BAB V

PENUTUP

A. Kesimpulan

Pertama, metil selulosa 4000 dan propilen glikol memberikan pengaruh terhadap stabilitas fisik serta aktivitas antioksidan gel vitamin C. Peningkatan konsentrasi metil selulosa 4000 meningkatkan respon viskositas, daya lekat, kadar dan aktivitas antioksidan gel serta menurunkan daya sebar dan pergeseran viskositas gel vitamin C. Peningkatan konsentrasi propilen glikol turut meningkatkan visksoitas gel, sedangkan interaksi antara metil selulosa 4000 dan propilen glikol meningkatkan aktivitas antioksidan gel vitamin C.

Kedua, formula gel vitamin C yang optimum diperoleh dengan konsentrasi metil selulosa 4000 2,71% dan propilen glikol 15,15%. Formula optimum stabil selama 28 hari penyimpanan dalam suhu kamar.

B. Saran

Perlu dilakukan studi lebih lanjut untuk mendapatkan formula dan metode pembuatan gel vitamin C agar tidak mengalami perubahan warna selama proses penyimpanan dan studi lebih lanjut secara *in vivo* untukmengetahui profil pelepasan dan penetrasi gel vitamin C dalam jaringan kulit.

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LAMPIRAN

Lampiran 1. Data pemeriksaan sifat fisik gel vitamin C

a. pH

- **pH hari ke-2**

Replikasi	pH			
	F1	F2	F3	F4
1	3,72	3,86	3,89	4,08
2	3,72	3,88	3,92	4,06
3	3,74	3,85	3,91	4,06
Rata-rata	3,73	3,86	3,91	4,7
SD	0,01	0,02	0,02	0,01

- **pH hari ke-28**

Replikasi	pH			
	F1	F2	F3	F4
1	3,60	3,64	3,72	4,84
2	3,58	3,66	3,72	4,82
3	3,60	3,62	3,72	4,82
Rata-rata	3,59	3,64	3,72	3,83
SD	0,01	0,02	0,00	0,01

b. Viskositas

- **Viskositas hari ke-2**

Replikasi	Viskositas (dPas)			
	F1	F2	F3	F4
1	750,00	890,00	2500,00	2600,00
2	760,00	900,00	2600,00	2600,00
3	740,00	875,00	2500,00	2700,00
Rata-rata	750,00	888,33	2533,33	2633,33
SD	10,00	12,58	57,74	57,74

- **Viskositas hari ke-28**

Replikasi	Viskositas (dPas)			
	F1	F2	F3	F4
1	700,00	820,00	2400,00	2500,00
2	680,00	840,00	2500,00	2500,00
3	690,00	820,00	2400,00	2600,00
Rata-rata	690,00	865,00	2433,33	2533,33
SD	10,00	8,66	57,74	57,74

c. Daya lekat

- **Daya lekat hari ke-2**

Replikasi	Daya lekat (detik)			
	F1	F2	F3	F4
1	0,47	0,36	0,52	0,44
2	0,43	0,42	0,49	0,48
3	0,43	0,44	0,57	0,50
Rata-rata	0,44	0,41	0,53	0,47
SD	0,02	0,04	0,04	0,03

- **Daya lekat hari ke-28**

Replikasi	Daya lekat (detik)			
	F1	F2	F3	F4
1	0,34	0,25	0,31	0,30
2	0,28	0,29	0,38	0,29
3	0,26	0,22	0,35	0,26
Rata-rata	0,29	0,25	0,35	0,28
SD	0,04	0,04	0,04	0,02

d. Daya sebar

- **Daya sebar hari ke-2**

Replikasi	Daya sebar (cm)			
	F1	F2	F3	F4
1	6,40	6,00	4,50	4,60
2	6,20	6,40	4,00	4,20
3	6,00	6,00	4,20	4,00
Rata-rata	6,20	6,13	4,23	4,27
SD	0,20	0,23	0,25	0,31

- **Daya sebar hari ke-28**

Replikasi	Daya sebar (cm)			
	F1	F2	F3	F4
1	6,50	6,10	4,50	4,40
2	6,60	6,40	4,80	4,20
3	6,80	6,00	4,80	4,60
Rata-rata	6,63	6,17	4,70	4,40
SD	0,15	0,21	0,17	0,20

e. Data pergeseran viskositas

Pergeseran viskositas = $\frac{|(viskositas\ hari\ ke{-}2) - (viskosi\ cas\ hari\ ke{-}28)|}{viskositas\ hari\ ke{-}2}$ x 100%

- **Formula 1**

  Replikasi 1 : $\frac{750-700}{750}$ x 100% = 6,67%

  Replikasi 2 : $\frac{740-680}{740}$ x 100% = 8,11%

  Replikasi 3 : $\frac{760-690}{760}$ x 100% = 9,21%

- **Formula 2**

  Replikasi 1 : $\frac{890-820}{890}$ x 100% = 7,87%

  Replikasi 2 : $\frac{900-840}{900}$ x 100% = 6,67%

  Replikasi 3 : $\frac{875-820}{760}$ x 100% = 6,29%

- **Formula 3**

  Replikasi 1 : $\frac{2500-2400}{2500}$ x 100% = 4,00%

  Replikasi 2 : $\frac{2600-2500}{2600}$ x 100% = 3,85%

  Replikasi 3 : $\frac{2500-2400}{2500}$ x 100% = 4,00%

- **Formula 4**

  Replikasi 1 : $\frac{2600-2500}{2600}$ x 100% = 3,85%

  Replikasi 2 : $\frac{2600-2500}{2600}$ x 100% = 3,85%

  Replikasi 3 : $\frac{2700-2600}{2700}$ x 100% = 3,70%

Replikasi	Pergeseran viskositas (%)			
	F1	F2	F3	F4
1	6,67	7,87	4,00	3,85
2	8,11	6,67	3,85	3,85
3	9,21	6,29	4,00	3,70
Rata-rata	7,99	6,94	3,95	3,80
SD	1,27	0,83	0,09	0,09

Lampiran 2. Pembuatan kurva kalibrasi dan validasi metode analisis

a. Penentuan panjang gelombang maksimum

Panjang gelombang	Absorbansi (serapan)	Panjang gelombang	Absorbansi (serapan)
300	0,451	245	0,505
295	0,462	240	0,499
290	0,472	235	0,494
285	0,484	230	0,489
280	0,497	225	0,481
275	0,505	220	0,474
270	0,528	215	0,469
265	0,534	210	0,466
260	0,527	205	0,466
255	0,519	200	0,459
250	0,512		

Panjang gelombang maksimum yang diperoleh dari *scanning* larutan vitamin C dengan konsentrasi 10µg/ml adalah pada 265 nm dengan serapan 0,534

b. Penentuan *operating time*

Waktu (menit)	Absorbansi	Waktu (menit)	Absorbansi	Waktu (menit)	Absorbansi
1	0,534	11	0,530	21	0,531
2	0,537	12	0,530	22	0,531
3	0,538	13	0,530	23	0,530
4	0,535	14	0,530	24	0,530
5	0,534	15	0,530	25	0,527
6	0,532	16	0,531	26	0,524
7	0,531	17	0,530	27	0,525
8	0,530	18	0,530	28	0,525
9	0,530	19	0,530	29	0,524
10	0,531	20	0,532	30	0,522

Scanning operating time menunjukkan bahwa pada interval waktu 0-25 menit larutan vitamin C stabil yang ditandai dengan serapan yang stabil, sedangkan pada menit ke-26 mulai terjadi penurunan absorbansi larutan vitamin C

c. Kurva kalibrasi

Konsentrasi (µg/ml)	Serapan		
	Pembacaan 1	Pembacaan 2	Rata-rata
4	0,232	0,224	0,228
6	0,338	0,336	0,337
8	0,441	0,437	0,439
10	0,545	0,548	0,547
12	0,651	0,655	0,653
14	0,758	0,750	0,754

Persamaan regresi linear antara konsentrasi (µg/ml) dengan serapan diperoleh nilai:

a = 0,0191

b = 0,0527

r = 0,9999

y = 0,0527x + 0,0191

dimana :
x = Kadar (µg/ml)
y = serapan

d. Penentuan LOD dan LOQ

Konsentrasi (µg/ml)	Serapan (y)	ŷ	y- ŷ	$\|y- \hat{y}\|^2$
4	0,2280	0,2299	-0,0019	0,0000036
6	0,3370	0,3353	0,0017	0,0000029
8	0,4390	0,4407	-0,0017	0,0000029
10	0,5465	0,5461	0,0004	0,0000002
12	0,6530	0,6515	0,0015	0,0000023
14	0,7540	0,7569	-0,0029	0,0000084
Jumlah total (Σ $\|y- \hat{y}\|^2$)				0,0000203

Nilai ŷ diperoleh dari substitusi konsentrasi dalam persamaan ŷ =0,0517x+0,0191 dengan x adalah konsentrasi (µg/ml) dan y adalah serapan (ŷ)

$$S_{x/y} = \sqrt{\frac{\sum |y-\hat{y}|^2}{N-2}}$$

$S_{x/y}$ = simpangan baku residual

N = jumlah data

Σ $|y- \hat{y}|^2$ = jumlah kuadrat total residual

$$S_{x/y} = \sqrt{\frac{0,0000203}{6-2}} = 0,002253$$

LOD $= 3x \frac{Sx/y}{b}$

LOD $= 3x \frac{0,002253}{0,0527}$

LOD = 0,1411 µg/ml

y = (0,1411 x 0,0527) + 0,0191

Serapan LOD = 0,027

LOQ $= 10x \frac{Sx/-}{b}$

LOD $= 10x \frac{0,002253}{0,0527}$

LOD = 0,4275 µg/ml

y = (0,4275 x 0,0527) + 0,0191

Serapan LOD = 0,042

e. Penentuan perolehan kembali (*recovery*)

Penambahan (mg)	Serapan				Kadar (µg/ml)	Jumlah terukur (mg)	*Recovery* (%)
	Rep 1	Rep 2	Rep 3	Rata-rata			
40	0,394	0,395	0,399	0,396	7,872	39,360	98,40
	0,398	0,396	0,403	0,399	7,936	39,680	98,20
	0,397	0,398	0,396	0,397	7,896	39,460	98,65
50	0,507	0,500	0,505	0,504	9,935	49,675	99,35
	0,501	0,501	0,498	0,500	9,851	49,755	98,51
	0,501	0,503	0,496	0,500	9,862	49,310	98,62
60	0,609	0,609	0,609	0,609	11,910	59,550	99,25
	0,609	0,609	0,615	0,611	11,952	59,760	99,65
	0,605	0,606	0,609	0,607	11,872	59,358	98,93
Rata-rata (%)							98,84
Simpangan baku (SD)							0,97
Simpangan baku relatif (RSD)							0,50

Keterangan :

Kadar = (rata-rata serapan – 0,0191)/0,0527

Jumlah terukur = $\frac{Kadar}{1000}$ x volume pembuatan x faktor pengenceran

= $\frac{Kadar}{1000}$ x 100ml x $\frac{50}{1}$

% *recovery* = $\frac{Kadar\ terukur}{peambahan}$ x 100%

f. Penetapan kadar

- **Formula 1 (F1) hari ke-2**

Replikasi	Serapan	Kadar (µg/ml)	Kadar (%)
1	0,276	4,879	97,58
2	0,279	4,923	98,51
3	0,276	4,879	97,58
Rata-rata		4,894	97,89
SD		0,025	0,537

- **Formula 1 (F1) hari ke-28**

Replikasi	Serapan	Kadar (µg/ml)	Kadar (%)
1	0,274	4,833	96,65
2	0,276	4,879	97,58
3	0,274	4,833	96,65
Rata-rata		4,848	96,96
SD		0,027	0,537

- **Formula 2 (F2) hari ke-2**

Replikasi	Serapan	Kadar (µg/ml)	Kadar (%)
1	0,291	5,159	103,17
2	0,291	5,159	103,17
3	0,290	5,135	102,70
Rata-rata		5,151	103,01
SD		0,014	0,271

- **Formula 2 (F2) hari ke-28**

Replikasi	Serapan	Kadar (µg/ml)	Kadar (%)
1	0,271	4,786	95,72
2	0,274	4,833	96,65
3	0,274	4,833	96,65
Rata-rata		4,817	96,34
SD		0,027	0,54

- **Formula 3 (F3) hari ke-2**

Replikasi	Serapan	Kadar (µg/ml)	Kadar (%)
1	0,290	5,135	102,70
2	0,289	5,112	102,23
3	0,291	5,159	103,17
Rata-rata		5,135	102,70
SD		0,024	0,47

- **Formula 3 (F3) hari ke-28**

Replikasi	Serapan	Kadar (µg/ml)	Kadar (%)
1	0,277	4,902	98,04
2	0,276	4,879	97,58
3	0,276	4,879	97,58
Rata-rata		4,887	97,73
SD		0,013	0,27

- **Formula 4 (F4) hari ke-2**

Replikasi	Serapan	Kadar (µg/ml)	Kadar (%)
1	0,289	5,112	102,23
2	0,289	5,112	102,23
3	0,289	5,112	102,23
Rata-rata		5,112	102,23
SD		0,000	0,00

- **Formula 4 (F4) hari ke-28**

Replikasi	Serapan	Kadar terukur (µg/ml)	Kadar (%)
1	0,280	4,949	98,98
2	0,277	4,902	98,04
3	0,276	4,879	97,58
Rata-rata		4,910	98,20
SD		0,036	0,71

Keterangan :

Kadar terukur (µg/ml) = $\frac{serapan-0,0191}{0,0527}$

Kadar (%) = $\frac{Kadar\ terukur}{kadar\ teoritis}$ x 100%

= $\frac{kadar\ terukur}{5}$ x 100%

Lampiran 4. Uji aktivitas antioksidan gel vitamin C metode peredaman DPPH

a. Penentuan panjang gelombang maksimum

Panjang gelombang	Absorbansi (serapan)	Panjang gelombang	Absorbansi (serapan)
600	0,357	545	0,607
595	0,369	540	0,640
590	0,383	535	0,670
585	0,399	530	0,694
580	0,415	525	0,708
575	0,434	520	0,712
570	0,455	515	0,703
565	0,480	510	0,682
560	0,508	505	0,652
555	0,539	500	0,615
550	0,573		

Panjang gelombang maksimum yang diperoleh dari *scanning* larutan DPPH dengan konsentrasi 0,5 mM adalah pada 520 nm dengan serapan 0,712

b. Penentuan *operating time*

Waktu (menit)	Absorbansi	Waktu (menit)	Absorbansi	Waktu (menit)	Absorbansi
1	0,703	11	0,702	21	0,705
2	0,703	12	0,704	22	0,705
3	0,705	13	0,705	23	0,704
4	0,703	14	0,705	24	0,703
5	0,704	15	0,705	25	0,703
6	0,704	16	0,704	26	0,705
7	0,704	17	0,704	27	0,704
8	0,705	18	0,703	28	0,703
9	0,705	19	0,704	29	0,704
10	0,706	20	0,705	30	0,703

Scanning operating time menunjukkan bahwa pada interval waktu 0-30 menit larutan DPPH stabil yang ditandai dengan serapan yang stabil.

c. Hasil uji peredaman DPPH

- **Formula 1 (F1) hari ke-2**

Konsentrasi Vitamin C (µg/ml)	Serapan DPPH	Serapan Sampel	% inhibisi	Persamaan Regresi Linear	IC_{50} (µg/ml)	Rata-rata IC_{50} (µg/ml)
1	0,708	0,669	5,52	y= 5,124x-2,470 r = 0,9990	10,240	10,157
2		0,639	9,69			
3		0,607	14,30			
4		0,550	22,37			
5		0,537	24,16			
1	0,708	0,668	5,62	y= 5,211x-2,667 r = 0,9986	10,107	
2		0,639	9,69			
3		0,608	14,19			
4		0,549	22,47			
5		0,537	24,16			
1	0,708	0,693	2,06	y= 5,20x-2,650 r = 0,9981	10,125	
2		0,651	8,02			
3		0,614	13,28			
4		0,576	18,64			
5		0,547	22,75			

- **Formula 1 (F1) hari ke-28**

Konsentrasi Vitamin C (µg/ml)	Serapan DPPH	Serapan Sampel	% inhibisi	Persamaan Regresi Linear	IC_{50} (µg/ml)	Rata-rata IC_{50} (µg/ml)
1	0,712	0,652	8,50	y= 4,22x+4,472 r = 0,9922	10,789	10,755
2		0,613	13,95			
3		0,599	15,87			
4		0,559	21,53			
5		0,528	25,81			
1	0,712	0,652	8,43	y= 4,255x+4,453 r = 0,9933	10,704	
2		0,612	14,04			
3		0,597	16,15			
4		0,559	21,49			
5		0,527	25,98			
1	0,712	0,652	8,50	y= 4,224x+4,996 r = 0,9931	10,773	
2		0,613	13,95			
3		0,598	16,01			
4		0,558	21,57			
5		0,528	25,81			

- **Formula 2 (F2) hari ke-2**

Konsentrasi Vitamin C (µg/ml)	Serapan DPPH	Serapan Sampel	% inhibisi	Persamaan Regresi Linear	IC_{50} (µg/ml)	Rata-rata IC_{50} (µg/ml)
1	0,708	0,669	5,52	y= 4,996x+0,22 r = 0,9863	10,240	9,975
2		0,639	9,69			
3		0,607	14,30			
4		0,550	22,37			
5		0,537	24,16			
1	0,708	0,668	5,62	y=4,986x+0,268 r = 0,9848	9,974	
2		0,639	9,69			
3		0,608	14,19			
4		0,549	22,47			
5		0,537	24,16			
1	0,708	0,673	4,99	y= 4,996x+0,108 r = 0,9981	9,986	
2		0,645	8,90			
3		0,611	13,67			
4		0,553	21,94			
5		0,541	23,59			

- **Formula 2 (F2) hari ke-28**

Konsentrasi Vitamin C (µg/ml)	Serapan DPPH	Serapan Sampel	% inhibisi	Persamaan Regresi Linear	IC_{50} (µg/ml)	Rata-rata IC_{50} (µg/ml)
1	0,712	0,650	8,71	y= 4,072x+5,286 r = 0,9936	10,981	10,950
2		0,608	14,61			
3		0,589	17,28			
4		0,562	21,07			
5		0,528	25,84			
1	0,712	0,651	8,57	y= 4,086x+5,188 r = 0,9912	10,967	
2		0,608	14,61			
3		0,588	17,42			
4		0,565	20,65			
5		0,527	25,98			
1	0,712	0,652	8,50	y= 4,128x+4,992 r = 0,9910	10,903	
2		0,609	14,47			
3		0,589	17,28			
4		0,566	20,51			
5		0,526	26,12			

- **Formula 3 (F3) hari ke-2**

Konsentrasi Vitamin C (µg/ml)	Serapan DPPH	Serapan Sampel	% inhibisi	Persamaan Regresi Linear	IC_{50} (µg/ml)	Rata-rata IC_{50} (µg/ml)
1	0,708	0,658	7,06	y= 5,241x+1,425 r = 0,9949	9,268	9,308
2		0,631	10,88			
3		0,585	17,37			
4		0,542	23,45			
5		0,517	26,98			
1	0,708	0,652	7,91	y=5,245x+1,309 r = 0,9944	9,283	
2		0,633	10,54			
3		0,584	17,49			
4		0,544	23,15			
5		0,517	26,98			
1	0,708	0,653	7,71	y= 5,138x+1,840 r = 0,9929	9,373	
2		0,633	10,54			
3		0,581	17,91			
4		0,546	22,88			
5		0,515	27,23			

- **Formula 3 (F3) hari ke-28**

Konsentrasi Vitamin C (µg/ml)	Serapan DPPH	Serapan Sampel	% inhibisi	Persamaan Regresi Linear	IC_{50} (µg/ml)	Rata-rata IC_{50} (µg/ml)
1	0,712	0,686	3,66	y= 4,965x-1,561 r = 0,9963	10,385	10,343
2		0,659	7,46			
3		0,613	13,87			
4		0,577	18,93			
5		0,550	22,75			
1	0,712	0,690	3,16	y= 5,062x-1,952 r = 0,9983	10,263	
2		0,657	7,70			
3		0,616	13,55			
4		0,578	18,88			
5		0,549	22,88			
1	0,712	0,690	3,12	y= 5,008x-1,994 r = 0,9995	10,382	
2		0,657	7,74			
3		0,619	13,08			
4		0,581	18,36			
5		0,549	22,88			

- **Formula 4 (F4) hari ke-2**

Konsentrasi Vitamin C (µg/ml)	Serapan DPPH	Serapan Sampel	% inhibisi	Persamaan Regresi Linear	IC_{50} (µg/ml)	Rata-rata IC_{50} (µg/ml)
1	0,708	0,665	6,07	y= 4,799x+2,811 r = 0,9834	9,833	9,857
2		0,613	13,45			
3		0,579	18,22			
4		0,545	23,02			
5		0,529	25,28			
1	0,708	0,664	6,21	y=4,718x+3,076 r = 0,9806	9,946	
2		0,613	13,42			
3		0,577	18,50			
4		0,545	23,02			
5		0,531	25,00			
1	0,708	0,664	6,17	y= 4,808x+2,926 r = 0,9826	9,791	
2		0,613	13,46			
3		0,576	18,64			
4		0,545	23,08			
5		0,528	25,40			

- **Formula 4 (F4) hari ke-28**

Konsentrasi Vitamin C (µg/ml)	Serapan DPPH	Serapan Sampel	% inhibisi	Persamaan Regresi Linear	IC_{50} (µg/ml)	Rata-rata IC_{50} (µg/ml)
1	0,712	0,655	8,08	y= 4,643x+2,963 r = 0,9982	10,131	10,251
2		0,627	11,94			
3		0,596	16,29			
4		0,557	21,77			
5		0,524	26,38			
1	0,712	0,653	8,29	y= 4,493x+3,347 r = 0,9966	10,383	
2		0,625	12,22			
3		0,599	15,87			
4		0,557	21,77			
5		0,527	25,98			
1	0,712	0,655	8,08	y= 4,577x+3,137 r = 0,9985	10,239	
2		0,626	12,08			
3		0,596	16,29			
4		0,557	21,77			
5		0,526	26,12			

Lampiran 5. Data pemeriksaan sifat fisik formula optimum gel vitamin C

a. pH

Replikasi	pH	
	Hari ke-2	Hari ke-28
1	3,94	3,72
2	3,96	3,72
3	3,98	3,72
Rata-rata	3,96	3,72
SD	0,02	0,00

b. Viskositas

Replikasi	Viskositas (dPas)	
	Hari ke-2	Hari ke-28
1	1900	1900
2	1900	1900
3	2000	1900
Rata-rata	1966,67	1900
SD	57,74	0,00

c. Daya sebar

Replikasi	Daya sebar (cm)	
	Hari ke-2	Hari ke-28
1	5,1	4,83
2	4,8	4,76
3	5,0	4,90
Rata-rata	4,97	4,83
SD	0,15	0,07

d. Daya Lekat

Replikasi	Daya Lekat (detik)	
	Hari ke-2	Hari ke-28
1	0,35	0,40
2	0,41	0,38
3	0,41	0,30
Rata-rata	0,39	0,36
SD	0,04	0,06

- **Kadar hari ke-2**

Replikasi	Serapan	Kadar (µg/ml)	Kadar (%)
1	0,289	5,116	102,32
2	0,284	5,032	100,64
3	0,284	5,020	100,40
Rata-rata		5,056	101,12
SD		0,060	1,060

- **Kadar hari ke-28**

Replikasi	Serapan	Kadar terukur (µg/ml)	Kadar (%)
1	0,279	4,923	98,46
2	0,280	4,942	98,84
3	0,276	4,881	97,62
Rata-rata		4,915	98,31
SD		0,027	0,624

Keterangan :

Kadar terukur (µg/ml) = $\frac{serapan - 0{,}0191}{0{,}0527}$

Kadar (%) = $\frac{Kadar\ terukur}{kadar\ teoritis}$ x 100%

= $\frac{kadar\ terukur}{5}$ x 100%

- **Aktivitas antioksidan hari ke-2**

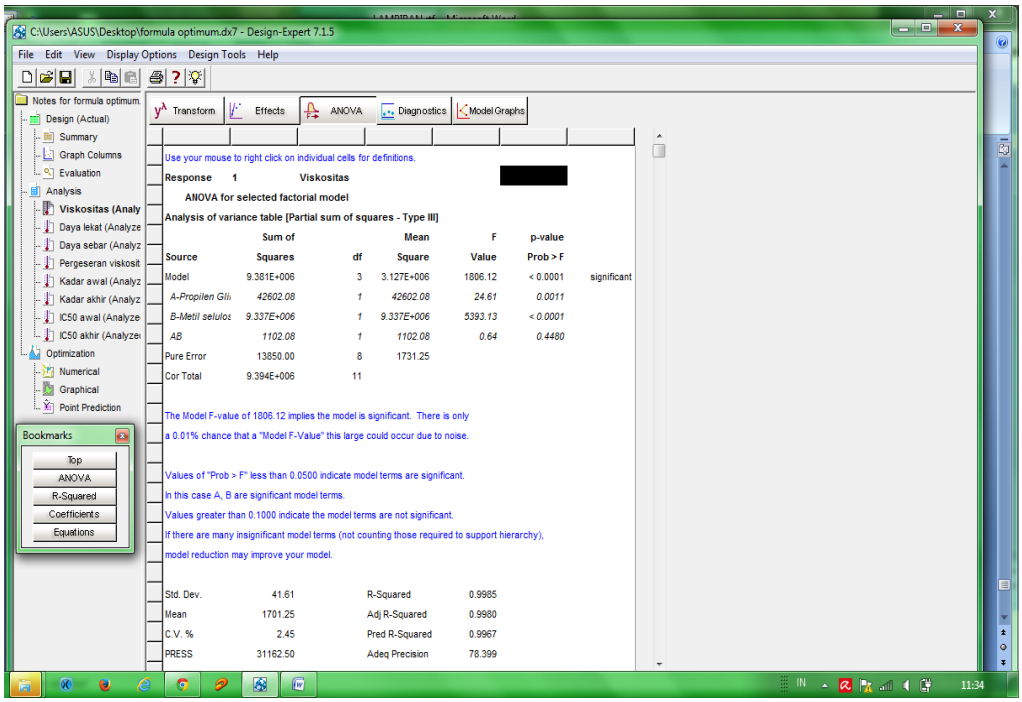
Konsentrasi Vitamin C (µg/ml)	Serapan DPPH	Serapan Sampel	% inhibisi	Persamaan Regresi Linear	IC_{50} (µg/ml)	Rata-rata IC_{50} (µg/ml)
1	0,708	0,665	6,07	y= 4,799x+2,811 r = 0,9834	9,722	9,915
2		0,613	13,45			
3		0,579	18,22			
4		0,545	23,02			
5		0,529	25,28			
1	0,708	0,664	6,21	y=4,718x+3,076 r = 0,9806	9,862	
2		0,613	13,42			
3		0,577	18,50			
4		0,545	23,02			
5		0,531	25,00			
1	0,708	0,664	6,17	y= 4,808x+2,926 r = 0,9826	10,160	
2		0,613	13,46			
3		0,576	18,64			
4		0,545	23,08			
5		0,528	25,40			

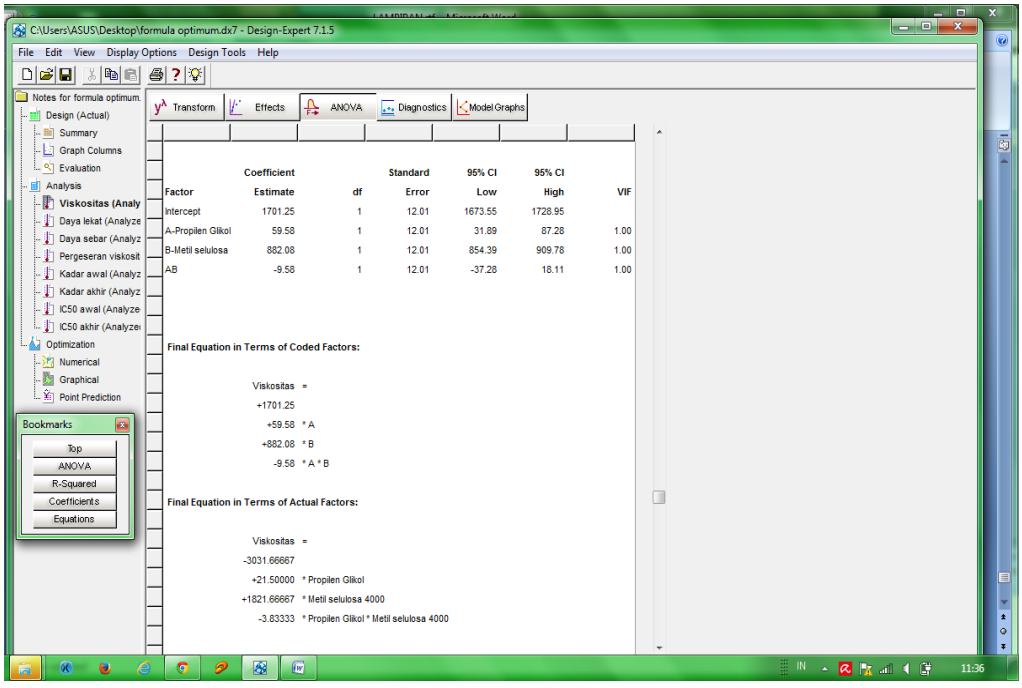
- **Aktivitas antioksidan hari ke-28**

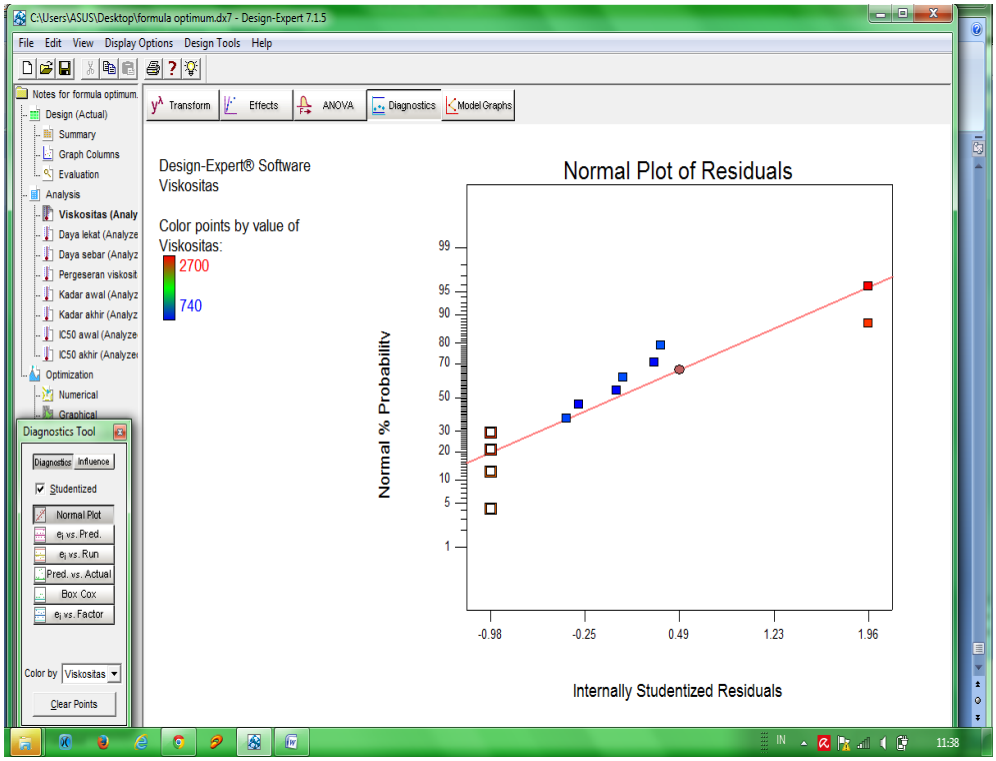
Konsentrasi Vitamin C (µg/ml)	Serapan DPPH	Serapan Sampel	% inhibisi	Persamaan Regresi Linear	IC_{50} (µg/ml)	Rata-rata IC_{50} (µg/ml)
1	0,712	0,655	8,08	y= 4,643x+2,963 r = 0,9982	10,440	10,635
2		0,627	11,94			
3		0,596	16,29			
4		0,557	21,77			
5		0,524	26,38			
1	0,712	0,653	8,29	y= 4,493x+3,347 r = 0,9966	10,820	
2		0,625	12,22			
3		0,599	15,87			
4		0,557	21,77			
5		0,527	25,98			
1	0,712	0,655	8,08	y= 4,577x+3,137 r = 0,9985	10,644	
2		0,626	12,08			
3		0,596	16,29			
4		0,557	21,77			
5		0,526	26,12			

Lampiran 6. Data hasil analisa dengan *Software Design Expert versi 7.1.1*

a. Hasil Analisa dengan *Software Design Expert* respon viskositas



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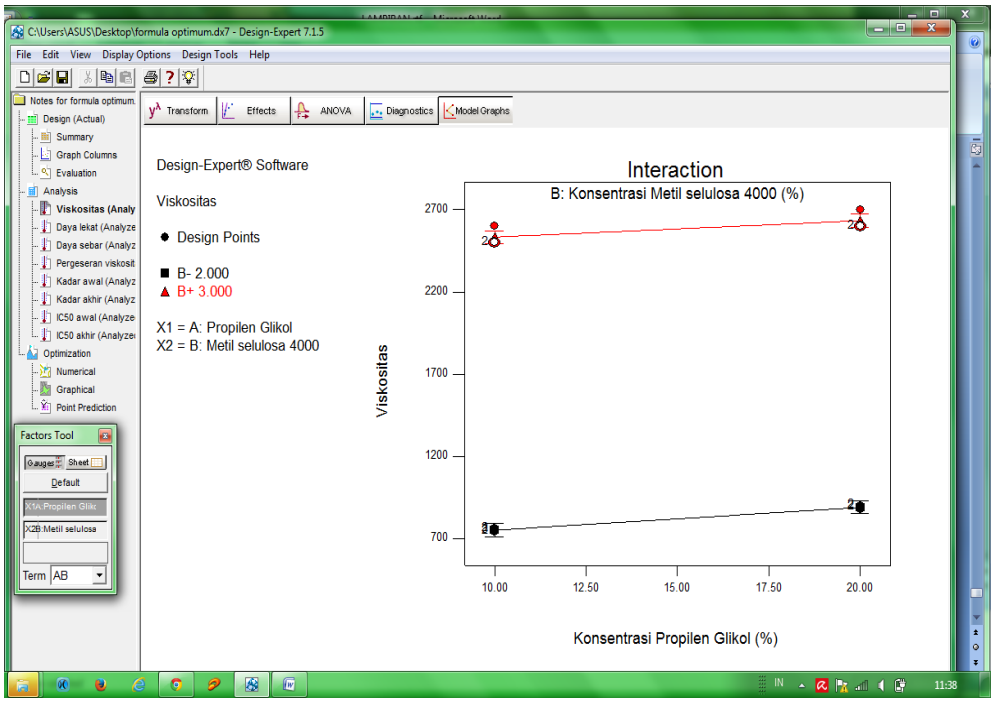
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
Viskositas
Color points by value of
Viskositas:
2700
740
Normal Plot of Residuals
Normal % Probability
99
95
90
80
70
50
30
20
10
5
1
-0.98
-0.25
0.49
1.23
1.96
Internally Studentized Residuals
Diagnostics Tool
Studentized
Normal Plot
Box-Cox
Color by Viskositas
Clear Points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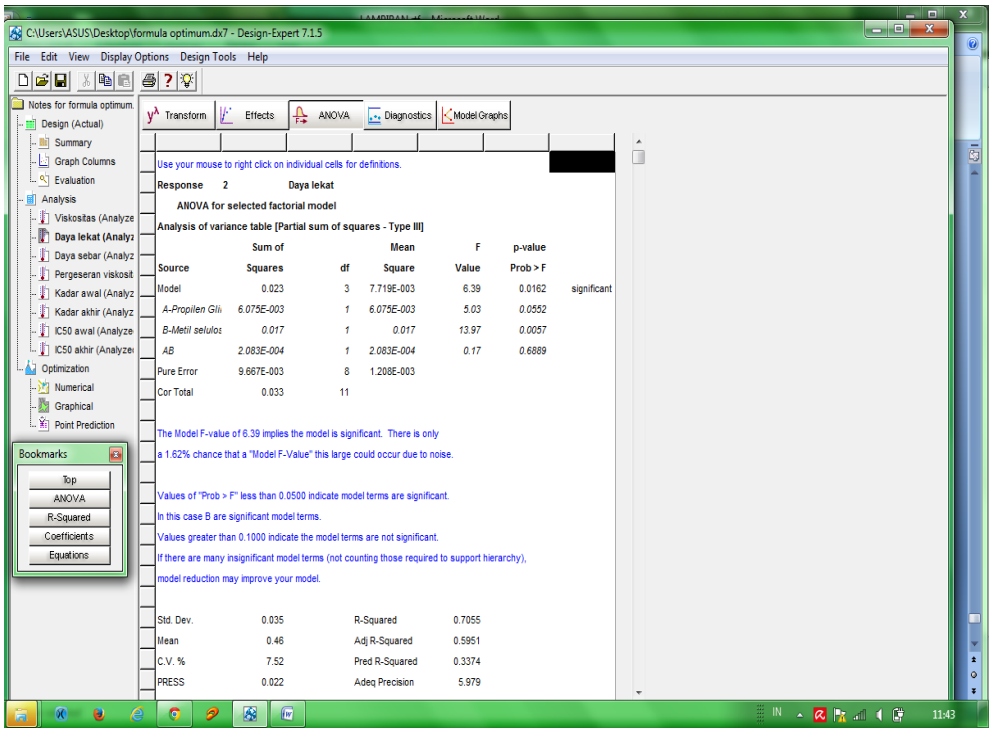
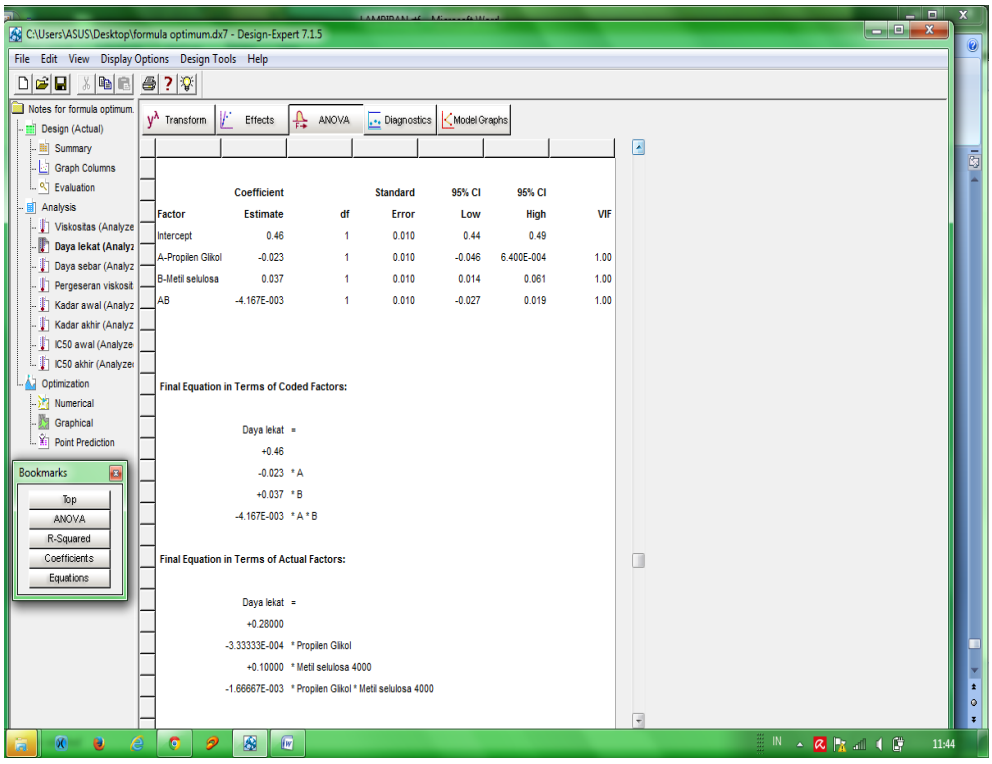
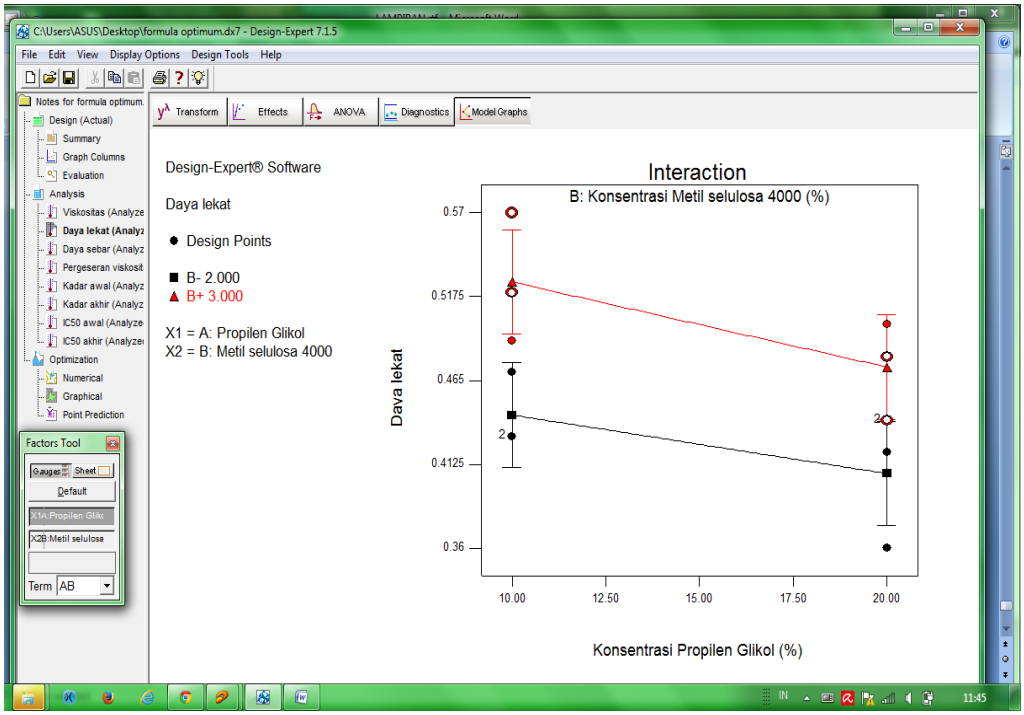
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
Viskositas
Design Points
B- 2.000
B+ 3.000
X1 = A: Propilen Glikol
X2 = B: Metil selulosa 4000
Interaction
B: Konsentrasi Metil selulosa 4000 (%)
Viskositas
2700
2200
1700
1200
700
10.00
12.50
15.00
17.50
20.00
Konsentrasi Propilen Glikol (%)
Factors Tool
Default
Term AB

b. Hasil Analisa dengan *Software Design Expert* respon Daya Lekat



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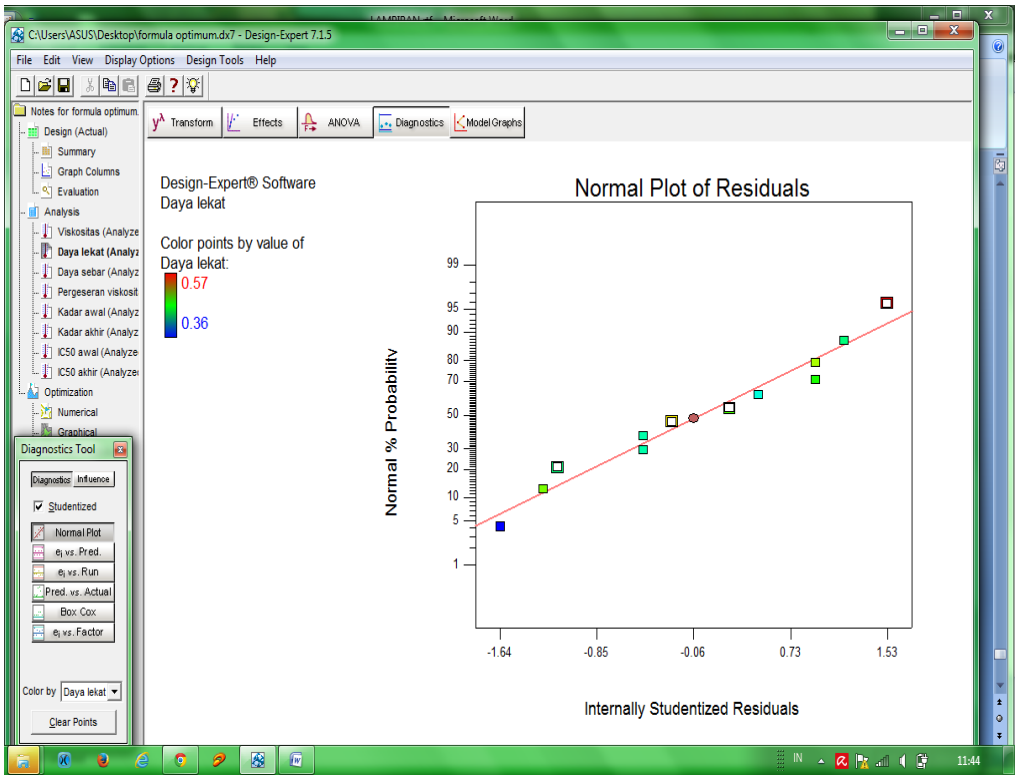
File Edit View Display Options Design Tools Help
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
Daya lekat
Design Points
B- 2.000
B+ 3.000
X1 = A: Propilen Glikol
X2 = B: Metil selulosa 4000
Interaction
B: Konsentrasi Metil selulosa 4000 (%)
Daya lekat
0.57
0.5175
0.465
0.4125
0.36
10.00
12.50
15.00
17.50
20.00
Konsentrasi Propilen Glikol (%)
Factors Tool
Default
Term AB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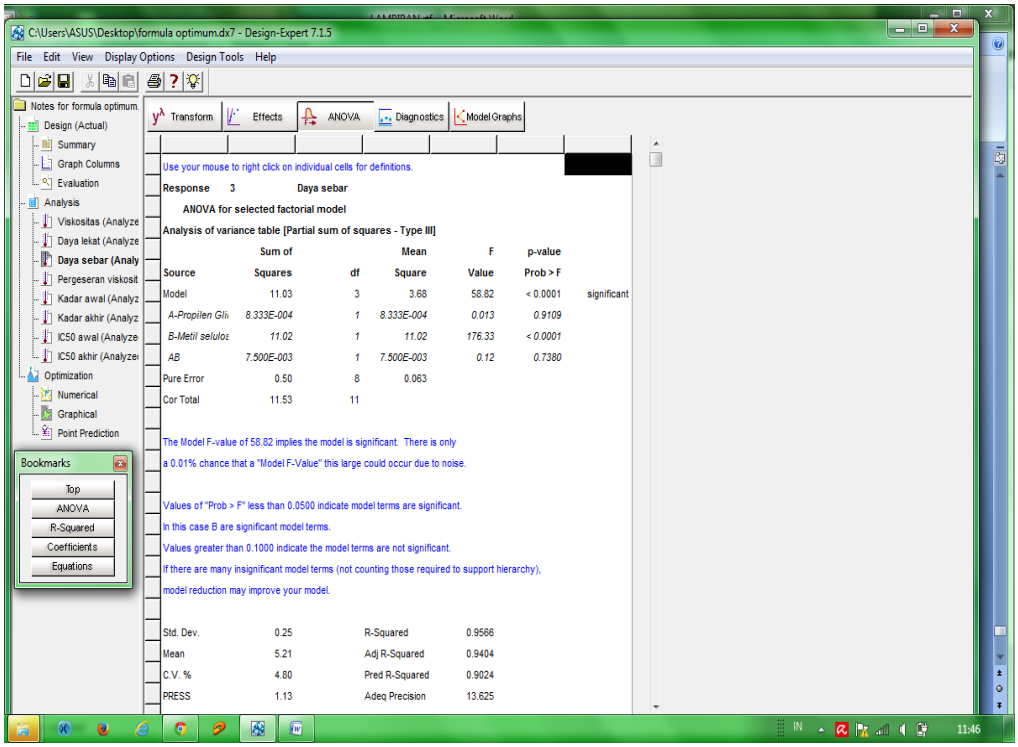
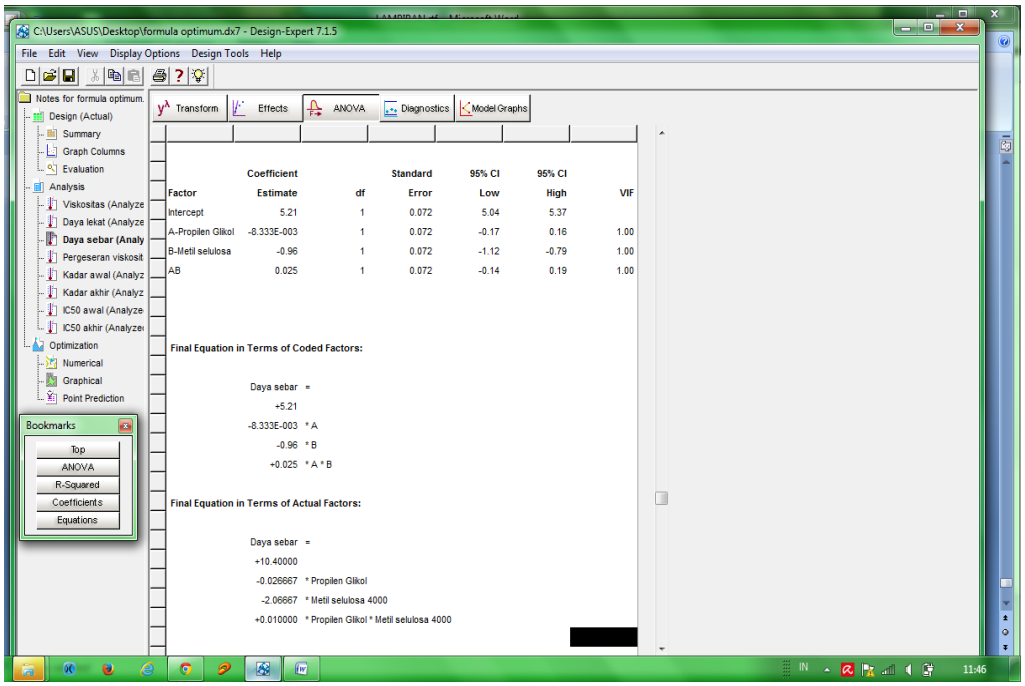
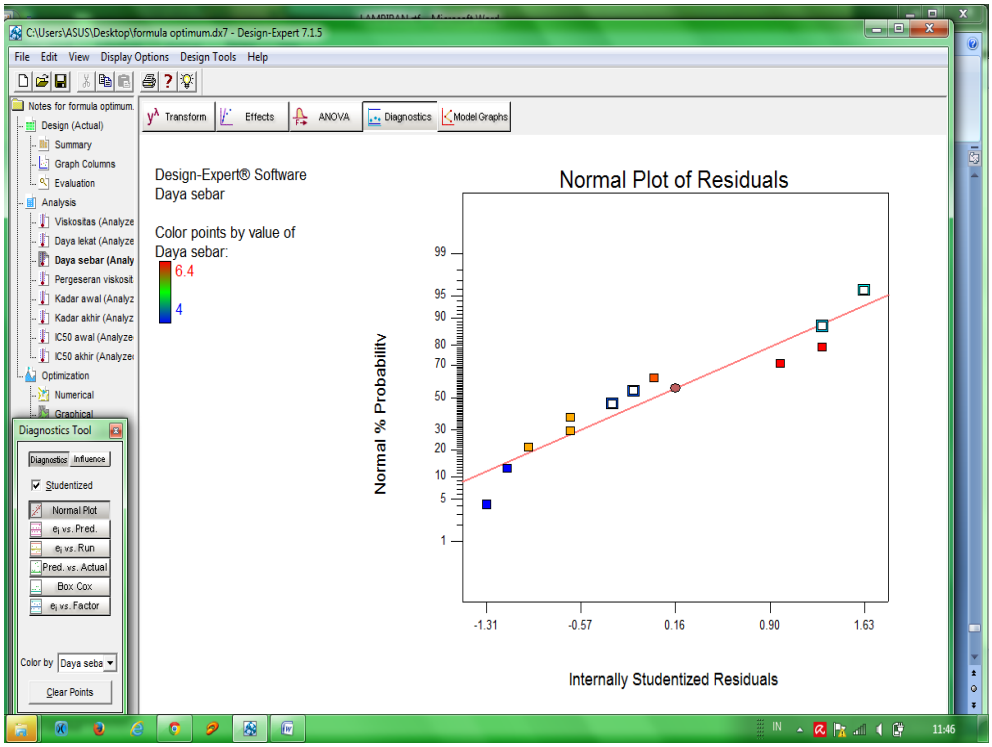
File Edit View Display Options Design Tools Help
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
Daya lekat
Color points by value of
Daya lekat:
0.57
0.36
Normal Plot of Residuals
Normal % Probability
99
95
90
80
70
50
30
20
10
5
1
-1.64
-0.85
-0.06
0.73
1.53
Internally Studentized Residuals
Diagnostics Tool
Studentized
Normal Plot
Box-Cox
Color by Daya lekat
Clear Points

c. Hasil Analisa dengan *Software Design Expert* respon Daya Sebar



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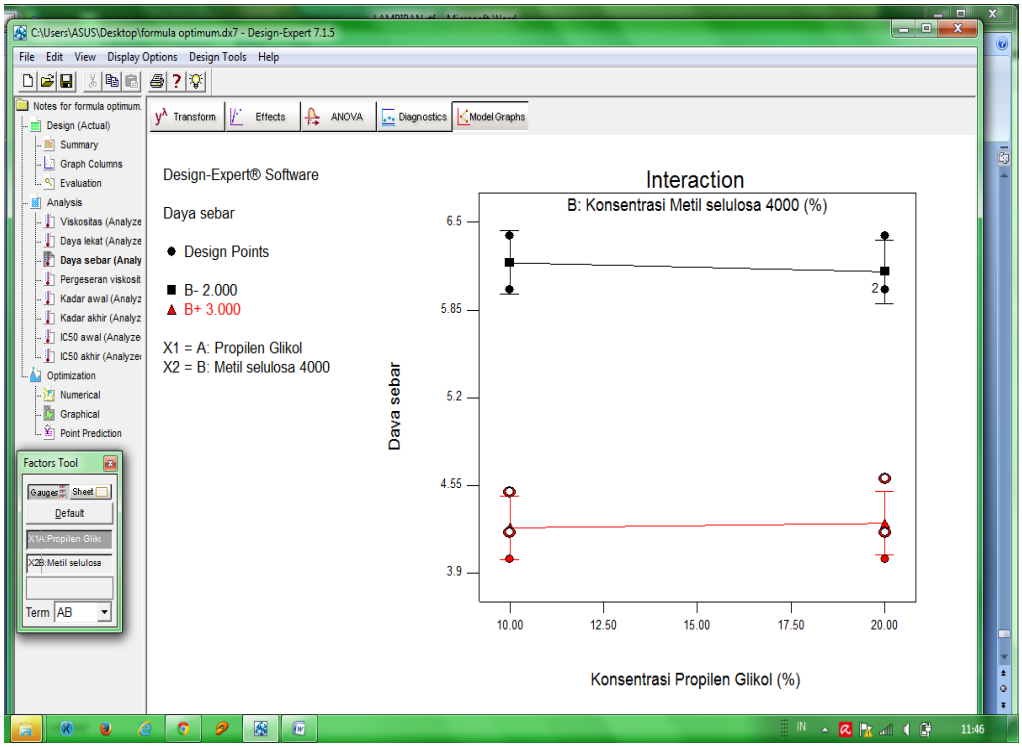
File Edit View Display Options Design Tools Help
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
Daya sebar
Color points by value of
Daya sebar:
6.4
4
Normal Plot of Residuals
Normal % Probability
99
95
90
80
70
50
30
20
10
5
1
-1.31
-0.57
0.16
0.90
1.63
Internally Studentized Residuals
Diagnostics Tool
Studentized
Normal Plot
Box Cox
Color by
Clear Points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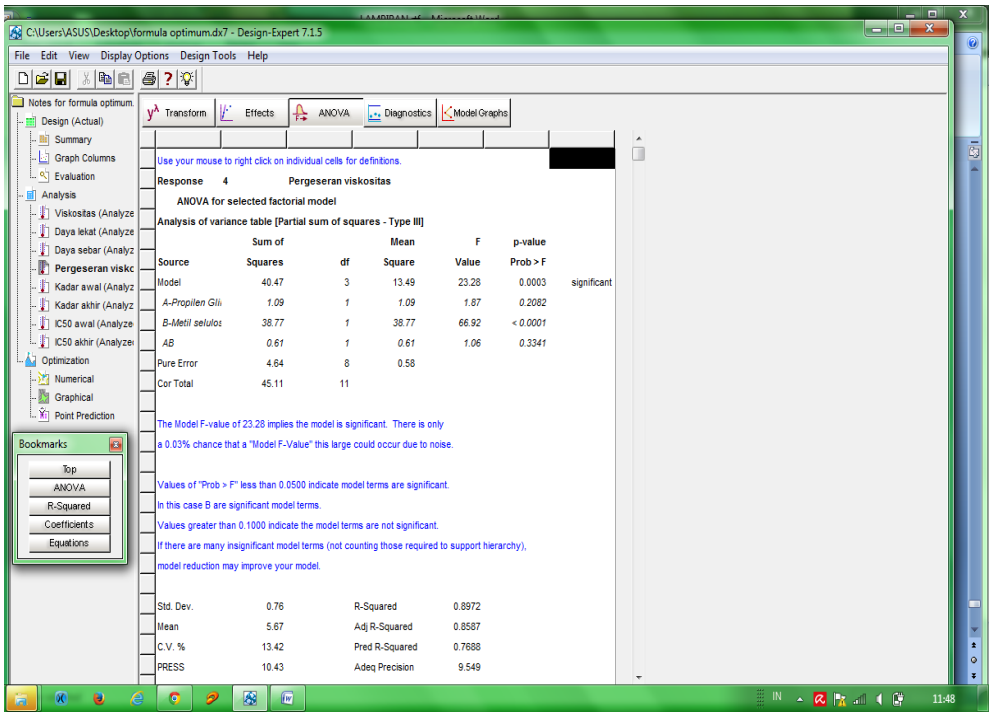
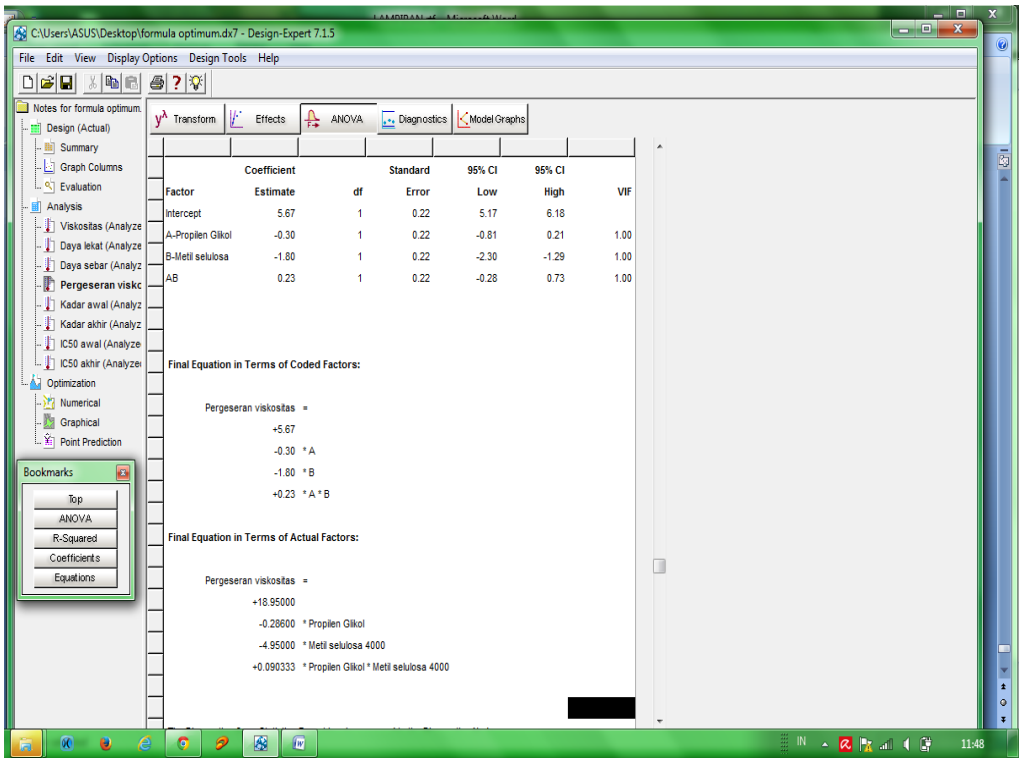
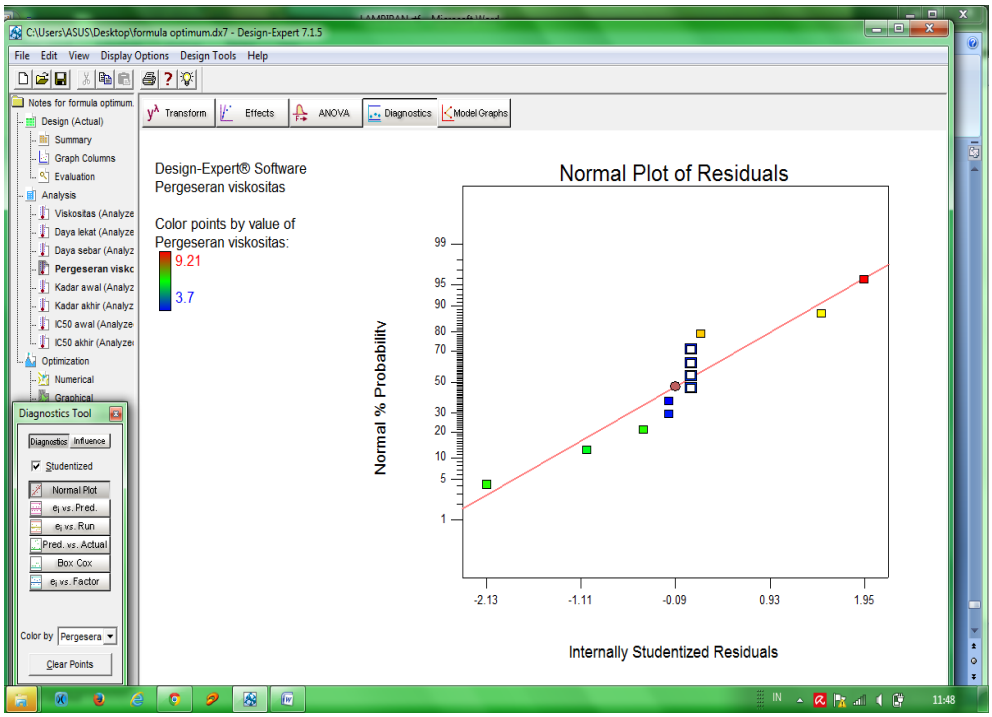
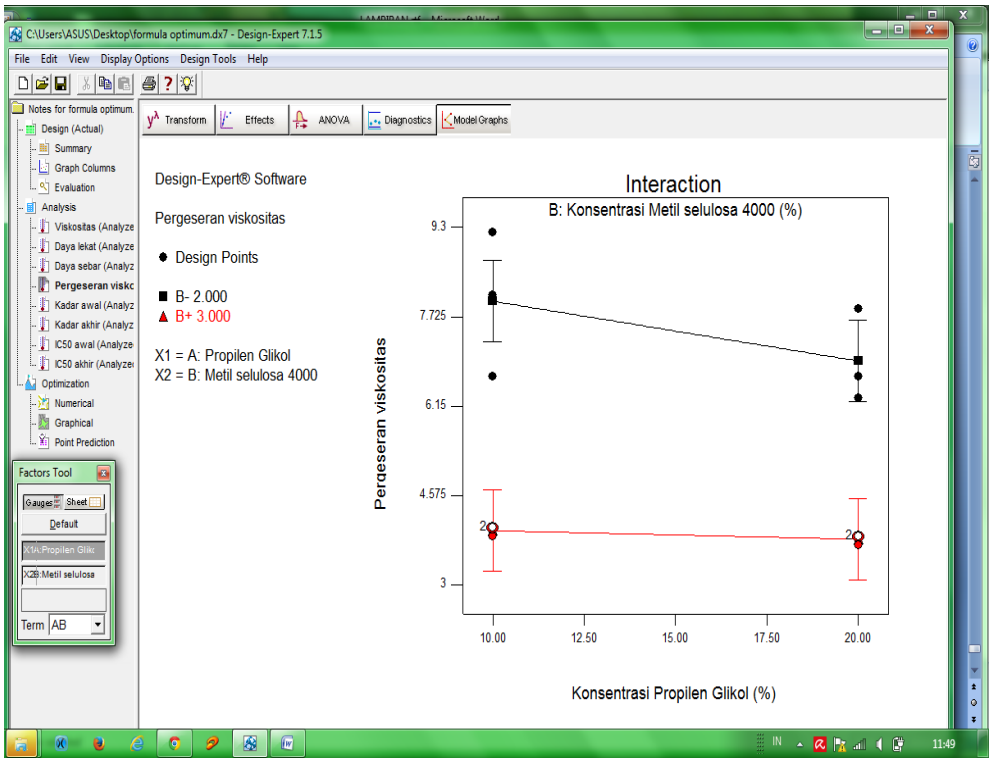
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
Daya sebar
Design Points
B- 2.000
B+ 3.000
X1 = A: Propilen Glikol
X2 = B: Metil selulosa 4000
Interaction
B: Konsentrasi Metil selulosa 4000 (%)
Daya sebar
6.5
5.85
5.2
4.55
3.9
2
10.00
12.50
15.00
17.50
20.00
Konsentrasi Propilen Glikol (%)
Factors Tool
Default
Term AB

D. Hasil Analisa dengan *Software Design Expert* respon Pergeseran Viskositas

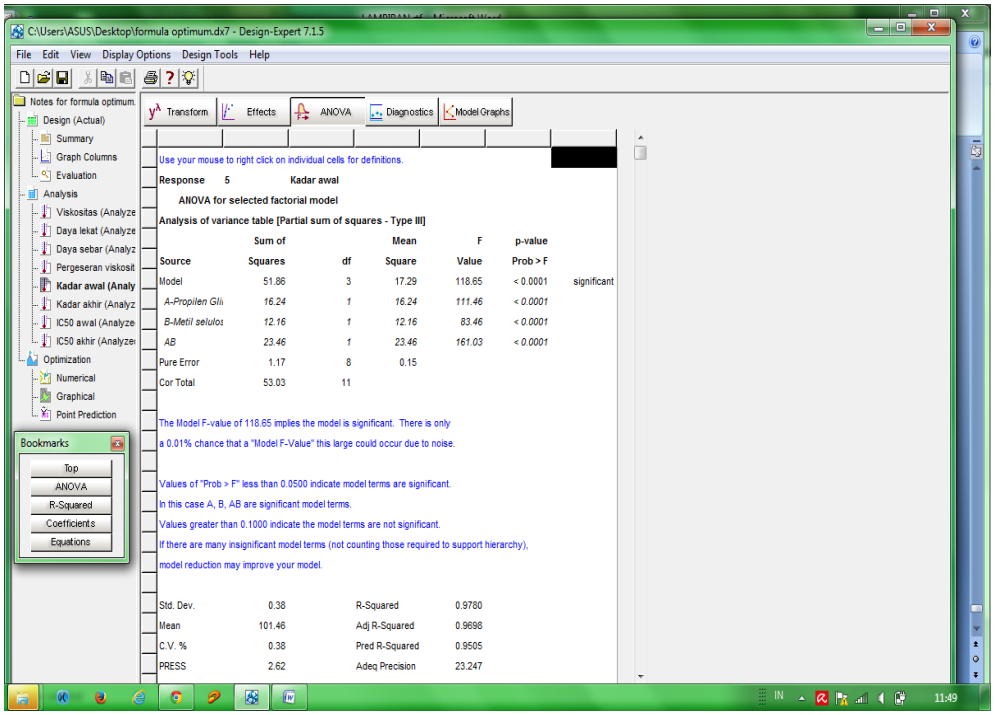





Design-Expert® Software
Pergeseran viskositas
Color points by value of
Pergeseran viskositas:
9.21
3.7
Normal Plot of Residuals
Normal % Probability
99
95
90
80
70
50
30
20
10
5
1
-2.13
-1.11
-0.09
0.93
1.95
Internally Studentized Residuals


Design-Expert® Software
Pergeseran viskositas
Design Points
B- 2.000
B+ 3.000
X1 = A: Propilen Glikol
X2 = B: Metil selulosa 4000
Interaction
B: Konsentrasi Metil selulosa 4000 (%)
Pergeseran viskositas
9.3
7.725
6.15
4.575
3
10.00
12.50
15.00
17.50
20.00
Konsentrasi Propilen Glikol (%)

E. Hasil Analisa dengan *Software Design Expert* respon Kadar hari ke-2



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Use your mouse to right click on individual cells for definitions.

Response 5 Kadar awal

ANOVA for selected factorial model

Analysis of variance table [Partial sum of squares - Type III]

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	51.86	3	17.29	118.65	< 0.0001	significant
A-Propilen Gli	*16.24*	*1*	*16.24*	*111.46*	*< 0.0001*	
B-Metil selulos	*12.16*	*1*	*12.16*	*83.46*	*< 0.0001*	
AB	*23.46*	*1*	*23.46*	*161.03*	*< 0.0001*	
Pure Error	1.17	8	0.15			
Cor Total	53.03	11				

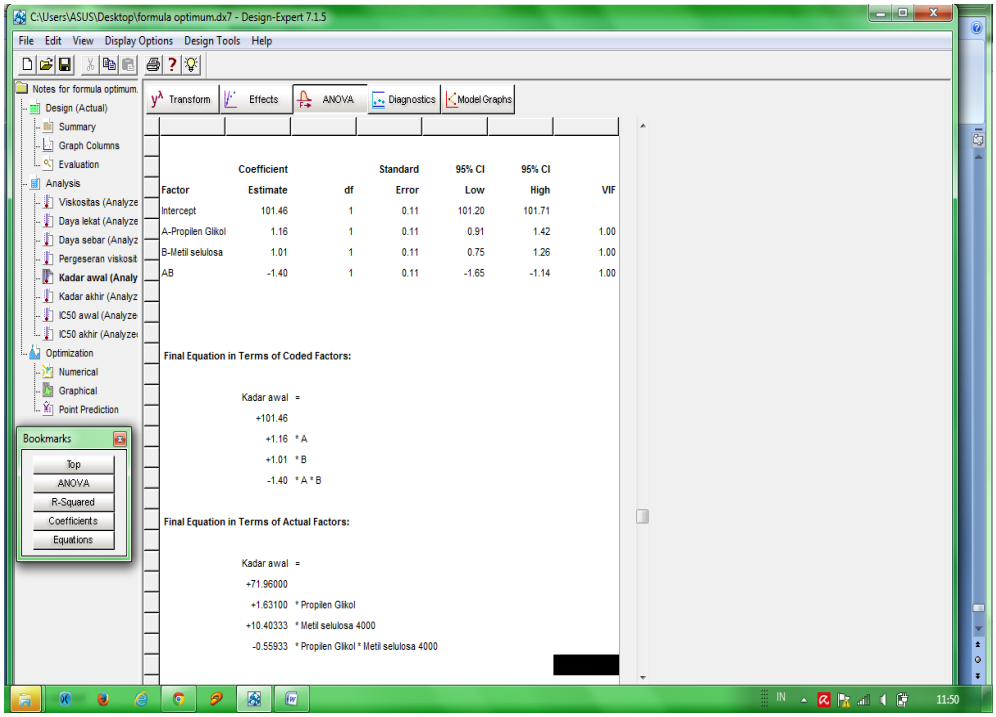
The Model F-value of 118.65 implies the model is significant. There is only a 0.01% chance that a "Model F-Value" this large could occur due to noise.

Values of "Prob > F" less than 0.0500 indicate model terms are significant.
In this case A, B, AB are significant model terms.
Values greater than 0.1000 indicate the model terms are not significant.
If there are many insignificant model terms (not counting those required to support hierarchy), model reduction may improve your model.

Std. Dev.	0.38	R-Squared	0.9780
Mean	101.46	Adj R-Squared	0.9698
C.V. %	0.38	Pred R-Squared	0.9505
PRESS	2.62	Adeq Precision	23.247

Notes for formula optimum
Design (Actual)
Summary
Graph Columns
Evaluation
Analysis
Viskositas (Analyze
Daya lekat (Analyze
Daya sebar (Analyz
Pergeseran viskosit
Kadar awal (Analy
Kadar akhir (Analyz
IC50 awal (Analyze
IC50 akhir (Analyze
Optimization
Numerical
Graphical
Point Prediction

Bookmarks: Top | ANOVA | R-Squared | Coefficients | Equations



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File Edit View Display Options Design Tools Help

Transform | Effects | ANOVA | Diagnostics | Model Graphs

Factor	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
Intercept	101.46	1	0.11	101.20	101.71	
A-Propilen Glikol	1.16	1	0.11	0.91	1.42	1.00
B-Metil selulosa	1.01	1	0.11	0.75	1.26	1.00
AB	-1.40	1	0.11	-1.65	-1.14	1.00

Final Equation in Terms of Coded Factors:

Kadar awal =
+101.46
+1.16 * A
+1.01 * B
-1.40 * A * B

Final Equation in Terms of Actual Factors:

Kadar awal =
+71.96000
+1.63100 * Propilen Glikol
+10.40333 * Metil selulosa 4000
-0.55933 * Propilen Glikol * Metil selulosa 4000

Notes for formula optimum
Design (Actual)
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Viskositas (Analyze
Daya lekat (Analyze
Daya sebar (Analyz
Pergeseran viskosit
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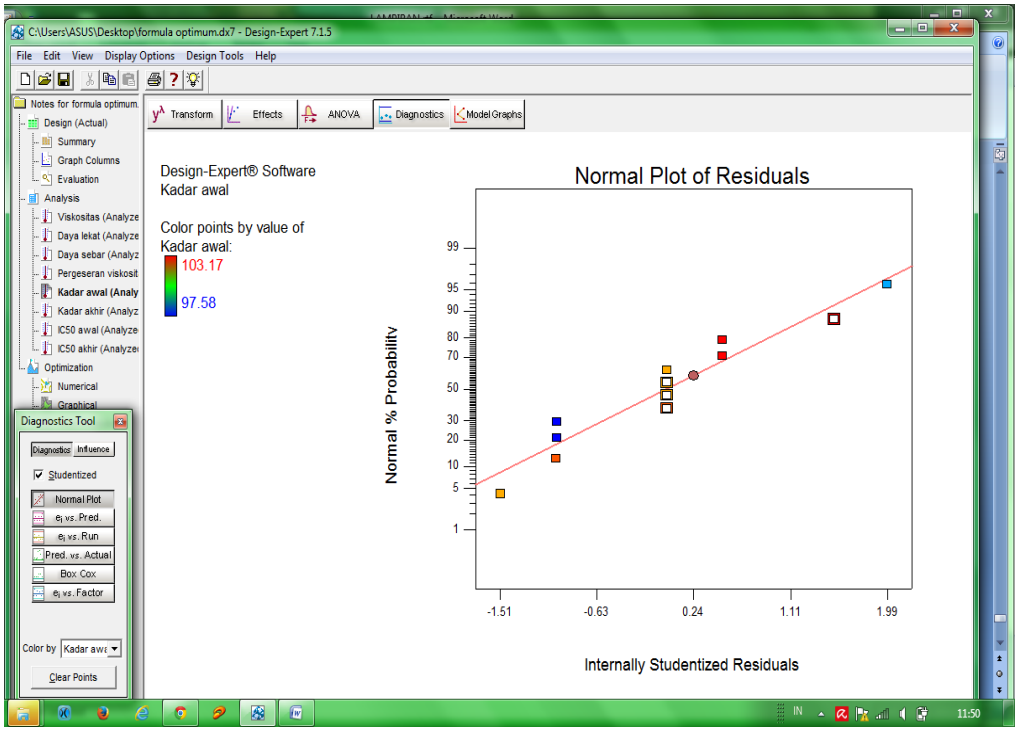
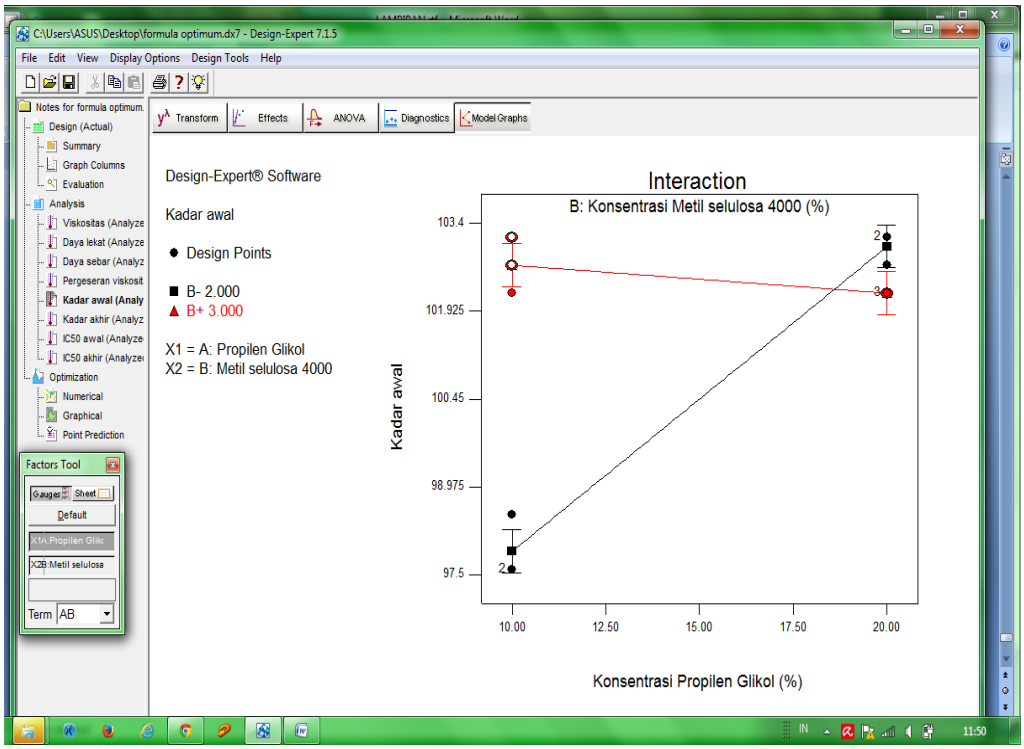
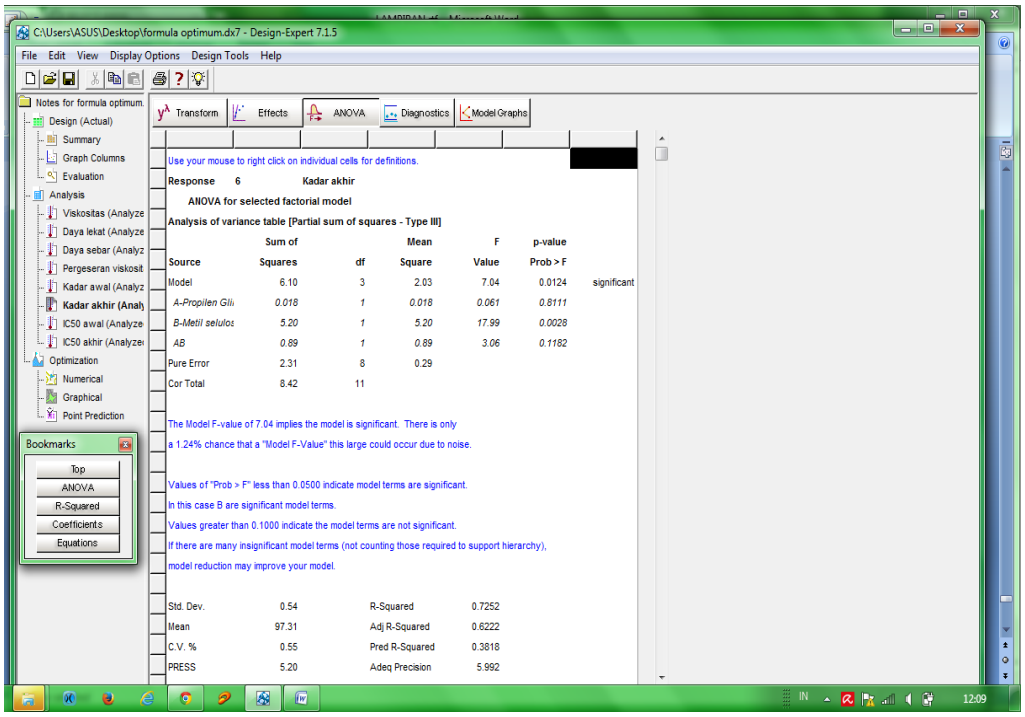
Optimization
Numerical
Graphical
Point Prediction

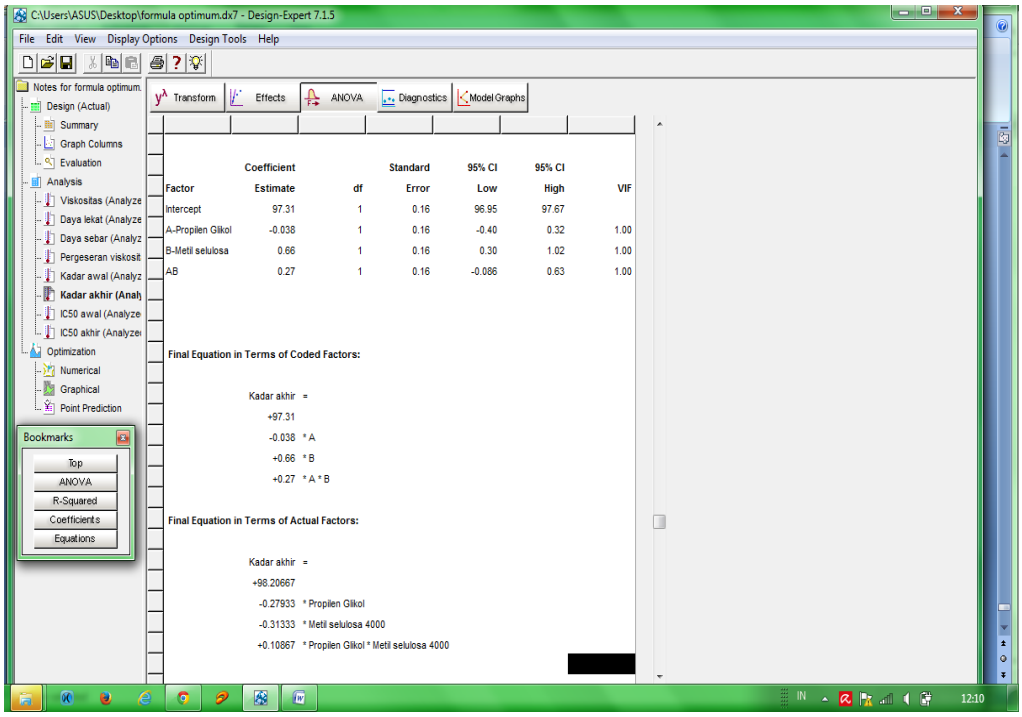
Bookmarks: Top | ANOVA | R-Squared | Coefficients | Equations

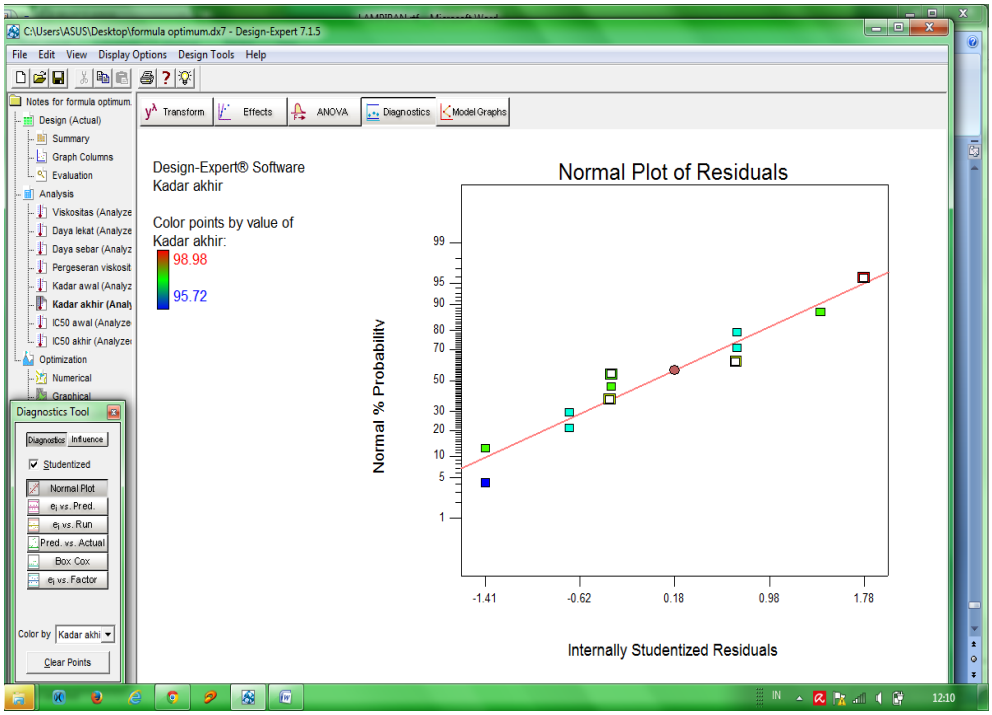

C:\Users\ASUS\Desktop\formula optimum.dx7 - Design-Expert 7.1.5
File Edit View Display Options Design Tools Help
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
Kadar awal
Color points by value of
Kadar awal:
103.17
97.58
Normal Plot of Residuals
Normal % Probability
99
95
90
80
70
50
30
20
10
5
1
-1.51
-0.63
0.24
1.11
1.99
Internally Studentized Residuals
Diagnostics Tool
Studentized
Normal Plot
Box Cox
Color by
Clear Points

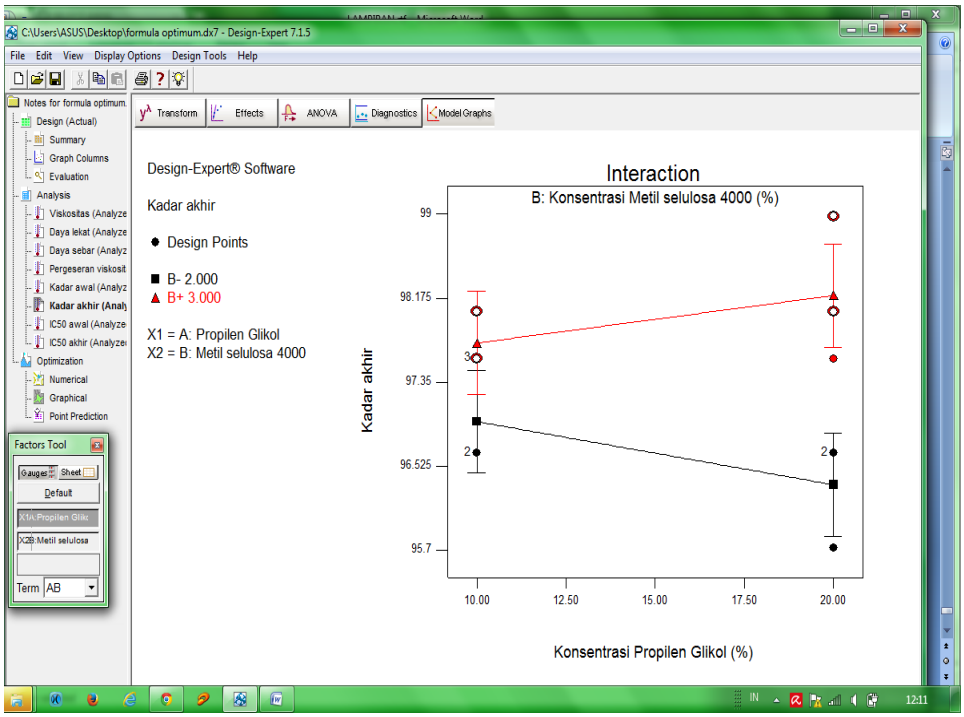

C:\Users\ASUS\Desktop\formula optimum.dx7 - Design-Expert 7.1.5
File Edit View Display Options Design Tools Help
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
Kadar awal
Design Points
B- 2.000
B+ 3.000
X1 = A: Propilen Glikol
X2 = B: Metil selulosa 4000
Interaction
B: Konsentrasi Metil selulosa 4000 (%)
Kadar awal
103.4
101.925
100.45
98.975
97.5
10.00
12.50
15.00
17.50
20.00
Konsentrasi Propilen Glikol (%)
Factors Tool
Default
Term AB

F. Hasil Analisa dengan *Software Design Expert* respon Kadar Hari ke-28

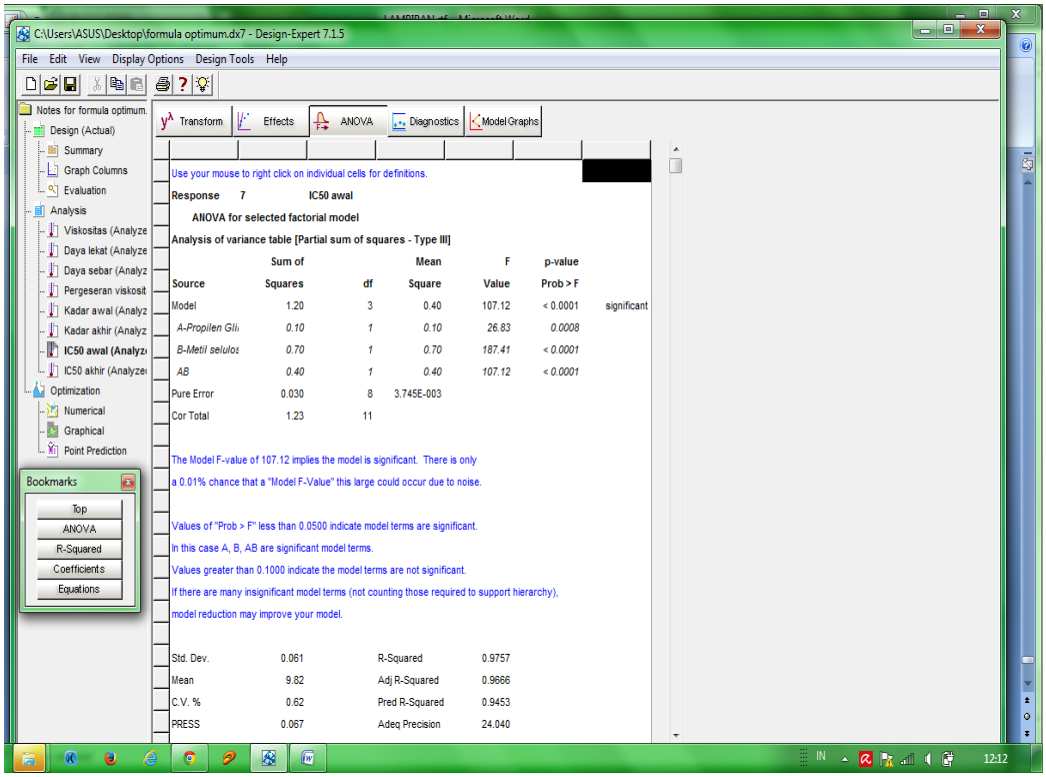


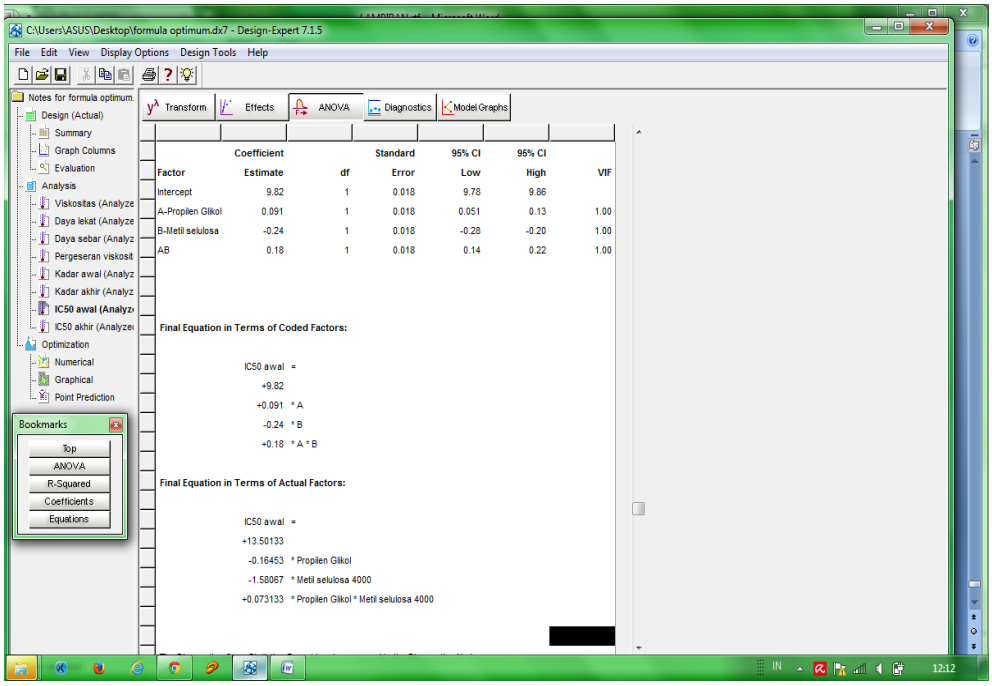


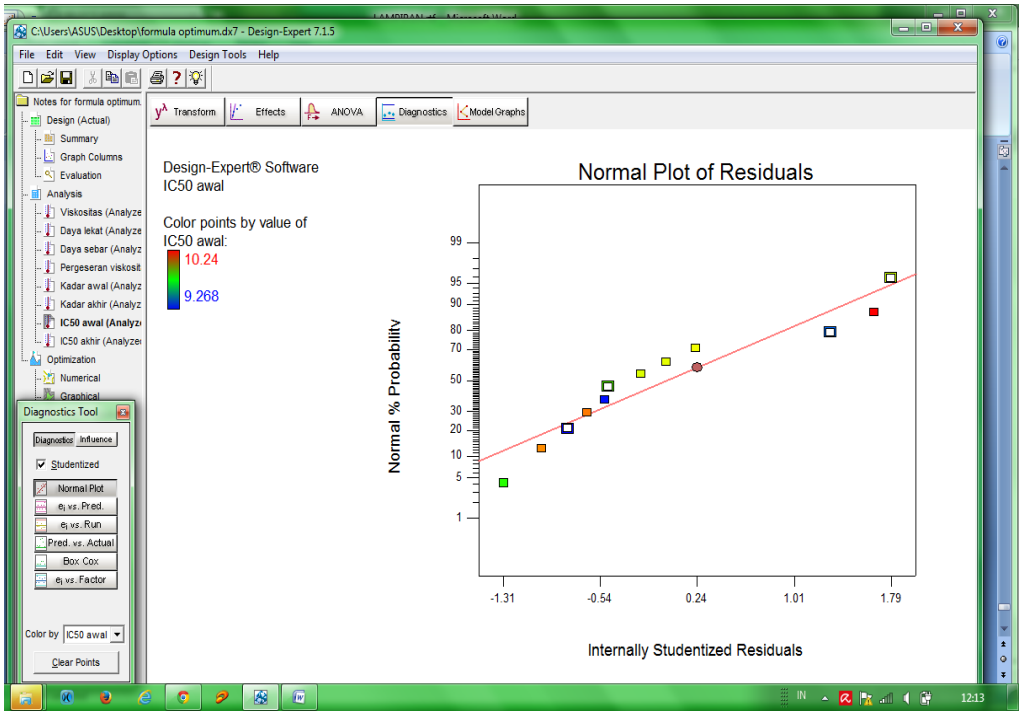

C:\Users\ASUS\Desktop\formula optimum.dx7 - Design-Expert 7.1.5
File Edit View Display Options Design Tools Help
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
Kadar akhir
Color points by value of
Kadar akhir:
98.98
95.72
Normal Plot of Residuals
Normal % Probability
99
95
90
80
70
50
30
20
10
5
1
-1.41
-0.62
0.18
0.98
1.78
Internally Studentized Residuals
Diagnostics Tool
Studentized
Normal Plot
Pred. vs. Actual
Box-Cox
Color by
Clear Points

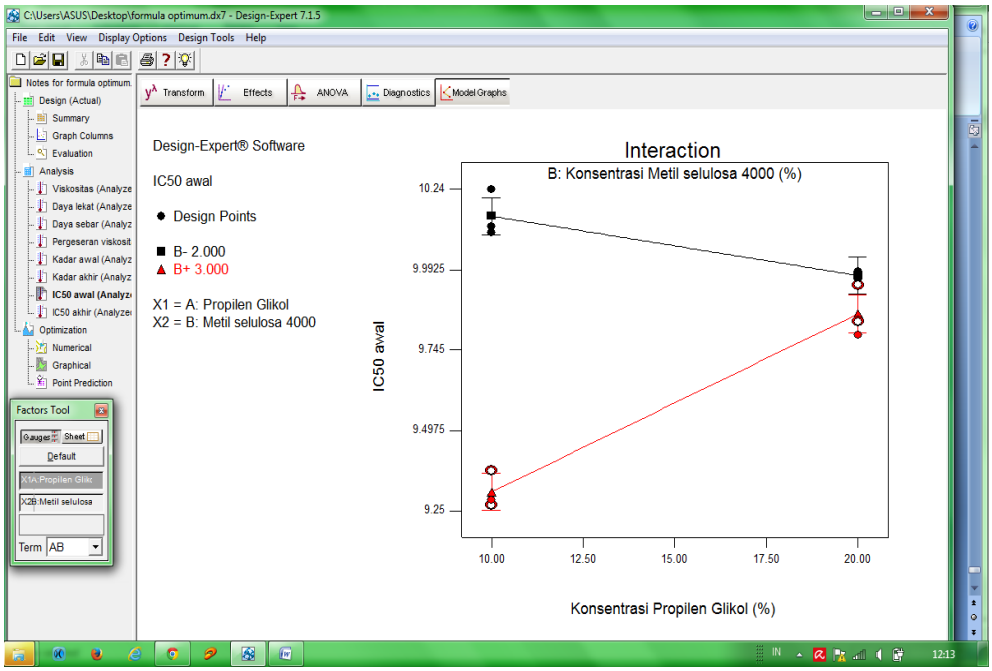

C:\Users\ASUS\Desktop\formula optimum.dx7 - Design-Expert 7.1.5
File Edit View Display Options Design Tools Help
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
Kadar akhir
Design Points
B- 2.000
B+ 3.000
X1 = A: Propilen Glikol
X2 = B: Metil selulosa 4000
Interaction
B: Konsentrasi Metil selulosa 4000 (%)
Kadar akhir
99
98.175
97.35
96.525
95.7
10.00
12.50
15.00
17.50
20.00
Konsentrasi Propilen Glikol (%)
Factors Tool
Default
Term AB

G. Hasil Analisa dengan *Software Design Expert* respon IC_{50} hari ke-2

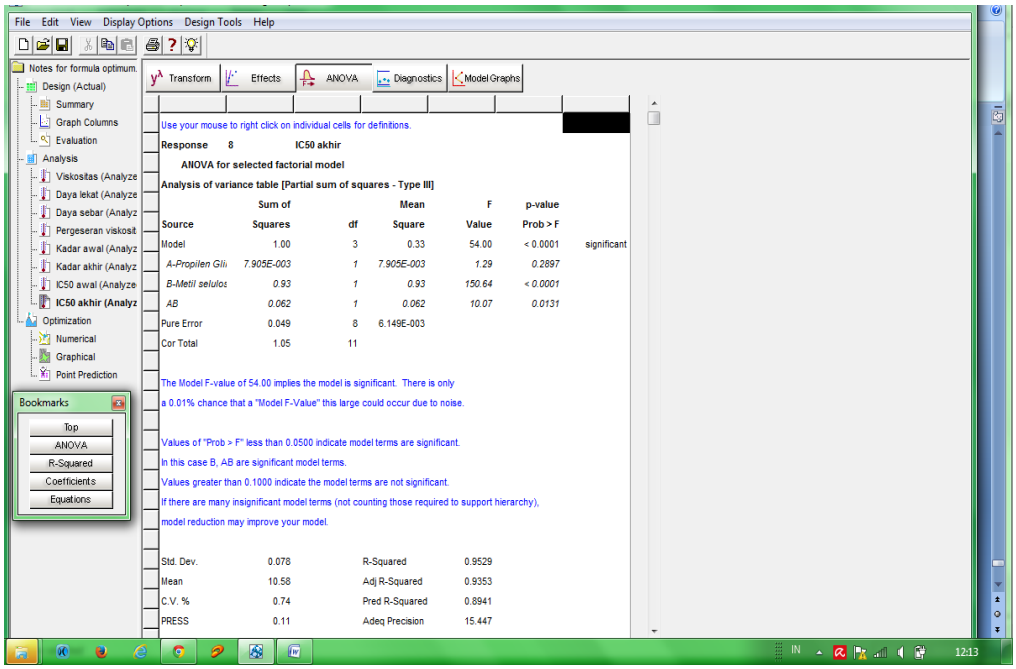


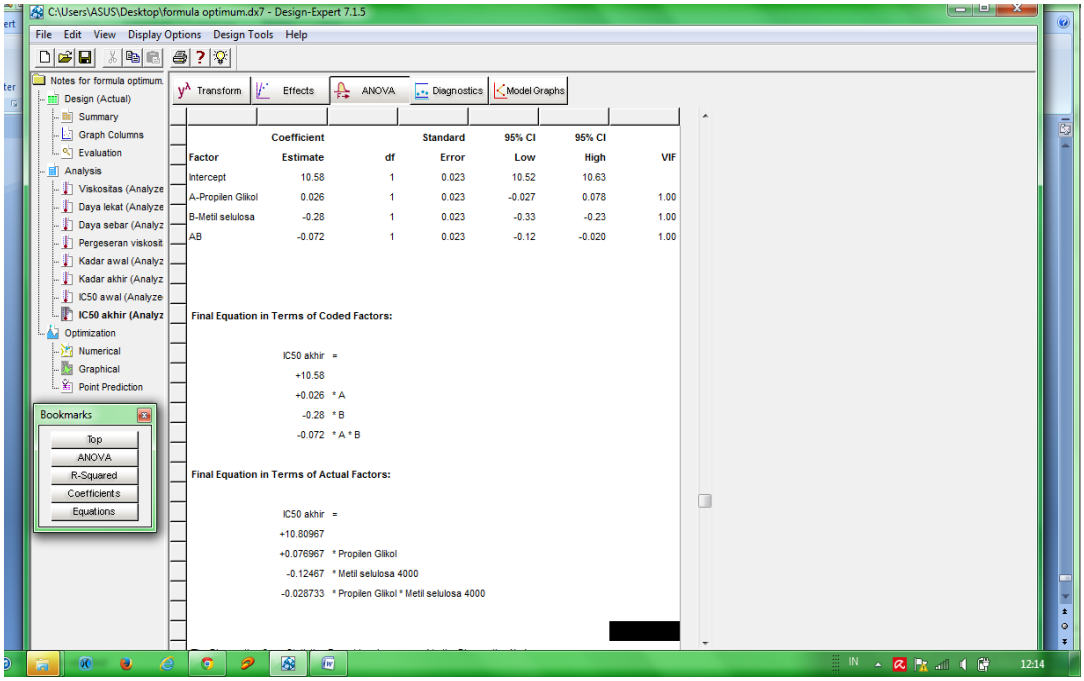






H. Hasil Analisa dengan *Software Design Expert* respon IC_{50} hari ke-28


File Edit View Display Options Design Tools Help
Notes for formula optimum
Design (Actual)
Summary
Graph Columns
Evaluation
Analysis
Viskositas (Analyze
Daya lekat (Analyze
Daya sebar (Analyz
Pergeseran viskosit
Kadar awal (Analyz
Kadar akhir (Analyz
IC50 awal (Analyze
IC50 akhir (Analyz
Optimization
Numerical
Graphical
Point Prediction
Bookmarks
Top
ANOVA
R-Squared
Coefficients
Equations
Transform
Effects
ANOVA
Diagnostics
Model Graphs
Use your mouse to right click on individual cells for definitions.
Response 8 IC50 akhir
ANOVA for selected factorial model
Analysis of variance table [Partial sum of squares - Type III]
Source | Sum of Squares | df | Mean Square | F Value | p-value Prob > F
Model 1.00 3 0.33 54.00 < 0.0001 significant
A-Propilen Gli 7.905E-003 1 7.905E-003 1.29 0.2897
B-Metil selulos 0.93 1 0.93 150.64 < 0.0001
AB 0.062 1 0.062 10.07 0.0131
Pure Error 0.049 8 6.149E-003
Cor Total 1.05 11
The Model F-value of 54.00 implies the model is significant. There is only
a 0.01% chance that a "Model F-Value" this large could occur due to noise.
Values of "Prob > F" less than 0.0500 indicate model terms are significant.
In this case B, AB are significant model terms.
Values greater than 0.1000 indicate the model terms are not significant.
If there are many insignificant model terms (not counting those required to support hierarchy),
model reduction may improve your model.
Std. Dev. 0.078 R-Squared 0.9529
Mean 10.58 Adj R-Squared 0.9353
C.V. % 0.74 Pred R-Squared 0.8941
PRESS 0.11 Adeq Precision 15.447
12:13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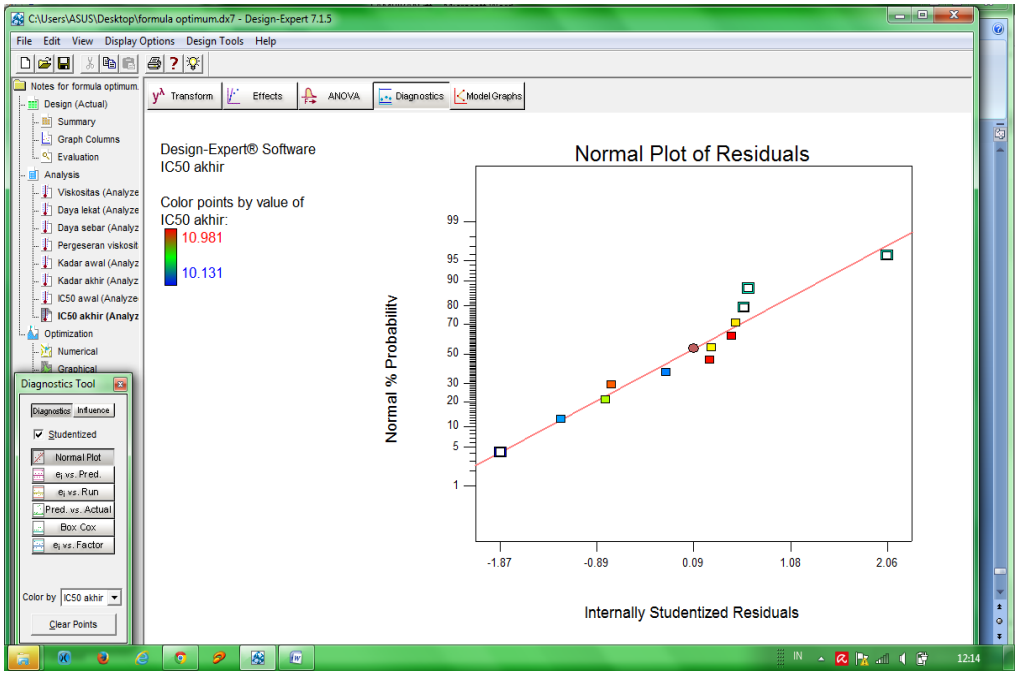
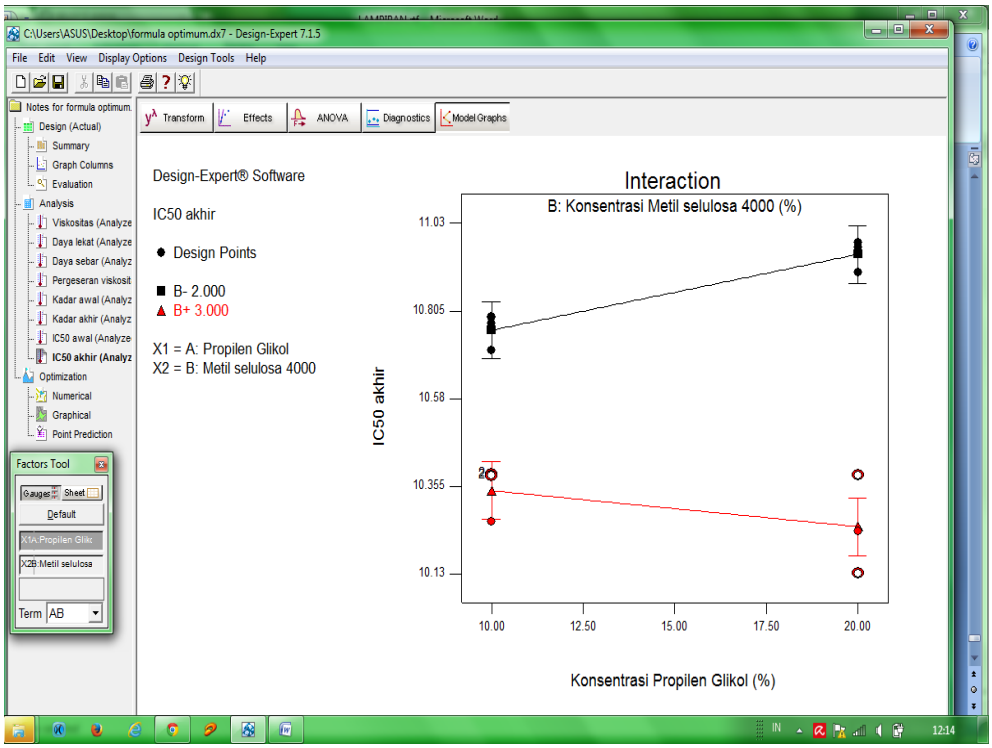
File Edit View Display Options Design Tools Help
Notes for formula optimum
Design (Actual)
Summary
Graph Columns
Evaluation
Analysis
Viskositas (Analyze
Daya lekat (Analyze
Daya sebar (Analyz
Pergeseran viskosit
Kadar awal (Analyz
Kadar akhir (Analyz
IC50 awal (Analyze
IC50 akhir (Analyz
Optimization
Numerical
Graphical
Point Prediction
Bookmarks
Top
ANOVA
R-Squared
Coefficients
Equations
Transform
Effects
ANOVA
Diagnostics
Model Graphs
Factor | Coefficient Estimate | df | Standard Error | 95% CI Low | 95% CI High | VIF
Intercept 10.58 1 0.023 10.52 10.63
A-Propilen Glikol 0.026 1 0.023 -0.027 0.078 1.00
B-Metil selulosa -0.28 1 0.023 -0.33 -0.23 1.00
AB -0.072 1 0.023 -0.12 -0.020 1.00
Final Equation in Terms of Coded Factors:
IC50 akhir =
+10.58
+0.026 * A
-0.28 * B
-0.072 * A * B
Final Equation in Terms of Actual Factors:
IC50 akhir =
+10.80967
+0.076967 * Propilen Glikol
-0.12467 * Metil selulosa 4000
-0.028733 * Propilen Glikol * Metil selulosa 4000
12:14


C:\Users\ASUS\Desktop\formula optimum.dx7 - Design-Expert 7.1.5
File Edit View Display Options Design Tools Help
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
IC50 akhir
Color points by value of
IC50 akhir:
10.981
10.131
Normal Plot of Residuals
Normal % Probability
99
95
90
80
70
50
30
20
10
5
1
-1.87
-0.89
0.09
1.08
2.06
Internally Studentized Residuals
Diagnostics Tool
Studentized
Normal Plot
Box Cox
Color by IC50 akhir
Clear Points


C:\Users\ASUS\Desktop\formula optimum.dx7 - Design-Expert 7.1.5
File Edit View Display Options Design Tools Help
Transform Effects ANOVA Diagnostics Model Graphs
Design-Expert® Software
IC50 akhir
Design Points
B- 2.000
B+ 3.000
X1 = A: Propilen Glikol
X2 = B: Metil selulosa 4000
Interaction
B: Konsentrasi Metil selulosa 4000 (%)
IC50 akhir
11.03
10.805
10.58
10.355
10.13
10.00
12.50
15.00
17.50
20.00
Konsentrasi Propilen Glikol (%)
Factors Tool
Default
Term AB