

Lampiran 1. Hasil Determinasi Tanaman kubis bunga



KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
UNIVERSITAS DIPONEGORO
FAKULTAS SAINS DAN MATEMATIKA
LABORATORIUM EKOLOGI DAN BIOSISTEMATIK DEPARTEMEN BIOLOGI
Jl. Prof. H. Soedarto SH Tembalang Semarang, 024 7474754, 024 76480923

158

SURAT KETERANGAN

Yang bertanda tangan dibawah ini, menyatakan bahwa mahasiswa sbb :

Nama	: UMMI CHAMDANAH
NIM	: 135010952
Fakultas / Prodi	: FARMASI
Perguruan Tinggi	: UNIVERSITAS WAHID HASYIM SEMARANG
Judul Skripsi	: "Pengaruh Suhu dan Lama Penyimpanan terhadap Kadar Flavonoid dalam Ekstak <i>Brassica oleracea</i> Var. <i>botrytis</i> L. dan Aktivitas Antioksidannya dengan Metode DPPH"
Pembimbing	: -

Telah melakukan determinasi / identifikasi sampel tumbuhan (satu jenis) di Laboratorium Ekologi dan Biosistematik Departemen Biologi Fakultas Sains dan Matematika Universitas Diponegoro. Hasil determinasi / identifikasi terlampir.

Demikian Surat Keterangan ini dibuat untuk dapat digunakan seperlunya.

Semarang, Juli 2017

Laboratorium Ekologi Dan Biosistematik



Dr. Mochamad Hadi, M.Si.

NIP. 196001081987031002

Lampiran 1. Lanjutan...



KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
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HASIL DETERMINASI / IDENTIFIKASI

KLASIFIKASI

Kingdom	: Plantae
Divisi	: Spermatophyta
Sub Divisi	: Angiospermae
Class	: Dicotyledoneae
Ordo	: Brassicales
Famili	: Brassicaceae / Cruciferae
Genus	: <i>Brassica</i>
Species	: <i>Brassica oleracea</i> var. <i>botrytis</i> .

DESKRIPSI

1b, 2b, 3b, 4b, 12b, 13b, 14b, 17b, 18b, 19b, 20b, 21b, 22b, 23b, 24b, 25b, 26b, 27b, 799b, 800b, 801b, 802a, 803b, 804b, 805c, 806b, 807b, 809b, 810b, 811a, 812b, 815b, 816b, 818b, 820b, 821b, 822b, 824b, 825b, 826b, 829b, 830b, 831b, 832b, 833b, 834a, 835a, 836a, 837c, 851a, 852b, 853b, 854a, 855c, 856b, 857a, 858a, 859c, 860b, 872b, 874b, 875b, 876b, 877c, 916a, 917a, 918b, 919b, Famili 32 : Brassicaceae 1b, 6b, 7b, 10a, Genus 3. *Brassica*. 1b Species : *Brassica oleracea* L. var *botrytis*.

DESKRIPSI

Kubis atau kol merupakan tanaman sayur famili Brassicaceae berupa tumbuhan berbatang lunak yang dikenal sejak jaman purbakala dan merupakan tanaman yang dipuja dan dimuliakan masyarakat Yunani Kuno. Mulanya kubis merupakan tanaman pengganggu (gulma) yang tumbuh liar disepanjang pantai laut Tengah, di karang-karang pantai Inggris, Denmark dan pantai Barat Prancis sebelah Utara. Kubis mulai ditanam di kebun-kebun Eropa kira-kira abad ke 9 dan dibawa ke Amerika oleh emigran Eropa serta ke Indonesia abad ke 16 atau 17.

PUSTAKA :

Backer and van den Brink (1968) Flora of Java, Vol. I – III, Wolters – Noordhoff NV – Groningen – The Netherlands.

Van Steenis, CGGJ. (1985) Flora untuk sekolah di Indonesia, terjemahan Moesa Suryowinoto, dkk) PT. Pradnya Paramita Jakarta Pusat.

Lampiran 1. Lanjutan...

Lampiran 2. Surat Keterangan telah Melakukan Penelitian di Laboratorium Kimia Fakultas Farmasi Universitas Wahid Hasyim Semarang

**UNIVERSITAS WAHID HASYIM**
FAKULTAS FARMASI
BAGIAN KIMIA FARMASI
Jl. Menoreh Tengah X / 22 Sampangan – Semarang 50236 Telp. (024) 8505680 – 8505681 fax. (024) 8505680

SURAT KETERANGAN
No.003 / C.05/UWH/I/ 2018

Assalamu'alaikum Wr. Wb.

Yang bertanda tangan dibawah ini, Kepala Bagian Kimia Farmasi Fakultas Farmasi Universitas Wahid Hasyim Semarang menerangkan bahwa :

Nama : Ummi Chamdanah
NIM : 135010952
Fak/ Univ/ Sekolah : Farmasi / Universitas Wahid Hasyim

Telah melakukan Penelitian menggunakan Spektrofotometer UV-Vis di Laboratorium Kimia Analisa, Fakultas Farmasi Universitas Wahid Hasyim Semarang, dengan judul penelitian :
"Pengaruh Suhu dan Lama Penyimpanan Terhadap Kadar Flavonoid Total dan Aktivitas Antioksidan Ekstrak Etanol Kubis Bunga (*Brassica oleracea* var. *Botrytis* L.)"

Demikian surat keterangan ini dibuat untuk dipergunakan semestinya.

Wassalamu'alaikum Wr. Wb.

Semarang, Januari 2018
Kep. Bag. Kimia Farmasi

Murni Ulfah, M.Sc, Apt



Lampiran 3. Surat Keterangan telah Melakukan Penelitian di Laboratorium Teknologi Pangan Fakultas Teknologi Pertanian Universitas Katholik Soegijapranata

Fakultas Teknologi Pertanian
Program Studi Teknologi Pangan
Jl. Pawiyatan Luhur IV/1 Benda Duwur Semarang 50234
Telp. (024) 8441555, 8505003(hunting) Fax. (024) 8415429 - 8445265
e-mail: unika@unika.ac.id http://www.unika.ac.id

Unika
SOEGIJAPRANATA

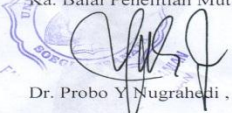
Nomor : 070 /H.5/FTP-CFA/IX/2017 6 September 2017
Lampiran : 1 lembar
Perihal : Hasil analisa

Kepada Yth.
Dekan
Fakultas Farmasi
Universitas Wahid Hasyim
Di Semarang

Dengan hormat,
Bersama surat ini kami beritahukan bahwa Mahasiswa atas nama Ummi Chamdanah (NIM : 135010952) telah melakukan proses ekstraksi dengan menggunakan *rotary evaporator* pada sampel Kubis Bunga di Laboratorium Ilmu Pangan Universitas Katolik Soegijapranata Semarang.

Demikian pemberitahuan kami, atas perhatian dan kerjasamanya kami ucapkan terima kasih.

Hormat kami,
Ka. Balai Penelitian Mutu dan Keamanan Pangan


Dr. Probo Y Nugrahedi, STP, MSc

Lampiran 4 . Perhitungan Rendemen Ekstrak Etanol Kubis bunga

$$\text{Rendemen} = \frac{\text{Berat ekstrak kental}}{\text{Berat kubis bunga}} \times 100\%$$

Keterangan :

Berat kubis bunga : 100 gram

Perlakuan	Ekstrak kental (Gram)	Rendemen (%)
Hari 0	5,350	5,35
Hari 3 (Suhu Dingin)	3,425	3,43
Hari 3 (Suhu Sejuk)	3,872	3,87
Hari 3 (Suhu Kamar)	4,221	4,22
Hari 6 (Suhu Dingin)	9,850	9,85
Hari 6 (Suhu Sejuk)	6,612	6,61
Hari 6 (Suhu Kamar)	6,090	6,09
Hari 9 (Suhu Dingin)	5,659	5,66
Hari 9 (Suhu Sejuk)	4,500	4,50
Hari 9 (Suhu Kamar)	9,751	9,75

Lampiran 5 . Hasil Perhitungan Identifikasi Flavonoid dengan KLT

1. Perhitungan Fase Gerak

Fase Gerak = Butanol : Asam Asetat : Aquadest (7:1:2)

Volume chamber = 40 mL

$$\text{Butanol} = \frac{7 \text{ mL}}{10 \text{ mL}} \times 40 \text{ mL} = 28 \text{ mL}$$

$$\text{Asam asetat} = \frac{1 \text{ mL}}{10 \text{ mL}} \times 40 \text{ mL} = 4 \text{ mL}$$

$$\text{Aquadest} = \frac{2 \text{ mL}}{10 \text{ mL}} \times 40 \text{ mL} = 8 \text{ mL}$$

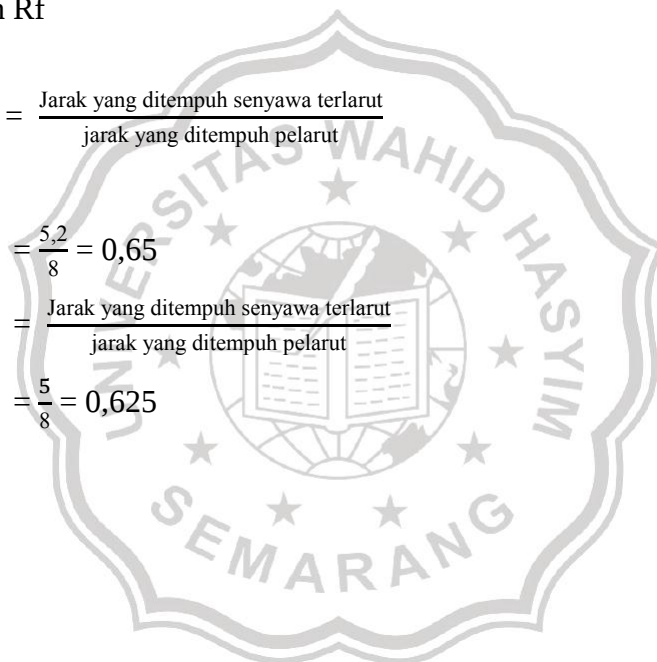
2. Perhitungan Rf

$$\text{Rf sampel} = \frac{\text{Jarak yang ditempuh senyawa terlarut}}{\text{jarak yang ditempuh pelarut}}$$

$$= \frac{5,2}{8} = 0,65$$

$$\text{Rf rutin} = \frac{\text{Jarak yang ditempuh senyawa terlarut}}{\text{jarak yang ditempuh pelarut}}$$

$$= \frac{5}{8} = 0,625$$

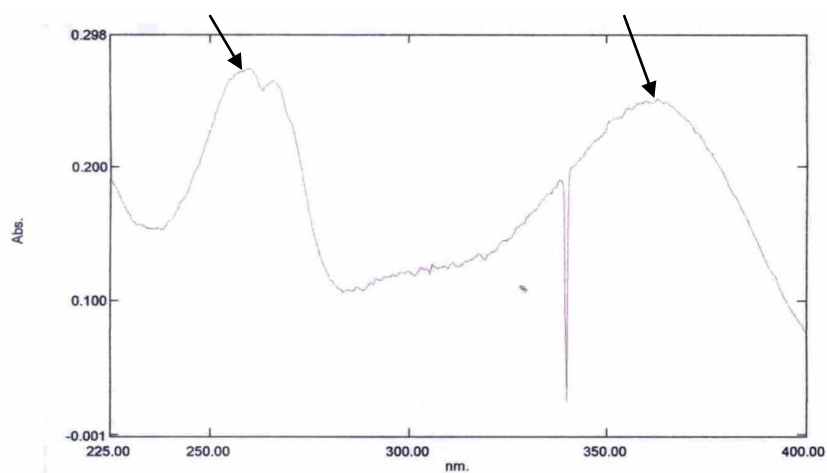


Lampiran 6. Hasil Penentuan Panjang Gelombang Maksimal Rutin

1. Perhitungan Larutan Stok

50 mg Rutin pa ad 10 mL = 5 mg/mL, diambil 2 mL → 10 mg ad 100 mL =
100 mcg/mL = 100 ppm

2. Penentuan Panjang Gelombang Maksimal



No.	P/V	Wavelength	Abs.	Description
1	●	372.80	0.225	
2	●	366.50	0.245	
3	●	364.70	0.248	
4	●	362.70	0.251	
5	●	359.70	0.249	
6	●	357.70	0.247	
7	●	355.30	0.244	
8	●	350.30	0.234	
9	●	338.60	0.189	
10	●	337.90	0.190	
11	●	336.70	0.185	
12	●	329.70	0.162	
13	●	323.70	0.145	
14	●	320.90	0.137	
15	●	320.10	0.134	
16	●	317.70	0.135	
17	●	314.20	0.129	
18	●	311.10	0.128	
19	●	305.90	0.127	
20	●	304.60	0.124	
21	●	303.10	0.125	
22	●	299.80	0.122	
23	●	297.90	0.121	
24	●	294.10	0.118	

No.	P/V	Wavelength	Abs.	Description
25	●	292.10	0.116	
26	●	290.50	0.114	
27	●	287.30	0.110	
28	●	265.70	0.264	
29	●	260.10	0.273	
30	●	255.10	0.266	
31	●	242.60	0.174	
32	●	372.30	0.225	
33	●	364.20	0.247	
34	●	361.30	0.248	
35	●	358.10	0.247	
36	●	355.90	0.242	
37	●	352.70	0.236	
38	●	350.80	0.233	
39	●	348.50	0.223	
40	●	339.70	0.024	
41	●	338.40	0.188	
42	●	336.90	0.184	
43	●	335.80	0.180	
44	●	329.10	0.157	
45	●	321.40	0.136	
46	●	319.10	0.130	
47	●	309.80	0.124	
48	●	307.30	0.124	

Panjang Gelombang (λ) Maksima = 260,1nm

Lampiran 7. Perhitungan Seri Konsentrasi Kurva Baku Rutin

$$25 \mu\text{L rutin } 5 \text{ mg/mL} \rightarrow \frac{0,025 \text{ mL}}{1 \text{ mL}} \times 5 \text{ mg} = 0,125 \text{ mg ad } 25 \text{ mL}$$

$$\rightarrow 125 \text{ mcg}/25 \text{ mL} = 5 \text{ mcg/mL} = 5 \text{ ppm}$$

$$50 \mu\text{L rutin } 5 \text{ mg/mL} \rightarrow \frac{0,050 \text{ mL}}{1 \text{ mL}} \times 5 \text{ mg} = 0,250 \text{ mg ad } 25 \text{ mL}$$

$$\rightarrow 250 \text{ mcg}/25 \text{ mL} = 10 \text{ mcg/mL} = 10 \text{ ppm}$$

$$75 \mu\text{L rutin } 5 \text{ mg/mL} \rightarrow \frac{0,075 \text{ mL}}{1 \text{ mL}} \times 5 \text{ mg} = 0,375 \text{ mg ad } 25 \text{ mL}$$

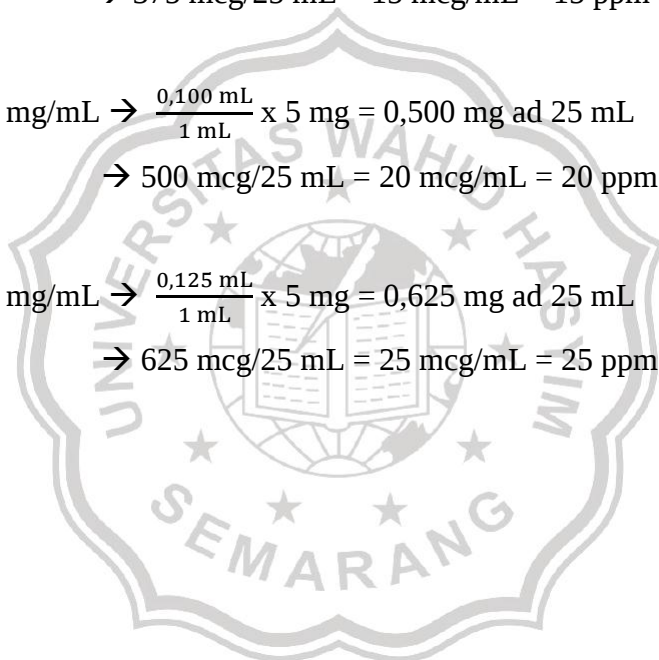
$$\rightarrow 375 \text{ mcg}/25 \text{ mL} = 15 \text{ mcg/mL} = 15 \text{ ppm}$$

$$100 \mu\text{L rutin } 5 \text{ mg/mL} \rightarrow \frac{0,100 \text{ mL}}{1 \text{ mL}} \times 5 \text{ mg} = 0,500 \text{ mg ad } 25 \text{ mL}$$

$$\rightarrow 500 \text{ mcg}/25 \text{ mL} = 20 \text{ mcg/mL} = 20 \text{ ppm}$$

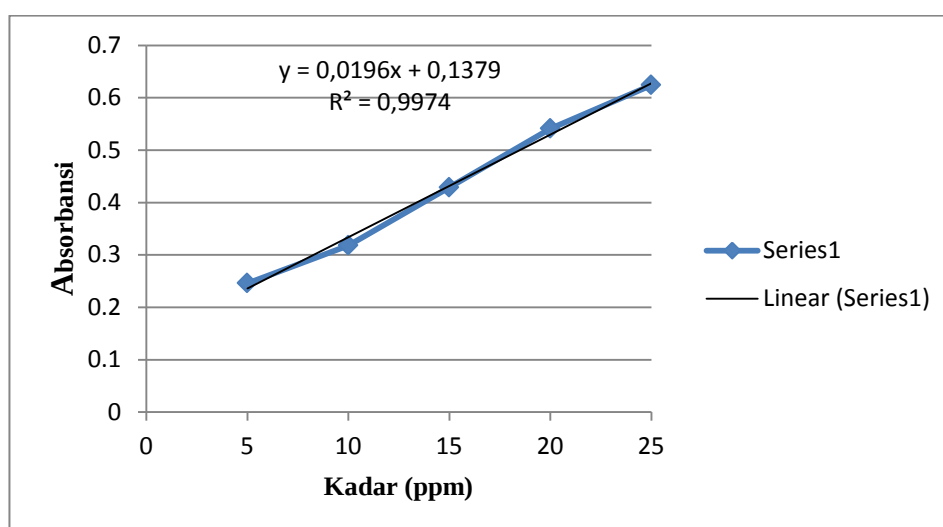
$$125 \mu\text{L rutin } 5 \text{ mg/mL} \rightarrow \frac{0,125 \text{ mL}}{1 \text{ mL}} \times 5 \text{ mg} = 0,625 \text{ mg ad } 25 \text{ mL}$$

$$\rightarrow 625 \text{ mcg}/25 \text{ mL} = 25 \text{ mcg/mL} = 25 \text{ ppm}$$



Lampiran 8. Hasil Absorbansi dan Perhitungan Persamaan Kurva Baku Rutin

Kadar (ppm)	Absorbansi (λ 260,1 nm)
5	0.246
10	0.318
15	0.429
20	0.541
25	0.624



Regresi Linier Persamaan Kurva Baku

$$a = 0,1379$$

$$b = 0,0196$$

$$r = 0,9974$$

$$Y = bX + a$$

$$Y = 0,0196X + 0,1379$$

Lampiran 9. Hasil Absorbansi dan Perhitungan Kadar Flavonoid Kubis Bunga

$$\begin{aligned}
 \text{Kadar Flavonoid (X)} &= \frac{Y-a}{b} \times \text{FP} \\
 &= \frac{Y-0,1379}{0,0196} \times \text{FP} \\
 &= \frac{0,619-0,1379}{0,0196} \times 10 \\
 &= 246,73 \text{ ppm}
 \end{aligned}$$

Lama	Suhu	Absorbansi	Kadar Flavonoid (ppm)	Kadar Rata-rata Flavonoid $\pm$ SD (ppm)
0 Hari	Kamar	0,619	245,71	246,73 $\pm$ 0,15
		0,621	246,73	
		0,623	247,75	
3 Hari	Dingin	0,546	208,43	209,28 $\pm$ 0,11
		0,549	209,96	
		0,548	209,45	
	Sejuk	0,585	228,34	228,86 $\pm$ 0,07
		0,586	228,86	
		0,587	229,37	
	Kamar	0,500	184,98	184,42 $\pm$ 0,07
		0,511	184,42	
		0,510	183,91	
6 Hari	Dingin	0,508	189,02	189,87 $\pm$ 0,11
		0,511	190,55	
		0,510	190,04	
	Sejuk	0,540	205,36	206,38 $\pm$ 0,65
		0,542	206,38	
		0,544	207,41	
	Kamar	0,466	157,35	158,03 $\pm$ 0,11
		0,447	157,86	
		0,449	158,89	
9 Hari	Dingin	0,429	148,67	182,21 $\pm$ 0,07
		0,430	149,18	
		0,428	148,16	
	Sejuk	0,495	182,38	182,21 $\pm$ 0,04
		0,494	181,89	
		0,495	182,38	
	Kamar	0,302	83,81	82,79 $\pm$ 0,14
		0,300	82,79	
		0,298	81,77	

Lampiran 10. Hasil Analisis Statistik Pengaruh Suhu dan Lama Penyimpanan terhadap Kadar Flavonoid

1. UJI HOMOGENITAS

Test of Homogeneity of Variances

Kadar

Levene Statistic	df1	df2	Sig.
1.008	9	20	.465

Signifikansi lebih dari 0,05 → data homogen

2. UJI NORMALITAS

perlakuan	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
kadar KB 0	.175	3	.	1.000	3	.999
KB 3 SD	.253	3	.	.964	3	.637
KB 3 SJ	.175	3	.	1.000	3	1.000
KB 3 SK	.175	3	.	1.000	3	1.000
KB 6 SD	.305	3	.	.906	3	.406
KB 6 SK	.328	3	.	.871	3	.298
KB 9 SD	.175	3	.	1.000	3	1.000
KB 9 SJ	.253	3	.	.964	3	.637
KB 9 SK	.175	3	.	1.000	3	1.000

a. Lilliefors Significance Correction

Signifikansi lebih dari 0,05 → data normal

Lanjutan

UJI ANOVA 2 JALAN

Tests of Between-Subjects Effects

Dependent Variable:kadar

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1165.127 ^a	9	129.459	6.421E3	.000
Intercept	36068.436	1	36068.436	1.789E6	.000
Perlakuan	1165.127	9	129.459	6.421E3	.000
Error	.403	20	.020		
Total	37233.965	30			
Corrected Total	1165.530	29			

a. R Squared = 1.000 (Adjusted R Squared = .999)

Signifikansi < 0,05 → terdapat perbedaan yang signifikan.



Lampiran 11. Analisis Statistik Kadar Flavonoid berdasarkan Suhu Penyimpanan

a. Dingin

Test of Homogeneity of Variances

Kadar

Levene Statistic	df1	df2	Sig.
.357	3	8	.786

Post Hoc Tests

Multiple Comparisons

Kadar

Tukey HSD

(I) perlakuan	(J) perlakuan	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
KB 0	KB 3 SD	5.31786 [*]	.09204	.000	5.1056	5.5301
	KB 6 SD	8.07348 [*]	.09204	.000	7.8612	8.2857
	KB 9 SD	13.92313 [*]	.09204	.000	13.7109	14.1354
KB 3 SD	KB 0	-5.31786 [*]	.09204	.000	-5.5301	-5.1056
	KB 6 SD	2.75562 [*]	.09204	.000	2.5434	2.9679
	KB 9 SD	8.60527 [*]	.09204	.000	8.3930	8.8175
KB 6 SD	KB 0	-8.07348 [*]	.09204	.000	-8.2857	-7.8612
	KB 3 SD	-2.75562 [*]	.09204	.000	-2.9679	-2.5434
	KB 9 SD	5.84965 [*]	.09204	.000	5.6374	6.0619
KB 9 SD	KB 0	-13.92313 [*]	.09204	.000	-14.1354	-13.7109
	KB 3 SD	-8.60527 [*]	.09204	.000	-8.8175	-8.3930
	KB 6 SD	-5.84965 [*]	.09204	.000	-6.0619	-5.6374

Signifikansi < 0,05 → terdapat perbedaan yang signifikan

Lanjutan

b. Sejuk

Test of Homogeneity of Variances

Kadar

Levene Statistic	df1	df2	Sig.
.829	3	8	.514

Post Hoc Tests

Multiple Comparisons

kadar

Tukey HSD

(I) perlakuan	(J) perlakuan	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
KB 0	KB 3 SJ	2.5381*	.09044	.000	2.2484	2.8277
	KB 6 SJ	5.7288*	.09044	.000	5.4392	6.0184
	KB 9 SJ	9.1612*	.09044	.000	8.8716	9.4509
KB 3 SJ	KB 0	-2.5381*	.09044	.000	-2.8277	-2.2484
	KB 6 SJ	3.1907*	.09044	.000	2.9011	3.4804
	KB 9 SJ	6.6232*	.09044	.000	6.3335	6.9128
KB 6 SJ	KB 0	-5.7288*	.09044	.000	-6.0184	-5.4392
	KB 3 SJ	-3.1907*	.09044	.000	-3.4804	-2.9011
	KB 9 SJ	3.4324*	.09044	.000	3.1428	3.7221
KB 9 SJ	KB 0	-9.1612*	.09044	.000	-9.4509	-8.8716
	KB 3 SJ	-6.6232*	.09044	.000	-6.9128	-6.3335
	KB 6 SJ	-3.4324*	.09044	.000	-3.7221	-3.1428

Signifikansi < 0,05 → terdapat perbedaan yang signifikan

Lanjutan

c. Kamar

Test of Homogeneity of Variances

Kadar

Levene Statistic	df1	df2	Sig.
.340	3	8	.797

Post Hoc Tests

Multiple Comparison

Kadar

Tukey HSD

(I) suhu_kamar (J) suhu_kamar	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
Kontrol KB 3 SK	8.846991*	.0996641	.000	8.527831	9.166150
	12.593667*	.0996641	.000	12.274507	12.912827
	23.277737*	.0996641	.000	22.958578	23.596897
KB 3 SK Kontrol	-8.846991*	.0996641	.000	-9.166150	-8.527831
	3.746676*	.0996641	.000	3.427517	4.065836
	14.430747*	.0996641	.000	14.111587	14.749907
KB 6 SK Kontrol	-12.593667*	.0996641	.000	-12.912827	-12.274507
	-3.746676*	.0996641	.000	-4.065836	-3.427517
	10.684071*	.0996641	.000	10.364911	11.003230
KB 9 SK Kontrol	-23.277737*	.0996641	.000	-23.596897	-22.958578
	-14.430747*	.0996641	.000	-14.749907	-14.111587
	-10.684071*	.0996641	.000	-11.003230	-10.364911

Signifikansi < 0,05 → terdapat perbedaan yang signifikan

Lampiran 12. Analisis Statistik Kadar Flavonoid berdasarkan Lama Penyimpanan

a. 3 hari

Test of Homogeneity of Variances

Kadar

Levene Statistic	df1	df2	Sig.
5.769	1	10	.572

Post Hoc Tests

Multiple Comparisons

kadar

Tukey HSD

(I) hari_3	(J) hari_3	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Control	3 suhu dingin	5.317863*	.0854613	.000	5.120789	5.514937
	3 suhu sejuk	2.538071*	.0854613	.000	2.340997	2.735145
	3 suhu kamar	8.846991*	.0854613	.000	8.649916	9.044065
3 suhu dingin	Control	-5.317863*	.0854613	.000	-5.514937	-5.120789
	3 suhu sejuk	-2.779792*	.0854613	.000	-2.976866	-2.582718
	3 suhu kamar	3.529127*	.0854613	.000	3.332053	3.726201
3 suhu sejuk	Control	-2.538071*	.0854613	.000	-2.735145	-2.340997
	3 suhu dingin	2.779792*	.0854613	.000	2.582718	2.976866
	3 suhu kamar	6.308920*	.0854613	.000	6.111845	6.505994
3 suhu kamar	Control	-8.846991*	.0854613	.000	-9.044065	-8.649916
	3 suhu dingin	-3.529127*	.0854613	.000	-3.726201	-3.332053
	3 suhu sejuk	-6.308920*	.0854613	.000	-6.505994	-6.111845

Signifikansi < 0,05 → terdapat perbedaan yang signifikan

Lanjutan

b. 6 hari

Test of Homogeneity of Variances

Kadar

Levene Statistic	df1	df2	Sig.
8.566	1	10	.450

Post Hoc Tests

Multiple Comparisons

Kadar

Tukey HSD

(I) hari_6	(J) hari_6	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
kontrol	HARI 6 SD	8.0735*	.10536	.000	7.8305	8.3165
	HARI 6 SJ	5.7288*	.10536	.000	5.4858	5.9718
	HARI 6 SK	12.5937*	.10536	.000	12.3507	12.8366
HARI 6 SD	Control	-8.0735*	.10536	.000	-8.3165	-7.8305
	HARI 6 SJ	-2.3447*	.10536	.000	-2.5877	-2.1017
	HARI 6 SK	4.5202*	.10536	.000	4.2772	4.7632
HARI 6 SJ	Control	-5.7288*	.10536	.000	-5.9718	-5.4858
	HARI 6 SD	2.3447*	.10536	.000	2.1017	2.5877
	HARI 6 SK	6.8649*	.10536	.000	6.6219	7.1078
HARI 6 SK	Control	-12.5937*	.10536	.000	-12.8366	-12.3507
	HARI 6 SD	-4.5202*	.10536	.000	-4.7632	-4.2772
	HARI 6 SJ	-6.8649*	.10536	.000	-7.1078	-6.6219

Signifikansi < 0,05 → terdapat perbedaan yang signifikan

Lanjutan

c. 9 hari

Test of Homogeneity of Variances

Kadar

Levene Statistic	df1	df2	Sig.
9.115	1	10	.230

Post Hoc Tests

Multiple Comparisons

Kadar

Tukey HSD

(I) hari_9	(J) hari_9	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
kontrol	HARI 9 SD	13.92313 [*]	.09044	.000	13.7146	14.1317
	HARI 9 SJ	9.16123 [*]	.09044	.000	8.9527	9.3698
	HARI 9 SK	23.27774 [*]	.09044	.000	23.0692	23.4863
HARI 9 SD	Control	-13.92313 [*]	.09044	.000	-14.1317	-13.7146
	HARI 9 SJ	-4.76190 [*]	.09044	.000	-4.9705	-4.5533
	HARI 9 SK	9.35460 [*]	.09044	.000	9.1460	9.5632
HARI 9 SJ	Control	-9.16123 [*]	.09044	.000	-9.3698	-8.9527
	HARI 9 SD	4.76190 [*]	.09044	.000	4.5533	4.9705
	HARI 9 SK	14.11651 [*]	.09044	.000	13.9079	14.3251
HARI 9 SK	Control	-23.27774 [*]	.09044	.000	-23.4863	-23.0692
	HARI 9 SD	-9.35460 [*]	.09044	.000	-9.5632	-9.1460
	HARI 9 SJ	-14.11651 [*]	.09044	.000	-14.3251	-13.9079

Signifikansi < 0,05 → terdapat perbedaan yang signifikan

Lampiran 13. Hasil Perhitungan Panjang Gelombang Maksimal DPPH

1. Perhitungan Stok DPPH

Molaritas DPPH yang dibutuhkan $0,4 \text{ mM} = 4 \times 10^{-4} \text{ M}$

MR DPPH = 394,32 g/mol

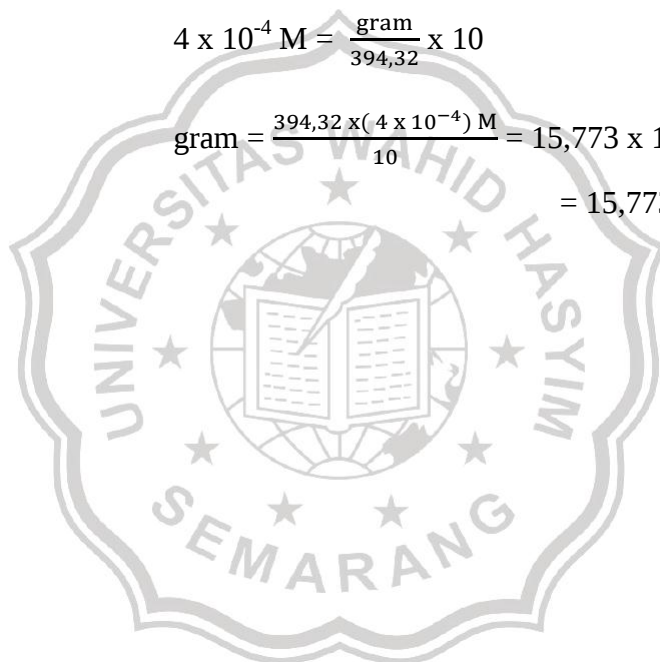
Volume larutan = 100 mL = 0,1 L

$$\text{Penimbangan DPPH} \Rightarrow \text{Molaritas} = \frac{\text{gram}}{\text{MR}} \times \frac{1000}{\text{volume}}$$

$$4 \times 10^{-4} \text{ M} = \frac{\text{gram}}{394,32} \times \frac{1000}{100}$$

$$4 \times 10^{-4} \text{ M} = \frac{\text{gram}}{394,32} \times 10$$

$$\begin{aligned} \text{gram} &= \frac{394,32 \times (4 \times 10^{-4}) \text{ M}}{10} = 15,773 \times 10^{-3} \text{ gram} \\ &= 15,773 \text{ mg} \end{aligned}$$



Lampiran 14. Perhitungan Seri Konsentrasi Larutan Rutin untuk Menentukan Aktivitas Antioksidan

1. Perhitungan Larutan Induk Rutin

$$10 \text{ mg Rutin} \text{ pada } 1000 \text{ mL} = 10 \text{ mcg/mL}$$

2. 1 mL rutin 10 mcg/mL $\rightarrow \frac{1 \text{ mL}}{1 \text{ mL}} \times 10 \text{ mcg} = 10 \text{ mcg}$ ad 5 mL

$$\rightarrow 10 \text{ mcg} / 5 \text{ mL} = 2 \text{ mcg/mL} = 2 \text{ ppm}$$

2 mL rutin 10 mcg/mL $\rightarrow \frac{2 \text{ mL}}{1 \text{ mL}} \times 10 \text{ mcg} = 20 \text{ mcg}$ ad 5 mL

$$\rightarrow 20 \text{ mcg} / 5 \text{ mL} = 4 \text{ mcg/mL} = 4 \text{ ppm}$$

3 mL rutin 10 mcg/mL $\rightarrow \frac{3 \text{ mL}}{1 \text{ mL}} \times 10 \text{ mcg} = 30 \text{ mcg}$ ad 5 mL

$$\rightarrow 30 \text{ mcg} / 5 \text{ mL} = 6 \text{ mcg/mL} = 6 \text{ ppm}$$

4 mL rutin 10 mcg/mL $\rightarrow \frac{4 \text{ mL}}{1 \text{ mL}} \times 10 \text{ mcg} = 40 \text{ mcg}$ ad 5 mL

$$\rightarrow 40 \text{ mcg} / 5 \text{ mL} = 8 \text{ mcg/mL} = 8 \text{ ppm}$$

5 mL rutin 10 mcg/mL $\rightarrow \frac{5 \text{ mL}}{1 \text{ mL}} \times 10 \text{ mcg} = 50 \text{ mcg}$ ad 5 mL

$$\rightarrow 50 \text{ mcg} / 5 \text{ mL} = 10 \text{ mcg/mL} = 10 \text{ ppm}$$

Lampiran 15. Hasil Absorbansi dan Perhitungan Aktivitas Antioksidan Kubis Bunga

$$\% \text{ inhibisi} = \frac{\text{absorbansi kontrol} - \text{absorbansi sampel}}{\text{absorbansi kontrol}} \times 100\%$$

Keterangan :

Absorbansi kontrol : Serapan radikal DPPH 0.4 mM pada panjang gelombang 518,5 nm => 0.970

Absorbansi sampel : Serapan radikal DPPH 0.4 mM dalam kubis bunga pada panjang gelombang 518,5 nm

Tabel Hasil Uji Aktivitas Antioksidan Ekstrak Etanol Kubis Bunga.

Lama	Suhu	Absorbansi	Aktivitas Antioksidan (%)	Rata-rata Aktivitas Antioksidan ± SD (%)
0 Hari	Kamar	0,649	33,09	33,40 ± 0,31
		0,646	33,40	
		0,643	33,71	
3 Hari	Dingin	0,678	30,10	30,27 ± 0,21
		0,674	30,51	
		0,677	30,21	
	Sejuk	0,658	32,16	32,30 ± 0,16
		0,655	32,47	
		0,657	32,27	
	Kamar	0,682	29,69	29,86 ± 0,21
		0,681	29,79	
		0,678	30,10	
6 Hari	Dingin	0,683	29,59	29,59 ± 0,10
		0,682	29,69	
		0,684	29,48	
	Sejuk	0,662	31,75	31,37 ± 0,36
		0,666	31,34	
		0,669	31,03	
	Kamar	0,692	28,03	28,63 ± 0,16
		0,694	28,66	
		0,691	28,75	
9 Hari	Dingin	0,701	27,73	27,56 ± 0,16
		0,704	27,42	
		0,703	27,52	
	Sejuk	0,678	30,10	30,07 ± 0,16
		0,677	30,21	
		0,680	29,90	
	Kamar	0,711	26,70	26,39 ± 0,31
		0,717	26,08	
		0,714	26,39	

Lampiran 16. Hasil Analisis Statistik Pengaruh Suhu dan Lama Penyimpanan terhadap Aktivitas Antioksidan Kubis Bunga

1. UJI HOMOGENITAS

Test of Homogeneity of Variances

Inhibisi

Levene Statistic	df1	df2	Sig.
.687	9	20	.713

Signifikansi lebih dari 0,05 → data homogen

2. UJI NORMALITAS

Perlakuan	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
Inhibisi KB 0	.175	3	.	1.000	3	1.000
KB 3 SD	.292	3	.	.923	3	.463
KB 3 SJ	.253	3	.	.964	3	.637
KB 3 SK	.292	3	.	.923	3	.463
KB 6 SD	.175	3	.	1.000	3	1.000
KB 6 SJ	.204	3	.	.993	3	.843
KB 6 SK	.253	3	.	.964	3	.637
KB 9 SD	.253	3	.	.964	3	.637
KB 9 SJ	.253	3	.	.964	3	.637
KB 9 SK	.175	3	.	1.000	3	1.000

Signifikansi lebih dari 0,05 → data normal.

3. UJI ANOVA 2 JALAN

Tests of Between-Subjects Effects

Dependent Variable

inhibisi

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	119.596 ^a	9	13.288	253.441	.000
Intercept	26901.122	1	26901.122	5.131E5	.000
Perlakuan	119.596	9	13.288	253.441	.000
Error	1.049	20	.052		
Total	27021.766	30			
Corrected Total	120.645	29			

Signifikansi < 0,05 → terdapat perbedaan yang signif

Lanjutan

SUHU PENYIMPANAN

Post Hoc Tests

Multiple Comparisons

Inhibisi

Tukey HSD

(I) SUHU	(J) SUHU	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Control	suhu dingin	14.471873*	.2051354	.000	14.048495	14.895252
	suhu sejuk	12.364199*	.2051354	.000	11.940820	12.787577
	suhu kamar	15.319525*	.2051354	.000	14.896146	15.742904
suhu dingin	Control	-14.471873*	.2051354	.000	-14.895252	-14.048495
	suhu sejuk	-2.107675*	.1450526	.000	-2.407049	-1.808301
	suhu kamar	.847652*	.1450526	.000	.548278	1.147026
suhu sejuk	Control	-12.364199*	.2051354	.000	-12.787577	-11.940820
	suhu dingin	2.107675*	.1450526	.000	1.808301	2.407049
	suhu kamar	2.955326*	.1450526	.000	2.655953	3.254700
suhu kamar	Control	-15.319525*	.2051354	.000	-15.742904	-14.896146
	suhu dingin	-.847652*	.1450526	.000	-1.147026	-.548278
	suhu sejuk	-2.955326*	.1450526	.000	-3.254700	-2.655953

Signifikansi < 0,05 terdapat → perbedaan yang bermakna.

LAMA PENYIMPANAN

Post Hoc Tests

Multiple Comparisons

Inhibisi

Inhibisi

Tukey HSD

(I) LAM A	(J) LAM A	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0 hari	3 hari	12.799479*	.2051354	.000	12.376100	13.222858
	6 hari	13.750224*	.2051354	.000	13.326845	14.173602
	9 hari	15.605894*	.2051354	.000	15.182515	16.029272
3 hari	0 hari	-12.799479*	.2051354	.000	-13.222858	-12.376100
	6 hari	.950745*	.1450526	.000	.651371	1.250118
	9 hari	2.806415*	.1450526	.000	2.507041	3.105789
6 hari	0 hari	-13.750224*	.2051354	.000	-14.173602	-13.326845
	3 hari	-.950745*	.1450526	.000	-1.250118	-.651371
	9 hari	1.855670*	.1450526	.000	1.556296	2.155044
9 hari	0 hari	-15.605894*	.2051354	.000	-16.029272	-15.182515
	3 hari	-2.806415*	.1450526	.000	-3.105789	-2.507041
	6 hari	-1.855670*	.1450526	.000	-2.155044	-1.556296

Signifikansi < 0,05 terdapat perbedaan yang bermakna.

Lampiran 17. Analisis Statistik Aktivitas Antioksidan berdasarkan Suhu Penyimpanan

a. Dingin

Test of Homogeneity of Variances

Inhibisi

Levene Statistic	df1	df2	Sig.
.874	3	8	.494

Post Hoc Tests

Multiple Comparisons

Inhibisi

Tukey HSD

(I) suhu_din gin	(J) suhu_din gin	Mean Difference (I- J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Control	KB 3 SD	3.1271478*	.1718213	.000	2.730927	3.523368
	KB 6 SD	3.8144330*	.1718213	.000	3.418212	4.210654
	KB 9 SD	5.8419244*	.1718213	.000	5.445704	6.238145
KB 3 SD kontrol	KB 6 SD	-.6872852*	.1718213	.004	-.291065	1.083506
	KB 9 SD	2.7147766*	.1718213	.000	2.318556	3.110997
	KB 3 SD kontrol	-3.1271478*	.1718213	.000	-3.523368	-2.730927
KB 6 SD kontrol	KB 9 SD	2.0274914*	.1718213	.000	1.631271	2.423712
	KB 3 SD	-.6872852*	.1718213	.004	-1.083506	-.291065
	KB 6 SD kontrol	-3.8144330*	.1718213	.000	-4.210654	-3.418212
KB 9 SD kontrol	KB 3 SD	-2.7147766*	.1718213	.000	-3.110997	-2.318556
	KB 6 SD	-2.0274914*	.1718213	.000	-2.423712	-1.631271
	KB 9 SD kontrol	-5.8419244*	.1718213	.000	-6.238145	-5.445704

Lanjutan

b. Sejuk

Test of Homogeneity of Variances

Inhibisi

Levene Statistic	df1	df2	Sig.
.727	3	8	.564

Post Hoc Tests

Multiple Comparisons

Inhibisi

Tukey HSD

(I) suhu_sej uk	(J) suhu_sej uk	Mean Difference (I- J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Control	KB 3 SJ	1.099656*	.2146047	.001	.604777	1.594536
	KB 6 SJ	2.027491*	.2146047	.000	1.532612	2.522371
	KB 9 SJ	3.333333*	.2146047	.000	2.838454	3.828213
KB 3 SJ	kontrol	-1.099656*	.2146047	.001	-1.594536	-.604777
	KB 6 SJ	.927835*	.2146047	.003	.432956	1.422714
	KB 9 SJ	2.233677*	.2146047	.000	1.738798	2.728556
KB 6 SJ	kontrol	-2.027491*	.2146047	.000	-2.522371	-1.532612
	KB 3 SJ	-.927835*	.2146047	.003	-1.422714	-.432956
	KB 9 SJ	1.305842*	.2146047	.000	.810963	1.800721
KB 9 SJ	kontrol	-3.333333*	.2146047	.000	-3.828213	-2.838454
	KB 3 SJ	-2.233677*	.2146047	.000	-2.728556	-1.738798
	KB 6 SJ	-1.305842*	.2146047	.000	-1.800721	-.810963

Signifikansi < 0,05 → terdapat perbedaan yang bermakna.

Lanjutan

c. Suhu kamar

Test of Homogeneity of Variances

Inhibisi

Levene Statistic	df1	df2	Sig.
.302	3	8	.823

Post Hoc Tests

Multiple Comparisons

Inhibisi

Tukey HSD

(I) suhu_sej uk	(J) suhu_sej uk	Mean Difference (I- J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Control	KB 3 SK	3.5395189*	.2090296	.000	3.057496	4.021542
	KB 6 SK	4.7766323*	.2090296	.000	4.294609	5.258656
	KB 9 SK	7.0103093*	.2090296	.000	6.528286	7.492332
KB 3 SK kontrol	KB 6 SK	1.2371134*	.2090296	.000	.755090	1.719137
	KB 9 SK	3.4707904*	.2090296	.000	2.988767	3.952814
	KB 3 SK kontrol	-3.5395189*	.2090296	.000	-4.021542	-3.057496
KB 6 SK kontrol	KB 9 SK	2.2336770*	.2090296	.000	1.751654	2.715700
	KB 3 SK	-1.2371134*	.2090296	.000	-1.719137	-.755090
	KB 6 SK kontrol	-4.7766323*	.2090296	.000	-5.258656	-4.294609
KB 9 SK kontrol	KB 3 SK	-3.4707904*	.2090296	.000	-3.952814	-2.988767
	KB 6 SK	-2.2336770*	.2090296	.000	-2.715700	-1.751654
	KB 9 SK kontrol	-7.0103093*	.2090296	.000	-7.492332	-6.528286

Signifikansi < 0,05 →terdapat perbedaan yang bermakna.

Lampiran 18. Analisis Statistik Aktivitas Antioksidan berdasarkan Lama Penyimpanan

a. 3 hari

Test of Homogeneity of Variances

Inhibisi

Levene Statistic	df1	df2	Sig.
.323	3	8	.809

Post Hoc Tests

Multiple Comparisons

Inhibisi

Tukey HSD

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) hari_3	(J) hari_3				Lower Bound	Upper Bound
Control	HARI SD	3.1271*	.18822	.000	2.6931	3.5612
	HARI 3 SJ	1.0997*	.18822	.000	.6656	1.5337
	HARI 3 SK	3.5395*	.18822	.000	3.1055	3.9736
HARI SD	3 Control	-3.1271*	.18822	.000	-3.5612	-2.6931
	HARI 3 SJ	-2.0275*	.18822	.000	-2.4615	-1.5935
	HARI 3 SK	.4124	.18822	.060	-.0217	.8464
HARI 3 SJ	Control	-1.0997*	.18822	.000	-1.5337	-.6656
	HARI SD	2.0275*	.18822	.000	1.5935	2.4615
	HARI 3 SK	2.4399*	.18822	.000	2.0058	2.8739
HARI 3 SK	Control	-3.5395*	.18822	.000	-3.9736	-3.1055
	HARI SD	-.4124	.18822	.060	-.8464	.0217
	HARI 3 SJ	-2.4399*	.18822	.000	-2.8739	-2.0058

Signifikansi < 0,05 → terdapat perbedaan yang bermakna

Lanjutan

b. 6 hari

Test of Homogeneity of Variances

Inhibisi

Levene Statistic	df1	df2	Sig.
1.880	3	8	.211

Multiple Comparisons

Inhibisi

Tukey HSD

(I) hari_6 (J) hari_6		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Control	HARI SD	.00000	.17182	.000	-.3962	.3962
	HARI 6 SJ	-1.78694*	.17182	.000	-2.1832	-1.3907
	HARI 6 SK	.96220*	.17182	.000	.5660	1.3584
HARI SD	6 kontrol	.00000	.17182	.000	-.3962	.3962
	HARI 6 SJ	-1.78694*	.17182	.000	-2.1832	-1.3907
	HARI 6 SK	.96220*	.17182	.000	.5660	1.3584
HARI 6 SJ kontrol	HARI SD	1.78694*	.17182	.000	1.3907	2.1832
	HARI 6 SD	1.78694*	.17182	.000	1.3907	2.1832
	HARI 6 SK	2.74914*	.17182	.000	2.3529	3.1454
HARI 6 SK kontrol	HARI SD	-.96220*	.17182	.000	-1.3584	-.5660
	HARI 6 SD	-.96220*	.17182	.000	-1.3584	-.5660
	HARI 6 SJ	-2.74914*	.17182	.000	-3.1454	-2.3529

Signifikansi < 0,05 → terdapat perbedaan yang bermakna

Lanjutan

c. 9 hari

Test of Homogeneity of Variances

Inhibisi

Levene Statistic	df1	df2	Sig.
6.784	1	10	.126

Post Hoc Tests

Multiple Comparisons

Inhibisi

Tukey HSD

(I) hari_9 (J) hari_9		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Control	HARI 9 SD	5.841924*	.2003764	.000	5.379856	6.303993
	HARI 9 SJ	3.333333*	.2003764	.000	2.871265	3.795402
	HARI 9 SK	7.010309*	.2003764	.000	6.548241	7.472378
HARI 9 SD	9 Control	-5.841924*	.2003764	.000	-6.303993	-5.379856
	HARI 9 SJ	-2.508591*	.2003764	.000	-2.970660	-2.046522
	HARI 9 SK	1.168385*	.2003764	.000	.706316	1.630454
HARI 9 SJ	Control	-3.333333*	.2003764	.000	-3.795402	-2.871265
	HARI 9 SD	2.508591*	.2003764	.000	2.046522	2.970660
	HARI 9 SK	3.676976*	.2003764	.000	3.214907	4.139045
HARI 9 SK	9 Control	-7.010309*	.2003764	.000	-7.472378	-6.548241
	HARI 9 SD	-1.168385*	.2003764	.000	-1.630454	-.706316
	HARI 9 SJ	-3.676976*	.2003764	.000	-4.139045	-3.214907

Signifikansi < 0,05 → terdapat perbedaan yang bermakna.