

# LAMPIRAN-LAMPIRAN



Lampiran 01. Berat kering sel (g/L) *R. mucilaginosus* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi 200 rpm dan penambahan magnesium sulfat yang berbeda

Perlakuan	Ulangan	Waktu inkubasi											
		Jam 0	Jam 12	Jam 24	Jam 36	Jam 48	Jam 60	Jam 72	Jam 84	Jam 96	Jam 108	Jam 120	
M <sub>0</sub>	1	0,70	3,60	6,80	4,90	6,10	4,10	6,50	6,50	6,20	7,00	5,80	
	2	0,40	3,50	7,10	4,00	6,70	5,40	5,60	7,70	7,00	7,70	6,30	
	3	0,60	4,10	6,40	5,90	6,20	5,30	6,60	7,10	6,30	7,00	6,40	
	rata-rata	0,57	3,73	6,77	4,93	6,33	4,93	6,23	7,10	6,50	7,23	6,17	
M <sub>1</sub>	1	1,10	6,00	5,30	6,70	6,90	6,90	6,70	6,50	8,40	7,80	7,60	
	2	0,80	5,80	6,70	6,90	6,50	7,80	6,70	7,80	7,30	8,80	7,60	
	3	0,90	5,90	6,30	6,50	6,10	7,50	6,60	7,40	6,80	7,50	6,80	
	rata-rata	0,93	5,90	6,10	6,70	6,50	7,40	6,67	7,23	7,50	8,03	7,33	
M <sub>2</sub>	1	0,60	4,40	6,70	6,20	5,40	6,50	7,20	6,90	7,20	7,00	7,90	
	2	0,70	5,60	4,50	5,20	5,50	6,40	6,20	7,70	7,90	8,20	7,00	
	3	0,50	5,20	5,90	8,70	6,00	8,30	7,40	7,60	6,90	8,20	7,80	
	rata-rata	0,60	5,07	5,70	6,70	5,63	7,07	6,93	7,40	7,33	7,80	7,57	
M <sub>3</sub>	1	0,40	4,60	4,90	5,90	6,30	6,90	6,20	7,80	7,60	7,40	7,20	
	2	0,50	3,50	4,00	7,70	7,90	6,00	6,20	7,20	7,60	7,30	7,20	
	3	0,60	5,70	5,90	6,20	7,10	7,30	6,10	7,90	7,30	8,00	6,90	
	rata-rata	0,50	4,60	4,93	6,60	7,10	6,73	6,17	7,63	7,50	7,57	7,10	

Lampiran 02. Berat kering sel (g/L) *R. mucilaginosus* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi 250 rpm dan penambahan magnesium sulfat yang berbeda

Perlakuan	Ulangan	Waktu inkubasi											
		Jam 0	Jam 12	Jam 24	Jam 36	Jam 48	Jam 60	Jam 72	Jam 84	Jam 96	Jam 108	Jam 120	
M <sub>0</sub>	1	0,40	2,30	3,50	5,00	5,30	5,10	5,70	5,10	5,20	5,60	3,90	
	2	0,50	2,10	3,90	4,60	4,50	5,30	6,20	4,80	5,30	5,40	4,00	
	3	0,60	3,00	4,40	5,90	5,10	4,80	5,50	5,20	5,60	6,50	4,50	
	rata-rata	<b>0,50</b>	<b>2,47</b>	<b>3,93</b>	<b>5,17</b>	<b>4,97</b>	<b>5,07</b>	<b>5,80</b>	<b>5,03</b>	<b>5,37</b>	<b>5,83</b>	<b>4,13</b>	
M <sub>1</sub>	1	0,90	3,70	5,20	5,90	6,90	6,00	7,60	6,60	7,80	7,20	6,90	
	2	1,00	4,10	5,10	6,00	5,80	5,20	7,30	6,40	6,60	8,00	6,70	
	3	0,80	4,30	4,50	5,10	5,30	6,10	6,30	7,40	7,40	7,70	5,30	
	rata-rata	<b>0,90</b>	<b>4,03</b>	<b>4,93</b>	<b>5,67</b>	<b>6,00</b>	<b>5,77</b>	<b>7,07</b>	<b>6,80</b>	<b>7,27</b>	<b>7,63</b>	<b>6,30</b>	
M <sub>2</sub>	1	0,60	3,30	5,10	4,30	6,30	5,70	6,60	7,00	6,40	7,40	6,50	
	2	0,40	3,10	4,40	4,50	6,00	4,80	6,50	6,70	5,30	5,10	6,10	
	3	0,70	3,70	5,50	5,00	5,70	6,10	7,00	6,20	6,40	7,70	7,60	
	rata-rata	<b>0,57</b>	<b>3,37</b>	<b>5,00</b>	<b>4,60</b>	<b>6,00</b>	<b>5,53</b>	<b>6,70</b>	<b>6,63</b>	<b>6,03</b>	<b>6,73</b>	<b>6,73</b>	
M <sub>3</sub>	1	0,50	3,50	4,50	6,70	6,30	6,40	7,30	6,80	7,70	7,20	7,00	
	2	0,70	4,20	3,50	7,20	5,50	5,90	6,30	6,10	6,90	7,50	5,90	
	3	0,60	3,50	5,20	6,50	6,00	6,20	6,40	5,80	7,20	7,40	6,60	
	rata-rata	<b>0,60</b>	<b>3,73</b>	<b>4,40</b>	<b>6,80</b>	<b>5,93</b>	<b>6,17</b>	<b>6,67</b>	<b>6,23</b>	<b>7,27</b>	<b>7,37</b>	<b>6,50</b>	

Lampiran 03. Perbandingan rata-rata berat kering sel (g/L) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan penambahan magnesium sulfat dan kecepatan agitasi yang berbeda

Inkubasi (jam)	Agitasi	Berat kering sel (g/L) dengan penambahan magnesium sulfat				Rata-rata
		M <sub>0</sub>	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	
0	A <sub>1</sub>	0,57	0,93	0,60	0,50	<b>0,65</b>
	A <sub>2</sub>	0,50	0,90	0,57	0,60	<b>0,64</b>
	<b>Rata-rata</b>	<b>0,53</b>	<b>0,92</b>	<b>0,58</b>	<b>0,55</b>	
12	A <sub>1</sub>	3,73	5,90	5,07	4,60	<b>4,83</b>
	A <sub>2</sub>	2,47	4,03	3,37	3,73	<b>3,40</b>
	<b>Rata-rata</b>	<b>3,10</b>	<b>4,97</b>	<b>4,22</b>	<b>4,17</b>	
24	A <sub>1</sub>	6,77	6,10	5,70	4,93	<b>5,88</b>
	A <sub>2</sub>	3,93	4,93	5,00	4,40	<b>4,57</b>
	<b>Rata-rata</b>	<b>5,35</b>	<b>5,52</b>	<b>5,35</b>	<b>4,67</b>	
36	A <sub>1</sub>	4,93	6,70	6,70	6,60	<b>6,23</b>
	A <sub>2</sub>	5,17	5,67	4,60	6,80	<b>5,56</b>
	<b>Rata-rata</b>	<b>5,05</b>	<b>6,18</b>	<b>5,65</b>	<b>6,70</b>	
48	A <sub>1</sub>	6,33	6,50	5,63	7,10	<b>6,39</b>
	A <sub>2</sub>	4,97	6,00	6,00	5,93	<b>5,73</b>
	<b>Rata-rata</b>	<b>5,65</b>	<b>6,25</b>	<b>5,82</b>	<b>6,52</b>	
60	A <sub>1</sub>	4,93	7,40	7,07	6,73	<b>6,53</b>
	A <sub>2</sub>	5,07	5,77	5,53	6,17	<b>5,63</b>
	<b>Rata-rata</b>	<b>5,00</b>	<b>6,58</b>	<b>6,30</b>	<b>6,45</b>	
72	A <sub>1</sub>	6,23	6,67	6,93	6,17	<b>6,50</b>
	A <sub>2</sub>	5,80	7,07	6,70	6,67	<b>6,56</b>
	<b>Rata-rata</b>	<b>6,02</b>	<b>6,87</b>	<b>6,82</b>	<b>6,42</b>	
84	A <sub>1</sub>	7,10	7,23	7,40	7,57	<b>7,33</b>
	A <sub>2</sub>	5,03	6,80	6,63	6,23	<b>6,18</b>
	<b>Rata-rata</b>	<b>6,07</b>	<b>7,02</b>	<b>7,02</b>	<b>6,90</b>	
96	A <sub>1</sub>	6,50	7,50	7,33	7,50	<b>7,21</b>
	A <sub>2</sub>	5,37	7,27	6,03	7,27	<b>6,48</b>
	<b>Rata-rata</b>	<b>5,93</b>	<b>7,38</b>	<b>6,68</b>	<b>7,38</b>	
108	A <sub>1</sub>	7,23	8,03	7,80	7,63	<b>7,68</b>
	A <sub>2</sub>	5,83	7,63	6,73	7,37	<b>6,89</b>
	<b>Rata-rata</b>	<b>6,53</b>	<b>7,83</b>	<b>7,27</b>	<b>7,50</b>	
120	A <sub>1</sub>	6,17	7,33	7,57	7,10	<b>7,04</b>
	A <sub>2</sub>	4,13	6,30	6,73	6,50	<b>5,92</b>
	<b>Rata-rata</b>	<b>5,15</b>	<b>6,82</b>	<b>7,15</b>	<b>6,80</b>	

Lampiran 04. Konsentrasi gula pereduksi (g/L) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi 200 rpm dan penambahan magnesium sulfat yang berbeda

Periakuan	Waktu inkubasi											
	Ulangan	Jam 0	Jam 12	Jam 24	Jam 36	Jam 48	Jam 60	Jam 72	Jam 84	Jam 96	Jam 108	Jam 120
M <sub>0</sub>	1	12,68	11,20	9,68	8,64	7,95	7,11	5,83	5,03	4,30	3,77	3,26
	2	12,68	10,55	9,40	9,14	8,17	7,11	6,00	5,18	4,44	3,51	3,14
	3	11,91	10,25	8,89	8,64	7,73	6,72	6,00	4,73	4,16	3,14	2,79
	rata-rata	12,42	10,67	9,32	8,81	7,95	6,98	5,94	4,98	4,30	3,47	3,07
M <sub>1</sub>	1	12,68	10,87	9,40	8,40	7,73	6,53	5,83	4,58	3,90	3,39	2,68
	2	12,29	9,96	8,64	7,95	7,31	6,53	5,50	4,87	4,03	3,39	2,91
	3	12,68	11,20	9,68	8,64	7,73	6,17	5,83	4,87	4,44	3,77	3,26
	rata-rata	12,55	10,68	9,24	8,33	7,59	6,41	5,72	4,78	4,12	3,51	2,95
M <sub>2</sub>	1	12,29	10,55	9,40	8,17	7,11	6,17	5,34	4,87	4,58	3,90	3,39
	2	12,29	9,96	8,40	7,73	7,73	5,83	5,18	4,44	3,90	3,51	3,14
	3	12,68	10,55	9,14	8,64	7,31	6,35	5,83	4,16	3,77	3,26	3,26
	rata-rata	12,42	10,36	8,98	8,18	7,38	6,12	5,45	4,49	4,08	3,56	3,27
M <sub>3</sub>	1	12,68	10,25	9,14	8,40	7,95	6,91	6,00	5,34	4,73	4,03	3,39
	2	12,29	10,25	8,64	8,17	7,11	6,17	5,34	4,44	3,90	3,39	3,14
	3	11,91	10,55	9,14	7,51	7,11	6,00	5,03	4,16	3,51	3,26	2,91
	rata-rata	12,29	10,35	8,97	8,03	7,39	6,36	5,45	4,65	4,04	3,56	3,15

Lampiran 05. Konsentrasi gula pereduksi (g/L) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi 250 rpm dan penambahan magnesium sulfat yang berbeda

Perlakuan	Waktu inkubasi											
	Ulangan	Jam 0	Jam 12	Jam 24	Jam 36	Jam 48	Jam 60	Jam 72	Jam 84	Jam 96	Jam 108	Jam 120
M <sub>0</sub>	1	13,55	12,68	11,20	9,96	9,68	9,14	8,64	6,00	5,50	5,03	3,51
	2	14,02	11,91	11,55	10,55	10,25	9,14	8,40	6,17	4,73	4,30	3,03
	3	13,10	11,55	10,87	10,25	9,14	9,40	9,14	6,00	4,87	3,77	2,79
	rata-rata	13,55	12,05	11,21	10,25	9,69	9,23	8,73	6,05	5,03	4,36	3,11
M <sub>1</sub>	1	13,10	11,20	10,25	9,68	8,89	8,17	6,53	6,00	4,03	3,14	2,68
	2	12,68	10,87	10,25	9,96	8,64	7,95	6,35	5,03	3,64	3,51	3,03
	3	13,55	10,87	10,55	10,25	9,14	7,31	6,72	4,58	4,73	3,77	2,79
	rata-rata	13,11	10,98	10,35	9,96	8,89	7,81	6,53	5,20	4,13	3,47	2,83
M <sub>2</sub>	1	13,55	11,91	10,87	10,25	9,14	8,89	8,40	5,50	4,30	2,68	2,91
	2	13,10	11,55	11,20	10,87	9,68	9,14	8,64	6,00	4,03	3,39	2,68
	3	13,10	11,55	11,20	10,25	9,96	9,14	7,31	6,53	6,35	3,51	2,79
	rata-rata	13,25	11,67	11,09	10,46	9,59	9,06	8,12	6,01	4,89	3,19	2,80
M <sub>3</sub>	1	13,55	11,55	10,55	10,25	8,40	7,73	6,72	4,44	3,51	4,03	3,51
	2	12,68	11,91	10,55	9,68	8,89	8,17	7,11	5,50	4,03	3,14	2,79
	3	13,10	12,29	11,20	9,40	8,40	7,95	6,35	5,18	4,58	3,64	3,14
	rata-rata	13,11	11,91	10,77	9,78	8,56	7,95	6,72	5,04	4,04	3,60	3,15

## Lampiran 06. Analisis regresi dan korelasi larutan glukosa standar

X	Y	X <sup>2</sup>	Y <sup>2</sup>	XY
0,20	0,0241	0,04	0,000581	0,00482
0,40	0,0334	0,16	0,001116	0,01336
0,60	0,0410	0,36	0,001681	0,02460
0,80	0,0555	0,64	0,003080	0,04440
1,00	0,0691	1,00	0,004775	0,06910
$\Sigma X = 3$ $\bar{X} = 0,6$	$\Sigma Y = 0,2231$ $\bar{Y} = 0,0446$	$\Sigma X^2 = 2,20$	$\Sigma Y^2 = 0,0112$	$\Sigma XY = 0,1563$

Persamaan kurva :

$$Y = a + bx$$

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}$$

$$= \frac{5(0,1563) - 3(0,04462)}{5(2,2) - 9}$$

$$= \frac{0,7814 - 0,6693}{2}$$

$$= 0,0560$$

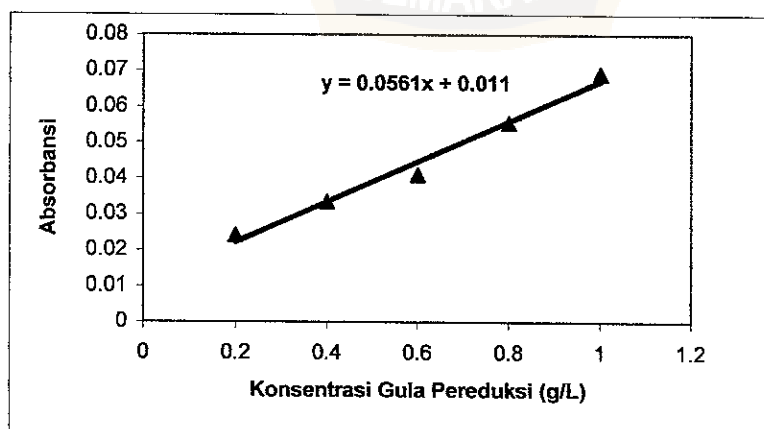
$$y = a + bx$$

$$a = y - bx$$

$$= 0,0446 - 0,056(0,6)$$

$$= 0,011$$

Persamaan regresi :  $Y = 0,056x + 0,011$



Gambar 09. Kurva standar gula pereduksi

Lampiran 07. Uji normalitas rata-rata berat kering sel (g/L) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan penambahan magnesium sulfat dan kecepatan agitasi yang berbeda (Steel and Torrie, 1996)

Tabel 05. Uji normalitas berat kering sel (g/L) *R. mucilaginosa* UICC Y-18 pada waktu inkubasi 84 jam

$x_i$	frekuensi kumulatif	$F_n(x_i)$	$z = \frac{x_i - \bar{x}}{s}$	$F_0(x_i)$	$ F_n(x_i) - F_0(x_i) $	$ F_n(x_{i-1}) - F_0(x_i) $
4,80	1	0,0417	-2,2052	0,0136	0,0281	0,0136
5,10	2	0,0833	-1,8674	0,0307	0,0526	0,0110
5,20	3	0,1250	-1,7548	0,0401	0,0849	0,0432
5,80	4	0,1667	-1,0792	0,1401	0,0266	0,0151
6,10	5	0,2083	-0,7413	0,2296	0,0213	0,0629
6,20	6	0,2500	-0,6287	0,2643	0,0143	0,0560
6,40	7	0,2917	-0,4035	0,3446	0,0529	0,0946
6,50	9	0,3750	-0,2909	0,3859	0,0109	0,0942
6,60	10	0,4167	-0,1783	0,4286	0,0119	0,0536
6,70	11	0,4583	-0,0657	0,4721	0,0138	0,0554
6,80	12	0,5000	0,0469	0,5199	0,0199	0,0616
6,90	13	0,5417	0,1595	0,5636	0,0219	0,0636
7,00	14	0,5833	0,2721	0,6064	0,0231	0,0647
7,10	15	0,6250	0,3847	0,6480	0,0230	0,0647
7,20	16	0,6667	0,4973	0,6915	0,0248	0,0665
7,40	18	0,7500	0,7226	0,7642	0,0142	<b>0,0975</b>
7,60	19	0,7917	0,9478	0,8289	0,0372	0,0789
7,70	21	0,8750	1,0604	0,8554	0,0196	0,0637
7,80	23	0,9583	1,1730	0,8790	0,0793	0,0040
7,90	24	1,0000	1,2856	0,9015	0,0985	0,0568

$$\bar{x} = \frac{\sum (y_{ij})}{n} = \frac{162,20}{24} = 6,7583$$

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

$$= \sqrt{\frac{[(6,50 - 6,75)^2 + (7,70 - 6,75)^2 + \dots + (5,80 - 6,75)^2]}{23}}$$

$$= 0,8880$$

$$D_{hitung} = 0,0975$$

$$D_{(0,05;24)} = 0,2690$$

Kesimpulan :  $D_{hitung} < D_{tabel} \rightarrow$  data normal



Lampiran 08. Uji homogenitas (Uji Bartlett) rata-rata berat kering sel (g/L) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan penambahan magnesium sulfat dan kecepatan agitasi yang berbeda (Gomez dan Gomez, 1995)

Tabel 06. Uji homogenitas (Uji Bartlett) rata-rata berat kering sel (g/L) *R. mucilaginosa* UICC Y-18 pada waktu inkubasi 84 jam

Perlakuan		Berat kering sel (g/L)			Jumlah perlakuan	Rataan
		R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>		
M <sub>0</sub>	A <sub>1</sub>	6,50	7,70	7,10	21,30	7,10
M <sub>1</sub>		6,50	7,80	7,40	21,70	7,23
M <sub>2</sub>		6,90	7,70	7,60	22,20	7,40
M <sub>3</sub>		7,80	7,20	7,90	22,90	7,63
M <sub>0</sub>	A <sub>2</sub>	5,10	4,80	5,20	15,10	5,03
M <sub>1</sub>		6,60	6,40	7,40	20,40	6,80
M <sub>2</sub>		7,00	6,70	6,20	19,90	6,63
M <sub>3</sub>		6,80	6,10	5,80	18,70	6,23
<b>Jumlah</b>		53,20	54,40	54,60	162,20	54,07

Perlakuan	Berat kering sel (g/L)		Jumlah perlakuan
	A <sub>1</sub>	A <sub>2</sub>	
M <sub>0</sub>	21,30	15,10	36,40
M <sub>1</sub>	21,70	20,40	42,10
M <sub>2</sub>	22,20	19,90	42,10
M <sub>3</sub>	22,90	18,70	41,60
<b>Jumlah rata-rata</b>	88,10	74,10	162,20

Perhitungan :

$$JK_i = \left( \sum_{i=1}^3 Y_i \right) - \frac{(JP_i)^2}{n}$$

1.  $JK_1 = \left\{ (6,50)^2 + (7,70)^2 + (7,10)^2 \right\} - \frac{(21,30)^2}{3} = 0,72$
2.  $JK_2 = \left\{ (6,50)^2 + (7,80)^2 + (7,40)^2 \right\} - \frac{(21,70)^2}{3} = 0,89$
3.  $JK_3 = \left\{ (6,90)^2 + (7,70)^2 + (7,60)^2 \right\} - \frac{(22,20)^2}{3} = 0,38$
4.  $JK_4 = \left\{ (7,80)^2 + (7,20)^2 + (7,90)^2 \right\} - \frac{(22,90)^2}{3} = 0,29$

$$5. JK_5 = \left\{ (5,10)^2 + (4,80)^2 + (5,20)^2 \right\} - \frac{(15,10)^2}{3} = 0,09$$

$$6. JK_6 = \left\{ (6,60)^2 + (6,40)^2 + (7,40)^2 \right\} - \frac{(20,40)^2}{3} = 0,56$$

$$7. JK_7 = \left\{ (7,00)^2 + (6,70)^2 + (6,20)^2 \right\} - \frac{(19,90)^2}{3} = 0,33$$

$$8. JK_8 = \left\{ (6,80)^2 + (6,10)^2 + (5,80)^2 \right\} - \frac{(18,70)^2}{3} = 0,53$$

$$S_i^2 = \frac{JK_i}{db} \rightarrow \log S_i^2$$

$$9. S_1^2 = \frac{0,72}{2} = 0,360 \rightarrow \log S_1^2 = -0,444$$

$$10. S_2^2 = \frac{0,89}{2} = 0,445 \rightarrow \log S_2^2 = -0,352$$

$$11. S_3^2 = \frac{0,38}{2} = 0,190 \rightarrow \log S_3^2 = -0,721$$

$$12. S_4^2 = \frac{0,29}{2} = 0,145 \rightarrow \log S_4^2 = -0,839$$

$$13. S_5^2 = \frac{0,09}{2} = 0,045 \rightarrow \log S_5^2 = -1,347$$

$$14. S_6^2 = \frac{0,56}{2} = 0,280 \rightarrow \log S_6^2 = -0,553$$

$$15. S_7^2 = \frac{0,33}{2} = 0,165 \rightarrow \log S_7^2 = -0,783$$

$$16. S_8^2 = \frac{0,53}{2} = 0,265 \rightarrow \log S_8^2 = -0,577$$

Tabel 07. Hasil uji homogenitas (Uji Bartlett) rata-rata berat kering sel (g/L) *R. mucilaginosa* UICC Y-18 pada waktu inkubasi 84 jam

No.	Perlakuan	db	1/db	JK	S <sup>2</sup>	log S <sup>2</sup>	db.log S <sup>2</sup>
1	A <sub>1</sub> M <sub>0</sub>	2	½	0,72	0,360	-0,444	-0,887
2	A <sub>2</sub> M <sub>0</sub>	2	½	0,09	0,045	-1,347	-2,694
3	A <sub>1</sub> M <sub>1</sub>	2	½	0,89	0,445	-0,352	-0,703
4	A <sub>2</sub> M <sub>1</sub>	2	½	0,56	0,280	-0,553	-1,106
5	A <sub>1</sub> M <sub>2</sub>	2	½	0,38	0,190	-0,721	-1,442
6	A <sub>2</sub> M <sub>2</sub>	2	½	0,33	0,165	-0,783	-1,565
7	A <sub>1</sub> M <sub>3</sub>	2	½	0,29	0,145	-0,839	-1,677
8	A <sub>2</sub> M <sub>3</sub>	2	½	0,53	0,265	-0,577	-1,154
<b>Jumlah</b>	<b>8</b>	<b>16</b>	<b>4</b>	<b>3,79</b>			<b>-11,228</b>

$$17. s^2 = \frac{\sum JK}{\sum db} = \frac{3,79}{16} = 0,237 \rightarrow \log s^2 = -0,625$$

$$\begin{aligned} 18. x^2 &= 2,3026 \left[ \left( \sum db \right) (\log s^2) - \left( \sum db \cdot \log S \right) \right] \\ &= 2,3026 \left[ (16)(-0,625) - (-11,228) \right] \\ &= 2,828 \end{aligned}$$

$$\begin{aligned} 19. \text{Faktor koreksi } C &= 1 + \frac{1}{3(\sum P - 1)} \left[ \left( \frac{1}{db} \right) - \frac{1}{\sum db} \right] \\ &= 1 + \frac{1}{3(8 - 1)} \left[ (4) - \frac{1}{16} \right] \\ &= 1,1875 \end{aligned}$$

$$\begin{aligned} 20. x^2_{\text{terkoreksi}} &= \frac{1}{C} (x^2) \\ &= \frac{1}{1,1875} (2,828) \\ &= 2,382 \end{aligned}$$

$$21. x^2_{(0.05;7)} = 14,1$$

Kesimpulan :  $x^2_{\text{terkoreksi}} < x^2_{\text{tabel}} \rightarrow$  data homogen



Lampiran 09. Analisis sidik ragam (Ansira) rata-rata berat kering sel (g/L) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan pemberian magnesium sulfat dan kecepatan agitasi yang berbeda waktu inkubasi 84 jam (Hanafiah, 2000)

Perhitungan :

$$\begin{aligned}
 1. \text{ FK} &= \frac{\left(\sum_{i=1}^n Y_i\right)^2}{r \cdot a \cdot b} = \frac{(162,20)^2}{3 \cdot 2 \cdot 4} = 1096,202 \\
 2. \text{ JKT} &= \left(\sum Y_i^2\right) - FK \\
 &= [(6,50)^2 + (7,70)^2 + (7,10)^2 + \dots + (5,80)^2] - 1096,202 = 18,138 \\
 3. \text{ JKK} &= \frac{\sum_{j=1}^r R_j^2}{a \cdot b} - FK \\
 &= \frac{[(53,20)^2 + (54,40)^2 + (54,60)^2]}{2 \cdot 4} - 1096,202 = 0,143 \\
 4. \text{ JKP} &= \frac{\left(\sum T_p^2\right)}{r} - FK \\
 &= \frac{[(21,30)^2 + (15,10)^2 + \dots + (18,70)^2]}{3} - 1096,202 = 14,365 \\
 5. \text{ JK(A)} &= \frac{\left(\sum A_p^2\right)}{r \cdot b} - FK \\
 &= \frac{[(88,10)^2 + (74,10)^2]}{3 \cdot 4} - 1096,202 = 8,166 \\
 6. \text{ JK(M)} &= \frac{\left(\sum M_p^2\right)}{r \cdot a} - FK \\
 &= \frac{[(36,40)^2 + (42,10)^2 + (42,10)^2 + (41,60)^2]}{3 \cdot 2} - 1096,202 = 3,855 \\
 7. \text{ JK(AM)} &= \text{JK (P)} - \text{JK (A)} - \text{JK (M)} \\
 &= 14,365 - 8,166 - 3,855 = 2,344 \\
 8. \text{ JKG} &= \text{JKT} - \text{JKK} - \text{JKP} \\
 &= 18,138 - 0,143 - 14,365 = 3,630 \\
 9. \text{ KTK} &= \frac{\text{JKK}}{\text{db Kelompok}} = \frac{0,143}{2} = 0,072 \\
 10. \text{ KTP} &= \frac{\text{JKP}}{\text{db Perlakuan}} = \frac{14,365}{7} = 2,052 \\
 11. \text{ KT(A)} &= \frac{\text{JK(A)}}{\text{db (A)}} = \frac{8,166}{1} = 8,166
 \end{aligned}$$

$$12. \text{KT(M)} = \frac{JK(M)}{db(M)} = \frac{3,855}{3} = 1,285$$

$$13. \text{KT(AM)} = \frac{JK(AM)}{db(AM)} = \frac{2,344}{3} = 0,781$$

$$14. \text{KTG} = \frac{JKG}{db Galat} = \frac{3,630}{14} = 0,259$$

$$15. F_{hit} K = \frac{KTK}{KTG} = \frac{0,072}{0,259} = 0,278$$

$$16. F_{hit} P = \frac{KTP}{KTG} = \frac{2,052}{0,259} = 7,923$$

$$17. F_{hit} (A) = \frac{KT(A)}{KTG} = \frac{8,166}{0,259} = 31,529$$

$$18. F_{hit} (M) = \frac{KT(M)}{KTG} = \frac{1,285}{0,259} = 4,961$$

$$19. F_{hit} (AM) = \frac{KT(AM)}{KTG} = \frac{0,781}{0,259} = 3,015$$

Koefisien Keragaman :

$$KK = \frac{\sqrt{KTG}}{y} \times 100 \% \quad \text{dimana} \quad \bar{y} = \frac{T_{ij}}{rt} = \frac{\sum Y_{ij}}{r \cdot t}$$

Tabel 08. Hasil analisis sidik ragam (Ansira) rata-rata berat kering sel (g/L) *R. mucilaginosa* UICC Y-18 pada waktu inkubasi 84 jam

Sumber Keragaman	db	JK	KT	F <sub>hit</sub>	F <sub>tabel</sub>	
					5%	1%
Kelompok	2	0,143	0,072	0,28 <sup>ns</sup>	3,74	6,51
Perlakuan	7	14,365	2,052	7,92 <sup>**</sup>	2,77	4,28
A	1	8,166	8,166	31,53 <sup>**</sup>	4,60	8,86
M	3	3,855	1,285	4,96 <sup>*</sup>	3,34	5,56
A x M	3	2,344	0,781	3,02 <sup>ns</sup>	3,34	5,56
Galat	14	3,630	0,259			
Total	23	32,503	12,615			

$$KK = \frac{\sqrt{0,259}}{6,759} \times 100 \% = 7,530 \%$$

Keterangan :

$F_{hit} < F_{tabel(5\%)} \rightarrow$  perlakuan tidak berbeda nyata

$F_{hit} < F_{tabel(5\%)} \leq F_{tabel(1\%)} \rightarrow$  perlakuan berbeda nyata

$F_{hit} > F_{tabel(1\%)} \rightarrow$  perlakuan berbeda sangat nyata

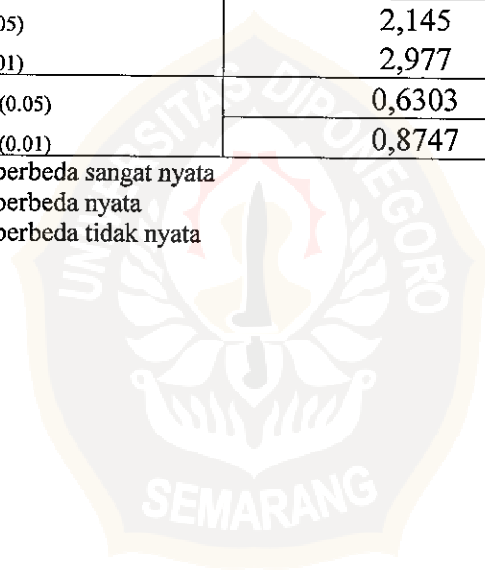
Lampiran 10. Uji Beda Nyata Terkecil rata-rata berat kering sel (g/L) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan penambahan magnesium sulfat yang berbeda pada waktu inkubasi 84 jam (Hanafiah, 2000)

$$S_{\bar{y}} = \sqrt{\frac{2KTG}{r.a}} = \sqrt{\frac{2(0,259)}{3.2}} = 0,294$$

$$BNT_{\alpha} = t_{\alpha(v)} \cdot S_{\bar{y}}$$

Perlakuan	Nilai tengah	M <sub>0</sub>	M <sub>3</sub>	M <sub>2</sub>	M <sub>1</sub>
M <sub>0</sub>	6,07	-	0,87*	0,95**	0,95**
M <sub>3</sub>	6,93		-	0,08 <sup>ns</sup>	0,08 <sup>ns</sup>
M <sub>2</sub>	7,02			-	0,00 <sup>ns</sup>
M <sub>1</sub>	7,02				-
	t <sub>(0.05)</sub>			2,145	
	t <sub>(0.01)</sub>			2,977	
	BNT <sub>(0.05)</sub>			0,6303	
	BNT <sub>(0.01)</sub>			0,8747	

Keterangan : \*\* : berbeda sangat nyata  
 \* : berbeda nyata  
 ns : berbeda tidak nyata



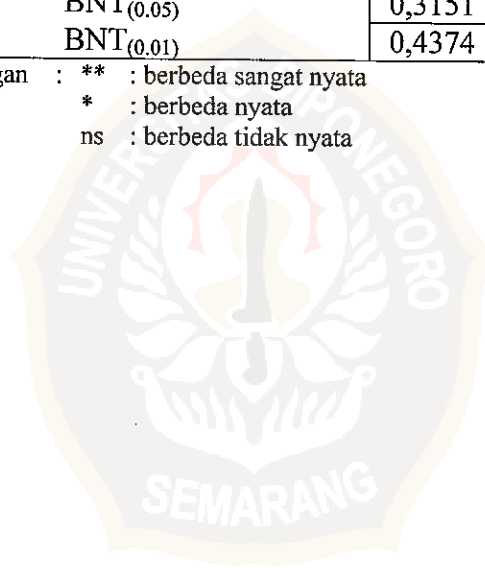
Lampiran 11. Uji Beda Nyata Terkecil rata-rata berat kering sel (g/L) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi yang berbeda pada waktu inkubasi 84 jam (Hanafiah, 2000)

$$S_{\bar{y}} = \sqrt{\frac{2KTG}{r.b}} = \sqrt{\frac{2(0,259)}{3.4}} = 0,208$$

$$BNT_{\alpha} = t_{\alpha(v)} \cdot S_{\bar{y}}$$

Perlakuan	Nilai tengah	A <sub>2</sub>	A <sub>1</sub>
A <sub>2</sub>	6,17	-	1,17**
A <sub>1</sub>	7,34		-
	t <sub>(0.05)</sub>		2,145
	t <sub>(0.01)</sub>		2,977
	BNT <sub>(0.05)</sub>		0,3151
	BNT <sub>(0.01)</sub>		0,4374

Keterangan : \*\* : berbeda sangat nyata  
 \* : berbeda nyata  
 ns : berbeda tidak nyata



Lampiran 12. Produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi 200 rpm dan penambahan magnesium sulfat yang berbeda

Perlakuan	Ulangan	Waktu inkubasi											
		Jam 0	Jam 12	Jam 24	Jam 36	Jam 48	Jam 60	Jam 72	Jam 84	Jam 96	Jam 108	Jam 120	
M <sub>0</sub>	1	0,00	22,62	11,98	16,62	54,22	60,19	50,89	63,94	67,03	59,37	57,03	
	2	0,00	0,00	0,00	82,69	62,03	61,25	59,06	53,97	59,37	65,11	65,97	
	3	0,00	19,86	12,72	56,06	53,35	62,41	75,96	70,61	52,50	59,37	64,94	
	rata-rata	<b>0,00</b>	<b>14,16</b>	<b>8,23</b>	<b>51,79</b>	<b>56,53</b>	<b>61,28</b>	<b>61,97</b>	<b>62,84</b>	<b>59,64</b>	<b>61,28</b>	<b>62,64</b>	
M <sub>1</sub>	1	0,00	27,28	30,89	74,83	72,66	72,66	87,76	103,94	90,97	86,62	88,89	
	2	0,00	28,22	24,43	60,23	63,94	75,39	87,76	97,97	80,55	86,84	88,89	
	3	0,00	27,74	25,98	50,89	54,22	78,40	89,09	91,30	99,35	101,89	86,47	
	rata-rata	<b>0,00</b>	<b>27,75</b>	<b>27,10</b>	<b>61,98</b>	<b>63,61</b>	<b>75,48</b>	<b>88,21</b>	<b>97,73</b>	<b>90,29</b>	<b>91,78</b>	<b>88,09</b>	
M <sub>2</sub>	1	0,00	18,51	12,15	39,81	76,96	77,13	69,63	97,91	81,67	84,00	85,52	
	2	0,00	14,54	18,10	31,48	60,14	78,34	80,86	76,36	85,52	82,39	84,00	
	3	0,00	15,66	13,80	38,02	69,27	60,40	79,46	88,89	85,22	93,19	86,62	
	rata-rata	<b>0,00</b>	<b>16,24</b>	<b>14,68</b>	<b>36,43</b>	<b>68,79</b>	<b>71,96</b>	<b>76,65</b>	<b>87,72</b>	<b>84,13</b>	<b>86,53</b>	<b>85,38</b>	
M <sub>3</sub>	1	0,00	17,70	16,62	41,83	65,97	60,23	67,03	75,39	77,37	79,46	81,67	
	2	0,00	23,27	20,36	42,96	63,46	69,27	80,86	93,83	65,97	92,55	69,63	
	3	0,00	28,72	27,74	53,35	58,54	68,68	68,13	74,43	80,55	84,45	85,22	
	rata-rata	<b>0,00</b>	<b>23,23</b>	<b>21,57</b>	<b>46,04</b>	<b>62,66</b>	<b>66,06</b>	<b>72,01</b>	<b>81,22</b>	<b>74,63</b>	<b>85,49</b>	<b>78,84</b>	



Lampiran 13. Produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi 250 rpm dan penambahan magnesium sulfat yang berbeda

Perlakuan	Ulangan	Waktu inkubasi											
		Jam 0	Jam 12	Jam 24	Jam 36	Jam 48	Jam 60	Jam 72	Jam 84	Jam 96	Jam 108	Jam 120	
M <sub>0</sub>	1	0,00	35,41	23,27	49,36	62,41	67,75	74,22	72,91	63,61	81,49	63,28	
	2	0,00	0,00	20,88	71,90	73,50	62,41	76,96	80,86	78,42	68,91	61,70	
	3	0,00	27,14	37,20	41,83	48,39	68,91	69,18	75,56	59,06	77,97	73,50	
	rata-rata	0,00	20,85	27,12	54,36	61,43	66,36	73,45	76,45	67,03	76,12	66,16	
M <sub>1</sub>	1	0,00	22,01	47,46	70,44	60,23	83,56	81,67	102,36	97,97	88,89	97,91	
	2	0,00	39,93	64,86	83,56	86,44	79,92	84,45	105,56	115,78	92,55	87,76	
	3	0,00	38,07	54,84	64,86	78,42	68,13	87,74	103,26	91,30	121,29	94,59	
	rata-rata	0,00	33,33	55,72	72,95	75,03	77,20	84,62	103,73	101,68	100,91	93,42	
M <sub>2</sub>	1	0,00	24,68	48,39	76,92	79,58	58,03	79,46	96,51	105,56	102,36	86,44	
	2	0,00	26,27	37,20	54,84	69,27	86,58	81,49	100,84	94,59	90,46	96,39	
	3	0,00	44,24	44,87	66,15	58,03	68,13	65,11	108,97	105,56	96,51	112,33	
	rata-rata	0,00	31,73	43,49	65,97	68,96	70,91	75,35	102,11	101,91	96,45	98,39	
M <sub>3</sub>	1	0,00	46,77	54,84	38,02	65,97	64,94	56,93	73,73	76,36	57,72	62,03	
	2	0,00	38,97	46,77	57,72	42,41	56,06	52,50	85,37	85,22	78,40	56,06	
	3	0,00	23,27	47,46	62,41	69,27	67,03	78,34	86,44	69,63	67,75	75,96	
	rata-rata	0,00	36,34	49,69	52,72	59,21	62,68	62,59	81,84	77,07	67,96	64,68	

Lampiran 14. Perbandingan rata-rata produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan penambahan magnesium sulfat dan kecepatan agitasi yang berbeda

Inkubasi (jam)	Agitasi	Produksi pigmen karotenoid ( $\mu\text{g/g}$ ) dengan penambahan magnesium sulfat				Rata-rata
		M <sub>0</sub>	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	
0	A <sub>1</sub>	0,00	0,00	0,00	0,00	<b>0,00</b>
	A <sub>2</sub>	0,00	0,00	0,00	0,00	<b>0,00</b>
	<b>Rata-rata</b>	<b>0,00</b>	<b>0,00</b>	<b>0,00</b>	<b>0,00</b>	
12	A <sub>1</sub>	14,16	27,75	16,24	23,23	<b>20,34</b>
	A <sub>2</sub>	20,85	33,33	31,73	36,34	<b>30,56</b>
	<b>Rata-rata</b>	<b>17,51</b>	<b>30,54</b>	<b>23,98</b>	<b>29,78</b>	
24	A <sub>1</sub>	8,23	27,10	14,68	21,57	<b>17,90</b>
	A <sub>2</sub>	27,12	55,72	43,49	49,69	<b>44,00</b>
	<b>Rata-rata</b>	<b>17,67</b>	<b>41,41</b>	<b>29,09</b>	<b>35,63</b>	
36	A <sub>1</sub>	51,79	61,98	36,43	46,04	<b>49,06</b>
	A <sub>2</sub>	54,36	72,95	65,97	52,72	<b>61,50</b>
	<b>Rata-rata</b>	<b>53,08</b>	<b>67,47</b>	<b>51,20</b>	<b>49,38</b>	
48	A <sub>1</sub>	56,53	63,61	68,79	62,66	<b>62,90</b>
	A <sub>2</sub>	61,43	75,03	68,96	59,21	<b>66,16</b>
	<b>Rata-rata</b>	<b>58,98</b>	<b>69,32</b>	<b>68,87</b>	<b>60,93</b>	
60	A <sub>1</sub>	61,28	75,48	71,96	66,06	<b>68,70</b>
	A <sub>2</sub>	66,36	77,20	70,91	62,68	<b>69,29</b>
	<b>Rata-rata</b>	<b>63,82</b>	<b>76,34</b>	<b>71,44</b>	<b>64,37</b>	
72	A <sub>1</sub>	61,97	88,21	76,65	72,01	<b>74,71</b>
	A <sub>2</sub>	73,45	84,62	75,35	62,59	<b>74,00</b>
	<b>Rata-rata</b>	<b>67,71</b>	<b>86,41</b>	<b>76,00</b>	<b>67,30</b>	
84	A <sub>1</sub>	62,84	97,73	87,72	85,49	<b>83,45</b>
	A <sub>2</sub>	76,45	103,73	102,11	81,84	<b>91,03</b>
	<b>Rata-rata</b>	<b>69,64</b>	<b>100,73</b>	<b>94,92</b>	<b>83,67</b>	
96	A <sub>1</sub>	59,64	90,29	84,13	74,63	<b>77,17</b>
	A <sub>2</sub>	67,03	101,68	101,91	77,07	<b>86,92</b>
	<b>Rata-rata</b>	<b>63,33</b>	<b>95,99</b>	<b>93,02</b>	<b>75,85</b>	
108	A <sub>1</sub>	61,28	91,78	86,53	81,22	<b>80,20</b>
	A <sub>2</sub>	76,12	100,91	96,45	67,96	<b>85,36</b>
	<b>Rata-rata</b>	<b>68,70</b>	<b>96,35</b>	<b>91,49</b>	<b>74,59</b>	
120	A <sub>1</sub>	62,64	88,09	85,38	78,84	<b>78,74</b>
	A <sub>2</sub>	66,16	93,42	98,39	64,68	<b>80,66</b>
	<b>Rata-rata</b>	<b>64,40</b>	<b>90,75</b>	<b>91,88</b>	<b>71,76</b>	

Lampiran 15. Uji normalitas rata-rata produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan penambahan magnesium sulfat dan kecepatan agitasi yang berbeda (Steel and Torrie, 1996)

Tabel 09. Uji normalitas rata-rata produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosa* UICC Y-18 pada waktu inkubasi 84 jam

$x_i$	frekuensi kumulatif	$F_n(x_i)$	$z = \frac{x_i - \bar{x}}{s}$	$F_0(x_i)$	$ F_n(x_i) - F_0(x_i) $	$ F_n(x_{i-1}) - F_0(x_i) $
53,97	1	0,0417	-2,1916	0,0143	0,0274	0,0143
63,94	2	0,0833	-1,5236	0,0643	0,0190	0,0226
70,61	3	0,1250	-1,0762	0,1401	0,0151	0,0568
72,91	4	0,1667	-0,9222	0,1788	0,0121	0,0538
73,73	5	0,2083	-0,8674	0,1922	0,0161	0,0255
74,43	6	0,2500	-0,8202	0,2061	0,0439	0,0022
75,39	7	0,2917	-0,7562	0,2236	0,0681	0,0264
75,56	8	0,3333	-0,7445	0,2266	0,1067	0,0651
76,36	9	0,3750	-0,6906	0,2451	0,1299	0,0882
80,86	10	0,4167	-0,3892	0,3483	0,0684	0,0267
85,37	11	0,4583	-0,0869	0,4641	0,0058	0,0474
86,44	12	0,5000	-0,0152	0,4920	0,0080	0,0337
88,89	13	0,5417	0,1495	0,5596	0,0179	0,0596
91,30	14	0,5833	0,3105	0,6217	0,0384	0,0800
93,83	15	0,6250	0,4806	0,6844	0,0594	0,1011
96,51	16	0,6667	0,6603	0,7454	0,0787	<b>0,1204</b>
97,91	17	0,7083	0,7541	0,7734	0,0651	0,1067
97,97	18	0,7500	0,7578	0,7764	0,0264	0,0681
100,84	19	0,7917	0,9500	0,8289	0,0372	0,0789
102,36	20	0,8333	1,0524	0,8531	0,0198	0,0614
103,26	21	0,8750	1,1128	0,8665	0,0085	0,0332
103,94	22	0,9167	1,1580	0,8770	0,0397	0,0020
105,56	23	0,9583	1,2669	0,8980	0,0603	0,0187
108,97	24	1,0000	1,4952	0,0143	0,0274	0,0143

$$\bar{x} = \frac{\sum(Y_{ij})}{n} = \frac{2079,97}{24} = 86,6654$$

$$s = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$$

$$= \sqrt{\frac{[(63,94 - 86,66)^2 + (53,97 - 86,66)^2 + \dots + (86,44 - 86,66)^2]}{23}} = 14,9162$$

$$D_{hitung} = 0,1204$$

$$D_{(0,05;24)} = 0,2690$$

Kesimpulan :  $D_{hitung} < D_{tabel} \rightarrow$  data normal

Lampiran 16. Uji homogenitas (Uji Bartlett) rata-rata produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan penambahan magnesium sulfat dan kecepatan agitasi yang berbeda (Gomez dan Gomez, 1995)

Tabel 10. Uji homogenitas (Uji Bartlett) rata-rata produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosa* UICC Y-18 pada waktu inkubasi 84 jam

Perlakuan		Berat kering sel (g/L)			Jumlah perlakuan	Rataan
		R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>		
M <sub>0</sub>	A1	63,94	53,97	70,61	188,53	62,84
M <sub>1</sub>		103,94	97,97	91,30	293,20	97,73
M <sub>2</sub>		97,91	76,36	88,89	263,17	87,72
M <sub>3</sub>		75,39	93,83	74,43	243,65	81,22
M <sub>0</sub>	A2	72,91	80,86	75,56	229,93	76,45
M <sub>1</sub>		102,36	105,56	103,26	311,19	103,73
M <sub>2</sub>		96,51	100,84	108,97	306,32	102,11
M <sub>3</sub>		73,73	85,37	86,44	245,53	81,84
<b>Jumlah</b>		686,69	694,77	699,47	2081,53	693,65

Perlakuan	Berat kering sel (g/L)		Jumlah perlakuan
	A <sub>1</sub>	A <sub>2</sub>	
M <sub>0</sub>	188,53	229,93	418,46
M <sub>1</sub>	293,20	311,19	604,39
M <sub>2</sub>	263,17	306,32	569,49
M <sub>3</sub>	243,65	245,53	489,18
<b>Jumlah rata-rata</b>	988,55	1092,97	2081,53

Perhitungan :

$$JK = \left( \sum_{i=1}^3 Y_i \right) - \frac{(JP)^2}{n}$$

1.  $JK_1 = \left\{ (63,94)^2 + (53,97)^2 + (70,61)^2 \right\} - \frac{(188,53)^2}{3} = 139,69$
2.  $JK_2 = \left\{ (103,94)^2 + (97,97)^2 + (91,30)^2 \right\} - \frac{(293,20)^2}{3} = 80,80$
3.  $JK_3 = \left\{ (97,91)^2 + (76,36)^2 + (88,89)^2 \right\} - \frac{(263,17)^2}{3} = 234,60$
4.  $JK_4 = \left\{ (75,39)^2 + (93,93)^2 + (74,43)^2 \right\} - \frac{(243,65)^2}{3} = 239,16$

$$5. JK_5 = \left\{ (72,91)^2 + (80,66)^2 + (75,56)^2 \right\} - \frac{(229,34)^2}{3} = 32,76$$

$$6. JK_6 = \left\{ (102,36)^2 + (105,56)^2 + (103,26)^2 \right\} - \frac{(311,19)^2}{3} = 5,47$$

$$7. JK_7 = \left\{ (96,51)^2 + (100,84)^2 + (108,97)^2 \right\} - \frac{(306,32)^2}{3} = 79,55$$

$$8. JK_8 = \left\{ (73,73)^2 + (85,37)^2 + (86,44)^2 \right\} - \frac{(245,53)^2}{3} = 100,20$$

$$S_i^2 = \frac{JK_i}{db} \rightarrow \log S_i^2$$

$$9. S_1^2 = \frac{139,69}{2} = 69,845 \rightarrow \log S_1^2 = 1,844$$

$$10. S_2^2 = \frac{80,80}{2} = 40,400 \rightarrow \log S_2^2 = 1,606$$

$$11. S_3^2 = \frac{234,60}{2} = 117,300 \rightarrow \log S_3^2 = 2,069$$

$$12. S_4^2 = \frac{239,16}{2} = 119,58 \rightarrow \log S_4^2 = 2,078$$

$$13. S_5^2 = \frac{32,76}{2} = 16,380 \rightarrow \log S_5^2 = 1,214$$

$$14. S_6^2 = \frac{5,47}{2} = 2,735 \rightarrow \log S_6^2 = 0,437$$

$$15. S_7^2 = \frac{79,55}{2} = 39,775 \rightarrow \log S_7^2 = 1,600$$

$$16. S_8^2 = \frac{100,20}{2} = 50,100 \rightarrow \log S_8^2 = 1,700$$

Tabel 11. Hasil uji homogenitas (Uji Bartlett) rata-rata produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosus* UICC Y-18 pada waktu inkubasi 84 jam

No.	Perlakuan	db	1/db	JK	$S^2$	$\log S^2$	$db \cdot \log S^2$
1	A <sub>1</sub> M <sub>0</sub>	2	½	139,69	69,845	1,844	3,688
2	A <sub>2</sub> M <sub>0</sub>	2	½	32,76	1,214	1,084	2,168
3	A <sub>1</sub> M <sub>1</sub>	2	½	80,80	40,400	1,606	3,213
4	A <sub>2</sub> M <sub>1</sub>	2	½	5,47	2,735	0,437	0,874
5	A <sub>1</sub> M <sub>2</sub>	2	½	234,60	117,300	2,069	4,139
6	A <sub>2</sub> M <sub>2</sub>	2	½	79,55	39,775	1,600	3,199
7	A <sub>1</sub> M <sub>3</sub>	2	½	239,16	119,580	2,078	4,155
8	A <sub>2</sub> M <sub>3</sub>	2	½	100,20	50,100	1,700	3,400
<b>Jumlah</b>	<b>8</b>	<b>16</b>	<b>4</b>	<b>912,23</b>			<b>24,836</b>

$$17. s^2 = \frac{\sum JK}{\sum db} = \frac{912,23}{16} = 57,014 \rightarrow \log s^2 = 1,756$$

$$18. x^2 = 2,3026 \left[ \left( \sum db \right) (\log s^2) - \left( \sum db \cdot \log S \right) \right]$$

$$= 2,3026 \left[ (16)(1,756) - (24,836) \right]$$

$$= 7,507$$

$$19. \text{Faktor koreksi } C = 1 + \frac{1}{3(\sum P - 1)} \left[ \left( \sum \frac{1}{db} \right) - \frac{1}{\sum db} \right]$$

$$= 1 + \frac{1}{3(8-1)} \left[ (4) - \frac{1}{16} \right]$$

$$= 1,1875$$

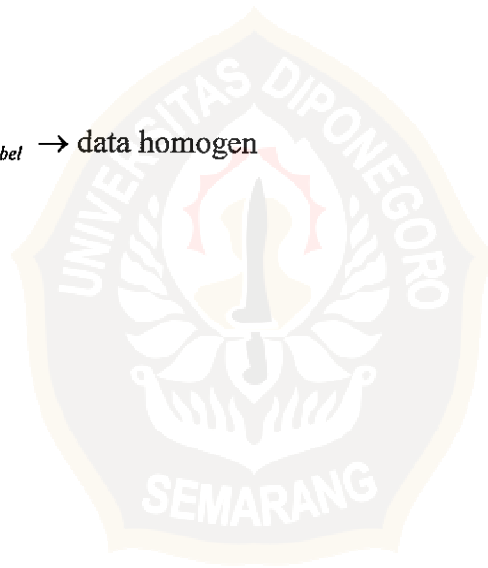
$$20. x^2_{\text{terkoreksi}} = \frac{1}{C} (x^2)$$

$$= \frac{1}{1,1875} (7,507)$$

$$= 6,321$$

$$21. x^2_{(0,05;7)} = 14,1$$

Kesimpulan :  $x^2_{\text{terkoreksi}} < x^2_{\text{tabel}} \rightarrow$  data homogen



Lampiran 17. Analisis sidik ragam (Ansira) rata-rata produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosus* UICC Y-18 pada medium air kelapa dengan penambahan magnesium sulfat dan kecepatan agitasi yang berbeda pada waktu inkubasi 84 jam (Hanafiah, 2000)

Perhitungan :

$$\begin{aligned}
 1. \text{ FK} &= \frac{\left(\sum_{i=1}^n Y_i\right)^2}{r.a.b} = \frac{(2080,92)^2}{3.2.4} = 180426,960 \\
 2. \text{ JKT} &= \left(\sum Y_i^2\right) - \text{FK} \\
 &= [(63,94)^2 + (53,97)^2 + (70,61)^2 + \dots + (86,44)^2] - 180426,960 \\
 &= 5045,930 \\
 3. \text{ JKK} &= \frac{\sum_{j=1}^r R_j^2}{a.b} - \text{FK} \\
 &= \frac{[(686,69)^2 + (694,77)^2 + (699,47)^2]}{2.4} - 180426,960 = 10,440 \\
 4. \text{ JKP} &= \frac{\left(\sum T_p^2\right)}{r} - \text{FK} \\
 &= \frac{[(188,53)^2 + (229,93)^2 + \dots + (245,53)^2]}{3} - 180426,960 \\
 &= 4134,680 \\
 5. \text{ JK(A)} &= \frac{\left(\sum A_p^2\right)}{r.b} - \text{FK} \\
 &= \frac{[(988,55)^2 + (1092,97)^2]}{3.4} - 180426,960 = 558,390 \\
 6. \text{ JK(M)} &= \frac{\left(\sum M_p^2\right)}{r.a} - \text{FK} \\
 &= \frac{[(418,46)^2 + (604,39)^2 + (569,49)^2 + (489,18)^2]}{3.2} - 180426,960 \\
 &= 3576,050 \\
 7. \text{ JK(AM)} &= \text{JKP} - \text{JK(A)} - \text{JK(M)} \\
 &= 4134,680 - 558,390 - 3576,050 = 0,240 \\
 8. \text{ JKG} &= \text{JKT} - \text{JKK} - \text{JKP} \\
 &= 5045,390 - 10,440 - 4134,680 = 900,810 \\
 9. \text{ KTK} &= \frac{\text{JKK}}{\text{db Kelompok}} = \frac{10,440}{2} = 5,220 \\
 10. \text{ KTP} &= \frac{\text{JKP}}{\text{db Perlakuan}} = \frac{4134,680}{7} = 590,668
 \end{aligned}$$

$$11. \text{KT(A)} = \frac{JK(A)}{db(A)} = \frac{558,390}{1} = 558,390$$

$$12. \text{KT(M)} = \frac{JK(M)}{db(M)} = \frac{3576,050}{3} = 1192,017$$

$$13. \text{KT(AM)} = \frac{JK(AM)}{db(AM)} = \frac{0,240}{3} = 0,080$$

$$14. \text{KTG} = \frac{JKG}{db \text{ Galat}} = \frac{900,810}{14} = 64,344$$

$$15. F_{\text{hit K}} = \frac{KTK}{KTG} = \frac{5,220}{64,344} = 0,081$$

$$16. F_{\text{hit P}} = \frac{KTP}{KTG} = \frac{590,668}{64,344} = 9,180$$

$$17. F_{\text{hit (A)}} = \frac{KT(A)}{KTG} = \frac{558,390}{64,344} = 8,678$$

$$18. F_{\text{hit (M)}} = \frac{KT(M)}{KTG} = \frac{1192,017}{64,344} = 18,526$$

$$19. F_{\text{hit (AM)}} = \frac{KT(AM)}{KTG} = \frac{0,080}{64,344} = 0,001$$

Koefisien Keragaman :

$$KK = \frac{\sqrt{KTG}}{y} \times 100 \% \quad \text{dimana} \quad y = \frac{T_{ij}}{rt} = \frac{\sum Y_{ij}}{r \cdot t}$$

Tabel 12. Hasil analisis sidik ragam (Ansira) rata-rata produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosa* UICC Y-18 pada waktu inkubasi 84 jam

Sumber Keragaman	db	JK	KT	F <sub>hit</sub>	F <sub>tabel</sub>	
					5%	1%
Kelompok	2	10,440	5,220	0,08 <sup>ns</sup>	3,74	6,51
Perlakuan	7	4134,680	590,668	9,18 <sup>**</sup>	2,77	4,28
A	1	558,390	558,390	8,68 <sup>*</sup>	4,60	8,86
M	3	3576,050	1192,017	18,53 <sup>**</sup>	3,34	5,56
A x M	3	0,240	0,080	0,001 <sup>ns</sup>	3,34	5,56
Galat	14	900,810	64,344			
Total	23	9180,610	2410,719			

$$KK = \frac{\sqrt{64,344}}{86,665} \times 100 \% = 9,256 \%$$

Keterangan :

$F_{\text{hit}} < F_{\text{tabel}(5\%)} \rightarrow$  perlakuan tidak berbeda nyata

$F_{\text{hit}} < F_{\text{tabel}(5\%)} \leq F_{\text{tabel}(1\%)} \rightarrow$  perlakuan berbeda nyata

$F_{\text{hit}} > F_{\text{tabel}(1\%)} \rightarrow$  perlakuan berbeda sangat nyata



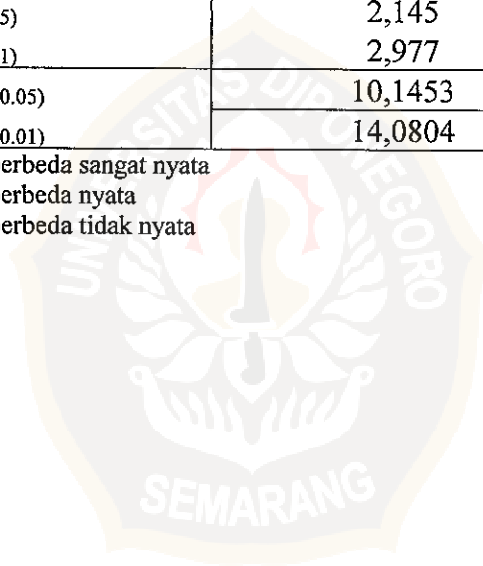
Lampiran 18. Uji Beda Nyata Terkecil rata-rata produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosus* UICC Y-18 pada medium air kelapa dengan penambahan magnesium sulfat yang berbeda pada waktu inkubasi 84 jam (Hanafiah, 2000)

$$S_{\bar{y}} = \sqrt{\frac{2KTG}{r.a}} = \sqrt{\frac{2(67,111)}{3.2}} = 4,730$$

$$BNT_{\alpha} = t_{\alpha(v)} \cdot S_{\bar{y}}$$

Perlakuan	Nilai tengah	M <sub>0</sub>	M <sub>3</sub>	M <sub>2</sub>	M <sub>1</sub>
M <sub>0</sub>	69,48	-	12,05*	25,43**	31,25**
M <sub>3</sub>	81,53		-	13,38*	19,20**
M <sub>2</sub>	94,92			-	5,82 <sup>ns</sup>
M <sub>1</sub>	100,73				-
	t <sub>(0.05)</sub>			2,145	
	t <sub>(0.01)</sub>			2,977	
	BNT <sub>(0.05)</sub>			10,1453	
	BNT <sub>(0.01)</sub>			14,0804	

Keterangan : \*\* : berbeda sangat nyata  
 \* : berbeda nyata  
 ns : berbeda tidak nyata



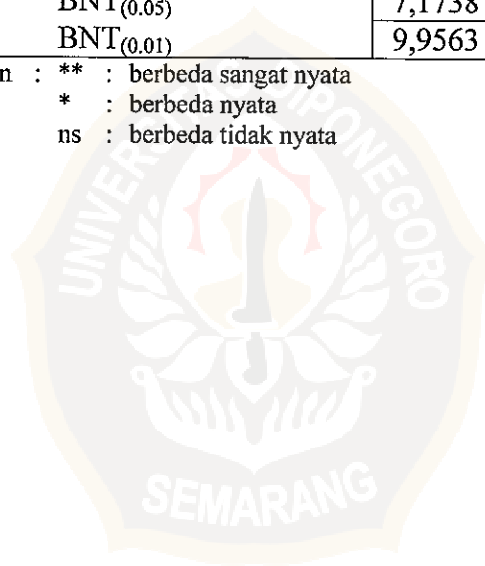
Lampiran 19. Uji Beda Nyata Terkecil rata-rata produksi pigmen karotenoid ( $\mu\text{g/g}$ ) *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi yang berbeda pada waktu inkubasi 84 jam (Hanafiah, 2000)

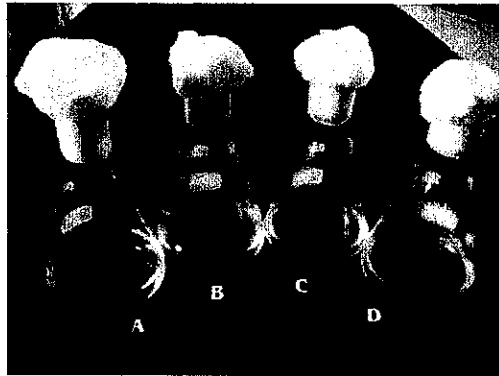
$$S_{\bar{y}} = \sqrt{\frac{2KTG}{r.b}} = \sqrt{\frac{2(67,111)}{3.4}} = 3,344$$

$$BNT_{\alpha} = t_{\alpha(v)} \cdot S_{\bar{y}}$$

Perlakuan	Nilai tengah	A <sub>1</sub>	A <sub>2</sub>
A <sub>1</sub>	82,38	-	8,57*
A <sub>2</sub>	90,95		-
	t <sub>(0.05)</sub>		2,145
	t <sub>(0.01)</sub>		2,977
	BNT <sub>(0.05)</sub>		7,1738
	BNT <sub>(0.01)</sub>		9,9563

Keterangan : \*\* : berbeda sangat nyata  
 \* : berbeda nyata  
 ns : berbeda tidak nyata





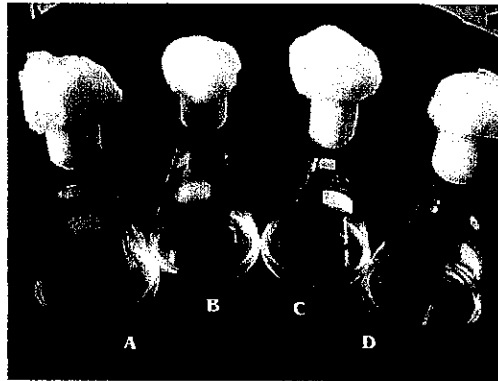
Gambar 10. Gambar pertumbuhan *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi 200 rpm dan penambahan magnesium sulfat yang berbeda pada waktu inkubasi 12 jam



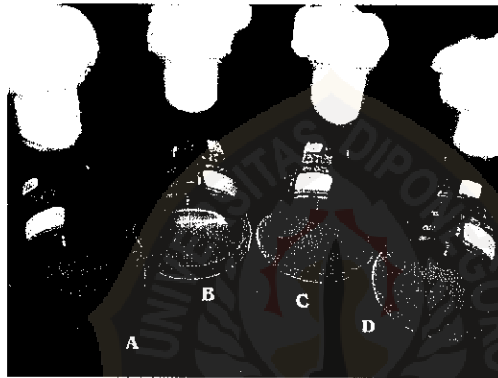
Gambar 11. Gambar pertumbuhan *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi 200 rpm dan penambahan magnesium sulfat yang berbeda pada waktu inkubasi 120 jam

Keterangan :

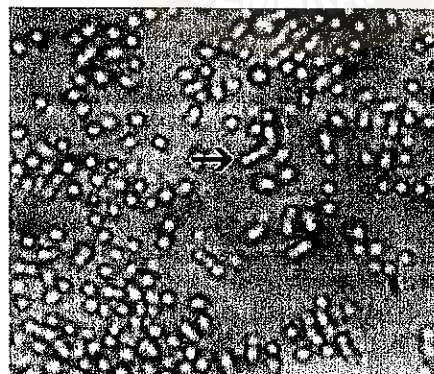
- A : Kontrol (tanpa penambahan magnesium sulfat)
- B : Penambahan magnesium sulfat 0,75 g/L
- C : Penambahan magnesium sulfat 1,00 g/L
- D : Penambahan magnesium sulfat 1,25 g/L



Gambar 12. Gambar pertumbuhan *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi 250 rpm dan penambahan magnesium sulfat yang berbeda pada waktu inkubasi 12 jam



Gambar 13. Gambar pertumbuhan *R. mucilaginosa* UICC Y-18 pada medium air kelapa dengan kecepatan agitasi 250 rpm dan penambahan magnesium sulfat yang berbeda pada waktu inkubasi 120 jam



Gambar 14. Gambar sel *R. mucilaginosa* UICC Y-18 yang ditumbuhkan pada medium air kelapa umur 120 jam (perbesaran mikroskop 1000 x). Tanda panah menunjukkan sel mengalami pembelahan dengan membentuk tunas ("budding")

