

7. LAMPIRAN

7.1.Perhitungan

7.1.1.Rendemen

Rumus :

$$\% \text{ Rendemen} = \frac{\text{berat ekstrak yang dihasilkan (gr)}}{\text{berat awal (gr)}} \times 100\%$$

No	Suhu (°C)	Waktu (menit)	Rasio (gr)	Rendemen (gr)	% rendemen
1	40.0	30.0	21.0	4.21	20.05
2	40.0	30.0	35.0	7.92	22.63
3	40.0	45.0	21.0	4.32	20.57
4	40.0	45.0	35.0	8.42	24.06
5	50.0	30.0	21.0	4.23	20.14
6	50.0	30.0	35.0	8.14	23.26
7	50.0	45.0	21.0	4.25	20.24
8	50.0	45.0	35.0	8.32	23.77
9	36.6	37.5	28.0	6.02	21.50
10	53.4	37.5	28.0	7.38	26.36
11	45.0	24.9	28.0	5.86	20.93
12	45.0	50.1	28.0	5.94	21.21
13	45.0	37.5	16.2	3.21	19.78
14	45.0	37.5	39.8	7.09	17.83
15 (C)	45.0	37.5	28.0	6.48	23.14
16 (C)	45.0	37.5	28.0	6.85	24.46
17 (C)	45.0	37.5	28.0	6.59	23.54
1'	40.0	30.0	21.0	4.22	20.10
2'	40.0	30.0	35.0	6.50	18.57
3'	40.0	45.0	21.0	4.35	20.71
4'	40.0	45.0	35.0	7.48	21.37
5'	50.0	30.0	21.0	4.20	20.00
6'	50.0	30.0	35.0	7.91	22.60
7'	50.0	45.0	21.0	4.20	20.00
8'	50.0	45.0	35.0	7.93	22.66
9'	36.6	37.5	28.0	6.45	23.04
10'	53.4	37.5	28.0	6.30	22.50
11'	45.0	24.9	28.0	6.50	23.21
12'	45.0	50.1	28.0	6.48	23.14
13'	45.0	37.5	16.2	3.24	19.97
14'	45.0	37.5	39.8	8.39	21.09
15 (C)'	45.0	37.5	28.0	6.88	24.57
16 (C)'	45.0	37.5	28.0	6.47	23.11
17 (C)'	45.0	37.5	28.0	6.69	23.89

Lampiran 1 Tabel Perhitungan Persen Rendemen

7.1.2. Bilangan Penyabunan

Rumus :

$$\text{Bilangan penyabunan} = \frac{(V_0 - V_1) \times N \times 56,1}{\text{gr sample}}$$

Keterangan :

V_0 = Volume HCl blanko (mL)

V_1 = Volume HCl sample (mL)

N = Normalitas HCl (28.05)

No	Suhu (°C)	Waktu (menit)	Rasio (gr)	Volume HCL (ml)	Angka penyabunan (mg KOH/ gr lemak)
1	40.0	30.0	21.0	50.8	140.25
2	40.0	30.0	35.0	50	155.21
3	40.0	45.0	21.0	50.3	149.6
4	40.0	45.0	35.0	49.5	164.56
5	50.0	30.0	21.0	49	173.91
6	50.0	30.0	35.0	49.8	158.95
7	50.0	45.0	21.0	49.5	164.56
8	50.0	45.0	35.0	50	155.21
9	36.6	37.5	28.0	49.3	168.3
10	53.4	37.5	28.0	49.5	164.56
11	45.0	24.9	28.0	49.5	164.56
12	45.0	50.1	28.0	50	155.21
13	45.0	37.5	16.2	50.3	149.6
14	45.0	37.5	39.8	49.7	160.82
15 (C)	45.0	37.5	28.0	51	136.51
16 (C)	45.0	37.5	28.0	51	136.51
17 (C)	45.0	37.5	28.0	50.5	145.86
1'	40.0	30.0	21.0	50.3	149.6
2'	40.0	30.0	35.0	51.2	132.77
3'	40.0	45.0	21.0	50.1	153.34
4'	40.0	45.0	35.0	49.7	160.82
5'	50.0	30.0	21.0	50.1	153.34
6'	50.0	30.0	35.0	51.7	123.42
7'	50.0	45.0	21.0	50.8	140.25
8'	50.0	45.0	35.0	49.2	170.17
9'	36.6	37.5	28.0	48	192.61
10'	53.4	37.5	28.0	48.5	183.26
11'	45.0	24.9	28.0	49.2	170.17
12'	45.0	50.1	28.0	50.1	153.34
13'	45.0	37.5	16.2	50.5	145.86
14'	45.0	37.5	39.8	49.8	158.95
15 (C)'	45.0	37.5	28.0	50.3	149.6
16 (C)'	45.0	37.5	28.0	52	117.81
17 (C)'	45.0	37.5	28.0	51	136.51
Blanko				58.3	

Lampiran 2 Tabel Perhitungan Bilangan Penyabunan

7.1.3. Bilangan Asam

Rumus :

$$\text{Bilangan asam} = \frac{V \times N \times 56,1}{\text{massa bahan}}$$

Keterangan :

V = Jumlah mL KOH untuk titrasi

N = Normalitas KOH (0.1)

56,1 = Bobot molekul KOH

No	Suhu (°C)	Waktu (menit)	Rasio (gr)	Jumlah KOH (ml)	Bilangan Asam
1	40.0	30.0	21.0	4.8	17.952
2	40.0	30.0	35.0	4.3	16.082
3	40.0	45.0	21.0	4.6	17.204
4	40.0	45.0	35.0	4.6	17.204
5	50.0	30.0	21.0	5.3	19.822
6	50.0	30.0	35.0	4.4	16.456
7	50.0	45.0	21.0	4.5	16.83
8	50.0	45.0	35.0	4.5	16.83
9	36.6	37.5	28.0	4.5	16.83
10	53.4	37.5	28.0	4	14.96
11	45.0	24.9	28.0	4.5	16.83
12	45.0	50.1	28.0	4.7	17.578
13	45.0	37.5	16.2	4.6	17.204
14	45.0	37.5	39.8	4.4	16.456
15 (C)	45.0	37.5	28.0	4.8	17.952
16 (C)	45.0	37.5	28.0	4.1	15.334
17 (C)	45.0	37.5	28.0	4.5	16.83
1'	40.0	30.0	21.0	3.9	14.586
2'	40.0	30.0	35.0	3.7	13.838
3'	40.0	45.0	21.0	4	14.96
4'	40.0	45.0	35.0	4	14.96
5'	50.0	30.0	21.0	4.3	16.082
6'	50.0	30.0	35.0	4.4	16.456
7'	50.0	45.0	21.0	4.2	15.708
8'	50.0	45.0	35.0	4.3	16.082
9'	36.6	37.5	28.0	4.8	17.952
10'	53.4	37.5	28.0	4.6	17.204
11'	45.0	24.9	28.0	4.2	15.708
12'	45.0	50.1	28.0	4.8	17.952
13'	45.0	37.5	16.2	4.3	16.082
14'	45.0	37.5	39.8	4.9	18.326
15 (C)'	45.0	37.5	28.0	5	18.7
16 (C)'	45.0	37.5	28.0	5.3	19.822
17 (C)'	45.0	37.5	28.0	5.1	19.074

Lampiran 3 Tabel Perhitungan Bilangan Asam

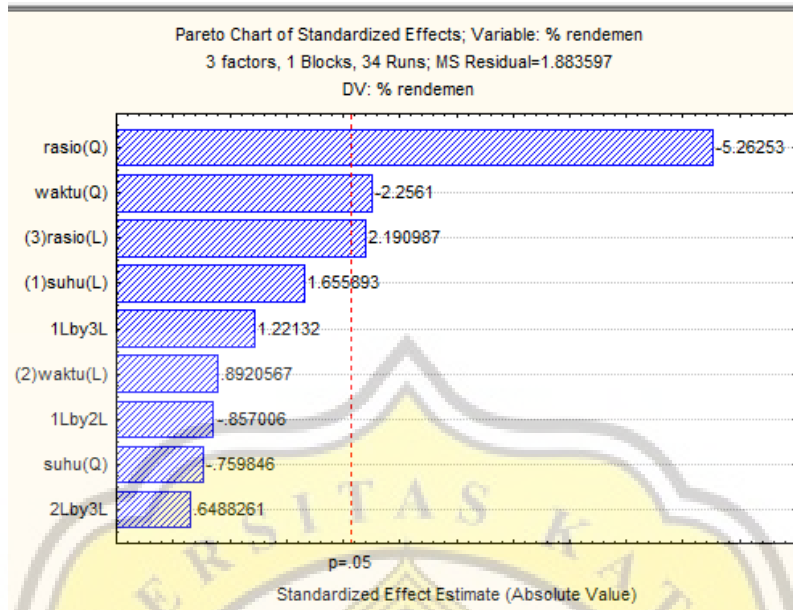
7.1.4. Bilangan Ester

Rumus : Bilangan penyabunan - Bilangan asam

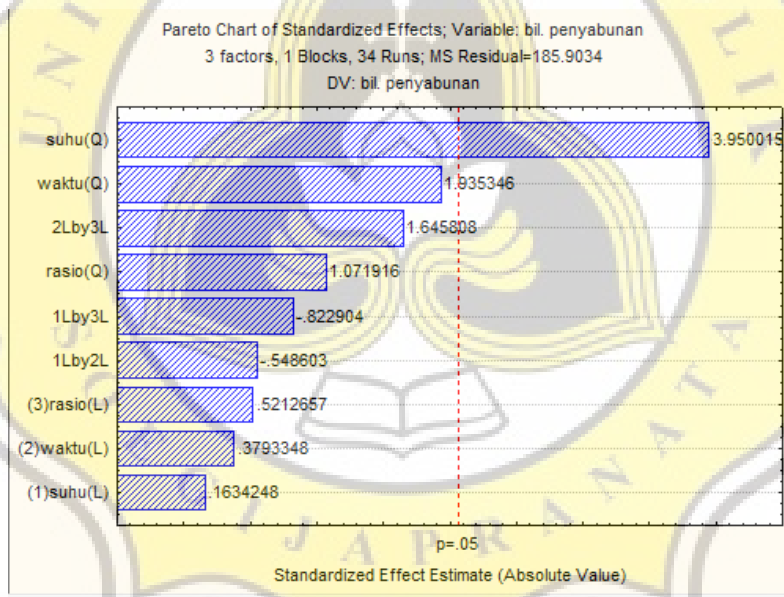
No	Suhu (°C)	Waktu (menit)	Rasio (gr)	Angka Penyabunan (mg KOH/ gr lemak)	Bilangan Asam (mg KOH/ gr lemak)	Bilangan Ester
1	40.0	30.0	21.0	140.25	17.952	122.298
2	40.0	30.0	35.0	155.21	16.082	139.128
3	40.0	45.0	21.0	149.6	17.204	132.396
4	40.0	45.0	35.0	164.56	17.204	147.356
5	50.0	30.0	21.0	173.91	19.822	154.088
6	50.0	30.0	35.0	158.95	16.456	142.494
7	50.0	45.0	21.0	164.56	16.83	147.73
8	50.0	45.0	35.0	155.21	16.83	138.38
9	36.6	37.5	28.0	168.3	16.83	151.47
10	53.4	37.5	28.0	164.56	14.96	149.6
11	45.0	24.9	28.0	164.56	16.83	147.73
12	45.0	50.1	28.0	155.21	17.578	137.632
13	45.0	37.5	16.2	149.6	17.204	132.396
14	45.0	37.5	39.8	160.82	16.456	144.364
15 (C)	45.0	37.5	28.0	136.51	17.952	118.558
16 (C)	45.0	37.5	28.0	136.51	15.334	121.176
17 (C)	45.0	37.5	28.0	145.86	16.83	129.03
1'	40.0	30.0	21.0	149.6	14.586	135.014
2'	40.0	30.0	35.0	132.77	13.838	118.932
3'	40.0	45.0	21.0	153.34	14.96	138.38
4'	40.0	45.0	35.0	160.82	14.96	145.86
5'	50.0	30.0	21.0	153.34	16.082	137.258
6'	50.0	30.0	35.0	123.42	16.456	106.964
7'	50.0	45.0	21.0	140.25	15.708	124.542
8'	50.0	45.0	35.0	170.17	16.082	154.088
9'	36.6	37.5	28.0	192.61	17.952	174.658
10'	53.4	37.5	28.0	183.26	17.204	166.056
11'	45.0	24.9	28.0	170.17	15.708	154.462
12'	45.0	50.1	28.0	153.34	17.952	135.388
13'	45.0	37.5	16.2	145.86	16.082	129.778
14'	45.0	37.5	39.8	158.95	18.326	140.624
15 (C)'	45.0	37.5	28.0	149.6	18.7	130.9
16 (C)'	45.0	37.5	28.0	117.81	19.822	97.988
17 (C)'	45.0	37.5	28.0	136.51	19.074	117.436

Lampiran 4 Tabel perhitungan Bilangan Ester

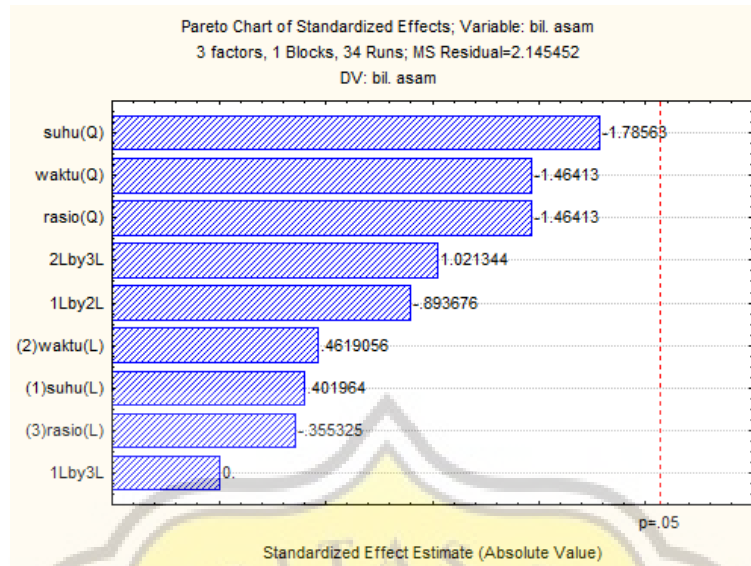
7.2. Diagram Pareto



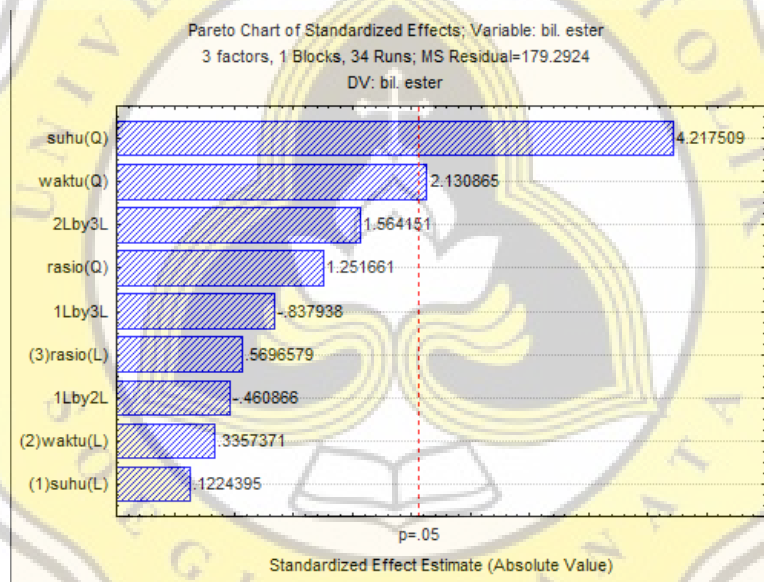
Lampiran 5 Diagram Pareto Persen Rendemen



Lampiran 6 Diagram Pareto Bilangan Penyabunan



Lampiran 7 Diagram Pareto Bilangan Asam



Lampiran 8 Diagram Pareto Bilangan Ester

7.3. Rancangan Percobaan

No	Suhu (°C)	Waktu (menit)	Rasio (gr)
1	40.0	30.0	21.0
2	40.0	30.0	35.0
3	40.0	45.0	21.0
4	40.0	45.0	35.0
5	50.0	30.0	21.0
6	50.0	30.0	35.0
7	50.0	45.0	21.0
8	50.0	45.0	35.0
9	36.6	37.5	28.0
10	53.4	37.5	28.0
11	45.0	24.9	28.0
12	45.0	50.1	28.0
13	45.0	37.5	16.2
14	45.0	37.5	39.8
15 (C)	45.0	37.5	28.0
16 (C)	45.0	37.5	28.0
17 (C)	45.0	37.5	28.0

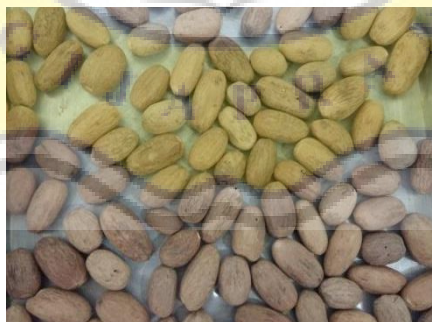
Lampiran 9 Rancangan Percobaan dengan RSM

7.4. Hasil Kadar Air

Batch	Kadar Air
Batch 1 (5 ons)	6,6%
Batch 2 (6 ons)	7,2%

Lampiran 10 Kadar Air bubuk Pala

7.5. Gambar Selama Penelitian



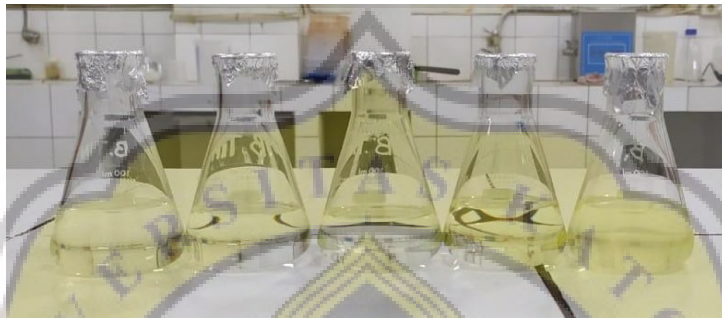
Lampiran 11 Foto Sebelum dikeringkan



Lampiran 12 Foto Setelah dikeringkan



Lampiran 13 Foto Bubuk Biji Pala



Lampiran 14 Foto Hasil Ekstraksi



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