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LAMPIRAN

Tahap I. Pengaruh Faktor Perlakuan pada Proses Likuifikasi

Lampiran 1. Hasil Pengujian Total Gula Heksosa Selama Proses Likuifikasi

Lampiran 1a. Tabel Hasil Pengujian Total Gula Heksosa (g/L) Selama Proses Likuifikasi

Variasi Kombinasi Jenis Enzim	Waktu Likuifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
E0: α -Amilase	0	94.63	72.71	83.67
	6	52.01	59.54	55.78
	12	80.59	26.24	53.42
	18	83.35	88.88	86.11
	24	70.41	26.58	48.50
E1: α -Amilase + Xylanase	0	91.46	109.76	100.61
	6	81.97	81.97	81.97
	12	89.05	82.15	85.60
	18	96.12	26.07	61.09
	24	108.89	83.87	96.38
E2: α -Amilase + Manannase	0	68.31	81.97	75.14
	6	73.06	116.89	94.97
	12	74.73	82.32	78.52
	18	98.71	79.21	88.96
	24	75.07	25.03	50.05
E3: α -Amilase + Xylanase + Manannase	0	87.87	105.44	96.65
	6	57.96	69.55	63.75
	12	67.31	79.90	73.60
	18	56.95	26.58	41.77
	24	67.82	25.89	46.86

Lampiran 1b. Rataan Hasil Pengamatan Gula Heksosa (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Likuifikasi

Variasi Kombinasi Jenis Enzim	Waktu Likuifikasi (Jam)					Rata-Rata
	0	6	12	18	24	
E0: α -Amilase	83.67	55.78	53.42	86.11	48.50	65.50
E1: α -Amilase + Xylanase	100.61	81.97	85.60	61.09	96.38	85.13
E2: α -Amilase + Manannase	75.14	94.97	78.52	88.96	50.05	77.53
E3: α -Amilase + Xylanase + Manannase	96.65	63.75	73.60	41.77	46.86	64.53
	89.02	74.12	72.79	69.48	60.45	73.17



Lampiran 1c. Analisis Sidik Ragam (ANOVA) Gula Heksosa (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Likuifikasi
Tests of Between-Subjects Effects

Dependent Variable: Total Gula Heksosa (g/L)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	13718.661 ^a	19	722.035	1.467	.201
Intercept	214192.006	1	214192.006	435.069	.000
enzim	2957.236	3	985.745	2.002	.146
waktu	3420.897	4	855.224	1.737	.181
enzim * waktu	7340.528	12	611.711	1.243	.323
Error	9846.337	20	492.317		
Total	237757.004	40			
Corrected Total	23564.998	39			

a. R Squared = .582 (Adjusted R Squared = .185)

Lampiran 2. Hasil Pengujian Total Gula Pentosa Selama Proses Likuifikasi

Lampiran 2a. Hasil Pengujian Total Gula Pentosa (g/L) Selama Proses Likuifikasi

Variasi Kombinasi Jenis Enzim	Likuifikasi (Jam)	Ulangan		Rerata
		I	II	
E0: α-Amilase	0	41.83	33.47	37.65
	6	44.13	39.88	42.01
	12	42.48	42.04	42.26
	18	47.45	43.27	45.36
	24	41.21	25.98	33.59
E1: α-Amilase + Xylanase	0	42.69	36.93	39.81
	6	42.98	41.85	42.41
	12	44.52	42.39	43.45
	18	46.07	41.60	43.84
	24	49.90	44.55	47.23
E2: α-Amilase + Manannase	0	38.19	45.83	42.01
	6	36.43	58.28	47.36
	12	39.59	42.09	40.84
	18	48.18	41.55	44.87
	24	44.20	25.58	34.89
E3: α-Amilase + Xylanase + Manannase	0	40.32	34.82	37.57
	6	32.46	41.75	37.10
	12	38.31	43.27	40.79
	18	29.40	25.88	27.64
	24	38.31	38.31	38.31



Lampiran 2b. Rataan Hasil Pengamatan Gula Total Pentosa (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Likuifikasi

Variasi Kombinasi Jenis Enzim	Waktu Likuifikasi (Jam)					Rata-Rata
	0	6	12	18	24	
E0: α -Amilase	37.65	42.01	42.26	45.36	33.59	40.17
E1: α -Amilase + Xylanase	39.81	42.41	43.45	43.84	47.23	43.35
E2: α -Amilase + Manannase	42.01	47.36	40.84	44.87	34.89	41.99
E3: α -Amilase + Xylanase + Manannase	37.57	37.10	40.79	27.64	38.31	36.28
Rata-Rata	39.26	42.22	41.84	40.43	38.50	40.45

Lampiran 2c. Analisis Sidik Ragam (ANOVA) Gula Pentosa (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Likuifikasi

Tests of Between-Subjects Effects

Dependent Variable: Total Gula Pentosa (g/L)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	888.476 ^a	19	46.762	1.238	.320
Intercept	65445.673	1	65445.673	1.732E3	.000
enzim	282.162	3	94.054	2.489	.090
waktu	82.035	4	20.509	.543	.706
enzim * waktu	524.279	12	43.690	1.156	.374
Error	755.708	20	37.785		
Total	67089.857	40			
Corrected Total	1644.184	39			

a. R Squared = .540 (Adjusted R Squared = .104)

Lampiran 3. Hasil Pengujian Total Dekstrosa Ekuivalen Selama Proses Likuifikasi

Lampiran 3a. Hasil Pengujian Dekstrosa Ekuivalen (%) Selama Proses Likuifikasi

Variasi Kombinasi Jenis Enzim	Waktu Likuifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
ase	0	26.88	23.80	25.34
	6	22.36	22.22	22.29
	12	22.94	22.30	22.62
	18	22.88	24.65	23.76
	24	26.77	24.87	25.82



Variasi Kombinasi Jenis Enzim	Waktu Likuifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
E1: α -Amilase + Xylanase	0	26.84	23.83	25.33
	6	24.75	24.06	24.40
	12	25.81	23.59	24.70
	18	26.88	23.00	24.94
	24	26.79	24.39	25.59
E2: α -Amilase + Manannase	0	23.97	23.11	23.54
	6	24.34	24.93	24.64
	12	24.86	23.25	24.05
	18	26.84	22.94	24.89
	24	26.73	23.12	24.93
E3: α -Amilase + Xylanase + Manannase	0	25.01	24.28	24.64
	6	19.97	24.11	22.04
	12	24.71	23.27	23.99
	18	26.74	24.04	25.39
	24	26.69	24.81	25.75

Lampiran 3b. Rataan Hasil Pengamatan Dekstrosa Ekuivalen (%) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Likuifikasi

Variasi Kombinasi Jenis Enzim	Waktu Likuifikasi (Jam)					Rata-Rata
	0	6	12	18	24	
E0: α -Amilase	25.34	22.29	22.62	23.76	25.82	23.97
E1: α -Amilase + Xylanase	25.33	24.40	24.70	24.94	25.59	24.99
E2: α -Amilase + Manannase	23.54	24.64	24.05	24.89	24.93	24.41
E3: α -Amilase + Xylanase + Manannase	24.64	22.04	23.99	25.39	25.75	24.36
Rata-Rata	24.71	23.34	23.84	24.75	25.52	24.43

Lampiran 3c. Analisis Sidik Ragam (ANOVA) Dekstrosa Ekuivalen (%) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Likuifikasi
Tests of Between-Subjects Effects

Dependent Variable: Dekstrosa Ekuivalen (%)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	47.207 ^a	19	2.485	.869	.619
Intercept	23879.348	1	23879.348	8.347E3	.000
enzim	5.374	3	1.791	.626	.606
waktu	23.210	4	5.803	2.028	.129
enzim * waktu	18.623	12	1.552	.542	.861
	57.215	20	2.861		
	23983.770	40			
	104.422	39			

.52 (Adjusted R Squared = -.068)



Lampiran 4. Hasil Pengujian Gula Non-Pereduksi Selama Proses Likuifikasi

Lampiran 4a. Hasil Pengujian Gula Non-Pereduksi (g/L) Selama Proses Likuifikasi

Variasi Kombinasi Jenis Enzim	Waktu Likuifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
E0: α -Amilase	0	53.76	47.60	50.68
	6	44.72	44.44	44.58
	12	45.88	44.60	45.24
	18	45.75	49.31	47.53
	24	53.55	49.74	51.64
E1: α -Amilase + Xylanase	0	53.67	47.65	50.66
	6	49.49	48.12	48.81
	12	51.63	47.18	49.41
	18	53.76	46.00	49.88
	24	53.58	48.78	51.18
E2: α -Amilase + Manannase	0	47.93	46.22	47.08
	6	48.68	49.87	49.27
	12	49.71	46.50	48.10
	18	53.67	45.88	49.77
	24	53.45	46.25	49.85
E3: α -Amilase + Xylanase + Manannase	0	50.02	48.56	49.29
	6	39.94	48.21	44.08
	12	49.43	46.53	47.98
	18	53.48	48.07	50.78
	24	53.39	49.62	51.50

Lampiran 4b. Rataan Hasil Pengamatan Gula Non-Pereduksi (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Likuifikasi

Variasi Kombinasi Jenis Enzim	Waktu Likuifikasi (Jam)					Rata-Rata
	0	6	12	18	24	
E0: α -Amilase	50.68	44.58	45.24	47.53	51.64	47.93
E1: α -Amilase + Xylanase	50.66	48.81	49.41	49.88	51.18	49.99
E2: α -Amilase + Manannase	47.08	49.27	48.10	49.77	49.85	48.82
E3: α -Amilase + Xylanase + Manannase	49.29	44.08	47.98	50.78	51.50	48.73
Rata-Rata	49.43	46.68	47.68	49.49	51.04	48.87



Lampiran 4c. Analisis Sidik Ragam (ANOVA) Gula Non-Pereduksi (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Likuiifikasi
Tests of Between-Subjects Effects

Dependent Variable: Gula Non-Pereduksi (g/L)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	188.974 ^a	19	9.946	.869	.618
Intercept	95513.484	1	95513.484	8.349E3	.000
enzim	21.435	3	7.145	.625	.607
waktu	92.913	4	23.228	2.030	.129
enzim * waktu	74.625	12	6.219	.544	.860
Error	228.807	20	11.440		
Total	95931.265	40			
Corrected Total	417.781	39			

a. R Squared = .452 (Adjusted R Squared = -.068)

Tahap II. Pengaruh Faktor Perlakuan pada Proses Sakarifikasi

Lampiran 5. Hasil Pengujian Total Gula Heksosa Selama Proses Sakarifikasi

Lampiran 5a. Tabel Hasil Pengujian Total Gula Heksosa (g/L) Selama Proses Sakarifikasi

Variasi Kombinasi Jenis Enzim	Waktu Sakarifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
E0: α-Amilase + AMG	0	70.42	26.59	48.50
	6	64.03	100.44	82.24
	12	93.88	77.15	85.52
	18	82.32	98.89	90.61
	24	21.42	72.71	47.06
	30	26.95	55.92	41.43
	36	37.48	94.92	66.20
	42	152.82	71.45	112.14
	48	116.39	54.20	85.30
	54	114.20	10.54	62.37
	60	106.15	73.35	89.75
	66	132.89	70.76	101.83
+ G	72	96.37	16.93	56.65
	0	108.90	83.88	96.39
	6	66.28	33.38	49.83
	12	77.49	106.31	91.90
	18	59.89	97.34	78.61
	24	111.61	83.53	97.57
	30	29.71	74.21	51.96



Variasi Kombinasi Jenis Enzim	Waktu Sakarifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
	36	45.60	65.07	55.33
	42	182.96	91.64	137.30
	48	41.79	84.05	62.92
	54	86.01	70.59	78.30
	60	127.14	92.16	109.65
	66	122.83	81.29	102.06
	72	65.60	17.73	41.67
E2: α-Amilase + Manannase + AMG	0	75.08	25.04	50.06
	6	117.35	26.24	71.80
	12	70.76	75.77	73.26
	18	66.28	75.77	71.02
	24	25.56	43.49	34.53
	30	36.67	54.71	45.69
	36	54.69	70.59	62.64
	42	54.56	101.30	77.93
	48	180.92	44.88	112.90
	54	156.19	79.56	117.88
	60	130.59	81.98	106.29
	66	162.58	75.94	119.26
	72	128.41	23.32	75.86
E3: α-Amilase + Xylanase + Manannase + AMG	0	67.83	25.90	46.86
	6	69.55	26.42	47.99
	12	79.56	86.29	82.93
	18	62.65	83.70	73.18
	24	22.34	88.71	55.52
	30	37.48	76.80	57.14
	36	41.46	64.90	53.18
	42	123.92	75.59	99.76
	48	180.92	85.60	133.26
	54	104.42	80.25	92.34
	60	95.22	86.64	90.93
	66	58.35	71.45	64.90
	72	122.20	19.58	70.89



Lampiran 5b. Rataan Hasil Pengamatan Gula Heksosa (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Sakarifikasi

Waktu Sakarifikasi (Jam)	Variasi Kombinasi Jenis Enzim				Rata-Rata	SD
	E0: α - Amilase +AMG	E1: α - Amilase + Xylanase + AMG	E2: α - Amilase + Mananase + AMG	E3: α - Amilase + Xylanase + Mananase +AMG		
0	48.50	96.39	50.06	46.86	60.45	23.99
6	82.24	49.83	71.80	47.99	62.96	16.80
12	85.52	91.90	73.26	82.93	83.40	7.74
18	90.61	78.61	71.02	73.18	78.35	8.77
24	47.06	97.57	34.53	55.52	58.67	27.33
30	41.43	51.96	45.69	57.14	49.06	6.91
36	66.20	55.33	62.64	53.18	59.34	6.11
42	112.14	137.30	77.93	99.76	106.78	24.78
48	85.30	62.92	112.90	133.26	98.59	30.85
54	62.37	78.30	117.88	92.34	87.72	23.54
60	89.75	109.65	106.29	90.93	99.15	10.28
66	101.83	102.06	119.26	64.90	97.01	22.91
72	56.65	41.67	75.86	70.89	61.27	15.40
Rata-Rata	74.58	81.04	78.39	74.53	77.14	

Lampiran 5c. Analisis Sidik Ragam (ANOVA) Gula Heksosa (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Sakarifikasi

Tests of Between-Subjects Effects

Dependent Variable: Total Gula Heksosa (g/L)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	65275.723 ^a	51	1279.916	.840	.732
Intercept	618792.397	1	618792.397	406.200	.000
enzim	783.227	3	261.076	.171	.915
waktu	36391.353	12	3032.613	1.991	.044
enzim * waktu	28101.143	36	780.587	.512	.982
Error	79215.199	52	1523.369		
Total	763283.319	104			
Corrected Total	144490.922	103			

.52 (Adjusted R Squared = -.086)



Lampiran 5d. Uji Lanjut Duncan (DMRT) Pengaruh Lama Sakarifikasi Terhadap Gula Heksosa Pada Proses Sakarifikasi

Total Gula Heksosa (g/L)

Waktu Sakarifikasi	N	Subset		
		1	2	3
30	8	49.0563		
24	8	58.6712	58.6712	
36	8	59.3388	59.3388	
0	8	60.4550	60.4550	
72	8	61.2675	61.2675	61.2675
6	8	62.9612	62.9612	62.9612
18	8	78.3550	78.3550	78.3550
12	8	83.4012	83.4012	83.4012
54	8	87.7200	87.7200	87.7200
66	8		97.0112	97.0112
48	8		98.5937	98.5937
60	8		99.1538	99.1538
42	8			1.0678E2
Sig.		.098	.088	.051

Means for groups in homogeneous subsets are displayed. Based on observed means. The error term is Mean Square(Error) = 1523.369.

Lampiran 6. Hasil Pengujian Total Gula Pentosa Selama Proses Sakarifikasi

Lampiran 6a. Hasil Pengujian Total Gula Pentosa (g/L) Selama Proses Sakarifikasi

Variasi Kombinasi Jenis Enzim	Waktu Sakarifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
E0: α -Amilase + AMG	0	41.21	25.98	33.59
	6	42.48	46.37	44.42
	12	45.33	42.04	43.69
	18	42.04	46.27	44.15
	24	35.03	33.60	34.31
	30	46.15	30.55	38.35
	36	91.10	35.00	63.05
	42	70.32	44.35	57.34
	48	92.25	36.59	64.42
	54	67.86	21.90	44.88
	60	70.07	45.53	57.80
	66	88.33	40.13	64.23
	72	61.31	32.81	47.06



Variasi Kombinasi Jenis Enzim	Waktu Sakarifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
E1: α-Amilase + Xylanase + AMG	0	49.90	44.55	47.23
	6	38.26	35.81	37.04
	12	41.06	50.59	45.83
	18	37.87	49.12	43.49
	24	31.16	51.67	41.42
	30	46.15	34.68	40.42
	36	71.00	38.80	54.90
	42	155.21	47.05	101.13
	48	59.03	40.27	49.65
	54	54.43	39.00	46.71
	60	71.22	44.11	57.66
	66	66.96	40.86	53.91
	72	68.95	37.46	53.21
E2: α-Amilase + Manannase + AMG	0	44.20	25.58	34.89
	6	45.14	25.63	35.38
	12	38.76	40.47	39.62
	18	40.08	41.26	40.67
	24	53.96	27.96	40.96
	30	55.57	35.51	45.54
	36	77.25	42.04	59.65
	42	61.48	47.74	54.61
	48	73.18	34.97	54.07
	54	88.74	40.37	64.56
	60	79.73	42.73	61.23
	66	90.96	39.49	65.22
	72	100.49	33.56	67.03
E3: α-Amilase + Xylanase + Manannase + AMG	0	38.31	38.31	38.31
	6	40.32	40.32	40.32
	12	41.50	42.93	42.21
	18	37.23	43.17	40.20
	24	32.47	43.71	38.09
	30	55.11	41.75	48.43
	36	80.85	39.78	60.32
	42	87.03	41.01	64.02
	48	74.16	43.66	58.91
	54	67.70	41.75	54.72
	60	78.09	42.24	60.17
	66	61.48	39.14	50.31
	72	73.37	37.33	55.35



Lampiran 6b. Rataan Hasil Pengamatan Total Gula Pentosa (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Sakarifikasi

Waktu Sakarifikasi (Jam)	Variasi Kombinasi Jenis Enzim				Rata-Rata
	E0: α - Amilase+ AMG	E1: α - Amilase + Xylanase + AMG	E2: α - Amilase + Mananase + AMG	E3: α - Amilase + Xylanase + Mananase + AMG	
0	33.59	47.23	34.89	38.31	38.50
6	44.42	37.04	35.38	40.32	39.29
12	43.69	45.83	39.62	42.21	42.84
18	44.15	43.49	40.67	40.20	42.13
24	34.31	41.42	40.96	38.09	38.70
30	38.35	40.42	45.54	48.43	43.18
36	63.05	54.90	59.65	60.32	59.48
42	57.34	101.13	54.61	64.02	69.27
48	64.42	49.65	54.07	58.91	56.76
54	44.88	46.71	64.56	54.72	52.72
60	57.80	57.66	61.23	60.17	59.21
66	64.23	53.91	65.22	50.31	58.42
72	47.06	53.21	67.03	55.35	55.66
Rata-Rata	49.02	51.74	51.03	50.11	50.47

Lampiran 6c. Analisis Sidik Ragam (ANOVA) Total Gula Pentosa (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Sakarifikasi

Tests of Between-Subjects Effects

Dependent Variable: Total Gula Pentosa (g/L)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	14812.192 ^a	51	290.435	.557	.981
Intercept	264957.408	1	264957.408	508.424	.000
enzim	107.892	3	35.964	.069	.976
waktu	9869.538	12	822.462	1.578	.127
enzim * waktu	4834.761	36	134.299	.258	1.000
Error	27098.996	52	521.135		
Total	306868.596	104			
Corrected Total	41911.188	103			

a. R Squared = .353 (Adjusted R Squared = -.281)



Lampiran 7. Hasil Pengujian Gula Pereduksi Selama Proses Sakarifikasi

Lampiran 7a. Hasil Pengujian Gula Pereduksi (g/L) Selama Proses Sakarifikasi

Variasi Kombinasi Jenis Enzim	Waktu Sakarifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
E0: α-Amilase + AMG	0	53.55	49.74	51.64
	6	63.88	53.23	58.56
	12	64.52	60.29	62.40
	18	64.22	60.55	62.38
	24	63.43	53.37	58.40
	30	62.76	55.09	58.92
	36	64.67	59.73	62.20
	42	64.62	60.36	62.49
	48	65.84	64.09	64.97
	54	66.54	64.09	65.32
	60	69.59	72.13	70.86
	66	72.32	72.34	72.33
	72	75.05	66.71	70.88
E1: α-Amilase + Xylanase + AMG	0	53.58	48.78	51.18
	6	53.83	53.08	53.45
	12	64.48	57.15	60.81
	18	63.88	60.44	62.16
	24	63.84	60.33	62.08
	30	63.69	52.99	58.34
	36	63.77	60.44	62.10
	42	70.60	72.26	71.43
	48	71.60	70.47	71.04
	54	67.67	69.07	68.37
	60	72.52	75.75	74.13
	66	70.47	70.77	70.62
	72	71.04	72.08	71.56
E2: α-Amilase + M... AMG	0	53.45	46.25	49.85
	6	53.95	53.14	53.55
	12	61.37	58.64	60.01
	18	59.43	60.59	60.01
	24	61.67	59.50	60.59
	30	63.69	60.63	62.16
	36	64.89	60.18	62.53
	42	70.60	60.40	65.50
	48	69.25	69.25	69.25
	54	70.60	71.04	70.82



Variasi Kombinasi Jenis Enzim	Waktu Sakarifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
	60	71.65	75.62	73.63
	66	70.47	73.13	71.80
	72	69.51	73.96	71.73
E3: α-Amilase + Xylanase + Manannase + AMG	0	53.39	49.62	51.50
	6	53.83	53.23	53.53
	12	64.63	60.06	62.35
	18	63.51	60.33	61.92
	24	60.66	57.52	59.09
	30	64.03	58.89	61.46
	36	64.48	60.25	62.37
	42	69.59	73.39	71.49
	48	69.51	71.95	70.73
	54	70.21	70.16	70.18
	60	69.90	74.22	72.06
	66	69.51	73.96	71.73
	72	71.04	75.49	73.26

Lampiran 7b. Rataan Hasil Pengamatan Gula Pereduksi (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Sakarifikasi

Waktu Sakarifikasi (Jam)	Variasi Kombinasi Jenis Enzim				Rata-Rata	SD
	E0: α -Amilase+AMG	E1: α -Amilase + Xylanase + AMG	E2: α -Amilase + Mananase + AMG	E3: α -Amilase + Xylanase + Mananase +AMG		
0	51.64	51.18	49.85	51.50	51.04	0.82
6	58.56	53.45	53.55	53.53	54.77	2.52
12	62.40	60.81	60.01	62.35	61.39	1.18
18	62.38	62.16	60.01	61.92	61.62	1.09
24	58.40	62.08	60.59	59.09	60.04	1.64
30	58.92	58.34	62.16	61.46	60.22	1.87
36	62.20	62.10	62.53	62.37	62.30	0.19
42	62.49	71.43	65.50	71.49	67.73	4.48
48	64.97	71.04	69.25	70.73	68.99	2.80
54	65.32	68.37	70.82	70.18	68.67	2.47
	70.86	74.13	73.63	72.06	72.67	1.50
	72.33	70.62	71.80	71.73	71.62	0.72
	70.88	71.56	71.73	73.26	71.86	1.00
	63.18	64.41	63.96	64.74	64.07	



Lampiran 7c. Analisis Sidik Ragam (ANOVA) Gula Pereduksi (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Sakarifikasi
Tests of Between-Subjects Effects

Dependent Variable: Gula Pereduksi (g/L)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4753.748 ^a	51	93.211	8.698	.000
Intercept	426945.822	1	426945.822	3.984E4	.000
enzim	35.662	3	11.887	1.109	.354
waktu	4432.013	12	369.334	34.466	.000
enzim * waktu	286.073	36	7.946	.742	.827
Error	557.224	52	10.716		
Total	432256.794	104			
Corrected Total	5310.972	103			

a. R Squared = .895 (Adjusted R Squared = .792)

Lampiran 7d. Uji Lanjut Duncan (DMRT) Pengaruh Lama Sakarifikasi Terhadap Gula Pereduksi Pada Proses Sakarifikasi
Gula Pereduksi (g/L)

Duncan

Waktu Sakarifikasi	N	Subset					
		1	2	3	4	5	6
0	8	51.0450					
6	8		54.7712				
24	8			60.0400			
30	8			60.2212			
12	8			61.3925			
18	8			61.6188			
36	8			62.3012			
42	8				67.7275		
54	8				68.6725	68.6725	
48	8				68.9950	68.9950	
66	8					71.6212	71.6212
72	8					71.8600	71.8600
60	8						72.6725
		1.000	1.000	.226	.471	.080	.550

in homogeneous subsets are displayed.
 and means.

Mean Square(Error) = 10.716.



Lampiran 8. Hasil Pengujian Gula Non-Pereduksi Selama Proses Sakarifikasi

Lampiran 8a. Hasil Pengujian Gula Non-Pereduksi (g/L) Selama Proses Sakarifikasi

Variasi Kombinasi Jenis Enzim	Waktu Sakarifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
E0: α-Amilase + AMG	0	58.08	2.82	30.45
	6	42.64	93.57	68.11
	12	74.70	58.90	66.80
	18	60.15	84.61	72.38
	24	-6.99	52.94	22.98
	30	10.34	31.38	20.86
	36	63.92	70.19	67.05
	42	158.53	55.44	106.98
	48	142.80	26.69	84.75
	54	115.52	-31.66	41.93
	60	106.62	46.75	76.69
	66	148.90	38.54	93.72
	72	82.62	-16.98	32.82
E1: α-Amilase + Xylanase + AMG	0	105.22	79.65	92.44
	6	50.71	16.12	33.41
	12	54.07	99.75	76.91
	18	33.88	86.01	59.95
	24	78.92	74.88	76.90
	30	12.17	55.89	34.03
	36	52.83	43.43	48.13
	42	267.57	66.44	167.00
	48	29.21	53.85	41.53
	54	72.77	40.51	56.64
	60	125.84	60.52	93.18
	66	119.32	51.38	85.35
	72	63.52	-16.89	23.31
E2: α-Amilase + Manannase + AMG	0	65.83	4.37	35.10
	6	108.54	-1.27	53.64
	12	48.15	57.59	52.87
	18	46.92	56.43	51.68
	24	17.84	11.95	14.90
	30	28.55	29.60	29.07
	36	67.05	52.46	59.75
	42	45.44	88.65	67.04
	48	184.86	10.60	97.73
	54	174.33	48.90	111.61
	60	138.68	49.09	93.88
	66	183.07	42.30	112.68
	72	159.40	-17.08	71.16



Variasi Kombinasi Jenis Enzim	Waktu Sakarifikasi (Jam)	Ulangan		Rata-Rata
		I	II	
E3: α-Amilase + Xylanase + Manannase + AMG	0	52.75	14.59	33.67
	6	56.05	13.50	34.78
	12	56.44	69.15	62.79
	18	36.37	66.55	51.46
	24	-5.85	74.90	34.52
	30	28.56	59.66	44.11
	36	57.84	44.43	51.13
	42	141.36	43.21	92.29
	48	185.58	57.31	121.45
	54	101.91	51.84	76.87
	60	103.41	54.65	79.03
	66	50.33	36.64	43.48
	72	124.54	-18.58	52.98

Lampiran 8b. Rataan Hasil Pengamatan Gula Non-Pereduksi (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Sakarifikasi

Waktu Sakarifikasi (Jam)	Variasi Kombinasi Jenis Enzim				Rata-Rata
	E0: α - Amilase+ AMG	E1: α - Amilase + Xylanase + AMG	E2: α - Amilase + Mananase + AMG	E3: α -Amilase + Xylanase + Mananase +AMG	
0	30.45	92.44	35.10	33.67	47.91
6	68.11	33.41	53.64	34.78	47.48
12	66.80	76.91	52.87	62.79	64.84
18	72.38	59.95	51.68	51.46	58.87
24	22.98	76.90	14.90	34.52	37.33
30	20.86	34.03	29.07	44.11	32.02
36	67.05	48.13	59.75	51.13	56.52
42	106.98	167.00	67.04	92.29	108.33
48	84.75	41.53	97.73	121.45	86.36
54	41.93	56.64	111.61	76.87	71.77
60	76.69	93.18	93.88	79.03	85.70
66	93.72	85.35	112.68	43.48	83.81
72	32.82	23.31	71.16	52.98	45.07
Rata-Rata	60.42	68.37	65.47	59.89	63.54



Lampiran 8c. Analisis Sidik Ragam (ANOVA) Gula Non-Pereduksi (g/L) Dari Pengaruh Penggunaan Variasi Kombinasi Jenis Enzim Dengan Lama Sakarifikasi
Tests of Between-Subjects Effects

Dependent Variable: Gula Non-Pereduksi (g/L)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	93822.144 ^a	51	1839.650	.571	.976
Intercept	419860.655	1	419860.655	130.344	.000
enzim	1301.673	3	433.891	.135	.939
waktu	48745.570	12	4062.131	1.261	.270
enzim * waktu	43774.900	36	1215.969	.377	.999
Error	167501.614	52	3221.185		
Total	681184.413	104			
Corrected Total	261323.758	103			

a. R Squared = .359 (Adjusted R Squared = -.270)

Lampiran 9. Dokumentasi Kegiatan Penelitian

A. Pembuatan Tepung Ubi Jalar Ungu

1. Proses Sortasi, Pengupasan Kulit, Pencucian, serta Pengirisan



2. Pengukusan



3. Pengeringan dengan Oven Blower



4. Penghalusan atau Penggilingan



5. Pengayakan



6. Pengukuran Kadar Air untuk Penentuan Basis Kering



B. Produksi Gula Cair Secara Enzimatis

1. Pembuatan Suspensi Tepung Ubi Jalar Ungu sebagai Substrat



2. Pengaturan pH 6,5



3. Gelatinisasi Pati



4. Likuifikasi dan Pengambilan Sampel



5. Pengaturan pH 4,5



6. Sakarifikasi dan Pengambilan Sampel



7. Penjernihan Sampel Gula



8. Analisa Gula

