7. LAMPIRAN

Lampiran 1. SNI 01-4320-1996

No.	Kriteria Uji	Satuan	Persyaratan
1.	Keadaan:		
1.1.	Warna		Normal
1.2.	Bau		Normal, khas rempah-rempah
1.3.	Rasa		Normal, khas rempah-rempah
2.	Air, b/b	%	Maks. 3,0
3.	Abu, b/b	%	Maks. 1,5
4.	Jumlah gula (dihitung sebagai sakarosa), b/b	%	Maks. 85,0
5.	Bahan tambahan makanan		
5.1.	Pemanis buatan	-	
	- Sakarin		Tidak boleh ada
	- Siklamat		Tidak boleh ada
5.2.	Pewarna tambahan	-	Sesuai SNI 01-0222-1995
6.	Cemaran logam:		
6.1.	Timbal (Pb)	mg/kg	Maks. 0,2
6.2.	Tembaga (Cu)	mg/kg	Maks. 2,0
6.3.	Seng (Zn)	mg/kg	Maks. 50
6.4.	Timah (Sn)	mg/kg	Maks. 40,0
7.	Cemaran arsen (As)	mg/kg	Maks. 0,1
8.	Cemaran mikroba:		
8.1.	Angka lempeng total	koloni/gr	3×10^3
8.2.	Coliform	APM/gr	< 3

Lampiran 2. Biji Pala Sebelum Dikupas

Lampiran 3. Biji Pala Sesudah Dikupas

Lampiran 4. Pengeringan Biji Pala

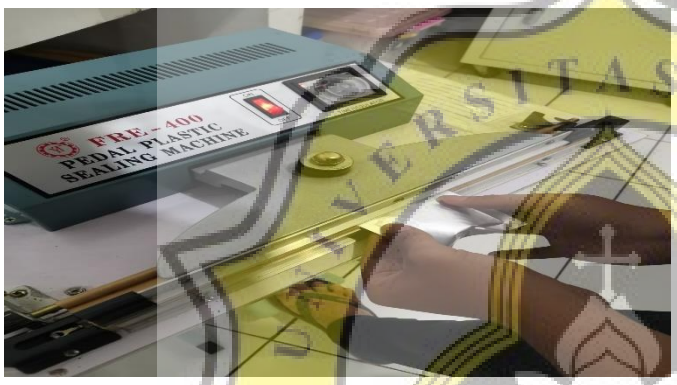
Lampiran 5. Biji Pala Kering Sesudah di Tumbuk

Lampiran 6. Biji Pala Kering Sesudah di Blender

Lampiran 7. Proses Kritalisasi Oleoresin Biji Pala

Lampiran 8. Hasil Kristalisasi Oleoresin Biji Pala

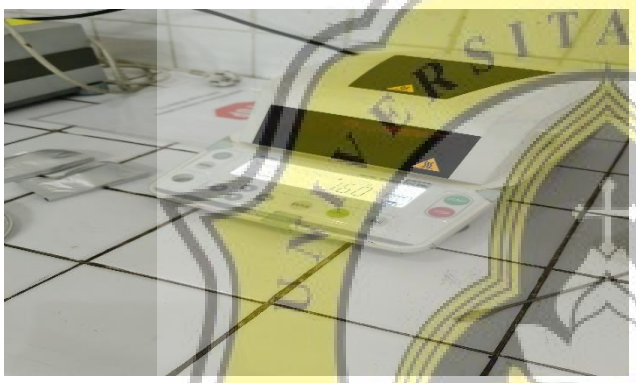
Lampiran 9. Proses Pengemasan Produk



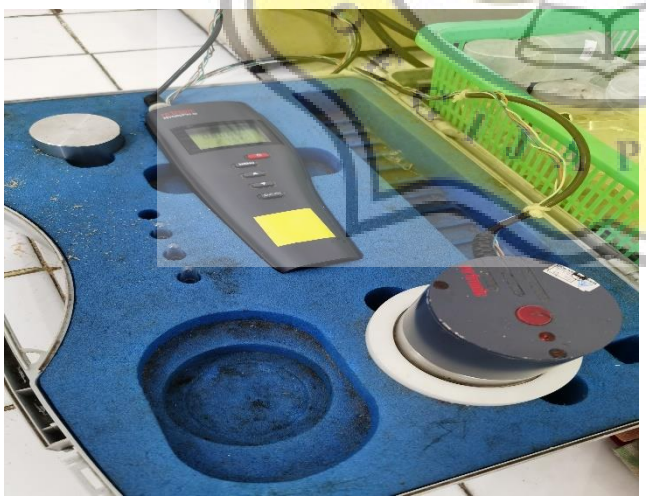
Lampiran 10. Penyimpanan Produk dalam Desikator

Lampiran 11. Penyimpanan Produk dalam Desikator

Lampiran 12. Uji Kadar Air dengan Alat *Moisture Balance*



Lampiran 13. Uji a_w dengan Alat a_w Meter



Lampiran 14. Normalitas Kadar Air, Aktivitas Air, dan *Bulk Density*

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Suhu	Statistic	df	Sig.	Statistic	df	Sig.
KadarAir	suhu 30	.141	27	.182	.963	27	.438
	suhu 20	.111	27	.200*	.960	27	.378
	suhu 40	.127	27	.200*	.909	27	.021
Bulk	suhu 30	.097	27	.200*	.985	27	.959
	suhu 20	.122	27	.200*	.981	27	.880
	suhu 40	.164	27	.059	.879	27	.005
Aw	suhu 30	.161	27	.070	.826	27	.000
	suhu 20	.165	27	.057	.907	27	.020
	suhu 40	.151	27	.119	.921	27	.041

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

a. Lilliefors Significance Correction

Lampiran 15. Normalitas Aktivitas Antioksidan

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Antioksidan	.092	63	.200*	.967	63	.089

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

a. Lilliefors Significance Correction

Lampiran 16. Normalitas Pembasahan

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	suhu	Statistic	df	Sig.	Statistic	df	Sig.
pembasahan	suhu 30	.116	24	.200*	.979	24	.878
	suhu 20	.117	24	.200*	.971	24	.689
	suhu 40	.106	24	.200*	.951	24	.283

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

a. Lilliefors Significance Correction

Lampiran 17. ANOVA Kadar Air, Aktivitas Air, dan *Bulk Density* Antar Suhu

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
KadarAir	Between Groups	.238	2	.119	13.906	.000
	Within Groups	.669	78	.009		
	Total	.907	80			
Bulk	Between Groups	.072	2	.036	33.409	.000
	Within Groups	.084	78	.001		
	Total	.157	80			
Aw	Between Groups	.078	2	.039	35.148	.000
	Within Groups	.086	78	.001		
	Total	.163	80			

Lampiran 18. Beda Nyata Kadar Air Antar Suhu

KadarAir

Duncan[a]

		Subset for alpha = 0.05		
Suhu	N	1	2	3
suhu 40	27	1.65444		
suhu 20	27		1.71574	
suhu 30	27			1.78722
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 27.000.

Lampiran 19. Beda Nyata *Bulk Density* Antar Suhu

Aw

Duncan[a]

		Subset for alpha = 0.05	
Suhu	N	1	2
suhu 40	27	.58930	
suhu 20	27		.65437
suhu 30	27		.65544
Sig.		1.000	.906

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 27.000.

Lampiran 20. Beda Nyata Aktivitas Air Antar Suhu

Aw

Duncan[a]

Suhu	N	Subset for alpha = 0.05	
		1	2
suhu 40	27	.58930	
suhu 20	27		.65437
suhu 30	27		.65544
Sig.		1.000	.906

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 27.000.

Lampiran 21. ANOVA Kadar Air, Aktivitas Air, *Bulk Density* Antar Minggu

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
air30	Between Groups	.096	8	.012	1.317	.297
	Within Groups	.164	18	.009		
	Total	.259	26			
air20	Between Groups	.047	8	.006	.508	.835
	Within Groups	.208	18	.012		
	Total	.255	26			
air40	Between Groups	.023	8	.003	.404	.904
	Within Groups	.131	18	.007		
	Total	.154	26			
aw30	Between Groups	.024	8	.003	94.320	.000
	Within Groups	.001	18	.000		
	Total	.025	26			
aw20	Between Groups	.031	8	.004	80.588	.000
	Within Groups	.001	18	.000		
	Total	.032	26			
aw40	Between Groups	.023	8	.003	12.645	.000
	Within Groups	.004	18	.000		
	Total	.027	26			
bulk30	Between Groups	.013	8	.002	5.847	.001
	Within Groups	.005	18	.000		
	Total	.017	26			
bulk20	Between Groups	.027	8	.003	3.762	.009
	Within Groups	.016	18	.001		
	Total	.043	26			
bulk40	Between Groups	.021	8	.003	11.858	.000
	Within Groups	.004	18	.000		
	Total	.024	26			

Lampiran 22. Beda Nyata Kadar Air Antar Minggu Suhu 20

air20

Duncan[a]

week	N	Subset for alpha = 0.05 1
7.00	3	1.65000
.00	3	1.67500
1.00	3	1.68333
4.00	3	1.69000
8.00	3	1.72500
2.00	3	1.73500
6.00	3	1.74000
3.00	3	1.75333
5.00	3	1.79000
Sig.		.180

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 23. Beda Nyata Kadar Air Antar Minggu Suhu 30

air30

Duncan[a]

week	N	Subset for alpha = 0.05 1	2
.00	3	1.67500	
1.00	3	1.72667	1.72667
4.00	3	1.74500	1.74500
7.00	3	1.79000	1.79000
6.00	3	1.79000	1.79000
2.00	3	1.81500	1.81500
5.00	3	1.82000	1.82000
8.00	3	1.84000	1.84000
3.00	3		1.88333
Sig.		.079	.094

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 24. Beda Nyata Kadar Air Antar Minggu Suhu 40

air40

Duncan[a]

week	N	Subset for alpha = 0.05 1
1.00	3	1.60000
2.00	3	1.62000
7.00	3	1.64000
3.00	3	1.65000
5.00	3	1.65000
.00	3	1.67500
8.00	3	1.67500
6.00	3	1.68500
4.00	3	1.69500
Sig.		.247

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 25. Beda Nyata Aktivitas Air Antar Minggu Suhu 20

aw20

Duncan[a]

week	N	Subset for alpha = 0.05 1	2	3	4	5	6
1.00	3	.54167					
6.00	3		.55467				
2.00	3		.55733				
4.00	3			.58067			
.00	3			.58267			
5.00	3				.59567		
3.00	3					.62467	
7.00	3					.63433	.63433
8.00	3						.63967
Sig.		1.000	.645	.730	1.000	.107	.361

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 26. Beda Nyata Aktivitas Air Antar Minggu Suhu 30

aw30

Duncan[a]

week	N	Subset for alpha = 0.05			
		1	2	3	4
.00	3	.58267			
1.00	3		.63433		
4.00	3			.65100	
6.00	3			.65367	
2.00	3			.65933	
3.00	3				.67633
8.00	3				.67667
5.00	3				.67933
7.00	3				.68567
Sig.		1.000	1.000	.106	.080

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 27. Beda Nyata Aktivitas Air Antar Minggu Suhu 40

aw40

Duncan[a]

week	N	Subset for alpha = 0.05			
		1	2	3	4
.00	3	.58267			
1.00	3		.63433		
3.00	3		.64033	.64033	
2.00	3		.64633	.64633	
4.00	3		.65967	.65967	.65967
8.00	3			.66333	.66333
7.00	3			.66367	.66367
5.00	3				.67867
6.00	3				.68767
Sig.		1.000	.072	.102	.053

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 28. Beda Nyata *Bulk Density* Antar Minggu Suhu 20

bulk20

Duncan[a]

week	N	Subset for alpha = 0.05	
		1	2
.00	3	.59667	
7.00	3		.67867
8.00	3		.68367
4.00	3		.68433
3.00	3		.68567
2.00	3		.68667
5.00	3		.68767
6.00	3		.69167
1.00	3		.72033
Sig.		1.000	.150

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 29. Beda Nyata *Bulk Density* Antar Minggu Suhu 30

bulk30

Duncan[a]

week	N	Subset for alpha = 0.05			
		1	2	3	4
2.00	3	.58133			
.00	3	.59667	.59667		
5.00	3	.60233	.60233	.60233	
8.00	3		.61900	.61900	
4.00	3		.62133	.62133	
6.00	3		.62733	.62733	
7.00	3		.62767	.62767	
3.00	3			.63100	
1.00	3				.66000
Sig.		.153	.052	.071	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 30. Beda Nyata *Bulk Density* Antar Minggu Suhu 40

bulk40

Duncan[a]

week	N	Subset for alpha = 0.05			
		1	2	3	4
5.00	3	.57500			
3.00	3	.58867			
.00	3	.59667	.59667		
4.00	3	.59700	.59700		
2.00	3	.60100	.60100		
1.00	3		.62300	.62300	
6.00	3			.63700	.63700
8.00	3			.64533	.64533
7.00	3				.66233
Sig.		.066	.058	.094	.060

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 31. ANOVA Aktivitas Antioksidan

ANOVA

Antioksidan

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.797	2	5.399	2.632	.080
Within Groups	123.057	60	2.051		
Total	133.854	62			

Lampiran 32. Beda Nyata Aktivitas Antioksidan Antar Suhu

Antioksidan

Duncan[a]

Suhu	N	Subset for alpha = 0.05	
		1	2
suhu 40	21	90.53443	
suhu 30	21	91.33348	91.33348
suhu 20	21		91.47467
Sig.		.076	.750

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 21,000.

Lampiran 33. ANOVA Aktivitas Antioksidan Antar Minggu

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Anti_20	Between Groups	54.062	6	9.010	8.136	.001
	Within Groups	15.504	14	1.107		
	Total	69.566	20			
Anti_30	Between Groups	9.006	6	1.501	1.086	.417
	Within Groups	19.343	14	1.382		
	Total	28.349	20			
Anti_40	Between Groups	19.465	6	3.244	8.002	.001
	Within Groups	5.676	14	.405		
	Total	25.141	20			

Lampiran 34. Beda Nyata Aktivitas Antioksidan Antar Minggu Suhu 20

Anti_20

Duncan[a]

		Subset for alpha = 0.05	
Week	N	1	2
5.00	3	88.03100	
8.00	3		90.93733
.00	3		90.96867
7.00	3		91.94467
6.00	3		92.74300
1.00	3		92.77867
3.00	3		92.91933
Sig.		1.000	.057

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 35. Beda Nyata Aktivitas Antioksidan Antar Minggu Suhu 30

Anti_30

Duncan[a]

Week	N	Subset for alpha = 0.05 1
6.00	3	90.30867
8.00	3	90.54700
.00	3	90.96867
7.00	3	91.76700
5.00	3	91.90933
3.00	3	91.91333
1.00	3	91.92033
Sig.		.156

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 36. Beda Nyata Aktivitas Antioksidan Antar Minggu Suhu 40

Anti_40

Duncan[a]

Week	N	Subset for alpha = 0.05 1	2	3
7.00	3	89.29367		
5.00	3	89.80267	89.80267	
3.00	3	90.06900	90.06900	
8.00	3	90.17900	90.17900	
.00	3		90.96867	
6.00	3		90.97267	
1.00	3			92.45533
Sig.		.138	.060	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 37. ANOVA Pembasahan Antar Suhu

ANOVA

pembasahan

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.461	2	.731	3.861	.026
Within Groups	13.057	69	.189		
Total	14.519	71			

Lampiran 38. Beda Nyata Pembasahan Antar Suhu

pembasahan

Duncan[a]

		Subset for alpha = 0.05	
suhu	N	1	2
suhu 30	24	1.5763	
suhu 40	24	1.6838	1.6838
suhu 20	24		1.9175
Sig.		.395	.067

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 24,000.

Lampiran 39. ANOVA Pembasahan Antar Minggu

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
pembasahan30	Between Groups	.945	7	.135	2.679	.049
	Within Groups	.806	16	.050		
	Total	1.751	23			
pembasahan20	Between Groups	6.762	7	.966	5.673	.002
	Within Groups	2.725	16	.170		
	Total	9.487	23			
pembasahan40	Between Groups	1.207	7	.172	4.508	.006
	Within Groups	.612	16	.038		
	Total	1.820	23			

Lampiran 40. Beda Nyata Pembasahan Antar Minggu Suhu 20

pembasahan20

Duncan[a]

week	N	Subset for alpha = 0.05		
		1	2	3
1.00	3	1.1333		
.00	3	1.3800		
2.00	3	1.5100	1.5100	
3.00	3	1.6200	1.6200	
5.00	3		2.2267	2.2267
4.00	3			2.4100
6.00	3			2.4700
7.00	3			2.5900
Sig.		.202	.060	.336

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 41. Beda Nyata Pembasahan Antar Minggu Suhu 30

pembasahan30

Duncan[a]

week	N	Subset for alpha = 0.05		
		1	2	3
7.00	3	1.2233		
.00	3	1.3800	1.3800	
2.00	3	1.5500	1.5500	1.5500
1.00	3	1.5600	1.5600	1.5600
3.00	3	1.6100	1.6100	1.6100
5.00	3	1.6100	1.6100	1.6100
4.00	3		1.7633	1.7633
6.00	3			1.9133
Sig.		.077	.079	.095

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 42. Beda Nyata Pembasahan Antar Minggu Suhu 40

pembasahan40

Duncan[a]

week	N	Subset for alpha = 0.05		
		1	2	3
.00	3	1.3800		
6.00	3	1.3867		
4.00	3	1.6233	1.6233	
1.00	3	1.6533	1.6533	
5.00	3	1.7100	1.7100	
2.00	3	1.7400	1.7400	
3.00	3		1.8700	1.8700
7.00	3			2.1067
Sig.		.060	.181	.158

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 43. Perhitungan Energi Aktivasi dan Umur Simpan dengan Parameter Kadar Air

- Energi Aktivasi
  - Persamaan *Arrhenius*
    y=-2806,5x-3,4275
  - Perhitungan Energi Aktivasi
    -EaR = -2806,5
    Ea= -(-2806,5 * 1,986) kal/mol K
    Ea = 5573.709 kkal/mol

- Umur Simpan Suhu 20°C

  y = -2806,5x-3,4275

  $\ln(\ln k) = -2806{,}5\left(\frac{1}{T}\right)+3{,}4275$

  $\ln(\ln k) = -2806{,}5\left(\frac{1}{293}\right)+3{,}4275$

  $\ln(\ln k) = -6{,}15099829351536$

  $k = 0{,}002131352992$

  $ts = \frac{|Q_0 - Q_{ek}|}{k}$

  $ts = \frac{|3-0{,}516|}{0{,}002131352992}$

  $ts = 273{,}44$ minggu

  Umur simpan = 273,44 minggu

- Umur Simpan Suhu 30°C

  y = -2806,5x-3,4275

  ln (ln k) =-2806,5$(\frac{1}{T})$+3,4275
  ln (ln k) =-2806,5$(\frac{1}{303})$+3,4275
  ln (ln k) =-5,83487623762376
  k=0,002923785092

  ts=$\frac{|Q_0 - Q_{ek}|}{k}$
  ts=$\frac{|3-0,516|}{0,002923785092}$
  ts=199,33 minggu

  Umur simpan = 199,33 minggu

- Umur Simpan Suhu 40°C

  y = -2806,5x-3,4275

  ln (ln k) =-2806,5$(\frac{1}{T})$+3,4275
  ln (ln k) =-2806,5$(\frac{1}{313})$+3,4275
  ln (ln k) = -5,53895367412141
  k=0,0039306374150

  ts=$\frac{|Q_0 - Q_{ek}|}{k}$
  ts=$\frac{|3-0,516|}{0,0039306374150}$
  ts=148,27 minggu

  Umur simpan = 148,27 minggu

Lampiran 44. Perhitungan Energi Aktivasi dan Umur Simpan dengan Parameter Aktivitas Air

- Energi Aktivasi
  - Persamaan *Arrhenius*
    y=-550,95x-2,9523
  - Perhitungan Energi Aktivasi
    -EaR = -550,95
    Ea= -(-550,85 * 1,986) kal/mol K
    Ea = 1092,3993 kkal/mol

- Umur Simpan Suhu 20^{o}C

  y = -550,95x-2,9523

  $\ln(\ln k) = -550{,}95\left(\frac{1}{T}\right)+2{,}9523$

  $\ln(\ln k) = -550{,}95\left(\frac{1}{293}\right)+2{,}9523$

  $\ln(\ln k) = -4{,}82960375426621$

  $k = 0{,}00798968652$

  $ts = \frac{|Q_0 - Q_{ek}|}{k}$

  $ts = \frac{|0{,}6-0{,}583|}{0{,}00798968652}$

  $ts = 2{,}13$ minggu

  Umur simpan = 2,13 minggu

- Umur Simpan Suhu 30^{o}C

  y = -550,95x-2,9523

  $\ln(\ln k) = -550{,}95\left(\frac{1}{T}\right)+2{,}9523$

  $\ln(\ln k) = -550{,}95\left(\frac{1}{303}\right)+2{,}9523$

  $\ln(\ln k) = -4{,}76764653465347$

  $k = 0{,}00850036194$

  $ts = \frac{|Q_0 - Q_{ek}|}{k}$

  $ts = \frac{|0{,}6-0{,}583|}{0{,}00850036194}$

  $ts = 2$ minggu

  Umur simpan = 2 minggu

- Umur Simpan Suhu 40^{o}C

  y = -550,95x-2,9523

  $\ln(\ln k) = -550{,}95\left(\frac{1}{T}\right)+2{,}9523$

  $\ln(\ln k) = -550{,}95\left(\frac{1}{303}\right)+2{,}9523$

  $\ln(\ln k) = -4{,}70964824281150$

  $k = 0{,}00900794563$

  $ts = \frac{|Q_0 - Q_{ek}|}{k}$

  $ts = \frac{|0{,}6-0{,}583|}{0{,}00900794563}$

  $ts = 1{,}89$ minggu

Umur simpan = 1,89 minggu

Lampiran 45. Hasil Plagscan