DAFTAR PUSTAKA

Abd-Allah, E. F. 2001. *Streptomyces plicatus* as a model biocontrol agent. Folia Microbiol 46: 309–314. https://doi.org/10.1007/BF02815619

Agustina, S., M. D. Swantara, dan I. N. Suartha. 2015. Isolasi kitin, karakterisasi, dan sintesis kitosan dari kulit udang. Jurnal Kimia 9 (2) : 271-278.

Alexander, M. 1977. Introduction to Soil Microbiology. Second Edition. John Willey and Sons. New York.

Altschul, A.M. 1976. New Protein Foods. Academic Press. New York.

Anderson, R.K.I. and K. Jayaraman. 2003. influence of carbon and nitrogen sources on the growth and sporulation of *Bacillus thuringiensis var galleriae* for biopesticide production. Chemichal and Biochemichal Engineering. Q. 17(3): 225–231.

Arif, R.A., Ischaidar, H. Natsir, dan S. Dali. 2013. Isolasi kitin dari limbah udang putih (*Penaeus merguiensis*) secara enzimatis. Prosiding: Seminar Nasional Kimia.

Bhattacharya D, A Nagpure and R. K. Gupta. 2007. Bacterial Chitinases: properties and potential. Critical Reviews in Biotechnology 27 : 21 -28.

Bissett, D. L., L. R. Robinson, P. S. Raleigh, K. Miyamoto, T. Hakozaki, J. Li, and G.R. Kelm. 2007. Reduction in the appearance of facial hyperpigmentation by topical N-acetylglucosamine. Journal Cosmetic Dermatologic. 6(1): 20-6. http://www.ncbi.nlm.nih.gov Diakses pada 1 Juli 2015.

Brunner, E., H. Ehrlich, P. Schupp, R. Hedrich, S. Hunoldt, M. Kammer, S. Machill, S. Paasch, V.V. Bazhenov, D. V. Kurek, T. Arnold, S. Brockmann, M. Ruhnow, R. Born. 2009. Chitinbased scaffolds are an integral part of the skeleton of the marine demosponge *Lanthella basta*. J.Struct. Biol 168 : 539–547.

Brzezinska, M.S. and W. Donderski. 2001. Occurrence and activity of the chitinolyticbacteria of aeromonas genus. Polish Journal of Environmental Studies. 10:27-31.

Cardenas, G., C. Gustavo, T. Edelio, S.M. Patricia. 2004. Chitin characterization by sem, ftir, xrd, and 13c cross polarization/mass angle Spinning NMR. Journal of Applied Polymer Science 93 : 1876-1885.

Carroad and Tom. 1978. Bioconversion of shellfish chitin wastes : process and selection of microorganism. Journal of Food Science. 43 : 1158.

Cempaka, L. 2015. Pengaruh variasi kecepatan agitasi pada produksi B-glukan dari *Saccharomyces cerevisiae.* Al-Kauniyah. Jurnal Biologi 8(1): 21-26

Chakrabortty, S., S. Bhattacharya, and A. Das. 2012. Optimization of process parameters for chitinase production by a marine isolate of *Serratia marcescens*. International Journal of Pharmacy and Biological Sciences. 2(2): 2230-7605.

Chen, J. K., C. R. Shen, & C.L. Liu. 2010. N-acetylglucosamin : production and applications. Marine Drugs. 8: 2493-2516.

Clarke, K.G. 2013. Bioprocess Engineering an Introductory Engineering and Life Science Approach. Woodhead Publishing. https://doi.org/10.1533/9781782421689.7.

Zabriskie, D. W., W. B. Armiger, D. H. Philips, and P. A. Albano . 1980. Trader's Guide to Fermentation Media Formulation, Trader's Oil Mill Co., Ft. Worth, TX.

Das, S., D. Roy, R. Sen. 2016. Utilization of chitinaceous wastes for the production of chitinase. Advances in Food and Nutrition Research 78 : 28-42. http://dx.doi.org/10.1016/bs.afnr.2016.04.001.

Dewi, I. M. 2008. Isolasi Bakteri dan Uji Aktivitas Kitinase Termofilik Kasar dari Sumber Air Panas Tinggi Raja, Simalungn, Sumatera Utara. Tesis. Program Pascasarjana. Universitas Sumatera Utara. Medan.

Dhar, P., Gurvinder, K. 2010. Effect of carbon and nitrogen sources on the induction and repression of chitinase enzyme from *Beauveria bassiana* isolates. African Journal of Biotechnology. 9 (47) : 8092-8099.

Dhony, S. dan F. Rama. 2011. Pembuatan Komposit Kitin/Kitosan yang Diekstrak dari Cangkang Kepiting dan Karakterisasinya. Fakultas MIPA Universitas Andalas.

El-Mansi, E. M. T., C. F. A. Bryce, A. L. Demain, A. R. Allman. 1999. Fermentation microbiology and biotechnology . Taylor & Francis. London.

Gangwar, M., S. Vineeta, K. P. Asheesh, C. K. M. Tripathi, B.N. Mishra. 2015. Purification and characterization of chitinase from *Streptomyces violascens* NRRL B2700. Indian Journal of Experimental Biology. 54 : 64-71.

Geisseler, D., R.H. William, G. J. Rainer, L. Bernard. 2010. Pathways of nitrogen utilization by soil microorganism - a review. Soil Biology and Biochemistry 42 : 20158-2067.

Han, Y., Y. Bingjie, Z. Fengli, M. Xiaoling, L. Zhiyong. 2009. Characterization of antifungal chitinase from marine *Streptomyces* sp. DA11 associated with south china sea sponge craniella australiensis. Marine Biotechnol 11 : 132-140. DOI 10.1007/s10126-008-9126-5.

Hargono, A., and I. Sumantri. 2008. Pembuatan kitosan dari cangkang udang serta aplikasinya dalam mereduksi kolesterol lemak kambing. Reaktor. 12:53-57.

Herdyastuti, N., T. J. Raharjo, Mudasir, dan S. Matsjeh . 2009. Chitinase and chitinolytic microorganism: isolation, characterization and potential. Indonesian Journal of Chemistry. 9 (1): 37-47.

Hsu, S. C. and J. L. Lockwood. 1975. Powdered chitin agar as a selective medium for enumeration of actinomycetes in water and soil. Applied Microbiology. 29: 422-426.

Islam, R., dan B. Datta. 2015. Diversity of chitinases and their industrial potential. J.Appl. 430 Res, 1: 55-60.

Islem, Y., R. Marguerite. 2015 Chitin and chitosan preparation from marine sources. structure, properties and applications. Mar. Drugs 13 : 1133-1174.

Jagedswari, S., K. P. Selvam. 2012. Optimization of chitinase production by soil *Streptomyces* sp. SJKP9. Journal Acad. Indus. Res. 1 (6) : 332-336.

Jha, S., A. M. Hasmukh, dan K. J. Chaitanya. 2016. Characterization of extracellular chitinase produced from *Streptomyces rubiginosus* isolated from rhizosphere of *Gossypium* sp. Cogent Food & Agriculture 2 : 1198225. https://doi.org/10.1080/23311932.2016.1198225.

Johnson, E.L., Q. P. Peniston. 1982. Utilization of shellfish waste for chitin and chitosan production. In Chemistry & Biochemistry of Marine Food Products; Martin, R.E., Flick, G.J., Hebard, C.E., Ward, D.R., Eds.; AVI Publishing Co.: Westport, CT, USA, 1982; Chapter 19, p. 415.

Juttner, F., and S. Watson. 2007. Biochemical and ecological control of geosmin and 2-methylisoborneol in source waters. Applied Environmental Microbiology. 73(14):4395-4406.

Khan, M.J., H. Rifat, A. Mahboob, M. Z. Abidin, and J. Saleem. 2010. Optimization of culture media for enhanced chitinase production from a novel strain of *Stenotrophomonas maltophilia* using response surface methodology. Journal of Microbiology and Biotechnology 20 (11) : 1597-1602. DOI : 10.4014/jmb.0909.09040.

Kholifah, A. 2015. Isolasi dan Identifikasi Bakteri-Bakteri Kitinolitik dari Sedimen Tambak Udang. Skripsi Program Studi Teknologi Hasil Perikanan. Departemen Perikanan. Fakultas Pertanian. Universitas Gadjah Mada. Yogyakarta. Skripsi.

Konopka A. 2009. What Is Microbial Community Ecology?. ISME J.DOI:10.1038/ismej.2009.88.

Martinez, J. P., M. P. Falomir, D. Gozalbo. 2009. Chitin: A Structural Biopolysaccharide. Encyclopedia of Life Sciences (ELS). John Wiley & Sons, Ltd. Chicester. DOI: 10.1002/9780470015902.a0000694.pub2.

Mejia Saules, J. E., K. N. Walizewaki, M. A. Gracia, R. Cruzcamarillo. 2006. The use of crude shrimp shell powder for chitinase production by *Serratia marcescens*. Food Techno. Biotechnology. 44 (1): 95-100.

Merrick, M. J., R. A. Edwards. 1995. Nitrogen control in bacteria. Microbiol. Mol. Biol. Rev. 59, 604 622.

Miles, A. A., S.S. Misra, & J.O. Irwin. 1938. The estimation of the bactericidal power of the blood. The Journal Of The Hygiene 38(6): 732-749.

Minami, S. & Y. Okamoto. 2007. Drug for remedy or treatment of wound. European Ptent Specification. Bulletin. 2014/17.

Monreal, J. & E. T. Reese. 1969. The Chitinase of *Serratia marcescens*. Canadian Journal of Microbiology. 15(7): 689-696. https://doi.org/10.1139/m69-122

Moreira, K. A., M. T. H. Cavalcanti, H. S. Duarte, E. B. Tambourgi, E. H. M. de Melo, V. L. Silva, A. L. F. Porto, J. L. L. Filho. 2011. Partial characterization of protease from streptomyces clavuligerus using an inexpensive medium. Brazilian Journal of Microbiology. 32:215-200.

Moussian B. 2019. Chitin: structure, chemistry and biology. *In*: Yang Q., Fukamizo T. (eds) Targeting Chitin-containing Organisms. Advances in Experimental Medicine and Biology, vol 1142. Springer, Singapore.

Muammaroh, R.F., M. Kahar., Siswanto. 2015. Enzim Kitinase Hasil Produksi Bakteri Kitinolitik Indigenous Isolat 26 pada Tepung Cangkang Udang. Artikel Ilmiah Hasil Penelitian Mahasiswa. http://repository.unej.ac.id/bitstream/handle/1234567. Diakses pada 10 Mei 2020 pukul 23.00 WIB.

Mukerjhee, G., dan S. K. Sen. 2006. Purification, characterization, and antifungal activity of chitinase from *Streptomyces venezuelae* P10. Current Microbiology 53 : 265-269. https://doi.org/10.1007/s00284-005-0412-4

Naiola, E dan N. Widhyastuti. 2002. Isolasi, seleksi dan optimasi protease dari beberapa isolat bakteri. Berita Biologi. 3 (6) : 467-473.

Narayana, K., and M. Vijayalakshmi. 2009. Chitinase production by *Streptomyces* sp. ANU 6277. Journal Microbiology. 40:725-733.

Nawani, N. N., B. P. Kapadnis. 2003. Optimization of chitinase production using statistics based experimental designs. Process Biochemistry 40 : 651-660. DOI :10.1016/j.procbio.2004.01.048.

Patil, R.S., V. Ghormade, M.V. Deshpande. 2000. Chitinolitic enzymes: an exploration. Enzyme and Microbial Technology. 26(2000): 473-483.

Peter, F. S., W. Allan, J. H. Stephen. 2013. Principles of Fermentation Technology. Elsevier, ISBN : 9781483292915. https://www.elsevier.com/books/principles-of-fermentation-technology/stanbury/978-0-08-036131-4.

Pramesti, E. 2019. Optimasi Konsentrasi Koloidal Kitin dan Inokulum dalam Produksi Kitinase oleh *Streptomyces* sp. PB 2 Menggunakan Response Surface Methodology. Yogyakarta: Universitas Gadjah Mada. Skripsi.

Pratiwi, R.S., T.E. Susanto, Y.A.K. Wardani, dan A. Sutrisno. 2015. Chitinase and the aplication in industry: A Review. Jurnal Pangan dan Agroindustri. 3(3): 878-887.

Pratiwi, S. T., 2008. Mikrobiologi Farmasi. Jakarta: Penerbit Erlangga. Hal.110.

Prescott, L.M., J. P. Harley, D. A. Klein. 2005. Microbiology. *In*: Willey, J.M., Sherwood, L.M., Woolverton, C.J. (Eds.), Metabolism: The Use of Energy in Biosynthesis, 6th edn. McGraw-Hill Higher Education, pp. 200 219.

Rabeeth, M., A. Anitha, S. Geetha. 2011. Purification of an antifungal endochitinase from a potential biocontrol agent *Streptomyces griseus*. Pakistan Journal of Biological Sciences 14(16) : 788-797. DOI : 10.3923/pbjs.2011.788.797.

Ray, L., N. P. Ananta, R. M. Samir, K. P. Ajit, K.A. Tapan, S. Mrutyunjay, R. Vishaka. 2018. Purification and characterization of an extracellular thermo-alkali stable, metal tolerant chitinase from *Streptomyces chilikensis* RC1830 isolated from a brackish water lake sediment. Biotechnology Reports 20 e00311. https://doi.org/10.1016/j.btre.2019.e00311

Richards, A.G. 1951. The Integument of Arthropods. The Chemical Components and Their Properties : The Anatomy and Development and Permeability. University of Minnesota Press, Minneapolis.

Rinaudo, M. and S. Perez. 2019. From Chitin To Chitosan. https://www.glycopedia.eu/e-chapters/from-chitin-to-chitosan/article/abstract-introduction. Diakses pada hari Selasa, 23 Juni 2020 pukul 09.18 WIB.

Roskoski, R. 2007. The Comprehensive Pharmacology Reference. LSU Health Science Center. New Orleans, United States. https://www.sciencedirect.com/science/article/pii/B978008055232360042X

Rout SK. 2001. Physicochemical, Functional and Spectroscopic Analysis of Crawfish Chitin and Chitosan as Affected by Process Modification, Louisiana State University.

Sanglier, J., H. Haag, T. Huck, and T. Fehr. 1993. Novel bioactive compounds from actinomycetes. Res Microbiol. 144(8), 661-663.

Sarwono, J. 2006. Metode Penelitian Kuantitatif dan Kualitatif. Graha Ilmu. Yogyakarta.

Seidl, V. 2008. Chitinases of filamentous fungi: a large group of diverse proteins with multiple physiological functions. Fungal Biology Reviews. 22:36–42.

Seong, C., J. Choi, and K. Baik. 2001. An improved selective isolation of rare Actinomycetes from forest soil. The Journal of Microbiology, 39(1), 17-23.

Shakhbazau, A.V. and N.A. Kartel. 2008. Chitinases in bioengineering research. Russian Journal of Genetics. 44(8): 881-889.

Shivalee, A., K. Lingappa., M. Divatar. 2018. Influence of bioprocess variables on the production of extracellular chitinase under submerged fermentation by *Streptomyces pratensis* strain KLSL55. Journal of Genetic Enginering and Biotechnology 16 : 421-426. https://doi.org/10.1016/j.jgeb.2017.12.006.

Shomurat, T., J. Yoshida, S. Amano, M. Kojina, and T. Niida. 1979. Studies on actinomycetal producing antibiotics only in agar culture. I. Screening taxonomy and morphology – productivity relationship of *Streptomyces halstedii*, strain SF. J Antibiot, 32, 427-435.

Silverstein, R. M., X. W. Francis, J. K. David.1989. Spectrometric identification of organic compound. Seventh Edition.

Smith, B. C. 1996. Fundamentals of fourier transform infrared spectroscopy. CRC Press: Boca Raton, FL, USA.

Soeka, Y. S., T. Evi, dan S. Ninu. 2010. Aktivitas aktinomisetes dari Bangka-Belitung koleksi bidang mikrobiologi, Puslit Biologi-LIPI dalam memproduksi enzim kitinase. Jurnal Teknologi Lingkungan 11(3) : 417-423.

Stainer, R. Y., M. Doudoroff, E. A. Adelberg. 1976. The Microbial World, third ed., Prentice Hall, Englewood Cliffs, NJ.

Stuart, B.H. 2004. Infrared Spectroscopy: Fundamentals and Applications (Analytical Techniques in the Sciences. Chichester, UK : John Wiley & Sons Ltd.

Sujatha, P., Rajub, and T. Ramana. 2005. Actinomycetes of loktak habitat: isolation and screening for antimicrobial activities. Mirobiological Research, 160, 119-126.

Sukalkar S. W., T. A. Kadam, H. J. Bhosale. 2018. Optimization of chitinase production from *Streptomyces macrosporeus* M1. RJLBCS 4(1) : 106-114. DOI : 10.26479/2018.0401.09

Sukalkar, S.R., T.A. Kadam., H. J. Bhosale. 2017. Isolation of chitinase producing *Streptomyces* sp. M1 for recycling of fungal biomass. I J Scientific Res Sci Tech. 3(8): 399-404.

Sumantha, A., C. Larroche and A. Pandey. 2006. Microbiology and industrial of food grade protease: a perspective. Food Technology Biotechnology. 44(2): 211-220.

Tanabe, T., K. Tomokazu, W. Takeshi, U. Yasushi, M. Masaru. 2000. Purification and characterization of a 49-kDa chitinase from *Streptomyces griseus* HUT 6037. Journal of Bioscience and Bioengineering 89 (1) : 27-32.

Tran, T.N., T. D. Chien, B. D. Van, D. N. Anh, L. W. San. 2018. The Isolation of chitinase from *Streptomyces thermocarboxydus* and its application in the

preparation of chitin oligomers. Research on Chemical Intermediates. https://doi.org/10.1007/s11164-018-3639-y.

Triwijayani, A.U. 2016. Identifkasi Bakteri Kitinolitik dari Sedimen Tambak Udang dan Karakteristik Kitinasenya. Fakultas Pertanian. Universitas Gadjah Mada. Yogyakarta. Skripsi.

Tsujibo, H., K. Minoura, K. Miyamoto, H. Endo, M. Moriwaki, and Y. Inamori. 1993. Purification and properties of a thermostable chitinase from *Streptomyces thermoviolaceus* OPC-520. Appl. Environ. Microbiol., 59(2), 620-622.

Ulhoa, C. J. dan J. F. Peberdy. 1991. Regulation of chitinase synthesis in *Trichoderma harzianum*. Journal of General Microbiology. 137 : 2163-2169. https://doi.org/10.1099/00221287-137-9-2163

Veliz, E. A., P. Martínez-Hidalgo, and A. M. Hirsch. 2017. Chitinase-producing bacteria and their role in biocontrol. AIMS microbiology, 3(3), 689–705. https://doi.org/10.3934/microbiol.2017.3.689

Vogel, H. C., M. T. Celeste. 2014. Fermentation and Biochemical Engineering Handbook 3th edition. Elsevier Inc. https://doi.org/10.1016/C2011-0-05779-4.

Wang, S.L., L. Bo-Shyun, T.W. Liang, C.L. Wang, W. Pei-Chen dan L. Je Ruei. 2010. Purification and characterization of chitinase from a new species strain *Pseudomonas* sp. TKU008. Journal of Microbiology Biotechnology. 20: 1001-5. Waksman, S.A. 1967. The Actinomycetes, A Summary of Current Knowledge. The Ronald Press Company. New York.

Wang, Y., Z. S. Zhang, J. Ruan, Y. M. Wang, and S. Ali. 1999. Investigation of actinomycete diversity in the tropical rainforests of Singapore. J. Ind. Microbiol. Biotechnol., 23, 178-187.

Yurnaliza, S. Margino, dan I. Sembiring. 2003. Isolasi aktinomisetes kitinolitik dari rhizosfer dan kompos. Komunikasi Penelitian 15 (2) : 27-35.

Yurnaliza, M. Sebastian, M. Langkah. 2008. Kondisi optimum untuk produksi kitinase dari *Streptomyces* RKT5 dan karakterisasi pH dan suhu enzim. Biota 13 (3) : 169-174.

Yurnaliza, M. Sebastian, S. Langkah. 2011. Kemampuan kitinase *Streptomyces* RKt5 sebagai antijamur terhadap patogen fusarium oxysporum. Jurnal Natur Indonesia. 14(1) : 42-48. DOI: 10.31258/jnat.14.1.42-46.

Yurnaliza. 2002. Senyawa kitin dan kajian aktivitas enzim mikrobial pendegradasinya. Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Sumatra Utara. Kajian Pustaka.