LAMPIRAN I
DATA PENGAMATAN DAN PERHITUNGAN

DATA PENGAMATAN

1. Data Pengamatan Analisa Uji Tarik

Data pengamatan analisa uji tarik terhadap plastik *biodegradable* dari pati singkong karet dan pati kulit singkong karet dapat dilihat pada tabel berikut.

Tabel 26. Hasil Analisa Uji Tarik

No.	Sampel	F (kg/s)	
		Singkong Karet	Kulit Singkong Karet
1	0% sorbitol + 40% gliserol	2	1
2	5% sorbitol + 35% gliserol	0,75	0,75
3	10% sorbitol + 30% gliserol	0,7	0,625
4	15% sorbitol + 35% gliserol	0,65	0,6
5	20% sorbitol + 20% gliserol	0,625	0,375
6	25% sorbitol + 15% gliserol	1,25	0,875
7	30% sorbitol + 10% gliserol	0,5	0,25
8	35% sorbitol + 5% gliserol	0,375	0,15
9	40% sorbitol + 0% gliserol	0,125	0,125

2. Data Pengamatan Analisa Persen Pemanjangan

Data pengamatan analisa persen pemanjangan terhadap plastik *biodegradable* dari pati singkong karet dan pati kulit singkong karet dapat dilihat pada tabel berikut.

Tabel 27. Hasil Analisa Uji Persen Pemanjangan

No.	Sampel	Singkong Karet		Kulit Singkong Karet	
		Panjang Awal (cm)	Panjang Akhir (cm)	Panjang Awal (cm)	Panjang Akhir (cm)
1	0% sorbitol + 40% gliserol	10	10,13	10	10,1
2	5% sorbitol + 35% gliserol	10	10,2	10	10,18
3	10% sorbitol + 30% gliserol	10	10,37	10	10,33
4	15% sorbitol + 35% gliserol	10	10,5	10	10,4
5	20% sorbitol + 20% gliserol	10	10,48	10	10,39
6	25% sorbitol + 15% gliserol	10	10,46	10	10,35
7	30% sorbitol + 10% gliserol	10	10,43	10	10,31
8	35% sorbitol + 5% gliserol	10	10,38	10	10,28
9	40% sorbitol + 0% gliserol	10	10,3	10	10,27

PERHITUNGAN

1. Kuat Tarik Plastik *Biodegradable*.

Konversi kg/cm^2 → MPa

1 Pa (N/m^2) = 0.0000102 kg/cm^2

1 Mpa = 1000000 Pa

A. Plastik *Biodegradable* dari Singkong Karet

a. Sampel 1 = 0% Sorbitol + 40% Gliserol

Luas permukaan = 10 cm x 2 cm = 2 cm^2

F = 2 kg/sec

Kuat tarik $= \frac{2\ \text{kg}}{20\ \text{cm}^2} = 0{,}1\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}1\ \frac{\cancel{kg}}{\cancel{cm^2}} \times \frac{1\ \cancel{Pa}}{0.0000102\ \frac{\cancel{kg}}{\cancel{cm^2}}} \times \frac{1\ MPa}{10^6\ \cancel{Pa}}$

$= \frac{0{,}1\ \text{kg/cm}^2}{10{,}2} = 0{,}0098$ Mpa

b. Sampel 2 = 5% Sorbitol + 35% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,75 kg/sec

Kuat tarik $= \frac{0{,}75\ \text{kg}}{20\ \text{cm}^2} = 0{,}0375\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}0375\ \frac{\cancel{kg}}{\cancel{cm^2}} \times \frac{1\ \cancel{Pa}}{0.0000102\ \frac{\cancel{kg}}{\cancel{cm^2}}} \times \frac{1\ MPa}{10^6\ \cancel{Pa}}$

$= \frac{0{,}0375\ \text{kg/cm}^2}{10{,}2} = 0{,}00368$ Mpa

c. Sampel 3 = 10% Sorbitol + 30% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,7 kg/sec

Kuat tarik $= \frac{0{,}7\ \text{kg}}{20\ \text{cm}^2} = 0{,}035\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}035\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}035\ \text{kg/cm}^2}{10{,}2} = 0{,}00343$ Mpa

d. Sampel 4 = 15% Sorbitol + 25% Gliserol

Luas permukaan = 10 cm x 2 cm = 2 cm^2

F = 0,65 kg/sec

Kuat tarik $= \frac{0{,}65\ \text{kg}}{20\ \text{cm}^2} = 0{,}0325\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}0325\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}3\ \text{kg/cm}^2}{10{,}2} = 0{,}00319$ Mpa

e. Sampel 5 = 20% Sorbitol + 20% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,625 kg/sec

Kuat tarik $= \frac{0{,}625\ \text{kg}}{20\ \text{cm}^2} = 0{,}03125\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}03125\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}03125\ \text{kg/cm}^2}{10{,}2} = 0{,}00306$ Mpa

f. Sampel 6 = 25% Sorbitol + 15% Gliserol

Luas permukaan = 10 cm x 2 cm = 21 cm^2

F = 1,25 kg/sec

Kuat tarik $= \frac{1{,}25\ \text{kg}}{20\ \text{cm}^2} = 0{,}0625\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}0625\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}0625\ \text{kg/cm}^2}{10{,}2} = 0{,}00613$ Mpa

g. Sample 7 = 0% Sorbitol + 40% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,5 kg/sec

Kuat tarik $= \frac{0{,}5\ \text{kg}}{20\ \text{cm}^2} = 0{,}025\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}025\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}025\ \text{kg/cm}^2}{10{,}2} = 0{,}00245$ Mpa

h. Sampel 8 = 35% Sorbitol + 30% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,375 kg/sec

Kuat tarik $= \frac{0{,}375\ \text{kg}}{20\ \text{cm}^2} = 0{,}01875\ \text{kg/cm}^2$

$= 0{,}01875\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}01875\ \text{kg/cm}^2}{10{,}2} = 0{,}00184$ Mpa

i. Sampel 9 = 5% Sorbitol + 35% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,125 kg/sec

Kuat tarik $= \frac{0{,}125\ \text{kg}}{20\ \text{cm}^2} = 0{,}00625\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}00625\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}00625\ \text{kg/cm}^2}{10{,}2} = 0{,}00061$ Mpa

B. Plastik *Biodegradable* dari Kulit Singkong Karet

a. Sampel 1 = 0% Sorbitol + 40% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 1 kg/sec

Kuat tarik $= \frac{1\ \text{kg}}{20\ \text{cm}^2} = 0{,}05\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}05\ \frac{\cancel{kg}}{\cancel{cm^2}} \times \frac{1\ \cancel{Pa}}{0.0000102\ \frac{\cancel{kg}}{\cancel{cm^2}}} \times \frac{1\ MPa}{10^6\ \cancel{Pa}}$

$= \frac{0{,}05\ \text{kg/cm}^2}{10{,}2} = 0{,}0049$ Mpa

b. Sampel 2 = 5% Sorbitol + 35% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,75 kg/sec

Kuat tarik $= \frac{0{,}75\ \text{kg}}{20\ \text{cm}^2} = 0{,}0375\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}0375\ \frac{\cancel{kg}}{\cancel{cm^2}} \times \frac{1\ \cancel{Pa}}{0.0000102\ \frac{\cancel{kg}}{\cancel{cm^2}}} \times \frac{1\ MPa}{10^6\ \cancel{Pa}}$

$= \frac{0{,}03571\ \text{kg/cm}^2}{10{,}2} = 0{,}00368$ Mpa

c. Sampel 3 = 10% Sorbitol + 30% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,625 kg/sec

Kuat tarik $= \frac{0{,}625\ \text{kg}}{20\ \text{cm}^2} = 0{,}03125\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}03125\ \frac{\cancel{kg}}{\cancel{cm^2}} \times \frac{1\ \cancel{Pa}}{0.0000102\ \frac{\cancel{kg}}{\cancel{cm^2}}} \times \frac{1\ MPa}{10^6\ \cancel{Pa}}$

$= \frac{0{,}03125\ \text{kg/cm}^2}{10{,}2} = 0{,}00306$ Mpa

d. Sample 4 = 15% Sorbitol + 25% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,6 kg/sec

Kuat tarik $= \frac{0{,}6\ \text{kg}}{20\ \text{cm}^2} = 0{,}03\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}03\ \frac{\cancel{kg}}{\cancel{cm^2}} \times \frac{1\ \cancel{Pa}}{0.0000102\ \frac{\cancel{kg}}{\cancel{cm^2}}} \times \frac{1\ MPa}{10^6\ \cancel{Pa}}$

$= \frac{0{,}03\ \text{kg/cm}^2}{10{,}2} = 0{,}00294$ Mpa

e. Sampel 5 = 20% Sorbitol + 20% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,375 kg/sec

Kuat tarik $= \frac{0{,}55\ \text{kg}}{20\ \text{cm}^2} = 0{,}0275\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}0275\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}0275\ \text{kg/cm}^2}{10{,}2} = 0{,}0027$ Mpa

f. Sampel 6 = 25% Sorbitol + 15% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,875 kg/sec

Kuat tarik $= \frac{0{,}875\ \text{kg}}{20\ \text{cm}^2} = 0{,}04375\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}0475\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}04167\ \text{kg/cm}^2}{10{,}2} = 0{,}00429$ Mpa

g. Sampel 7 = 30% Sorbitol + 10% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,25 kg/sec

Kuat tarik $= \frac{0{,}25\ \text{kg}}{20\ \text{cm}^2} = 0{,}01275\ \text{kg/cm}^2$

$= 0{,}01275\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}01275\ \text{kg/cm}^2}{10{,}2} = 0{,}00125$ Mpa

h. Sampel 8 = 35% Sorbitol + 5% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,15 kg/sec

Kuat tarik $= \frac{0{,}15\ \text{kg}}{20\ \text{cm}^2} = 0{,}0075\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}0075\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}0075\ \text{kg/cm}^2}{10{,}2} = 0{,}00074$ Mpa

i. Sampel 9 = 40% Sorbitol + 0% Gliserol

Luas permukaan = 10 cm x 2 cm = 20 cm^2

F = 0,125 kg/sec

Kuat tarik $= \frac{0{,}125\ \text{kg}}{20\ \text{cm}^2} = 0{,}00625\ \frac{\text{kg}}{\text{cm}^2}$

$= 0{,}00625\ \frac{kg}{cm^2} \times \frac{1\ Pa}{0.0000102\ \frac{kg}{cm^2}} \times \frac{1\ MPa}{10^6\ Pa}$

$= \frac{0{,}00625\ \text{kg/cm}^2}{10{,}2} = 0{,}00061$ Mpa

2. Elongasi Plastik *Biodegradable*

A. Plastik *Biodegradable* dari Singkong Karet

a. Sample 1 = 0% Sorbitol + 40% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,13 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \text{x } 100\%$

$= \frac{10{,}13\ \text{cm} - 10\ \text{cm}}{10\ \text{cm}} \text{ x } 100\% = 1{,}3\%$

b. Sample 2 = 5% Sorbitol + 35% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,2 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \text{x } 100\%$

$= \frac{10{,}2\ \text{cm} - 10\ \text{cm}}{10\ \text{cm}} \text{ x } 100\% = 2\%$

c. Sample 3 = 10% Sorbitol + 30% Gliserol
Panjang awal = 10 cm
Panjang setelah ditarik = 10,37 cm
Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$$= \frac{10{,}37 \text{ cm} - 10 \text{ cm}}{10 \text{ cm}} \times 100\% = 3{,}7\%$$

d. Sample 4 = 15% Sorbitol + 25% Gliserol
Panjang awal = 10 cm
Panjang setelah ditarik = 10,5 cm
Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$$= \frac{10{,}5 \text{ cm} - 10 \text{ cm}}{10 \text{ cm}} \times 100\% = 5\%$$

e. Sample 5 = 20% Sorbitol + 20% Gliserol
Panjang awal = 10 cm
Panjang setelah ditarik = 10,48 cm
Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$$= \frac{10{,}48 \text{ cm} - 10 \text{ cm}}{10 \text{ cm}} \times 100\% = 4{,}8\%$$

f. Sample 6 = 25% Sorbitol + 15% Gliserol
Panjang awal = 10 cm
Panjang setelah ditarik = 10,46 cm
Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$$= \frac{10{,}46 \text{ cm} - 10 \text{ cm}}{10 \text{ cm}} \times 100\% = 4{,}6\%$$

g. Sample 7 = 30% Sorbitol + 10% Gliserol
Panjang awal = 10 cm

Panjang setelah ditarik = 10,43 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}43\text{ cm} - 10\text{ cm}}{10\text{ cm}} \times 100\% = 4{,}3\%$

h. Sample 8 = 35% Sorbitol + 5% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,38 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}38\text{ cm} - 10\text{ cm}}{10\text{cm}} \times 100\% = 3{,}8\%$

i. Sample 9 = 40% Sorbitol + 0% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,3 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}3\text{ cm} - 10\text{ cm}}{10\text{ cm}} \times 100\% = 3\%$

B. Plastik *Biodegradable* dari Kulit Singkong Karet

a. Sample 1 = 0% Sorbitol + 40% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,1 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}1\text{ cm} - 10\text{ cm}}{10\text{ cm}} \times 100\% = 1\%$

b. Sample 2 = 5% Sorbitol + 35% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,18 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}18\ \text{cm} - 10\ \text{cm}}{10\ \text{cm}} \times 100\% = 1{,}8\%$

c. Sample 3 = 10% Sorbitol + 30% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,33 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}33\ \text{cm} - 10\ \text{cm}}{10\ \text{cm}} \times 100\% = 3{,}3\%$

d. Sample 4 = 15% Sorbitol + 25% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,4 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}4\ \text{cm} - 10\ \text{cm}}{10\ \text{cm}} \times 100\% = 4\%$

e. Sample 5 = 20% Sorbitol + 20% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,39 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}39\ \text{cm} - 10\ \text{cm}}{10\ \text{cm}} \times 100\% = 3{,}9\%$

f. Sample 6 = 25% Sorbitol + 15% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,35 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}35\text{ cm} - 10\text{ cm}}{10\text{ cm}} \times 100\% = 3{,}5\%$

g. Sample 7 = 30% Sorbitol + 10% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,31 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}31\text{ cm} - 10\text{ cm}}{10\text{ cm}} \times 100\% = 3{,}1\%$

h. Sample 8 = 35% Sorbitol + 5% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,28 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}28\text{ cm} - 10\text{ cm}}{10\text{ cm}} \times 100\% = 2{,}8\%$

i. Sample 9 = 40% Sorbitol + 0% Gliserol

Panjang awal = 10 cm

Panjang setelah ditarik = 10,27 cm

Elongasi $= \frac{L_1 - L_0}{L_0} \times 100\%$

$= \frac{10{,}27\text{ cm} - 10\text{ cm}}{10\text{ cm}} \times 100\% = 2{,}7\%$

LAMPIRAN II
DOKUMENTASI PENELITIAN

Proses Pembuatan Pati dari Singkong Karet

Gambar 16. Singkong Karet

Gambar 17. Kulit Singkong Karet

Gambar 18. Perendaman Singkong

Gambar 19. Pemarutan Singkong Karet

Gambar 20. Penghalusan Kulit Singkong Karet

Gambar 21. Pemisahan Ampas dengan Cairan

Gambar 22. Pengendapan Pati

Gambar 23. Tepung Singkong Karet

Gambar 24. Tepung Kulit Singkong Karet

Gambar 25. Penimbangan Bahan

Proses Pembuatan Plastik *Biodegradable*

Gambar 26. Penambahan Aquadest

Gambar 27. Penambahan Asam Asetat

Gambar 28. Penambahan *Plasticizer*

Gambar 29. Pemanasan Larutan pada Suhu 70-80 ^{o}C

Gambar 30. Pencetakan pada Plat Kaca

Gambar 31. Pengeringan Plastik pada Suhu Kamar

Gambar 32. Plastik *Biodegradable* dari Pati Singkong Karet

Gambar 33. Plastik *Biodgradable* dari Pati Kulit Singkong Karet