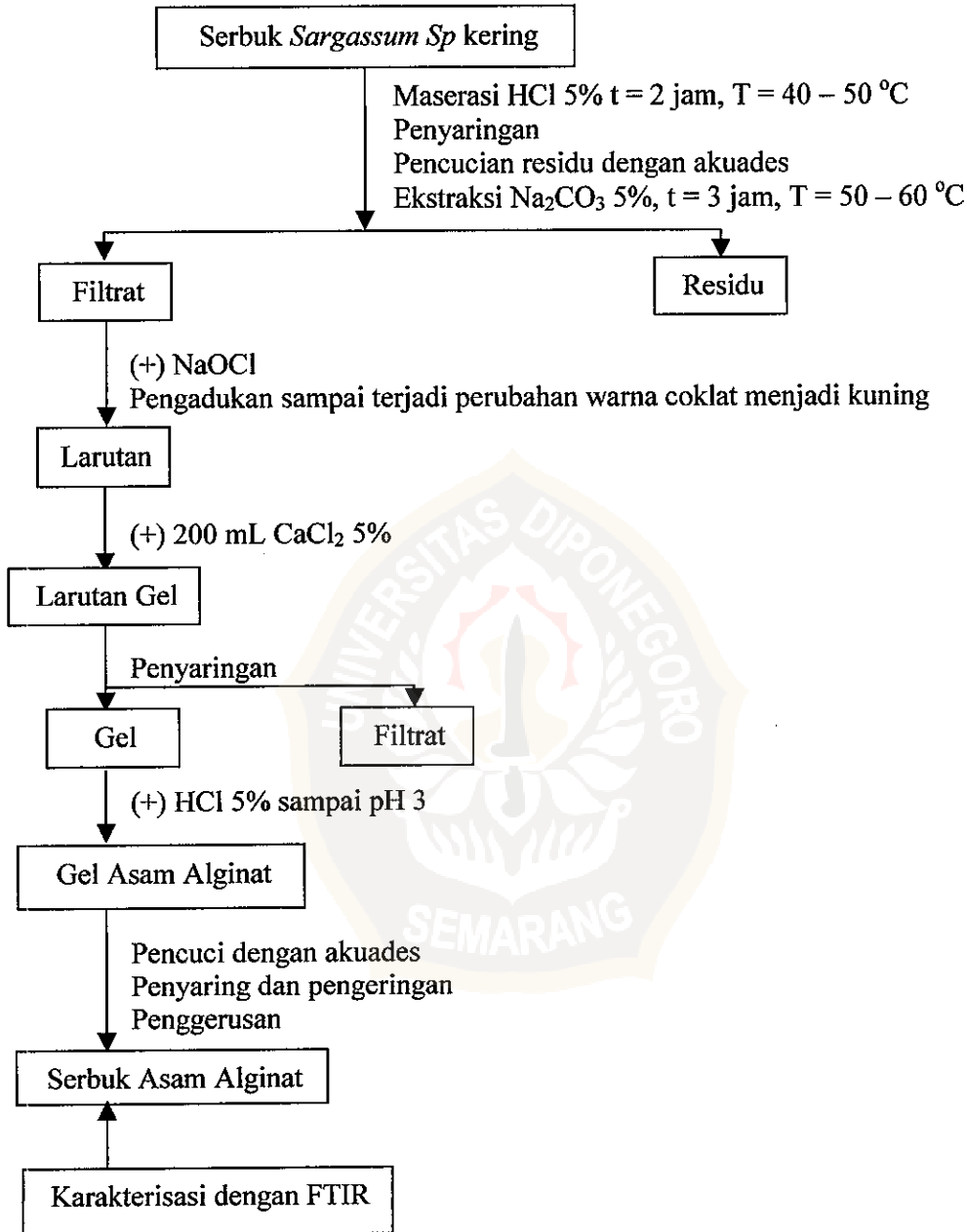


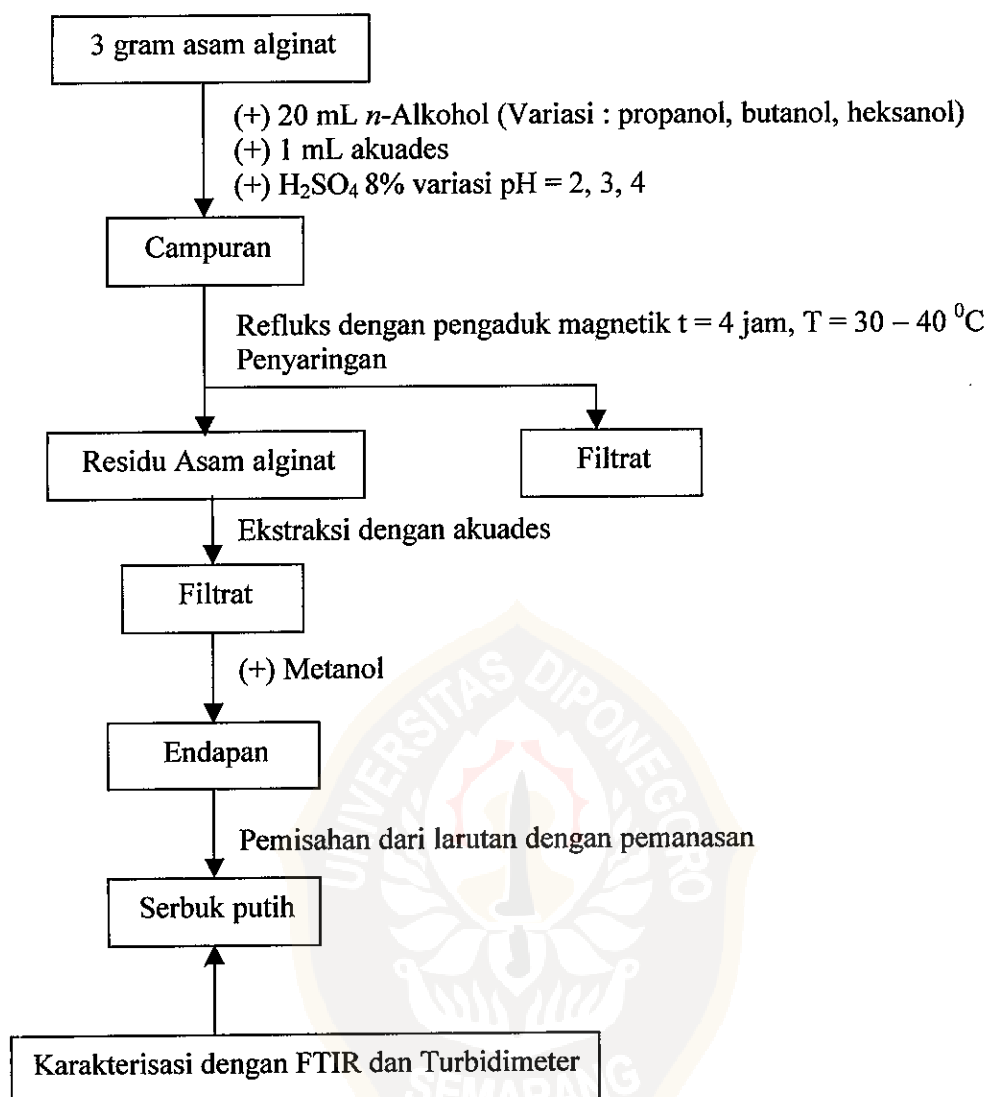
## Lampiran A

### Diagram Kerja

#### Isolasi Asam Alginat

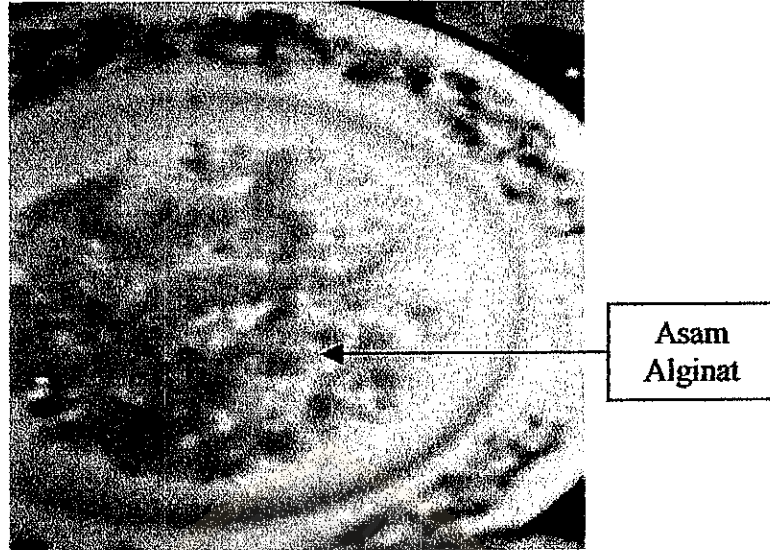


### Sintesis Ester Alginat

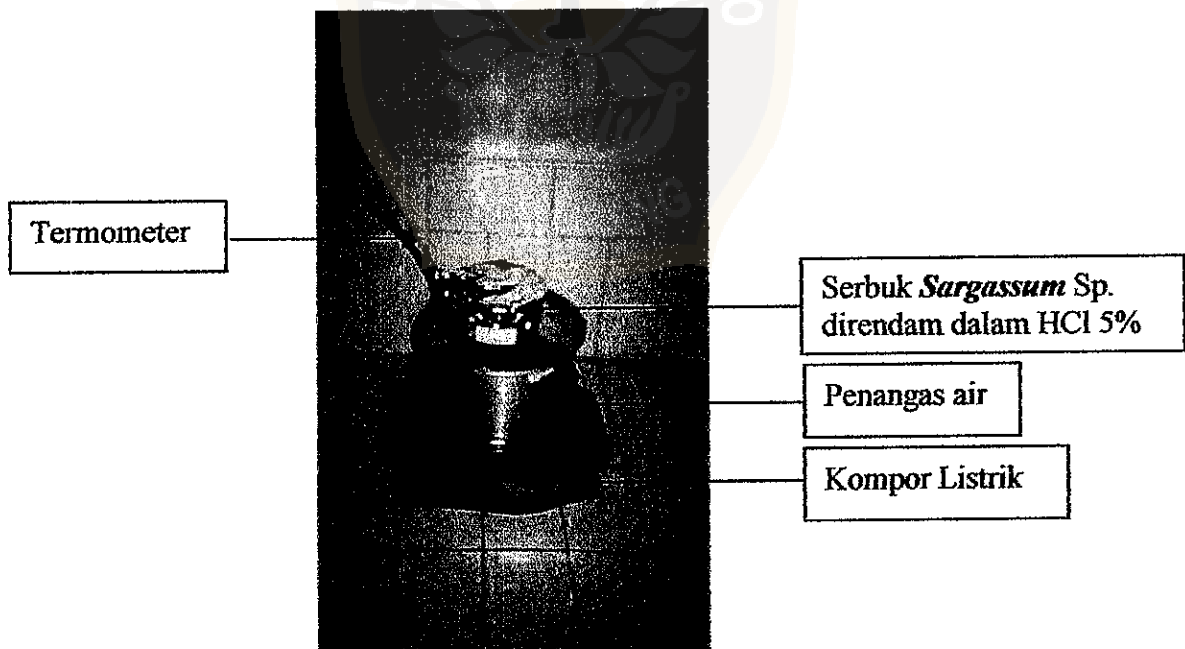


**Lampiran B**

**Gambar Hasil Penelitian**



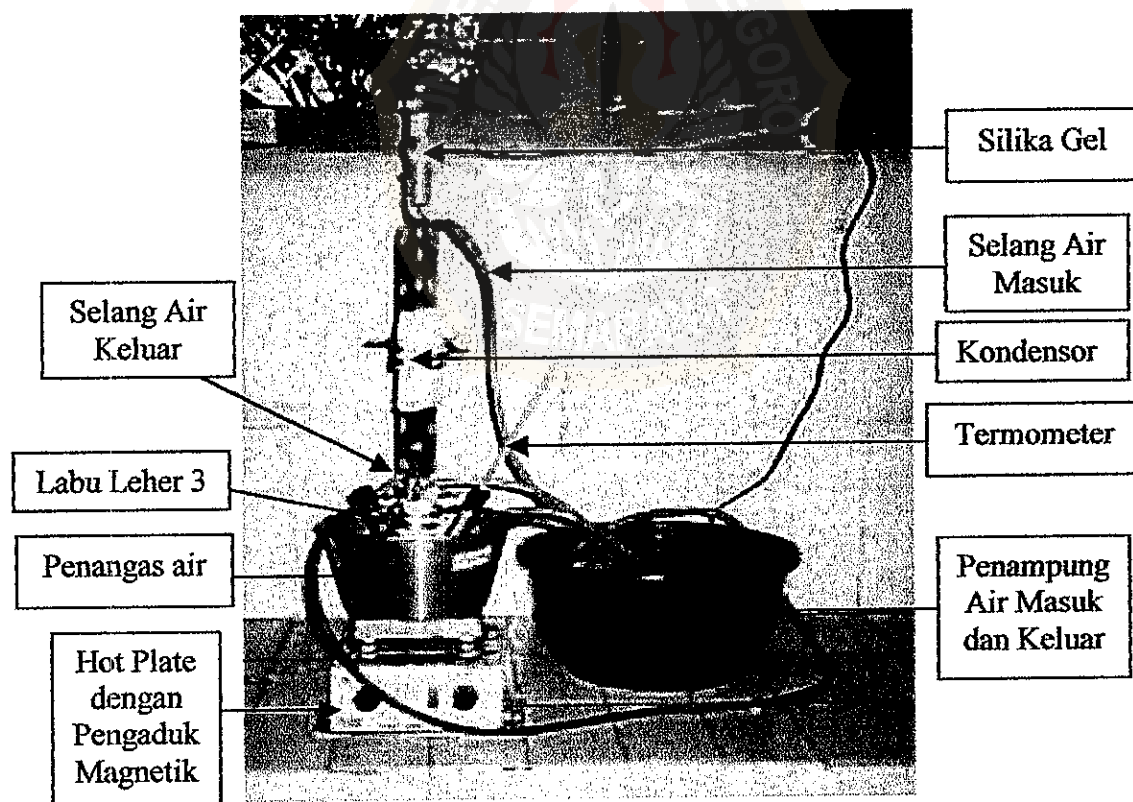
**Gambar 1. Asam Alginat Hasil Isolasi dari *Sargassum* Sp.**



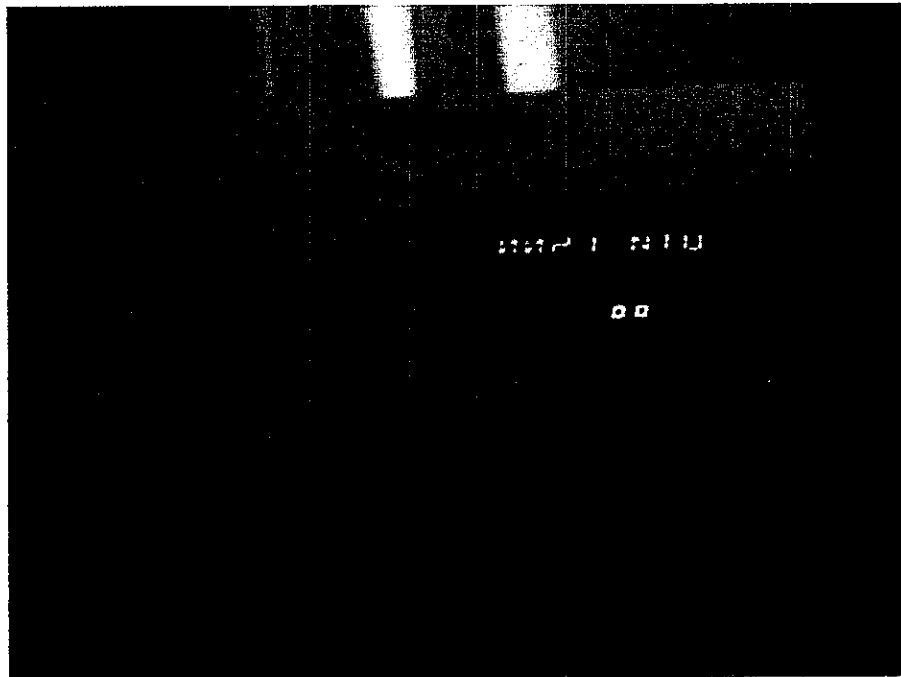
**Gambar 2. Maserasi *Sargassum* Sp. dengan HCl 5%**



**Gambar 3. Spektrofotometer Shimadzu FTIR - 8201PC**



**Gambar 4. Refluks Asam Alginat dengan *n*-Alkohol**



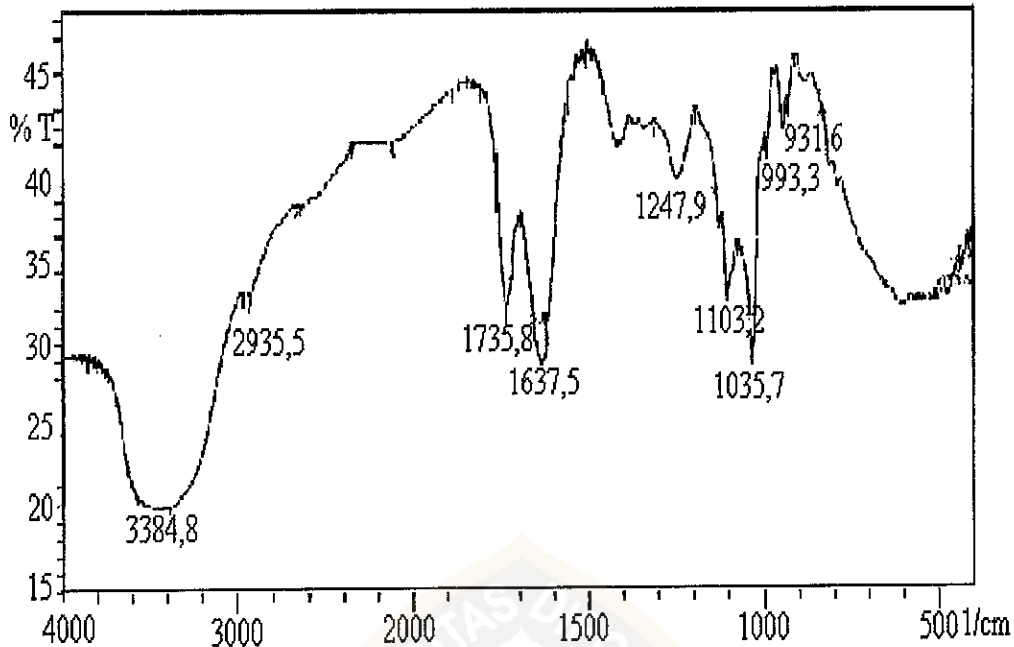
**Gambar 5. Turbidimeter Hach 2100AN**



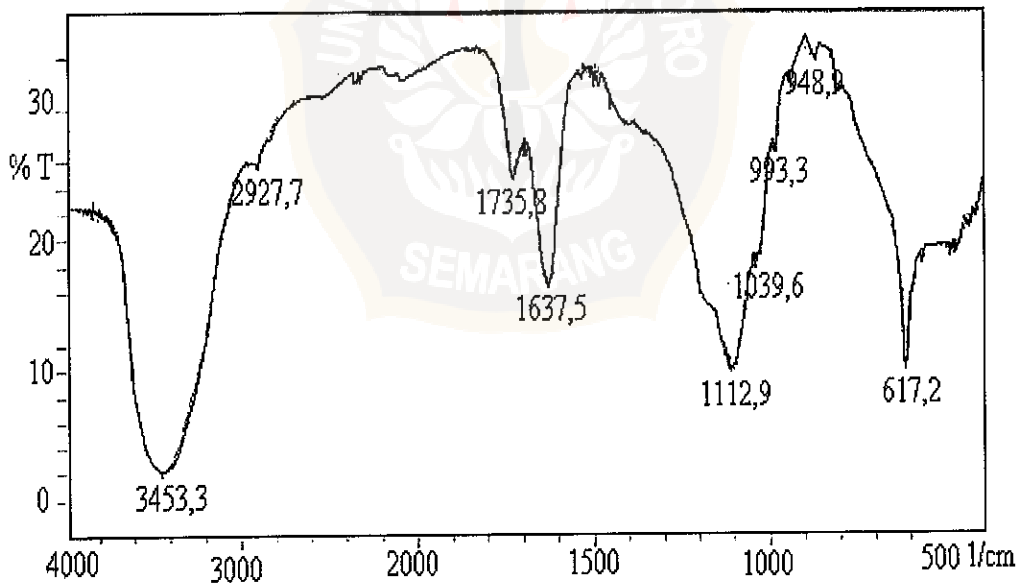
**Gambar 6. Larutan Hasil Esterifikasi Alginat dengan *n*-Alkohol yang Diuji Kekeruhannya**

## Lampiran C

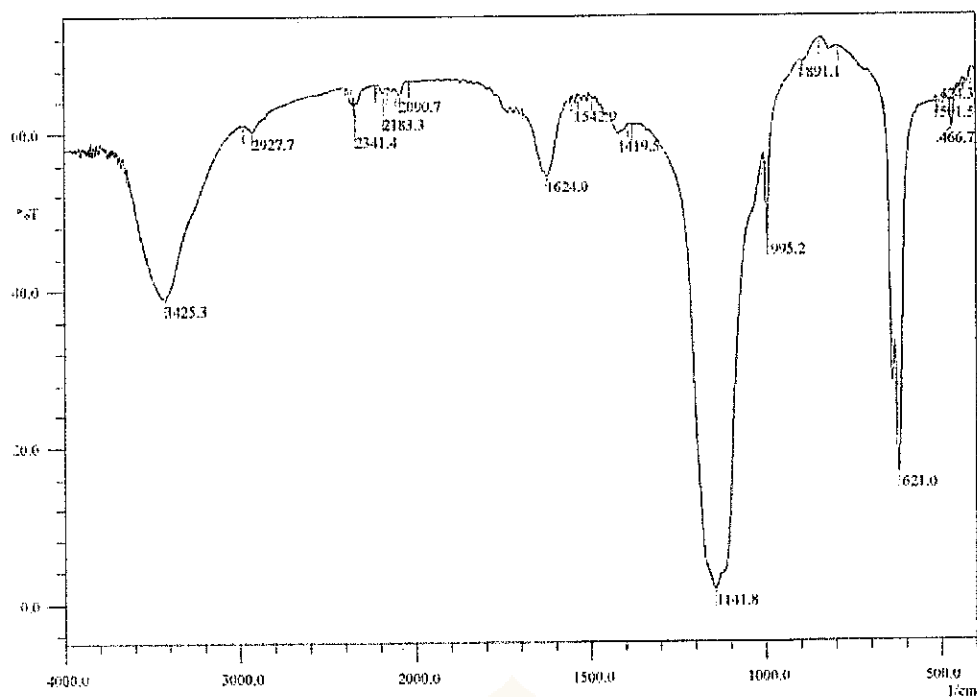
### Spektra Asam Alginat dan Spektra Hasil Ester Alginat



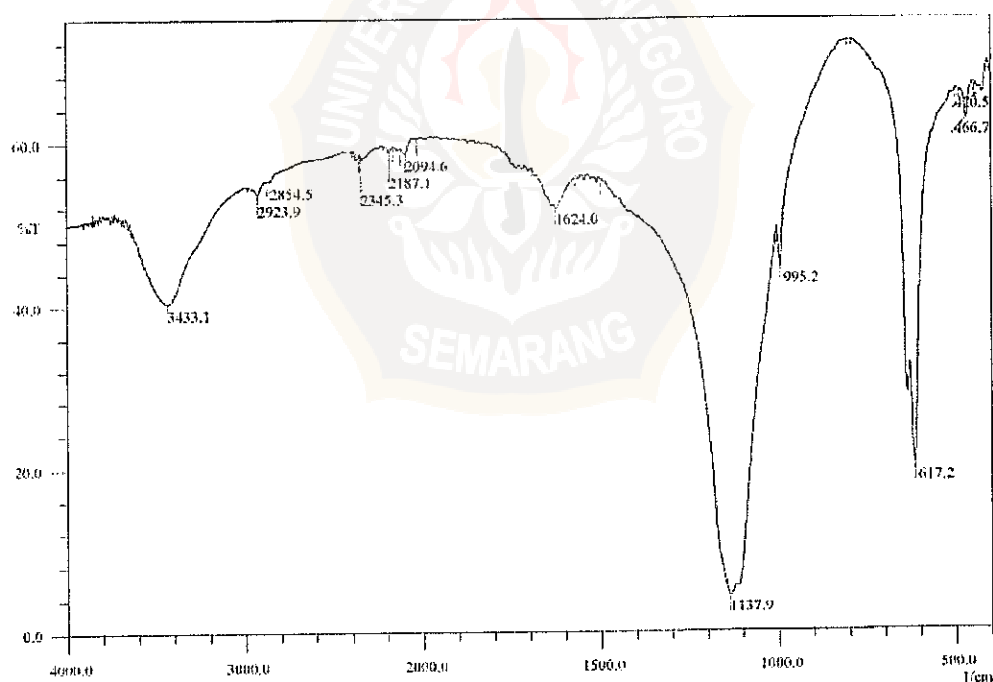
Gambar 4.1. Spektra Asam Alginat Hasil Isolasi dari *Sargassum* Sp.



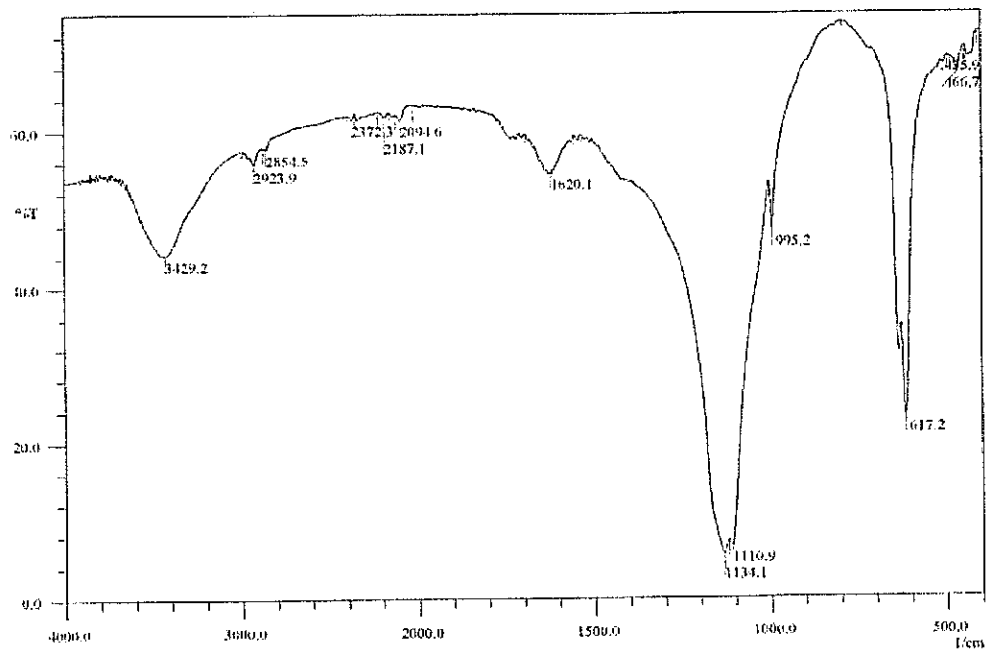
Gambar 4.2. Spektra Asam Alginat Komersial



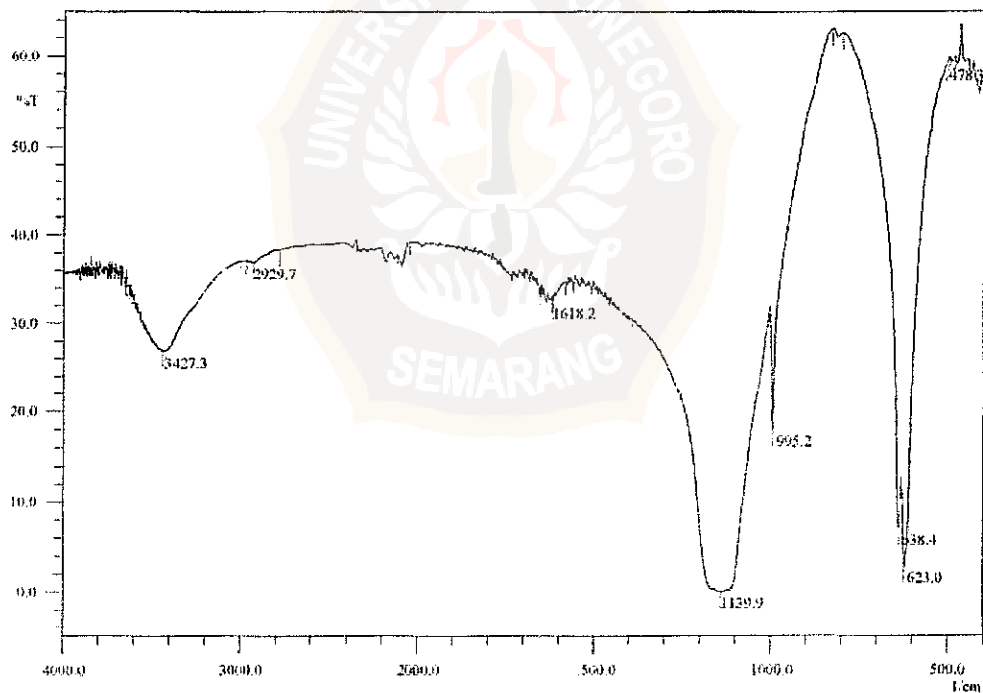
**Gambar 4.10. Spektra Sintesis Propil Alginat pH 2**



**Gambar 4.11. Spektra Sintesis Propil Alginat pH 3**

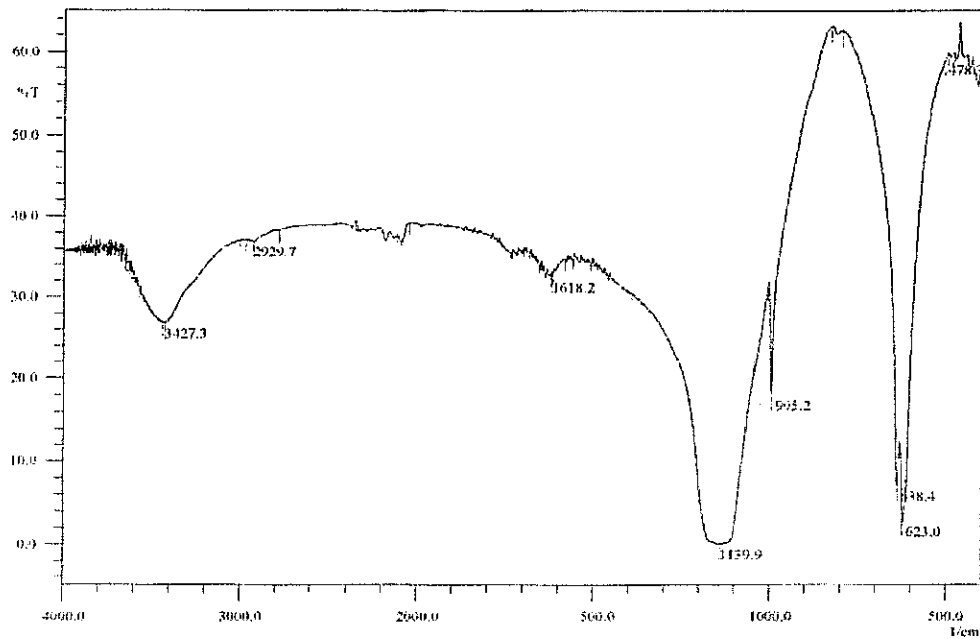


**Gambar 4.12. Spektra Sintesis Propil Alginat pH 4**

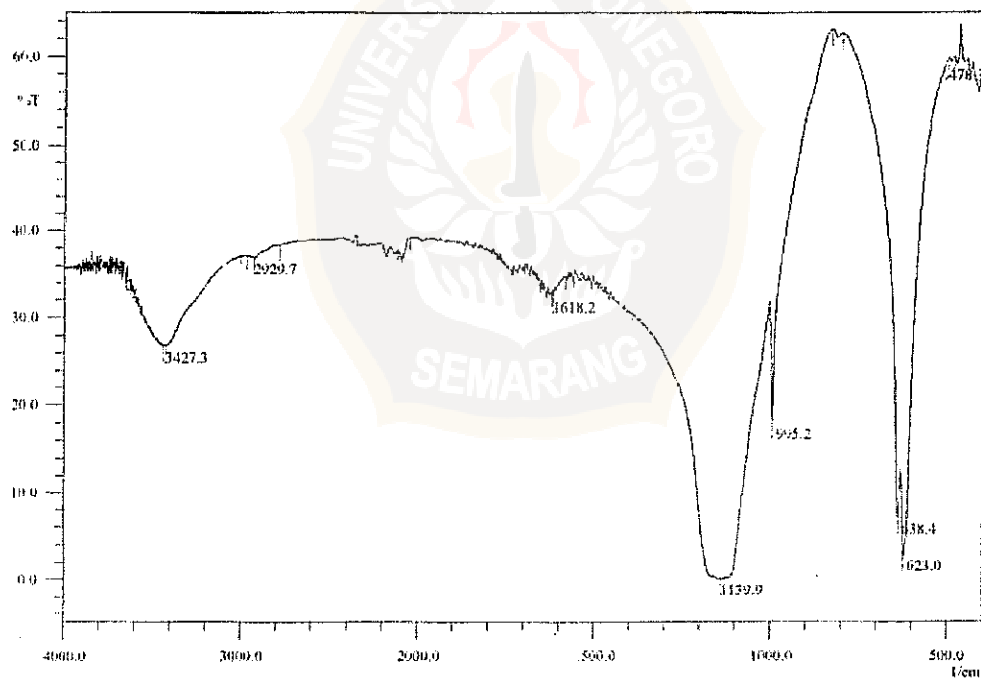


**Gambar 4.13. Spektra Sintesis Butil Alginat pH 2**

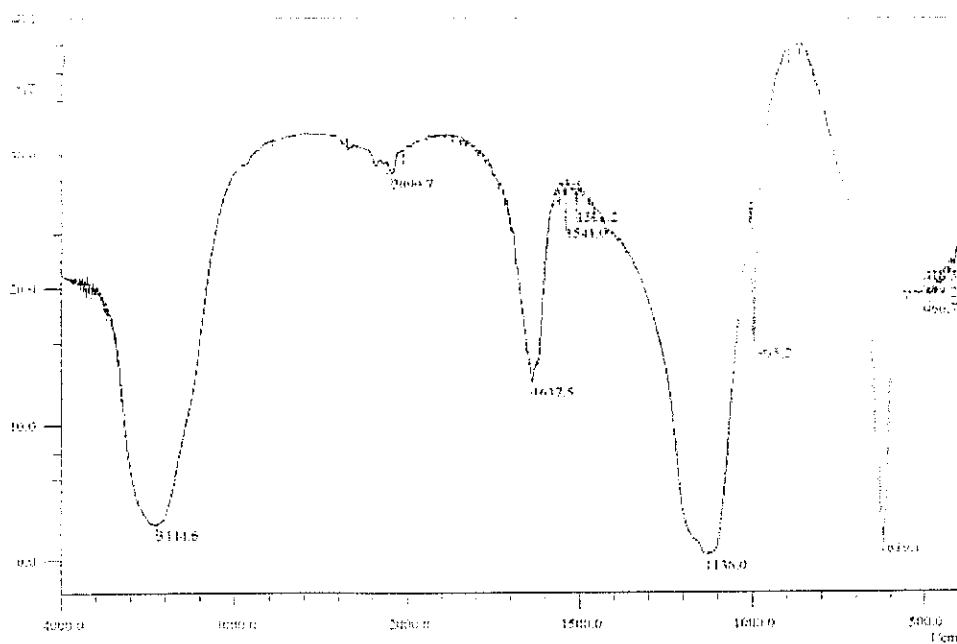




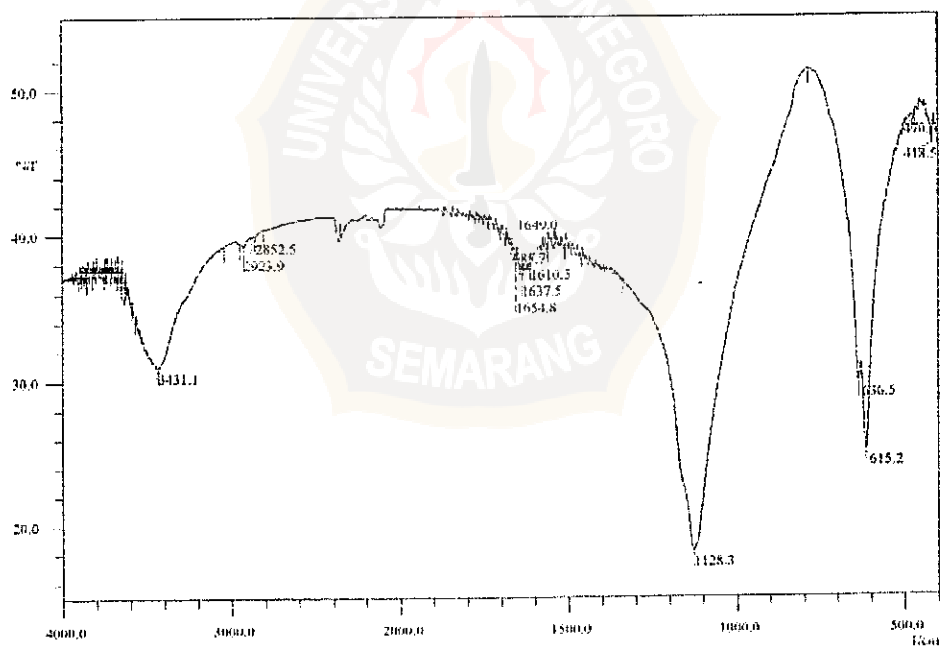
**Gambar 4.14. Spektra Sintesis Butil Alginat pH 3**



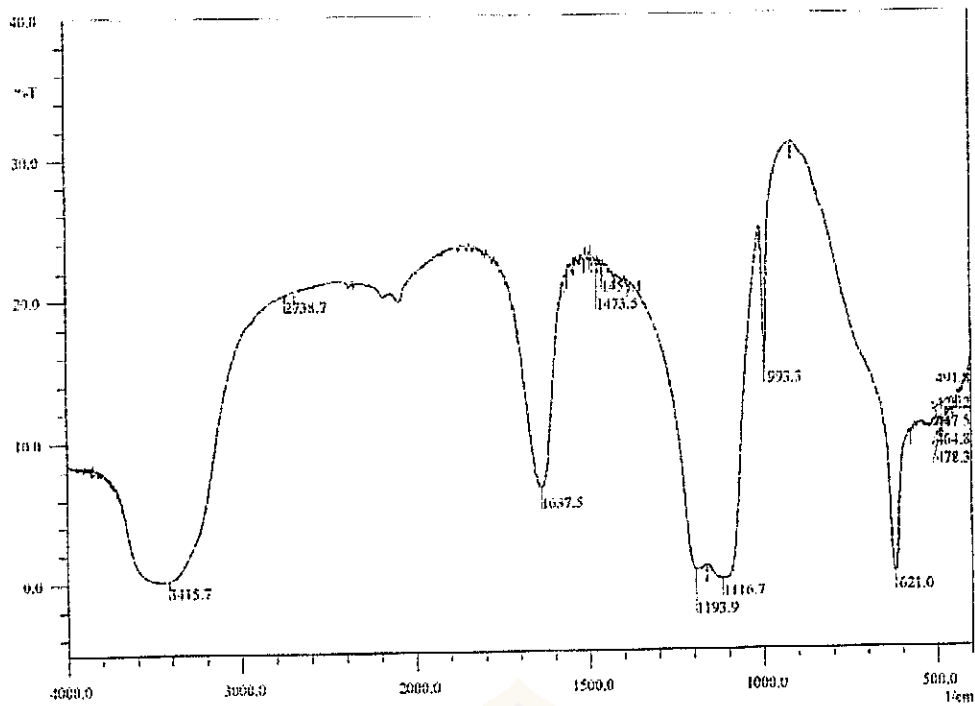
**Gambar 4.15. Spektra Sintesis Butil Alginat pH 4**



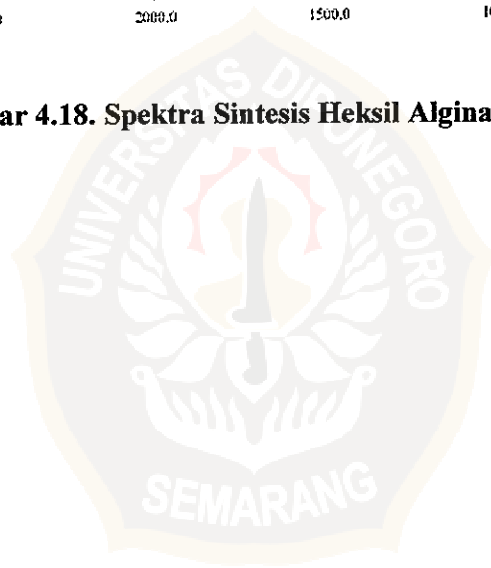
**Gambar 4.16. Spektra Sintesis Heksil Alginat pH 2**



**Gambar 4.17. Spektra Sintesis Heksil Alginat pH 3**



**Gambar 4.18. Spektra Sintesis Heksil Alginat pH 4**



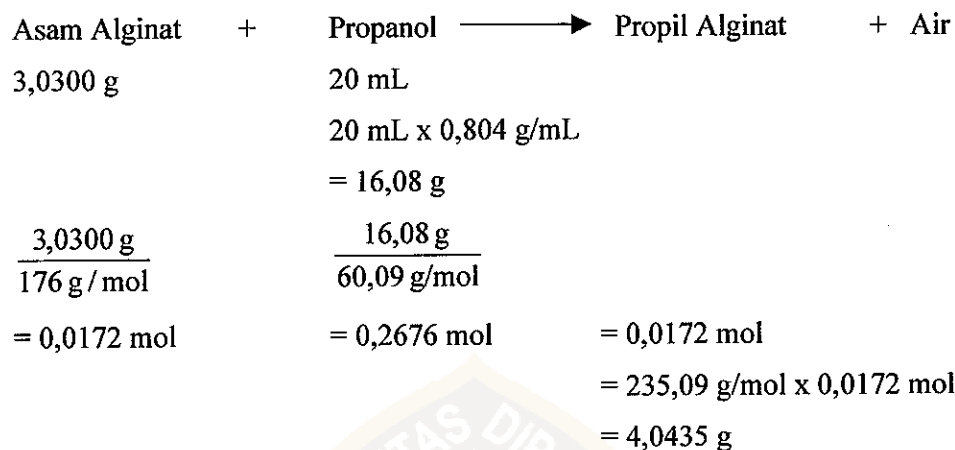
## Lampiran D

### Perhitungan rendemen persentase produk sintesis

#### Hasil teoritis produk sintesis

##### ❖ Propil alginat

Reaksi:



$$\text{Rendemen persentase} : \frac{\text{Hasil Nyata}}{\text{Hasil Teoritis}} \times 100 \%$$

Tabel D.1. Berat Molekul dan Massa Jenis Alkohol Primer

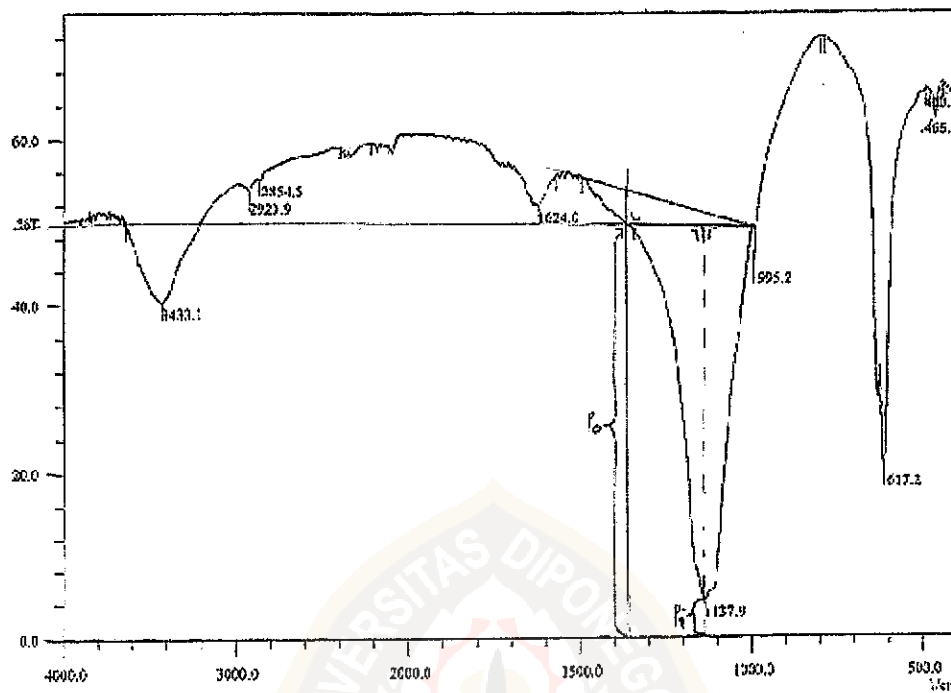
Jenis <i>n</i> -Alkohol	Berat Molekul <i>n</i> -Alkohol	Massa Jenis <i>n</i> -Alkohol
Propanol	60,09 g/mol	0,804 g/mL
Butanol	74,12 g/mol	0,817 g/mL
Heksanol	102,18 g/mol	0,820 g/mL

Tabel D.2. Data Rendemen Ester Alginat

Ester Alginat Variasi pH	Hasil Sintesis (gram)	Hasil teoritis (gram)	Rendemen (%)
Propil Alginat pH 2	0,3516	4,0435	8,6954
Propil Alginat pH 3	0,4890	4,0435	12,0934
Propil Alginat pH 4	0,3926	4,0435	9,7094
Butil Alginat pH 2	0,1402	4,2848	3,2720
Butil Alginat pH 3	0,7822	4,2848	18,2552
Butil Alginat pH 4	0,4202	4,2848	9,8067
Heksil Alginat pH 2	0,3699	4,7675	7,7588
Heksil Alginat pH 3	0,7900	4,7675	16,5705
Heksil Alginat pH 4	0,3870	4,7675	8,1175

### Derajat Esterifikasi

Rasio =  $\text{Log} \frac{P_o}{P_i}$  pada serapan 1115 - 11190  $\text{cm}^{-1}$

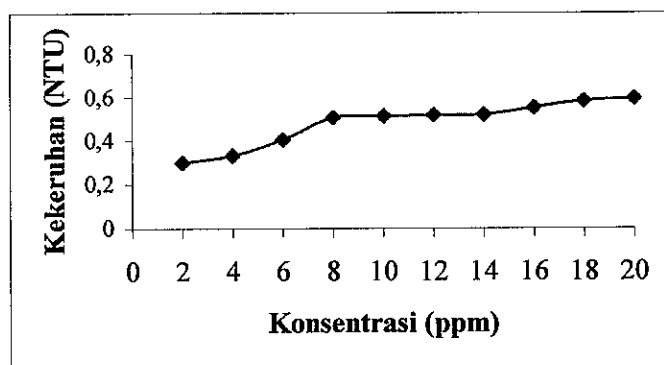


### Perubahan Derajat Esterifikasi :

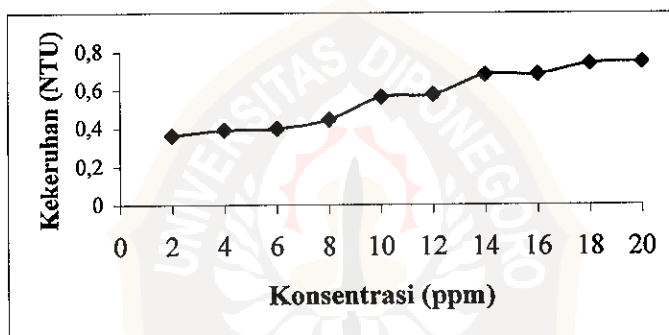
$$\frac{\text{Rasio sampel yang dicari}}{\text{Rasio sampel yang dicari} + \text{Rasio sampel pH 2}} \times 100 \%$$

## Lampiran E

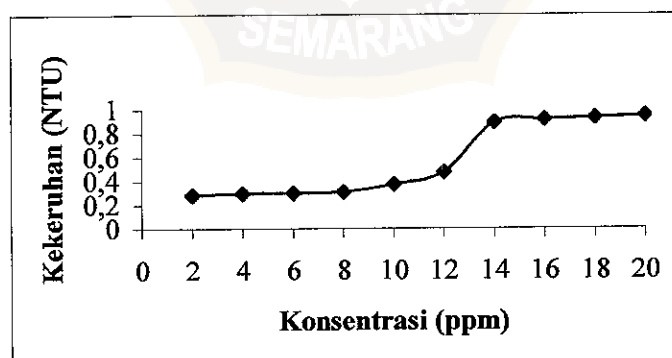
### Hasil Analisis C.M.C Dengan Turbidimeter



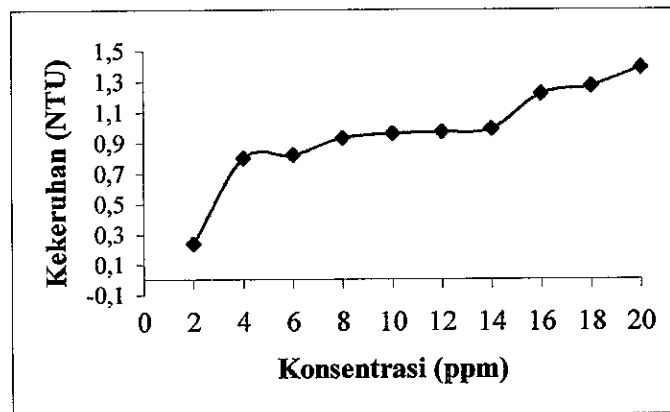
Gambar 4.19. Grafik C.M.C Propil Alginat pH 2



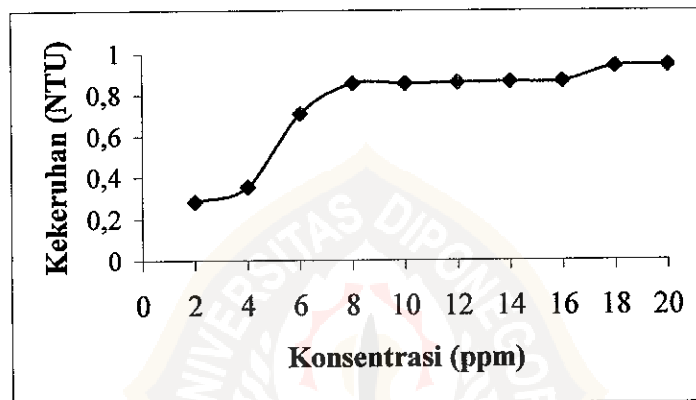
Gambar 4.20. Grafik C.M.C Propil Alginat pH 3



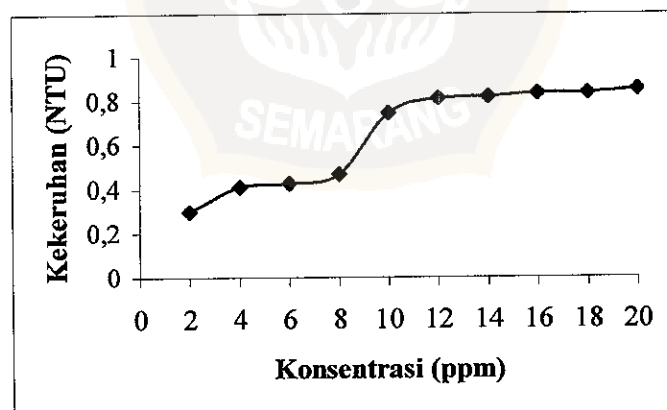
Gambar 4.21. Grafik C.M.C Propil Alginat pH 4



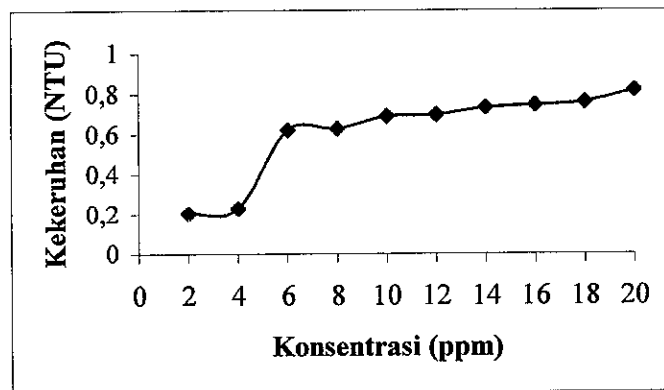
**Gambar 4.22. Grafik C.M.C Butil Alginat pH 2**



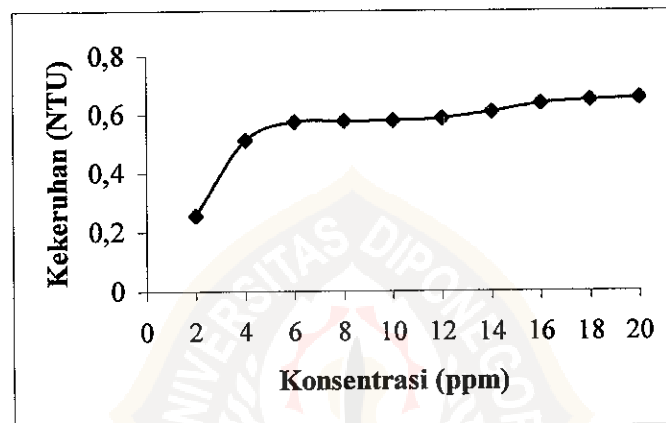
**Gambar 4.23. Grafik C.M.C Butil Alginat pH 3**



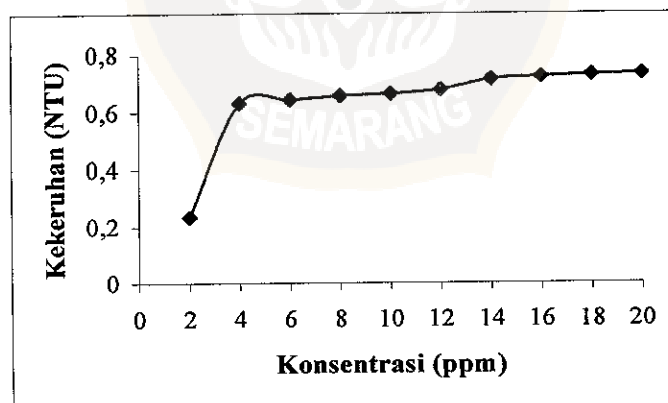
**Gambar 4.24. Grafik C.M.C Butil Alginat pH 4**



**Gambar 4.25. Grafik C.M.C Heksil Alginat pH 2**

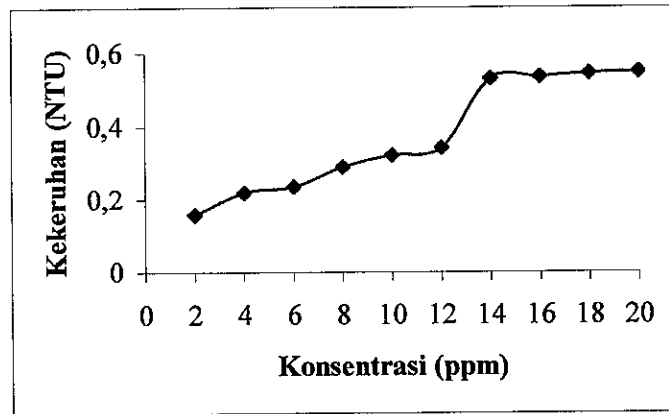


**Gambar 4.26. Grafik C.M.C Heksil Alginat pH 3**



**Gambar 4.27. Grafik C.M.C Heksil Alginat pH 4**





**Gambar 4.28. Grafik C.M.C Asam Alginat**



## LAMPIRAN F

### Perhitungan Rendemen, Derajat Esterifikasi, dan Daya Emulsi Ester Alginat Secara Statistik

#### PENGARUH TERHADAP RENDEMEN

##### Program

```
data rak;
input produk ph rendemen;
cards;
1 2 8.6954
1 3 12.0934
1 4 9.7094
2 2 3.2720
2 3 18.2552
2 4 9.8067
3 2 7.7588
3 3 16.5705
3 4 8.1175
;
proc anova data=rak;
class produk ph;
model rendemen=produk ph;
means produk ph/duncan;
run;
```

##### Output

```
The SAS System 22:15 Wednesday, October 22, 1997 1
Analysis of Variance Procedure
Class Level Information
Class Levels Values
PRODUK 3 1 2 3
PH 3 2 3 4
Number of observations in data set = 9
```

```
The SAS System 22:15 Wednesday, October 22, 1997 2
Analysis of Variance Procedure
```

Dependent Variable: RENDEMEN

Source	DF	Sum of Squares	Mean Square	F Value	Pr >
F					
Model	4	131.07169759	32.76792440	3.43	
0.1301					
Error	4	38.25265367	9.56316342		
Corrected Total	8	169.32435126			

R-Square	C.V.	Root MSE	RENDEMEN Mean
0.774087	29.52085	3.09243649	10.47543333

Source	DF	Anova SS	Mean Square	F Value	Pr >
F					
PRODUK	2	0.63710921	0.31855460	0.03	
0.9675					

PH	2	130.43458838	65.21729419	6.82
0.0514				

The SAS System 22:15 Wednesday, October 22, 1997 3

Analysis of Variance Procedure

Duncan's Multiple Range Test for variable: RENDEMEN

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 4 MSE= 9.563163

Number of Means 2 3

Critical Range 7.010 7.164

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PRODUK
A	10.816	3	3
A			
A	10.445	3	2
A			
A	10.166	3	1

The SAS System 22:15 Wednesday, October 22, 1997 4

Analysis of Variance Procedure

Duncan's Multiple Range Test for variable: RENDEMEN

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

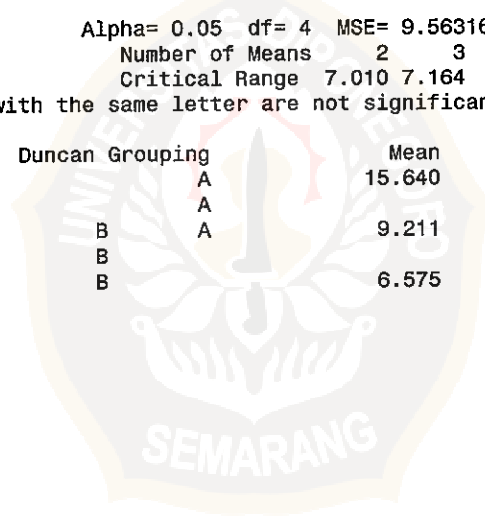
Alpha= 0.05 df= 4 MSE= 9.563163

Number of Means 2 3

Critical Range 7.010 7.164

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PH
A	15.640	3	3
A			
B	9.211	3	4
B			
B	6.575	3	2



## PENGARUH TERHADAP DERAJAT ESTERIFIKASI

### Program

```

data rak;
input produk ph ester;
cards;
1 2 1.523
1 3 1.053
1 4 12.644
2 2 0.068
2 3 2.814
2 4 3.125
3 2 1.825
3 3 0.304
3 4 1.886
;
proc anova data=rak;
class produk ph;
model ester=produk ph;
means produk ph/duncan;
run;

```

### Output

```

The SAS System 22:15 Wednesday, October 22, 1997 5
Analysis of Variance Procedure
Class Level Information
Class Levels Values
PRODUK 3 1 2 3
PH 3 2 3 4
Number of observations in data set = 9

```

```

The SAS System 22:15 Wednesday, October 22, 1997 6
Analysis of Variance Procedure

```

Dependent Variable: ESTER					
Source	DF	Sum of Squares	Mean Square	F Value	Pr
> F					
Model	4	66.61520667	16.65380167	1.32	
0.3979					
Error	4	50.55735333	12.63933833		
Corrected Total	8	117.17256000			

R-Square	C.V.	Root MSE	ESTER Mean		
0.568522	126.7596	3.55518471	2.80466667		
Source	DF	Anova SS	Mean Square	F Value	Pr
> F					
PRODUK	2	23.82216200	11.91108100	0.94	
0.4620					
PH	2	42.79304467	21.39652233	1.69	
0.2933					

```

The SAS System 22:15 Wednesday, October 22, 1997 7
Analysis of Variance Procedure

```

Duncan's Multiple Range Test for variable: ESTER

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

```

Alpha= 0.05 df= 4 MSE= 12.63934
Number of Means 2 3

```

Critical Range 8.059 8.236

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PRODUK
A	5.073	3	1
A			
A	2.002	3	2
A			
A	1.338	3	3

The SAS System 22:15 Wednesday, October 22, 1997 8

Analysis of Variance Procedure

Duncan's Multiple Range Test for variable: ESTER

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

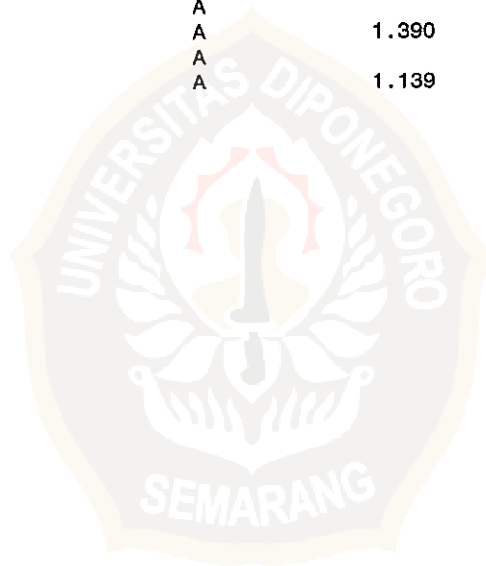
Alpha= 0.05 df= 4 MSE= 12.63934

Number of Means 2 3

Critical Range 8.059 8.236

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PH
A	5.885	3	4
A			
A	1.390	3	3
A			
A	1.139	3	2



## PENGARUH TERHADAP DAYA EMULSI

### Program

```

data rak;
input produk ph emulsi;
cards;
1 2 6
1 3 8
1 4 12
2 2 2
2 3 4
2 4 8
3 2 4
3 3 2
3 4 2
;
proc anova data=rak;
class produk ph;
model emulsi=produk ph;
means produk ph/duncan;
run;

```

### Output

```

The SAS System 22:15 Wednesday, October 22, 1997 9
Analysis of Variance Procedure
Class Level Information
Class Levels Values
PRODUK 3 1 2 3
PH 3 2 3 4
Number of observations in data set = 9

```

```

The SAS System 22:15 Wednesday, October 22, 1997 10
Analysis of Variance Procedure

```

Dependent Variable: EMULSI					
Source	DF	Sum of Squares	Mean Square	F Value	Pr
> F					
Model	4	74.66666667	18.66666667	3.50	
Error	4	21.33333333	5.33333333		
Corrected Total	8	96.00000000			
R-Square		C.V.	Root MSE	EMULSI Mean	
0.777778		43.30127	2.30940108	5.33333333	

Source	DF	Anova SS	Mean Square	F Value	Pr
> F					
PRODUK	2	56.00000000	28.00000000	5.25	
0.0761					
PH	2	18.66666667	9.33333333	1.75	
0.2844					

```

The SAS System 22:15 Wednesday, October 22, 1997 11
Analysis of Variance Procedure

```

Duncan's Multiple Range Test for variable: EMULSI

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 4 MSE= 5.333333

Number of Means 2 3  
 Critical Range 5.235 5.350

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PRODUK
A	8.667	3	1
A			
B	4.667	3	2
B			
B	2.667	3	3

The SAS System 22:15 Wednesday, October 22, 1997 12  
 Analysis of Variance Procedure

Duncan's Multiple Range Test for variable: EMULSI

NOTE: This test controls the type I comparisonwise error rate, not the xperimentwise error rate

Alpha= 0.05 df= 4 MSE= 5.333333

Number of Means 2 3  
 Critical Range 5.235 5.350

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PH
A	7.333	3	4
A			
A	4.667	3	3
A			
A	4.000	3	2

