DAFTAR PUSTAKA

Agustiyani, D., H. Imamudin, Faridah, N. Erni dan Oedjijono. 2004. Pengaruh pH dan Substrat Organik Terhadap Pertumbuhan dan Aktivitas Bakteri Pengoksidasi Amonia. Jurnal Biodiversitas. 5(2): 43-47.

Anggraeini, W. 2015. Pengaruh pH terhadap aktivitas enzim kitinase dari isolat *Actinomycetes* dengan metode Somogyi-Nelson. Jurnal Ilmiah Pendidikan Fisika Al-Biruni. 4(2): 217-228.

Anggraini, A., S. Yuniningsih dan M.M. Sota. 2017. Pengaruh pH terhadap kualitas produk etanol dari molasses melalui proses fermentasi. Jurnal Reksa Buana. 2(2): 99-105.

Anggraini, M. 2003. Isolasi Bakteri Penghasil Protease Alkalin dan Karakterisasi Enzim, Institut Pertanian Bogor. Skripsi.

Ariyadi, T dan S. Dewi. 2009. Pengaruh sinar ultra violet terhadap pertumbuhan bakteri *Bacillus* sp. sebagai bakteri kontaminan. Jurnal Kesehatan UNIMUS. 2(2): 20-25.

Arnold, N. dan Solomon. 1986. Manual of Industrial Microbiology and Biotechnology. American Society for Microbiology. Washington.

Bhargav, S., B.P. Panda, M. Ali, dan S. Javed. 2008. Solid-state fermentation: an overview. Chemical Biochemical Engineering Q. 22: 49-70.

Bhattacharya, S., Chakrabortty, S. and A. Das. 2012. Optimization of Process Parameters for Chitinase Production by a Marine Isolate of *Serratia marcescens*. IJPBS. 2(2): 8-20.

Black, J.G. 2008. Microbiology: Principles and Explorations. John Wiley and Sons. Arlington.

Bowra, B.J dan M.J Dilworth. 1981. Motility and Chemotaxis towards Sugars in *Rhizobium leguminosarum*. Journal Genetical Microbiology. 126(1): 231-235.

Brzezinska, M.S. and W. Donderski. 2001. Occurrence and Activity of the Chitinolytic Bacteria of Aeromonas Genus. Polish Journal of Environmental Studies. 10: 27-31.

Bushan, B. 2000. Chitinase from *Bacillus* sp. BG-11. The society for applied microbiology. *J. Appl. Microbiol*. 88: 800-808.

Chang, S. C., J. T. Wang, P. Vandamme, J. H. Hwang., P. S Chang dan W. M Chen. 2004. Chitinimonas taiwanensis gen. nov., sp. nov., a Novel Chitinolytic Bacterium Isolated from a Freshwater Pond for Shrimp Culture. J. System. Appl. Microbiol. 27: 43– 49.

Chang, W., C. Chen, and S. Wang. 2003. An Antifungal Chitinase Produced by Bacillus cereus with Shrimp and Crab Shell Powder as a Carbon Source. Current Microbiology. 47: 102–108.

Cheba, B.A., T.I. Zaghloul, A.R. El-Mahdy and H. El-Massry. 2016. Effect of pH and Temperature on *Bacillus* sp. R2 Chitinase Activity and Stability. Procedia Technology. 22: 471-477.

Dahlan, A., S. Wahyuni dan Ansharullah. 2017. Morfologi dan karakterisasi pertumbuhan bakteri asam laktat (UM 1.3A) dari proses fermentasi wikau maombo untuk studi awal produksi enzim amilase. Jurnal Sains dan Teknologi Pangan (JSTP). 2(4): 657-663.

Departemen Kelautan dan Perikanan Republik Indonesia. 2003. Perkembangan ekspor komoditi hasil perikanan Indonesia 1998-2002. url: http://www.dkp.go.id/

Dhananjaya, I. G. 2018. Pengaruh pH, Suhu dan Jenis Substrat Terhadap Aktivitas Kitinase *Bacillus cereus* SMG 1.1. Universitas Gadjah Mada. Skripsi.

Donderski, W. and M. Trzebiatowska. 1999. Chitinase Activity Production by Planktonic, Benthic and Epiphytic Bacteria Inhabiting the Moty Bay of The Jeziorak Lake (Poland). Polish Journal of Environmental Studies. 8: 215–220.

Elias, M., G. Wieczorek, S. Rosenne, and D.S. Taufik. 2014. The universality of enzymatic rate temperature dependency. *Trends Biochem. Sci.* 39: 1-7.

Fardiaz, S. 1987. Fisiologi Fermentasi. Pusat Antar Universitas IPB. Bogor.

Fardiaz, S. 1992. Mikrobiologi Pengolahan Pangan. Departemen Pendidikan dan Kebudayan Direktorat Jenderal Pendidikan Tinggi Pusat Antar Universitas Pangan dan Gizi Institut Pertanian Bogor. Bogor.

Gao, JMW., KR. Bauer, MA. Shockley, Pysz, and RM. Kelly. 2003. Growth of Hiperthermophilic Archaeon *Pyrococcus furiosus* on Chitin Involves Two Family 18 Chitinases. J. App. Env. Microbiol. 69:3119-3128.

Gohel, V., A. Singh, M. Vimal, P. Ashwini, and H.S. Chhatpar. 2006. Bioprospecting and antifungal potential of chitinolytic Microorganisms. Afr. J. Biotechnol. 5: 54-72.

Gomaa, E. 2012. Chitinase Production by *Bacillus thuringiensis* and *Bacillus licheniformis*: Their Potential in Antifungal Biocontrol. The Journal of Microbiology. 50: 103 –111.

Gooday, G.W. 1994. Physiology of Microbial Degradation of Chitin and Chitosan. J. Biodegradation. 1:177-190.

Gooday, G.W. 1986. Plant chitinases and lysozymes, in Chitin in Nature and Technology, Muzzarelli, R., Jennianx, C., and Gooday, G.W. Plenum Press. NY.

Goosen, MFA. 1997. Applications of Chitin and Chitosan. Technomic Pub. p.7

Ghozali, I. 2009. Aplikasi Analisis Multivariate Dengan Program SPSS. Badan Penerbit Universitas Diponegoro. Semarang.

Haedar, N., F. Fahruddin, W. Aryanti dan H. Natsir. 2017. Produksi dan karakterisasi enzim kitinase dari bakteri kitinolitik asal kerang Anadara granosa. Jurnal Ilmu Alam dan Lingkungan. 8(1).

Haliza, W. dan M. Suhartono. 2012. Karakteristik kitinase dari mikroba. Buletin Teknologi Pascapanen Pertanian. 8(1):1-14.

Hamid, R., M.A. Khan, M. Ahmad, M.M. Ahmad, J. Musarrat, and S. Javed. 2014. Chitinases: An Update. Journal of Pharmacy and Bioallied Sciences. 5(1): 21-29.

Hardi, J., Ruslan, Razak, A.R. dan Silva. 2016. Karakterisasi Enzim Kitinase dari Isolat Bakteri Termofilik B1211 asal Air Panas Bora. Kovalen. 3(2): 172-179.

Hargogya, A.M. dan Ustadi. 2020. Isolation and Molecular Identification of Chitinolytic Bacteria from Ronto. 3rd International Symposium on Marine and Fisheries Research. 147: 1-8.

Harini, I. N., S. Winarni, dan E. Setyaningsih. 2004. Pemanfaatan Teknologi Pengolahan Limbah Kulit/ Kepala Udang Menjadi Chitosan untuk Ingredient Pembuatan Permen Di Home Industri Kebon Agung Kepanjen Malang. Jurnal Dedikasi. 1(2).

Harper, H.A., V.W. Rodwel and P.A. Mayer. 1984. Review of Physiological Chemistry. Lange Medical Publication. California.

Hatmanti, A. 2000. Pengenalan *Bacillus* spp. Oseana. 25: 31-41.

Herdyastuti, N., T. J. Raharjo, Mudasir dan S. Matsjeh. 2009a. Chitinase and Chitinolytic Microorganism: Isolation, Characterization and Potential. Indo. J. Chem. 9(1): 37-47.

Herdyastuti, N., S.E. Cahyaningrum, M. Tamimi and A. Wirawan. 2015. Modification of chitin as substrates for chitinase. Afr. J. Biotechnol. 14(18): 1590-1595.

Hidayat, I. 2005. Pengaruh pH terhadap aktivitas *Endo-1,4-* β *-Glucanase Bacillus* sp. AR 009. Biodiversitas. 6(4): 242-244.

Hogg, S. 2005. Essential Microbiology. John Wiley and Sons, Inc. England.

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.

Imas, T., R. S. Hadioetomo, A. G. Gunawan, dan Y. Setiadi. 1989. Mikrobiologi Tanah II. PAU IPB. Bogor. hlm 68

Ilankovan, P., S. Hein, H. Chuen, T.S. Trung, and W.F. Stevens. 2006. Production of N-acetyl Chitobiose from Various Chitin Substrates Using Commercial Enzymes. Journal of Carbohydrate Polymer. 63: 245-250.

Illanes, A. 2008. Enzym Biocatalysis Principles and Application. Springer. Chille.

Jabeen, F dan J. I. Qazi. 2014. Isolation of Chitinase Yielding *Bacillus cereus* JF68 from Soil Employing an Edible Crab Shell Chitin. JSI. 73(1): 771-776.

Kuk, J. H., W.J. Jung, G.H. Jo, J.S. Ahn, K.Y. Kim, and R.D. Park. 2004. Selective preparation of N-acetyl-D-glukosamin and N,N`-deacetylchitobiose from chitin using a crude enzyme preparation from *Aeromonas* sp. Biotech. Lett. 27: 7-11.

Kurita, K. 1997. β-Chitin and reactivity characteristics. Di Dalam M.F.A. Goosen (ed). Applications of Chitin and Chitosan. Technomic Publ Co Inc. Basel.

Mabuchi, N., I. Hashizume, and Y. Araki. 2000. Characterization of chitinases excreted by *Bacillus cereus* CH. Can J Microbiol. 46: 370 –375.

Majtan, J., K. Blikova, O. Markovic, J. Grof, G. Kogan, and J. Simuth. 2007. Isolation and characterization of chitin from bumblebee (*Bombus terrestris*). Intern. J. Biol. Macromol. 40: 237– 241.

Muharni dan E. Nurnawati. 2007. Pengujian Aktivitas Kitinase dari *Bacillus circulans* untuk dikembangkan sebagai agen biokontrol pada penyakit tanaman. Jurnal penelitian sain. 10: 144-150.

Muzzarelli, R.A.A. 1977. Chitin. Pergamon Press Ltd. England.

Nafiah, H., S. Pujiyanto, dan B. Raharjo. 2017. Isolasi dan Uji Aktivitas Kitinase Isolat Bakteri Dari Kawasan Geotermal Dieng. Bioma. 19(1): 22-29.

Nikolov, S., H. Fabritius, M. Petrov, M. Friak, Lymperakis., Sachs, Raabe, and J. Neugebauer. 2011. Robustness and Optimal Use on Design Principles of Arthropod Exoskeletons studied by ab Initio-based Multiscale Simulation. Journal of the mechanical Behavior of Biomedical Material. 4: 129-145.

Park, SH., J. Lee and HK. Lee. 2000. Purification and Characterization of Chitinase from A Marine Bacterium, *Vibrio* sp. 98CJ11027. J. Microbiol. 38(4): 224-229.

Patil, RS., V. Chormade, and MV. Desphande. 2000. Chitinolytic enzymes an exploration. Enz Microb Tech. 26: 473-483.

Pelczar, M.J. and E.C.S. Chan. 1986. Dasar-dasar Mikrobiologi. UI Press. Jakarta.

Prakash, B., P. Perumai, J. Gowrishankar, P. Sivasankari, L. Ashokkumar and Tamilman. 2015. Optimization of Cultural Conditions for Production of Chitinase by *Bacillus* sp. Isolated from Agriculture Soil using Substrate as Marine Crab Shell Waste. International Journal of Current Microbiology and Applied Sciences. 4: 192-198.

Pratiwi, R.S., T.E. Susanto, Y.A.K. Wardani, dan A. Sutrisno. 2014. Enzim kitinase dan aplikasi di bidang industri. Jurnal Pangan dan Agroindustri. 3(3): 878-887.

Purnawan, C., N. A. Hidayat, I. Kartini, dan E. Suguharto. 2008. Kajiao Analisis Termal Kitin-Kitosan Cangkang Udang Menggunakan Thermogravimetric Analysis Dan Differential Thermal Analysis (TGA-DTA). Sains dan Terapan Kimia. 2 (2): 44-52.

Purwani, E. Y., M.T. Suhartono, Y. Rukayuadi, J.K. Hwang, dan Y.R. Pyun. 2004. Characteristics of thermostable chitinase enzymes from the Indonesian *Bacillus* sp. 13.26. Enzyme. Microbiol. Technol. 35: 147-153.

Rahayu S, T. Fredy, T.S. Maggy, J.K. Hwang, dan Y.R. Pyun. 1999. Eksplorasi Bakteri Termofilik Penghasil Enzim Kitinase Asal Indonesia. Prosiding Seminar Hasil-Hasil Penelitian Bidang Ilmu Hayat. Pusat Antar Universitas Ilmu Hayat IPB. Bogor.

Rahayu, S. 2000. Pemurnian dan Karakterisasi Kitinase dan Kitin Deasetilase Termostabil dari Isolat *Bacillus* K-29-14 Asal Kawah Lamojang, Jawa Barat. Institut Pertanian Bogor. Thesis.

Rahayu, S., F.M. Suhartati, E.K. Rimbawanto, dan N. Iriyanto. 2003. Isolasi dan identifikasi bakteri kitinolitik asal rumen. Jurnal Animal Production. 5(2).

Rahmawati, D. 2011. Penentuan pH dan Suhu Optimum Aktivitas Kitinase *Bacillus cereus* I.5 dan Pengujian Kitinase dalam Mendegradasi Eksoskeleton Kutu Bertepung Putih (*Ferrisia virgata Cockerel).* Institut Pertanian Bogor. Skripsi.

Reissig, J.L., J.L. Strominger, dan F.A Leloir. 1955. A Modified Colorimetric Method for The Estimation of N-acetylamino Sugars. The Journal of Biological Chemistry. 217:959-966.

Robbins, P.W., C. Albright, and B. Benfield. 1988. Cloning and expression of a *Streptomyces plicatus* chitinase (chitinase-63) in *Escherichia coli*. J. Biol. Chem. 263: 443–447.

Rochima, E. 2014. Kajian Pemanfaatan Limbah Rajungan dan Aplikasinya untuk Bahan Minuman Kesehatan Berbasis Kitosan. Jurnal Akuatika. 5(1): 71-82.

Rudiger, A., A. Sunna, and G. Antranikian. 1994. Enzymes from Extreme Thermophilic and Hyperthermophilic Archea and Bacteria. Di dalam: Carbohydrases, Handbook of Enzyme Catalysis in Organic Synthesis. VCH Verlagsgesellschafft. Weinhem.

Sanjaya, I. dan L. Yuanita. 2007. Adsorpsi Pb (Il) oleh Kitosan Hasil Isolasi Kitin Cangkaog Kepiting Bakau *(Scylla* sp.). Jumal Ilmu Dasar. 8 (1): 30-36.

Sarni, Natsir, Hasnah dan S. Dali. 2015. Produksi dan Karakterisasi Enzim Kitosanase dari Isolat Bakteri *Klebsiella* sp. Jurnal Techno. 4(2): 8-15.

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

Shantosh, S. dan P.T. Mathew. 2007. Preparation of glucosamine and carboxymethylchitin from shrimp shell. Journal of Applied Polymer Science. 107: 280-285.

Soeka, Y.S. 2011. Seleksi, Karakterisasi, dan Identifikasi Bakteri Penghasil Kitinase yang Diisolasi dari Gunung Bromo Jawa Timur. Jurnal Natur Indonesia. 13: 155-161.

Subagiyo, S. Margino, Triyanto dan W.A. Setyati. 2015. Pengaruh pH, Suhu dan Salinitas Terhadap Pertumbuhan dan Produksi Asam Organik Bakteri Asam Laktat Yang Diisolasi dari Intestinum Udang Penaeid. Jurnal Ilmu Kelautan. 20(4): 187-194.

Sumantha, A., C. Larroche, and A. Pandey. 2006. Microbiology and Industrial of Food Grade Protease: A Perspective. Food Technology and Biotechnology. 44: 211-220.

Sumardi, S. Farisi, C.N. Ekowati, dan S.A. Oktalia. 2019. Co-Culture Anoxygenic Photosynthetic Bacteria with *Bacillus* sp. Isolated from Hanura Beach Against *Vibrio* sp. Jurnal Ilmiah Biologi Eksperiman dan Keanekaragaman Hayati. 6(2): 62-70.

Suryadi, Y., T. P. Priyatno, M. Samudra, D. N. Susilowati, N. Yudhistira dan E. Purwakusumah. 2013. Isolasi dan Karakterisasi Kitinase asal Bacillus cereus 11 UJ. Jurnal Biologi Indonesia. 9(1): 51-62.

Suryadi, Y., T. P. Priyatno, M. Samudra, D. N. Susilowati, N. Lawati dan E. Kustaman. 2013. Pemurnian Parsial dan Karakterisasi Kitinase Asal Jamur Entomopatogen *Beauveria bassiana* Isolat BB200109. J. Agro Biogen. 9(2):77-84.

Susanto, A., PS. Sudharto, and RY. Purba. 2005. Enhancing biological control of basal stem rot disease (*Ganoderma boninense*) in oil palm plantation. Mycopath Journal. 159(1): 153-157.

Svitil, A.L., S.N. Nichadain, J.A. Moore, dan D.L. Kirchman. 1997. Chitin degradation proteins produced by the marine bacterium *Vibrio harveyii* growing on different forms of chitin. Appl. Environ. Microbiol. 63:408-413.

Taufan, M. R S. dan Zulfahmi. 2010. Pemanfaatan Limbah Kulit Udang sebagai Bahan Anti Rayap (Bio-termitisida) pada Bangunan Berbahan Kayu. Universitas Diponegoro. Skripsi.

Toharisman, A., M.T. Suhartono, M. Spindler-Barth, J.K. Hwang, and Y.R. Pyun. 2005. Purification and characterization of a thermostable chitinase from *Bacillus licheniformis* Mb-2. World Journal of Microbiology and Biotechnology. 21(5):733 738.

Wahyuni, Sri., F. Zakaria, A. Witaro, D. Syah, dan M. Suhartono. 2006. Aktivitas Anti Kanker Senyawa-Senyawa Kitooligomer. Jurnal Teknologi dan Industri Pangan. 17: 12-22.

Wang, S.L. and W.T. Chang. 1997. Purification and characterization of two bifunctional chitinases/lysozymes extracellulary produced by *Pseudomonas aeruginosa* K-187 in a shrimp and crab shell powder medium. Appl. Environ. Microbiol. 63**:** 380‑86.

Wang, S., C. Chia-Hsing, L. Tzu-Wen, and C. Chung-Chih. 2009. Purification and Characterization of Protease and Chitinase from *Bacillus cereus* TKU006 and Conversion of Marine Wastes by These Enzymes. Journal Marine Biotechnology. 11: 334-34.

Wang, S.L., T.Y. Lin, Y.H. Yen, H.F. Liao, and Y.J. Chen. 2006. Bioconversion of shellfish chitin wastes for the production of *Bacillus subtilis* W-118 chitinase. Carbohydrate Research. 341: 2507-2515.

Wang, S.Y., A. Moyne, G. Thottappilly, S. Wu, R.D. Locy, and N.K. Singh. 2001. Purification and characterization of a *Bacillus cereus* exochitinase. Enzyme Microb Technol. 28:492– 498.

Whitaker, J. R. 1994. Principle of enzymology for the food science. Marcel Decker. New York.

Widhyastuti, N. 2010. Purifikasi N-Asetil-D-glukosamina Hasil Sintesa Secara Enzimatis untuk Bahan Obat dan Pangan Fungsional. Pusat Penelitian Biologi Lembaga Ilmu Pengetahuan Indonesia. Laporan Akhir Program Insentif Peneliti dan Perekayasa LIPI.

Wu, ML., YC. Chuang, JP. Chen, CS. Chen, and MC. Chang. 2001. Identification and Characterization of the Three Chitin-Binding Domains within the Multidomain Chitinase Chi92 from *Aeromonas hydrophila* jp 101. J. Appl. Env. Microbiol. 67: 5100-5106.

Wulansari, B., N.B. Isnaini, I.D. Puspita, A. Husni, dan Ustadi. 2017. Pembentukan N-Asetilglukosamin dari Kitin Cangkang Udang oleh *Serratia marcescens* PT-6 yang dikultur pada berbagai pH dan Suhu. Jurnal Perikanan Universitas Gadjah Mada. 19(1): 53-59.

Yamasaki, Y., Y. Ohta, K. Marita, T. Nakagawa, M. Kawamukai, and H. Matsuda. 1992. Isolation, Identification and Effect of Oxygen Supply on Cultivation of Chitin and Chitosan Degradating Bacterium. Biosci. Biotech. Biochem. 56(8): 1325-1326.

Yusriah dan N.D. Kuswytasari. 2012. Pengaruh pH dan Suhu Terhadap Aktivitas Protease *Penicillium* sp. Jurnal sains dan seni POMITS. 2(1): 2337-3520.

Zhang, Y., M. Himmel, and J. Mielenz. 2006. Outlook for cellulase improvement: Screening and selection strategies Biotechnology Advances. Elsevier. Amsterdam.