

## DAFTAR PUSTAKA

- Ahuja, I., Dauksas, E., Remme, J. F., Richardsen, R., & Løes, A. K. (2020). Fish and fish waste-based fertilizers in organic farming – With status in Norway: A review. *Waste Management*, *115*, 95–112. <https://doi.org/10.1016/j.wasman.2020.07.025>
- Abdulkareem, M. O., Olukotun, N., Sam, A. R. M., Lim, N. H. A. S., & Olukotun, A. (2020). Biogenic approach for concrete durability and sustainability using effective microorganisms: A review. *Construction and Building Materials*, *261*(119664), 1-9. doi 10.1016/j.conbuildmat.2020.119664.
- Ali, M., Nisak, F., & Ika Pratiwi, Y. (2020). Pemanfaatan Limbah Cair Ikan Tuna Terhadap Pertumbuhan Tanaman Pakcoi Dengan Wick System Hidroponik. *Agro Bali: Agricultural Journal*, *3*(2), 186–193. <https://doi.org/10.37637/ab.v3i2.616>
- Anastasia dkk. (2023). Metode Penelitian Kuantitatif. PT. Sonpedia Publishing Indonesia.
- Andri, K., Yonik, M., & Arif, S. P. (2015). *Reduksi Limbah Ikan Menjadi Pupuk Cair Organik Dengan Variasi Lama Fermentasi Dan Konsentrasi Biokatalisator Em4* *Reduction of Fish Wastes Into Organic Liquid Fertilizer With Variation of Fermentation Time and the Concentration of Em4 Biocatalysator. March*. <https://www.researchgate.net/publication/297377827>
- Andri Kurniawan, Khalis Arrasiksycyah, & Denny Syaputra. (2023). Pengaruh Konsentrasi Biokatalisator Cairan Rusip dalam Mereduksi Limbah Ikan menjadi Pupuk Organik Cair. *Al-Ard: Jurnal Teknik Lingkungan*, *9*(1), 26–36. <https://doi.org/10.29080/alard.v9i1.1796>
- Andriani, D. P. (2014). *Metode Taguchi*. 43.
- Azmi, M. H., Mayasari, A., Sumarsono, & Afiatna, F. A. N. F. (2024). Desain Eksperimen Tahu Dengan Pendekatan Metode Taguchi Di Pabrik Tahu JB. *Jurnal Penelitian Bidang Inovasi & Pengelolaan Industri (INVANTRI)*, *4*(1),

6–18.

- Badan Meteorologi Klimatologi dan Geofisika. (2024, 19 Juli). Suhu Udara Bikin Menggigil, Ternyata ini Penyebabnya!. Diakses dari: <https://www.bmkg.go.id/siaran-pers/suhu-udara-bikin-menggigil-ternyata-ini-penyebabnya>
- Badan Pusat Statistik (2021) *Banyaknya Tempat Pelelangan Ikan (TPI) Menurut Kabupaten/Kota di Jawa Tengah, Badan Pusat Statistik.*
- Barbara & Redman. (2022). Fish Wastes: Present Status of Utilization and Scope of Valorization.289-309. doi: 10.1201/9781003300595-16
- Begum R., dkk. (2024) ‘Fish Waste: Understanding the Pollution Potential and Sustainable Mitigation Strategies’, pp 427-440. Doi: 10.1007/978-981-99-8593-7\_20
- Bernal, M. P., Asuncion, Roig., Miguel, A., Sánchez-Monedero., Concepción, Paredes., D., García. (1996). Nitrogen in Composting: Relevance of the Material and the System Used. 1074-1077. doi: 10.1007/978-94-009-1569-5\_110
- Bluepeacemaldives. 7 Februari 2010. Fish Waste : Potential Revenue Dumped Into The Sea. Diakses pada 25 Januari 2025, dari <https://www.bluepeacemaldives.org/blog/renewable-energy/fish-waste>
- Coppola, D., Lauritano, C., Esposito, F. P., Riccio, G., Rizzo, C., de Pascale, D., & de Pascale, D. (2021). Fish Waste: From Problem to Valuable Resource. *Marine Drugs*, 19(2), 116. <https://doi.org/10.3390/MD19020116>
- Direktorat Jenderal Pengelolaan Kelautan dan Ruang Laut. (2020). *Konservasi Perairan sebagai Upaya Menjaga Potensi Kelautan dan Perikanan Indonesia.*
- Diver, S. (2001). Nature farming and effective microorganisms. rhizosphere ii: Publications, resource lists, and web links from Steve Diver.
- Ekawandani, N., & Anzi Kusuma, A. (2018). Pengomposan Sampah Organik (Kubis Dan Kulit Pisang) Dengan Menggunakan EM4. *Tedc*, 12(1), 38–43.

- FAO. (2020). *The State of World Fisheries and Aquaculture. Sustainability in action*. Doi: <https://doi.org/10.4060/ca9229en>. Rome.
- FAO. (2022). *Fishery and Aquaculture Statistics. Global capture and Aquaculture Production 1950-2020 (FishstatJ)*. In: FAO Fisheries Division [online]. Rome. Updated 2022.
- Fitry Purnamasari, Sri Hardianti Rosadi, Ayu Saputri Bahar, & Wardimansyah Ridwan. (2023). Pelatihan Pemanfaatan Limbah Ikan Menjadi Pupuk Organik Cair (POC) di Kampung Terapung Danau Tempe, Kabupaten Wajo. *ABDIKAN: Jurnal Pengabdian Masyarakat Bidang Sains Dan Teknologi*, 2(4), 558–565. <https://doi.org/10.55123/abdikan.v2i4.2746>
- Giri, L. P., Panjaitan, K. F., Burhannudin, Y., & Ibrahim, A. (2019). *Optimal Conditions of Tool Wear and Surface Roughness of Magnesium Workpiece in Milling Machine with Combination of Taguchi Methods , Grey Relational Analysis and Principal Component Analysis*. 9–10.
- Gomez, M. B., Dorette, S. M., Veronika, H., Lars, SS. J., Jakob, M. (2022). Nutrient interactions and salinity effects on plant uptake of fosforus from waste-based fertilisers. *Geoderma*, 422:115939-115939. doi: 10.1016/j.geoderma.2022.115939
- Hapsari, N., & Welasih, T. (2013). Pemanfaatan Limbah Ikan Menjadi Pupuk Organik. *Jurnal Teknik Lingkungan*, 2(1), 1–6. <https://core.ac.uk/download/pdf/12219482.pdf>
- Hermawan, T. and Sutanto, R. (2022) ‘Strategi Pertahanan Laut Indonesia Dalam Analisa Ancaman Dan Kekuatan Laut.’, *Jurnal Education and Development*, 10(2), 363-371., 10(2), pp. 363–371.
- Hidayati, N. L., Rusmana, Yenny, R. F., & Sulistyorini, E. (2024). Pengaruh jenis dan konsentrasi pupuk organik cair terhadap pertumbuhan bibit jambu air madu deli (*Syzygium samarangense*). 2748(105), 1–75.
- Islamiati, W. (2023). Lirik Ekspor NPK Kala Kebutuhan Nasional Belum Terpenuhi, Ini Kata Pupuk Indonesia. <https://ekonomi.bisnis.com/read/20230213/257/1627618/lirik-ekspor-npk-kala-kebutuhan-nasional-belum-terpenuhi-ini-kata-pupuk-indonesia>.

- Isnaeni, N. (2020). *Enzim*. Universitas Indonesia.
- Kasprzycka, A., Lalak-Kańczugowska, J., Tys, J., Chmielewska, M., & Pawlowska, M. (2018). Chemical stability and sanitary properties of pelletized organo-mineral waste-derived fertilizer. *Archives of Environmental Protection*, *44*(3), 106–113. <https://doi.org/10.24425/122284>
- Katadata.co.id. 6 Agustus 2021. Mengenal Manfaat Nanas dan Cara Mengonsumsinya. Diakses pada 25 Januari 2025, dari <https://katadata.co.id/berita/lifestyle/610d42f6b49c0/mengenal-manfaat-nanas-dan-cara-mengonsumsinya>
- Kataria, P., Jagdeep, S., Manpreet, S., Mavi., Mika, S., Saleh, A. (2024). Residual fosfor availability after soil application of different organic waste in varying soil P status soils. *Heliyon*, doi: 10.1016/j.heliyon.2024.e25732
- Kelautan dan Perikanan dalam Angka. (2022). Kementerian dan Kelautan dan Perikanan.
- Kurdi, P., & Hansawasdi, C. (2015). Assessment of the prebiotic potential of oligosaccharide mixtures from rice bran and cassava pulp. *Lwt*, *63*(2), 1288–1293. <https://doi.org/10.1016/j.lwt.2015.04.031>
- Kurnia, V. C., Sumiyati, S., & Samudro, G. (2017). Pengaruh Kadar Air Terhadap Hasil Pengomposan Sampah Organik Dengan Metode Open Windrow. *Jurnal Teknik Mesin*, *6*(2), 58. <https://doi.org/10.22441/jtm.v6i2.1191>
- Kurniawan, L., Maryudi, M., & Astuti, E. (2024). Utilization of Tofu Liquid Waste as Liquid Organic Fertilizer Using the Fermentation Method with Activator Effective Microorganisms 4 (EM-4): A Review. *Equilibrium Journal of Chemical Engineering*, *8*(1), 100. <https://doi.org/10.20961/equilibrium.v8i1.84056>
- Kusuma, I. M., Syafrudin, & Yulianto, B. (2019). Utilization of Fish Waste Processing as Compost Raw Material in Tambak Lorok Market. *E3S Web of Conferences*, *125*(2019), 9–11. <https://doi.org/10.1051/e3sconf/201912507004>
- Leksono, T., Banjarnahor, R., Irasari, N., & Sidauruk, S. W. (2024). Liquid Organic Fertilizer Produced from Innards Waste of Catfish (*Pangasius djambal*) by

- Using Fermentative Microbes (EM4) and Molasses. *IOP Conference Series: Earth and Environmental Science*, 1328(1). <https://doi.org/10.1088/1755-1315/1328/1/012019>
- Maghfirani, N. N., Amelia, N. N., Setiani, V., & Lesmana, I. (2024). Analisis Variasi Bahan terhadap Kualitas Pupuk Organik Cair ( POC ) Dari Sisa Makanan Analysis of Material Variations to Fertilizer Organic Liquid From Food Waste. *6*(2), 81–90.
- Mardhiah, A., Putri, N., Apriliani, D., & Handayani, L. (2022). Peningkatan Nilai Tambah Kulit Ikan Tuna sebagai Bahan Baku Pupuk Organik Cair. *Jurnal Pascapanen Dan Bioteknologi Kelautan Dan Perikanan*, *17*(2), 135. <https://doi.org/10.15578/jpbkp.v17i2.861>
- Meriatna, M., Suryati, S., & Fahri, A. (2019). Pengaruh Waktu Fermentasi dan Volume Bio Aktivator EM4 (Effective Microorganisme) pada Pembuatan Pupuk Organik Cair (POC) dari Limbah Buah-Buahan. *Jurnal Teknologi Kimia Unimal*, *7*(1), 13. <https://doi.org/10.29103/jtku.v7i1.1172>
- Monica, D. T., Aprilya, R., & Anggun, S. (2024). Inovasi dan Karakteristik BAL Limbah Bonggol Nanas dalam Menghasilkan Enzim Bromelin. 96–106.
- Mulyono, S. E., Riasih, T., Candra, M. F. S., & Islamia, H. (2023). Pemanfaatan Limbah Pengolahan Ikan Menjadi Pupuk Organik Cair (POC) di Desa Randuputih. *Jurnal Peradaban Masyarakat*, *3*(5), 185–188. <https://doi.org/10.55182/jpm.v3i5.306>
- Mustapha, A. N., Zhang, Y., Zhang, Z., Ding, Y., Yuan, Q., & Li, Y. (2021). Taguchi and ANOVA analysis for the optimization of the microencapsulation of a volatile phase change material. *Journal of Materials Research and Technology*, *11*, 667–680. <https://doi.org/10.1016/j.jmrt.2021.01.025>
- Nagendra Prasad MN, N. P., KR, S., & Khatokar M, S. (2011). Health Benefits of Rice Bran - A Review. *Journal of Nutrition & Food Sciences*, *01*(03). <https://doi.org/10.4172/2155-9600.1000108>
- Ni'matul Maula, R., Astuti, A. P., Tri, E., & Maharani, W. (2020). Analisis Efektifitas Penggunaan Eco-enzyme pada Pengawetan Buah Stroberi dan Tomat dengan Perbandingan Konsentrasi. *Prosiding Seminar Edusainstech* ,

4, 434–442.

- Ni Made Darmadi, I Gusti Made Arjana, Dewa Gede Semara Edi, Hitler Sumah, & I Kadek Riko Adi Antara. (2023). Community Partnership Program of Making Liquid Organic Fertilizer from Fish Waste in Pedungan Village, Denpasar. *Asian Journal of Community Services*, 2(6), 453–460. <https://doi.org/10.55927/ajcs.v2i6.4621>
- Niemiec, M., Mudryk, K., Sikora, J., Szelaĝ-Sikora, A., & Komorowska, M. (2018). Possibility to Utilize Fish Processing By-Products in the Context of Management of Non-renewable Resources. *Renewable Energy Sources: Engineering, Technology, Innovation, Springer*, 3, 413–421. <https://doi.org/10.1007/978-3-319-72371-6>
- Nindyapuspa, A., Setiani, V., Astuti, U. P., & Azam, M. A. (2024). EM4 Addition Effect with Eisenia foetida Worms on Compost Characteristics as a Soil Improver. *Jurnal Presipitasi : Media Komunikasi Dan Pengembangan Teknik Lingkungan*, 21(2), 355–368. <https://doi.org/10.14710/presipitasi.v21i2.355-368>
- Nur, T., Noor, A. R., & Elma, M. (2018). Tangga Dengan Penambahan Bliioaktivator EM 4 ( Effective Microorganisms ). *Konversi*, 5(2), 5–12.
- Panisson, R., Paiva Muscope, F., Müller, C., Treichel, H., & Korf, E. P. (2021). Increased quality of small-scale organic compost with the addition of efficient microorganisms. *Revista Brasileira de Ciências Ambientais*, 56(3), 531–540. <https://doi.org/10.5327/z21769478949>
- Pintami, Hasbi, M., & Budijono. (2015). *The effectiveness of EM4 and Acetic Acid activator addition in processing aquaculture waste into liquid fertilizer for the growth of*. 2(2), 1–6.
- Puspitasari, Y., Suryanti., Maimuna, N. (2022). Lama Fermentasi dan Volume Effective Microorganism-4 (EM-4) dalam Pembuatan Pupuk Organik Padat Berbahan Dasar Serbuk Gergaji Kayu dan Kotoran Ayam. *Jurnal Agrotek Mas*. 3 (2), 124-135.
- Putri dkk., (2022). Peningkatan Potensi Ekonomi Masyarakat Desa Pliwetan, Kecamatan Palang, Kabupaten Tuban Melalui Pembuatan dan Pemasaran

- Olahan Nugget Ikan Serta Pemanfaatan Limbah Olahan Ikan Sebagai Alternatif Pupuk Organik Cair. (2022). *Sewagati*, 6(1), 1–9. <https://doi.org/10.12962/j26139960.v6i1.8>
- Putri, M. S. A., Eko, S., Denaya, A. P., Achmad, C. N., Nur, A. A. (2024). The EM4 Addition Affect Water Absorption Time and Compost Quality in Biopore Infiltration Hole. *Jurnal Kesehatan Lingkungan: Jurnal & Aplikasi Teknik Kesehatan Lingkungan*, 21(1):45-58. doi: 10.31964/jkl.v21i1.715
- Prastari, C., Ibrahim, R., & Alhaviz, A. (2024). Testing The Physicochemical Properties Of Liquid Organic Fertilizer Waste Of Spincord Fish (*Channa Striata*). *JURAGAN - Jurnal Agroteknologi*, 2(2), 44–48. <https://doi.org/10.58794/juragan.v2i2.964>
- Qurrotu'aini, N. R., Mawarni, M., Beay, Y., & Nurrochman, N. (2022). Pengaruh EM4 Terhadap Pengolahan Limbah Cair Industri Tahu Menjadi Pupuk Organik Cair. *Jurnal Pengendalian Pencemaran Lingkungan (JPPL)*, 4(1), 7–12. <https://doi.org/10.35970/jppl.v4i1.1097>
- Rohimah, F. H. (2022). Kearifan Lokal Berbasis Mitigasi Bencana Pada Masyarakat Pesisir Kecamatan Adipala Kabupaten Cilacap. *Jurnal Pembelajaran IPS*, 5(3601417036), 26–33.
- Samad, S., A. Mahmud, S., Sabban, H., Haryanto, S., & Abdullah, H. (2021). Pupuk Organik Cair Limbah Ikan (Pocli) dan Produksi Tanaman Selada (*Nasturtium Officinale* R. Br). *Jurnal Sosial Sains*, 1(10), 1188–1192. <https://doi.org/10.59188/jurnalsosains.v1i10.227>
- Sandu, S., & Hallerm, E. (2013). Biodegradation of Nitrogen in a Commercial Recirculating Aquaculture Facility. In *Biodegradation - Engineering and Technology*. <https://doi.org/10.5772/55841>
- Sanes, F. S. M., Strassburger, A. S., Araújo, F. B., & Medeiros, C. A. B. (2015). Waste composting and proving fish for production the organic fertilizers. *Semina: Ciências Agrárias*, 36(3), 1241–1251. <https://doi.org/10.5433/1679-0359.2015v36n3p1241>
- Saropah, D. A., Jannah, A., & Maunatin, A. (2013). Kinetika Reaksi Enzimatis Ekstrak Kasar Enzim Selulase Bakteri Selulolitik Hasil Isolasi Dari Bekatul.

- Alchemy*, 2(1), 35–45. <https://doi.org/10.18860/al.v0i0.2297>
- Sawadikiat, P., Setwipattanachai, P., Chaiseri, S., & Hongsprabhas, P. (2015). Rice phytochemicals concentrated by molecular distillation process and their use as co-surfactant in water dispersion. *Journal of Food Science and Technology*, 52(12), 8014–8022. <https://doi.org/10.1007/s13197-015-1885-1>
- Shenbagavalli, S., Prabu, T., & Dhanushkodi, V. (2023). Nutrient Composition of Fosforus Enriched Compost from Seafood Processing Unit Waste. *International Journal of Plant & Soil Science*, 35(15), 104–110. <https://doi.org/10.9734/ijpss/2023/v35i153083>
- Shift Indonesia. (2012, 15 Januari). *Design of Experiment (DOE)*. <https://shiftindonesia.com/design-of-experiment-doe/>
- Shobib, A. (2020). Pembuatan Pupuk Organik Dari Kotoran Sapi Dan Jerami Padi Dengan Proses Fermentasi Menggunakan Bioaktivator M-Dec. *Jurnal Inovasi Teknik Kimia*, 5(1). <https://doi.org/10.31942/inteka.v5i1.3399>
- Shopee. Diakses pada 25 Januari 2025, dari <https://shopee.co.id/Pupuk-Cair-Organik-EM4-Kuning-untuk-Tanaman-1-Liter-i.125925661.2388041187>
- Shopee. Diakses pada 25 Januari 2025, dari <https://shopee.co.id/Bekatul-Dedak-Padi-Halus-1kg-Pakan-Ayam-bebek-segala-ternak-unggas-i.870705613.22608222369>
- Shripat dkk. (2024). Decomposing Unit for Agricultural Waste. *International Journal of Advanced Research in Science, Communication and Technology*, doi: 10.48175/ijarsct-18219
- Simanjuntak, E. (2023). Sosialisasi Pemanfaatan Limbah Jeroan Ikan Patin (*Pangasius Sp.*) Sebagai Pupuk Organik Cair Di Desa Pulau Semambu Kabupaten Ogan Ilir Sumatera Selatan (Issue April).
- Soares, P. A. G., Vaz, A. F. M., Correia, M. T. S., Pessoa, A., & Carneiro-Da-Cunha, M. G. (2012). Purification of bromelain from pineapple wastes by ethanol precipitation. *Separation and Purification Technology*, 98, 389–395. <https://doi.org/10.1016/j.seppur.2012.06.042>
- Soejanto, I. 2009. *Desain Eksperimen dengan Metode Taguchi*. Yogyakarta: Graha Ilmu.
- Standar Nasional Indonesia 19-7030-2004



- Statistik Perikanan. (2022). Pelabuhan Perikanan Samudera Cilacap
- Statistik Pertanian Organik. (2023).
- Statistik Sumber Daya Laut dan Pesisir. (2021).
- Suherman, R. S., Yamaguchi, Y., Yanagihara, A., Yamauchi, T., & Matsuda, S. (2019). Effect of Rice Bran on Continuous Organic Waste Decomposition Processes. *Energy and Environment Research*, 9(1), 61. <https://doi.org/10.5539/eer.v9n1p61>
- Support minitab, <https://support.minitab.com/en-us/minitab/help-and-how-to/statistical-modeling/doe/supporting-topics/taguchi-designs/what-is-the-mean-in-a-taguchi-design/>
- Takahashi, Y., & Katoh, M. (2024). Variations in the level of available fosforus with changes in the status of water-soluble organic matter derived from different organic materials in soil. *Journal of Environmental Management*, 370(September), 122531. <https://doi.org/10.1016/j.jenvman.2024.122531>
- Tanti, N., Nurjannah, N., & Kalla, R. (2020). Pembuatan Pupuk Organik Cair Dengan Cara Aerob. *ILTEK : Jurnal Teknologi*, 14(2), 2053–2058. <https://doi.org/10.47398/iltek.v14i2.415>
- Weriono, Rinaldi, & Sepfitrah. (2023). Evaluasi Pengujian Kekerasan Material Aisi 4140 Menggunakan Full Factorial Design Of Experiment. *Jurnal Rekayasa Material, Manufaktur Dan Energi*, 6(1), 137–143. <http://jurnal.umsu.ac.id/index.php/RMME>
- Wicaksono, G. D., & Rachmawati, S. H. (2022). Analisis NPK Pupuk Organik Cair Limbah Ikan Nila dengan Pemanfaatan Mikroorganisme Lokal Kulit Pepaya. *Jurnal Fishtech*, 11(1), 47–57. <https://doi.org/10.36706/fishtech.v11i1.17540>
- Woolf, P. (n.d.). *14 : Design Of Experiments 14 . 1 : Design Of Experiments Via Taguchi Methods - Orthogonal*.
- Yuniati, R., Damayanti, M. E., & Wardhana, W. (2025). Effect Of Em4 ( Effective Microorganism 4 ) On Growth And Productivity Of Cucumber ( Cucumis Sativus L .). *18(1)*, 134–143.
- Yusuf, M., Nancy, W. M., & Tubagus, A. D. (2024). Utilization of Fishery Waste Product: The Case of MSMEs (in Central Java, Indonesia). *International*

*Journal of Law, Public Administration and Social Studies*. 1 (5), 529-536.

Yuwono, Kompos Cara Aerob dan Anaerob Menghasilkan Kompos Berkualitas (Jakarta: Seri Agritekno, 2006).

Zhan, C. (2024). Microbial Decomposition and Soil Health: Mechanisms and Ecological Implications. *Molecular Soil Biology*.  
<https://doi.org/10.5376/msb.2024.15.0007>

Zhang, J., Akyol, Ç., & Meers, E. (2023). Nutrient recovery and recycling from fishery waste and by-products. *Journal of Environmental Management*, 348(March). <https://doi.org/10.1016/j.jenvman.2023.119266>