DAFTAR PUSTAKA

Akakuru, O. U., and Isiuku, B. O. 2017. Chitosan Hydrogels and their Glutaraldehyde-Crosslinked Counterparts as Potential Drug Release and Tissue Engineering Systems - Synthesis, Characterization, Swelling Kinetics and Mechanism. *Journal of Physical Chemistry & Biophysics*, 7(3): 1-7.

ldawsari, M. F., Anwer, M. K., Ahmed, M. M., Fatima, F., Soliman, G. A., Bhatia, S., Zafar, A., & Aboudzadeh, M. A. 2021. Enhanced dissolution of sildenafil citrate using solid dispersion with hydrophilic polymers: Physicochemical characterization and in vivo sexual behavior studies in male rats. *Polymers*, *13*(20): 1–15.

Alkilani, A. Z., Mccrudden, M. T. C., & Donnelly, R. F. 2015. Transdermal Drug Delivery: Innovative Pharmaceutical Developments Based on Disruption of the Barrier Properties of the stratum corneum. *Pharmaceutics*. 7: 438–

Andreas, H., & Casini, L. 2019. Hypothetical Interventions and Belief Changes. *Foundations of Science*. 24(4): 681–704.

Anjani, Q. K., Permana, A. D., Cárcamo-Martínez, Á., Domínguez-Robles, J., Tekko, I. A., Larrañeta, E., Vora, L. K., Ramadon, D., & Donnelly, R. F. 2021. Versatility of hydrogel-forming microneedles in in vitro transdermal delivery of tuberculosis drugs. *European Journal of Pharmaceutics and Biopharmaceutics*. 158*:* 294–312.

Baishya, H. 2017. Application of Mathematical Models in Drug Release Kinetics of Carbidopa and Levodopa ER Tablets. *Journal of Developing Drugs*. 6(2): 1–8.

Birowo, P., Deswanto, I. A., & Rasyid, N. 2019. Epidemiology of erectile dysfunction: A cross-sectional web-based survey conducted in an Indonesian national referral hospital [version 1; peer review: 1 approved with reservations]. *F1000Research*. 8:1–12.

Burnett, A. L., Nehra, A., Breau, R. H., Culkin, D. J., Faraday, M. M., Hakim, L. S., Heidelbaugh, J., Khera, M., McVary, K. T., Miner, M. M., Nelson, C. J., Sadeghi-Nejad, H., Seftel, A. D., & Shindel, A. W. 2018). Erectile Dysfunction: AUA Guideline. *Journal of Urology*. 200(3): 633–641.

Chandran, R., Mohd Tohit, E. R., Stanslas, J., Salim, N., & Tuan Mahmood, T. M. 2022. Investigation and Optimization of Hydrogel Microneedles for Transdermal Delivery of Caffeine. *Tissue Engineering Part C: Methods*,

28(10): 545–556.

Cheung, K., & Das, D. B. 2016. Microneedles for drug delivery: trends and progress. *Drug Delivery*. 23(7): 2338–2354.

Deshmukh, A. S., Tiwari, K. J., & Mahajan, V. R. 2018. Solubility Enhancement Techniques for Poorly Water-Soluble Drugs. *International Journal of Pharmaceutical Sciences and Nanotechnology*. 10(3): 3701-3708.

Donnelly, R. F., McCrudden, M. T. C., Alkilani, A. Z., Larrañeta, E., McAlister, E., Courtenay, A. J., Kearney, M. C., Raj Singh, T. R., McCarthy, H. O., Kett, V. L., Caffarel-Salvador, E., Al-Zahrani, S., & Woolfson, A. D. 2014. Hydrogel-forming microneedles prepared from “super swelling” polymers combined with lyophilised wafers for transdermal drug delivery. *PLoS ONE*. 9(10): 1-12

Donnelly, R. F., Singh, T. R. R., Garland, M. J., Migalska, K., Majithiya, R., McCrudden, C. M., Kole, P. L., Mahmood, T. M. T., McCarthy, H. O., & Woolfson, A. D. 2012. Hydrogel-forming microneedle arrays for enhanced transdermal drug delivery. *Advanced Functional Materials*. *22*(23): 4879–4890.

El-Wakeel, L. M., Fouad, F. A., Saleem, M. D., & Saber-Khalaf, M. 2020. Efficacy and tolerability of sildenafil/l-arginine combination relative to sildenafil alone in patients with organic erectile dysfunction. *Andrology*. 8(1): 143–147.

Gan, K., Lu, Y., Wu, J. M., Zhang, X., Wang, Y., Ren, B., Huo, W., Chen, Y., & Yang, J. 2020. In situ coagulation of yttria-stabilized zirconia ceramic with enhancement of green body via polyvinyl pyrrolidone crosslink. *Journal of Applied Polymer Science*. 137(29): 1-8.

Goldstein, I., Tseng, L., Creanga, D., Stecher, V., & Kaminetsky, J. C. 2016. 095 Efficacy and Safety of Sildenafil by Age in Men With Erectile Dysfunction. *The Journal of Sexual Medicine*. 13(5): S45–S46.

Graziano, S., Montana, A., Zaami, S., Rotolo, M. C., & Minutillo, A. 2017. Sildenafil-associated hepatoxicity : a review of the literature. *Eueopan Review for Medical and Pharmacological* Sciences. 21(1 Suppl): 17–22.

Haider, M., Elsherbeny, A., Pittalà, V., Fallica, A. N., Alghamdi, M. A., & Greish, K. 2021. The potential role of sildenafil in cancer management through epr augmentation. *Journal of Personalized Medicine*. 11(6): 1–17.

Husain, M. S. B., Gupta, A., Alashwal, B. Y., & Sharma, S. 2018. Synthesis of PVA/PVP based hydrogel for biomedical applications: a review. *Energy*

Sources, Part A: Recovery, Utilization and Environmental Effects. 40(20):1-6.

Jannini, E. A., and Droupy, S. 2019. Needs and Expectations of Patients with Erectile Dysfunction: An Update on Pharmacological Innovations in Phosphodiesterase Type 5 Inhibition with Focus on Sildenafil. *Sexual Medicine*. 7(1): 1–10.

Jung, J. H., and Jin, S. G. 2021. Microneedle for transdermal drug delivery: current trends and fabrication. *Journal of Pharmaceutical Investigation*, 51(5): 503–517.

Jung, S. Y., Seo, Y. G., Kim, G. K., Woo, J. S., Yong, C. S., & Choi, H. G. 2011. Comparison of the solubility and pharmacokinetics of sildenafil salts. *Archives of Pharmacal Research*. 34(3): 451–454.

Kashyap, N., Kumar, N., & Kumar, M. N. V. R. 2005. Hydrogels for pharmaceutical and biomedical applications. *Critical Reviews in Therapeutic Drug Carrier Systems*. 22(2): 107–149.

Katzung, B. G., Masters, S. B., & Trevor, A. J. 2012. *Basic and Clinical Pharmacology*. 12th Edition. New York: McGraw-Hill.

Kessler, A., Sollie, S., Challacombe, B., Briggs, K., & Van Hemelrijck, M. 2019. The global prevalence of erectile dysfunction: a review. *BJU International*. 124(4): 587–599.

Khan, S., and Ranjha, N. M. 2014. Effect of degree of cross-linking on swelling and on drug release of low viscous chitosan/poly(vinyl alcohol) hydrogels. *Polymer Bulletin*. 71(8): 2133–2158.

Lakouraj, M. M., Tajbakhsh, M., & Mokhtary, M. 200. Synthesis and swelling characterization of cross-linked PVP/PVA hydrogels. *Iranian Polymer Journal (English Edition).* 14(12), 1022–1030.

Larrañeta, E., Moore, J., Vicente-Pérez, E. M., González-Vázquez, P., Lutton, R., Woolfson, A. D., & Donnelly, R. F. 2014. A proposed model membrane and test method for microneedle insertion studies. *International Journal of Pharmaceutics*. 472(1–2): 65–73.

McCabe, M. P., Sharlip, I. D., Atalla, E., Balon, R., Fisher, A. D., Laumann, E., Lee, S. W., Lewis, R., & Segraves, R. T. 2016. Definitions of Sexual Dysfunctions in Women and Men: A Consensus Statement From the Fourth International Consultation on Sexual Medicine 2015. *Journal of Sexual Medicine*. 13(2): 135–143.

Mobley, D. F., Khera, M., & Baum, N. 2017. Recent advances in the treatment of erectile dysfunction. *Postgraduate Medical Journal*. 93(1105): 679–685.

Ouranidis, A., Tsiaxerli, A., Vardaka, E., Markopoulou, C. K., Zacharis, C. K., Nicolaou, I., Hatzichristou, D., Haidich, A. B., Kostomitsopoulos, N., & Kachrimanis, K. 2021. Sildenafil 4.0-integrated synthetic chemistry, formulation and analytical strategies effecting immense therapeutic and societal impact in the fourth industrial era. *Pharmaceuticals*. 14(4): 1–43.

Permana, A. D., Paredes, A. J., Zanutto, F. V., Amir, M. N., Ismail, I., Bahar, M. A., Sumarheni, Palma, S. D., & Donnelly, R. F. 2021. Albendazole Nanocrystal-Based Dissolving Microneedles with Improved Pharmacokinetic Performance for Enhanced Treatment of Cystic Echinococcosis. *ACS Applied Materials and Interfaces*. 13(32): 38745–38760.

Permana, A. D., Tekko, I. A., McCrudden, M. T. C., Anjani, Q. K., Ramadon, D., McCarthy, H. O., & Donnelly, R. F. 2019. Solid lipid nanoparticle-based dissolving microneedles: A promising intradermal lymph targeting drug delivery system with potential for enhanced treatment of lymphatic filariasis. *Journal of Controlled Release*. 316: 34–52.

Rowe, R. C, Sheskey, P. J., & Quinn, M. E. 2009. *Handbook of Pharmaceutical Excipients*. 6th Edition. London: Pharmaceutical Press.

Roy, N., and Saha, N. 2012. PVP-based hydrogels: Synthesis, properties and applications. *Hydrogel: Synthesis, Characterization and Applications*: 227-252.

Silva-Abreu, M., Espinoza, L. C., Halbaut, L., Espina, M., García, M. L., & Calpena, A. C. (2018). Comparative study of Ex Vivo transmucosal permeation of pioglitazone nanoparticles for the treatment of Alzheimer's disease. *Polymers*. 10(3): 1-13.

Singh, T. R. R., Garland, M. J., Migalska, K., Salvador, E. C., Shaikh, R., McCarthy, H. O., McCarthy, Woolfson, A. D. & Donnelly, R. F. 2012. Influence of a pore-forming agent on swelling, network parameters, and permeability of poly (ethylene glycol)-crosslinked poly (methyl vinyl ether-co-maleic acid) hydrogels: Application in transdermal delivery systems. *Journal of applied polymer science*. 125(4): 2680-2694.

Singh, T. R. R., McCarron, P. A., Woolfson, A. D., & Donnelly, R. F. 2009. Investigation of swelling and network parameters of poly(ethylene glycol)-crosslinked poly(methyl vinyl ether-co-maleic acid) hydrogels. *European Polymer Journal*. 45(4): 1239–1249.

Tekko, I. A., Chen, G., Domínguez-Robles, J., Thakur, R. R. S., Hamdan, I. M. N., Vora, L., Larrañeta, E., McElnay, J. C., McCarthy, H. O., Rooney, M., & Donnelly, R. F. 2020. Development and characterisation of novel poly (vinyl alcohol)/poly (vinyl pyrrolidone)-based hydrogel-forming microneedle arrays for enhanced and sustained transdermal delivery of methotrexate. *International Journal of Pharmaceutics*. *586*, 119580: 1-50.

Turner, J. G., White, L. R., Estrela, P., & Leese, H. S. 2021. Hydrogel-Forming Microneedles: Current Advancements and Future Trends. *Macromolecular Bioscience*. 21(2): 1–18.

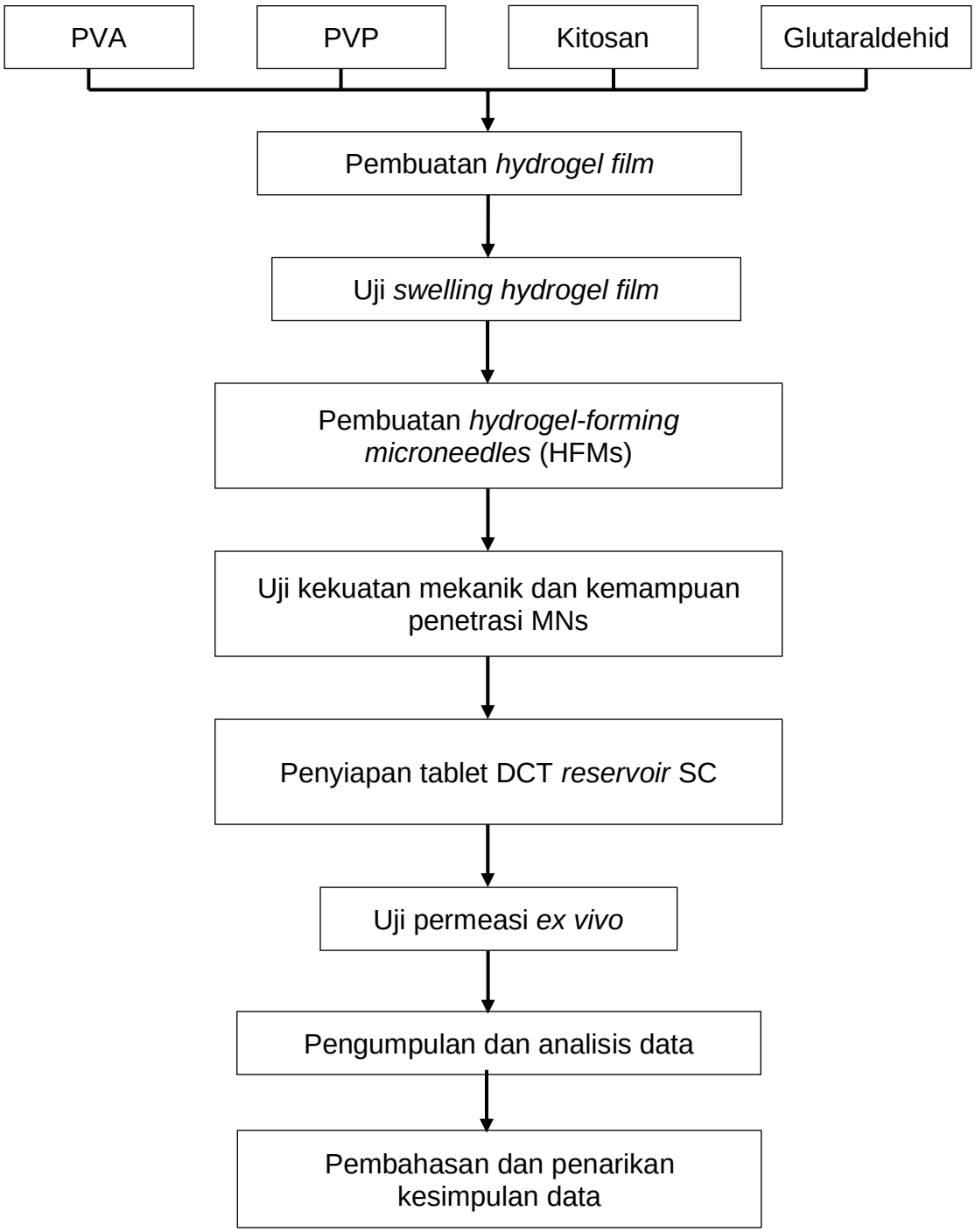
Volpe-Zanutto, F., Vora, L. K., Tekko, I. A., McKenna, P. E., Permana, A. D., Sabri, A. H., Anjani, Q. K., McCarthy, H. O., Paredes, A. J., & Donnelly, R. F. 2022. Hydrogel-forming microarray patches with cyclodextrin drug reservoirs for long-acting delivery of poorly soluble cabotegravir sodium for HIV Pre-Exposure Prophylaxis. *Journal of Controlled Release*. 348: 771–785.

Waghule, T., Singhvi, G., Kumar, S., & Monohar, M. 2019. Biomedicine & Pharmacotherapy Microneedles : A smart approach and increasing potential for transdermal drug delivery system. *Biomedicine & Pharmacotherapy*. 109: 1249–1258.

Zidan, H. M., Abdelrazek, E. M., Abdelghany, A. M., & Tarabiah, A. E. 2019. Characterization and some physical studies of PVA/PVP filled with MWCNTs. *Journal of Materials Research and Technology*. 8(1): 904–913.

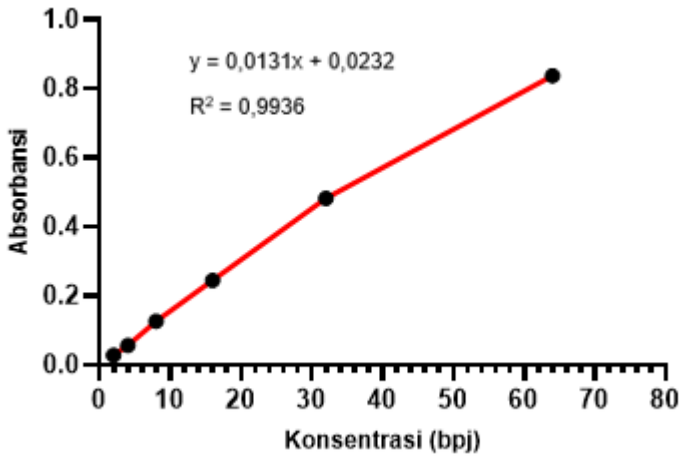
LAMPIRAN

Lampiran 1. Skema kerja



Lampiran 2. Hasil panjang gelombang maksimum dan kurva baku SC

Gambar 17. Panjang gelombang maksimum SC



Gambar 18. Kurva baku SC

Lampiran 3. Tabel data hasil pengujian

Lampiran 3.1 Uji *swelling*

Tabel 6. Data hasil uji *swelling hydrogel film* F1

Waktu (jam)	Bobot (g)	Swelling (%)	Rata-rata	SD
	0,11	0		
0	0,11	0	0	0
	0,11	0		
	0,32	193,72		
0,25	0,31	188,00	186,36	8,3
	0,30	177,37		
	0,46	327,42		
0,5	0,45	324,37	321,65	7,5
	0,45	313,17		
	0,62	472,30		
1	0,61	472,45	468,69	6,38
	0,61	461,32		
	0,82	658,63		
2	0,81	658,95	654,56	7,33
	0,80	646,10		
	0,98	800,83		
3	0,96	799,72	794,46	10,08
	0,95	782,84		
	1,02	844,60		
4	1,01	842,55	838,05	9,63
	1,00	826,99		
	1,13	946,54		
5	1,10	931,87	929,88	17,74
	1,09	911,22		
	1,11	927,15		
6	1,10	929,33	922,66	9,73
	1,09	911,5		
	1,11	920,78		
8	1,11	939,64	918,35	22,61
	1,07	894,62		
	1,10	913,39		
24	1,08	911,25	907,25	8,84
	1,07	897,12		

Tabel 7. Data hasil uji *swelling hydrogel film* F2

Waktu (jam)	Bobot (g)	Swelling (%)	Rata-rata	SD
	0,11	0		
0	0,11	0	0	0
	0,11	0		
	0,31	200,10		
0,25	0,31	195,64	194,45	6,33
	0,30	187,61		
	0,45	330,67		
0,5	0,44	324,78	323,9	7,26
	0,43	316,23		
	0,63	503,27		
1	0,62	500,68	498,72	5,78
	0,62	492,22		
	0,82	690,96		
2	0,81	684,41	682,79	9,09
	0,80	673,01		
	1,02	885,29		
3	1,01	880,93	877,12	10,
	1,00	865,13		
	1,06	920,58		
4	1,05	916,36	913,14	9,46
	1,04	902,50		
	1,20	1050,77		
5	1,19	1050,05	1044,59	10,09
	1,18	1032,95		
	1,21	1063,46		
6	1,20	1058,18	1054,51	11,25
	1,19	1041,88		
	1,30	1151,25		
8	1,29	1148,21	1143,05	11,67
	1,28	1129,68		
	1,28	1132,31		
24	1,29	1150,34	1139,97	9,31
	1,29	1137,27		

Tabel 8. Data hasil uji *swelling hydrogel film* F3

Waktu (jam)	Bobot (g)	Swelling (%)	Rata-rata	SD
	0,11	0		
0	0,11	0	0	0
	0,11	0		
	0,42	295,64		
0,25	0,41	286,01	285,23	10,83
	0,39	274,02		
	0,67	532,23		
0,5	0,65	514,65	518,64	12,10
	0,64	509,04		
	0,88	737,06		
1	0,87	725,43	729,74	6,37
	0,87	726,74		
	1,11	948,44		
2	1,10	939,70	942,73	4,94
	1,09	940,06		
	1,28	1117,91		
3	1,27	1101,70	1106,35	10,08
	1,26	1099,43		
	1,32	1154,79		
4	1,31	1141,68	1145,73	7,86
	1,30	1140,72		
	1,34	1171,28		
5	1,33	1154,06	1157,99	11,83
	1,31	1148,62		
	1,34	1172,04		
6	1,33	1157,94	1161,31	9,5
	1,32	1153,95		
	1,30	1131,56		
8	1,28	1113,23	1118,39	11,5
	1,27	1110,37		
	1,19	1023,70		
24	1,17	1008,22	1015,08	78,9
	1,17	1013,32		

Lampiran 3.2 Uji kekuatan mekanik

Tabel 9. Data hasil uji kekuatan mekanik

Formula	Sebelum perlakuan	Setelah perlakuan	Pengurangan ketinggian MNs (%)	Rata-rata	SD
	Tinggi MNs (µm)	Tinggi MNs (µm)			
	691,42	653,86	5,43		
F1	691,22	653,88	5,40	5,41	0,02
	691,23	653,86	5,41		
	722,73	697,58	3,48		
F2	722,36	697,46	3,45	3,46	0,02
	722,39	697,45	3,45		
	647,67	632,06	2,41		
F3	647,64	631,14	2,55	2,29	0,33
	647,64	635,18	1,92		

Lampiran 3.3 Uji kemampuan penetrasi

Tabel 10. Data hasil uji kemampuan penetrasi MNs F1

Lapisan parafilm® M	Jumlah lubang yang terbentuk			Jumlah lubang parafilm® M (%)			Rata-rata	SD
	Replikasi			Replikasi				
	1	2	3	1	2	3		
1	95	95	96	95	95	96	95	0,58
2	62	59	7	62	59	7	61	1,53
3	11	7	9	11	7	9	9	2
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0

Tabel 11. Data hasil uji kemampuan penetrasi HFMs F2

Lapisan parafilm® M	Jumlah lubang yang terbentuk			Jumlah lubang parafilm® M (%)			Rata-rata	SD
	Replikasi			Replikasi				
	1	2	3	1	2	3		
1	100	100	100	100	100	100	100	0
2	76	79	82	76	79	82	77	1,53
3	24	18	16	24	18	16	19	4,16
4	10	6	5	10	6	5	7	2,64
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0

Tabel 12. Data hasil uji kemampuan penetrasi MNs F3

Lapisan parafilm® M	Jumlah lubang yang terbentuk			Jumlah lubang parafilm® M (%)			Rata-rata	SD
	Replikasi			Replikasi				
	1	2	3	1	2	3		
1	100	100	100	100	100	100	100	0
2	82	80	83	82	80	83	82	1,53
3	36	29	33	36	29	33	33	3,51
4	12	10	8	12	10	8	10	2
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0

Lampiran 3.4 Uji permeasi *ex vivo*

Tabel 13. Data hasil uji permeasi *ex vivo* HFMs F1

Waktu (jam)	Absorbansi	Konsentrasi (µg/ml)	Faktor Pengenceran	13 ml (µg)	Faktor Koreksi	Permeasi SC (mg)	Permeasi SC (µg/cm^2)	Rata-rata	SD
	0,156	10,14	1,00	0,13	0,00	0,13	74,60		
0,25	0,133	8,38	1,00	0,11	0,00	0,11	61,68	66,36	7,16
	0,135	8,53	1,00	0,11	0,00	0,11	62,81		
	0,234	16,09	1,00	0,21	0,01	0,22	118,42		
0,5	0,255	17,69	1,00	0,23	0,01	0,24	130,22	126.28	6,81
	0,255	17,69	1,00	0,23	0,01	0,24	130,22		
	0,527	38,46	1,00	0,50	0,03	0,53	283,02		
1	0,58	42,50	1,00	0,55	0,03	0,58	312,79	304,93	19,22
	0,591	43,34	1,00	0,56	0,03	0,59	318,97		
	0,614	45,10	1,00	0,59	0,06	0,65	331,89		
2	0,617	45,33	1,00	0,59	0,07	0,66	333,58	328,15	7,99
	0,591	43,34	1,00	0,56	0,07	0,63	318,97		
	0,631	46,40	1,00	0,60	0,11	0,71	341,44		
3	0,622	45,71	1,00	0,59	0,11	0,71	336,39	340,13	3,29
	0,633	46,55	1,00	0,61	0,11	0,72	342,57		
	0,636	46,78	1,00	0,61	0,16	0,76	344,25		
4	0,669	49,2977	1,00	0,64	0,16	0,80	362,79	356,6115	10,70
	0,669	49,2977	1,00	0,64	0,16	0,80	362,79		

Lanjutan tabel

Waktu (jam)	Absorbansi	Konsentrasi (µg/ml)	Faktor Pengenceran	13 ml (µg)	Faktor Koreksi	Permeasi SC (mg)	Permeasi SC (µg/cm^2)	Rata-rata	SD
	0,648	47,69	1,00	0,62	0,20	0,82	350,99		
5	0,676	49,83	1,00	0,65	0,21	0,86	366,72	361,48	9,08
	0,676	49,83	1,00	0,65	0,21	0,86	366,72		
	0,679	50,06	1,00	0,65	0,25	0,90	368,41		
6	0,682	50,29	1,00	0,65	0,26	0,91	370,09	370,66	2,57
	0,688	50,75	1,00	0,66	0,26	0,92	373,46		
	0,688	50,75	1,00	0,66	0,30	0,96	373,46		
7	0,691	50,98	1,00	0,66	0,31	0,97	375,15	374,03	0,97
	0,688	50,75	1,00	0,66	0,31	0,97	373,46		
	0,721	53,27	1,00	0,69	0,35	1,04	392,00		
8	0,746	55,18	1,00	0,72	0,36	1,08	406,05	401,36	0,11
	0,746	55,18	1,00	0,72	0,36	1,08	406,05		
	0,291	20,44	4,00	1,06	0,40	1,47	601,77		
24	0,295	20,75	4,00	1,08	0,42	1,49	610,76	620,49	0,09
	0,312	22,05	4,00	1,15	0,42	1,56	648,96		

Tabel 14. Data hasil uji permeasi *ex vivo* HFMs F2

Waktu (jam)	Absorbansi	Konsentrasi (µg/ml)	Faktor Pengenceran	13 ml (µg)	Faktor Koreksi	Permeasi SC (mg)	Permeasi SC (µg/cm^2)	Rata-rata	SD
	0,225	15,40	1,00	0,20	0,00	0,20	113,37		
0,25	0,221	15,10	1,00	0,20	0,00	0,20	111,12	113,37	2,25
	0,229	15,71	1,00	0,20	0,00	0,20	115,61		
	0,527	38,46	1,00	0,50	0,02	0,52	283,02		
0,5	0,515	37,54	1,00	0,49	0,02	0,50	276,28	277,96	4,46
	0,512	37,31	1,00	0,49	0,02	0,50	274,59		
	0,665	48,99	1,00	0,64	0,05	0,69	360,54		
1	0,688	50,75	1,00	0,66	0,05	0,71	373,46	362,60	9,99
	0,653	48,08	1,00	0,62	0,05	0,68	353,80		
	0,711	52,50	1,00	0,68	0,10	0,79	386,39		
2	0,694	51,21	1,00	0,67	0,10	0,77	376,84	372,34	16,75
	0,653	48,08	1,00	0,62	0,10	0,73	353,80		
	0,723	53,42	1,00	0,69	0,16	0,85	393,13		
3	0,641	47,16	1,00	0,61	0,15	0,77	347,06	373,28	23,68
	0,699	51,59	1,00	0,67	0,15	0,82	379,64		
	0,364	26,02	4,00	1,35	0,21	1,56	765,80		
4	0,337	23,95	4,00	1,25	0,20	1,45	705,13	715,62	45,85
	0,324	22,96	4,00	1,19	0,20	1,39	675,92		

Lanjutan tabel

Waktu (jam)	Absorbansi	Konsentrasi (µg/ml)	Faktor Pengenceran	13 ml (µg)	Faktor Koreksi	Permeasi SC (mg)	Permeasi SC (µg/cm^2)	Rata-rata	SD
	0,349	24,87	4,00	1,29	0,23	1,53	732,10		
5	0,349	24,87	4,00	1,29	0,23	1,52	732,10	746,33	24,65
	0,368	26,32	4,00	1,37	0,22	1,59	774,79		
	0,366	26,17	4,00	1,36	0,26	1,62	770,30		
6	0,364	26,02	4,00	1,35	0,25	1,60	765,80	747,08	36,40
	0,337	23,95	4,00	1,25	0,25	1,50	705,13		
	0,363	25,94	4,00	1,35	0,29	1,63	763,56		
7	0,365	26,09	4,00	1,36	0,28	1,63	768,05	768,80	5,66
	0,368	26,32	4,00	1,37	0,27	1,64	774,79		
	0,375	26,85	4,00	1,40	0,31	1,71	790,52		
8	0,375	26,85	4,00	1,40	0,30	1,70	790,52	795,02	7,78
	0,381	27,31	4,00	1,42	0,30	1,72	804,00		
	0,415	29,91	4,00	1,56	0,34	1,89	880,41		
24	0,465	33,73	4,00	1,75	0,33	2,08	992,76	955,31	64,87
	0,465	33,73	4,00	1,75	0,33	2,08	992,76		

Tabel 15. Data hasil uji permeasi *ex vivo* HFMs F3

Waktu (jam)	Absorbansi	Konsentrasi (µg/ml)	Faktor Pengenceran	13 ml (µg)	Faktor Koreksi	Permeasi SC (mg)	Permeasi SC (µg/cm^2)	Rata-rata	SD
	0,243	16,78	1,00	0,22	0,00	0,22	123,48		
0,25	0,243	16,78	1,00	0,22	0,00	0,22	123,48	132,09	14,92
	0,289	20,29	1,00	0,26	0,00	0,26	149,32		
	0,544	39,76	1,00	0,52	0,02	0,53	292,57		
0,5	0,556	40,67	1,00	0,53	0,02	0,55	299,31	303,43	13,40
	0,59	43,27	1,00	0,56	0,02	0,58	318,41		
	0,556	40,67	1,00	0,53	0,06	0,59	299,31		
1	0,653	48,08	1,00	0,62	0,06	0,68	353,80	323,84	27,65
	0,59	43,27	1,00	0,56	0,06	0,63	318,41		
	0,601	44,11	1,00	0,57	0,10	0,67	324,59		
2	0,601	44,11	1,00	0,57	0,11	0,68	324,59	329,65	8,76
	0,628	46,17	1,00	0,60	0,11	0,71	339,76		
	0,649	47,77	1,00	0,62	0,14	0,76	351,56		
3	0,636	46,78	1,00	0,61	0,15	0,76	344,25	347,62	3,68
	0,641	47,16	1,00	0,61	0,15	0,77	347,06		
	0,653	48,08	1,00	0,62	0,19	0,81	353,80		
4	0,676	49,83	1,00	0,65	0,20	0,84	366,72	355,86	9,99
	0,641	47,16	1,00	0,61	0,20	0,81	347,06		

Lanjutan tabel

Waktu (jam)	Absorbansi	Konsentrasi (µg/ml)	Faktor Pengenceran	13 ml (µg)	Faktor Koreksi	Permeasi SC (mg)	Permeasi SC (µg/cm^2)	Rata-rata	SD
	0,699	51,59	1,00	0,67	0,24	0,91	379,64		
5	0,676	49,83	1,00	0,65	0,25	0,89	366,72	375,34	7,46
	0,699	51,59	1,00	0,67	0,25	0,92	379,64		
	0,686	50,60	1,00	0,66	0,29	0,95	372,34		
6	0,735	54,34	1,00	0,71	0,30	1,00	399,87	383,95	14,26
	0,699	51,59	1,00	0,67	0,30	0,97	379,64		
	0,699	51,59	1,00	0,67	0,34	1,01	379,64		
7	0,723	53,42	1,00	0,69	0,35	1,04	393,13	384,14	7,78
	0,699	51,59	1,00	0,67	0,35	1,02	379,64		
	0,256	17,77	4,00	0,92	0,39	1,32	523,12		
8	0,259	18,00	4,00	0,94	0,40	1,34	529,86	529,11	5,66
	0,261	18,15	4,00	0,94	0,40	1,35	534,36		
	0,365	26,09	4,00	1,36	0,41	1,77	768,05		
24	0,365	26,09	4,00	1,36	0,42	1,78	768,05	783,78	27,24
	0,386	27,69	4,00	1,44	0,42	1,86	815,24		

Lampiran 3.5 Fluks

Tabel 16. Data hasil fluks HFMs F1

Waktu (jam)	Permeasi SC kumulatif (µg/cm²)	Fluks (µg/cm².jam)	Rata-rata	SD
0,25	74,60	298,41	265,45	28,63
	61,68	246,73		
	62,81	251,22		
0,5	193,02	386,05	385,30	1,30
	191,90	383,80		
	193,02	386,05		
1	476,04	476,04	497,58	19,00
	504,69	504,69		
	512,00	512,00		
2	807,94	403,97	412,86	7,92
	838,27	419,14		
	830,97	415,48		
3	1149,38	383,13	388,62	4,76
	1174,66	391,55		
	1173,54	391,18		
4	1493,63	373,41	380,62	6,25
	1537,45	384,36		
	1536,33	384,08		
5	1844,63	368,93	376,79	6,81
	1904,18	380,84		
	1903,05	380,61		
6	2213,04	368,84	375,77	6,00
	2274,27	379,04		
	2276,52	379,42		
7	2586,50	369,50	375,52	5,21
	2649,42	378,49		
	2649,98	378,57		
8	2978,50	372,31	378,75	5,57
	3055,47	381,93		
	3056,03	382,00		
24	3580,27	149,18	152,10	2,66
	3666,22	152,76		
	3704,98	154,37		

Tabel 17. Data hasil fluks HFMs F2

Waktu (jam)	Permeasi SC kumulatif (µg/cm²)	Fluks (µg/cm².jam)	Rata-rata	SD
0,25	113,37	453,46	453,4606	8,99
	111,12	444,47		
	115,61	462,45		
0,5	396,38	792,77	782,6577	9,20
	387,40	774,79		
	390,21	780,41		
1	756,93	756,93	753,9326	8,82
	760,86	760,86		
	744,01	744,01		
2	1143,31	571,66	563,1368	12,40
	1137,70	568,85		
	1097,81	548,91		
3	1536,44	512,15	499,8503	10,71
	1484,76	494,92		
	1477,45	492,48		
4	2302,25	575,56	553,79	19,40
	2189,89	547,47		
	2153,38	538,34		
5	3034,34	606,87	592,30	12,63
	2921,99	584,40		
	2928,17	585,63		
6	3804,64	634,11	618,10	14,59
	3687,79	614,63		
	3633,30	605,55		
7	4568,20	652,60	639,63	11,74
	4455,85	636,55		
	4408,10	629,73		
8	5358,72	669,84	659,05	9,59
	5246,37	655,80		
	5212,10	651,51		
24	6239,13	259,96	259,49	0,82
	6239,13	259,96		
	6204,86	258,54		

Tabel 18. Data hasil fluks HFMs F3

Waktu (jam)	Permeasi SC kumulatif (µg/cm²)	Fluks (µg/cm².jam)	Rata-rata	SD
0,25	123,48	493,91	528,36	59,68
	123,48	493,91		
	149,32	597,27		
0,5	416,05	832,09	871,04	56,19
	422,79	845,58		
	467,73	935,46		
1	715,36	715,36	759,36	38,41
	776,59	776,59		
	786,14	786,14		
2	1039,95	519,97	4544,50	22,12
	1101,18	550,59		
	1125,90	562,95		
3	1391,50	463,83	478,88	13,81
	1445,43	481,81		
	1472,96	490,99		
4	1745,31	436,33	448,12	10,26
	1812,16	453,04		
	1820,02	455,01		
5	2124,95	424,99	433,57	7,71
	2178,88	435,78		
	2199,67	439,93		
6	2497,29	416,22	425,30	7,87
	2578,75	429,79		
	2579,31	429,89		
7	2876,94	410,99	419,42	7,36
	2971,87	424,55		
	2958,95	422,71		
8	3400,06	425,01	433,13	7,05
	3501,74	437,72		
	3493,31	436,66		
24	4168,11	173,67	177,03	3,02
	4269,79	177,91		
	4308,55	179,52		

Lampiran 4. Contoh perhitungan

Lampiran 4.1 Uji *swelling hydrogel film*

Perhitungan %*swelling hydrogel film* F1 jam ke-24

Diketahui :

Bobot *hydrogel film* 24 jam (m_t) = 1,0749 g

Bobot awal *hydrogel film* (m_0) = 0,1078 g

Ditanya :

%*swelling* ….?

Penyelesaian :

%*swelling* = $\frac{\mathbf{m_t - m_0}}{\mathbf{m_0}} \times \mathbf{100}\%$

= $\frac{\mathbf{1{,}0749 - 0{,}1078}}{\mathbf{0{,}1078}} \times \mathbf{100}\%$

= 897,12%

Lampiran 4.2 Uji kekuatan mekanik

Perhitungan %pengurangan ketinggian MNs pada HFMs 1

Diketahui :

Tinggi MNs sebelum penyisipan (H_{BI}) = 691,42 µm

Tinggi MNs setelah penyisipan (H_{AI}) = 653,86 µm

Ditanya :

%pengurangan ketinggian MNs ….?

Penyelesaian :

%pengurangan ketinggian MNs = $\frac{\mathbf{H_{BI} - H_{AI}}}{\mathbf{H_{BI}}} \times \mathbf{100}\%$

= $\frac{\mathbf{691{,}42 - 653{,}86}}{\mathbf{691{,}422}} \times \mathbf{100}\%$

= 5,43%

Lampiran 4.3 Uji kemampuan penetrasi MNs

Perhitungan %jumlah lubang dalam parafilm® M lapisan 1 HFMs F1

Diketahui :

Jumlah lubang yang diamati = 95

Jumlah lubang keseluruhan = 100

Ditanya :

%jumlah lubang dalam parafilm® M ….?

Penyelesaian :

$$\%\ \text{Jumlah lubang dalam parafilm® M} = \frac{\text{Jumlah lubang yang diamati}}{\text{Jumlah lubang keseluruhan}} \times 100\%$$

$$= \frac{95}{100} \times 100\%$$

$$= 95\%$$

Lampiran 4.4 Uji permeasi *ex vivo*

Perhitungan permeasi SC jam ke-24 (µg/cm^2) pada HFMs F1

Diketahui :

Persamaan regresi kurva baku y = 0,0131x + 0,0232

Absorbansi (y) = 0,312

Konsentrasi SC jam sebelumnya (jam ke-8) = 55,1576 µg

= 0,0552 mg

Faktor koreksi jam sebelumnya (jam ke-8) = 0,3061 mg

Faktor pengenceran jam ke-24 = 4

Luas permukaan (A) = 1,7665 cm^2

Ditanya :

Permeasi SC jam ke-24 pada HFMs F1 (mg)… ?

Permeasi SC jam ke-24 pada HFMs F1 (µg/cm^2)… ?

Penyelesaian :

y = 0,0131x + 0,0232

$$x = \frac{0{,}312 - 0{,}0232}{0{,}0131}$$

x = 22,0458 µg/ml (konsentrasi dalam 1 ml)

Kons. dalam 13 ml = Konsentrasi dalam 1 ml x faktor pengenceran x 13

= 22,0458 µg/ml x 4 x 13

= 1146,38 µg

= 1,1464 mg

Faktor koreksi = Kons jam sebelumnya + faktor koreksi jam sebelumnya

= 0,0552 mg + 0,3601 mg

= 0,4152 mg

Jumlah permeasi SC (mg) = Kons. Dalam 13 ml + Faktor koreksi

= 1,1464 mg + 0,4152 mg

= 1,56 mg

Jumlah permeasi SC (µg/cm^2) = $\frac{Kons.dalam\ 13\ ml}{Luas\ permukaan}$

= $\frac{1146{,}38\ \mu g}{1{,}7665\ cm^2}$

= 648,96 µg/cm^2

Lampiran 4.5 Fluks

Perhitungan fluks jam ke-24 HFMs F1

Diketahui :

Jumlah permeasi SC kumulatif (µg/cm^2) (Q_t) = 3704,9844 µg/cm^2

Waktu (t) = 24 jam

Ditanya :

Fluks (J_{ss}) ke-24 jam ….?

Penyelesaian

J_{ss} = $\frac{Qt}{t}$

= $\frac{3704{,}9844\ \mu g/cm^2}{24\ jam}$

= 154,37 µg/cm^2.jam

Lampiran 5. Hasil analisis data secara statistik

Lampiran 5.1 Uji *swelling hydrogel film*

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Formula	Statistic	df	Sig.	Statistic	df	Sig.
%swelling	F1	.341	3	.	.847	3	.232
	F2	.281	3	.	.937	3	.515
	F3	.255	3	.	.963	3	.629

a. Lilliefors Significance Correction

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
%swelling	Based on Mean	.096	2	6	.910
	Based on Median	.013	2	6	.987
	Based on Median and with adjusted df	.013	2	5.516	.987
	Based on trimmed mean	.084	2	6	.920

Multiple Comparisons

Dependent Variable: %swelling

			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
	(I) Formula	(J) Formula				Lower Bound	Upper Bound
Tukey HSD	F1	F2	-232.72000*	7.10462	.000	-254.5189	-210.9211
		F3	-107.82667*	7.10462	.000	-129.6256	-86.0277
	F2	F1	232.72000*	7.10462	.000	210.9211	254.5189
		F3	124.89333*	7.10462	.000	103.0944	146.6923
	F3	F1	107.82667*	7.10462	.000	86.0277	129.6256
		F2	-124.89333*	7.10462	.000	-146.6923	-103.0944
Games-Howell	F1	F2	-232.72000*	7.41416	.000	-259.1773	-206.2627
		F3	-107.82667*	6.84079	.000	-132.3533	-83.3001
	F2	F1	232.72000*	7.41416	.000	206.2627	259.1773
		F3	124.89333*	7.04703	.000	99.4596	150.3271
	F3	F1	107.82667*	6.84079	.000	83.3001	132.3533
		F2	-124.89333*	7.04703	.000	-150.3271	-99.4596

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

Gambar 19. Hasil analisis statistik uji *swelling hydrogel film*

Lampiran 5.2 Uji kekuatan mekanik

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Formula	Statistic	df	Sig.	Statistic	df	Sig.
%Pengurangan ketinggian MNs	F1	.340	3	.	.848	3	.235
	F2	.345	3	.	.839	3	.213
	F3	.305	3	.	.906	3	.406

a. Lilliefors Significance Correction

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
%Pengurangan ketinggian MNs	Based on Mean	10.063	2	6	.012
	Based on Median	1.854	2	6	.236
	Based on Median and with adjusted df	1.854	2	2.028	.348
	Based on trimmed mean	8.977	2	6	.016

Multiple Comparisons

Dependent Variable: %Pengurangan ketinggian MNs

			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
	(I) Formula	(J) Formula				Lower Bound	Upper Bound
Tukey HSD	F1	F2	1.953000*	.154672	.000	1.47842	2.42758
		F3	3.120000*	.154672	.000	2.64542	3.59458
	F2	F1	-1.953000*	.154672	.000	-2.42758	-1.47842
		F3	1.167000*	.154672	.001	.69242	1.64158
	F3	F1	-3.120000*	.154672	.000	-3.59458	-2.64542
		F2	-1.167000*	.154672	.001	-1.64158	-.69242
Games-Howell	F1	F2	1.953000*	.014020	.000	1.90280	2.00320
		F3	3.120000*	.189149	.007	2.01166	4.22834
	F2	F1	-1.953000*	.014020	.000	-2.00320	-1.90280
		F3	1.167000*	.189201	.045	.05966	2.27434
	F3	F1	-3.120000*	.189149	.007	-4.22834	-2.01166
		F2	-1.167000*	.189201	.045	-2.27434	-.05966

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

Gambar 20. Hasil analisis statistik uji kekuatan mekanik

Lampiran 5.3 Uji kemampuan penetrasi MNs

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Formula	Statistic	df	Sig.	Statistic	df	Sig.
%Jumlah lubang parafilm® M lapisan ke-3	F1	.175	3	.	1.000	3	1.000
	F2	.292	3	.	.923	3	.463
	F3	.204	3	.	.993	3	.843

a. Lilliefors Significance Correction

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
%Jumlah lubang parafilm® M lapisan ke-3	Based on Mean	.966	2	6	.433
	Based on Median	.289	2	6	.759
	Based on Median and with adjusted df	.289	2	4.180	.763
	Based on trimmed mean	.906	2	6	.453

Multiple Comparisons

Dependent Variable: %Jumlah lubang parafilm® M lapisan ke-3

						95% Confidence Interval	
	(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Tukey HSD	F1	F2	-10.3333*	2.7352	.022	-18.726	-1.941
		F3	-23.6667*	2.7352	.000	-32.059	-15.274
	F2	F1	10.3333*	2.7352	.022	1.941	18.726
		F3	-13.3333*	2.7352	.007	-21.726	-4.941
	F3	F1	23.6667*	2.7352	.000	15.274	32.059
		F2	13.3333*	2.7352	.007	4.941	21.726
Games-Howell	F1	F2	-10.3333	2.6667	.065	-21.796	1.129
		F3	-23.6667*	2.3333	.003	-33.076	-14.258
	F2	F1	10.3333	2.6667	.065	-1.129	21.796
		F3	-13.3333*	3.1447	.030	-24.690	-1.977
	F3	F1	23.6667*	2.3333	.003	14.258	33.076
		F2	13.3333*	3.1447	.030	1.977	24.690

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

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Formula	Statistic	df	Sig.	Statistic	df	Sig.
%Jumlah lubang parafilm® M lapisan ke-4	F2	.314	3	.	.893	3	.363
	F3	.175	3	.	1.000	3	1.000

a. Lilliefors Significance Correction

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
%Jumlah lubang parafilm® M lapisan ke-4	Equal variances assumed	.571	.492	-1.567	4	.192	-3.0000	1.9149
	Equal variances not assumed			-1.567	3.723	.197	-3.0000	1.9149

Gambar 21. Hasil analisis statistik uji kemampuan penetrasi MNs

Lampiran 5.4 Uji permeasi *ex vivo*

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Formula	Statistic	df	Sig.	Statistic	df	Sig.
Permeasi SC (mg)	F1	.278	3	.	.940	3	.526
	F2	.382	3	.	.758	3	.018
	F3	.338	3	.	.852	3	.245

a. Lilliefors Significance Correction

Pairwise Comparisons of Formula

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
F1-F3	-3.000	2.236	-1.342	.180	.539
F1-F2	-6.000	2.236	-2.683	.007	.022
F3-F2	3.000	2.236	1.342	.180	.539

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Independent-Samples Kruskal-Wallis Test Summary

Total N	9
Test Statistic	7.200[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	.027

a. The test statistic is adjusted for ties.

Gambar 22. Hasil analisis statistik uji permeasi *ex vivo*

Lampiran 5.5 Fluks

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Formula	Statistic	df	Sig.	Statistic	df	Sig.
Fluks jam ke-24 (µg/cm2. jam)	F1	.264	3	.	.954	3	.589
	F2	.385	3	.	.750	3	.000
	F3	.280	3	.	.937	3	.517

a. Lilliefors Significance Correction

Pairwise Comparisons of Formula

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
F1-F3	-3.000	2.227	-1.347	.178	.534
F1-F2	-6.000	2.227	-2.695	.007	.021
F3-F2	3.000	2.227	1.347	.178	.534

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Independent-Samples Kruskal-Wallis Test Summary

Total N	9
Test Statistic	7.261[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	.027

a. The test statistic is adjusted for ties.

Gambar 23. Hasil analisis statistik nilai fluks

Lampiran 5. Hasil kinetika pelepasan obat

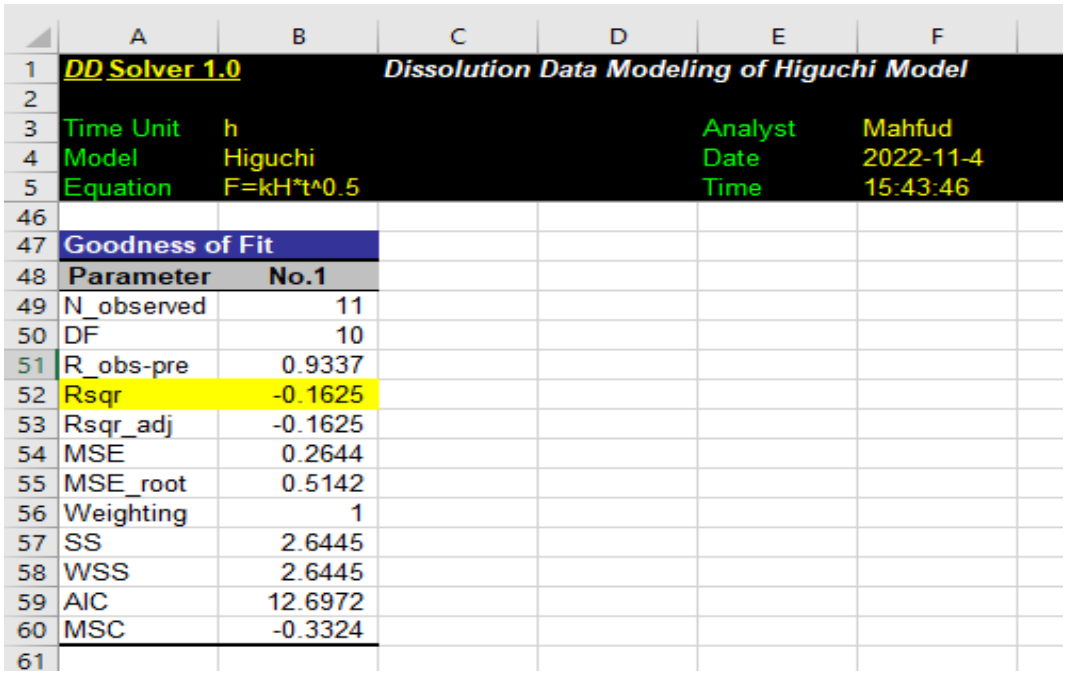
Lampiran 5.1 Kinetika HFMs F1

	A	B	C	D	E	F
1	DD Solver 1.0		Dissolution Data Modeling of Zero-order Model			
2						
3	Time Unit	h			Analyst	Mahfud
4	Model	Zero-order			Date	2022-11-4
5	Equation	F=k0*t			Time	15:34:37
46						
47	Goodness of Fit					
48	Parameter	No.1				
49	N_observed	11				
50	DF	10				
51	R_obs-pre	0.7928				
52	Rsqr	-4.4221				
53	Rsqr_adj	-4.4221				
54	MSE	1.2334				
55	MSE_root	1.1106				
56	Weighting	1				
57	SS	12.3339				
58	WSS	12.3339				
59	AIC	29.6359				
60	MSC	-1.8723				
61						

Gambar 24. Hasil analisis model kinetika orde 0 HFMs F1

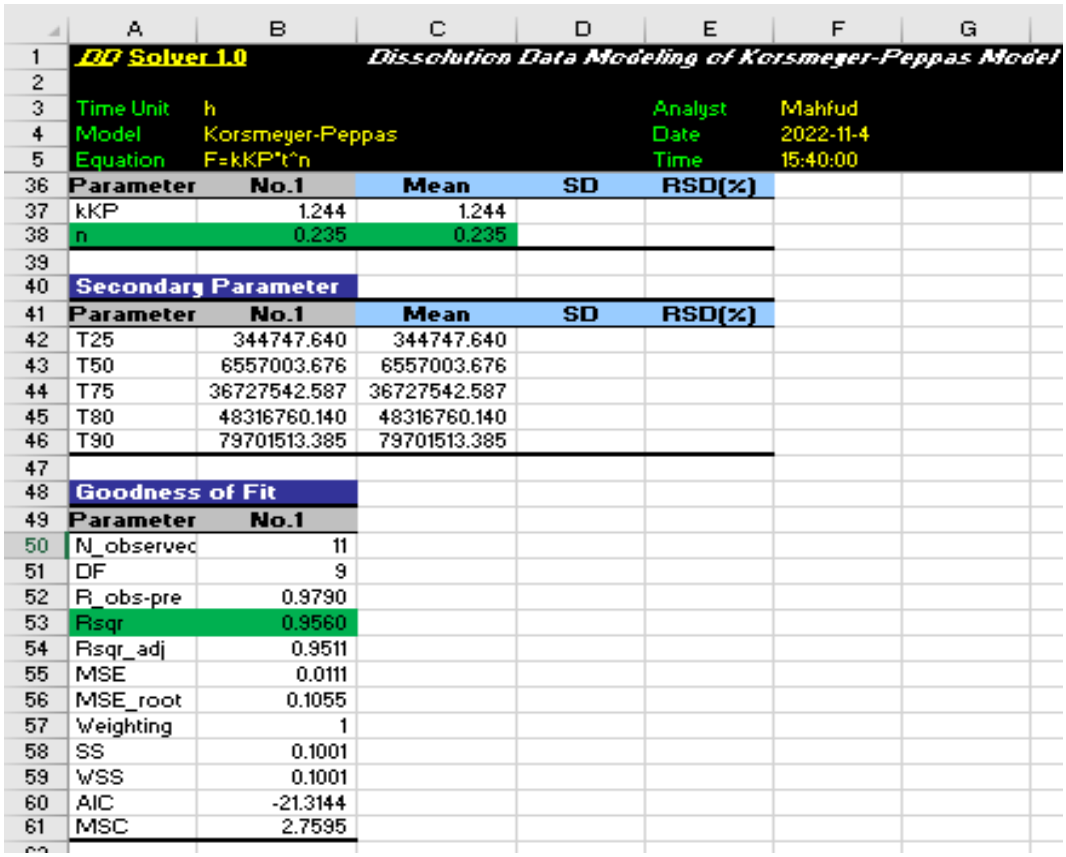
	A	B	C	D	E	F	G
1	DD Solver 1.0		Dissolution Data Modeling of First-order Model				
2							
3	Time Unit	h			Analyst	Mahfud	
4	Model	First-order			Date	2022-11-4	
5	Equation	F=100*[1-Exp(-k1*t)]			Time	15:42:04	
46							
47	Goodness of Fit						
48	Parameter	No.1					
49	N_observed	11					
50	DF	10					
51	R_obs-pre	0.7962					
52	Rsqr	-4.3450					
53	Rsqr_adj	-4.3450					
54	MSE	1.2158					
55	MSE_root	1.1026					
56	Weighting	1					
57	SS	12.1583					
58	WSS	12.1583					
59	AIC	29.4782					
60	MSC	-1.8580					
61							

Gambar 25. Hasil analisis model kinetika orde 1 HFMs F1



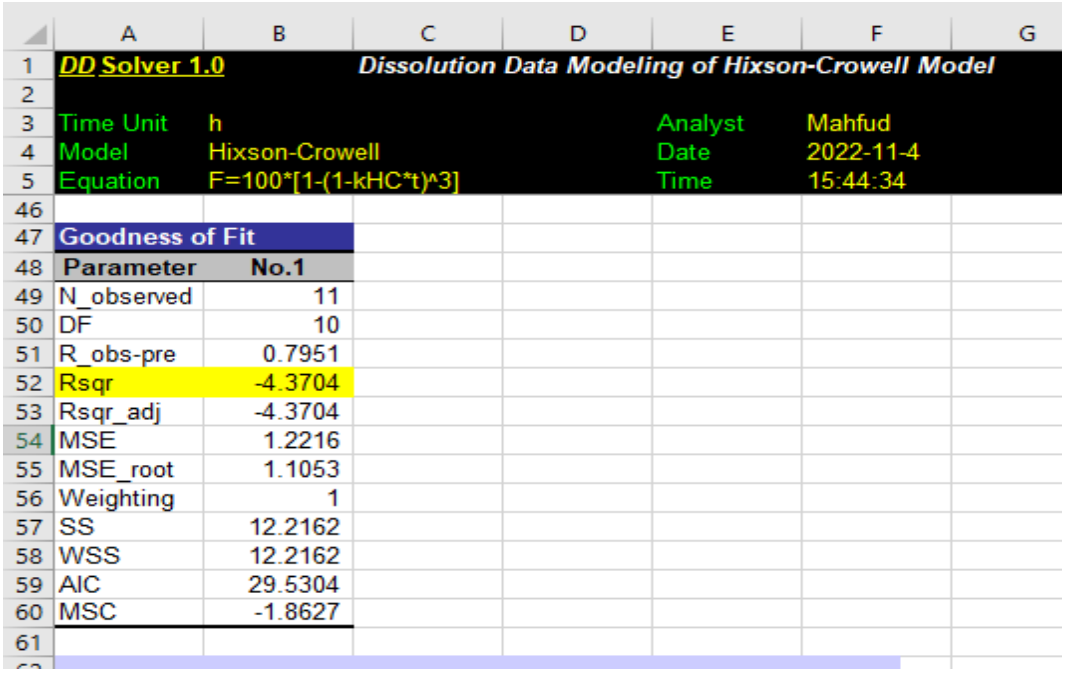
	A	B	C	D	E	F
1	DD Solver 1.0		Dissolution Data Modeling of Higuchi Model			
2						
3	Time Unit	h			Analyst	Mahfud
4	Model	Higuchi			Date	2022-11-4
5	Equation	F=kH*t^0.5			Time	15:43:46
46						
47	Goodness of Fit					
48	Parameter	No.1				
49	N_observed	11				
50	DF	10				
51	R_obs-pre	0.9337				
52	Rsqr	-0.1625				
53	Rsqr_adj	-0.1625				
54	MSE	0.2644				
55	MSE_root	0.5142				
56	Weighting	1				
57	SS	2.6445				
58	WSS	2.6445				
59	AIC	12.6972				
60	MSC	-0.3324				
61						

Gambar 26. Hasil analisis model kinetika higuchi HFMs F1



	A	B	C	D	E	F	G
1	DD Solver 1.0		Dissolution Data Modeling of Korsmeyer-Peppas Model				
2							
3	Time Unit	h			Analyst	Mahfud	
4	Model	Korsmeyer-Peppas			Date	2022-11-4	
5	Equation	F=kKP*t^n			Time	15:40:00	
36	Parameter	No.1	Mean	SD	RSD(%)		
37	kKP	1.244	1.244				
38	n	0.235	0.235				
39							
40	Secondary Parameter						
41	Parameter	No.1	Mean	SD	RSD(%)		
42	T25	344747.640	344747.640				
43	T50	6557003.676	6557003.676				
44	T75	36727542.587	36727542.587				
45	T80	48316760.140	48316760.140				
46	T90	79701513.385	79701513.385				
47							
48	Goodness of Fit						
49	Parameter	No.1					
50	N_observec	11					
51	DF	9					
52	R_obs-pre	0.9790					
53	Rsqr	0.9560					
54	Rsqr_adj	0.9511					
55	MSE	0.0111					
56	MSE_root	0.1055					
57	Weighting	1					
58	SS	0.1001					
59	WSS	0.1001					
60	AIC	-21.3144					
61	MSC	2.7595					

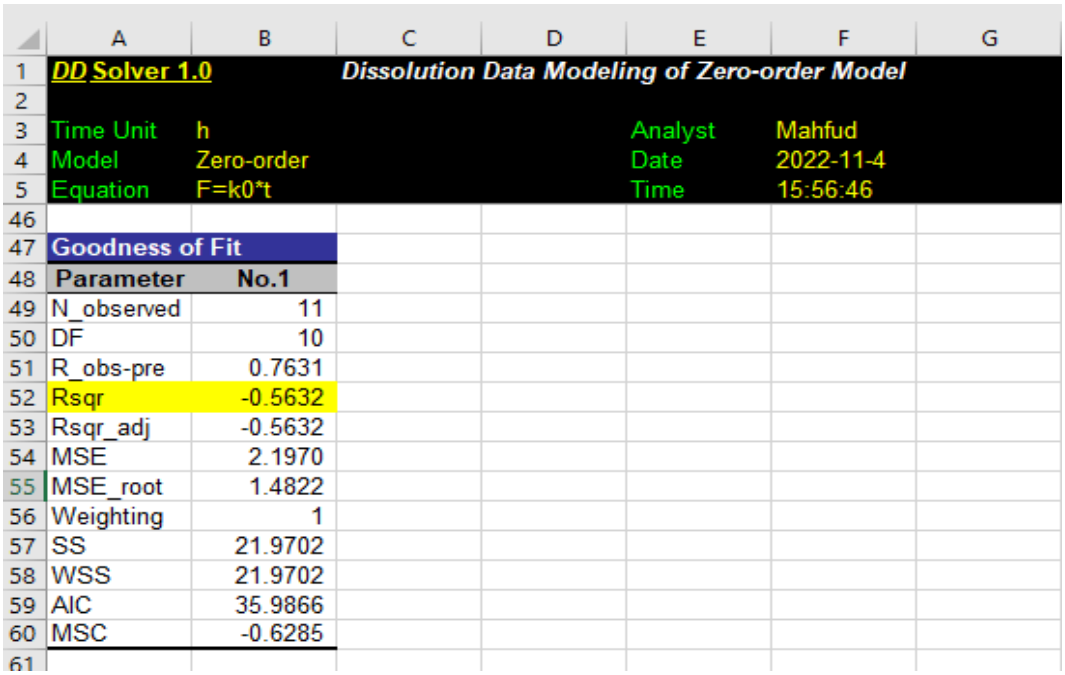
Gambar 27. Hasil analisis model kinetika *korsmeyer-peppas* HFMs F1



	A	B	C	D	E	F	G
1	***DD* Solver 1.0**		***Dissolution Data Modeling of Hixson-Crowell Model***				
2							
3	Time Unit	h			Analyst	Mahfud	
4	Model	Hixson-Crowell			Date	2022-11-4	
5	Equation	F=100*[1-(1-kHC*t)^3]			Time	15:44:34	
46							
47	**Goodness of Fit**						
48	**Parameter**	**No.1**					
49	N_observed	11					
50	DF	10					
51	R_obs-pre	0.7951					
52	Rsqr	-4.3704					
53	Rsqr_adj	-4.3704					
54	MSE	1.2216					
55	MSE_root	1.1053					
56	Weighting	1					
57	SS	12.2162					
58	WSS	12.2162					
59	AIC	29.5304					
60	MSC	-1.8627					
61							

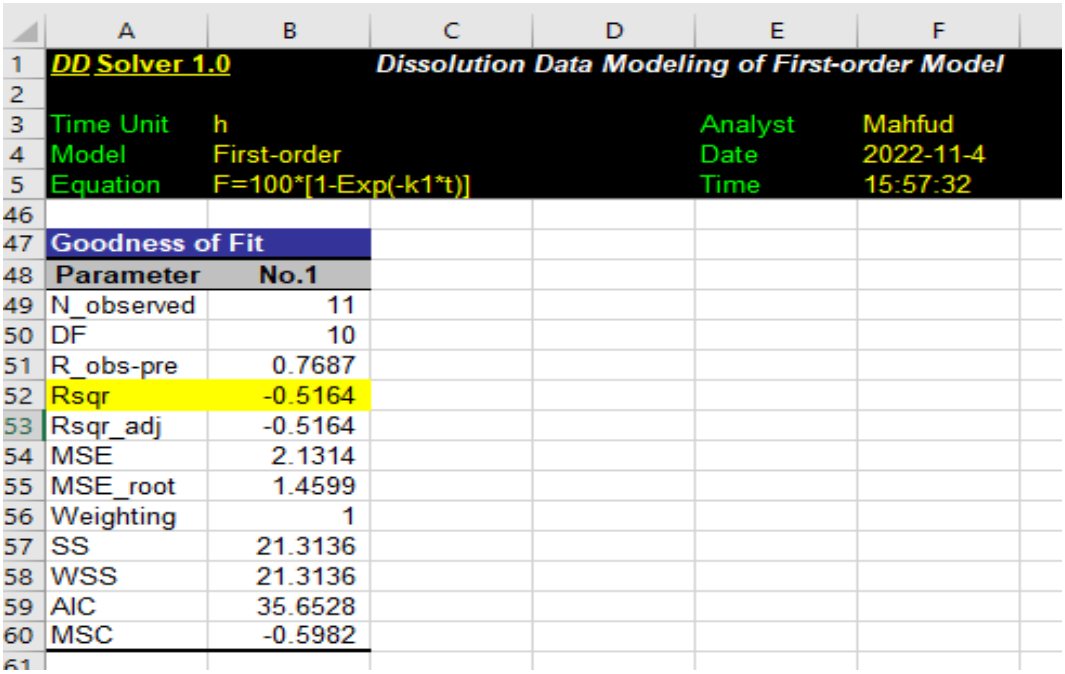
Gambar 28. Hasil analisis model kinetika *hixon-crowell* HFMs F1

Lampiran 5.2 Kinetika HFMs F2



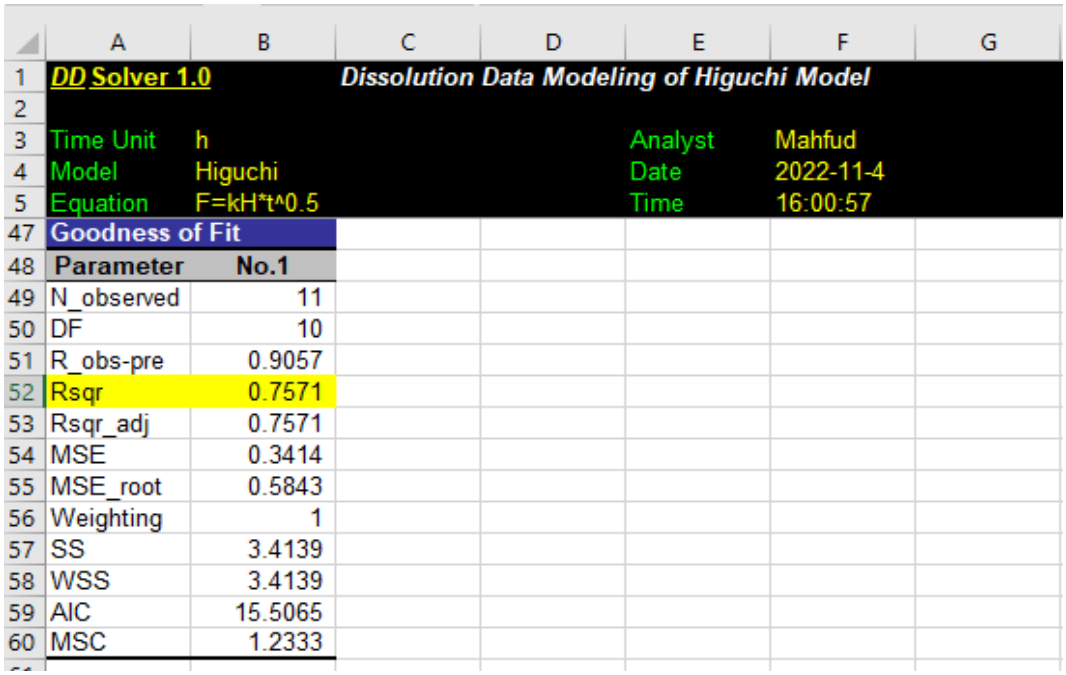
	A	B	C	D	E	F	G
1	DD Solver 1.0		Dissolution Data Modeling of Zero-order Model				
2							
3	Time Unit	h			Analyst	Mahfud	
4	Model	Zero-order			Date	2022-11-4	
5	Equation	F=k0*t			Time	15:56:46	
46							
47	Goodness of Fit						
48	Parameter	No.1					
49	N_observed	11					
50	DF	10					
51	R_obs-pre	0.7631					
52	Rsqr	-0.5632					
53	Rsqr_adj	-0.5632					
54	MSE	2.1970					
55	MSE_root	1.4822					
56	Weighting	1					
57	SS	21.9702					
58	WSS	21.9702					
59	AIC	35.9866					
60	MSC	-0.6285					
61							

Gambar 29. Hasil analisis model kinetika orde 0 HFMs F2



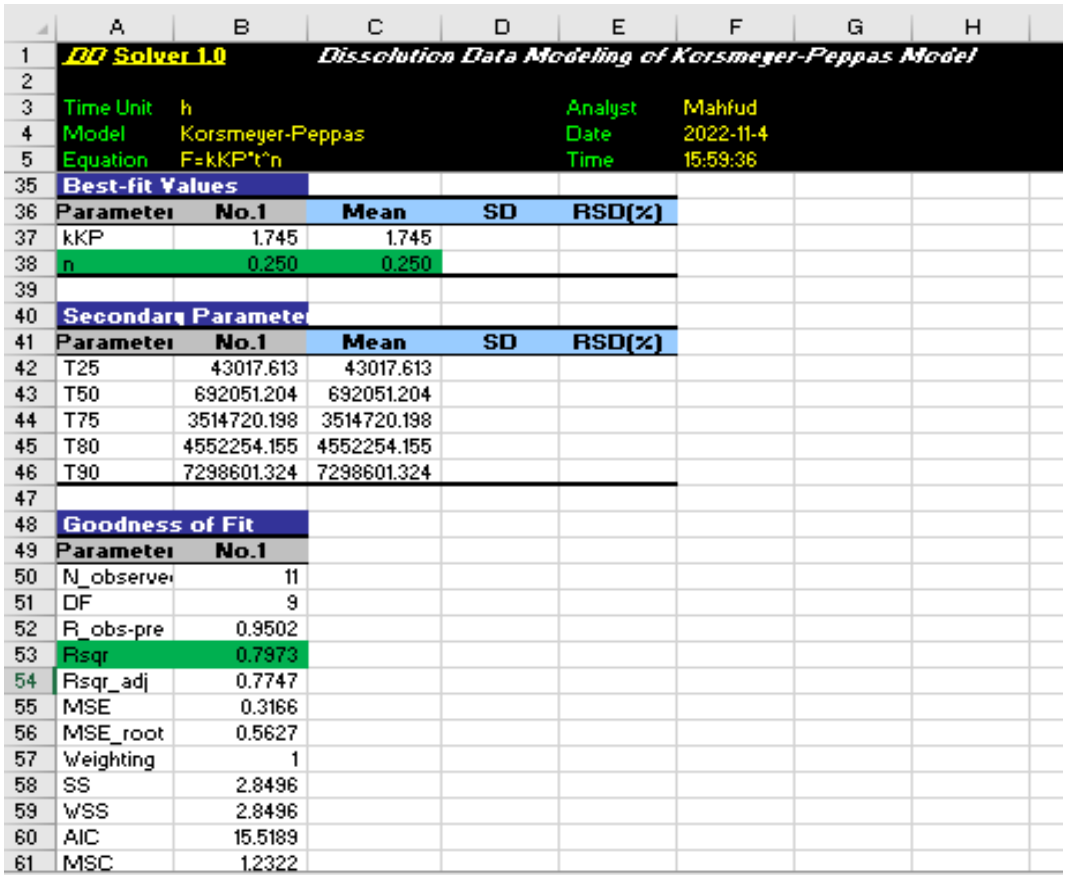
	A	B	C	D	E	F
1	DD Solver 1.0		Dissolution Data Modeling of First-order Model			
2						
3	Time Unit	h			Analyst	Mahfud
4	Model	First-order			Date	2022-11-4
5	Equation	F=100*[1-Exp(-k1*t)]			Time	15:57:32
46						
47	Goodness of Fit					
48	Parameter	No.1				
49	N_observed	11				
50	DF	10				
51	R_obs-pre	0.7687				
52	Rsqr	-0.5164				
53	Rsqr_adj	-0.5164				
54	MSE	2.1314				
55	MSE_root	1.4599				
56	Weighting	1				
57	SS	21.3136				
58	WSS	21.3136				
59	AIC	35.6528				
60	MSC	-0.5982				
61						

Gambar 30. Hasil analisis model kinetika orde 1 HFMs F2



	A	B	C	D	E	F	G
1	DD Solver 1.0		Dissolution Data Modeling of Higuchi Model				
2							
3	Time Unit	h			Analyst	Mahfud	
4	Model	Higuchi			Date	2022-11-4	
5	Equation	F=kH*t^0.5			Time	16:00:57	
47	Goodness of Fit						
48	Parameter	No.1					
49	N_observed	11					
50	DF	10					
51	R_obs-pre	0.9057					
52	Rsqr	0.7571					
53	Rsqr_adj	0.7571					
54	MSE	0.3414					
55	MSE_root	0.5843					
56	Weighting	1					
57	SS	3.4139					
58	WSS	3.4139					
59	AIC	15.5065					
60	MSC	1.2333					

Gambar 31. Hasil analisis model kinetika higuchi HFMs F2



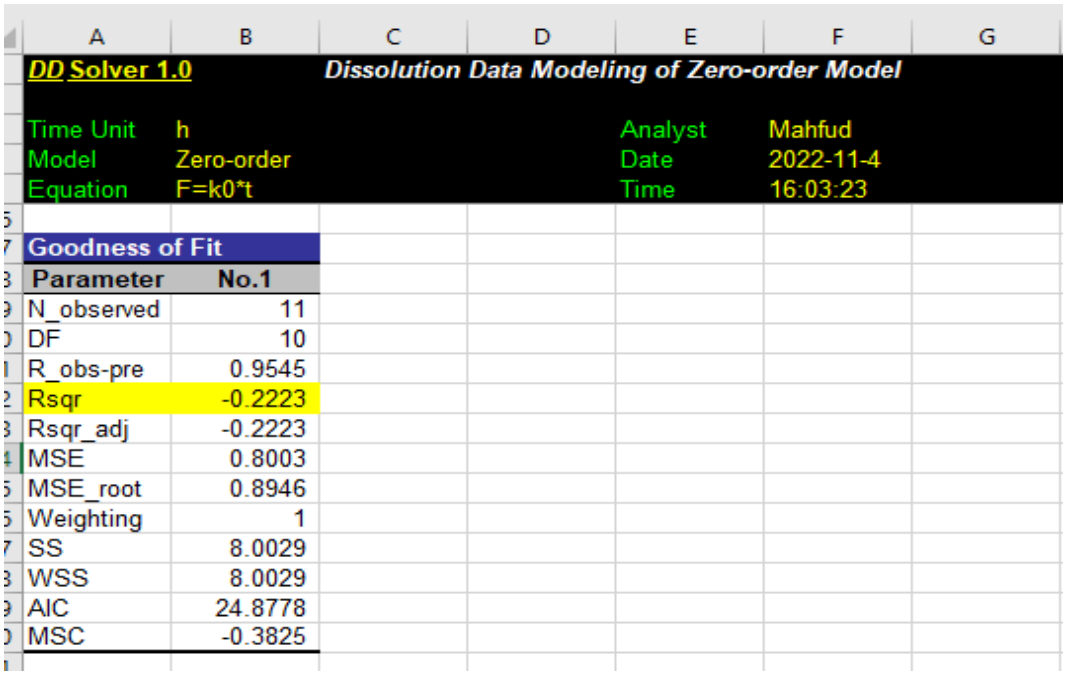
	A	B	C	D	E	F	G	H
1	DD Solver 1.0		Dissolution Data Modeling of Korsmeyer-Peppas Model					
2								
3	Time Unit	h			Analyst	Mahfud		
4	Model	Korsmeyer-Peppas			Date	2022-11-4		
5	Equation	F=kKP*t^n			Time	15:59:36		
35	Best-fit Values							
36	Parameter	No.1	Mean	SD	RSD(%)			
37	kKP	1.745	1.745					
38	n	0.250	0.250					
39								
40	Secondary Parameter							
41	Parameter	No.1	Mean	SD	RSD(%)			
42	T25	43017.613	43017.613					
43	T50	692051.204	692051.204					
44	T75	3514720.198	3514720.198					
45	T80	4552254.155	4552254.155					
46	T90	7298601.324	7298601.324					
47								
48	Goodness of Fit							
49	Parameter	No.1						
50	N_observe	11						
51	DF	9						
52	R_obs-pre	0.9502						
53	Rsqr	0.7973						
54	Rsqr_adj	0.7747						
55	MSE	0.3166						
56	MSE_root	0.5627						
57	Weighting	1						
58	SS	2.8496						
59	WSS	2.8496						
60	AIC	15.5189						
61	MSC	1.2322						

Gambar 32. Hasil analisis model kinetika *korsmeyer-peppas* HFMs F2

	A	B	C	D	E	F	G
1	***DD* Solver 1.0**			***Dissolution Data Modeling of Hixson-Crowell Model***			
2							
3	Time Unit	h			Analyst	Mahfud	
4	Model	Hixson-Crowell			Date	2022-11-4	
5	Equation	F=100*[1-(1-kHC*t)^3]			Time	16:01:42	
46							
47	**Goodness of Fit**						
48	**Parameter**	**No.1**					
49	N_observed	11					
50	DF	10					
51	R_obs-pre	0.7668					
52	Rsqr	-0.5317					
53	Rsqr_adj	-0.5317					
54	MSE	2.1528					
55	MSE_root	1.4673					
56	Weighting	1					
57	SS	21.5283					
58	WSS	21.5283					
59	AIC	35.7630					
60	MSC	-0.6082					

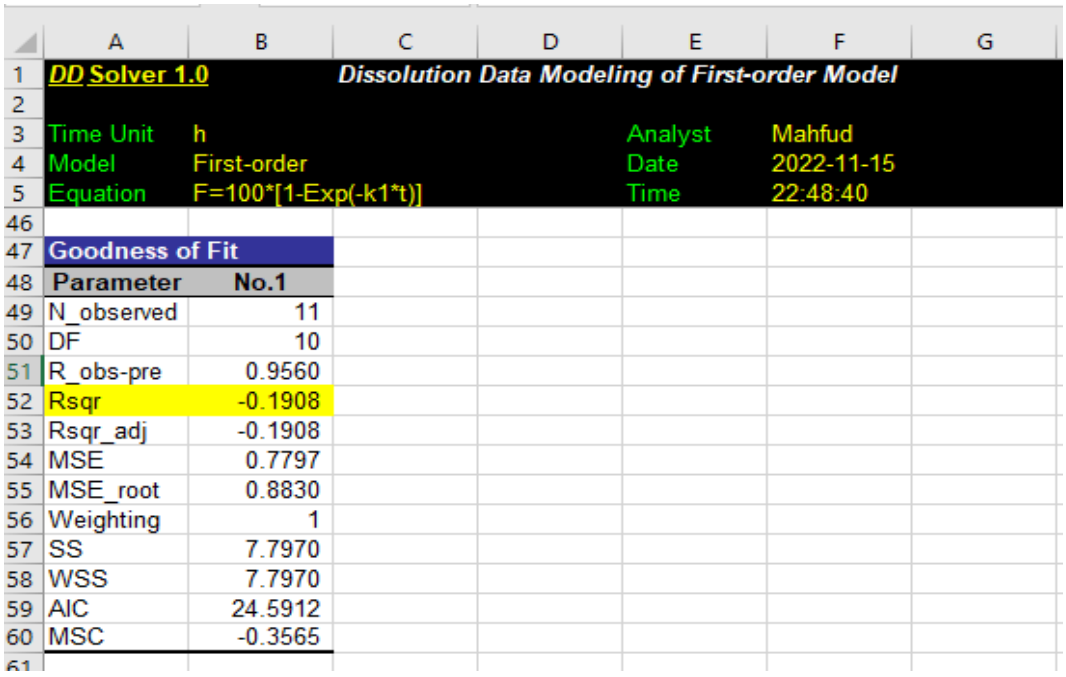
Gambar 33. Hasil analisis model kinetika *hixson-crowell* HFMs F2

Lampiran 5.3 Kinetika HFMs F3



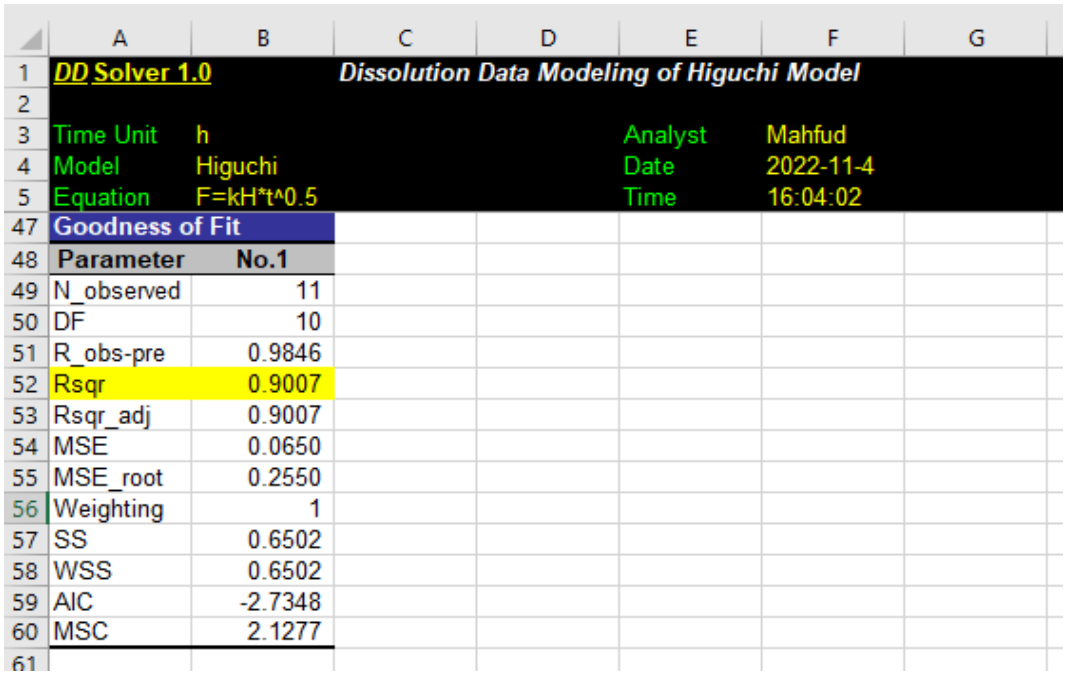
	A	B	C	D	E	F	G
	DD Solver 1.0		Dissolution Data Modeling of Zero-order Model				
	Time Unit	h			Analyst	Mahfud	
	Model	Zero-order			Date	2022-11-4	
	Equation	F=k0*t			Time	16:03:23	
5							
7	Goodness of Fit						
8	Parameter	No.1					
9	N_observed	11					
10	DF	10					
11	R_obs-pre	0.9545					
12	Rsqr	-0.2223					
13	Rsqr_adj	-0.2223					
14	MSE	0.8003					
15	MSE_root	0.8946					
16	Weighting	1					
17	SS	8.0029					
18	WSS	8.0029					
19	AIC	24.8778					
20	MSC	-0.3825					

Gambar 34. Hasil analisis model kinetika orde 0 HFMs F3



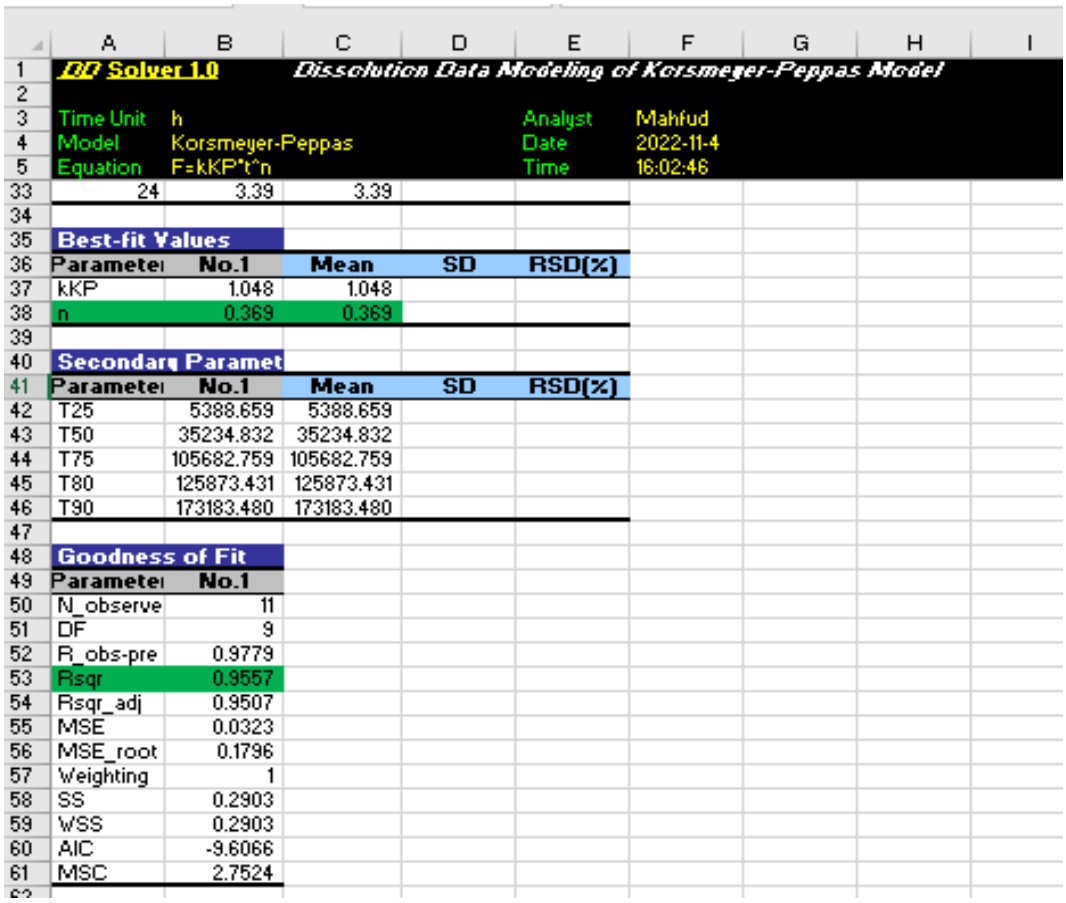
	A	B	C	D	E	F	G
1	DD Solver 1.0		Dissolution Data Modeling of First-order Model				
2							
3	Time Unit	h			Analyst	Mahfud	
4	Model	First-order			Date	2022-11-15	
5	Equation	F=100*[1-Exp(-k1*t)]			Time	22:48:40	
46							
47	Goodness of Fit						
48	Parameter	No.1					
49	N_observed	11					
50	DF	10					
51	R_obs-pre	0.9560					
52	Rsqr	-0.1908					
53	Rsqr_adj	-0.1908					
54	MSE	0.7797					
55	MSE_root	0.8830					
56	Weighting	1					
57	SS	7.7970					
58	WSS	7.7970					
59	AIC	24.5912					
60	MSC	-0.3565					

Gambar 35. Hasil analisis model kinetika orde 1 HFMs F3



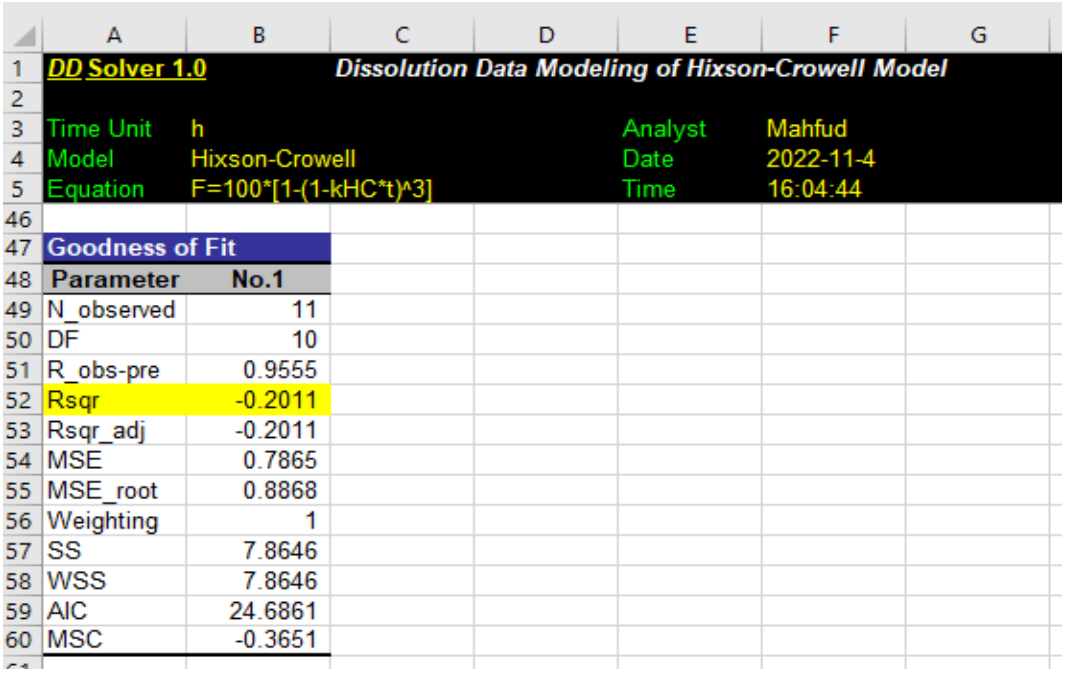
	A	B	C	D	E	F	G
1	DD Solver 1.0		Dissolution Data Modeling of Higuchi Model				
2							
3	Time Unit	h			Analyst	Mahfud	
4	Model	Higuchi			Date	2022-11-4	
5	Equation	F=kH*t^0.5			Time	16:04:02	
47	Goodness of Fit						
48	Parameter	No.1					
49	N_observed	11					
50	DF	10					
51	R_obs-pre	0.9846					
52	Rsqr	0.9007					
53	Rsqr_adj	0.9007					
54	MSE	0.0650					
55	MSE_root	0.2550					
56	Weighting	1					
57	SS	0.6502					
58	WSS	0.6502					
59	AIC	-2.7348					
60	MSC	2.1277					
61							

Gambar 36. Hasil analisis model kinetika higuchi HFMs F3



	A	B	C	D	E	F	G	H	I
1	DD Solver 1.0		Dissolution Data Modeling of Korsmeyer-Peppas Model						
2									
3	Time Unit	h			Analyst	Mahfud			
4	Model	Korsmeyer-Peppas			Date	2022-11-4			
5	Equation	F=kKP*t^n			Time	16:02:46			
33	24	3.39	3.39						
34									
35	Best-fit Values								
36	Parameter	No.1	Mean	SD	RSD(%)				
37	kKP	1.048	1.048						
38	n	0.369	0.369						
39									
40	Secondary Paramet								
41	Parameter	No.1	Mean	SD	RSD(%)				
42	T25	5388.659	5388.659						
43	T50	35234.832	35234.832						
44	T75	105682.759	105682.759						
45	T80	125873.431	125873.431						
46	T90	173183.480	173183.480						
47									
48	Goodness of Fit								
49	Parameter	No.1							
50	N_observe	11							
51	DF	9							
52	R_obs-pre	0.9779							
53	Rsqr	0.9557							
54	Rsqr_adj	0.9507							
55	MSE	0.0323							
56	MSE_root	0.1796							
57	Weighting	1							
58	SS	0.2903							
59	WSS	0.2903							
60	AIC	-9.6066							
61	MSC	2.7524							

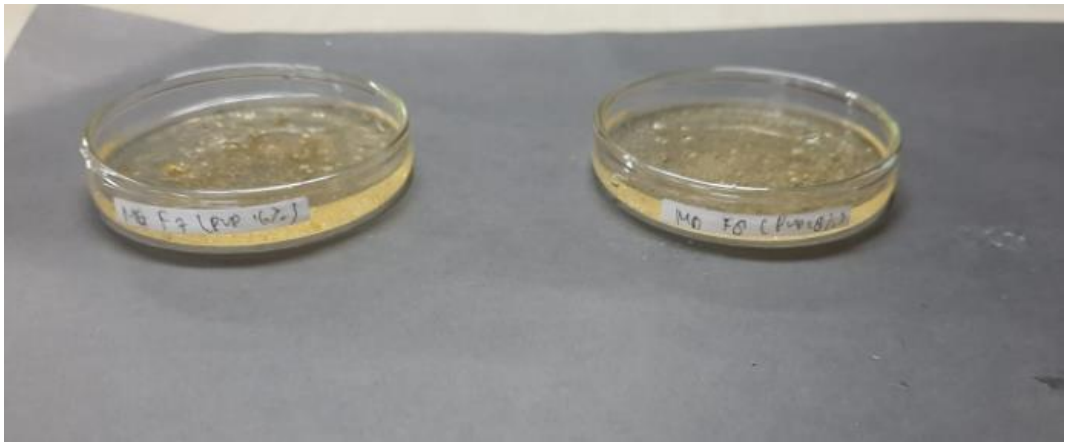
Gambar 37. Hasil analisis model kinetika *korsmeyer-peppas* HFMs F3



	A	B	C	D	E	F	G
1	DD Solver 1.0		Dissolution Data Modeling of Hixson-Crowell Model				
2							
3	Time Unit	h			Analyst	Mahfud	
4	Model	Hixson-Crowell			Date	2022-11-4	
5	Equation	F=100*[1-(1-kHC*t)^3]			Time	16:04:44	
46							
47	Goodness of Fit						
48	Parameter	No.1					
49	N_observed	11					
50	DF	10					
51	R_obs-pre	0.9555					
52	Rsqr	-0.2011					
53	Rsqr_adj	-0.2011					
54	MSE	0.7865					
55	MSE_root	0.8868					
56	Weighting	1					
57	SS	7.8646					
58	WSS	7.8646					
59	AIC	24.6861					
60	MSC	-0.3651					

Gambar 38. Hasil analisis model kinetika *hixson-crowell* HFMs F3

Lampiran 6. Dokumentasi penelitian



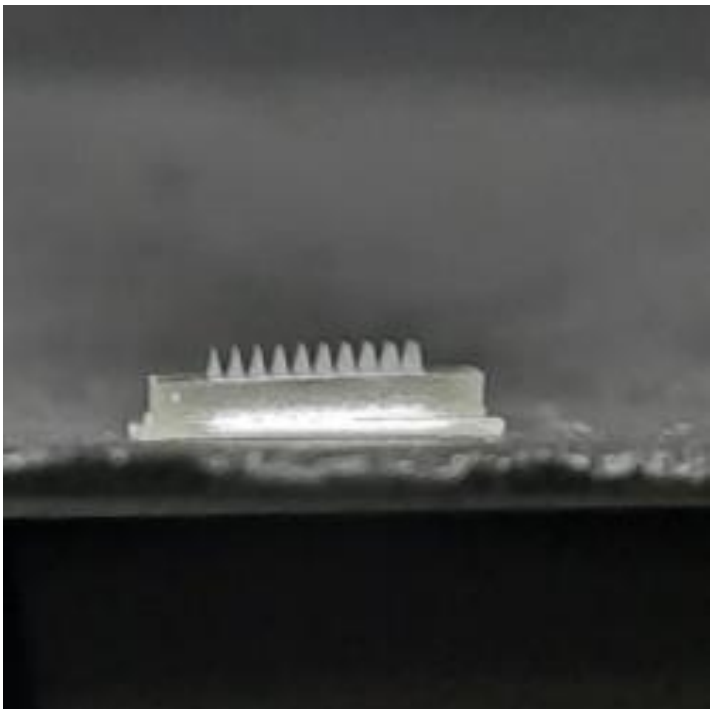
Gambar 39. Proses pencetakan *Hydrogel film*

Gambar 40. *Hydrogel film* setelah dikeringkan

Gambar 41. Uji *swelling hydrogel film*

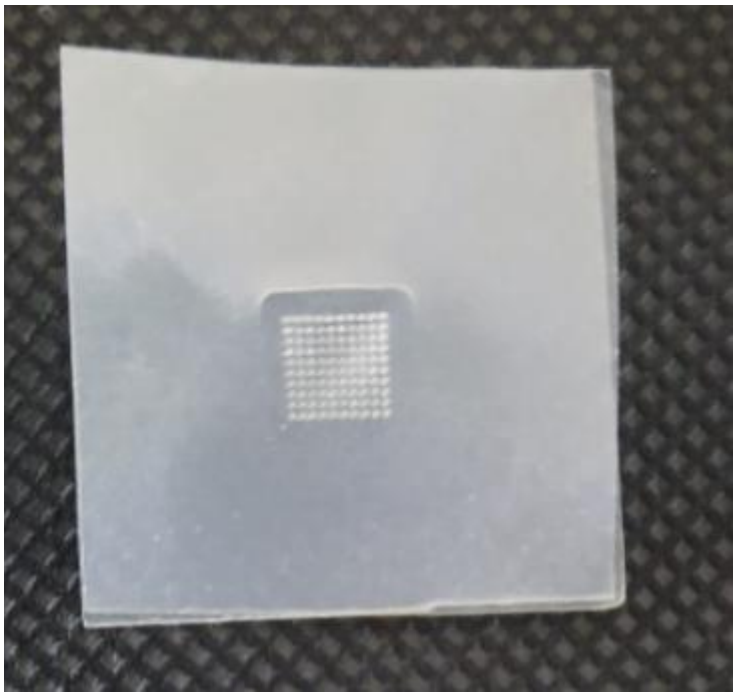
Gambar 42. Kondisi *hydrogel film* setelah uji *swelling*

Gambar 43. Proses pencetakan HFMs

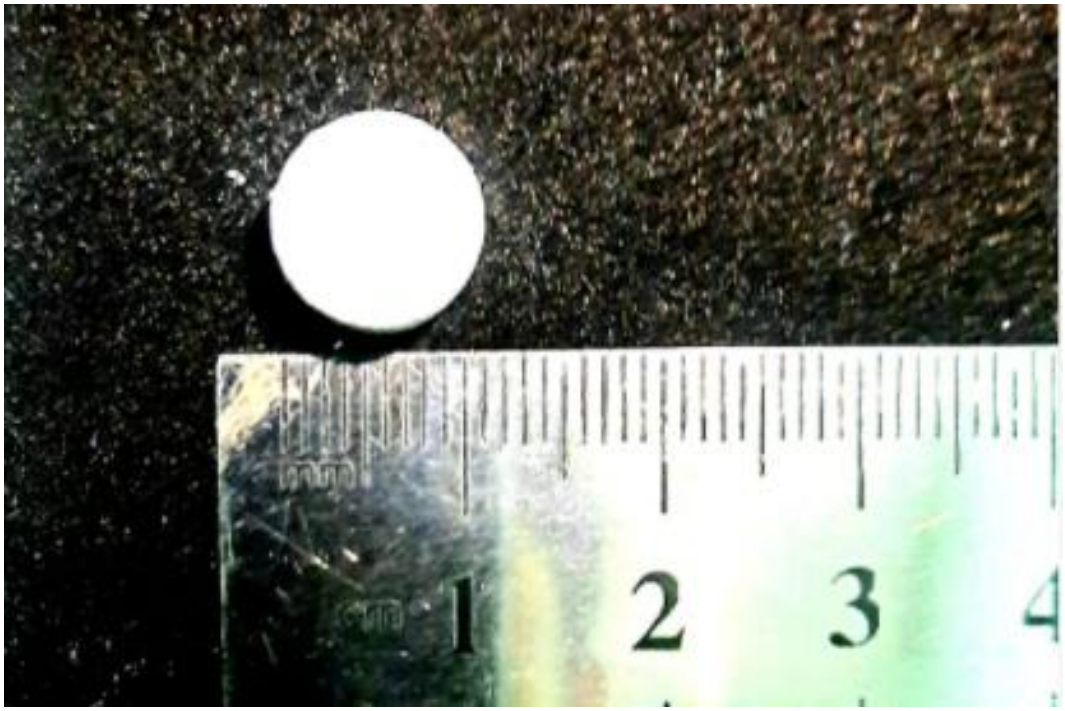


Gambar 44. HFMs setelah dikeringkan

Gambar 45. Karakterisasi HFMs



Gambar 46. Kondisi parafilm® M setelah uji kemampuan penetrasi



Gambar 47. DCT *reservoir* SC

Gambar 48. Uji permeasi *ex vivo*