

REFERENCES

- Adlin, I.A., Sebastiani, Y. & Hidayanti, T.N., 2020. Karakterisasi Pembuatan Edible Film dengan Variabel Kombinasi Tepung Konjak dan Karagenan Serta Konsentrasi Gliserol. *Jurnal Ilmiah Teknik Kimia*, 4(2), pp.88-95.
- Agustina, S., Muliadi. & Helena, S., 2023. Struktur Komunitas Makroalga di Perairan Bagian Selatan Pulau Kabung Kabupaten Bengkayang Kalimantan Barat. *Jurnal Laut Khatulistiwa*, 6(1), pp.50-57.
- Alaydin, S., Bhernama, G.B. & Yulian, M., 2020. Literature Review: Perbandingan Kadar Selulosa dari Rumput Laut Merah (Rhodophyta). *Ar-Raniry Chemistry Journal*, 1(2), pp.33-37.
- Allouache, A., Majda, A., Toudert, A.Z., Amrane, A. & Ballesteros, M., 2021. Cellulosic Bioethanol Production from *Ulva Lactuca* Macroalgae. *Cellulose Chemistry and Technology*, 55(5-6), pp.629-635.
- Alzate-Gaviria, L., Domínguez-Maldonado, J., Chablé-Villacís, R., Olguin-Maciél, E., Leal-Bautista, R. M., Canché-Escamilla, G., Caballero-Vázquez, A., Hernández-Zepeda, C., Barredo-Pool, F. A. & Tapia-Tussell, R., 2020. Presence of Polyphenols Complex Aromatic “Lignin” in *Sargassum* spp. from Mexican Caribbean. *Journal of Marine Science and Engineering*, 9(1), pp.1-10.
- Amir, H. & Ari, B.S., 2022. Effect of Isolation Method on Characteristics of Microcrystalline Cellulose from Brown Seaweed *Sargassum vulgare*. *Indonesian Journal of Pharmacy*, 33(1), pp.42-51.
- Balakrishnan, P., Geethamma, V.G., Gopi, S., Thomas, M.G., Kunaver, M., Huskić, M., Kalarikkal, N., Volova, T., Rouxel, D. & Thomas, S., 2019. Thermal, Biodegradation and Theoretical Perspectives on Nanoscale Confinement in Starch Cellulose Nanocomposite Modified Via Green Crosslinker Rights and Content. *International Journal of Biological Macromolecules*, 134, pp.781-790.
- Bar-Shai, N., Sharabani-Yosef, O., Zollmann, M., Lesman, A. & Golberg, A., 2021. Seaweed Cellulose Scaffolds Derived from Green Macroalgae for Tissue Engineering. *Scientific Reports*, 11, pp.1-17.
- Bogolitsyn, K., Parshina, A. & Aleshina, L., 2020. Structural Features of Brown Algae Cellulose. *Cellulose*, 27(17), pp.9787-9800.
- Boroujeni, F.M., Fioravanti, G. & Kander, R., 2024. Synthesis and Characterization of Cellulose Microfibril-Reinforced Polyvinyl Alcohol Biodegradable Composites. *Materials*, 17(2), pp.1-18.
- Carpena, M., Perez, P. G., Oliveira, P.G., Chamorro, F., Otero, P., Lopes, C.L., Cao, H., Gandara, J.S. & Prieto, M.A., 2022. Biological Properties and Potential of Compounds Extracted from Red Seaweeds. *Phytochemistry Reviews*, 22, pp.1509-1540.
- Cebrián-Lloret, V., Martínez-Abad, A., López-Rubio, A. & Martínez-Sanz, M., 2023. Sustainable Bio-Based Materials from Minimally Processed Red Seaweeds: Effect of Composition and Cell Wall Structure. *Journal of Polymers and the Environment*, 31(3), pp.886-899.

- Cengristitama. & Insan, V.D.N., 2020. Pemanfaatan Limbah Sekam Padi dan Minyak Jelantah Untuk Pembuatan Bioplastik. *Jurnal Technical Education Development Center*, 14(1), pp.15-22.
- Chirilli, C. & Torri, L., 2023. Effect of Biobased Cling Films on Cheese Quality: Color and Aroma Analysis for Sustainable Food Packaging. *Foods*, 12(3672), pp.1-15.
- Davoodi, M.N., Milani, J.M. & Farahmandfar, R., 2020. Preparation and Characterization of A Novel Biodegradable Film Based on Sulfated Polysaccharide Extracted from Seaweed *Ulva intestinalis*. *Food Science and Nutrition*, 9, pp.4108-4116.
- Faisal, M., Žmiri'c, M., Kim, N.Q.N., Bruun, S., Mariniello, L., Famiglietti, M., Bordallo, H.N., Kirkensgaard, J.J.K., Jørgensen, B. & Ulvskov, P., 2023. A Comparison of Cellulose Nanocrystals and Nanofibers As Reinforcements to Amylose-Based Composite Bioplastics. *Coatings*, 13, pp.1-20.
- Folino, A., Karageorgiou, A., Calabrò, P. S. & Komilis, D., 2020. Biodegradation of Wasted Bioplastics in Natural and Industrial Environments: A Review. *Sustainability*, 12(15), pp.1-37.
- Gomaa, M., Al-Badaani, A.A., Hifney, A.F. & Adam, M.S., 2021. Industrial Optimization of Alkaline and Bleaching Conditions for Cellulose Extraction from the Marine Seaweed *Ulva lactuca*. *Journal of Applied Phycology*. 33, pp.4093-4103.
- Hambali, E., Sakti, S.C.W., Fahmi, M.Z., Wahyudianto, F.E., Nuryono, Yessi, P., Yani, M., Sinurat, E. & Pratama, B.S., 2018. Effect of Extraction Time and Na₂CO₃ Concentration on the Characteristics of Alginate Extracted from *Sargassum* sp. *IOP Conference Series: Earth and Environmental Science*, 209, pp.1-7.
- Hermawan, D., Lai, T.K., Jafarzadeh, S., Gopakumar, D.A., Hasan, Owolabi, F.A.T, Aprilia, N.A.S., Rizal, S. & Khalil, H.P.S.A., 2019. Development Seaweed-Based Bamboo Microcrystalline Cellulose Films Intended for Suitanable Food Packaging Applications. *BioResources*, 14(2), pp.3389-3410.
- Hidayati, S., Zulferiyenni. & Satyajaya, W., 2019. Optimasi Pembuatan Biodegradable Film dari Selulosa Limbah Padat Rumput Laut *Eucheuma Cottonii* dengan Penambahan Gliserol, Kitosan, CMC dan Tapioka. *Jurnal Pengolahan Hasil Perikanan Indonesia*, 22(2), pp.340-354.
- Huwaidi, A.F. & Supriyo, E., 2022. Pembuatan Plastik Biodegradable Pati Jagung Terplastisasi Sorbitol dengan Pengisi Selulosa dari Ampas Tebu. *Equilibrium Journal of Chemical Engineering*, 6(1), pp.45-49.
- Indriyawati, N., Supriyanto. & Nabwiyah, N.D.N., 2024. Nutritional composition of *Sargassum* sp. and *Padina* sp. *BIO Web of Conferences*, 127, pp.1-7.
- Ismanto, H., 2022. Uji Organoleptik Keripik Udang (*L. vannamei*) Hasil Penggorengan Vakum. *AgroSainta: Widyaaiswara Mandiri Membangun Bangsa*, 6(2), pp.53-58.
- Kamal, Ahmad, Mardawati, Efri, Purwanto, Heri, E. & Rosalinda, S., 2023. Optimasi Microwave-Assisted Pretreatment dalam Delignifikasi Asam Oksalat Pada Kulit Kakao Menggunakan Response Surface Methodology (RSM). *Agrointek: Jurnal Teknologi Industri Pertanian*. 17(4), pp.724-736.

- Karamanlioglu, M., Preziosi, R. & Robson, G.D., 2017. Abiotic and Biotic Environmental Degradation of the Bioplastic Polymer Poly(Lactic Acid): A Review. *Polymer Degradation and Stability*, 137, pp.122-130.
- Kidgell, J.T., Magnusson, M., de Nys, R. & Glasson, C.R.K., 2019. Ulvan: A Systematic Review of Extraction, Composition and Function. *Algal Research*, 39, pp.1-20.
- Lismeri, L., Agustina, E., Darni, Y., Agustin, N. & Damara, N., 2020. Preparasi dan Karakterisasi Mikrokristalin Selulosa dari Limbah Batang Ubi Kayu. *Jurnal Teknologi dan Inovasi Industri*, 1(1), pp.28-36.
- Lu, Z., Huang, J., E, S., Li, J., Si, L., Yao, C., Jia, F. & Zhang, M., 2020. All Cellulose Composites Prepared By Hydroxyethyl Cellulose and Cellulose Nanocrystals Through the Crosslink of Polyisocyanate. *Carbohydrate Polymers*, 250, pp.1-8.
- Machado, B., Costa, S.M., Costa, I., Fangueiro, R. & Ferreira, D.P., 2024. the Potential of Algae As A Source of Cellulose and Its Derivatives for Biomedical Applications. *Cellulose*, 31, pp.3353-3376.
- Marda S.R, H., Mutiar, S. & Kasim, A., 2023. Effect of NaOH Concentration in the Pulpig Process on Yield and Organoleptic of Art Paper from *Citronella* Distillation Waste. *Agroindustrial Technology Journal*, 7(3), pp.141-152.
- Meziane, H., Laita, M., Azzaoui, K., Boulouiz, A., Neffa, M., Sabbahi, R., Nandiyanto, A.B.D., El Idrissi, A., Abidi, N., Siaj, M. & Touzani, R., 2024. Nanocellulose Fibers: A Review of Preparation Methods, Characterization Techniques, and Reinforcement Applications. *Moroccan Journal of Chemistry*, 12(1), pp.305-343.
- Mouga, T., Almeida, M.M., Pitacas, F.I., Rodrigues, A.M., Vitória, C. & Anjos, O., 2025. Elemental and Nutritional Characterisation with Vibrational Spectroscopy Analysis of *Ulva* sp., *Gracilaria multipartita*, and *Sargassum muticum*. *Applied Sciences*, 15(8), pp.1-24.
- Mulyadi, I., 2019. Isolasi dan Karakterisasi Selulosa: Review. *Jurnal Sains dan Matematika Unpam*, 1(2), pp.177-182.
- Nairfana. & Ramdhani, M., 2021. Karakteristik Fisik Edible Film Pati Jagung (*Zea mays* L) Termodifikasi Kitosan dan Gliserol. *Jurnal Sains Teknologi & Lingkungan*, 7(10), pp.91-102.
- Naserifar, S., Koschella, A., Heinze, T., Bernin, D. & Hasani, M., 2023. Investigation of Cellulose Dissolution in Morpholinium-Based Solvents: Impact of Solvent Structural Features on Cellulose Dissolution. *RSC Advances*, 13(27), pp.18639-18650.
- Nissa, R.C., Abdullah, A.H.D., Firdiana, B., Kosasih, W., Endah, E.S., Marliah, S. & Rahmat, A., 2023. Characterization of Microcrystalline Cellulose from Red Seaweed *Gracilaria verucosa* and *Eucheuma cottonii*. *IOP Conference Series*, 1201(1), pp.1-8.
- Nokling-Eide, K., Tan, F., Wang, S., Zhou, Q., Gravdahl, M., Langeng, A., Bulone, V., Aachmann, F.L., Sletta, H., Arlov, O., 2023. Acid Preservation of Cultivated Brown Algae *Saccharina latissima* and *Alaria esculenta* and Characterization of Extracted Alginate and Cellulose. *Algal Research*, 71, pp. 1-11.

- Nurfauzi, S., Sutan, S.M., Argo, B.D. & Djoyowasito, G., 2018. Pengaruh Konsentrasi CMC dan Suhu Pengeringan Terhadap Sifat Mekanik dan Sifat Degradasi pada Plastik Biodegradable Berbasis Tepung Jagung. *Jurnal Keteknikan Pertanian Tropis dan Biosistem*, 6(1), pp.90-91.
- Nurhayati, Irianto, H.E., Supriyanto, A., Kusumawati, R., Basmal, J., Munifah, I., Setiawati, N.P., Kusumaningrum, W.B., Amanda, P., Roziafanto, A.N., Riastuti, R. & Chalid, M., 2025. Isolation and Characterization of Cellulose Microfibril (MFC) from *Gracilaria* sp. with Different Quality Grades. *Science and Technology Indonesia*, 10(3), pp.712-724.
- Pakidi, C.S. & Suwoyo, H.S., 2017. Potensi dan Pemanfaatan Bahan Aktif Alga Cokelat *Sargassum* sp. *Octopus: Jurnal Ilmu Perikanan*, 6(1), pp.551-562.
- Panggabean, J.E., Dotulong, V., Montolalu, R.I., Damongilala, L.J., Harikedua, S. D. & Makapedua, D.M., 2018. Ekstraksi Karaginan Rumput Laut Merah (*Kappaphycus alvarezii*) dengan Perlakuan Perendaman dalam Larutan Basa. *Media Teknologi Hasil Perikanan*, 6(3), pp.65-70.
- Pari, R.F., Uju, U., Hardiningtyas, S.D., Ramadhan, W., Wakabayashi, R., Goto, M. & Kamiya, N., 2025. *Ulva* Seaweed-Derived Ulvan: A Promising Marine Polysaccharide As A Sustainable Resource for Biomaterial Design. *Marine Drugs*, 23(2), pp.1-28.
- Poeloengasih, C.D., Srianisah, M., Jatmiko, T.H. & Prasetyo, D.J., 2019. Postharvest Handling of the Edible Green Seaweed *Ulva Lactuca*: Mineral Content, Microstructure, and Appearance Associated It Rinsing Water and Drying Methods, *IOP Conference Series: Earth and Environmental Science*, 253, pp.1-6.
- Puja, L.M., Azmin, N. & Ariyansyah., 2024. Keragaman Makro Alga Berdasarkan Karakter Morfologis di Pantai Ria Kecamatan Woja Kabupaten Dompu. *Jurnal Sains dan Terapan*, 3(1), pp.17-24.
- Rama, D.L., Lavarias, E.M.J. & Monserate, J., 2019. Synthesis, Characterization, Fabrication and Application of Electrospun Nanofiber Polymer Composite: A Potential Bio-Material for Black Mold Rot (*Aspergillus niger*) of Onions (*Allium cepa* L.). *Journal of Physics: Conference Series*. 1310, pp.1-9.
- Ramadhan, N.H., Munawaroh, Z., Irawan, A.P. & Sayekti, T., 2023. Pengembangan Biodegradable Plastic Berbasis Singkong Genderuwo Berpenguat Nanoselulosa Kulit Durian dengan Ekstrak Kayu Secang Sebagai Antimikroba. *Jurnal Tadris IPAIndonesia*, 3(3), pp.293-302.
- Rashad, S. & El-Chaghabby, G.A., 2020. Marine Algae in Egypt: Distribution, Phytochemical Composition and Biological Uses As Bioactive Resources (A Review). *Egyptian Journal of Aquatic Biology and Fisheries*, 24(5), pp.147-160.
- Risdianto, W., Ahmad, A. & Ermawar, A., 2023. Synthesis of Cellulose Acetate (CA) from Algae *Gracilaria* sp. Composited With Nickel Oxide (NiO) As A Supercapacitor Base Material. *Communications in Science and Technology*, 8(1), pp.87-92.
- Risqan, A., Tamrin., Faradilla, F.R. & Rejeki, S., 2024. Pengembangan Bioplastik Hidrofobik Berbasis Nanoselulosa Kulit Biji Kakao (*Theobroma cacao* L.) dengan Metode Coating. *Jurnal Teknologi Pangan dan Produk Pertanian Inovatif*, 2(1), pp.21-28.

- Rodríguez-Quesada, J., Rodríguez Mora, K., Bernal-Samaniego, C.A., Jirón-García, E.G. & Rojas-Alvarado, C., 2024. Development of Nanocellulose Hydrogels from *Sargassum* Seaweed as Controlled Nutrient Release Systems and their Application in Germination. *Ecological Engineering and Environmental Technology*, 25(11), pp.308-320.
- Rompas, I.F.X. & Gasah, O., 2022. Efektifitas Ekstrak Rumput Laut Hijau (*Ulva Lactuca*) Terhadap Aktivitas Antioksidan Sebagai Sumber Pangan Berkelanjutan. *Bio-Edu: Jurnal Pendidikan Biologi*, 7(3), pp.172-189.
- Rusliman, D., Wicaksono, R. & Wibowo, C., 2025. Formulasi dan Karakterisasi Biodegradable Film Berbahan Chitosan dan Sodium Alginate dengan Kombinasi Pati Ganyong dan Konjak Glukomanan. *Agrointek*, 19(2), pp.297-309.
- Sánchez-Gutiérrez, M., Bascón-Villegas, I., Espinosa, E., Carrasco, E., Pérez-Rodríguez, F. & Rodríguez, A., 2021. Cellulose Nanofibers from Olive Tree Pruning as Food Packaging Additive of a Biodegradable Film. *Foods*, 10(7), pp.1-15.
- Sanger, G., Wonggo, D., Montolalu, L.A.D.Y. & Dotulong, V., 2022. *Pigments Constituents, Phenolic Content and Antioxidant Activity of Brown Seaweed Sargassum sp.* In: *IOP Conference Series: Earth and Environmental Science*. Institute of Physics.
- Simon, C., McHale, M. & Sulpice, R., 2022. Applications of *Ulva* Biomass and Strategies to Improve Its Yield and Composition: A Perspective for *Ulva* Aquaculture. *Biology*, 11, pp.1-17.
- Sofiana, M.S.J. & Warsidah., 2023. Potensi Sitotoksik dan Antibakteri dari Ekstrak Metanol *Sargassum* sp Asal Perairan Pulau Kabung Kalimantan Barat. *Journal of the Indonesian Society of Integrated Chemistry*, 15(1), pp.48-55.
- Sundararajan, S.M.V. & Mani, M., 2024. Biodegradable Edible Microbial Cellulose-Based Film for Sustainable Packaging from Lab to Land: Physicomechanical Study. *International Journal of Experimental Research and Review*, 39, pp.142-153.
- Susilowati, S., Humaidi, F.A., Fachri, B.A., Palupi, B., Rizkiana, M.F., Rahmawati, I. & Amini, H.W., 2024. Optimization of Chlorophyll Extraction from *Ulva* Sp. with Ultrasound-Assisted Liquid Biphasic Systems Method. *Indonesian Journal of Science and Education*, 8(1), pp.26-41.
- Thapliyal, C., Priya, A., Singh, S.B., Bahuguna, V. & Daverey, A., 2024. Potential Strategies for Bioremediation of Microplastic Contaminated Soil. *Environmental Chemistry and Ecotoxicology*, 6, pp.117-131.
- Tarmizi, A., Diniarti, N. & Azhar, F., 2022. Analisis Kesesuaian Lokasi di Perairan Pulau Lombok untuk Pengembangan Budidaya Rumput Laut (*Gracilaria* sp.). *Indonesian Journal of Aquaculture Medium*, 2(2), pp.190-205.
- Tirpan, D.R.C., Koncsag, C.I. & Dobre, T., 2020. Cellulose Fibers Extraction from *Ulva lactuca* from the Black Sea. *Ovidius University Annals of Chemistry*, 31(2), pp.158-162.
- Ummat, V., Sivagnanam, S.P., Rajauria, G., O'Donnell, C. & Tiwari, B.K., 2021. Advances In Pre-Treatment Techniques and Green Extraction Technologies for

- Bioactives from Seaweeds. *Trends in Food Science & Technology*, 110, pp.90-106.
- Unsa, L.K. & Paramastri, G.A., 2018. Kajian Jenis Plasticizer Campuran Gliserol dan Sorbitol Terhadap Sintesis dan Karakterisasi Edible Film Pati Bonggol Pisang Sebagai Pengemas Buah Apel. *Jurnal Kompetensi Teknik*, 10(1), pp.35-47.
- Vladu, M.I. & Sariciftci, N.S., 2024. Natural Polymers for Emerging Technological Applications: Cellulose, Lignin, Shellac and Silk. *Polymer International*, 74, pp. 71-86.
- Yahaya, W.A., Azman, N.A.M., Adam, F., Subramaniam, S.D., Hamid, K.H.A & Almajano, M.P., 2023. Exploring the Potential of Seaweed Derivatives for the Development of Biodegradable Plastics: A Comparative Study. *Polymers*, 15(13), pp.1-18.
- Yudiati, E., A. Ridlo, A.A. Nugroho, S. Sedjati. & L. Maslukah., 2020. Analisis Kandungan Agar, Pigmen dan Proksimat Rumput Laut *Gracilaria* sp. Pada Reservoir dan Biofilter Tambak Udang *Litopenaeus Vannamei*. *Buletin Oseanografi Marina*, 9(2), pp.133-140.
- Zainuddin., 2023. Potensi Pengolahan dan Pengelolaan Budidaya Rumput Laut (*Kappaphycus alvarezii*) di Wilayah Provinsi Kalimantan Utara. *Jurnal Teknologi Pangan dan Agroindustri Perkebunan*, 3(1), pp.1-17.
- Zhu, X., Healy, L., Das, R.S., Bhavya, M.L., Karuppusamy, S., Sun, D., Donnell, C. & Tiwari, B.K., 2023. Novel Biorefinery Process for Extraction of Laminarin, Alginate and Protein from Brown Seaweed Using Hydrodynamic Cavitation, *Algal Research*, 74, pp.1-8.