

DAFTAR PUSTAKA

- Aberoumand, A. dan Hoseinian, M. 2025. Extraction of Chitosan from shells of crab (*Liocarcinus vernalis*). *Applied Food Research*. **5**(1): 1–8.
- Abirami, S., Nagarajan, D., Samrot, A. V., Mini Varsini, A., Sugasini, A., dan Anand, D. A. 2021. Extraction, characterization, and utilization of shrimp waste chitin derived chitosan in antimicrobial activity, seed germination, preservative, and microparticle formulation. *Biointerface Research in Applied Chemistry*. **11**(2): 8725–8739.
- Adekanmi, A. A., Adekanmi, S. A., dan Adekanmi, S. O. 2020. Different Processing Sequential Protocols for Extraction, Quantification and Characterization of Chitosan from Cray Fish. *International Journal of Engineering and Information Systems (IJEAIS)*. **4**(4): 47–61.
- Adella, A. S., Yudiati, E., dan Sedjati, S. 2023. Suplementasi Alginat dan Spirulina Meningkatkan Ketahanan Udang *Litopenaeus vannamei* Terhadap Pajanan Salinitas. *Journal of Marine Research*. **12**(4): 655–662.
- Ahmed, A., Hassan, A., dan Nour, M. 2020. Utilization of chitosan extracted from shrimp shell waste in wastewater treatment as low cost biosorbent. *Egyptian Journal of Chemistry*. **64**(2): 981–988.
- Aini, N. A., Munfarida, I., dan Nurmaningsih, D. R. 2023. Efektifitas Limbah Kulit Udang dalam Menurunkan CO dari Kendaraan Bermotor. *Jurnal Serambi Engineering*. **VIII**(1): 4907–4916.
- Aldila, H., Asmar, Fabiani, V. A., Dalimunthe, D. Y., dan Irwanto, R. 2020a. The effect of deproteinization temperature and NaOH concentration on deacetylation step in optimizing extraction of chitosan from shrimp shells waste. *IOP Conference Series: Earth and Environmental Science*. **599**(1): 1–6.
- Aldila, H., Asmar, A., Fabiani, V. A., Dalimunthe, D. Y., Megiyo, M., dan Irwanto, R. 2020b. Pengaruh Temperatur Deproteinasi Pada Deasetilasi Kitin Cangkang Udang Krosok (*Penaeus semisulcatus*) Terhadap Adsorpsi Logam Besi (Fe). *Stannum : Jurnal Sains dan Terapan Kimia*. **2**(1): 31–35.
- Aldila, H., Fabiani, V. A., dan Dalimunthe, D. Y. 2021. The effect of deproteinization temperature on chitosan extraction for iron metal ions adsorption: Case study in Bangka post tin mining water. *Journal of Physics: Conference Series*. **1869**(1): 1–5.
- Amor, I. Ben, Hemmami, H., Laouini, S. E., Abdelaziz, A. G., dan Barhoum, A. 2024. Influence of chitosan source and degree of deacetylation on antibacterial activity and adsorption of AZO dye from water. *Biomass Conversion and Biorefinery*. **14**(14): 16245–16255.
- Anggreini, D., Yuandani, Y., dan Sinaga, S. M. 2023. Isolation of Chitosan From Dogol Shrimp Skin (*Parapenaeopsis sculptilis*). *International Journal of Science, Technology & Management*. **4**(1): 69–72.
- Apriliani, D., Handayani, L., Putri, N., Zuhrayani, R., dan Syahputra, F. 2023. Isolasi kitosan dari cangkang udang pisang (*Penaeus* sp.) sebagai spesies endemik di pantai barat Aceh. *Agrointek : Jurnal Teknologi Industri Pertanian*. **17**(3): 599–607.

- Association of Official Analytical Chemists (AOAC). 2005. Official Methods of Analysis. 1–246.
- Badan Standardisasi Nasional (BSN). 2013. SNI 7949:2013 Kitosan-Syarat mutu dan pengolahan. 13.
- Bajaj, M., Winter, J., dan Gallert, C. 2011. Effect of deproteination and deacetylation conditions on viscosity of chitin and chitosan extracted from Crangon crangon shrimp waste. *Biochemical Engineering Journal*. **56**(1–2): 51–62.
- Basir, B., Artikel, I., Htchery, L., dan Hasanuddin, U. 2023. Patogenitas dan Pengendalian Infeksi Vibrio sp pada Udang Vaname Menggunakan Ekstrak Daun Miana (*Coleus scutellarioides* (L) Benth). *Musamus Fisheries and Marine Journal*. **5**(2): 9–16.
- Benettayeb, A., Seihoub, F. Z., Pal, P., Ghosh, S., Usman, M., Chia, C. H., Usman, M., dan Sillanpää, M. 2023. Chitosan Nanoparticles as Potential Nano-Sorbent for Removal of Toxic Environmental Pollutants. *Nanomaterials*. **13**(3): 1–25.
- Budiman, M. A., Tarman, K., Hardiningtyas, S. D., dan Nurazizah, M. A. 2024. Exploration of Enzymatic Activity of Marine Endophyte Fungi and Its Application for Chitosan Hydrolysis. *Jurnal Pengolahan Hasil Perikanan Indonesia*. **27**(11): 1035–1049.
- Cahyono, E. 2018. Karakteristik Kitosan Dari Limbah Cangkang Udang Windu (*Panaeus monodon*). *Akuatika Indonesia*. **3**(2): 96–102.
- Caraballo, R. M., Saleh Medina, L. M., Gomez, S. G. J., Vensaus, P., dan Hamer, M. 2021. Turmeric and RGB Analysis: A Low-Cost Experiment for Teaching Acid-Base Equilibria at Home. *Journal of Chemical Education*. **98**(3): 958–965.
- Cheng, J., Zhu, H., Huang, J., Zhao, J., Yan, B., Ma, S., Zhang, H., dan Fan, D. 2020. The physicochemical properties of chitosan prepared by microwave heating. *Food Science and Nutrition*. **8**(4): 1987–1994.
- DecaNet. 2025. *Litopenaeus vannamei* (Boone, 1931) WORMS: <https://www.marinespecies.org/aphia.php?p=taxdetails&id=247789>. Diakses tanggal 7 Februari 2025.
- Desai, N., Rana, D., Salave, S., Gupta, R., Patel, P., Karunakaran, B., Sharma, A., Giri, J., Benival, D., dan Kommineni, N. 2023. Chitosan: A Potential Biopolymer in Drug Delivery and Biomedical Applications. *Pharmaceutics*. **15**(1313): 1–69.
- Eamrat, R., Rujakom, S., Pussayanavin, T., Taweesan, A., Witthayaphirom, C., dan Kamei, T. 2024. Optimizing biocoagulant aid from shrimp shells (*Litopenaeus vannamei*) for enhancing microplastics removal from aqueous solutions. *Environmental Technology and Innovation*. **33**(103457): 1–13.
- Febrinawati, N., Putri, B., dan Hudaidah, S. 2020. Pemanfaatan Limbah Budidaya Udang Vaname (*Litopenaeus vannamei*) Sebagai Media Kultur Chaetoceros amami. *Jurnal Perikanan Unram*. **10**(1): 20–28.
- Fransisca, S. A., Sipahutar, Y. H., dan Prayudi, A. 2024. Karakteristik Kitosan dari Cangkang Udang Windu (*Panaeus monodon*), hal. 361–367, in *Prosiding Seminar Nasional Ikan XII*.
- Generally Recognized As Safe (GRAS). 2012. Chitoclear® shrimp-derived

- chitosan: food usage conditions for general recognition of safety. 1–150.
- Hajijah, ZA, N., Suryati, Meriatna, dan Sulhatun. 2023. Pengaruh Konsentrasi Pelarut Asam Sitrat Dan Suhu Pada Tahap Demineralisasi Terhadap Karakteristik Kitosan Dari Limbah Kulit Udang Vannamei (*Litopenaeus vannamei*). *Chemical Engineering Journal Storage (CEJS)*. **3**(4): 517.
- Hakam, M., Praditama, F., dan Kurniati, E. 2023. Peningkatan Derajat Deasetilasi Dalam Sintesis Kitosan Dari Cangkang Kerang Darah. *Jurnal Teknik Kimia*. **17**(2): 97–104.
- Hamid, M., Dayana, I., Sholeha, D., Siregar, M. F., Roza, I., Junaidi, Rianna, M., dan Wijoyo, H. 2025. Eco-friendly utilization of chitosan from shrimp shells for used lubricating oil cleaning. *Results in Surfaces and Interfaces*. **18**(100368): 1–5.
- Hermawati, A. T., Fajarwati, F. I., dan Widada, S. 2022. Analisis Kadar Nitrogen Total pada Pupuk Padat dengan Metode Kjeldahl di Balai Pengkajian Teknologi Pertanian (BPTP) Yogyakarta. *Indonesian Journal of Chemical Research*. **6**(2): 80–91.
- HIMEDIA. 2025. Chitosan, From Shrimp Shells, hal. 1, in *Labchemicals&BioChemicals*.
- Hosney, A., Ullah, S., dan Barčauskaitė, K. 2022. A Review of the Chemical Extraction of Chitosan from Shrimp Wastes and Prediction of Factors Affecting Chitosan Yield by Using an Artificial Neural Network. *Marine Drugs*. **20**(11): 1–29.
- Ikbāl, A., Chowdhury, S., Bhattacharya, A., Murmu, P., dan Nath, S. 2022. Production and characterization of chitosan extracted from *Penaeus vannamei* (Boone, 1931) shell wastes. *Indian Journal of Animal Health*. **61**(2): 285–294.
- Jiang, Y., Fu, C., Wu, S., Liu, G., Guo, J., dan Su, Z. 2017. Determination of the deacetylation degree of chitooligosaccharides. *Marine Drugs*. **15**(11): 1–14.
- Kamal, D. F. 2023. Proses Demineralisasi Pada Unit Pengolahan Air Di Pt. Xyz. *Jurnal Ilmiah Teknik Mesin*. **3**(1): 34–41.
- Kedang, Y. I., Oktavianawati, I., dan Tea, M. T. D. 2024. Utilization of Windu Shrimp Shell Waste from Malaka-NTT for Chitosan Synthesis: Characterization Study and Application Potential. *Berkala Sainstek*. **12**(4): 157–163.
- Kejla, L., Svoboda, P., Sedláček, J., dan Šimáček, P. 2022. Gravimetric titrations in a modern analytical laboratory: evaluation of performance and practicality in everyday use. *Chemical Papers*. Advance Access published 2022: doi:10.1007/s11696-021-02004-z.
- Kelautan, P. K. 2023. KKP Siap Berkolaborasi dengan K/L Lain Genjot Produksi Udang di 2024 KKP: <https://kkp.go.id/news/news-detail/kkp-siap-berkolaborasi-dengan-kl-lain-genjot-produksi-udang-di-202465c1924c13a3e.html>. Diakses tanggal 7 Februari 2025.
- Kherbache, A., Youcefi, F., Ouahab, L. O., Ouided, D., dan Cherifi, A. 2024. Optimization of Deproteinization and Deacetylation of Shrimp Shell Waste for Chitosan Production Using Fractional Factorial Design (FFD). 0–26.
- Kurniawidi, D. W., Alaa, S., Nurhaliza, E., Safitri, D. O., Rahayu, S., Ali, M., dan

- Amin, M. 2022. Synthesis and Characterization of Nano Chitosan from Vannamei Shrimp Shell (*Litopenaeus vannamei*). *Jurnal Ilmiah Perikanan dan Kelautan*. **14**(2): 380–387.
- Kusmiati, A. R. dan Hayati, N. 2020. Pemanfaatan Kitosan Dari Cangkang Udang sebagai Adsorben Logam Berat Pb pada Limbah Praktikum Kimia Farmasi. *Indonesian Journal of Laboratory*. **3**(1): 6–14.
- Lakshmi, A. S. E. dan Sudaryanto, E. 2022. Analisis Dampak Tayangan Kartun Televisi Pada Perkembangan Bahasa Anak Di Masa Pandemi (Studi Deskriptif Komparatif Pada Tk Srikandi Surabaya). **02**(03): 1–23.
- Leba, M. A. U., Mau, S. D. B., Boelan, E. G., Taek, M. M., Ruas, J. de C., Lawung, Y. D., Ruas, A. de C., Kopon, A. M., dan Ruas, N. A. 2023. Pigmen Umbi Ubi Jalar Ungu dan Rimpang Kunyit: Indikator Ramah Lingkungan dan Murah untuk Eksperimen Titrasi Asam-Basa. *Journal of The Indonesian Society of Integrated Chemistry*. **15**(2): 99–109.
- Liyanage, C. S., Gonapinuwala, S. T., Fernando, C. A. N., dan De Croos, M. D. S. T. 2022. Physico-chemical properties of chitosan extracted from Whiteleg shrimp (*Litopenaeus vannamei*) processing shell waste in Sri Lanka. *Sri Lanka Journal of Aquatic Sciences*. **27**(2): 107.
- Lukum, A., Kadir, A., Sukamto, K., Mohamad, E., Thayban, T., dan Paramata, A. R. 2023. Application of Shrimp Shell Waste Chitosan as Edible Coating to Extend the Shelf-Life of Tomato (*Solanum lycopersicum* L.), hal. 1–10, in *E3S Web of Conferences*.
- Luthfiyana, N., Ratrinia, P. W., Rukisah, Asniar, dan Hidayat, T. 2022. Optimization of Demineralization Stage in Chitosan Extraction from Mangrove Crab Shell (*Scylla* sp.). *Jurnal Pengolahan Hasil Perikanan Indonesia*. **25**(2): 352–363.
- Mahatmanti, W. F., Kusumastuti, E., Jumaeri, Sulistyani, M., Susiyanti, A., Haryati, U., dan Dirgantari, P. S. 2022. Pembuatan Kitin dan Kitosan dari Limbah Cangkang Udang sebagai Upaya Memanfaatkan Limbah menjadi Material Maju, hal. 1–38, in *Book Chapter Kimia*.
- Maia, M. L., Grosso, C., Barroso, M. F., Silva, A., Delerue-Matos, C., dan Domingues, V. F. 2023. Bioactive Compounds of Shrimp Shell Waste from *Palaemon serratus* and *Palaemon varians* from Portuguese Coast. *Antioxidants*. **12**(2): 1–12.
- Mardiana, U. 2021. Isolasi dan Karakterisasi Kitosan pada Kerang Darah (*Anadara granosa*). *Journal of BTH Medical Laboratory Technology*. **1**(1): 1–9.
- Meru, S., Abd, M. H. bin M., dan Wid, N. 2024. The effect of deproteinization temperature on chitosan extraction from shrimp shell in Sabah. *Transactions on Science and Technology*. **11**(4): 242–248.
- Mittal, A., Singh, A., Aluko, R. E., dan Benjakul, S. 2021. Pacific white shrimp (*Litopenaeus vannamei*) shell chitosan and the conjugate with epigallocatechin gallate: Antioxidative and antimicrobial activities. *Journal of Food Biochemistry*. **45**(1): 1–16.
- Mohan, K., Ganesan, A. R., Muralisankar, T., Jayakumar, R., Sathiskumar, P., Uthayakumar, V., Chandirasekar, R., dan Revathi, N. 2020. Recent insights into the extraction, characterization, and bioactivities of chitin and chitosan

- from insects. *Trends in Food Science & Technology*. **105**(1): 17–42.
- Nadia, L. M. H., Suptijah, P., Huli, L. O., dan Nadia, L. O. A. R. 2021. Produksi dan Karakterisasi Kitosan dari Cangkrang Udang Putih (*Litopenaeus vannamei*), hal. 88–94, in *Prosiding Seminar Nasional Perikanan dan Kelautan*.
- Nainggolan, K. N. 2023. Ekstraksi Enzimatis Kitin dan Kitosandari Limbah Udang. *Manfish Journal*. **4**(1): 50–71.
- Nakul, F., Pardede, R., Budiana, B., Mahdaliza, R., dan Wijanarko, H. 2021. Sistem Inspeksi Label Produk Menggunakan Metode Golden Template Comparison dan Konveyor Pemilah. *Journal of Applied Electrical Engineering*. **5**(1): 20–25.
- Natalia, D. A., Dharmayanti, N., dan Dewi, F. R. 2021. The Production of Chitosan from Crab Shell (*Portunus* sp.) at Room Temperature. *Jurnal Pengolahan Hasil Perikanan Indonesia*. **24**(3): 301–309.
- Noguchi, D. 2024. Methyl orange: A brief note on its structural changes. *International Research Journal of Sciece, Technology, Education, and Management*. **4**(2): 50–57.
- Nosa, S. P., R. Karnila, dan A. Diharmi. 2020. Potensi Kappa Karaginan Rumput Laut (*Eucheuma cottonii*) Sebagai Antioksidan Dan Inhibitor Enzim α -Glukosidase. *Berkala Perikanan Terubuk*. **48**: 1–10.
- Öğretmen, Ö. Y., Karsli, B., dan Çağlak, E. 2022. Extraction and Physicochemical Characterization of Chitosan from Pink Shrimp (*Parapenaeus longirostris*) Shell Wastes. *Tarim Bilimleri Dergisi*. **28**(3): 490–500.
- Oktaviansa, N. S., Rahmadi, A., Yuliani, dan Rohmah, M. 2023. Optimasi Enkapsulasi Bubuk Mandai: Pengaruh Rasio Maltodekstrin-Kitosan terhadap Nilai Proximat dan Senyawa Bioaktif. *STPI*. 336–348.
- Pakizeh, M., Moradi, A., dan Ghassemi, T. 2021. Chemical extraction and modification of chitin and chitosan from shrimp shells. *European Polymer Journal*. **159**(2021): 1–17.
- Pal, S., Galui, S., dan Sarkar, S. 2021. Deproteinizing agent, a fore step to better bonding: A literature review. *International Journal of Pedodontic Rehabilitation*. **6**(1): 1–5.
- Pratiwi, S. N., Utami, N., dan Damayanti, P. N. 2022. Extraction Chitosan And Characterization Nanoparticle Chitosan From Pupae Sheels Of Black Soldier Fly (*Hermetia illucens*). *Medical Sains*. **7**(4): 963–972.
- Priyanga, A., Atmaja, L., Santoso, M., Jaafar, J., Santoso, E., Hartanto, D., Adya Salsabila, R., Ningtyas, A., dan Putra Ramdhani, E. 2023. The Potential Development of Shrimp Shell Waste Into Chitosan Originating from Pacitan Coast, Indonesia. *BIO Web of Confernces*. **70**(02002): 1–10.
- Rahmaniah, Isdar, E., dan Rani, S. R. A. 2024. Sintesis dan Karakterisasi Kitosan Berbasis Cangkrang Landak Laut sebagai Kandidat Absorban Logam Berat. *JoP*. **9**(2): 30–36.
- Rini, S., Septoratto, S., Deana, W., dan M. Taufik, F. 2021. Potensi Keberhasilan Kulit Udang Sebagai Bahan Dasar Polimer Kitosan: Studi Literatur. *Jurnal Penelitian dan Karya Ilmiah Lembaga Penelitian Universitas Trisakti*. **6**(1): 132–144.
- Rohyami, Y. dan Sari, N. A. 2021. Simple method on determination of

- deacetylation degree for chitosan. *AIP Conference Proceedings*. **2370**(January).
- Salsabilla, A., Hakim, M. F., Putra, A., dan Fatin, A. 2024. Pengaruh Variasi Konsentrasi KOH dan Waktu Pengadukan Terhadap Nilai Derajat Deasetilasi dan Karakteristik Kitosan dari Cangkang Rajungan. *Innov. J. Sos. Sci. Res.* **4**(1): 6786–6800.
- Setha, B., Rumata, F., Sillaban, B. 2019. Karakteristik Kitosan Dari Kulit Udang Vaname Dengan Menggunakan Suhu dan Waktu Yang Berbeda dalam Proses Deasetilasi. *Jurnal Pengolahan Hasil Perikanan Indonesia*. **22**(3): 498–507.
- Setiati, R., Siregar, S., Wahyuningrum, D., dan Rinanti, A. 2021. Synthesis method of chitin become chitosan polymer from shrimp shells for enhanced oil recovery. *IOP Conference Series: Earth and Environmental Science*. **737**(2021): 1–6.
- Sipahutar, Y. H., Hutapea, N. S., Affifah, R. A., dan Sitorus, P. P. 2024. Isolasi Kitosan dari Limbah Kulit Udang Vaname, hal. 219–233, in *Prosiding Seminar Nasional Perikanan Indonesia ke-25*.
- Sujatmiko, M., Nurilmala, M., dan Tarman, K. 2023. Ekstraksi dan karakterisasi glukosamin dari cangkang udang vaname (*Litopenaeus vannamei*) dengan metode hidrolisis bertekanan. *Jurnal Pengolahan Hasil Perikanan Indonesia*. **26**(2): 326–339.
- Sulistiyawati, L., Foliatini, F., Nurdiani, N., dan Puspita, F. 2022. Isolasi dan Karakterisasi Kitin dan Kitosan dari Pupa *Black Soldier Fly* (BSF). *Warta Akab.* **46**(1): 56–62.
- Thanakkasaranee, S., Jantanasakulwong, K., Phimolsiripol, Y., Leksawasdi, N., Seesuriyachan, P., Chaityaso, T., Jantrawut, P., Ruksiriwanich, W., Sommano, S. R., Punyodom, W., Reungsang, A., Ngo, T. M. P., Thipchai, P., Tongdeesoontorn, W., et al. 2021. High substitution synthesis of carboxymethyl chitosan for properties improvement of carboxymethyl chitosan films depending on particle sizes. *Molecules*. **26**(19): 1–116.
- Tuslinah, L., Widyastuti, L. R., dan Fathurohman, M. 2025. Validation of the Use of Anthocyanin as Indicators for Acid-Base Titration. *Jurnal Kimia Sains dan Aplikasi*. **28**(2): 53–61.
- Wang, K., Zhang, F., Xu, K., Che, Y., Qi, M., dan Song, C. 2023. Modified magnetic chitosan materials for heavy metal adsorption: a review. *RSC Advances*. **13**(10): 6713–6736.