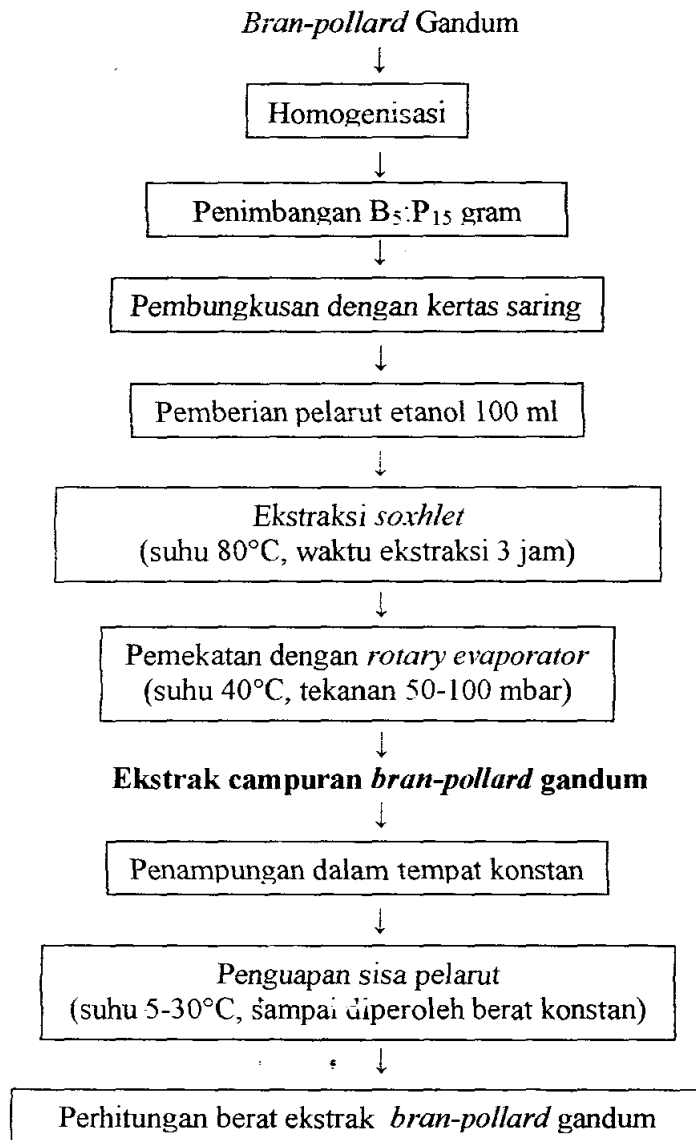


LAMPIRAN

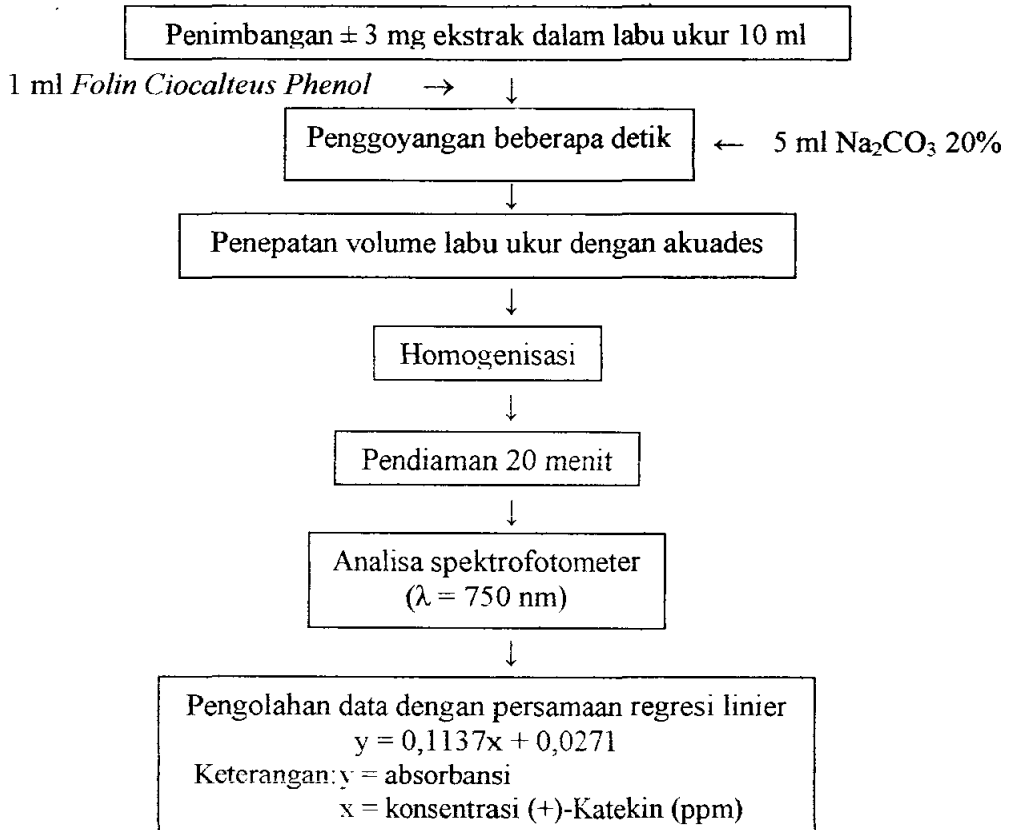
Lampiran 1. Skema Kerja Penyiapan Ekstrak Campuran *Bran-Pollard* Gandum



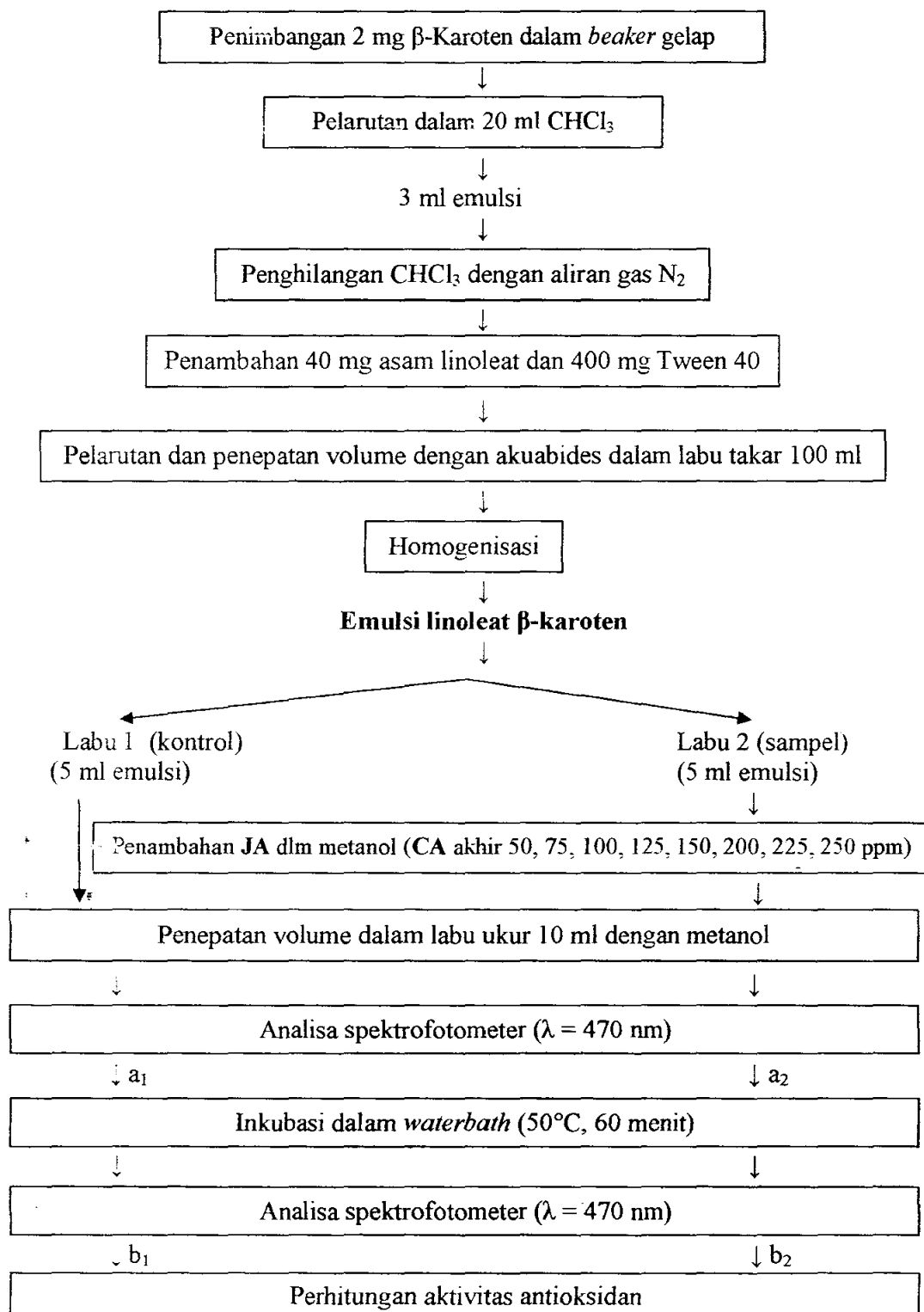
Rumus:

$$\text{Berat ekstrak} = (\text{Berat}_{\text{tempat+ ekstrak konstan}} - \text{Berat}_{\text{tempat konstan}}) / \text{Berat}_{\text{bahan awal}}$$

Lampiran 2. Skema Kerja Penentuan Kadar Senyawa Antioksidan Ekstrak Campuran *Bran-Pollard* Gandum (Metode Julkunen-Tiitto, 1985)



Lampiran 3. Penentuan Aktivitas Senyawa-Senyawa Antioksidan dalam Sistem Model Asam Linoleat- β -Karoten (Metode Miller, 1971)



Keterangan: **JA** = jenis antioksidan (ekstrak campuran *bran-pollard* gandum, TBHQ, α -tokoferol dan β -karoten)
CA = konsentrasi antioksidan

Data yang diperoleh diolah dengan menggunakan rumus:

$$\text{AOA} = 100 (\text{DRc}-\text{DRs})/\text{DRc}$$

Keterangan :

DRc adalah laju degradasi radikal bebas pada kontrol = $\ln (a_1/b_1)/60$

DRs adalah laju degradasi radikal bebas pada sampel = $\ln (a_2/b_2)/60$

a dan b adalah absorbansi pada waktu 0 dan 60 menit

Lampiran 4. Data Nilai AOA Ekstrak Campuran *Bran-Pollard* Gandum

Ulangan 1 Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,273	0,539	-0,011337396	-0,011337396	0,0000
50 ppm	1,737	2,215		-0,004051549	64,2639
75 ppm	2,325	2,914		-0,003763444	66,8050
100 ppm	2,960	3,311		-0,001867683	83,5264
125 ppm	3,135	3,215		-0,00041997	96,2957
150 ppm	3,612	3,215		0,001940571	117,1166
175 ppm	3,612	3,068		0,002720596	123,9967
200 ppm	4,000	3,068		0,004421141	138,9961
225 ppm	4,000	2,914		0,005279461	146,5668
250 ppm	4,000	3,068		0,004421141	138,9961

Ulangan 2 Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,271	0,456	-0,0086729	-0,0086729	0,0000
50 ppm	2,157	2,872		-0,004771505	44,9837
75 ppm	2,325	2,914		-0,003763444	56,6069
100 ppm	2,960	3,215		-0,001377301	84,1195
125 ppm	3,135	3,135		0,000000000	100,0000
150 ppm	3,612	3,215		0,001940571	122,3751
175 ppm	3,612	3,068		0,002720596	131,3689
200 ppm	4,000	3,068		0,004421141	150,9765
225 ppm	4,000	2,960		0,005018418	157,8632
250 ppm	4,000	3,068		0,004421141	150,9765

Ulangan 3 Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,213	0,456	-0,01268667	-0,012686677	0,0000
50 ppm	0,990	1,741		-0,0094085	25,8395
75 ppm	1,759	2,872		-0,008171053	35,5934
100 ppm	2,767	3,311		-0,002991443	76,4206
125 ppm	3,215	3,215		0,000000000	100,0000
150 ppm	3,436	3,215		0,001108011	108,7337
175 ppm	3,612	3,068		0,002720596	121,4445
200 ppm	3,913	3,135		0,003694586	129,1218
225 ppm	4,000	2,937		0,005148428	140,5814
250 ppm	4,000	3,135		0,004061086	132,0106

Ulangan 4	Absorbansi		DRc	DRs	AOA
	Konsentrasi	0 menit			
	0 ppm	0,208		-0,013937467	0,0000
	50 ppm	0,990		-0,009157724	34,2942
	75 ppm	1,747		-0,008285144	40,5549
	100 ppm	2,767		-0,002991443	78,5367
	125 ppm	3,215	-0,01393746	0,000000000	100,0000
	150 ppm	3,436		0,001527981	110,9631
	175 ppm	3,612		0,002720596	119,5200
	200 ppm	4,000		0,004061086	129,1379
	225 ppm	4,000		0,005279461	137,8796
	250 ppm	4,000		0,004421141	131,7213

Rata-Rata Nilai AOA Ekstrak Campuran *Bran-Pollard* Gandum

Konsentrasi	AOA
0 ppm	0,0000
50 ppm	42,3453
75 ppm	49,8901
100 ppm	80,6508
125 ppm	99,0739
150 ppm	114,7971
175 ppm	124,0825
200 ppm	137,0581
225 ppm	145,7228
250 ppm	138,4261

Contoh Perhitungan Nilai AOA Ekstrak Campuran *Bran-Pollard* Gandum:

Misal: Ulangan 4 dengan konsentrasi 50 ppm.

$$DRc = \ln (a_1/b_1)/60 = \ln (0,208/0,480)/60 = -0,01393746$$

$$DRs = \ln (a_2/b_2)/60 = \ln (0,990/1,715)/60 = -0,009157724$$

$$AOA = 100 (DRc-DRs)/DRc = \frac{100 (-0,01393746-(-0,009157724))}{(-0,01393746)} = 34,2942$$

DRc adalah nilai absorbansi pada 0 ppm, DRs adalah nilai absorbansi pada 50 ppm

Lampiran 5. Analisa Nilai AOA Ekstrak Campuran *Bran-Pollard* Gandum dengan ANAVA

Konsentrasi (t)	Kelompok (r)				Total Perlakuan
	1	2	3	4	
0	0,0000	0,0000	0,0000	0,0000	0,0000
50	64,2639	44,9837	36,8880	34,2942	180,4298
75	66,8050	56,6068	45,1888	40,5549	209,1555
100	83,5263	84,1195	79,9335	78,5367	326,1160
125	96,2957	100,0000	100,0000	100,0000	396,2957
150	117,1166	122,3751	107,4325	110,9631	457,8873
175	123,9967	131,3689	118,2497	119,5200	493,1353
200	138,9961	150,9765	124,7832	129,1379	543,8937
225	146,5668	157,8632	134,5355	137,8796	576,8451
250	138,9961	150,9765	127,2417	131,7213	548,9356
Total Kel.	976,5632	999,2702	874,2529	882,6077	3732,6940

r = 4			
t = 10	F koreksi =	348325,1124	KT kel = 409,3326
db total = 39	JKT =	84578,7662	KT perl = 9142,9593
db kel = 3	JKK =	1227,9977	KT galat = 39,4124
db perl = 9	JKP =	82286,6341	
db galat = 27	JKG =	1064,1344	F hit = 231,9819

Tabel ANAVA

Sumber Keragaman	db	JK	KT	F hit	F Tabel	
					5%	1%
Kelompok	3	1227,9977	409,3326			
Perlakuan	9	82286,6341	9142,9593	231,9819	2,25	3,14
Galat	27	1064,1344	39,4124			
Total	39	84578,7662	-			

F hitung > F tabel berarti terdapat perbedaan antara perlakuan dengan berbagai konsentrasi

Uji DMRT

$$S_y = (KTG/r)^{0,5}$$

$$S_y = 3,1390$$

	rp	
2	2,905	9,1187
3	3,05	9,5738
4	3,145	9,8720
5	3,205	10,0604
6	3,265	10,2487
7	3,300	10,3586
8	3,335	10,4684

Hasil Uji DMRT

Konsentrasi (ppm)	AOA	Uji Beda
0	0,0000	a
50	45,1075	b
75	52,2889	b
100	81,5290	c
125	99,0739	d
150	114,4718	e
175	123,2838	f
200	135,9734	g
250	137,2339	g
225	144,2113	g

Lampiran 6. Data Nilai AOA TBHQ

Ulangan 1

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,3015	0,4370	-0,006186053	-0,006186053	0,0000
50 ppm	0,2835	0,2930		-0,000549341	91,1197
75 ppm	0,2950	0,3720		-0,003865308	37,5158
100 ppm	0,2785	0,2860		-0,000442896	92,8404
125 ppm	0,2910	0,2960		-0,000283936	95,4100
150 ppm	0,2730	0,3570		-0,004471066	27,7234
175 ppm	0,2825	0,3755		-0,004742999	23,3275
200 ppm	0,2840	0,3990		-0,005666453	8,3995
225 ppm	0,2855	0,5050		-0,009505273	-53,6565

Ulangan 2

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,3210	0,4025	-0,0037709	-0,0037709	0,0000
50 ppm	0,3405	0,3600		-0,000928148	75,3866
75 ppm	0,3335	0,3700		-0,001731002	54,0958
100 ppm	0,3490	0,3250		0,001187446	131,4897
125 ppm	0,3235	0,3270		-0,000179351	95,24382
150 ppm	0,3260	0,3955		-0,00322089	14,5856
175 ppm	0,3515	0,3715		-0,000922319	75,5411
200 ppm	0,3140	0,3525		-0,001927627	48,8815
225 ppm	0,3385	0,3970		-0,00265687	29,5428

Ulangan 3

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,2533	0,2515	0,000118859	0,000118859	0,0000
50 ppm	0,2432	0,2665		-0,001524835	1382,8890
75 ppm	0,2408	0,2590		-0,001214356	1121,6737
100 ppm	0,2582	0,2445		0,000908653	-664,4767
125 ppm	0,2547	0,2412		0,000907665	-663,6458
150 ppm	0,2663	0,2967		-0,001801634	1615,7682
175 ppm	0,2652	0,2612		0,000253298	-113,1069
200 ppm	0,2812	0,2483		0,002073808	-1644,7562
225 ppm	0,2763	0,2647		0,000714835	-501,4123

Ulangan 4

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,3000	0,2675	0,001911048	0,001911048	0,0000
50 ppm	0,3045	0,2525		0,003120997	-63,3134
75 ppm	0,2885	0,2585		0,00182999	4,2416
100 ppm	0,3025	0,2435		0,003616072	-89,2193
125 ppm	0,2920	0,2550		0,002258171	-18,1640
150 ppm	0,3115	0,2515		0,003565939	-86,5960
175 ppm	0,3020	0,2440		0,003554313	-85,9876
200 ppm	0,3165	0,2485		0,00403134	-110,9491
225 ppm	0,2990	0,2500		0,002983044	-56,0946

Rata-Rata AOA TBHQ

Konsentrasi	AOA
0 ppm	0,0000
50 ppm	371,5205
75 ppm	304,3817
100 ppm	-132,3415
125 ppm	-122,7890
150 ppm	392,8703
175 ppm	-25,0564
200 ppm	-424,6061
225 ppm	-145,4052

Lampiran 7. Analisa Nilai AOA TBHQ dengan ANAVA

Konsentrasi	Kelompok				Total Perlakuan
	1	2	3	4	
0 ppm	0,0000	0,0000	0,0000	0,0000	0,0000
50 ppm	91,1197	75,3865	1382,8890	-63,3134	1486,0819
75 ppm	37,5158	54,0957	1121,6737	4,2416	1217,5269
100 ppm	92,8404	131,4897	-664,4767	-89,2193	-529,3659
125 ppm	95,4100	95,2438	-663,6458	-18,1640	-491,1559
150 ppm	27,7234	14,5856	1615,7682	-86,5960	1571,4812
175 ppm	23,3275	75,5411	-113,1069	-85,9876	-100,2260
200 ppm	8,3995	48,8815	-1644,7562	-110,9491	-1698,4243
225 ppm	-53,6565	29,5428	-501,4123	-56,0946	-581,6206
Total Kelom.	322,6799	524,7669	532,9330	-506,0824	874,2973

r = 4	F koreksi = 21233,2163	KT kelompok = 26982,9904
t = 9	JKT = 9729905,4262	KT perlakuan = 307183,3347
db total = 35	JKK = 80948,9711	KT galat = 299645,4074
db kelompok = 3	JKP = 2457466,6777	
db perlakuan = 8	JKG = 7191489,7774	F hitung = 1,0252
db galat = 24		

Tabel ANAVA

Sumber Ragam	db	JK	KT	F Hitung	F Tabel	
					5%	1%
Kelompok	3	80948,9711	26982,9904	1,0252	3,16	5,09
Perlakuan	8	2457466,6777	307183,3347			
Galat	24	7191489,7774	299645,4074			
Total	35	9729905,4262	-			

F hitung < F tabel berarti tidak terdapat perbedaan antara perlakuan dengan berbagai konsentrasi

Lampiran 8. Data Nilai AOA β -Karoten

Ulangan 1

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,2960	0,4300	-0,006223763	-0,006223763	0,0000
50 ppm	0,4255	0,4665		-0,001533218	75,3651
75 ppm	0,4980	0,4785		0,000665731	110,6966
100 ppm	0,5530	0,5415		0,000350249	105,6276
125 ppm	0,5835	0,5790		0,000129033	102,0732
150 ppm	0,6145	0,5805		0,000948652	115,2424
175 ppm	0,7205	0,7230		-5,77301E-05	99,0724
200 ppm	0,7410	0,8575		-0,002433676	60,8970
225 ppm	0,7690	0,9415		-0,003373056	45,8036

Ulangan 2

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,3265	0,4525	-0,005439297	-0,005439297	0,0000
50 ppm	0,4910	0,3820		0,004183725	176,9167
75 ppm	0,5945	0,5090		0,002587878	147,5774
100 ppm	0,6590	0,6045		0,001438698	126,4501
125 ppm	0,7415	0,7295		0,001147596	121,0982
150 ppm	0,7815	0,6955		0,00273439	150,2710
175 ppm	0,8195	0,8520		0,001033408	118,9989
200 ppm	0,9065	0,9040		0,001001732	118,4166
225 ppm	0,9600	0,9500		0,000174522	103,2085

Ulangan 3

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,3102	0,2785	0,001796653	0,001796653	0
50 ppm	0,3802	0,3377		0,001975658	-9,9633
75 ppm	0,4395	0,4537		-0,000529974	129,4979
100 ppm	0,5152	0,5425		-0,000860549	147,8973
125 ppm	0,5483	0,6352		-0,002451955	236,4735
150 ppm	0,6063	0,6865		-0,002070522	215,2433
175 ppm	0,6512	0,7797		-0,00300154	267,0628
200 ppm	0,6940	0,9232		-0,004756232	364,7273
225 ppm	0,7405	0,9717		-0,004528691	352,0626

Ulangan 4

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,3350	0,2730	0,003410979	0,003410979	0
50 ppm	0,4880	0,2575		0,010654928	-212,3716
75 ppm	0,5885	0,3670		0,007870251	-130,7330
100 ppm	0,6980	0,4850		0,006067837	-77,89136
125 ppm	0,7195	0,5240		0,005284414	-54,9237
150 ppm	0,8390	0,6775		0,003563353	-4,4672
175 ppm	0,8890	0,7040		0,003888648	-14,0039
200 ppm	1,0260	0,9115		0,001972191	42,1811
225 ppm	1,0650	0,9495		0,001913242	43,9093

Rata-Rata AOA β -Karoten

Konsentrasi	AOA
0 ppm	0.0000
50 ppm	7.4867
75 ppm	64.2597
100 ppm	75.5209
125 ppm	101.1803
150 ppm	119.0724
175 ppm	117.7826
200 ppm	146.5555
225 ppm	136.2460

Lampiran 9. Analisa Nilai AOA β -Karoten dengan ANAVA

Konsentrasi	Kelompok				Total Perlakuan
	1	2	3	4	
0 ppm	0,0000	0,0000	0,0000	0,0000	0,0000
50 ppm	75,3651	176,9167	-9,9633	-212,3716	29,9469
75 ppm	110,6966	147,5774	129,4979	-130,7329	257,0390
100 ppm	105,6276	126,4501	147,8973	-77,8914	302,0836
125 ppm	102,0732	121,0982	236,4735	-54,9237	404,7212
150 ppm	115,2424	150,2710	215,2433	-4,4672	476,2895
175 ppm	99,0724	118,9989	267,0629	-14,0039	471,1303
200 ppm	60,8970	118,4166	364,7273	42,1811	586,2220
225 ppm	45,8036	103,2085	352,0626	43,9093	544,9840
Total Kel.	714,7779	1062,9374	1703,0015	-408,3003	3072,4165

$r = 4$
 $t = 9$ F koreksi = 262215,0875 KT kel = 86952,9933
 db total = 35 JKT = 495835,3055 KT perl = 11332,4533
 db kel = 3 JKK = 260858,9799 KT galat = 6013,1958
 db perl = 8 JKP = 90659,6266
 db galat = 24 JKG = 144316,6990 F hit = 1,8846

Tabel ANAVA

Sumber Ragam	db	JK	KT	F Hitung	F Tabel	
					5%	1%
Kelompok	3	260858,9799	86952,9933	1,8846	3,16	5,09
Perlakuan	8	90659,6266	11332,4533			
Galat	24	144316,6990	6013,1958			
Total	35	495835,3055	-			

F Hitung < F Tabel berarti tidak terdapat perbedaan antara perlakuan dengan berbagai konsentrasi

Lampiran 10. Data Nilai AOA α -Tokoferol

Ulangan 1

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,3205	0,4125	-0,004205899	-0,004205899	0,0000
50 ppm	0,3275	0,8555		-0,016003301	-280,4966
75 ppm	0,3520	0,5145		-0,006326073	-50,4095
100 ppm	0,3520	0,3575		-0,000258403	93,8562
125 ppm	0,3740	0,3795		-0,000243313	94,2150
150 ppm	0,3560	0,3760		-0,000910974	78,3406
175 ppm	0,3840	0,4420		-0,002344455	44,2579
200 ppm	0,3730	0,4655		-0,003692228	12,2131
225 ppm	0,4020	0,4790		-0,002920808	30,5545

Ulangan 2

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,3585	0,4350	-0,003223623	-0,003223623	0,0000
50 ppm	0,3260	0,9330		-0,01752513	-443,6470
75 ppm	0,3345	0,8090		-0,014719367	-356,6095
100 ppm	0,3620	0,4295		-0,002849625	11,6018
125 ppm	0,3640	0,4430		-0,003273598	-1,55029
150 ppm	0,3840	0,4720		-0,003438941	-6,6794
175 ppm	0,3795	0,4890		-0,004225132	-31,0678
200 ppm	0,4145	0,5000		-0,003125585	3,0412
225 ppm	0,3795	0,5130		-0,005023687	-55,8398

Ulangan 3

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,2563	0,2907	-0,002099053	-0,002099053	0,0000
50 ppm	0,2535	0,5130		-0,011748534	-459,7064
75 ppm	0,2538	0,4738		-0,010403979	-395,6511
100 ppm	0,2767	0,3122		-0,002011835	4,1551
125 ppm	0,2802	0,3278		-0,002615001	-24,5800
150 ppm	0,2988	0,3762		-0,003839108	-82,8971
175 ppm	0,2990	0,3610		-0,003140573	-49,6185
200 ppm	0,3295	0,3918		-0,002886253	-37,5026
225 ppm	0,4072	0,4082		-4,08798E-05	98,05246679

Ulangan 4

Konsentrasi	Absorbansi		DRc	DRs	AOA
	0 menit	60 menit			
0 ppm	0,3015	0,2855	0,0009088	0,0009088	0,0000
50 ppm	0,3156	0,3225		-0,0003631	139,9538
75 ppm	0,2960	0,3145		-0,00101041	211,1807
100 ppm	0,3225	0,3525		-0,001482458	263,1226
125 ppm	0,3290	0,3725		-0,002069655	327,7350
150 ppm	0,3435	0,4135		-0,003091173	440,1380
175 ppm	0,3480	0,4155		-0,002954669	425,1177
200 ppm	0,4015	0,4335		-0,001278071	240,6328
225 ppm	0,3605	0,4705		-0,0044384	588,3804

Rata-Rata AOA α -Tokoferol

Konsentrasi	AOA
0 ppm	0,0000
50 ppm	-260,9741
75 ppm	-147,8723
100 ppm	93,1839
125 ppm	98,95490
150 ppm	107,2255
175 ppm	97,1723
200 ppm	54,5961
225 ppm	165,2868

Lampiran 11. Analisa Nilai AOA α -Tokoferol dengan ANAVA

Konsentrasi	Kelompok				Total Perlakuan
	1	2	3	4	
0 ppm	0,0000	0,0000	0,0000	0,0000	0,0000
50 ppm	-280,4966	-443,6470	-459,7064	140,2444	-1043,6056
75 ppm	-50,4095	-356,6095	-395,6511	211,1807	-591,4894
100 ppm	93,8562	11,6018	4,1551	263,1226	372,7357
125 ppm	94,2150	-1,5503	-24,5800	327,7350	395,8197
150 ppm	78,3406	-6,6794	-82,8971	440,1380	428,9021
175 ppm	44,2579	-31,0678	-49,6186	425,1177	388,6892
200 ppm	12,2131	3,0412	-37,5026	240,6329	218,3846
225 ppm	30,5545	-55,8398	98,0525	588,3804	661,1476
Total Kel.	22,5312	-880,7508	-947,7482	2636,5517	830,5839

r =	4	F koreksi =	19163,0449	KT kelompok =	313088,6570
t =	9	JKT =	1825485,3716	KT perlakuan =	77430,3001
db total =	35	JKK =	939265,9711	KT galat =	11115,7083
db kelompok =	3	JKP =	619442,4011		
db perlakuan =	8	JKG =	266776,9994	F hitung =	6,9658
db galat =	24				

Tabel ANAVA

Sumber Ragam	db	JK	KT	F Hitung	F Tabel	
					5%	1%
Kelompok	3	939265,9711	313088,6570	6,9658	3,16	5,09
Perlakuan	8	619442,4011	77430,3001			
Galat	24	266776,9994	11115,7083			
Total	35	1825485,3716	-			

F Hitung > F Tabel berarti terdapat perbedaan antara perlakuan dengan berbagai konsentrasi

$$S_y = (KTG/r)^{0,5}$$

$$S_y = 52,7155$$

	rp	Sy x rp
2	2,92	153,9293
3	3,07	161,8367
4	3,15	166,0539
5	3,22	169,7440
6	3,28	172,9069
7	3,31	174,4884
8	3,34	176,0699

Hasil Uji DMRT

Konsentrasi	AOA	Uji Beda
0 ppm	0,0000	a
50 ppm	-260,9741	b
75 ppm	-147,8723	b
200 ppm	54,5961	c
100 ppm	93,1839	c
175 ppm	97,1723	c
125 ppm	98,95490	c
150 ppm	107,2255	c
225 ppm	165,2868	c

PERPUSTAKAAN
Universitas Katolik Widyadarmas
SUKADAYA