

## Lampiran 1

### PERNYATAAN KEASLIAN TULISAN

Saya yang bertanda tangan di bawah ini:

Nama : Koko Andi Irawan

NIM : 0910730053

Program Studi : Program Studi Ilmu Gizi Kesehatan

Fakultas Kedokteran Universitas Brawijaya,

menyatakan dengan sebenarnya bahwa Tugas Akhir yang saya tulis ini benar-benar hasil karya saya sendiri, bukan merupakan pengambilan tulisan atau pikiran orang lain yang saya akui sebagai tulisan atau pikiran saya sendiri. Apabila di kemudian hari dapat dibuktikan bahwa Tugas Akhir ini adalah jiplakan, maka saya bersedia menerima sanksi atas perbuatan tersebut.

Malang, Juli 2013

Yang membuat pernyataan,

Koko Andi Irawan  
NIM. 0910730053

## Lampiran 2 Rancangan Percobaan

Taraf Perlakuan	Replikasi					
(% Tepung tanah liat : % Tepung rumput laut)						
P0 (100: 0)	P0R1 A	P0R1 B	P0R2 A	P0R2 B	P0R3 A	P0R3 B
P1 (90 : 10)	P1R1 A	P1R1 B	P1R2 A	P1R2 B	P1R3 A	P1R3 B
P2 (80: 20)	P2R1 A	P2R1 B	P2R2 A	P2R2 B	P2R3 A	P2R3 B
P3 (70 : 30)	P3R1 A	P3R1 B	P3R2 A	P3R2 B	P3R3 A	P3R3 B

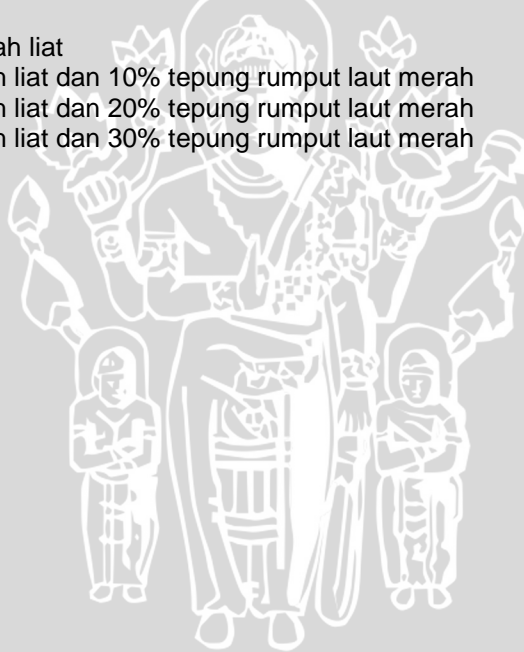
Keterangan:

P0: 100% tepung tanah liat

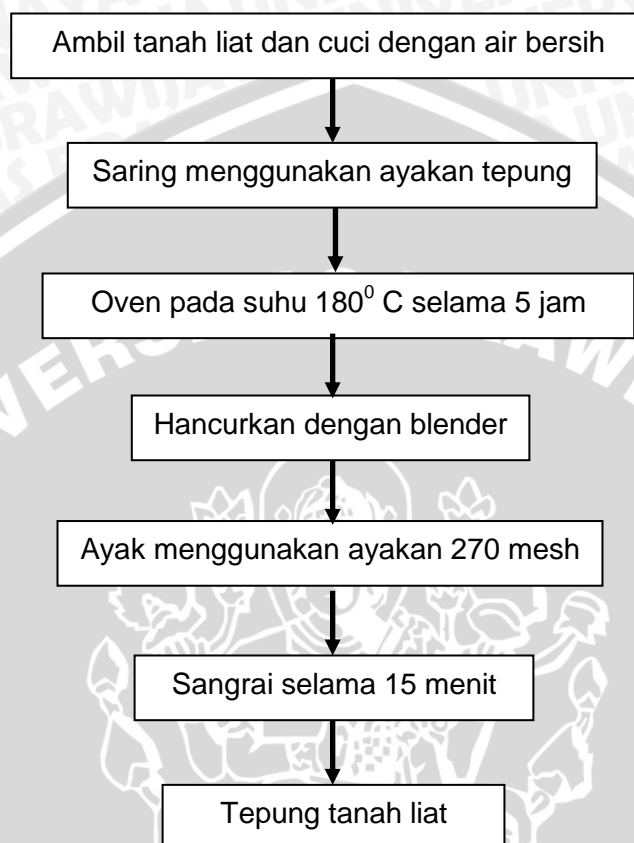
P1: 90% tepung tanah liat dan 10% tepung rumput laut merah

P2: 80% tepung tanah liat dan 20% tepung rumput laut merah

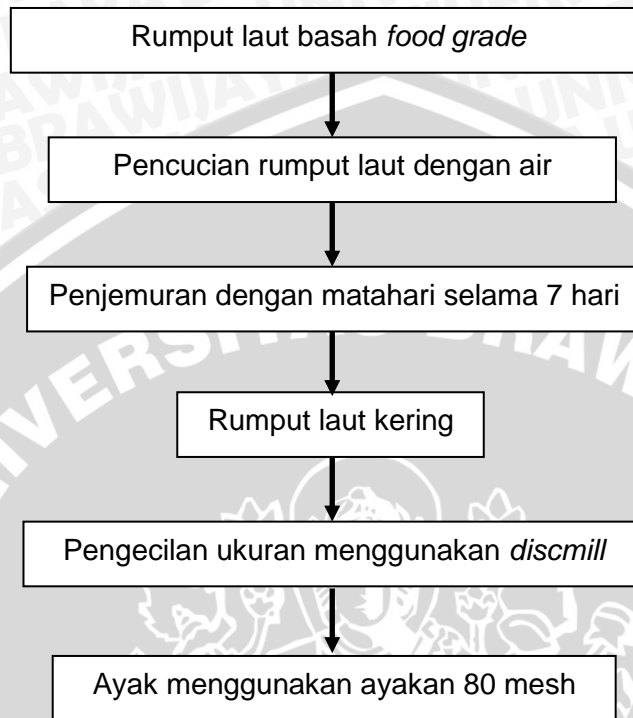
P3: 70% tepung tanah liat dan 30% tepung rumput laut merah



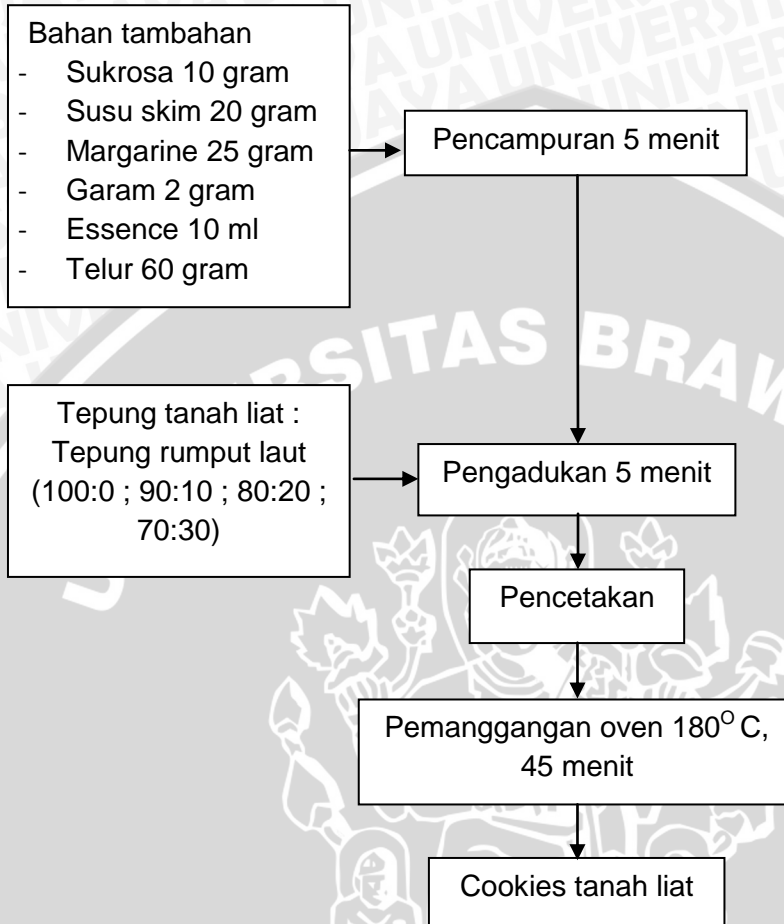
## Lampiran 3 Diagram Alur Pembuatan Tepung Tanah Liat



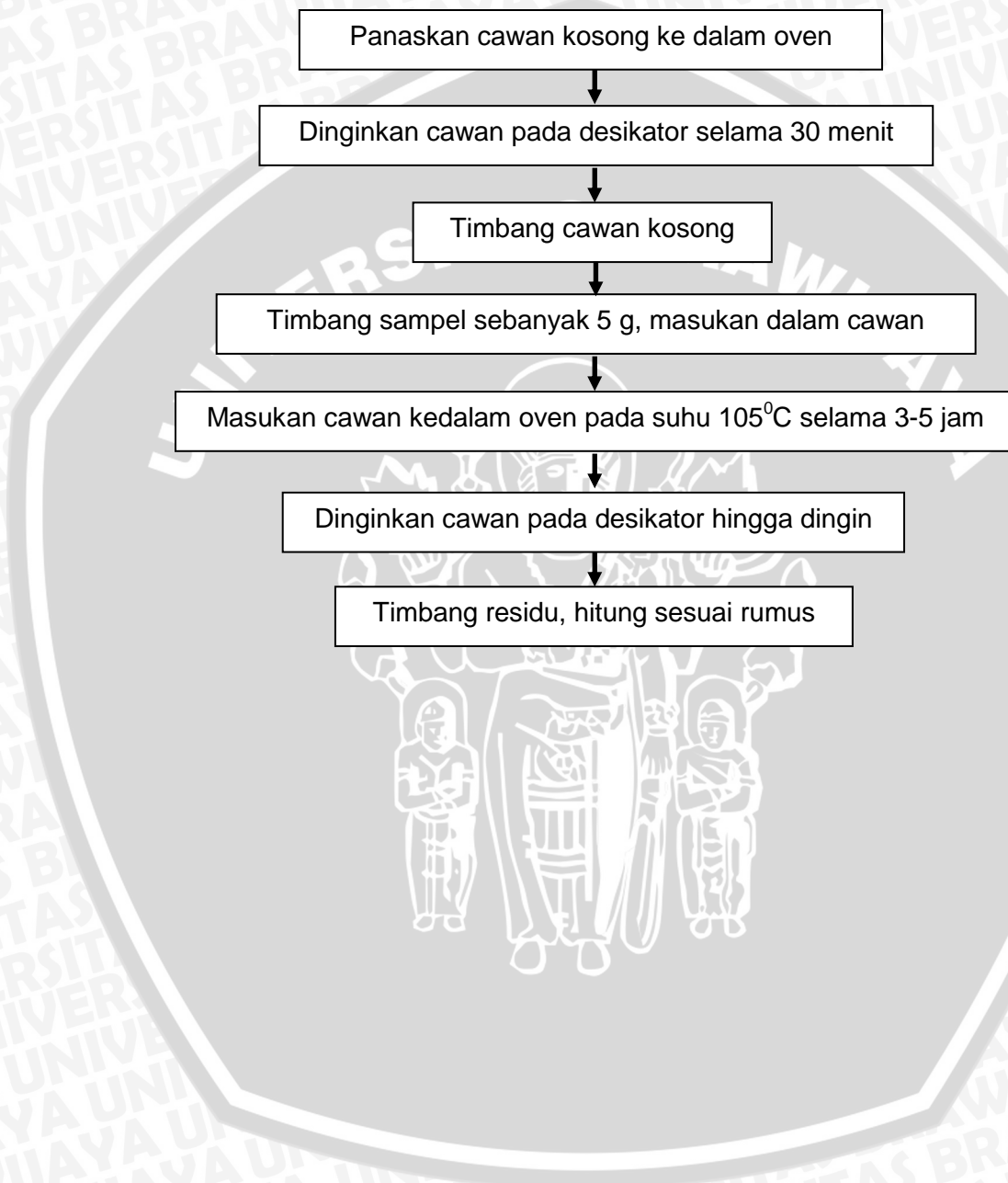
## Lampiran 4 Diagram Alur Pembuatan Tepung Rumput Laut



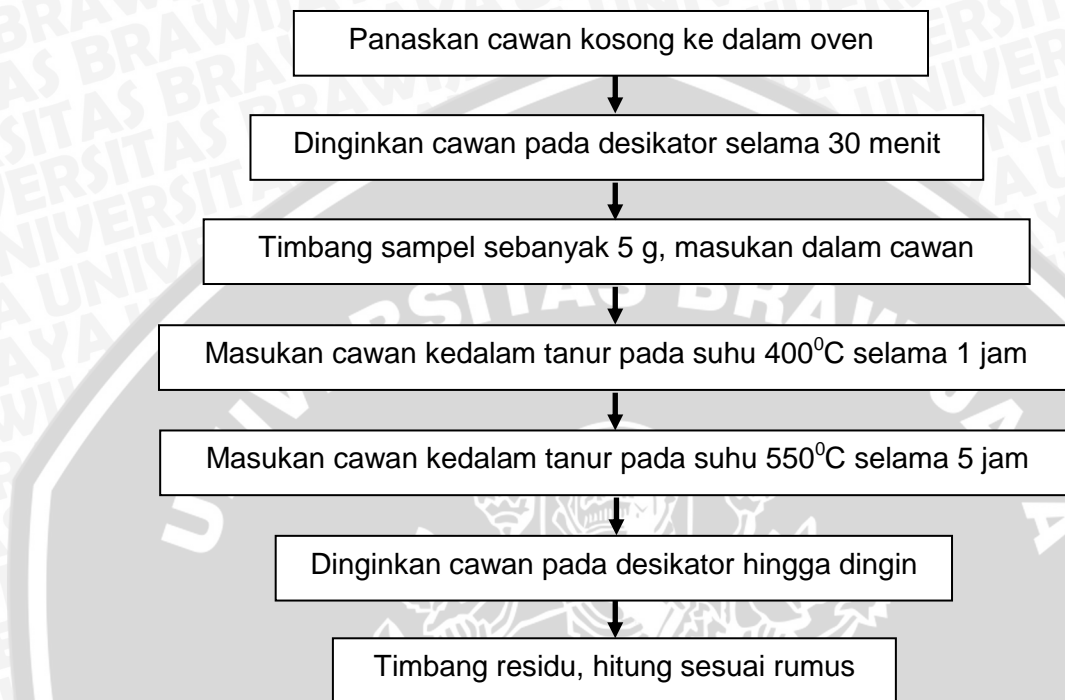
Lampiran 5 Diagram Alur Pembuatan Cookies

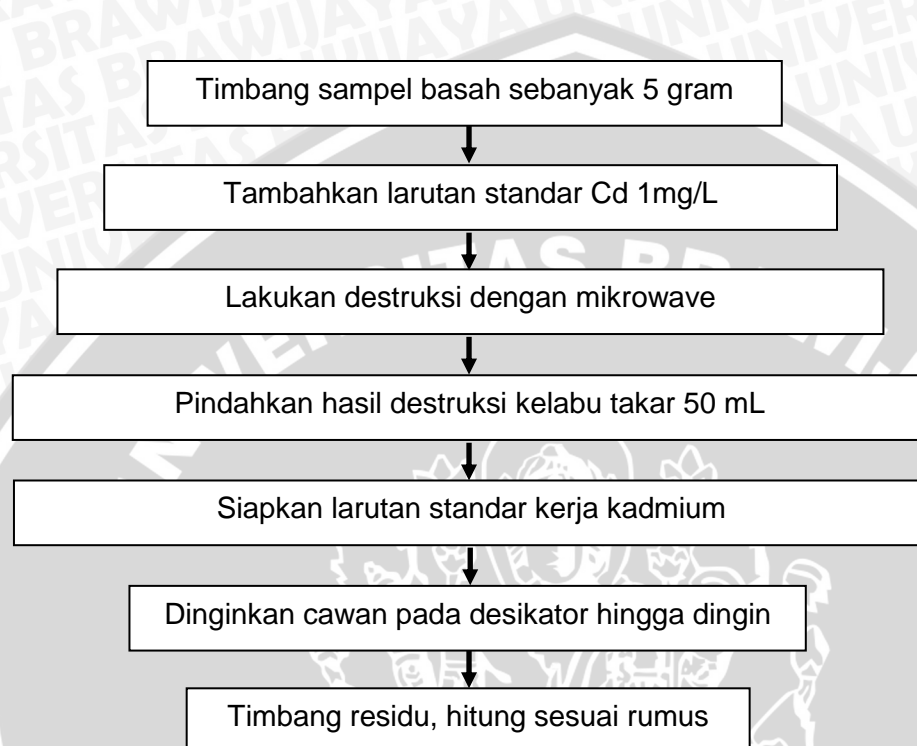


## Lampiran 6 Diagram Alur Analisis Kadar Air



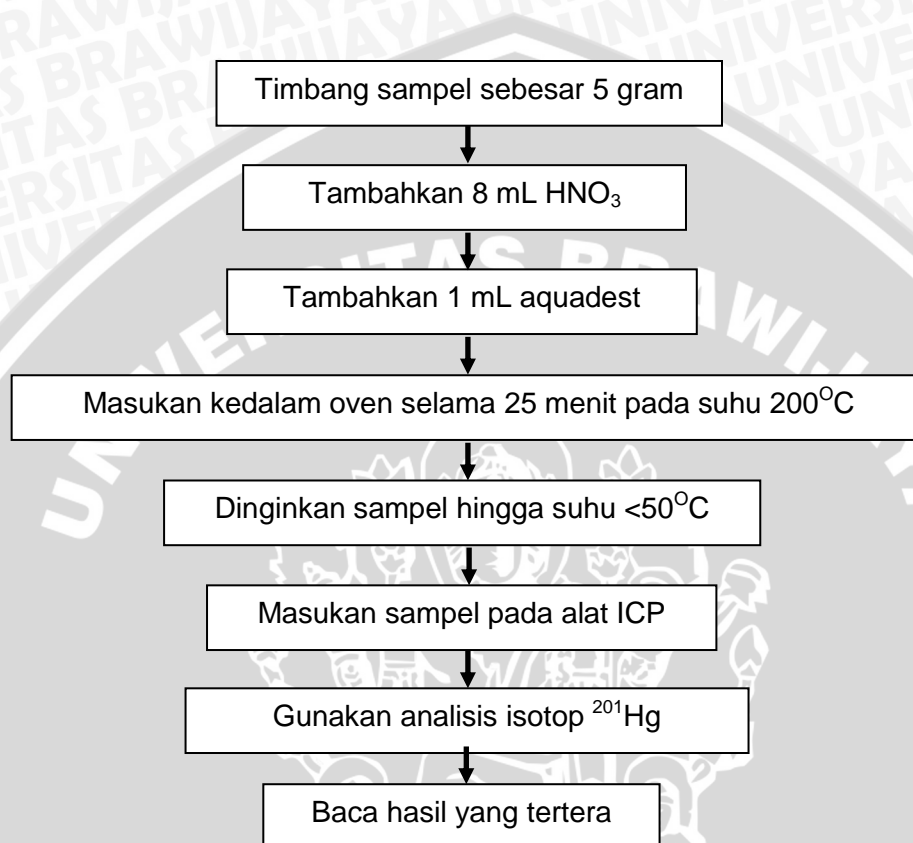
## Lampiran 7 Diagram Alur Analisis Kadar Abu



**Lampiran 8 Diagram Alur Analisis Kadar Kadmium**



## Lampiran 9 Diagram Alur Analisis Kadar Merkuri



## Lampiran 10 Hasil Analisis

### 1. Analisis Proksimat

Jenis Sampel (Sample Name)	No. Rujukan (Reference Number)	Jenis Uji (Analysis)	Hasil Analisa (Analysis Result)		Metode Analisis (Analysis Method)
			Nilai (Value)	Satuan (Unit)	
Cookies Tanah Liat P0 R1	214/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,34	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,15	%	
		Kadar Lemak	13,84	%	SNI 01-2891-1992 Butir 8.1
			13,88	%	
		Kadar Air	1,56	%	SNI 01-2891-1992 Butir 5.1
			1,38	%	
		Kadar Abu	56,25	%	SNI 01-2891-1992 Butir 6.1
			55,87	%	
Karbohidrat (by different)	20,01	%	Karbohidrat (by different)		
	20,72	%			
Serat Kasar	4,16	%	Gravimetri		
	3,98	%			
Cookies Tanah Liat P0 R2	215/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,14	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,39	%	
		Kadar Lemak	15,31	%	SNI 01-2891-1992 Butir 8.1
			15,11	%	
		Kadar Air	1,9	%	SNI 01-2891-1992 Butir 5.1
			1,91	%	
		Kadar Abu	54,58	%	SNI 01-2891-1992 Butir 6.1
			54,3	%	
Karbohidrat (by different)	20,07	%	Karbohidrat (by different)		
	20,29	%			
Serat Kasar	3,06	%	Gravimetri		
	3,44	%			
Cookies Tanah Liat P0 R3	216/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,5	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,55	%	
		Kadar Lemak	15,25	%	SNI 01-2891-1992 Butir 8.1
			14,97	%	
		Kadar Air	2,81	%	SNI 01-2891-1992 Butir 5.1
			2,9	%	
		Kadar Abu	53,54	%	SNI 01-2891-1992 Butir 6.1
			53,56	%	
Karbohidrat (by different)	19,9	%	Karbohidrat (by different)		
	20,02	%			
Serat Kasar	4,24	%	Gravimetri		
	3,28	%			

Cookies Tanah Liat P1 R1	217/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,97	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,92	%	
		Kadar Lemak	15,66	%	SNI 01-2891-1992 Butir 8.1
			15,47	%	
		Kadar Air	2,65	%	SNI 01-2891-1992 Butir 5.1
			2,64	%	
		Kadar Abu	49,06	%	SNI 01-2891-1992 Butir 6.1
			49,1	%	
Karbohidrat (by different)	23,66	%	Karbohidrat (by different)		
	23,87	%			
Serat Kasar	4,47	%	Gravimetri		
	4,55	%			
Cookies Tanah Liat P1 R2	218/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,41	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,39	%	
		Kadar Lemak	14,56	%	SNI 01-2891-1992 Butir 8.1
			14,55	%	
		Kadar Air	3,04	%	SNI 01-2891-1992 Butir 5.1
			3	%	
		Kadar Abu	49,31	%	SNI 01-2891-1992 Butir 6.1
			49,53	%	
Karbohidrat (by different)	24,68	%	Karbohidrat (by different)		
	24,53	%			
Serat Kasar	4,14	%	Gravimetri		
	4,16	%			
Cookies Tanah Liat P1 R3	219/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,28	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,32	%	
		Kadar Lemak	13,39	%	SNI 01-2891-1992 Butir 8.1
			13,47	%	
		Kadar Air	5,96	%	SNI 01-2891-1992 Butir 5.1
			6,06	%	
		Kadar Abu	48,36	%	SNI 01-2891-1992 Butir 6.1
			48,38	%	
Karbohidrat (by different)	24,01	%	Karbohidrat (by different)		
	23,77	%			
Serat Kasar	3,30	%	Gravimetri		
	4,10	%			

Cookies Tanah Liat P2 R1	220/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,86	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,89	%	
		Kadar Lemak	14,77	%	SNI 01-2891-1992 Butir 8.1
			14,78	%	
		Kadar Air	1,82	%	SNI 01-2891-1992 Butir 5.1
			1,62	%	
		Kadar Abu	44,81	%	SNI 01-2891-1992 Butir 6.1
			45,54	%	
Karbohidrat (by different)	29,74	%	Karbohidrat (by different)		
	29,17	%			
Serat Kasar	5,60	%	Gravimetri		
	6,01	%			
Cookies Tanah Liat P2 R2	221/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,94	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,8	%	
		Kadar Lemak	14,32	%	SNI 01-2891-1992 Butir 8.1
			14,52	%	
		Kadar Air	4,12	%	SNI 01-2891-1992 Butir 5.1
			4,16	%	
		Kadar Abu	43,66	%	SNI 01-2891-1992 Butir 6.1
			43,14	%	
Karbohidrat (by different)	28,96	%	Karbohidrat (by different)		
	29,38	%			
Serat Kasar	4,31	%	Gravimetri		
	4,39	%			
Cookies Tanah Liat P2 R3	222/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,81	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,71	%	
		Kadar Lemak	15,02	%	SNI 01-2891-1992 Butir 8.1
			15,04	%	
		Kadar Air	2,27	%	SNI 01-2891-1992 Butir 5.1
			2,31	%	
		Kadar Abu	44,91	%	SNI 01-2891-1992 Butir 6.1
			45,08	%	
Karbohidrat (by different)	28,99	%	Karbohidrat (by different)		
	28,86	%			
Serat Kasar	4,82	%	Gravimetri		
	4,65	%			

Cookies Tanah Liat P3 R1	223/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,49	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,48	%	
		Kadar Lemak	13,54	%	SNI 01-2891-1992 Butir 8.1
			13,75	%	
		Kadar Air	4,61	%	SNI 01-2891-1992 Butir 5.1
			4,51	%	
		Kadar Abu	40,53	%	SNI 01-2891-1992 Butir 6.1
			40,47	%	
Karbohidrat (by different)	32,83	%	Karbohidrat (by different)		
	32,79	%			
Serat Kasar	4,23	%	Gravimetri		
	4,74	%			
Cookies Tanah Liat P3 R2	224/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,83	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,73	%	
		Kadar Lemak	14,61	%	SNI 01-2891-1992 Butir 8.1
			14,57	%	
		Kadar Air	2,43	%	SNI 01-2891-1992 Butir 5.1
			2,53	%	
		Kadar Abu	41,12	%	SNI 01-2891-1992 Butir 6.1
			41,16	%	
Karbohidrat (by different)	33,01	%	Karbohidrat (by different)		
	33,01	%			
Serat Kasar	4,51	%	Gravimetri		
	5,11	%			
Cookies Tanah Liat P3 R3	225/S-UJ/LSIH-UB/III/2013	Kadar Protein	8,58	%	Inhouse method (IKP/1.0.4.03/LSIH)
			8,47	%	
		Kadar Lemak	14	%	SNI 01-2891-1992 Butir 8.1
			13,65	%	
		Kadar Air	5,83	%	SNI 01-2891-1992 Butir 5.1
			5,71	%	
		Kadar Abu	39,84	%	SNI 01-2891-1992 Butir 6.1
			39,83	%	
Karbohidrat (by different)	31,75	%	Karbohidrat (by different)		
	32,24	%			
Serat Kasar	4,48	%	Gravimetri		
	4,75	%			

2. Perhitungan Total Energi

Perlakuan	Pengujian	Karbohidrat (gram)	Lemak (gram) *	Protein (gram) **	Karbohidrat (kkal)	Lemak (kkal)	Protein (kkal)	Energi (kkal)
P0 R1	I	20.01	13.84	8.34	80.04	124.56	33.36	273.96
	II	20.72	13.88	8.15	82.88	124.92	32.6	240.4
P0 R2	I	20.07	15.31	8.14	80.28	137.79	32.56	250.63
	II	20.29	15.11	8.39	81.16	135.99	33.56	250.71
P0 R3	I	19.9	15.25	8.5	79.6	137.25	34	250.85
	II	20.02	14.97	8.55	80.08	134.73	34.2	249.01
P1 R1	I	23.66	15.66	8.97	94.64	140.94	35.88	271.46
	II	23.87	15.47	8.92	95.48	139.23	35.68	270.39
P1 R2	I	24.68	14.56	8.41	98.72	131.04	33.64	263.4
	II	24.53	14.55	8.39	98.12	130.95	33.56	262.63
P1 R3	I	24.01	13.39	8.28	96.04	120.51	33.12	249.67
	II	23.77	13.47	8.32	95.08	121.23	33.28	249.59
P2 R1	I	29.74	14.77	8.86	118.96	132.93	35.44	287.33
	II	29.17	14.78	8.89	116.68	133.02	35.56	285.26
P2 R2	I	28.96	14.32	8.94	115.84	128.88	35.76	280.48
	II	29.38	14.52	8.8	117.52	130.68	35.2	283.4
P2 R3	I	28.99	15.02	8.81	115.96	135.18	35.24	286.38
	II	28.86	15.04	8.71	115.44	135.36	34.84	285.64
P3 R1	I	32.83	13.54	8.49	131.32	121.86	33.96	287.14
	II	32.79	13.75	8.48	131.16	123.75	33.92	288.83
P3 R2	I	33.01	14.61	8.83	132.04	131.49	35.32	298.85
	II	33.01	14.57	8.73	132.04	131.13	34.92	298.09
P3 R3	I	31.75	14	8.58	127	126	34.32	287.32
	II	32.34	13.65	8.47	129.36	122.85	33.88	286.09

\*) Hasil penelitian Bagus Dermawan

\*\*\*) Hasil penelitian Khunto Ajie Wijoyo

## 3. Hasil Analisis Logam Kadmium

No	Kode Sampel	Parameter	Hasil Analisa		Metode Analisis	
			Kadar	Satuan	Pereaksi	Metode
1	P0 R1	Kadmium	1,45	mg/kg	HNO <sub>3</sub>	AAS
			1,41	mg/kg		
2	P0 R2	Kadmium	2,12	mg/kg	HNO <sub>3</sub>	AAS
			2,16	mg/kg		
3	P0 R3	Kadmium	2,59	mg/kg	HNO <sub>3</sub>	AAS
			2,62	mg/kg		
4	P1 R1	Kadmium	1,13	mg/kg	HNO <sub>3</sub>	AAS
			1,26	mg/kg		
5	P1 R2	Kadmium	2,94	mg/kg	HNO <sub>3</sub>	AAS
			3,01	mg/kg		
6	P1 R3	Kadmium	2,77	mg/kg	HNO <sub>3</sub>	AAS
			2,73	mg/kg		
7	P2 R1	Kadmium	3,14	mg/kg	HNO <sub>3</sub>	AAS
			3,09	mg/kg		
8	P2 R2	Kadmium	3,05	mg/kg	HNO <sub>3</sub>	AAS
			3,11	mg/kg		
9	P2 R3	Kadmium	2,84	mg/kg	HNO <sub>3</sub>	AAS
			2,77	mg/kg		
10	P3 R1	Kadmium	2,84	mg/kg	HNO <sub>3</sub>	AAS
			2,77	mg/kg		
11	P3 R2	Kadmium	2,27	mg/kg	HNO <sub>3</sub>	AAS
			2,32	mg/kg		
12	P3 R3	Kadmium	1,23	mg/kg	HNO <sub>3</sub>	AAS
			1,30	mg/kg		



## 4. Hasil Analisis Kadar Merkuri



**KEMENTERIAN PENDIDIKAN DAN KEBUDAYAAN**  
**INSTITUT TEKNOLOGI SEPULUH NOPEMBER**  
**FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM**  
**JURUSAN KIMIA**  
 Kampus ITS Sukolilo, Surabaya 60111  
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Kepada Yth :  
 KOKO ANDI IRAWAN  
 Kejapanan No 28 Gempol - Pasuruan

<b>LAPORAN ANALISIS</b> Subyek : Tanah liat	No	: 577/IT2.1.1.4/PM.05.02/2013
	Tanggal	: 28 Agustus 2013
	Metode	: ---
	Diteliti Oleh	: Fatati K
Tanggal diterima sampel : 14 Agustus 2013		

No	Parameter Uji	Hasil Analisa	Metode
1	Merkuri (Hg)	Tidak Terdeteksi	Spektrofotometer

## Catatan :

- Hasil analisis ini mengacu pada sampel yang diterima laboratorium Kimia ITS dan tidak dapat digunakan sebagai alat bukti hukum
- Pengambilan sampel tidak dilakukan oleh Laboratorium Kimia ITS

Hormat Kami,  
  
 Hamzah Fansuri, Ph. D.  
 Ketua





**Lampiran 11 Hasil Uji Statistik**

**1. Kadar Air**

**Tests of Normality**

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
KADAR_AIR	.135	24	.200*	.945	24	.206

a. Lilliefors Significance Correction

\*. This is a lower bound of the true significance.

**Test of Homogeneity of Variance**

		Levene Statistic	df1	df2	Sig.
KADAR_AIR	Based on Mean	.396	3	20	.757
	Based on Median	.470	3	20	.706
	Based on Median and with adjusted df	.470	3	19.355	.706
	Based on trimmed mean	.397	3	20	.757

**ANOVA**

KADAR_AIR					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.356	3	.119	4.485	.015
Within Groups	.530	20	.026		
Total	.886	23			



**Multiple Comparisons**

KADAR\_AIR

Tukey HSD

(I)	(J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
P0	P1	-.25978	.09395	.054	-.5227	.0032
	P2	-.10322	.09395	.694	-.3662	.1597
	P3	-.30417*	.09395	.020	-.5671	-.0412
P1	P0	.25978	.09395	.054	-.0032	.5227
	P2	.15656	.09395	.367	-.1064	.4195
	P3	-.04439	.09395	.964	-.3074	.2186
P2	P0	.10322	.09395	.694	-.1597	.3662
	P1	-.15656	.09395	.367	-.4195	.1064
	P3	-.20095	.09395	.175	-.4639	.0620
P3	P0	.30417*	.09395	.020	.0412	.5671
	P1	.04439	.09395	.964	-.2186	.3074
	P2	.20095	.09395	.175	-.0620	.4639

\*. The mean difference is significant at the 0.05 level.

**2. Kadar Abu**

**Tests of Normality**

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Kadar_abu	.129	24	.200*	.923	24	.069

a. Lilliefors Significance Correction

\*. This is a lower bound of the true significance.



## Test of Homogeneity of Variance

	Levene Statistic	df1	df2	Sig.
Kadar_abu Based on Mean	2.369	3	20	.101
Based on Median	1.174	3	20	.345
Based on Median and with adjusted df	1.174	3	14.206	.354
Based on trimmed mean	2.187	3	20	.121

## ANOVA

Kadar_abu	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	667.483	3	222.494	324.746	.000
Within Groups	13.703	20	.685		
Total	681.186	23			

## Multiple Comparisons

Kadar\_abu  
Tukey HSD

(I) Perlakuan	(J) Perlakuan	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
P0	P1	5.72667*	.47789	.000	4.3891	7.0642
	P2	10.16000*	.47789	.000	8.8224	11.4976
	P3	14.19167*	.47789	.000	12.8541	15.5292
P1	P0	-5.72667*	.47789	.000	-7.0642	-4.3891
	P2	4.43333*	.47789	.000	3.0958	5.7709
	P3	8.46500*	.47789	.000	7.1274	9.8026
P2	P0	-10.16000*	.47789	.000	-11.4976	-8.8224
	P1	-4.43333*	.47789	.000	-5.7709	-3.0958
	P3	4.03167*	.47789	.000	2.6941	5.3692
P3	P0	-14.19167*	.47789	.000	-15.5292	-12.8541
	P1	-8.46500*	.47789	.000	-9.8026	-7.1274
	P2	-4.03167*	.47789	.000	-5.3692	-2.6941

\*. The mean difference is significant at the 0.05 level.

### 3. Karbohidrat

**Kruskal-Wallis Test Ranks**

	Perlakuan	N	Mean Rank
Karbohidrat	P0	6	3.50
	P1	6	9.50
	P2	6	15.50
	P3	6	21.50
	Total	24	

**Test Statistics<sup>a,b</sup>**

	Karbohidrat
Chi-Square	21.609
df	3
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Karbohidrat	P0	6	3.50	21.00
	P1	6	9.50	57.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Karbohidrat
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Karbohidrat	P0	6	3.50	21.00
	P2	6	9.50	57.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Karbohidrat
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Karbohidrat	P0	6	3.50	21.00
	P3	6	9.50	57.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Karbohidrat
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan



**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Karbohidrat	P1	6	3.50	21.00
	P2	6	9.50	57.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Karbohidrat
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Karbohidrat	P1	6	3.50	21.00
	P3	6	9.50	57.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Karbohidrat
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.887
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan



**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Karbohidrat	P2	6	3.50	21.00
	P3	6	9.50	57.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Karbohidrat
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.887
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**4. Energi**

**Kruskal-Wallis Test Ranks**

	Perlakuan	N	Mean Rank
Energi	P0	6	5.50
	P1	6	7.50
	P2	6	16.17
	P3	6	20.83
	Total	24	

**Test Statistics<sup>a,b</sup>**

	Energi
Chi-Square	18.827
df	3
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: Perlakuan



**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Energi	P0	6	5.50	33.00
	P1	6	7.50	45.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Energi
Mann-Whitney U	12.000
Wilcoxon W	33.000
Z	-.961
Asymp. Sig. (2-tailed)	.337
Exact Sig. [2*(1-tailed Sig.)]	.394 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Energi	P0	6	3.50	21.00
	P2	6	9.50	57.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Energi
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan





**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Energi	P0	6	3.50	21.00
	P3	6	9.50	57.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Energi
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Energi	P1	6	3.50	21.00
	P2	6	9.50	57.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Energi
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan



**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Energi	P1	6	3.50	21.00
	P3	6	9.50	57.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Energi
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Energi	P2	6	4.17	25.00
	P3	6	8.83	53.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Energi
Mann-Whitney U	4.000
Wilcoxon W	25.000
Z	-2.242
Asymp. Sig. (2-tailed)	.025
Exact Sig. [2*(1-tailed Sig.)]	.026 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan



5. Merkuri

**Kruskal-Wallis Test Ranks**

	Perlakuan	N	Mean Rank
Merkuri	P0	6	12.50
	P1	6	19.17
	P2	6	13.17
	P3	6	5.17
	Total	24	

**Test Statistics<sup>a,b</sup>**

	Merkuri
Chi-Square	11.840
df	3
Asymp. Sig.	.008

a. Kruskal Wallis Test

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Merkuri	P0	6	4.17	25.00
	P1	6	8.83	53.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Merkuri
Mann-Whitney U	4.000
Wilcoxon W	25.000
Z	-2.242
Asymp. Sig. (2-tailed)	.025
Exact Sig. [2*(1-tailed Sig.)]	.026 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Merkuri	P0	6	6.17	37.00
	P2	6	6.83	41.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Merkuri
Mann-Whitney U	16.000
Wilcoxon W	37.000
Z	-.320
Asymp. Sig. (2-tailed)	.749
Exact Sig. [2*(1-tailed Sig.)]	.818 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Merkuri	P0	6	9.17	55.00
	P3	6	3.83	23.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Merkuri
Mann-Whitney U	2.000
Wilcoxon W	23.000
Z	-2.562
Asymp. Sig. (2-tailed)	.010
Exact Sig. [2*(1-tailed Sig.)]	.009 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan



**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Merkuri	P1	6	7.83	47.00
	P2	6	5.17	31.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Merkuri
Mann-Whitney U	10.000
Wilcoxon W	31.000
Z	-1.281
Asymp. Sig. (2-tailed)	.200
Exact Sig. [2*(1-tailed Sig.)]	.240 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Merkuri	P1	6	9.50	57.00
	P3	6	3.50	21.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Merkuri
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan



**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Merkuri	P2	6	8.17	49.00
	P3	6	4.83	29.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Merkuri
Mann-Whitney U	8.000
Wilcoxon W	29.000
Z	-1.601
Asymp. Sig. (2-tailed)	.109
Exact Sig. [2*(1-tailed Sig.)]	.132 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**6. Kadmium**

**Kruskal-Wallis Test Ranks**

	Perlakuan	N	Mean Rank
Kadmium	P0	6	8.17
	P1	6	12.00
	P2	6	20.42
	P3	6	9.42
	Total	24	

**Test Statistics<sup>a,b</sup>**

	Kadmium
Chi-Square	10.950
df	3
Asymp. Sig.	.012

a. Kruskal Wallis Test

b. Grouping Variable: Perlakuan



**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Kadmium	P0	6	5.50	33.00
	P1	6	7.50	45.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Kadmium
Mann-Whitney U	12.000
Wilcoxon W	33.000
Z	-.961
Asymp. Sig. (2-tailed)	.337
Exact Sig. [2*(1-tailed Sig.)]	.394 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Kadmium	P0	6	3.50	21.00
	P2	6	9.50	57.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Kadmium
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan



**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Kadmium	P0	6	6.17	37.00
	P3	6	6.83	41.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Kadmium
Mann-Whitney U	16.000
Wilcoxon W	37.000
Z	-.320
Asymp. Sig. (2-tailed)	.749
Exact Sig. [2*(1-tailed Sig.)]	.818 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Kadmium	P1	6	4.33	26.00
	P2	6	8.67	52.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Kadmium
Mann-Whitney U	5.000
Wilcoxon W	26.000
Z	-2.082
Asymp. Sig. (2-tailed)	.037
Exact Sig. [2*(1-tailed Sig.)]	.041 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan





**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Kadmium	P1	6	7.17	43.00
	P3	6	5.83	35.00
	Total	12		

**Test Statistics<sup>b</sup>**

	Kadmium
Mann-Whitney U	14.000
Wilcoxon W	35.000
Z	-.641
Asymp. Sig. (2-tailed)	.522
Exact Sig. [2*(1-tailed Sig.)]	.589 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan

**Mann-Whitney Test Ranks**

	Perlakuan	N	Mean Rank	Sum of Ranks
Kadmium	P2	6	9.25	55.50
	P3	6	3.75	22.50
	Total	12		

**Test Statistics<sup>b</sup>**

	Kadmium
Mann-Whitney U	1.500
Wilcoxon W	22.500
Z	-2.647
Asymp. Sig. (2-tailed)	.008
Exact Sig. [2*(1-tailed Sig.)]	.004 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Perlakuan



7. Analisis Uji Korelasi

Correlations

			Merkuri	Perlakuan
Spearman's rho	Merkuri	Correlation Coefficient	1.000	-.452*
		Sig. (2-tailed)	.	.027
		N	24	24
	Perlakuan	Correlation Coefficient	-.452*	1.000
		Sig. (2-tailed)	.027	.
		N	24	24

\*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

			Perlakuan	Kadar_air
Spearman's rho	Perlakuan	Correlation Coefficient	1.000	.366
		Sig. (2-tailed)	.	.079
		N	24	24
	Kadar_air	Correlation Coefficient	.366	1.000
		Sig. (2-tailed)	.079	.
		N	24	24

Correlations

			Perlakuan	Kadar_abu
Spearman's rho	Perlakuan	Correlation Coefficient	1.000	-.969**
		Sig. (2-tailed)	.	.000
		N	24	24
	Kadar_abu	Correlation Coefficient	-.969**	1.000
		Sig. (2-tailed)	.000	.
		N	24	24

\*\* . Correlation is significant at the 0.01 level (2-tailed).



**Correlations**

			Perlakuan	Kadmium
Spearman's rho	Perlakuan	Correlation Coefficient	1.000	.197
		Sig. (2-tailed)	.	.357
		N	24	24
	Kadmium	Correlation Coefficient	.197	1.000
		Sig. (2-tailed)	.357	.
		N	24	24

**Correlations**

			Perlakuan	Energi
Spearman's rho	Perlakuan	Correlation Coefficient	1.000	.883**
		Sig. (2-tailed)	.	.000
		N	24	24
	Energi	Correlation Coefficient	.883**	1.000
		Sig. (2-tailed)	.000	.
		N	24	24

\*\* . Correlation is significant at the 0.01 level (2-tailed).

**Correlations**

			Perlakuan	Karbohidrat
Spearman's rho	Perlakuan	Correlation Coefficient	1.000	.969**
		Sig. (2-tailed)	.	.000
		N	24	24
	Karbohidrat	Correlation Coefficient	.969**	1.000
		Sig. (2-tailed)	.000	.
		N	24	24

\*\* . Correlation is significant at the 0.01 level (2-tailed).



## Lampiran 12 Hasil Uji Taksonomi Rumput Laut



LABORATORIUM TAKSONOMI, STRUKTUR DAN  
PERKEMBANGAN TUMBUHAN  
JURUSAN BIOLOGI, FAKULTAS MIPA  
UNIVERSITAS BRAWIJAYA  
JALAN VETERAN, MALANG 65145  
Telepon/faks: 0341-575841

## KETERANGAN IDENTIFIKASI

No. 0076/Takso.Identifikasi/03/2013

Kepala Laboratorium Taksonomi, Struktur dan Perkembangan Tumbuhan, Jurusan Biologi, Fakultas MIPA, Universitas Brawijaya, menerangkan bahwa spesimen yang dibawa oleh:

Nama : Khunto Ajie Wijoyo (NIM. 0910733027)  
Instansi : Gizi, Fakultas Kedokteran, Universitas Brawijaya

Berdasarkan deskripsi karakter dan kunci identifikasi pada Plant Resource of South East Asia. 15. Cryptogams: Algae. Prosea Foundation Bogor (W.F.P. von Reine & G.C. Trono, tahun 2002), halaman 150-153 diidentifikasi sebagai:

**Familia** : Solieraceae  
**Genus** : *Eucheuma*  
**Species** : *Eucheuma cottonii*

Demikian surat keterangan identifikasi ini dibuat untuk digunakan seperlunya.

Malang, 4 Maret 2013

Kepala Laboratorium  
Taksonomi, Struktur dan  
Perkembangan Tumbuhan,

LABORATORIUM  
TAKSONOMI, STRUKTUR DAN  
PERKEMBANGAN TUMBUHAN

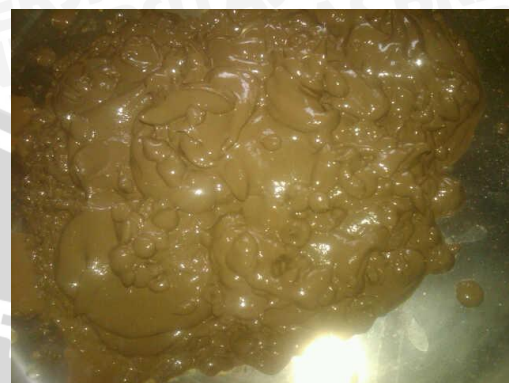
Dr. Serafinah Indriyani, M.Si.  
NIP. 19630909 198802 2 001



### Lampiran 13 Dokumentasi Penelitian



Gambar 1 Rumput Laut Merah



Gambar 2 Tanah Liat



Gambar 3 Suasana Di Laboratorium



Gambar 4 Menimbang Bahan





Gambar 5 Cookies P0



Gambar 6 Cookies P1



Gambar 7 Cookies P2



Gambar 8 Cookies P3

