DAFTAR PUSTAKA

[1] L. J. Muiz, A. L. Juwono, and Y. K. Krisnandi, “A review: Silver-zinc oxide nanoparticles-organoclay-reinforced chitosan bionanocomposites for food packaging,” *Open Chemistry*, vol. 20, no. 1. De Gruyter Open Ltd, pp. 1155–1170, Jan. 01, 2022. doi: 10.1515/chem-2022-0224.

[2] S. Rai, C. Suman Rai, and A. Poonia, “Formulation and characterization of edible films from pea starch and casein,” *~ 317 ~ Journal of Pharmacognosy and Phytochemistry*, vol. 8, no. 2, 2019.

[3] J. Xu, R. Xia, L. Zheng, T. Yuan, and R. Sun, “Plasticized hemicelluloses/chitosan-based edible films reinforced by cellulose nanofiber with enhanced mechanical properties,” *Carbohydr Polym*, vol. 224, Nov. 2019, doi: 10.1016/j.carbpol.2019.115164.

[4] L. Ballesteros-Mártinez, C. Pérez-Cervera, and R. Andrade-Pizarro, “Effect of glycerol and sorbitol concentrations on mechanical, optical, and barrier properties of sweet potato starch film,” *NFS Journal*, vol. 20, pp. 1–9, Aug. 2020, doi: 10.1016/j.nfs.2020.06.002.

[5] A. Galindez, L. D. Daza, A. Homez-Jara, V. S. Eim, and H. A. Váquiro, “Characterization of ulluco starch and its potential for use in edible films prepared at low drying temperature,” *Carbohydr Polym*, vol. 215, pp. 143–150, Jul. 2019, doi: 10.1016/j.carbpol.2019.03.074.

[6] E. W. Riptanti, H. Irianto, and Mujiyo, “Strategy to improve the sustainability of ‘porang’ (Amorphophallus muelleri Blume) farming in support of the triple export movement policy in Indonesia,” *Open Agric*, vol. 7, no. 1, pp. 566–580, Jan. 2022, doi: 10.1515/opag-2022-0121.

[7] N. Nurlela, N. Ariesta, E. Santosa, and T. Muhandri, “Physicochemical properties of glucomannan isolated from fresh tubers of Amorphophallus muelleri Blume by a multilevel extraction method,” *Food Res*, vol. 6, no. 4, pp. 345–353, Aug. 2022, doi: 10.26656/fr.2017.6(4).580.

[8] I. W. Rai Widarta, A. Rukmini, U. Santoso, Supriyadi, and S. Raharjo, “Optimization of oil-in-water emulsion capacity and stability of octenyl

succinic anhydride-modified porang glucomannan (Amorphophallus muelleri Blume),” *Heliyon*, vol. 8, no. 5, May 2022, doi: 10.1016/j.heliyon.2022.e09523.

[9] R. Anugrahwidya, B. Armynah, and D. Tahir, “Bioplastics Starch-Based with Additional Fiber and Nanoparticle: Characteristics and Biodegradation Performance: A Review,” *Journal of Polymers and the Environment*, vol. 29, no. 11. Springer, pp. 3459–3476, Nov. 01, 2021. doi: 10.1007/s10924-021-02152-z.

[10] M. Rosseto, D. D. C. Krein, N. P. Balbé, and A. Dettmer, “Starch–gelatin film as an alternative to the use of plastics in agriculture: a review,” *Journal of the Science of Food and Agriculture*, vol. 99, no. 15. John Wiley and Sons Ltd, pp. 6671–6679, Dec. 01, 2019. doi: 10.1002/jsfa.9944.

[11] O. A. Silva *et al.*, “Synthesis and characterization of a low solubility edible film based on native cassava starch,” *Int J Biol Macromol*, vol. 128, pp. 290–296, May 2019, doi: 10.1016/j.ijbiomac.2019.01.132.

[12] L. Anggraini and E. Suprayitno, “The Effect of Variations in Concentration Plasticizer Sorbitol on the Characteristics of Edible Film Made from Tilapia Fish Skin Gelatin (Oreochromis niloticus),” *International Journal of Scientific and Research Publications (IJSRP)*, vol. 11, no. 10, pp. 376–381, Oct. 2021, doi: 10.29322/ijsrp.11.10.2021.p11844.

[13] *Bioplastics for Sustainable Development*. Springer Singapore, 2021. doi: 10.1007/978-981-16-1823-9.

[14] A. Shafqat, A. Tahir, A. Mahmood, A. B. Tabinda, A. Yasar, and A. Pugazhendhi, “A review on environmental significance carbon foot prints of starch based bio-plastic: A substitute of conventional plastics,” *Biocatalysis and Agricultural Biotechnology*, vol. 27. Elsevier Ltd, Aug. 01, 2020. doi: 10.1016/j.bcab.2020.101540.

[15] M. Mujtaba *et al.*, “Lignocellulosic biomass from agricultural waste to the circular economy: A review with focus on biofuels, biocomposites and bioplastics,” *J Clean Prod*, p. 136815, May 2023, doi: 10.1016/j.jclepro.2023.136815.

[16] P. Rabiah, A. Adawiah, R. Azrianingsih, and R. Mastuti, "Effect of Place and Time Storage on the Quality of Tubers Amorphophallus muelleri Blume," *Life Sci*, vol. 9, no. 1, 2019, [Online]. Available: http://blynk.ub.ac.id/microclimate.php

[17] "Growth Response of Porang (Amorphophallus muelleri Blume) Grown with Different Sizes of Bulbils on Saline Soil," *International Journal of Research Studies in Agricultural Sciences*, vol. 6, no. 4, 2020, doi: 10.20431/2454-6224.0604002.

[18] Tjitrosoepomo and 2002. G., *Taksonomi Tumbuhan (Spermatophyta). Yogyakarta: Gadjah Mada University Press*.

[19] H. V. Lee, S. B. A. Hamid, and S. K. Zain, "Conversion of lignocellulosic biomass to nanocellulose: Structure and chemical process," *Scientific World Journal*, vol. 2014, 2014, doi: 10.1155/2014/631013.

[20] S. M. Handayani, F. Widadie, Setyowati, and M. T. Sundari, "Value chain mapping of porang (Amorphophallus muelleri) in Wonogiri Regency," in *IOP Conference Series: Earth and Environmental Science*, Institute of Physics, 2022. doi: 10.1088/1755-1315/1114/1/012026.

[21] U. Habibah Hasyim, N. Pratmono Aji, F. Sari, T. Yuni Hendrawati, and R. Ariatmi Nugrahani, "Characteristics of Edible Film from Rice Bran Starch as Affected by the Concentration of Sorbitol Plasticizer," 2022.

[22] M. K. Marichelvam *et al.*, "Extraction and development of starch-based bioplastics from Prosopis Juliflora Plant: Eco-friendly and sustainability aspects," *Current Research in Green and Sustainable Chemistry*, vol. 5, Jan. 2022, doi: 10.1016/j.crgsc.2022.100296.

[23] P. Jha, "Effect of plasticizer and antimicrobial agents on functional properties of bionanocomposite films based on corn starch-chitosan for food packaging applications," *Int J Biol Macromol*, vol. 160, pp. 571–582, Oct. 2020, doi: 10.1016/j.ijbiomac.2020.05.242.

[24] V. Manigandan, R. Karthik, S. Ramachandran, and S. Rajagopal, "Chitosan Applications in Food Industry," in *Biopolymers for Food Design*, Elsevier Inc., 2018, pp. 469–491. doi: 10.1016/B978-0-12-811449-0.00015-3.

[25] S. (Gabriel) Kou, L. M. Peters, and M. R. Mucalo, “Chitosan: A review of sources and preparation methods,” *International Journal of Biological Macromolecules*, vol. 169. Elsevier B.V., pp. 85–94, Feb. 01, 2021. doi: 10.1016/j.ijbiomac.2020.12.005.

[26] Z. Shariatinia, “Pharmaceutical applications of chitosan,” *Advances in Colloid and Interface Science*, vol. 263. Elsevier B.V., pp. 131–194, Jan. 01, 2019. doi: 10.1016/j.cis.2018.11.008.

[27] N. A. Negm, H. H. H. Hefni, A. A. A. Abd-Elaal, E. A. Badr, and M. T. H. Abou Kana, “Advancement on modification of chitosan biopolymer and its potential applications,” *International Journal of Biological Macromolecules*, vol. 152. Elsevier B.V., pp. 681–702, Jun. 01, 2020. doi: 10.1016/j.ijbiomac.2020.02.196.

[28] M. Flórez, E. Guerra-Rodríguez, P. Cazón, and M. Vázquez, “Chitosan for food packaging: Recent advances in active and intelligent films,” *Food Hydrocolloids*, vol. 124. Elsevier B.V., Mar. 01, 2022. doi: 10.1016/j.foodhyd.2021.107328.

[29] J. Uranga, A. I. Puertas, A. Etxabide, M. T. Dueñas, P. Guerrero, and K. de la Caba, “Citric acid-incorporated fish gelatin/chitosan composite films,” *Food Hydrocoll*, vol. 86, pp. 95–103, Jan. 2019, doi: 10.1016/j.foodhyd.2018.02.018.

[30] H. Wu *et al.*, “Effect of citric acid induced crosslinking on the structure and properties of potato starch/chitosan composite films,” *Food Hydrocoll*, vol. 97, Dec. 2019, doi: 10.1016/j.foodhyd.2019.105208.

[31] M. S. Hernández, L. N. Ludueña, and S. K. Flores, “Citric acid, chitosan and oregano essential oil impact on physical and antimicrobial properties of cassava starch films,” *Carbohydrate Polymer Technologies and Applications*, vol. 5, Jun. 2023, doi: 10.1016/j.carpta.2023.100307.

[32] K. Chuaynukul, M. Nagarajan, T. Prodpran, S. Benjakul, P. Songtipya, and L. Songtipya, “Comparative Characterization of Bovine and Fish Gelatin Films Fabricated by Compression Molding and Solution Casting Methods,” *J Polym*

Environ, vol. 26, no. 3, pp. 1239–1252, Mar. 2018, doi: 10.1007/s10924-017-1030-5.

[33] J. Alipal *et al.*, “A review of gelatin: Properties, sources, process, applications, and commercialisation,” in *Materials Today: Proceedings*, Elsevier Ltd, 2019, pp. 240–250. doi: 10.1016/j.matpr.2020.12.922.

[34] S. Sahraee, J. M. Milani, J. M. Regenstein, and H. S. Kafil, “Protection of foods against oxidative deterioration using edible films and coatings: A review,” *Food Bioscience*, vol. 32. Elsevier Ltd, Dec. 01, 2019. doi: 10.1016/j.fbio.2019.100451.

[35] W. Zhang, J. Chen, Q. Chen, H. Wu, and W. Mu, “Sugar alcohols derived from lactose: lactitol, galactitol, and sorbitol,” *Applied Microbiology and Biotechnology*, vol. 104, no. 22. Springer Science and Business Media Deutschland GmbH, pp. 9487–9495, Nov. 01, 2020. doi: 10.1007/s00253-020-10929-w.

[36] R. U. Hatmi, E. Apriyati, and N. Cahyaningrum, “Edible Coating Quality With Three Types Of Starch And Sorbitol Plasticizer,” in *E3S Web of Conferences*, EDP Sciences, Jan. 2020. doi: 10.1051/e3sconf/202014202003.

[37] M. Rezal Tanjung, I. Rostini, M. Rudyansyah Ismail, and R. Intan Pratama, “Characterization of edible film from catfish (Pangasius sp.) surimi waste water with the addition sorbitol as plasticizer”, [Online]. Available: www.worldnewsnaturalsciences.com

[38] W. S. Lim, S. Y. Ock, G. D. Park, I. W. Lee, M. H. Lee, and H. J. Park, “Heat-sealing property of cassava starch film plasticized with glycerol and sorbitol,” *Food Packag Shelf Life*, vol. 26, Dec. 2020, doi: 10.1016/j.fpsl.2020.100556.

[39] R. Das, A. J. Pattanayak, and S. K. Swain, “Polymer nanocomposites for sensor devices,” in *Polymer-based Nanocomposites for Energy and Environmental Applications: A volume in Woodhead Publishing Series in Composites Science and Engineering*, University of Ottawa Press, 2018, pp. 206–216. doi: 10.1016/B978-0-08-102262-7.00007-6.

[40] T. H. de Almeida, M. Sardela, and F. A. R. Lahr, "X-ray diffraction on aged Brazilian wood species," *Mater Sci Eng B Solid State Mater Adv Technol*, vol. 246, pp. 96–103, Jul. 2019, doi: 10.1016/j.mseb.2019.05.028.

[41] M. Hasan, R. Rusman, I. Khaldun, L. Ardana, M. Mudatsir, and H. Fansuri, "Active edible sugar palm starch-chitosan films carrying extra virgin olive oil: Barrier, thermo-mechanical, antioxidant, and antimicrobial properties," *Int J Biol Macromol*, vol. 163, pp. 766–775, Nov. 2020, doi: 10.1016/j.ijbiomac.2020.07.076.

[42] B. Armynah, R. Anugrahwidya, and D. Tahir, "Composite cassava starch/chitosan/Pineapple Leaf Fiber (PALF)/Zinc Oxide (ZnO): Bioplastics with high mechanical properties and faster degradation in soil and seawater," *Int J Biol Macromol*, vol. 213, pp. 814–823, Jul. 2022, doi: 10.1016/j.ijbiomac.2022.06.038.

[43] S. Mallakpour, F. Sirous, and C. M. Hussain, "A journey to the world of fascinating ZnO nanocomposites made of chitosan, starch, cellulose, and other biopolymers: Progress in recent achievements in eco-friendly food packaging, biomedical, and water remediation technologies," *International Journal of Biological Macromolecules*, vol. 170. Elsevier B.V., pp. 701–716, Feb. 15, 2021. doi: 10.1016/j.ijbiomac.2020.12.163.

[44] S. Strnad, Z. Oberhollenzer, O. Šauperl, T. Kreže, and L. F. Zemljič, "Modifying Properties Of Feather Keratin Bioplastic Films Using Konjac Glucomannan." *Cellulose Chem. Technol*., 53 (9-10), 1017-1027(2019)

[45] J. Sun *et al.*, "Transparent bionanocomposite films based on konjac glucomannan, chitosan, and TEMPO-oxidized chitin nanocrystals with enhanced mechanical and barrier properties," *Int J Biol Macromol*, vol. 138, pp. 866–873, Oct. 2019, doi: 10.1016/j.ijbiomac.2019.07.170.

[46] C. Wu *et al.*, "Novel konjac glucomannan films with oxidized chitin nanocrystals immobilized red cabbage anthocyanins for intelligent food packaging," *Food Hydrocoll*, vol. 98, Jan. 2020, doi: 10.1016/j.foodhyd.2019.105245.

[47] A. Pavinatto, A. V. de Almeida Mattos, A. C. G. Malpass, M. H. Okura, D. T. Balogh, and R. C. Sanfelice, “Coating with chitosan-based edible films for mechanical/biological protection of strawberries,” *Int J Biol Macromol*, vol. 151, pp. 1004–1011, May 2020, doi: 10.1016/j.ijbiomac.2019.11.076.

[48] W. S. Abo-Elseoud, M. L. Hassan, M. W. Sabaa, M. Basha, E. A. Hassan, and S. M. Fadel, “Chitosan nanoparticles/cellulose nanocrystals nanocomposites as a carrier system for the controlled release of repaglinide,” *Int J Biol Macromol*, vol. 111, pp. 604–613, May 2018, doi: 10.1016/j.ijbiomac.2018.01.044.

[49] K. Zheng *et al.*, “Chitosan-acorn starch-eugenol edible film: Physico-chemical, barrier, antimicrobial, antioxidant and structural properties,” *Int J Biol Macromol*, vol. 135, pp. 344–352, Aug. 2019, doi: 10.1016/j.ijbiomac.2019.05.151.

[50] A. Acemi, Ö. Çobanoğlu, and S. Türker-Kaya, “FTIR-based comparative analysis of glucomannan contents in some tuberous orchids, and effects of pre-processing on glucomannan measurement,” *J Sci Food Agric*, vol. 99, no. 7, pp. 3681–3686, May 2019, doi: 10.1002/jsfa.9596.

[51] K. Kasinathan, B. Murugesan, N. Pandian, S. Mahalingam, B. Selvaraj, and K. Marimuthu, “Synthesis of biogenic chitosan-functionalized 2D layered MoS2 hybrid nanocomposite and its performance in pharmaceutical applications: In-vitro antibacterial and anticancer activity,” *Int J Biol Macromol*, vol. 149, pp. 1019–1033, Apr. 2020, doi: 10.1016/j.ijbiomac.2020.02.003.

[52] F. López-Saucedo, L. Buendía-González, H. Magaña, G. G. Flores-Rojas, and E. Bucio, “Crosslinked Chitosan Films Supplemented with Randia sp. Fruit Extract,” *Polymers (Basel)*, vol. 15, no. 12, p. 2724, Jun. 2023, doi: 10.3390/polym15122724.

[53] L. X. Wang, A. R. Lee, Y. Yuan, X. M. Wang, and T. J. Lu, “Preparation and FTIR, Raman and SEM characterizations of konjac glucomannan-KCl electrogels,” *Food Chem*, vol. 331, Nov. 2020, doi: 10.1016/j.foodchem.2020.127289.

[54] M. K. Marichelvam, M. Jawaid, and M. Asim, "Corn and rice starch-based bio-plastics as alternative packaging materials," *Fibers*, vol. 7, no. 4, Apr. 2019, doi: 10.3390/fib7040032.

[55] A. S. Eltaweil, M. S. Ahmed, G. M. El-Subruiti, R. E. Khalifa, and A. M. Omer, "Efficient loading and delivery of ciprofloxacin by smart alginate/carboxylated graphene oxide/aminated chitosan composite microbeads: In vitro release and kinetic studies," *Arabian Journal of Chemistry*, vol. 16, no. 4, Apr. 2023, doi: 10.1016/j.arabjc.2022.104533.

[56] Y. Han, S. Chen, M. Yang, H. Zou, and Y. Zhang, "Inorganic matter modified water-based copolymer prepared by chitosan-starch-CMC-Na-PVAL as an environment-friendly coating material," *Carbohydr Polym*, vol. 234, Apr. 2020, doi: 10.1016/j.carbpol.2020.115925.

[57] S. Agarwal, M. Hoque, N. Bandara, K. Pal, and P. Sarkar, "Synthesis and characterization of tamarind kernel powder-based antimicrobial edible films loaded with geraniol," *Food Packag Shelf Life*, vol. 26, Dec. 2020, doi: 10.1016/j.fpsl.2020.100562.

[58] M. Hasan *et al.*, "Evaluation of the thermomechanical properties and biodegradation of brown rice starch-based chitosan biodegradable composite films," *Int J Biol Macromol*, vol. 156, pp. 896–905, Aug. 2020, doi: 10.1016/j.ijbiomac.2020.04.039.

[59] S. X. Tan *et al.*, "Characterization and Parametric Study on Mechanical Properties Enhancement in Biodegradable Chitosan-Reinforced Starch-Based Bioplastic Film," *Polymers (Basel)*, vol. 14, no. 2, Jan. 2022, doi: 10.3390/polym14020278.

[60] C. L. Luchese *et al.*, "Effect of chitosan addition on the properties of films prepared with corn and cassava starches," *J Food Sci Technol*, vol. 55, no. 8, pp. 2963–2973, Aug. 2018, doi: 10.1007/s13197-018-3214-y.

LAMPIRAN

Lampiran 1. Alat, Bahan dan Prosedur Penelitian

1. Alat Penelitian

Oven

Neraca Analitik

Hot Plate Stirrer

Magnetic Bar

Gelas Beakar 500 mL

Gelas ukur 50 mL

Pipet tetes

Spatula besi

Pengaduk kaca

Cetakan

Guntung

Penggaris

Tanah

Texture Analyzer

X-Ray Diffraction

Fourier Transform Infrared

2. Bahan Penelitian

Aquades

Pati Porang

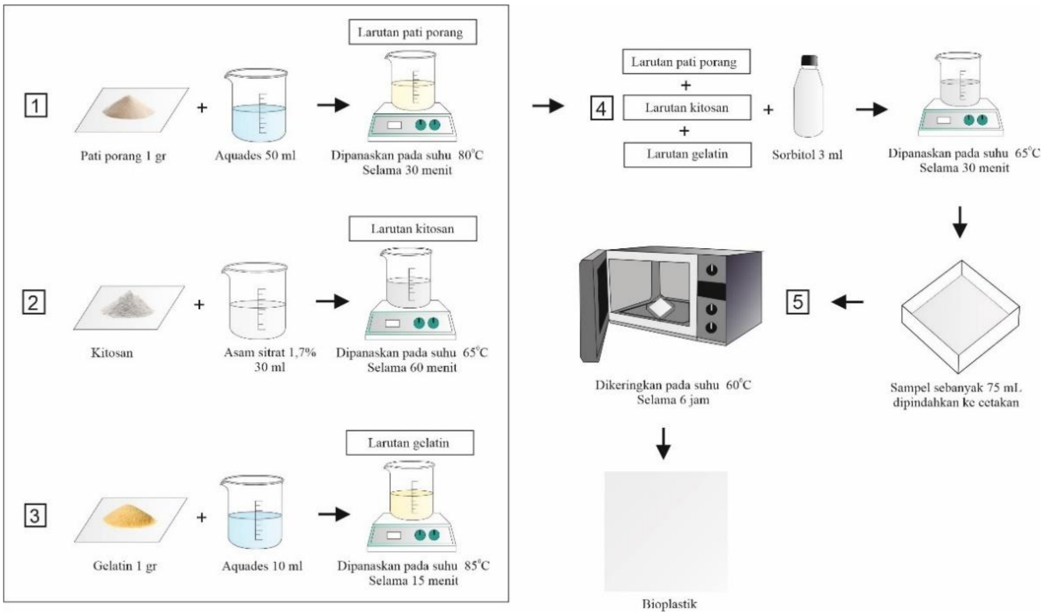
Gelatin

Kitosan

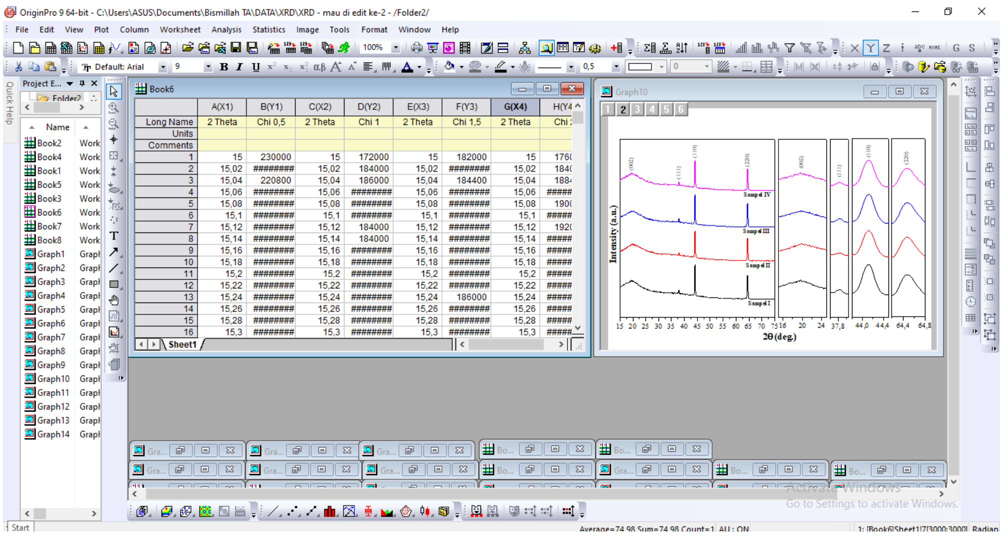
Sorbitol

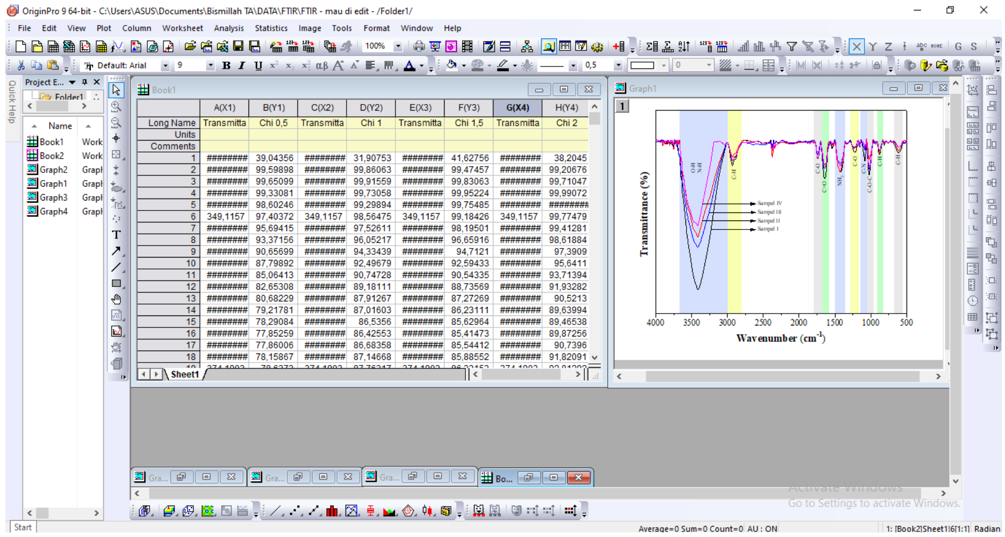
Asam Sitrat 1,7%

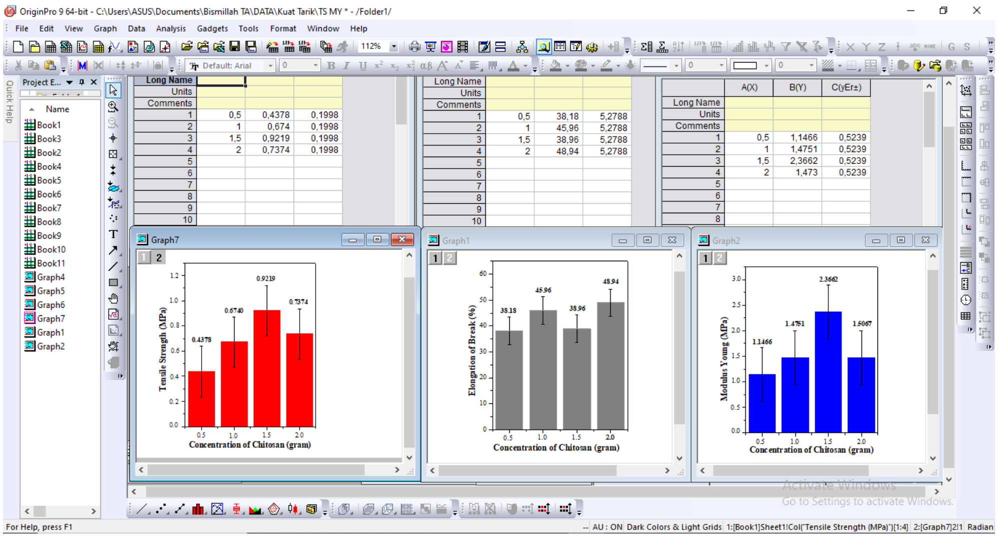
3. Prosedur Penelitian

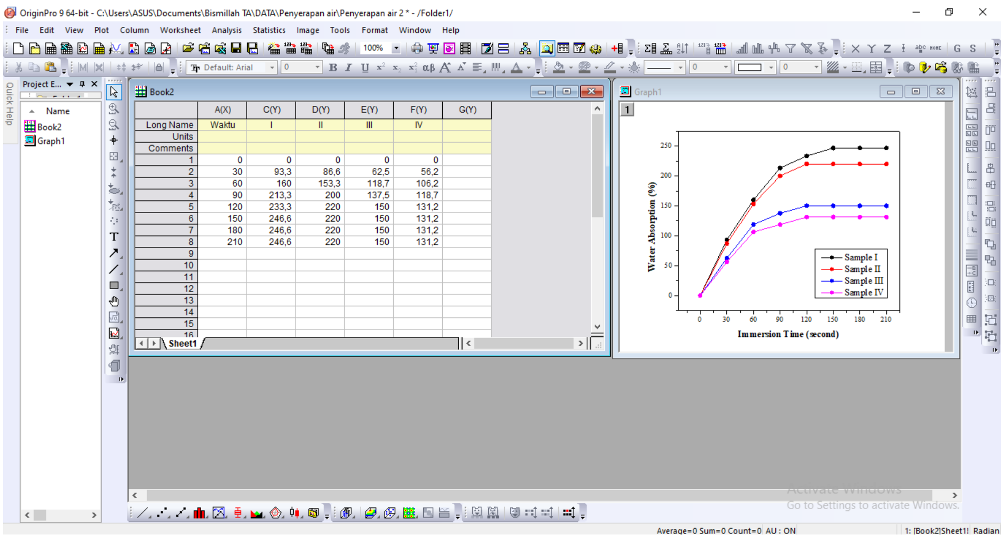


Lampiran 2. Analisis Data




OriginPro 9 64-bit - C:\Users\ASUS\Documents\Bismillah TA\DATA\FTIR\FTIR - mau di edit - /Folder1/
Transmittance (%)
Wavenumber (cm-1)


OriginPro 9 64-bit - C:\Users\ASUS\Documents\Bismillah TA\DATA\Kuat Tarik\TS MY * - /Folder1/
Tensile Strength (MPa)
Concentration of Chitosan (gram)
Elongation of Break (%)
Concentration of Chitosan (gram)
Modulus Young (MPa)
Concentration of Chitosan (gram)


OriginPro 9 64-bit - C:\Users\ASUS\Documents\Bismillah TA\DATA\Penyerapan air\Penyerapan air 2 * - /Folder1/
Water Absorption (%)
Immersion Time (second)
Sample I
Sample II
Sample III
Sample IV

Lampiran 3. Hasil Uji Kekuatan Tarik (Tensile Strength) pada Bioplastik

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LAPORAN PENGUJIAN

Nomor : 2.4656/LU-BBSPJIHPMM/VII/2023

Nomor Analisis : P. 4019
Tanggal Penerimaan : 22 Juni 2023
Nama Pelanggan : Nurafikasari Siregar
Alamat : Fisika, Universitas Hasanuddin
Nama Contoh : Bioplastik
Keterangan Contoh : Kode 915.1309.1, Keadaan Contoh Baik, Chitosan 0,50 g, Untuk Analisis Fisika
Pengambilan Contoh : -
Berita Acara : -
Tanggal Analisis : 23 Juni 2023
Tanggal Penerbitan : 17 Juli 2023

Setelah dilakukan pengujian, diperoleh hasil sebagai berikut :

Parameter	Satuan	Hasil		Metode Uji
		I	II	
Kuat Tarik	N/mm^2	0,6788	0,4378	IK-MT-28.01
Kuat Mulur	%	50,39	38,18	IK-MT-28.01

Koordinator Inspeksi Teknis, Pengujian dan Kalibrasi

MAMANG

Catatan :
- Hasil Uji hanya berlaku untuk contoh tersebut di atas

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Telp: (0411) 441207 Fax: (0411) 441135 Website: www.bbihp.kemenperin.go.id E-mail.: bbihp@kemenperin.go.id

LAPORAN PENGUJIAN

Nomor : 2.4657/LU-BBSPJIHPMM/VII/2023

Nomor Analisis	:	P. 4020
Tanggal Penerimaan	:	22 Juni 2023
Nama Pelanggan	:	Nurafikasari Siregar
Alamat	:	Fisika, Universitas Hasanuddin
Nama Contoh	:	Bioplastik
Keterangan Contoh	:	Kode 915.1309.2, Keadaan Contoh Baik, Chitosan ,1 g, Untuk Analisis Fisika
Pengambilan Contoh	:	-
Berita Acara	:	-
Tanggal Analisis	:	23 Juni 2023
Tanggal Penerbitan	:	17 Juli 2023

Setelah dilakukan pengujian, diperoleh hasil sebagai berikut :

Parameter	Satuan	Hasil		Metode Uji
		I	II	
Kuat Tarik	N/mm^2	0,4507	0,6740	IK-MT-28.01
Kuat Mulur	%	35,52	45,96	IK-MT-28 01

Koordinator Inspeksi Teknis, Pengujian dan Kalibrasi

MAMANG

Catatan :

- *Hasil Uji hanya berlaku untuk contoh tersebut di atas*
- *Dilarang mengutip/menyalin sebagian isi hasil uji ini*

Halaman 1 dari 1

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Telp: (0411) 441207 Fax: (0411) 441135 Website: www.bbihp.kemenperin.go.id E-mail.: bbihp@kemenperin.go.id

LAPORAN PENGUJIAN

Nomor : 2.4658/LU-BBSPJIHPMM/VII/2023

Nomor Analisis	:	P. 4021
Tanggal Penerimaan	:	22 Juni 2023
Nama Pelanggan	:	Nurafikasari Siregar
Alamat	:	Fisika, Universitas Hasanuddin
Nama Contoh	:	Bioplastik
Keterangan Contoh	:	Kode 915.1309.3, Keadaan Contoh Baik, Chitosan 1,5 g, Untuk Analisis Fisika
Pengambilan Contoh	:	-
Berita Acara	:	-
Tanggal Analisis	:	23 Juni 2023
Tanggal Penerbitan	:	17 Juli 2023

Setelah dilakukan pengujian, diperoleh hasil sebagai berikut :

Parameter	Satuan	Hasil		Metode Uji
		I	II	
Kuat Tarik	N/mm^2	0,9219	0,8820	IK-MT-28.01
Kuat Mulur	%	38,95	51,14	IK-MT-28.01

Koordinator Inspeksi Teknis, Pengujian dan Kalibrasi

MAMANG

Catatan :

- *Hasil Uji hanya berlaku untuk contoh tersebut di atas*
- *Dilarang mengutip/menyalin sebagian isi hasil uji ini*

Halaman 1 dari 1

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LAPORAN PENGUJIAN

Nomor : 2.4659/LU-BBSPJIHPMM/VII/2023

Nomor Analisis	:	P. 4022
Tanggal Penerimaan	:	22 Juni 2023
Nama Pelanggan	:	Nurafikasari Siregar
Alamat	:	Fisika, Universitas Hasanuddin
Nama Contoh	:	Bioplastik
Keterangan Contoh	:	Kode 915.1309.4, Keadaan Contoh Baik, Chitosan 2,0 g, Untuk Analisis Fisika
Pengambilan Contoh	:	-
Berita Acara	:	-
Tanggal Analisis	:	23 Juni 2023
Tanggal Penerbitan	:	17 Juli 2023

Setelah dilakukan pengujian, diperoleh hasil sebagai berikut :

Parameter	**Satuan**	**Hasil**		**Metode Uji**
		I	**II**	
Kuat Tarik	N/mm^2	0,7374	0,5264	IK-MT-28.01
Kuat Mulur	%	50,06	48,94	IK-MT-28.01

Koordinator Inspeksi Teknis, Pengujian dan Kalibrasi

MAMANG

Catatan :
- *Hasil Uji hanya berlaku untuk contoh tersebut di atas*
- *Dilarang mengutip/menyalin sebagian isi hasil uji ini*

Lampiran 4. Hasil Perhitungan Uji Ketahanan Terhadap Air pada Bioplastik

Sampel	Mo (gram)	M1 (gram)						
		30 detik	60 detik	90 detik	120 detik	150 detik	180 detik	210 detik
I	0,15	0,29	0,39	0,47	0,50	0,52	0,52	0,52
II	0,15	0,28	0,38	0,45	0,48	0,48	0,48	0,48
III	0,16	0,26	0,35	0,38	0,40	0,40	0,40	0,40
IV	0,16	0,25	0,33	0,35	0,37	0,37	0,37	0,37

Sampel	Penyerapan Air (%)						
	30 detik	60 detik	90 detik	120 detik	150 detik	180 detik	210 detik
I	93,3	160	213,3	233,3	246,6	246,6	246,6
II	86,6	153,3	200	220	220	220	220
III	62,5	118,7	137,5	150	150	150	150
IV	56,2	106,2	118,8	131,2	131,2	131,2	131,2

Ket: M_0 = Massa awal sebelum perendaman (gram)

M_1 = Massa akhir setelah perendaman (gram)

1. Konsentrasi 0,5 gram kitosan

   Dik: M_0 = 0,15 gram

   $M_1 \rightarrow$ 30 detik = 0,29 gram, 60 detik = 0,39 gram, 90 detik = 0,47 gram, 120 detik = 0,50 gram, 150 detik = 0,52 gram, 180 detik = 0,52 gram, 210 detik = 0,52 gram.

   Dit: Penyerapan air (%)….?

   Penyelesaian:

$$\text{Penyerapan air (\%)} = \frac{M1-M0}{M0} \times 100\%$$

$$= \frac{0,29-0,15}{0,15} \times 100\% = 93,3\% \text{ (30 detik)}$$

$$= \frac{0,39-0,15}{0,15} \times 100\% = 160\% \text{ (60 detik)}$$

$$= \frac{0,47-0,15}{0,15} \times 100\% = 213,3\% \text{ (90 detik)}$$

$= \frac{0,50-0,15}{0,15}$ x 100% = 233,3% (120 detik)

$= \frac{0,52-0,15}{0,15}$ x 100% = 246,6% (150 detik)

$= \frac{0,52-0,15}{0,15}$ x 100% = 246,6% (180 detik)

$= \frac{0,52-0,15}{0,15}$ x 100% = 246,6% (210 detik)

2. Konsentrasi 1 gram kitosan

Dik: M_0 = 0,15 gram

$M_1 \rightarrow$ 30 detik = 0,28 gram, 60 detik = 0,38 gram, 90 detik = 0,45 gram, 120 detik = 0,48 gram, 150 detik = 0,48 gram, 180 detik = 0,48 gram, 210 detik = 0,48 gram.

Dit: Penyerapan air (%)….?

Penyelesaian:

Penyerapan air (%) $= \frac{M1-M0}{M0}$ x 100%

$= \frac{0,28-0,15}{0,15}$ x 100% = 86,6% (30 detik)

$= \frac{0,38-0,15}{0,15}$ x 100% = 153,3% (60 detik)

$= \frac{0,45-0,15}{0,15}$ x 100% = 200% (90 detik)

$= \frac{0,48-0,15}{0,15}$ x 100% = 220% (120 detik)

$= \frac{0,48-0,15}{0,15}$ x 100% = 220% (150 detik)

$= \frac{0,48-0,15}{0,15}$ x 100% = 220% (180 detik)

$= \frac{0,48-0,15}{0,15}$ x 100% = 220% (210 detik)

3. Konsentrasi 1,5 gram kitosan

Dik: M_0 = 0,16 gram

$M_1 \rightarrow$ 30 detik = 0,26 gram, 60 detik = 0,35 gram, 90 detik = 0,38 gram, 120 detik = 0,40 gram, 150 detik = 0,40 gram, 180 detik = 0,40 gram, 210 detik = 0,40 gram.

Dit: Penyerapan air (%)….?

Penyelesaian:

Penyerapan air (%) $= \frac{M1-M0}{M0}$ x 100%

$= \frac{0,26-0,16}{0,16}$ x 100% = 62,5% (30 detik)

$= \frac{0,35-0,16}{0,16}$ x 100% = 118,7% (60 detik)

$= \frac{0,38-0,16}{0,16}$ x 100% = 137,5% (90 detik)

$= \frac{0,40-0,16}{0,16}$ x 100% = 150% (120 detik)

$= \frac{0,40-0,16}{0,16}$ x 100% = 150% (150 detik)

$= \frac{0,40-0,16}{0,16}$ x 100% = 150% (180 detik)

$= \frac{0,40-0,16}{0,16}$ x 100% = 150% (210 detik)

4. Konsentrasi 2 gram kitosan

Dik: M_0 = 0,16 gram

$M_1 \rightarrow$ 30 detik = 0,25 gram, 60 detik = 0,33 gram, 90 detik = 0,35 gram, 120 detik = 0,37 gram, 150 detik = 0, 37 gram, 180 detik = 0, 37 gram, 210 detik = 0, 37 gram.

Dit: Penyerapan air (%)….?

Penyelesaian:

Penyerapan air (%) $= \frac{M1-M0}{M0}$ x 100%

$= \frac{0,25-0,16}{0,16}$ x 100% = 56,2% (30 detik)

$= \frac{0,33-0,16}{0,16}$ x 100% = 106,2% (60 detik)

$= \frac{0,35-0,16}{0,16}$ x 100% = 118,7% (90 detik)

$= \frac{0,37-0,16}{0,16}$ x 100% = 131,2% (120 detik)

$= \frac{0,37-0,16}{0,16}$ x 100% = 131,2% (150 detik)

$= \frac{0,37-0,16}{0,16}$ x 100% = 131,2% (180 detik)

$= \frac{0,37-0,16}{0,16}$ x 100% = 131,2% (210 detik)