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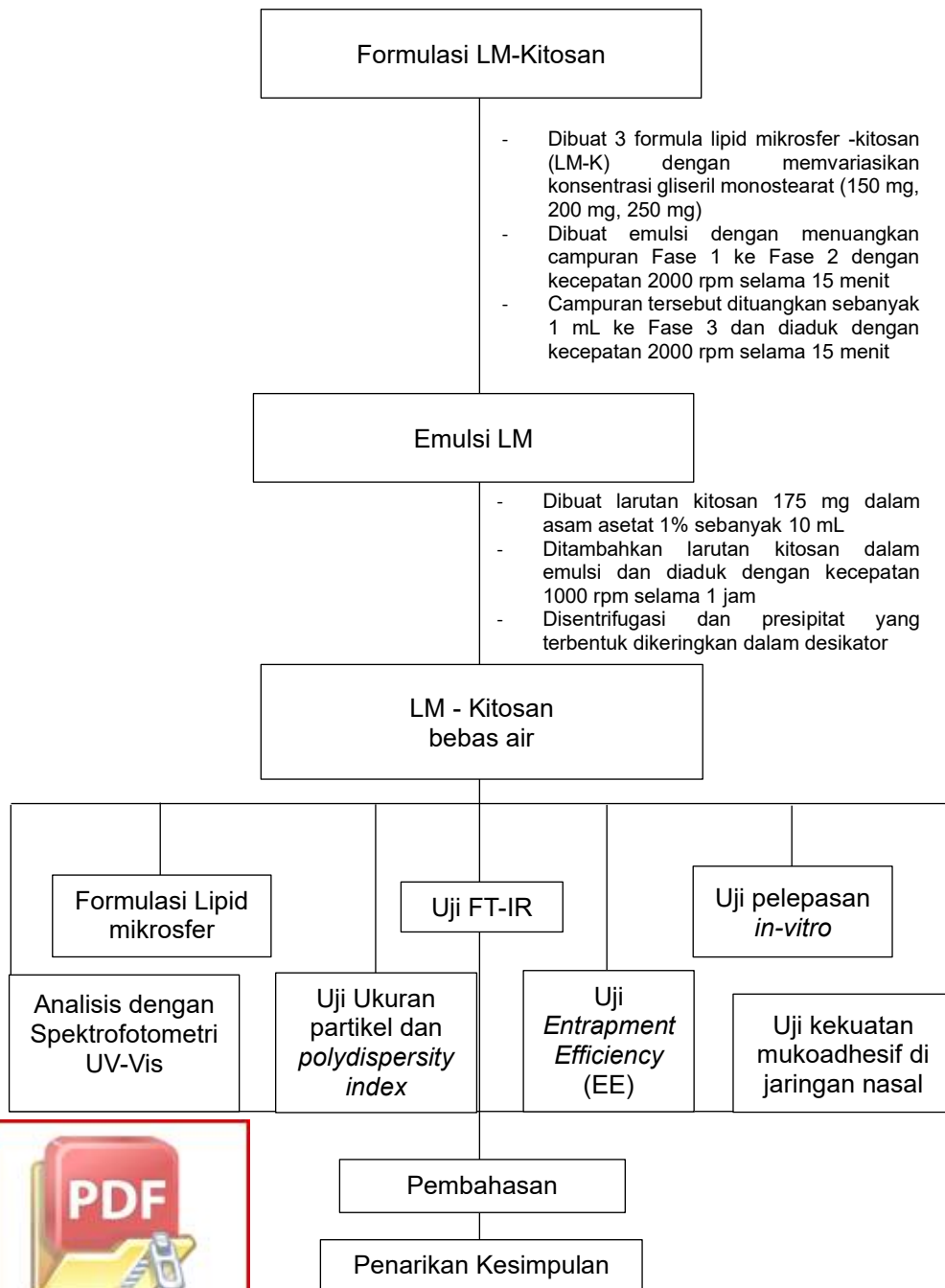


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LAMPIRAN

Lampiran 1. Skema Kerja Penelitian



Lampiran 2. Perhitungan

a. Uji Entrapment Efficiency (EE)

$$\% EE = \frac{\text{Jumlah obat pada formulasi} - \text{Jumlah obat pada fase cair}}{\text{Jumlah obat pada formulasi}} \times 100\%$$

- **LM-K1**

$$\text{Replikasi 1: \% EE} = \frac{100 \text{ mg} - 21,427 \text{ mg}}{100 \text{ mg}} \times 100\% = 78,573\%$$

$$\text{Replikasi 2: \% EE} = \frac{100 \text{ mg} - 16,317 \text{ mg}}{100 \text{ mg}} \times 100\% = 83,683\%$$

$$\text{Replikasi 3: \% EE} = \frac{100 \text{ mg} - 18,687 \text{ mg}}{100 \text{ mg}} \times 100\% = 81,303\%$$

$$\text{Rata-rata EE} = \frac{78,573\% + 83,683\% + 81,303\%}{3} = 81,1863\%$$

- **LM-K2**

$$\text{Replikasi 1: \% EE} = \frac{100 \text{ mg} - 14,637 \text{ mg}}{100 \text{ mg}} \times 100\% = 85,363\%$$

$$\text{Replikasi 2: \% EE} = \frac{100 \text{ mg} - 13,493 \text{ mg}}{100 \text{ mg}} \times 100\% = 86,506\%$$

$$\text{Replikasi 3: \% EE} = \frac{100 \text{ mg} - 10,133 \text{ mg}}{100 \text{ mg}} \times 100\% = 89,866\%$$

$$\text{Rata-rata EE} = \frac{85,363\% + 86,506\% + 89,866\%}{3} = 87,245\%$$

- **LM-K3**

$$\text{Replikasi 1: \% EE} = \frac{100 \text{ mg} - 14,077 \text{ mg}}{100 \text{ mg}} \times 100\% = 85,923\%$$

$$\text{Replikasi 2: \% EE} = \frac{100 \text{ mg} - 9,200 \text{ mg}}{100 \text{ mg}} \times 100\% = 90,799\%$$

$$\text{Replikasi 3: \% EE} = \frac{100 \text{ mg} - 6,843 \text{ mg}}{100 \text{ mg}} \times 100\% = 93,156\%$$

$$\text{Rata-rata EE} = \frac{85,923\% + 90,799\% + 93,156\%}{3} = 89,959\%$$

b. Uji Polydispersity index (PDI)

$$PDI = \left(\frac{\text{SD ukuran partikel}}{\text{Rata-rata ukuran partikel}} \right)^2$$

- **LM-K1**

$$PDI = \left(\frac{\text{SD ukuran partikel}}{\text{Rata-rata ukuran partikel}} \right)^2$$

$$= \left(\frac{2,304}{16,307} \right)^2$$

$$= 0,01995$$

- **LM-K2**

$$PDI = \left(\frac{\text{SD ukuran partikel}}{\text{Rata-rata ukuran partikel}} \right)^2$$

$$= \left(\frac{758}{557} \right)^2$$

$$= 0,557$$



$$\begin{aligned} \text{PDI} &= \left(\frac{\text{SD ukuran partikel}}{\text{Rata-rata ukuran partikel}} \right)^2 \\ &= \left(\frac{2,997}{33,195} \right)^2 \\ &= 0,00815 \end{aligned}$$

c. Uji pelepasan *in vitro*

Persamaan: $y = 0,0009x + 0,0362$

Keterangan:

Y = serapan

X = konsentrasi

LM-RT-K replikasi 1 jam ke-8 diperoleh serapan = 0,125, Sehingga, untuk mendapatkan konsentrasi:

$$0,125 = 0,0009x + 0,0362$$

$$x = \frac{0,125 + 0,0362}{0,0009} = 98,67 \mu\text{g/mL}$$

$$\begin{aligned} \text{Konsentrasi dalam 1 mL} &= 98,67 \mu\text{g/mL} \times 1 \text{ mL} \\ &= 98,67 \mu\text{g} \end{aligned}$$

$$\begin{aligned} \text{Konsentrasi dalam 100 mL (mg)} &= \frac{98,67 \mu\text{g/mL} \times 100 \text{ mL}}{1000} \\ &= 9,866 \text{ mg} \end{aligned}$$

$$\begin{aligned} \text{Faktor koreksi} &= \text{konsentrasi jam sebelumnya} + \text{faktor koreksi jam sebelumnya} \\ &= (0,0742 + 0,354) \text{ mg} \\ &= 0,3548889 \end{aligned}$$

$$\begin{aligned} \text{Jumlah pelepasan} &= \text{konsentrasi dalam 28 mL} + \text{faktor koreksi} \\ &= 17,02 \mu\text{g} + 0,0033187 \mu\text{g} \\ &= 17,0233187 \mu\text{g} \end{aligned}$$

d. Uji kekuatan mukoadesif

$$\text{Force of adhesion (N)} = \frac{\text{Berat beban yang diberikan (g)}}{1000} \times 9,8$$

$$\text{Bond strength (N m}^{-2}\text{)} = \frac{\text{Force of adhesion (N)}}{\text{Luas area (m}^2\text{)}}$$

Pada formula **LM1** dengan **Kitosan**, didapatkan data sebagai berikut:

$$\text{Luas permukaan} = 0,00572 \text{ m}^2$$

Berat beban yang diberikan

$$\text{Replikasi 1} = 13 \text{ g/1000} = 0,013 \text{ kg}$$

$$= 11 \text{ g/1000} = 0,011 \text{ kg}$$

$$= 15 \text{ g/1000} = 0,015 \text{ kg}$$

$$= 9,8 \text{ m/s}^2$$



Force of adhesion (N)

Replikasi 1 $= 0,013 \text{ kg} \times 9,8 \text{ m/s}^2 = 0,1274 \text{ N}$

Replikasi 2 $= 0,013 \text{ kg} \times 9,8 \text{ m/s}^2 = 0,1078 \text{ N}$

Replikasi 3 $= 0,013 \text{ kg} \times 9,8 \text{ m/s}^2 = 0,147 \text{ N}$

Bond strength (N m⁻²)

Replikasi 1 $= 0,1274 \text{ N} / 0,00572 \text{ m}^2 = 22,242 \text{ N m}^{-2}$

Replikasi 2 $= 0,1078 \text{ N} / 0,00572 \text{ m}^2 = 18,820 \text{ N m}^{-2}$

Replikasi 3 $= 0,147 \text{ N} / 0,00572 \text{ m}^2 = 25,664 \text{ N m}^{-2}$



Lampiran 3. Tabel Hasil Evaluasi

Lampiran 3.1 Tabel Ukuran Partikel

Tabel 2. Hasil pengukuran ukuran partikel dan PDI (n=100)

	Ukuran partikel (μm)		
	LM-K1	LM-K2	LM-K3
Rata-Rata	16,307	23,557	33,195
SD	2,304	1,758	2,997
RSD	14,127	7,464	9,029
PDI	0,01995	0,00557	0,00815

Ket : LM-K = lipid mikrosfer kitosan

PDI = *polydispersity index*

SD = Standar Deviasi

RSD = Standar Deviasi Relatif

Lampiran 3.2 Tabel *Efficiency Entrapment*Tabel 3. Hasil Uji *Efficiency Entrapment*

Replikasi	EE (%)		
	LM-K1	LM-K2	LM-K3
1	78,573	85,363	85,923
2	83,683	86,50633	90,79967
3	81,303	89,86633	93,15633
Rata-Rata	81,18633333	87,24522222	89,95966667
SD	2,556996937	2,340826856	3,689102571
RSD	3,149541101	2,683043033	4,100840641

Ket : LM-K = lipid mikrosfer kitosan

SD = Standar Deviasi

RSD = Standar Deviasi Relatif

Lampiran 3.3 Tabel Uji Kekuatan Mukoadesif

Tabel 4. Hasil Uji Kekuatan Mukoadesif LM

Replikasi	Kekuatan Mukoadesif (N m^{-2})		
	LM1	LM2	LM3
1	8,554682629	22,24217483	34,21873052
2	13,68749221	17,10936526	35,92966704
3	10,26561915	27,37498441	41,06247662
Rata-Rata	10,83593133	22,24217483	38,40362473
SD	2,613498713	5,132809577	3,561598393
RSD	24,11881945	23,07692308	9,607689228

d mikrosfer

andar Deviasi

andar Deviasi Relatif



Tabel 5. Hasil Uji Kekuatan Mukoadesif LM-Kitosan

Replikasi	Kekuatan Mukoadesif (N m ⁻²)		
	LM-K1	LM-K2	LM-K3
1	22,24217483	53,0390323	85,54682629
2	18,82030178	51,32809577	82,12495324
3	25,66404789	59,8827784	70,14839756
Rata-Rata	81,18633333	54,74996882	79,27339236
SD	3,421873052	4,526712556	8,085570569
RSD	15,38461538	8,267972847	10,19960207

Ket : LM-K = lipid mikrosfer kitosan

SD = Standar Deviasi

RSD = Standar Deviasi Relatif



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Lampiran 3.4. Tabel Uji Pelepasan *In-Vitro*Tabel 6. Uji pelepasan *in vitro* rivastigmin (mg)

Replikasi	Jumlah zat yang terlepas pada jam ke- (mg)								
	0,5	1	2	3	4	5	6	7	8
1	26,755	45,689	63,810	67,108	78,654	77,976	79,617	83,822	97,729
2	27,088	46,693	63,379	68,561	66,566	77,99	80,85	84,406	98,763
3	28,088	46,592	63,721	67,573	67,680	77,336	82,1942	85,092	98,790
Rata-Rata	27,311	46,325	63,637	67,748	70,967	77,768	80,889	84,441	98,428
SD	0,694	0,552	0,228	0,742	6,681	0,373	1,289	0,636	0,605

Ket : SD = Standar Deviasi

Tabel 7. Uji pelepasan *in vitro* LM-K1 (mg)

Replikasi	Jumlah zat yang terlepas pada jam ke- (mg)								
	0,5	1	2	3	4	5	6	7	8
1	1,756	2,662	3,466	4,834	4,992	5,041	5,979	7,703	10,222
2	1,533	2,882	3,244	4,276	4,985	5,256	5,973	8,253	10,555
3	1,422	2,992	3,577	4,168	5,098	4,814	5,972	8,585	10,668
Rata-Rata	1,570	2,845	3,429	4,426	5,025	5,037	5,975	8,180	10,482
SD	0,170	0,168	0,170	0,357	0,063	0,221	0,004	0,446	0,232

Ket : LM-K = lipid mikrosfer kitosan

SD = Standar Deviasi



Tabel 8. Uji pelepasan *in vitro* LM-K2 (mg)

Replikasi	Jumlah zat yang terlepas pada jam ke- (mg)								
	0,5	1	2	3	4	5	6	7	8
1	0,756	0,763	0,882	2,7793	3,3624	4,2844	4,4376	4,8140	8,5271
2	0,533	0,872	1,436	3,2282	3,3713	4,4044	4,5587	5,0473	6,9849
3	1,089	1,100	1,777	3,2393	3,3824	4,7489	4,4620	5,3940	6,2238
Rata-Rata	0,793	0,912	1,365	3,082	3,372	4,479	4,486	5,085	7,245

Ket : LM-K = lipid mikrosfer kitosan

SD = Standar Deviasi

Tabel 9. Uji pelepasan *in vitro* LM-K3 (mg)

Replikasi	Jumlah zat yang terlepas pada jam ke- (mg)								
	0,5	1	2	3	4	5	6	7	8
1	0,200	0,313	0,538	1,655	1,560	2,687	2,824	4,407	6,339
2	0,200	0,202	0,982	1,992	2,122	3,032	2,951	4,757	6,804
3	0,422	0,538	1,210	2,110	2,354	3,154	3,296	5,106	6,823
Rata-Rata	0,274	0,351	0,910	1,919	2,012	2,958	3,024	4,757	6,655
SD	0,128	0,171	0,341	0,236	0,408	0,243	0,244	0,349	0,274

Ket : LM-K = lipid mikrosfer kitosan

SD = Standar Deviasi



Lampiran 4. Data Hasil Analisis Statistika

Lampiran 4.1 Uji Ukuran Partikel

Tabel 10. Data Analisis Statistik Uji Ukuran Partikel

Tests of Normality

	Formula	Statistic	Kolmogorov-Smirnov ^a		Shapiro-Wilk		
			df	Sig.	Statistic	df	Sig.
Ukuranpartikel	LM1	.039	100	.200*	.994	100	.225
	LM2	.044	100	.200*	.993	100	.192
	LM3	.051	100	.053	.968	100	.000

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

a. Lilliefors Significance Correction

ANOVA

Ukuranpartikel

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14354.712	2	7177.356	1226.391	.000
	1738.169	297	5.852		
	16092.881	299			



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Post Hoc Tests

Multiple Comparisons

Dependent Variable: Ukuranpartikel

Tukey HSD

(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
LM-K1	LM-K2	-7.249950*	.342123	.000	-8.05583	-6.44407
	LM-K3	-16.887680*	.342123	.000	-17.69356	-16.08180
LM-K2	LM-K1	7.249950*	.342123	.000	6.44407	8.05583
	LM-K3	-9.637730*	.342123	.000	-10.44361	-8.83185
LM-K3	LM-K1	16.887680*	.342123	.000	16.08180	17.69356
	LM-K2	9.637730*	.342123	.000	8.83185	10.44361

is significant at the 0.05 level.



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Lampiran 4.2 Uji Entrapment Efficiency

Tabel 11. Data Analisis Statistik Uji Entrapment Efficiency

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
EfisiensiPenjerapan	.134	9	.200*	.981	9	.967

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

a. Lilliefors Significance Correction

ANOVA

EfisiensiPenjerapan

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	121.050	2	60.525	7.085	.026
Within Groups	51.254	6	8.542		
Total	172.304	8			



Optimization Software:
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Post Hoc Tests

Multiple Comparisons

Dependent Variable: EfisiensiPenjerapan

	(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	LM-K1	LM-K2	-6.058889	2.386405	.097	-13.38104	1.26326
		LM-K3	-8.773333*	2.386405	.024	-16.09548	-1.45119
	LM-K2	LM-K1	6.058889	2.386405	.097	-1.26326	13.38104
		LM-K3	-2.714444	2.386405	.528	-10.03659	4.60770
	LM-K3	LM-K1	8.773333*	2.386405	.024	1.45119	16.09548
		LM-K2	2.714444	2.386405	.528	-4.60770	10.03659

*. The mean difference is significant at the 0.05 level.



Lampiran 4.3 Uji Kekuatan Mukoadesif

Tabel 12. Data Analisis Statistik Uji Kekuatan Mukoadesif LM

		Tests of Normality					
		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Formula	Statistic	df	Sig.	Statistic	df	Sig.
Mucoadhesive	LM1	.253	3	.	.964	3	.637
	LM2	.175	3	.	1.000	3	1.000
	LM3	.292	3	.	.923	3	.463

a. Lilliefors Significance Correction

ANOVA

Mucoadhesive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1038.217	2	519.109	33.957	.001
Within Groups	91.722	6	15.287		
Total	1129.939	8			



Multiple Comparisons

Dependent Variable: Kekuatanmukoadesif-tanpakitosa

Tukey HSD

(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
LM1	LM2	-11.406244*	3.192390	.027	-21.20137	-1.61111
	LM3	-26.234360*	3.192390	.000	-36.02949	-16.43923
LM2	LM1	11.406244*	3.192390	.027	1.61111	21.20137
	LM3	-14.828117*	3.192390	.008	-24.62325	-5.03299
LM3	LM1	26.234360*	3.192390	.000	16.43923	36.02949
	LM2	14.828117*	3.192390	.008	5.03299	24.62325

ce is significant at the 0.05 level.



Optimization Software:
www.balesio.com

Tabel 13. Data Analisis Statistik Uji Kekuatan Mukoadesif LM-Kitosan

		Tests of Normality					
		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Formula	Statistic	df	Sig.	Statistic	df	Sig.
Mucoadhesive	LM-K1	.175	3	.	1.000	3	1.000
	LM-K2	.314	3	.	.893	3	.363
	LM-K3	.304	3	.	.907	3	.407

a. Lilliefors Significance Correction

ANOVA

Mucoadhesive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4910.715	2	2455.357	75.490	.000
Within Groups	195.154	6	32.526		
Total	5105.868	8			



Post Hoc Tests

Multiple Comparisons

Dependent Variable: KekuatanMukoadesif-kitosan

Tukey HSD

(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
LM-K1	LM-K2	-32.507794*	4.656579	.001	-46.79546	-18.22013
	LM-K3	-57.031218*	4.656579	.000	-71.31888	-42.74355
LM-K2	LM-K1	32.507794*	4.656579	.001	18.22013	46.79546
	LM-K3	-24.523424*	4.656579	.005	-38.81109	-10.23576
LM-K3	LM-K1	57.031218*	4.656579	.000	42.74355	71.31888
	LM-K2	24.523424*	4.656579	.005	10.23576	38.81109

*. The mean difference is significant at the 0.05 level.



Lampiran 5. Dokumentasi Penelitian



Gambar 16. Proses Analisis Rivastigmin Tartrat



Gambar 17. Proses pengujian EE



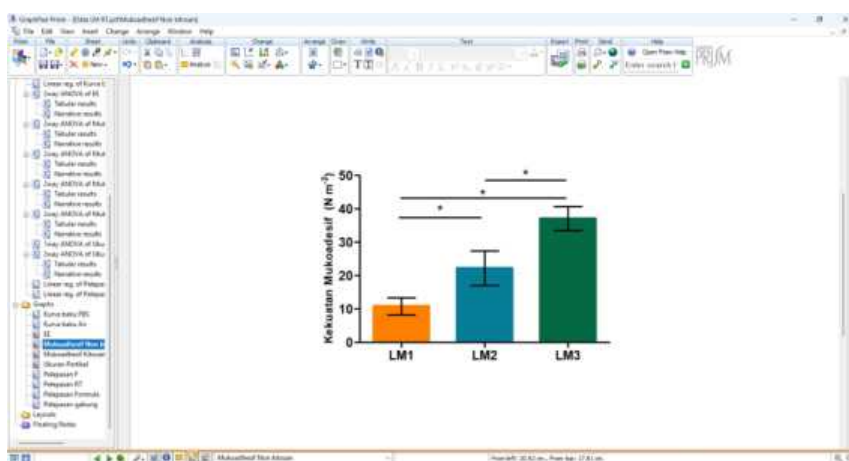
Gambar 18. Proses pengujian mukoadesif



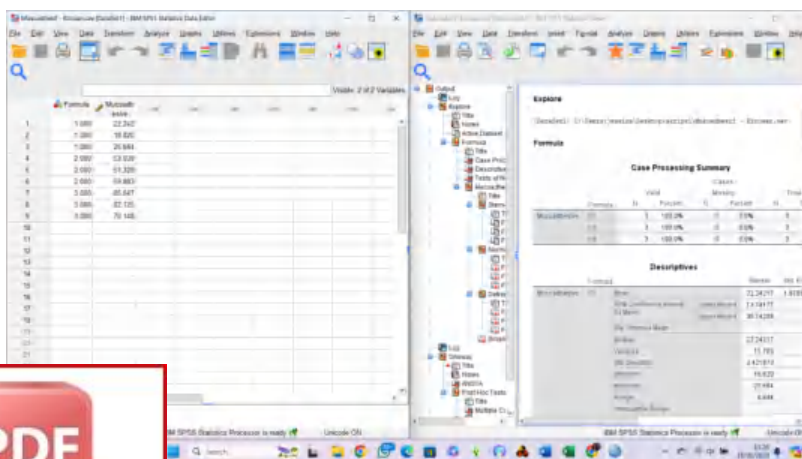
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Gambar 19. Proses pengujian pelepasan *in vitro*



Gambar 20. Proses pembuatan grafik menggunakan *GraphPad Prism*®



Optimization Software:
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Proses pengolahan data menggunakan *IBS SPSS Statistic*®