DAFTAR PUSTAKA

Adzet, J.M. 2010. Transformation of lime split trimmings into different collagen materials. JALCA. 105: 10 - 13.

Ali, T.H., N.H. Ali, and L.A. Mohamed. 2011. Production, purification and some properties of extracellular keratinase from feathers-degrading bacteria by *Aspergillus orizae* NRRL-447. J. Appl. Sci. Environ. Sanit. 6 (2): 123 – 136.

Aliabadi, M. A., M. F. Ghasemi, and K. H. Isaazadeh. 2014. Antimicrobial activity bioactive compounds produced by *Exiguobacterium acetylicum* PTCC1756 against pathogenic bacteria. Sci. J. Microbiol. 3(4) 55-62

Anbu, P., S. C. B. Gopinath, A. Hilda, N. Mathivanan, and G. Annadural. 2006. Secretion of keratinolytic enzymes and keratinolysis by *Scopulariopsis brevicaulis and Trichophyton mentagrophytes*: regression analysis. Can. J. Microbiol. 52: 1060 – 1069.

Anonim. 1996. Teknologi Pengendalian dampak Lingkungan Industri Penyamakan Kulit. Badan Pengendalian Dampak Lingkungan. Jakarta. 29-47

APHA. 2005. Standard Methode for the Examination of Water and Wastewater. 21th ed. Washington DC.

Apriyantono, A., D. Fardiaz, N. L. Puspitasari, Sedarnawati, dan S. Budiyanto. 1989. Analisis Pangan. Departemen Pendidikan dan Kebudayaan Direktorat Jenderal Pendidikan Tinggi Pusat Antar Universitas Pangan dan Gizi. Institut Pertanian Bogor. 74 – 76.

Atlas, R.M., and Bartha, R. 1997. Microbial Ecology, Fundamentals and Aplication. An Imprint of Addison Wesley Longman, Inc. New York

Balaji, S., M. S. Kumar, R. Karthikeyan, R, Kumar, S. Kirubanandan, R. Sridhar, and P. K. Sehgal. 2008. Purification and characterization of an extracellular keratinase from a hornmeal-degrading *Bacillus subtilis* MTCC 9102. World. J. Microbiol. Biotechnol. 24:2741–2745

Banerjee, R., dan B. C. Bhattacharyya. 2001. Enzyme technology for improving tannery management in rural area. J. Ind. Leat. Technologist Assoc.. 3: 182 – 185.

Benson. 2001. Microbiological Aplication Labolatory Manual in General Microbilogy. Eight Ed. The McGraw-Hill. 64 – 66.

Bernal, C, L. Vidal, E. Valdivieso, and N. Coello. 2003. Keratinolitik activity of *Kocuria rosea*. World J. Microbiol. Biotechnol. 19: 255 – 261

Bernal, C, I. Diaz, and N. Caello. 2006. Response surface methodology for the optimization of keratinase production in culture medium containing feathers produced by *Kocuria rosea*. Can. J. Microbiol. 52:445-450

Biswanger, H. 2011. Practical Enzimology. 2nd ed. Wiley-Blackwell. Germany. 28 – 66.

Bollag, M.D., M.D. Rzycki, and S.J. Edelstein. 1996. Protein Methode. 2nd edition. John Wiley & Sons. New York.

Brandelli, A., and A Riffel,. 2005. Production of an extracellular keratinase from *Chryseobacterium* sp. growing on raw feathers. Eur. J. Biotechnol. 8. 35–42.

Brandelli, A. 2008. Bakteri keratinases: useful enzymes for bioprocessing agroindustrial wastes and beyond. Food Bioprocess Technol. 1: 105 –116

Brandelli, A., D.J. Daroit, and A. Riffel. 2010. Biochemical features of mikroba keratinases and their production and aplications. Appl. Microbiol. Biotechnol. 85: 1735 -1750.

Bressollier, P,, F Letourneau, M. Urdaci, and B. Verneuil. 1999. Purification and characterization of a keratinolytic serine proteinase from *Streptomyces albidoflavus*. Appl. Environ. Microbiol. 65:2570–2576

Brown, E.M. 2008. The Collagen Microfibril Model as a Tool for Leather Scientists. USDA. Wyndmoor.

Cai, C., J. Chen, J Qi, Y. Yin, and X. Zheng. 2008. Purification and characterization of keratinase from a new *Bacillus subtilis* strain. J. Zhejiang Univ. Sci. 9:713 - 720.

Cai, C., and X. Zheng. 2009. Medium optimization for keratinase production in hair substrate be a new *Bacillus subtilis* KD-N2 using response surface methodology. J. Ind. Microbiol. Biotechnol. 36:875 – 883.

Cao, Z., Q. Zhang, D. Wei, L. Chen, J. Wang, X. Zhang, and M Zhou. 2009. Characterization of novel *Stenotrophomonas* isolate with high keratinase activity and purification of enzyme. J. Ind. Microbiol. Biotechnol. 36:181 – 188.

Cedrola, S.M.L., A.C.N. de Melo, A.M. Mazotto, U. Lins, R.B. Zangali, A.S. Rosado, R.S. Peixoto, and A.B. Vermelho. 2011. Keratinases and sulfide from *Bacillus subtilis* SLC to recycle feather waste. Word J. Microbiol. Biotechnol. 27:1355-1365.

Chaudhari, P. N, S. B. Chincholkar, and B. L. Chaudhari. 2013. Biodegradation of feather keratin with a PEGylated protease of *Chryseobacterium gleum*. Process Biochem. 48:1952–1963.

Cheng, S.W., H. M. Hu, S. W. Shen, H. Takagi, M. Asano, and Y. C. Tasi. 1995. Production and characterization of keratinase of a feather-degrading *Bacillus licheniformis* PWD-1. Biosci. Biotechnol. Biochem. 59: 2239 – 2243.

Collins, C.H., P.M. Lyne, and J. M. Grange. 1989. Collins and Lynes Microbiological Methods.6th ed. Butterworths. London. 100 – 105.

Correa, A. P. F., D. J. daroit, and A. Brandelli. 2010. Characterization of keratinase produced by *Bacillus* sp. P7 isolated from an Amazonian environment. Int. Biodeter. Biodegr. 64: 1 – 6.

Covington, A. D., 2011. Tanning Chemistry The Science of Leather. RSC. UK. 20 – 27.

De Toni, C.H., M.F. Richter, J.R. Chagas, J.A.P. Henriques, and C. Termignoni, 2002. Purification and characterization of an alkalin serine endopeptidase from a feather-degrading *Xanthomonas maltophila* strain. Can. J. Microbiol. 48: 342 – 348.

Dellman, H. D., dan E. M. Brown. 1992. Buku Teks Histologi Veteriner. Alih bahasa. R. Hartono. UI-Press. Jakarta.

Dewan Standardisasi Nasional. 1990. SNI 06-1795-1990 Cara Uji Tegangan Tarik Dan Kekuatan Regang. Jakarta.

Dewan Standardisasi Nasional. 1998. SNI 19-4795-1998 Cara Uji Kadar Sulfida Dalam Air Limbah Penyamakan Kulit. Jakarta.

Djojowidagdo, S. 1988. Kulit Kerbau Lumpur Jantan, Sifat-sifat dan Karakteristiknya Sebagai Bahan Wayang Kulit Purwa. Disertasi. Universitas Gadjah Mada. Yogyakarta. 28 – 31.

Eliades, L., M. Cabello, C. Voget, B. Galarza, and M. Suparrat. 2010. Screening for alkaline keratinolytic activity in fungi isolated from soil of the biosphere reserve “Parkuet Costero del Sur” (Argentina). World J Microbiol Biotechnol. 26: 2105 – 2111.

Fakhfakh, N., N. Hmidet, A. Haddar, S. Kanoun, and M. Nasri. 2010. A novel serine metallokeratinase from a newly isolated *Bacillus pumilus* A1 grown on chicken feather meal: biochemical and molecular characterization. Appl. Biochem. Boetechnol. 162:329 – 344.

Farag, A. M., and M. A. Hassan. 2004. Purification, characterization and immobilization of a keratinase from *Aspergillus orizae*. Enzyme Microb. Technol. 34: 85 – 93.

Gaspersz, V. 2006. Teknik Analisis Dalam Penelitian Percobaan. Jilid 1. Cet. ke 3. Tarsito. Bandung. 136 – 140.

Ghosh, A, Chakrabarti K, and Chattopadhyay D. 2008. Degradation of raw feather by a novel high molecular weight extracellular protease from newly isolated *Bacillus cereus* DCUW. J. Ind. Microbiol. Biotech 35:825–834

Giongo, J.L., F. Oise, S. Lucas, F. Casarin, P. Hebs, and A. Brandelli. 2007. Keratinolitik proteases of *Bacillus* species isolatd from the Amazon basin

showing remarkable de-hairing activity. World J. Microbiol, Biotechnol. 23: 375 – 382.

Gumilar, J., 2010. Hubungan Antara Berat Kuilt Domba Garaman, *Berat Blotten* dan Berat *Wet Blue* dengan Luas Kulit Jadi. Proseding Seminar Nasional Perspektif Pengembangan Agribisnis di Indonesia. Fakultas Peternakan, Universitas Jenderal Sudirman, Purwokerto. 563 – 567.

Gupta, R., and P. Ramnani. 2006. Mikroba keratinases and their prospective applications: an overview. Appl. Microbiol. Biotechnol. 70: 21 – 33.

Gushterova, A., E. Vasileva-Tonkova, E. Dimova, P. Nedkov, and T. Haertlé. 2005. Keratinase production by newly isolate *Antarctic actinomycetes* strains. World J. Microbiol. Biotechnol. 21: 831 – 834.

Herdyastuti, N. 2010. Karakterisasi Kitinase yang Diproduksi oleh Isolat Bakteri dari Lumpur Sawah. Program Stusi S3 Kimia. FMIPA. UGM. 130 – 132.

Heriyadi, D., 2011. Pernak-pernik dan Senarai Domba Garut, Unpad Press. Bandung, 3-20.

Hu, H., J. Gao, J. He, B. Yu, P. Zheng, Z. Huang, X. Mao, J. Yu, G. Han, and D. Chen. 2013. Codon optimization significantly improves the expression level of a keratinase gene in *Pichia pastoris*. PLoS ONE 8(3): e58393.

Infante, I., M. A. Morel, M.C. Ubalde, C.M. Rosales, S. Belvisi, and S.C. Sowinski. 2010. Wol-degrading *Bacillus* isolats: extracellular protease production for microbial processing of fabrics. Word J. Microbiol. Biotechnol. 26: 1047 - 1052.

Ionata, E., F. Canganella, G. Bianconi, Y. Benno, M. Sakamoto, A. Capasso, M. Rossi, and F. La Cara. 2008. A novel keratinase from *Clostridium sporogenes* bv. *pennavorans* bv. a thermotolerant organism isolated from solfataric muds. Microbiol Res 163:105–112

Irianto, K. 2007. Mikrobiologi: Menguak Dunia Mikroorganisme. Jilid 2. Yrama Widya, Bandung. 15 – 24.

Jaouadi, B., S. E. Chaabouni, M.B. Ali, E.B. Messaoud., B. Naili, A. Dhouib, and S. Bejar. 2009. Excellent laundry detergent compatibility and high dehairing ability of the *Bacillus pumilus* cbs alkalin proteinase (SAPB). Biotechnol. Bioprocess. Eng. 14: 503 – 512.

Jaouadi, B., B. Abdelmalek, D. Fodil, F. Z. Ferradji, H. Rekik, and N. Zaria. 2010. Purification and characterization of a thermostable keratinolytic serine alkaline preteinase from *Streptomyces* sp. Stran AB1 with high stability in organic solvents. Biores. Technol. 101:8361 – 8360.

Jaouadi N. Z, H. Rekik, A. Badis, S. Trabelsi, and M. Belhoul. 2013. Biochemical and molecular characterization of a serine keratinase from *Brevibacillus*

brevis US575 with promising keratin-biodegradation and hide-dehairing activities. PLoS ONE 8(10): e76722.

Jenie, B. S. L dan W. P. Rahayu, 1993. Penanganan Limbah Industri Pangan. Penerbit kanisius. Yogyakarta.48 – 60.

Kamini, N. R., Hemachander, C., Geraldine, and S. M., Puvanakrishan. 1999. Microbial enzyme technology as an alternative to conventional chemicals in leather industry. Departement of biotechnology. Central Letaher Research Institute. Adyar. Chenai. India.

Kansoh, A. L., E. N. Hossiny, and E. K. A. EL-Hameed. 2009. Keratinase production from feather wastes using some local *Streptomyces* isolates. Aus. J. Basic Appl. Sci. 3(2): 561 – 571.

Kasana, R. C., Sudesh, K. Yadav. 2007. Isolation of a psychrotrophic *Exiguobacterium* sp. SKPB5 (MTCC 7803) and characterization of Its alkaline protease. Cur Microbiol 54: 224–229.

Khardenavis, A, A., A. Kapley, H. J. Purohit. 2009. Processing of poultry feathers by alkaline keratin hydrolyzing enzyme from *Serratia* sp. HPC 1383. Waste Manage. 29:1409–1415.

Kreplak, L., J. Doucet, P. Dumas and F. Briki. 2004. New aspects of the α-helix to β-sheet transition in stretched hard α-keratin fibers. Biophysic. J. 87: 640 – 647.

Kumar, A. G., S. Swarnalatha, S. Gayathri, N. Nagesh, and G. Sekaran. 2008. Characterization of an alkaline active—thiol forming extracellular serine keratinase by the newly isolated Bacillus pumilus. J. Appl. Microbiol. 104:411–419.

Kumar, R., S. Balaji, T. S. Uma, A. B. Mandal, and P. K. Sehgal. 2010. Optimization of influential parameters for extracellular keratinase production by *Bacillus subtilis* (MTCC9102) in solid state fermentation using horn. Appl. Biochem. Biotechnol. 160:30 – 39.

Kumar, M. P., R. Aravindhan, K.J. Sreeram, J.R. Rao, and B.U. Nair. 2011. Green chemistry approach in leather processing: a case of chrome tanning. JALCA. 106: 113 - 118.

Kunert, J. 2000. Physiology of keratinophilic fungi. *Revista Iberoamericana de Micologia*. *Bilbao*: 66-85.

Laemmli, U.K. 1970. Cleavage of structural proteins during assembly of head of bacteriophage T4. Nature. 227:680–685.

Lakshmi, P. 2010. Purification And Characterization Of An Alkaline Protease From *Exiguobacterium Acetylicum* MTCC 9115. Research And Development Cell Jawaharlal Nehru Technological University Hyderabad Kukatpally, Hyderabad – 500 085 India.

Lehninger, A. L. 1993. Dasar Dasar Biokimia. Alih bahasa. M. Thenawidjaja. Cetakan ketiga. Erlangga. Jakarta.

Lin X., D. W. Kelemen, E. S. Miller, and J. C. H. Shih. 1995. Nucleotide sequence and expression of *kerA*, the gene encoding a keratinolytic protease of *Bacillus licheniformis* PWD-1. Appl. Environ. Microbiol. 61 (4) : 1469–1474.

Macedo, A. J., W.O. Beys Da Silva, R. Gava, D. Driemier, J. A. P. Henriques, and C. Termigonu. 2005. Novel keratinase from *Bacillus subtilis* s14 exhibiting remarkable dehairing capabilities. Appl. Environ. Microbiol. 71: 594 – 596.

Mandigan, M. T., J. M. Martinko, D. A. Stahl, and D. P. Clark. 2012. Brock: Biology of Microorganisms. 13th ed. Pearson Education Inch. San Francisco. USA.

Mazotto, A. M., A. Cristina, N. de Melo, A. Macrae, A.S.Rosado, R. Peixoto, S.M.L. Cedrola, S. Couri, R.B. Zingali, A.L.V. Villa, L.Rabinovitch, J.Q. Chaves, and A.B. Vermelho. 2011. Biodegradation of feather waste by extracellular keratinases and gelatinases from *Bacillus* spp. World J. Microbiol. Biotechnol. 27: 1355 – 1365.

Morsy, M., and A. E. Gendy. 2010. Keratinase production by endophytic *Penicillium* spp. Morsy1 under solid state fermentation using rice straw. Appl Biochem Biotechnol. 162: 780 – 794.

Mowafy, M., and R. G. Casen. 1975. Microscopic structure of fig skin. J. Anim. Sci. 41 (5): 1281 – 1290.

Mukhtar, H., and I. U. Haq. 2008. Production of alkaline protease by *Bacillus subtilis* and its application as a depilating agent in leather processing. Pak. J. Bot. 40 (4): 1673 – 1679.

Muray, R.K., D.A. Bender, K. M. Botham, P. J. Kenelly, V. W. Rodwel, and P. A. Weil, 2009. Harper's Ilustrated Biochemistry. 28ed. MC-Graw Hill Lange.

Nazir, M. 1988. Metode Paenelitian. Ghalia Indonesia, Jakarta. 63 – 74.

Nelson, D.L., and M.M. Cox. 2008. Lehninger Principles of Biochemistry. W. H. Freeman and Company, New York. 123 – 125.

Nilegaonkar, S. S., V. P. Zambare, P. P. Kanekar, P. K. Dhakephalkar, and S. S. Sarnaik. 2007. Production and partial characterization of dehairing protease from Bacillus cereus MCM B-326. Biores. Tech. 98. 1238 – 1245.

Ockerman, H. W. And C. L. Hansen. 2000. Animal By Product Processing and Utilizations. CRC Press, New York. 159 - 162.

Ogawa, S, K. Fujii, K. Kaneyama, and K. Arai. 2008. Action of thioglycolic acid and l-cysteine to disulfide cross link in hair waving during permanent waving. Sen'I Gakkaishi, 64 (6) : 137 – 144.

Park, G. T., and H. J. Son. 2009. Keratinolytic activity of *Bacillus megaterium* F7-1, a feather degrading mesophilic bacterium. Microbiological res. 164: 478 – 485.

Parthasarathi, K. 2000. Manual on Tanning and Finishing. Consultant Unido, India. 15 – 16.

Pillai, P., and G. Archana. 2008. Hide depilation and feather disintegration studies with keratinolitik serine protease from a novel *Bacillus subtilis* isolat. Appl. Microbiol. Biotechnol. 78 : 643 – 650.

Pillai, P., S. Mandge, and G. Archana. 2011. Statistical optimization of production and tannery applications of a keratinolytic serine protease from *Bacillus subtilis* P13. Proc. Biochem. 46: 1110 – 1117.

Pommerville, J.C. 2011. Alcamo's Fundamentals of Microbiology. 9th ed. Jones and Burtlett Publisher. Massacusetts. 150 – 154..

Prakash, P., S.K. Jayalakshmi, and K. Sreeramulu. 2010. Production of keratinase by free and immobilized cells of *Bacillus halodurans* strain ppks-2: partial characterization and its application in feather degradation and dehairing of the goat skin. Appl. Biochem. Biotechnol. 160 : 1909 – 1920.

Prawiroharsono, S. 2008. Penerapan enzim untuk penyamakan kulit ramah lingkungan. J. Tek. Ling. 9 (1) : 51 – 58.

Prescott, L. M., J. P. Harley, and D. A. Klein. 1999. Microbiology. 4th ed. WCB McGraw-Hill. Boston

Presland, R.B., K.Gregg, P.L. Molloy, C.P. Morris, L.A. Crocker, and G.E. Rogers 1989. Avian keratin genes. I. A molecular analysis of the structure and expression of a group of feather keratin genes. J. Mol. Biol 209: 549-559.

Radha, S. and P. Gunasekaran. 2007. Cloning and expression of keratinase gene in *Bacillus megaterium* and optimization of fermentation conditions for the production of keratinase by recombinant strain. J. Appl. Microbiol. 103 : 1301–1310.

Rahayu, S., D. Syah, and M. T. Suhartono. 2012. Degradation of keratin by keratinase and disulfide reductase from *Bacillus* sp. MTS of Indonesian origin. Biocatal. Agricultural Biotechnol. 1: 152 – 158.

Riessen, S., and G. Antranikian. 2001. Isolation of *Thermoanaerobacter keratinophilus* sp., a novel thermophilic, anaerobic bacterium with keratinolytic activity. Extremophiles. 5 : 399 – 408.

Riffel, A., and A. Brandelli. 2002. Isolation and characterization of a feather-degrading bacterium from the poultry processing industri. J. Ind. Microbiol. Biotechnol. 29 : 255 – 258.

Riffel, A., F. Lucas, P. Heeb, and A. Brandelli. 2003. Characterization of a new keratinolytic bacterium that completely degrades native feather keratin. Arch. Microbiol. 179 : 258 – 265.

Rismayanti, Y. 2010. Petunjuk Teknis Baudidaya Ternak Domba. BPTP Jawa Barat. 2010. 14-15

Saitou, N., and M. Nei. 1987. The neighbor-joining method: a new method for reconstructing phylogenic trees, Mol. Biol. Evol. 4: 406 - 425.

Salaki, C.L., L. Sembiring, J. Situmorang, dan N.S.N. Handayani. 2010. Karakterisasi dan identifikasi molekuler (*ardra: amplified ribosomal DNA digestion analysis*) isolat bakteri *Bacillus thuringiensis* berliner endogenik Indonesia sebagai agensia pengendali hayati hama *Crocidolomia binotalis* Zell. Proceding Seminar Nasional. Fakultas Biologi UGM, Yogyakarta. 585 – 591.

Sangali, S., and A. Brandelli. 2000. Feather keratin hydrolysis by a *Vibrio* sp. strain kr2. J. Appl. Microbiol. 89: 735 – 743.

Saravanabhavan, S., J.R. Rao, B.U. Nair, and T. Rasamani. 2007. An eco-efficient rationalized leather process. J. Chem. Technol. Biotechnol. 82: 971 – 984.

Sarkar, K.T. 1995. Theory and Practice of Leathher Manufacture. Mahatma Gandhi Road, Madras. 236 – 366.

Scopes, R.K. 1994. Protein purification principles and practice. Edisi ke-2. New York: Springer Verlag.

Selvakumar, G., P. Joshi, S. Nazim. P. K. Mishra, S.Kundu, and H. S. Gupta. 2009. *Exiguobacterium acetylicum* strain 1P (MTCC 8707) a novel bacterial antagonist from the North Western Indian Himalayas. World J. Microbiol. Biotechnol. 25:131–137

Sharma, R., and R. Gupta. 2010. Substrate specificity characterization of thermostable keratinase from *Pseudomonas aeruginosa* KS-1. J. Ind. Microbiol. Biotechnol. 37:785 – 792.

Sharpouse, J. H. 1983. Leather Technician's Handbook. London. 114 – 134.

Sigma Aldrich. 1998. Suitability Assay for Keratin Azure as a Substrate for Proteinase K.

Srinivas, D. and G. R. Naik. 2011. Characterization of alkaline thermostable keratinolytic protease from thermoalkalophilic *Bacillus halodurans* JB 99 exhibiting dehairing activity. Intr. Biodeter. Biodegr. 65:29 – 35.

Suharsono. 1990. Enzimologi. Pusat Antar Universitas Pangan dan Gizi. Universitas Gadjah Mada. Yogyakarta.

Sulandari, S. dan M. S. A. Zein. 2003. Panduan Praktikum Laboratorium DNA. Bidang Zoologi. Pusat Penelitian Biologi. Lembaga Ilmu Pengetahuan Indonesia.

Sunaryo, I., S. Sutyasmi., H. Mustafa, J. Susilo, dan Heryanto. 2005. Pengaruh Pengurangan Na_2S Pada Proses Buang Rambut Terhadap Mutu Kulit Dan Beban Cemaran. Workshop Hasil Litbang Bidang Pengendalian Pencemaran, BBKKP, Yogyakarta. 71 – 82.

Sundararajan, S., C.N. Kannan, and S. Chittibabu. 2011. Alkaline protease from *Bacillus cereus* VITSN04: Potential application as a dehairing agent. J. Biosci. Bioeng. 111 (2): 128 – 133.

Sumantri, C. A. Einstiana, J.F. Salamena, dan I. Inounu. 2007 Keragaan dan Hubungan Phylogenik antar Domba Lokal di Indonesia melalui Pendekatan Analisis Morfologi. JITV. 12(1). 42 – 54.

Syed, D. G., J. C. Lee, W. Li, C. Kim, and D. Agasar. 2009. Production, characterization and application of keratinase from *Streptomyces gulbargensis.* Bioresource Technol. 100:1868 – 1871.

Tancous, J. J., W. T. Roddy, and O. Flahtery. 1981. Defek-Defek Pada kulit Mentah dan Kulit Samak. Terjemahan. R. M. Judoamidjodjo. Bhatara Karya Aksara. Jakarta.

Tatineni, R., K.K. Dodappeni, R.C. Potumarthi, R.N. Vellanki, M.J Kandhatil., N.Kolli, and L.N Mangamoori. 2008. Purification and characterization of alkaline keratinase from *Streptomyces* sp. Bioresource Technol. 99: 1596-1602.

Tchobanoglous, G. and F. L. Burton, 1992. Wastewater Engineering. Treatment, Disposal, and Reuse. Third Ed. Mc Graw-Hill Inc. Toronto. 71 – 83.

Thanikaivelan, P., J.R. Rao, B.U. Nair, and T. Ramasami. 2004. Progress and recent trends in biotechnological methods for leather. Trends Biotechnol. 22 (4): 181 - 188.

Thanikaivelan, P., J.R. Rao, B.U. Nair, and T. Ramasami. 2005. Recent trends in leather making: Processes, problems, and pathways. Environ. Sci. Technol. 35: 37 - 79.

Thanikaivelan, P., C.K. Bharath, S. Saravanabhavan, J.R. Rao, B. Chandrasekaran, N.K. Chandrababu, and B.U. Nair. 2007. Integrated hair removal and fiber opening process using mixed enzymes. Clean Techn. Environ. Policy. 9: 61 – 68.

Tiwary, E., and R Gupta. 2010. Medium optimization for a novel 58 kDa dimeric keratinase from Bacillus licheniformis ER-15: Biochemical characterization and application in feather degradation and dehairing of hides. Bioresourece Technol. 101:6103 – 6110.

Tortora, G. J., B. R. Funke, and C. L. Case. 2001. Microbiology an Introduction. 7th ed. Addison Wesley Longman, Inc. USA. 69 – 73.

Triatmojo, S. dan H. W. B. Santoso, 2001. Biometanogenesis sebagai alternatif bioremediasi limbah industri yang tercemar logam berat crom. Buletin Peternakan. Edisi Tambahan. Fakultas Peternakan. UGM. Yogyakarta.

Triatmojo, S. 2009. Implementasi Produksi Bersih dalam Industri Penyamakan Kulit Guna Peningkatan Efisiensi dan Pencegahan Pencemaran Lingkungan. Seminar Sehari, Dies Natalis ke 51, Akademi Teknologi Kulit, Yogyakarta. 2.

Triatmojo, S., M. Z. Abidin. 2014. Penyamakan Kulit Ramah Lingkungan. Gadjah Mada University Press. Yogyakarta. 99 – 101.

Untari, S., Emiliana, Sulistyah Wrd, S. Sutyasmi, dan J. Susilo. 2009. Mapping Industri Kreatif Produk Kulit di Pulau Jawa. Program Hibah Diknas 2009. Balai Besar Karet Kulit dan Plastik, Yogyakarta. 1 - 3.

Vijayalaxmi, S., K. A. A. Appaiah, S. K. Jayalakshmi , V. H. Mulimani, and K. Sreeramulu. 2013. Production of Bioethanol from Fermented Sugars of Sugarcane Bagasse Produced by Lignocellulolytic Enzymes of *Exiguobacterium* sp. VSG-1. Appl. Biochem. Biotechnol. 171:246–260

Voet, D., J. G. Voet, and C. W. Pratt. 2008. Fundamentals of Biochemistry Life At The Molecular Level. 3rd ed. John Wiley & Sons, Inc. United States Of America.

Wang, S., W. Hsu, T. Liang, Y. Yen, and C. Wang. 2008. Purification and characterization of three novel keratinolytic metaloproteases produced by *Chryseobacterium indologenes* TKU014 in a shrimp shell powder medium. Bioresource Technol. 99:5679 – 5686.

Wilson, R. H., and H. B. Lewis. 1927. The cystine content of hair and other epidermal tisues. J. Biol. Chem. 73: 543-553.

Winarno, F. G. 1986. Enzim Pangan. PT. Gramedia. Jakarta.

Yamamura, S., Y. Morita, Q. Hasan, K. Yokoyama, and E. Tamiya, 2002. Keratin degradation: a cooperative action of two enzymes from *Stenotrophomonas* sp. Biochem. Biophys. Res. C. 294: 1138 – 1143.

Yurmiati, H., dan K. Suradi. 2010. Hubungan berat potong dengan kuantitas pelt domba lokal jantan. Prosiding Seminar Nasional Peternakan Berkelanjutan 2010, Fakultas Peternakan, Universitas Padjadjaran, Bandung. 655 - 661.

Yuwono, T., 2006. Teori dan Aplikasi *Polymerase Chain Reaction*, CV. & I Offset, Yogyakarta.

Zhang, B., Jiang D., Zhou W. W., Hao H. K., and T. G. Niu. 2009. Isolation and characterization of new *Bacillus* sp. 50-3 with highly alkaline keratinase

activity from *Calotes versicolor* faeces. World J. Microbiol. Biotechnol. 25: 583 – 590.

Zambare, V.P., S.S. Nilegaonkar, and P. Kanekaret. 2007. Production of an alkalin protease by *Bacillus cereus* MCM B-326 and its application as a dehairing agent. World J. Microbiol. Biotechnol. 23: 1569 – 1574