LAMPIRAN - LAMPIRAN

Lampiran 01. Hasil pengukuran kadar protein *C. uitilis* (% b.k)

Tabel 05. Data pengukuran kadar protein *C. uitilis* (% b.k) yang diukur berdasarkan kandungan nitrogen total secara Makro-Kjeldahl

Perlakuan		Kadar protein			Total Perlakuan	Rata-rata
Glukosa (G)	Urea (U)	I	II	III		
G_0	U_0	10,119	11,975	11,913	34,007	11,336
	U_1	13,561	13,957	12,885	40,403	13,468
	U_2	12,181	12,983	13,957	39,121	13,040
G_1	U_0	13,231	14,845	20,037	48,113	16,038
	U_1	21,342	21,846	20,926	64,114	21,371
	U_2	16,029	16,826	13,147	46,002	15,334
G_2	U_0	14,162	17,346	12,955	44,463	14,821
	U_1	24,422	23,468	22,226	70,116	23,372
	U_2	18,351	17,421	13,201	48,973	16,324
G_3	U_0	14,421	16,871	19,463	50,755	16,918
	U_1	28,578	23,468	21,578	73,624	24,541
	U_2	17,863	17,443	13,037	48,343	16,114
G_4	U_0	17,543	21,975	21,173	60,691	20,230
	U_1	12,021	16,342	13,755	42,118	14,039
	U_2	18,147	18,638	13,147	49,932	16,644

Sumber: Fajarwati, 2001

Keterangan:

G_0 : Glukosa 0%
G_1 : Glukosa 2%
G_2 : Glukosa 4%
G_3 : Glukosa 6%
G_4 : Glukosa 8%

U_0 : Urea 0%
U_1 : Urea 0,15%
U_3 : Urea 0,3%

Tabel. 06. Data kadar protein *C. utilis* (% b.k) menurut kombinasi G x U

Perlakuan	Urea (U)			Total Perlakuan	Rata-Rata
Glukosa (G)	U_0	U_1	U_2	Glukosa (G)	
G_0	34.007	40.403	39.121	113.531	12.615
G_1	48.113	64.114	46.002	158.229	17.581
G_2	44.463	70.116	48.973	163.552	18.172
G_3	50.755	73.624	48.343	172.722	19.191
G_4	60.691	42.118	49.932	152.741	16.971
Total Perlakuan U	238.029	290.375	232.371	760.775	
Rata-rata	15.869	19.358	15.491		16.906

Keterangan:

G_0 : Glukosa 0%
G_1 : Glukosa 2%
G_2 : Glukosa 4%
G_3 : Glukosa 6%
G_4 : Glukosa 8%

U_0 : Urea 0%
U_1 : Urea 0,15%
U_3 : Urea 0,3%

Lampiran 02. Hasil transformasi Arc.Sin √P dari persen kadar protein *C. utilis*.

Tabel 07. Data transformasi Arc.Sin √P dari persen kadar protein *C. utilis*.

Perlakuan		Kelompok			Total Perlakuan	Rata-rata
Glukosa (G)	Urea (U)	I	II	III		
G_0	U_0	18,548	20,246	20,191	58,985	19,662
	U_1	21,608	21,937	21,036	64,581	21,527
	U_2	20,427	21,120	21,937	63,484	21,161
G_1	U_0	21,331	22,662	26,592	70,584	23,528
	U_1	27,515	27,865	27,223	82,603	27,534
	U_2	23,601	24,217	21,259	69,077	23,026
G_2	U_0	22,106	24,613	21,096	67,815	22,605
	U_1	29,616	28,976	28,128	86,720	28,907
	U_2	25,365	24,670	21,305	71,339	23,780
G_3	U_0	22,318	24,252	26,178	72,748	24,249
	U_1	32,316	28,976	27,679	88,971	29,657
	U_2	25,002	24,686	21,166	70,854	23,618
G_4	U_0	24,762	27,955	27,396	80,113	26,704
	U_1	20,286	23,844	21,770	65,900	21,967
	U_2	25,214	25,577	21,259	72,049	24,016
Total Kelompok		360,013	371,595	354,216	1085,824	
Rata-rata Kelompok		24,001	24,77297	23,614		24,129

Keterangan:

G_0 : Glukosa 0%
G_1 : Glukosa 2%
G_2 : Glukosa 4%
G_3 : Glukosa 6%
G_4 : Glukosa 8%

U_0 : Urea 0%
U_1 : Urea 0,15%
U_3 : Urea 0,3%

Lampiran 03. Perhitungan analisis sidik ragam (Anova) kandungan protein *C. utilis* (% b.k)

1. Faktor Koreksi (FK) $= \frac{1085{,}824^2}{45} = 26200{,}283$

2. Jumlah Kuadrat Total (JKT) $= \left(18548^2 + 20{,}246^2 + ... + 21{,}259^2\right) - FK$

$= 440{,}591$

3. Jumlah Kuadrat Kelompok (JKK) $= \left(\frac{360{,}013^2 + 371{,}595^2 + 354{,}216^2}{15}\right) - FK$

$= 10{,}439$

4. Jumlah Kuadrat Perlakuan (JKP) $= \left(\frac{58{,}985^2 + ... + 72{,}049^2}{3}\right) - FK$

$= 384{,}390$

5. Jumlah Kuadrat Galat (JKG) = JKT - JKK - JKP

$= 440{,}591 - 10{,}439 - 384{,}390$

$= 81{,}762$

Tabel 08. Data transformasi Arc.Sin √P dari persen kadar protein *C. uitilis* (% b.k) menurut kombinasi G x U

Perlakuan	Urea (U)			Total Perlakuan	Rata-rata
Glukosa (G)	U_0	U_1	U_2	Glukosa (G)	
G_0	58,985	64,581	63,484	187,050	20,783
G_1	70,584	82,603	69,077	222,264	24,696
G_2	67,815	86,720	71,339	225,874	25,097
G_3	72,748	88,971	70,854	232,573	25,841
G_4	80,113	65,900	72,049	218,062	24,229
Total Perlakuan U	350,245	388,775	346,804	1085,824	
Rata-Rata	23,350	25,918	23,120		24,129

6. Jumlah Kuadrat Glukosa (JKGl) $= \left(\frac{187{,}050^2 + \ldots + 218{,}062^2}{9} \right) - FK$

$= 138{,}548$

7. Jumlah Kuadrat Ur ea (JKU) $= \left(\frac{350{,}245^2 + 388{,}775^2 + 346{,}804^2}{15} \right) - FK$

$= 72{,}399$

8. Jumlah Kuadrat Interaksi (JKI) = JKP-JKGl-JKU

$= 348{,}390 - 138{,}548 - 72{,}399$

$= 137{,}443$

Tabel 09. Anova kadar protein *C. uitilis* (% b.k)

Sumber Keragaman	Db	JK	KT	F Hitung	F tabel 5%	F tabel 1%
Kelompok	2	10,439	5,220	1,788	3,34	5,54
Perlakuan	14	348,390	24,885	8,522**	2,06	2,80
Glukosa (G)	4	138,548	34,637	11,862**	2,71	4,07
Urea (U)	2	72,399	36,200	12,397**	3,34	5,54
Interaksi	8	137,443	17,180	5,884**	2,29	3,23
Galat	28	81,762	2,920			
Total	44	440,591	10,013			

Lampiran 04. Uji Duncan pengaruh interaksi perlakuan terhadap kadar protein *C.utilis* (% b.k)

$D_{(p,5\%)} = R_{(DBG,p,5\%)} \times S_X$ Dimana $Sx = \sqrt{\frac{2,920}{3}} = 0,98$

Tabel 10. Nilai R pada DBG = 28 untuk wilayah 2,3,4…,15 adalah sebagai berikut:

	p	2	3	4	5	6	7	8	9	10	11	12	13	14	15
R(28,p,	5%	2.898	3.501	3.863	4.123	4.325	4.489	4.617	4.749	4.854	4.948	5.033	5.111	5.181	5.247
	1%	3.911	4.079	4.191	4.272	4.338	4.389	4.432	4.468	4.500	4.527	4.550	4.572	4.590	4.607
D(p,	5%	2.840	3.431	3.786	4.041	4.239	4.399	4.525	4.654	4.757	4.849	4.932	5.009	5.077	5.142
	1%	3.833	3.997	4.107	4.187	4.251	4.301	4.343	4.379	4.410	4.436	4.459	4.481	4.498	4.515

Tabel 11. Selisih rerata kadar protein *C.utilis* (% b.k) antar perlakuan

Perlakuan	Rerata	Selisih														
		G_3U_1	G_2U_1	G_1U_1	G_4U_0	G_3U_0	G_4U_2	G_2U_2	G_3U_2	G_1U_0	G_1U_2	G_2U_0	G_4U_1	G_0U_1	G_0U_2	G_0U_0
G_3U_1	29.657	–														
G_2U_1	28.907	0.750	–													
G_1U_1	27.534	2.123	1.373	–												
G_4U_0	26.704	2,953*	2.203	0.830	–											
G_3U_0	24.249	5,408**	4,658**	3.285	2.455	–										
G_4U_2	24.016	5,641**	4,891**	3.518	2.688	0.233	–									
G_2U_2	23.780	5,877**	5,127**	3.754	2.924	0.469	0.236	–								
G_3U_2	23.618	6,039**	5,289**	3,916*	3.086	0.631	0.398	0.162	–							
G_1U_0	23.528	6,129**	5,379**	4,006*	3.176	0.721	0.488	0.252	0.090	–						
G_1U_2	23.026	6,631**	5,881**	4,508**	3.678	1.223	0.990	0.754	0.592	0.502	–					
G_2U_0	22.605	7,052**	6,302**	4,929**	4,099*	1.644	1.411	1.175	1.013	0.923	0.421	–				
G_4U_1	21.967	7,690**	6,940**	5,567**	4,737**	2.282	2.049	1.813	1.651	1.561	1.059	0.638	–			
G_0U_1	21.527	8,130**	7,380**	6,007**	5,117**	2.722	2.489	2.253	2.091	2.001	1.499	1.078	0.440	–		
G_0U_2	21.161	8,496**	7,746**	6,373**	5,543**	3.088	2.855	2.619	2.457	2.367	1.865	1.444	0.806	0.366	–	
G_0U_0	19.662	9,995**	9,245**	7,872**	7,042**	4,587**	4,354**	4.118	3.956	3.866	3.364	2.943	2.305	1.865	1.499	–

Lampiran 05. Uji Duncan pengaruh glukosa dan urea terhadap kadar Protein *C. utilis* (% b.k)

1. Uji Duncan pengaruh glukosa terhadap kadar Protein *C. utilis* (% b.k)

$D_{(p,5\%)} = R_{(DBG,p,5\%)} \times S_X$ Dimana $Sx = \sqrt{\frac{2,920}{3 \times 3}} = 0,50$

Tabel 12. Nilai R pada DBG 28 untuk wilayah 2, 3,..., 5 adalah sebagai berikut:

	p	2	3	4	5
R(28,	5%	2.898	3.501	3.863	4.123
	1%	3.911	4.079	4.191	4.272
D	5%	1.449	1.751	1.932	2.062
	1%	1.956	2.040	2.096	2.136

Tabel 13. Selisih rerata kadar protein *C.utilis* (% b.k) antar perlakuan dengan pengaruh glukosa

Glukosa	Rerata	Selisih				
		G_3	G_2	G_1	G_4	G_0
G_3	25.841	_				
G_2	25.097	0.744	_			
G_1	24.696	1.145	0.401	_		
G_4	24.229	1,612*	0.868	0.467	_	
G_0	20.783	5,058**	4,314**	3,913**	3,446**	_

2. Uji Duncan pengaruh urea terhadap kadar Protein *C. utilis* (% b.k)

$D_{(p,5\%)} = R_{(DBG,p,5\%)} \times S_X$ Dimana $Sx = \sqrt{\frac{2,920}{3 \times 5}} = 0,44$

Tabel 14. Nilai R pada BDG 28 untuk wilayah 2, 3 adalah sebagai berikut:

	p	2	3
R(28,	5%	2.898	3.501
	1%	3.911	4.079
D	5%	1.275	1.540
	1%	1.721	1.795

Tabel 15. Selisih rerata kadar protein *C.utilis* (% b.k) antar perlakuan dengan pengaruh urea

Urea	Rerata	Selisih		
		U_1	U_0	U_2
U_1	25.918	_		
U_0	23.350	2,568**	_	
U_2	23.120	2,796**	0.230	_

Lampiran 06. Hasil pengukuran biomassa protein *C. uitilis* (g/l)

Tabel 16. Data pengukuran biomassa *C. uitilis* (g/l) yang diukur berdasarkan berat kering sel

Perlakuan		Kelompok			Total Perlakuan	Rata-rata
Glukosa (G)	Urea (U)	I	II	III		
G_0	U_0	3,951	9,877	5,926	19,754	6,585
	U_1	9,877	19,800	7,000	36,677	12,226
	U_2	6,420	8,644	10,000	25,064	8,355
G_1	U_0	9,877	12,840	23,944	46,661	15,554
	U_1	29,136	30,123	25,278	84,537	28,179
	U_2	13,827	14,822	9,333	37,982	12,661
G_2	U_0	11,358	18,272	7,500	37,130	12,377
	U_1	36,533	35,556	33,222	105,311	35,104
	U_2	21,235	18,267	9,278	48,780	16,260
G_3	U_0	11,852	17,778	23,000	52,630	17,543
	U_1	46,911	35,556	29,222	111,689	37,230
	U_2	19,753	18,422	9,056	47,231	15,744
G_4	U_0	17,284	30,617	29,000	76,901	25,634
	U_1	6,914	14,400	10,289	31,603	10,534
	U_2	20,741	22,844	9,389	52,974	17,658
Jumlah Kelompok		265,669	307,818	241,437	814,924	18,109

Sumber: Fajarwati, 2001

Keterangan:

G_0 : Glukosa 0%
G_1 : Glukosa 2%
G_2 : Glukosa 4%
G_3 : Glukosa 6%
G_4 : Glukosa 8%
U_0 : Urea 0%
U_1 : Urea 0,15%
U_3 : Urea 0,3%

Lampiran 07. Perhitungan analisis sidik ragam (Anova) biomassa *C. utilis* (g/l)

1. Faktor Koreksi (FK) $= \frac{814{,}924^2}{45}$

$= 14757{,}803$

2. Jumlah Kuadrat Total (JKT) $= (3{,}951^2 + 9{,}877^2 + \ldots + 9{,}389^2) - FK$

$= 4560{,}649$

3. Jumlah Kuadrat Kelompok (JKK) $= \left(\frac{265{,}669^2 + 307{,}818^2 + 241{,}437^2}{15} \right) - FK$

$= 100{,}170$

4. Jumlah Kuadrat Perlakuan (JKP) $= \left(\frac{19{,}754^2 + \ldots.. + 52{,}974^2}{3} \right) - FK$

$= 3700{,}114$

5. Jumlah Kuadrat Galat (JKG) = JKT – JKK – JKP

$= 4560{,}649 - 100{,}170 - 3700{,}114$

$= 760{,}365$

Tabel 17. Data biomassa *C. utilis* (g/l) menurut kombinasi G x U

Perlakuan Glukosa (G)	Faktor Urea (U)			Total Perlakuan Glukosa (G)	Rata-Rata
	U_0	U_1	U_2		
G_0	19,754	36,677	25,064	81,495	9,055
G_1	46,661	84,537	37,982	169,180	18,798
G_2	37,130	105,311	48,780	191,221	21,247
G_3	52,630	111,689	47,231	211,550	23,506
G_4	76,901	31,603	52,974	161,478	17,942
Total Perlakuan U	233,076	369,817	212,031	814,924	
Rata-Rata	15,538	24,654	14,135		18,109

6. Jumlah Kuadrat Glukosa (JKGl) $= \left(\frac{81{,}495^2 + \ldots.. + 161{,}478^2}{9} \right) - FK$

$= 1358{,}947$

7. Jumlah Kuadrat Urea (JKU) $= \left(\frac{233{,}076^2 + 369{,}817^2 + 212{,}031^2}{15} \right) - FK$

$= 978{,}609$

8. Jumlah Kuadrat Interaksi (JKI) = JKP – JKGl – JKU

$= 3700{,}114 - 1358{,}947 - 978{,}609$

$= 1362{,}558$

Tabel 18. Anova biomassa *C. uitilis* (g/l)

Sumber Keragaman	Db	JK	KT	F Hitung	F tabel 5%	F tabel 1%
Kelompok	2	100,170	50,085	1,844	3,34	5,54
Perlakuan	14	3700,114	264,294	9,732**	2,06	2,80
Glukosa (G)	4	1358,947	339,737	12,511**	2,71	4,07
Urea (U)	2	978,609	489,305	18,018**	3,34	5,54
Interaksi	8	1362,558	170,320	6,272**	2,29	3,23
Galat	28	760,365	27,156			
Total	44	4560,649	103,651			

Lampiran 08. Uji Duncan pengaruh interaksi perlakuan terhadap biomassa *C.utilis* (g/l)

$D_{(p,5\%)} = R_{(DBG,p,5\%)} \times S_X$ Dimana $Sx = \sqrt{\frac{27,156}{3}} = 3,00$

Tabel 19. Nilai R pada DBG = 28 untuk wilayah 2,3,4…,15 adalah sebagai berikut

	p	2	3	4	5	6	7	8	9	10	11	12	13	14	15
R(28,p,	5%	2.898	3.501	3.863	4.123	4.325	4.489	4.617	4.749	4.854	4.948	5.033	5.111	5.181	5.247
	1%	3.911	4.079	4.191	4.272	4.338	4.389	4.432	4.468	4.500	4.527	4.550	4.572	4.590	4.607
D(p,	5%	8.694	10.503	11.589	12.369	12.975	13.467	13.851	14.247	14.562	14.844	15.099	15.333	15.543	15.741
	1%	11.733	12.237	12.573	12.816	13.014	13.167	13.296	13.404	13.500	13.581	13.650	13.716	13.770	13.821

Tabel 20. Selisih rerata biomassa *C.utilis* (g/l) antar perlakuan

Perlakuan	Rerata	Selisih														
		G_3U_1	G_2U_1	G_1U_1	G_4U_0	G_4U_2	G_3U_0	G_2U_2	G_3U_2	G_1U_0	G_1U_2	G_2U_0	G_0U_1	G_4U_1	G_0U_2	G_0U_0
G_3U_1	37.23	_														
G_2U_1	35.10	2.13	_													
G_1U_1	28.18	9,05**	6.92	_												
G_4U_0	25.63	11,60**	9.47	2.55	_											
G_4U_2	17.66	19,57**	17,44**	10.52	7.97	_										
G_3U_0	17.54	19,69**	17,56**	10.64	8.09	0.12	_									
G_2U_2	16.26	20,97**	18,84**	11,92*	9.37	1.40	1.28	_								
G_3U_2	15.74	21,49**	19,36**	12,44*	9.89	1.92	1.80	0.52	_							
G_1U_0	15.55	21,68**	19,55**	12,63*	10.08	2.11	1.99	0.71	0.19	_						
G_4U_1	14.83	22,40**	20,27**	13,35**	10.80	2.83	2.71	1.43	0.91	0.72	_					
G_1U_2	12.66	24,57**	22,44**	15,52**	12,97**	5.00	4.88	3.60	3.08	2.89	2.17	_				
G_2U_0	12.38	24,85**	22,72**	15,80**	13,25**	5.28	5.16	3.88	3.36	3.17	2.45	0.28	_			
G_0U_2	8.36	28,88*	26,75**	19,83**	17,28**	9.31	9.19	7.91	7.39	7.20	6.48	4.31	4.03	_		
G_0U_1	7.93	29,30**	27,17**	20,25**	17,70**	9.73	9.61	8.33	7.81	7.62	6.90	4.73	4.45	0.43	_	
G_0U_0	6.59	30,65**	28,52**	21,60**	19,05**	11.08	10.96	9.68	9.16	8.97	8.25	6.08	5.80	1.78	1.35	_

Lampiran 09. Uji Duncan pengaruh glukosa dan urea terhadap biomassa *C. utilis* (g/l)

1. Uji Duncan pengaruh glukosa terhadap biomassa *C. utilis* (g/l)

$D_{(p,5\%)} = R_{(DBG,p,5\%)} \times S_X$ Dimana $Sx = \sqrt{\frac{27,156}{3 \times 3}} = 1,73$

Tabel 21. Nilai R pada DBG = 28 untuk wilayah 2, 3, 4, 5 adalah sebagai berikut

	p	2	3	4	5
R(28,	5%	2.898	3.501	3.863	4.123
	1%	3.911	4.079	4.191	4.272
D	5%	5.014	6.057	6.683	7.133
	1%	6.766	7.057	7.250	7.391

Tabel 22. Selisih rerata biomassa *C.utilis* (g/l) antar perlakuan dengan pengaruh glukosa

Glukosa	Rerata	Selisih				
		G_3	G_2	G_4	G_1	G_0
G_3	23.51	_				
G_2	21.25	2.26	_			
G_4	19.38	4.13	1.87	_		
G_1	18.80	4.71	2.45	0.58	_	
G_0	9.06	14,46**	12,20**	10,33**	9,74**	_

2. Uji Duncan pengaruh urea terhadap biomassa *C. utilis* (g/l)

$D_{(p,5\%)} = R_{(DBG,p,5\%)} \times S_X$ Dimana $Sx = \sqrt{\frac{27,156}{3 \times 5}} = 1,34$

Tabel 23. Nilai R pada DBG = 28 untuk wilayah 2, 3 adalah sebagai berikut:

	p	2	3
R(28,	5%	2.898	3.501
	1%	3.911	4.079
D	5%	3.883	4.691
	1%	5.241	5.466

Tabel 24. Selisih rerata biomassa *C.utilis* (g/l) antar perlakuan dengan pengaruh urea

Urea	Rerata	Selisih		
		U_1	U_0	U_2
U_1	24.65	_		
U_0	15.54	9,11**	_	
U_2	14.14	10,52**	1.40	_

Lampiran 10. Hasil analisis molase

Tabel 25. Hasil analisis beberapa komponen/kandungan molase dari PG/PS Madukismo Yogyakarta tahun produksi 2000 dan 2001

Jenis Analisis Komponen/Kandungan		Tahun produksi 2000	Tahun produksi 2001
Berat jenis		1,4540	1,4705
Brix		86,94	89,36
% Polarisasi		35,44	27,15
Berat kering (b.k)	%	84,5	86,3
Sukrosa	% b.k	32,6	34,2
Gula invert	% b.k	20,8	24,0
Bahan organik lain	% b.k	17	19,6
Nitrogen	% b.k	1,6	1,5
Phosphor (P_2O_3)	% b.k	0,4 - 2,0	0,6 - 2,0
Kalsium (CaO)	% b.k	0,1 - 0,5	0,5 - 1,1
Abu	% b.k	7,0 - 11,0	8,0 - 13,0