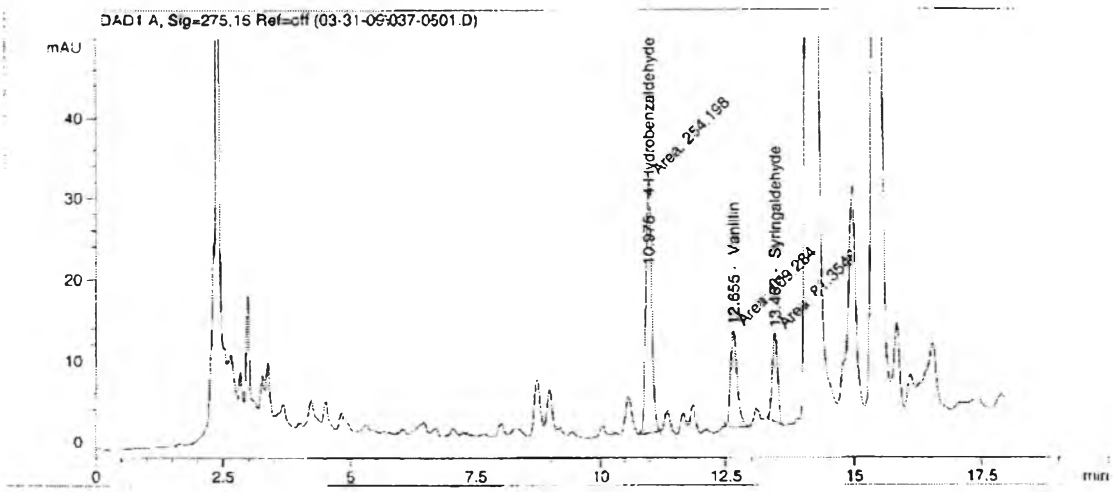
- <u>Sugar</u>



Retention time (min)	Area	Name	Amount (ng/ul)	Amount (mg/ml)
12.327	-	Glucose	-	-
13.479	-	Xylose	-	-

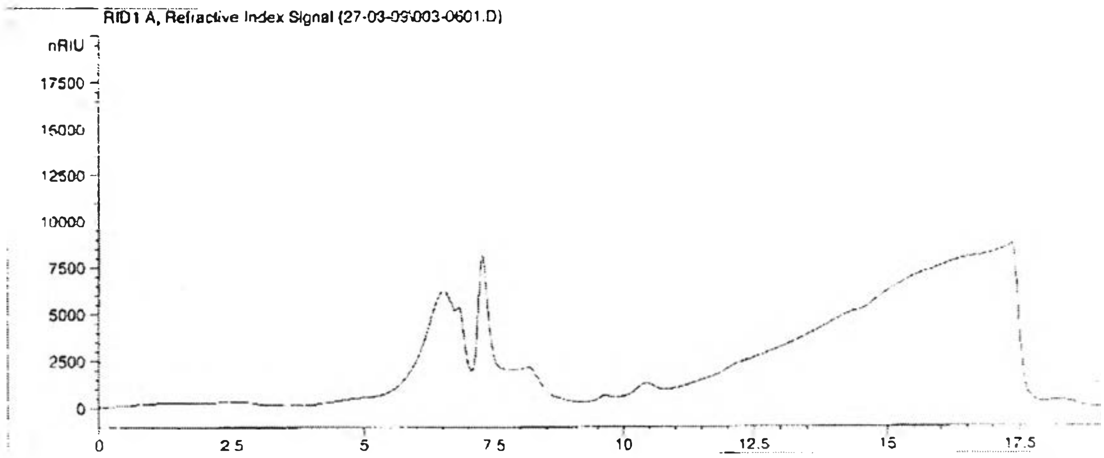
Sample 3: Reducing sugar 0.059 mg/ml

- Inhibitors



Retention time (min)	**Area**	**Name**	**Amount (ppm)**	**Amount (mg/ml)**
5.025	-	Hydroxymethyl furfural (HMF)	-	-
6.552	-	Furfural	-	-
10.975	254.19751	4-Hydrobenzaldehyde	6.98534e-1	0.000698
12.655	109.28412	Vanillin	5.48040e-1	0.000548
13.463	81.35482	Syringaldehyde	1.26538	0.001180

- <u>Sugar</u>

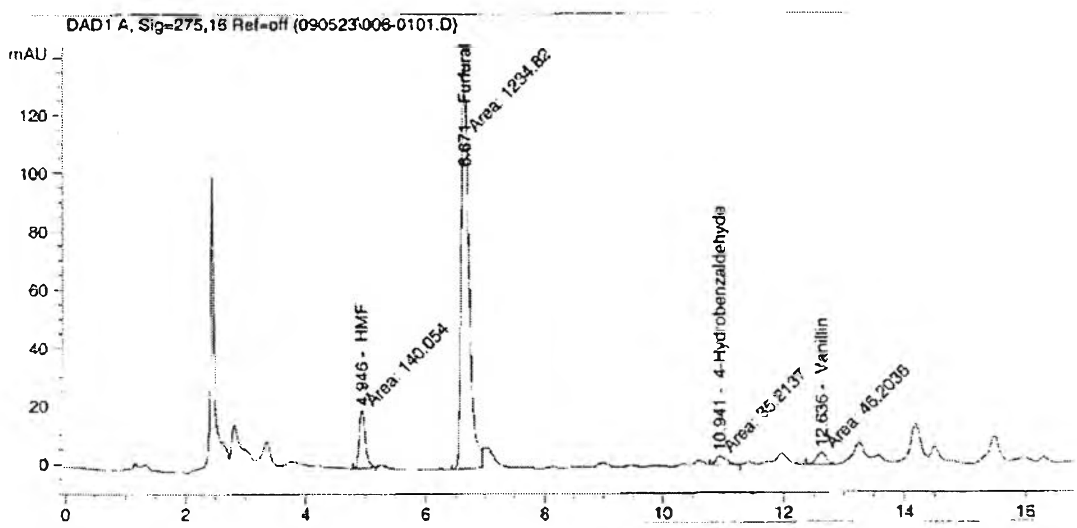


Retention time (min)	Area	Name	Amount (ng/ul)	Amount (mg/ml)
12.327	-	Glucose	-	-
13.479	-	Xylose	-	-

D.2 Sugar and byproducts in H_2SO_4 pretreatment hydrolysate

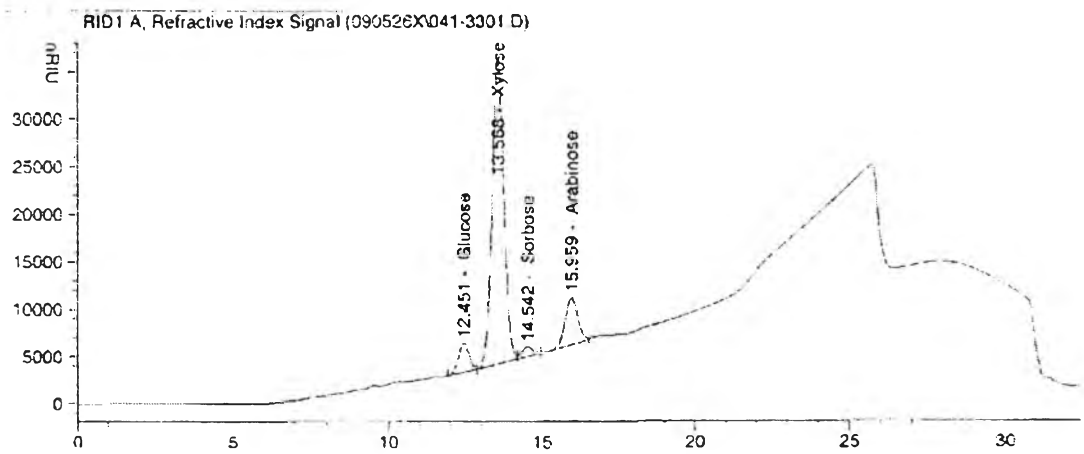
Sample 1: Reducing sugar 9.519 mg/ml

- Inhibitors



Retention time (min)	Area	Name	Amount (ppm)	Amount (mg/ml)
4.946	140.05389	Hydroxymethyl furfural (HMF)	6.35864	0.00636
6.671	1234.81677	Furfural	19.99388	0.01999
10.941	35.21370	4-Hydrobenzaldehyde	1.36509	0.00137
12.636	46.20361	Vanillin	1.98365	0.001984
13.434	-	Syringaldehyde	-	-

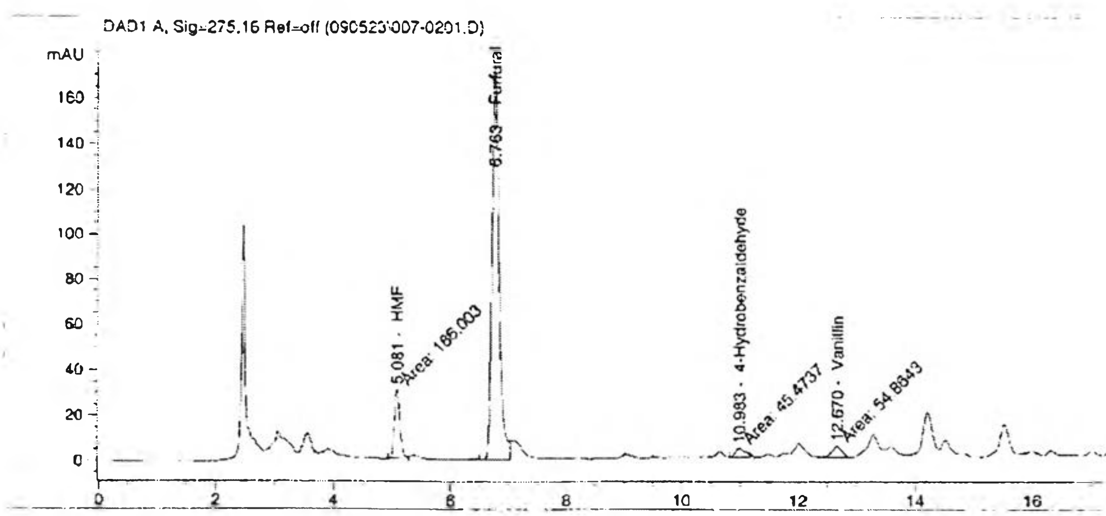
- Sugar



Retention time (min)	Area	Name	Amount (ng/ul)	Amount (mg/ml)
12.399	4.131e5	Glucose	1.501	1.501
13.568	8.580e5	Xylose	3.15071	3.15071

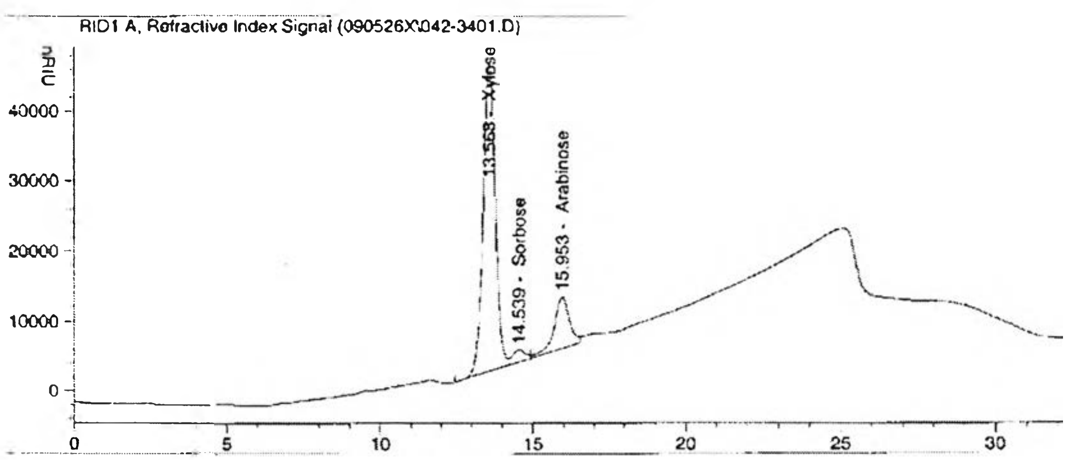
Sample 2: Reducing sugar 11.148 mg/ml

- Inhibitors



Retention time (min)	Area	Name	Amount (ppm)	Amount (mg/ml)
5.081	186.00275	Hydroxymethyl furfural (HMF)	8.44478	0.00844
6.763	1459.18420	Furfural	23.62679	0.02363
10.983	45.47371	4-Hydrobenzaldehyde	1.76283	0.00176
12.670	54.86431	Vanillin	2.35548	0.00235
13.434	-	Syringaldehyde	-	-

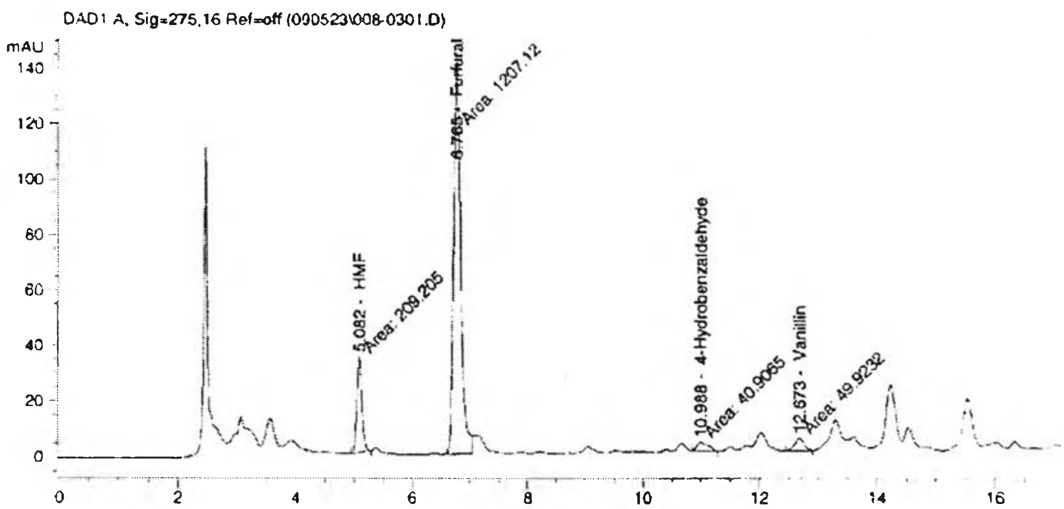
- Sugar



Retention time (min)	Area	Name	Amount (ng/ul)	Amount (mg/ml)
12.399	2.927e5	Glucose	1.063	1.063
13.568	1.196e6	Xylose	4.3919	3.15071

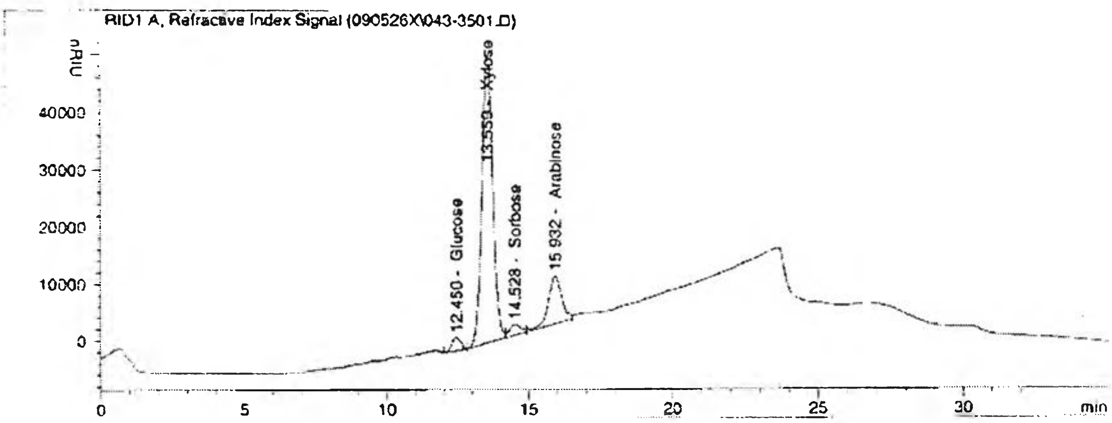
Sample 3: Reducing sugar 11.410 mg/ml

- <u>Inhibitors</u>



Retention time (min)	Area	Name	Amount (ppm)	Amount (mg/ml)
5.082	209.20476 -	Hydroxymethyl furfural (HMF)	9.49818	0.00950
6.765	1207.12183	Furfural	19.54545	0.01955
10.988	40.90649	4-Hydrobenzaldehyde	1.58577	0.00159
12.673	49.92317	Vanillin	2.14335	0.00214
13.434	-	Syringaldehyde	-	-

- Sugar



Retention time (min)	Area	Name	Amount (ng/ul)	Amount (mg/ml)
12.404	4.118e5	Glucose	1.496	1.496
13.559	1.344e6	Xylose	4.9354	3.15071

BIOGRAPHY

Miss Suwaphat Ratsamee was born in August 31, 1984 in Phichit, Thailand. She graduated from Department of Microbiology, Faculty of Science, Chulalongkorn University, Thailand with Bachelor Degree of Science since 2007.

Academic presentation :

1. Suwapat Ratsamee, Ancharida Akaracharanya, Natchanan Leepipatpiboon, Vichien Kitpreechavanich, Vasana Tolieng, Teerapatr Srinorakutara and. 2009. Efficiency of dilute acid and lime on increasing *Panicum maximum* CV TD 53 cellulase susceptibility. The 3th Fermentation Technology for Value Added Agricultural Products conference. August 26-28, 2009 at Kosa Hotel, Khon Kean, Thailand.