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Lampiran 1. Data Statistik Selulosa

Perlakuan	Blok		Jumlah	Rata-rata
	I	II		
	B1 (50°C)			
A1 (30 Menit)	55,77	56,07	111,84	55,92
A2 (1 Jam)	56,69	56,53	113,21	56,61
A3 (2 Jam)	59,49	59,34	118,84	59,42
	B2 (60°C)			
A1 (30 Menit)	55,73	55,77	111,49	55,75
A2 (1 Jam)	56,65	56,39	113,04	56,52
A3 (2 Jam)	56,50	56,32	112,82	56,41
	B3 (70°C)			
A1 (30 Menit)	55,80	55,44	111,238	55,62
A2 (1 Jam)	58,75	58,14	116,882	58,44
A3 (2 Jam)	56,15	56,12	112,27	56,14
Jumlah	511,53	510,12	1021,64	510,82
Rata-rata umum	56,83	56,68	113,51	56,75

$$\begin{aligned}
 GT &= x_a + x_b + x_c + \dots + x_n \\
 &= 55,77 + 56,07 + 56,69 + \dots + 56,12 \\
 &= 1021,6377
 \end{aligned}$$

$$\begin{aligned}
 GT^2 &= 1021,6377^2 \\
 &= 1043743,59
 \end{aligned}$$

$$\begin{aligned}
 FK &= \frac{GT^2}{r.a.b} \\
 &= \frac{1043743,59}{2 \times 3 \times 3} \\
 &= 57985,755
 \end{aligned}$$

$$\begin{aligned}
 JK \text{ Tot} &= (x_a^2 + x_b^2 + x_c^2 + \dots + x_n^2) - FK \\
 &= (55,77^2 + 56,07^2 + 56,69^2 + \dots + 56,12^2) - 57985,755 \\
 &= 27,4077
 \end{aligned}$$

$$\begin{aligned}
 JK \text{ Blok} &= \left(\frac{\sum j b_1^2 + \sum j b_2^2}{r} \right) - FK \\
 &= \left(\frac{521872,80}{9} \right) - 57985,755 \\
 &= 0,11178
 \end{aligned}$$

Tabel AxB				Rata-rata
	B1	B2	B3	
A1	55,92	55,75	55,62	55,76
A2	56,61	56,52	58,44	57,19
A3	59,42	56,41	56,14	57,32
Rerata	57,31	56,23	56,73	

$$\begin{aligned}
 \text{JK Perlakuan} &= \left(\frac{A_1 B_1^2 + A_2 B_2^2 + \dots + A_n B_n^2}{r} \right) - \text{FK} \\
 &= \left(\frac{116025,5880}{2} \right) - 57985,755 \\
 &= 27,039
 \end{aligned}$$

$$\begin{aligned}
 \text{JK A} &= \left(\frac{\sum A_1^2 + \sum A_2^2 + \dots + \sum A_n^2}{r.b} \right) - \text{FK} \\
 &= \left(\frac{347968,3915}{2 \times 3} \right) - 57985,755 \\
 &= 8,9769
 \end{aligned}$$

$$\begin{aligned}
 \text{JK B} &= \left(\frac{\sum B_1^2 + \sum B_2^2 + \dots + \sum B_n^2}{r.b} \right) - \text{FK} \\
 &= \left(\frac{347935,9014}{2 \times 3} \right) - 57985,755 \\
 &= 3,5619
 \end{aligned}$$

$$\begin{aligned}
 \text{JK AxB} &= \text{JK perlakuan} - \text{JK A} - \text{JK B} \\
 &= 27,039 - 8,9769 - 3,5619 \\
 &= 14,5002
 \end{aligned}$$

$$\begin{aligned}
 \text{JK Error} &= \text{JK tot} - \text{JK Blok} - \text{JK Perlakuan} \\
 &= 27,4077 - 27,039 - 0,11178 \\
 &= 0,25692
 \end{aligned}$$

Tabel ANAKA

No	Sumber Keragaman	Db	Jk	Rk	Fh	Ft	
						5%	1%
1	Perlakuan						
	A	2	8,9769	4,4885	139,7833*	4,46	8,56
	B	2	3,5619	1,7809	55,4639*	4,46	8,56
2	AxB	4	14,50002	3,6250	112,8944*	3,84	7,01
3	Blok	1	0,1118	0,1118			
4	Error	8	0,2569	0,0321			
Total		17	27,4077	10,0383			

$$db\ A = (tA - 1) = 3 - 1 = 2$$

$$db\ B = (tB - 1) = 3 - 1 = 2$$

$$db\ AxB = (tA - 1) (tB - 1) = (3 - 1) (3 - 1) = 4$$

$$db\ Blok = (r - 1) = (2 - 1) = 1$$

$$db\ Error = (r - 1) ((a \cdot b) - 1) = (2 - 1) ((3 \times 3) - 1) = 8$$

$$RK = \frac{JK}{db}$$

$$RK\ A = \frac{141,0216}{2} = 70,5108$$

$$RK\ B = \frac{85,69043}{2} = 42,8452$$

$$RK\ AxB = \frac{109,2014}{4} = 27,3004$$

$$RK\ Blok = \frac{358,74}{1} = 358,74$$

$$RK\ Error = \frac{96,34502}{8} = 12,0431$$

$$F\ Hit = \frac{RK}{RK\ Error}$$

$$F\ Hit\ A = \frac{70,5108}{12,0431} = 5,854858$$

$$F\ Hit\ B = \frac{42,8452}{12,0431} = 3,57648$$

$$F\ Hit\ AxB = \frac{27,3004}{12,0431} = 2,266882$$

UJI DUNCAN

Faktor A

$$A = \frac{\text{jumlah perlakuan } B}{r \times t_b}$$

$$A1 = 55,76$$

$$A2 = 57,19$$

$$A3 = 57,32$$

$$\text{Peringkat} = A3, A2, A1$$

$$Sd = \sqrt{\frac{2 \times RKE}{r \times t_b}} = \sqrt{\frac{2 \times 0,0321}{2 \times 3}} = 0,1034$$

	P	Rp	JBD = (rp x SD) √2
A1			
A2	2	3,26	0,239
A3	3	3,39	0,248

Perhitungan

$$A3 - A2 = 57,32 - 57,19 = 0,13 < \text{JBD}$$

$$A3 - A1 = 57,32 - 55,76 = 1,56 > \text{JBD}$$

$$A2 - A1 = 57,19 - 55,76 = 1,43 > \text{JBD}$$

Keterangan : jika selisih menunjukkan hasil lebih kecil dari JBD maka perlakuan tidak berbeda nyata, sedangkan jika selisih menunjukkan hasil yang lebih besar dari JBD maka berbeda nyata antar perlakuan.

Analisis Uji Jarak Berganda Duncan

Tabel A X B	B1	B2	B3	Rerata
A1	55,92	55,75	55,62	55,76
A2	56,61	56,52	58,44	57,19
A3	59,42	56,41	56,14	57,32
Rerata	57,31	56,23	56,73	

a

a

bc

Keterangan : rerata yang diikuti huruf yang sama menunjukkan tidak ada pengaruh nyata dengan uji Duncan jenjang 5%.

Lampiran 2. Data Statistik Hemiselulosa

Perlakuan	Blok		Jumlah	Rata-rata
	I	II		
	B1(50°C)			
A1(30 Menit)	17,03	17,10	34,12	17,06
A2(1 Jam)	15,73	15,47	31,20	15,60
A3(2 Jam)	16,77	16,91	33,67	16,84
	B2(60°C)			
A1(30 Menit)	19,14	19,19	38,32	19,16
A2(1 Jam)	18,64	18,40	37,04	18,52
A3(2 Jam)	17,84	17,59	35,43	17,71
	B3(70°C)			
A1(30 Menit)	18,3207	18,40	36,82	18,41
A2(1 Jam)	20,55795	16,60	33,27	16,64
A3(2 Jam)	23,3837	17,10	34,22	17,11
Jumlah	157,37	156,76	314,11	157,05
Rata-rata umum	17,48	17,41	34,90	17,45

$$\begin{aligned}
 GT &= x_a + x_b + x_c + \dots + x_n \\
 &= 17,03 + 17,10 + 15,73 + \dots + 17,10 \\
 &= 314,11
 \end{aligned}$$

$$\begin{aligned}
 GT^2 &= 314,11^2 \\
 &= 98665,0921
 \end{aligned}$$

$$\begin{aligned}
 FK &= \frac{GT^2}{r.a.b} \\
 &= \frac{98665,0921}{2 \times 3 \times 3} \\
 &= 5481,394
 \end{aligned}$$

$$\begin{aligned}
 JK \text{ Tot} &= (x_a^2 + x_b^2 + x_c^2 + \dots + x_n^2) - FK \\
 &= (5501,0976) - 5481,394 \\
 &= 19703,606
 \end{aligned}$$

$$JK \text{ Blok} = \left(\frac{\sum j b_1^2 + \sum j b_2^2}{r} \right) - FK$$

$$= \left(\frac{49332,73}{9} \right) - 5481,394$$

$$= 0,02044$$

Tabel AxB				Rata-rata
	B1	B2	B3	
A1	17,06	19,16	18,41	18,21
A2	15,60	18,52	16,64	16,92
A3	16,84	17,71	17,11	17,22
Rerata	16,50	18,47	17,39	

$$\text{JK Perlakuan} = \left(\frac{A_1 B_1^2 + A_2 B_2^2 + \dots + A_n B_n^2}{r} \right) - \text{FK}$$

$$= \left(\frac{11001,9686}{2} \right) - 5481,394$$

$$= 19,5903$$

$$\text{JK A} = \left(\frac{\sum A_1^2 + \sum A_2^2 + \dots + \sum A_n^2}{r.b} \right) - \text{FK}$$

$$= \left(\frac{32921,2733}{2 \times 3} \right) - 5481,391$$

$$= 5,48488$$

$$\text{JK B} = \left(\frac{\sum B_1^2 + \sum B_2^2 + \dots + \sum B_n^2}{r.b} \right) - \text{FK}$$

$$= \left(\frac{32958,1521}{2 \times 3} \right) - 5481,391$$

$$= 11,63135$$

$$\text{JK AxB} = \text{JK perlakuan} - \text{JK A} - \text{JK B}$$

$$= 19,5903 - 5,4848 - 11,63135$$

$$= 2,47415$$

$$\text{JK Error} = \text{JK tot} - \text{JK Blok} - \text{JK Perlakuan}$$

$$= 19,703606 - 19,5903 - 0,02044$$

$$= 0,092866$$

Tabel ANAKA

No	Sumber Keragaman	db	Jk	rk	Fh	Ft	
						5%	1%
1	Perlakuan						
	A	2	5,4849	2,7424	237,2278*	4,46	8,65
	B	2	11,6314	5,8157	503,0703*	4,46	8,65
2	AxB	4	2,4741	0,6185	53,5036*	3,84	7,01
3	Blok	1	0,0208	0,0208			
4	Error	8	0,0925	0,0116			
Total		17	19,7036	9,2090			

$$\text{db A} = (tA - 1) = 3 - 1 = 2$$

$$\text{db B} = (tB - 1) = 3 - 1 = 2$$

$$\text{db AxB} = (tA - 1)(tB - 1) = (3 - 1)(3 - 1) = 4$$

$$\text{db Blok} = (r - 1) = (2 - 1) = 1$$

$$\text{db Error} = (r - 1)((a \cdot b) - 1) = (2 - 1)((3 \times 3) - 1) = 8$$

$$RK = \frac{JK}{db}$$

$$RK A = \frac{112,91977384}{2} = 6,459887$$

$$RK B = \frac{50,58641348}{2} = 25,29321$$

$$RK AxB = \frac{19,77028583}{4} = 4,942571$$

$$RK \text{ Blok} = \frac{0,178901681}{1} = 0,178902$$

$$RK \text{ Error} = \frac{30,37453221}{8} = 3,796817$$

$$F \text{ Hit} = \frac{RK}{RK \text{ Error}}$$

$$F \text{ Hit A} = \frac{6,459887}{3,796817} = 1,701395597$$

$$F \text{ Hit B} = \frac{25,29321}{3,796817} = 6,661687908$$

$$F \text{ Hit AxB} = \frac{4,942571}{3,796817} = 1,301767263$$

UJI DUNCAN

Faktor A

$$A = \frac{\text{jumlah perlakuan B}}{r \times t_b}$$

$$A1 = 18,21$$

$$A2 = 16,92$$

$$A3 = 17,22$$

$$\text{Peringkat} = A1, A3, A2$$

$$Sd = \sqrt{\frac{2 \times RKE}{r \times t_b}} = \sqrt{\frac{2 \times 0,0116}{2 \times 3}} = 0,0616$$

	P	Rp	JBD = (rp x SD) √2
B3			
B1	2	3,26	0,1424
B2	3	3,39	0,1481

Perhitungan

$$A1 - A3 = 18,21 - 17,22 = 0,99 > \text{JBD}$$

$$A1 - A2 = 18,21 - 16,92 = 1,29 > \text{JBD}$$

$$A3 - A2 = 17,22 - 16,92 = 0,3 > \text{JBD}$$

Keterangan : jika selisih menunjukkan hasil lebih kecil dari JBD maka perlakuan tidak berbeda nyata, sedangkan jika selisih menunjukkan hasil yang lebih besar dari JBD maka berbeda nyata antar perlakuan.

Analisis Uji Jarak Berganda Duncan

Tabel A x B	B1	B2	B3	Rerata	
A1	17,06	19,16	18,41	18,21	Ac
A2	15,60	18,52	16,64	16,92	B
A3	16,84	17,71	17,11	17,22	A
rerata	16,50	18,47	17,39		

Keterangan : rerata yang diikuti huruf yang sama menunjukkan tidak ada pengaruh nyata dengan uji Duncan jenjang 5%.

Lampiran 3. Data Statistik Lignin

Perlakuan	Blok		Jumlah	Rata-rata
	I	II		
	B1(50°C)			
A1(30 Menit)	14,24	14,50	28,74	14,37
A2(1 Jam)	17,32	17,57	34,89	17,45
A3(2 Jam)	18,35	18,17	36,52	18,26
	B2(60°C)			
A1(30 Menit)	16,77	16,34	33,11	16,56
A2(1 Jam)	15,19	15,30	30,49	15,25
A3(2 Jam)	19,64	19,78	39,42	19,71
	B3(70°)			
A1(30 Menit)	16,93	16,72	33,65	16,83
A2(1 Jam)	17,05	17,16	34,21	17,11
A3(2 Jam)	18,42	18,49	36,91	18,46
Jumlah	153,91	154,03	307,94	154
Rata-rata umum	17,10	17,11	34,21	17,11

$$\begin{aligned}
 GT &= x_a + x_b + x_c + \dots + x_n \\
 &= 14,24 + 14,50 + 17,32 + \dots + 18,49 \\
 &= 308,03
 \end{aligned}$$

$$\begin{aligned}
 GT^2 &= 308,03^2 \\
 &= 94882,48
 \end{aligned}$$

$$\begin{aligned}
 FK &= \frac{GT^2}{r.a.b} \\
 &= \frac{94882,48}{2 \times 3 \times 3} \\
 &= 5271,24894
 \end{aligned}$$

$$\begin{aligned}
 JK \text{ Tot} &= (x_a^2 + x_b^2 + x_c^2 + \dots + x_n^2) - FK \\
 &= (5314,2249) - 5271,24894 \\
 &= 42,97596
 \end{aligned}$$

$$JK \text{ Blok} = \left(\frac{\sum j b_1^2 + \sum j b_2^2}{r} \right) - FK$$

$$= \left(\frac{47441,25}{9} \right) - 5271,24894$$

$$= 0,00106$$

Tabel AxB				Rata-rata
	B1	B2	B3	
A1	14,37	16,56	16,83	15,92
A2	17,45	15,25	17,11	16,60
A3	18,26	19,71	18,46	18,81
Rerata	16,69	17,17	17,46	

$$\text{JK Perlakuan} = \left(\frac{A_1 B_1^2 + A_2 B_2^2 + \dots + A_n B_n^2}{r} \right) - \text{FK}$$

$$= \left(\frac{10628,0069}{2} \right) - 5271,24894$$

$$= 42,75451$$

$$\text{JK A} = \left(\frac{\sum A_1^2 + \sum A_2^2 + \dots + \sum A_n^2}{r.b} \right) - \text{FK}$$

$$= \left(\frac{31792,0840}{2 \times 3} \right) - 5271,24894$$

$$= 27,43173$$

$$\text{JK B} = \left(\frac{\sum B_1^2 + \sum B_2^2 + \dots + \sum B_n^2}{r.b} \right) - \text{FK}$$

$$= \left(\frac{31638,3863}{2 \times 3} \right) - 5271,24894$$

$$= 1,81544$$

$$\text{JK AxB} = \text{JK perlakuan} - \text{JK A} - \text{JK B}$$

$$= 42,75451 - 27,43173 - 1,81544$$

$$= 13,50734$$

$$\text{JK Error} = \text{JK tot} - \text{JK Blok} - \text{JK Perlakuan}$$

$$= 42,97596 - 42,75451 - 0,00106$$

$$= 0,22033$$

Tabel ANAKA

No	Sumber Keragaman	db	jk	rk	Fh	Ft	
						5%	1%
1	Perlakuan						
	A	2	27,4210	13,7105	500,1552*	4,46	8,65
	B	2	1,8135	0,9068	33,0788*	4,46	8,65
2	AxB	4	13,5231	3,3808	123,3293*	3,84	7,01
3	Blok	1	0,0008	0,0008			
4	Error	8	0,2193	0,0274			
Total		17	42,9777	18,0263			

$$db\ A = (tA - 1) = 3 - 1 = 2$$

$$db\ B = (tB - 1) = 3 - 1 = 2$$

$$db\ AxB = (tA - 1)(tB - 1) = (3 - 1)(3 - 1) = 4$$

$$db\ Blok = (r - 1) = (2 - 1) = 1$$

$$db\ Error = (r - 1)((a \cdot b) - 1) = (2 - 1)((3 \times 3) - 1) = 8$$

$$RK = \frac{JK}{db}$$

$$RK\ A = \frac{6,954711}{2} = 3,477355$$

$$RK\ B = \frac{0,139283}{2} = 0,069641$$

$$RK\ AxB = \frac{53,34695}{4} = 13,33674$$

$$RK\ Blok = \frac{0,167138}{1} = 0,167138$$

$$RK\ Error = \frac{78,31943}{8} = 9,789928$$

$$F\ Hit = \frac{RK}{RK\ Error}$$

$$F\ Hit\ A = \frac{3,477355}{9,789928} = 0,355197$$

$$F\ Hit\ B = \frac{0,069641}{9,789928} = 0,007113$$

$$F\ Hit\ AxB = \frac{13,33674}{9,789928} = 1,362291$$

UJI DUNCAN

Faktor A

$$A = \frac{\text{jumlah perlakuan } B}{r \times t_b}$$

$$A1 = 15,92$$

$$A2 = 16,61$$

$$A3 = 18,81$$

$$\text{Peringkat} = A3, A2, A1$$

$$Sd = \sqrt{\frac{2 \times RKE}{r \times t_b}} = \sqrt{\frac{2 \times 0,0275}{2 \times 3}} = 0,95$$

	P	Rp	JBD = (rp x SD) √2
A1			
A2	2	3,26	2,20
A3	3	3,39	2,28

Perhitungan

$$A3 - A2 = 18,81 - 16,61 = 2,2 > \text{JBD}$$

$$A3 - A1 = 18,81 - 15,92 = 2,89 > \text{JBD}$$

$$A2 - A1 = 16,61 - 15,92 = 0,69 < \text{JBD}$$

Keterangan : jika selisih menunjukkan hasil lebih kecil dari JBD maka perlakuan tidak berbeda nyata, sedangkan jika selisih menunjukkan hasil yang lebih besar dari JBD maka berbeda nyata antar perlakuan.

Analisis Uji Jarak Berganda Duncan

Tabel A X B	B1	B2	B3	Rerata
A1	14,37	16,56	16,83	15,92
A2	17,45	15,25	17,11	16,60
A3	18,26	19,71	18,46	18,81
Rerata	16,69	17,17	17,46	

a

a

bc

Keterangan : rerata yang diikuti huruf yang sama menunjukkan tidak ada pengaruh nyata dengan uji Duncan jenjang 5%.

Lampiran 4. Foto Kegiatan



Pencucian TKS



Pengeringan TKS



Pengecilan Ukuran



Proses *Bleaching*



Penimbangan Sampel



Pengenceran H_2O_2



Pengecekan Suhu



Pengovenan



Hasil *Bleaching* TKS