

## DAFTAR PUSTAKA

- Abu-Ghazealah, A. A., D. J. Schingoethe, dan A. R. Hippen. 2001. Blood amino acids and milk composition from cows fed soybean meal, fish meal, or both. *J. Dairy Sci.* 84:1174-1181.
- Adams, S., P. Green, R. Claxton, S. Simcox, M.V. Williams, K. Walsh, and C. Leeuwenburgh. 2001. Reactive carbonyl formation by oxidative and nonoxidative pathways. *Front. Biosci.* 6(1):17–24.
- Alberts, B., D. Bray, K. Hopkin, A. Johnson, J. Lewis, K. Robberts, dan P. Walter. 2014. *Essential Cell Biology*. Garland Science, New York.
- Alexander, R. R., and J. M. Griffith. 1993. *Basic Biochemical Methods*. 2nd ed. Wiley-Liss Inc., New York.
- Alsaht, A. A., S. M. Bassiony, G. A. Abdel-Rahman, dan S. A. Shehata. 2014. Effect of cinnamaldehyde thymol mixture on growth performance and some ruminal and blood constituents in growing lambs fed high concentrate diet. *Life Sci. J.* 11(3):240-248.
- Antoniewicz, A. M., V. Vuuren, C. J. van der Koelen, dan I. Kosmala. 1992. Intestinal digestibility of rumen undegraded protein of formaldehyde-treated feedstuffs measured by mobile bag and in vitro technique. *Anim. Feed Sci. Technol.* 39(1):111-124.
- AOAC. 2005. *Official Method of Analysis of the Association of Official Analytical Chemists*. 18th ed. Maryland: AOAC International. William Harwitz (ed). United States of America.
- Astuti, M. 2007. *Pengantar Ilmu Statistik untuk Peternakan dan Kesehatan Hewan*. Binasti Publisher, Bogor.
- Bach, A., S. Calsamiglia, dan M. D. Stern. 2005. Nitrogen metabolism in the rumen. *J. Dairy Sci* 88(1):9-21.
- Banaszkiewicz, T. 2011. Nutritional Value of Soybean Meal, Soybean and Nutrition, Hany El-Shemy (ed), IntechOpen. <http://www.intechopen.com/books/soybean-and-nutrition/nutritional-value-of-soybean-meal>. Diakses tanggal 19 September 2019.
- Bansal, S. and G. Goel. 2015. Rumen Microbiology: An Overview. Pages 281-292 In *Rumen Microbiology: From Evolution to Revolution*. A. K. Puniya, R. Singh, and D. N. Kamra, ed. Springer, New Delhi.
- Baldwin, R. L., dan M. J. Allison. 1983. Rumen metabolism. *J. Anim. Sci.* 57:461-477.
- Beauchemin, K. A. dan S. M. McGinn. 2006. Methane emissions from beef cattle: Effects of fumaric acid, essential oil, and canola oil. *J. Anim. Sci.* 84(6):1489–1496.
- Benchaa C., T.A. McAllister and P. Y. Chouinard. 2008. Digestion, ruminal fermentation, ciliate protozoal populations, and milk production from dairy cows fed cinnamaldehyde, quebracho condensed tannin, or yucca schidigera saponin extracts. *J. Dairy Sci.* 91(12):4765–4777.

- Benchaar, C. 2016. Diet supplementation with cinnamon oil, cinnamaldehyde, or monensin does not reduce enteric methane production of dairy cows. *Animal*. 10(3):418-425.
- Benchaar, C., A. C. Chaves, G. R. Fraser, Y. Wang, K. A. Beuchemin, and T. A. McAllister. 2007. Effects of essential oils and their components on *in vitro* rumen microbial fermentation. *Can. J. Anim. Sci.* 87(11):413–419.
- Bergmeyer, H.U., J. Bergmeyer, dan M. Grassl. 1983. *Method of Enzymatic Analysis Vol. 2*. Weinhein, Deerfiel Beach, Florida.
- Bisswanger, H. 2017. *Enzyme Kinetics: Principles and Methods*. 3<sup>rd</sup> ed. Wiley-VCH. Weinheim.
- Blackwood, C. B., D. Hudleston, D. R. Zak, dan J. S. Buyer. 2007. Interpreting ecological diversity indices applied to terminal restriction fragment length polymorphism data: insights from simulated microbial communities. *Appl. Environ. Microbiol.* 73(16):5276–5283.
- Blanch, M., M. D. Carro, M. J. Ranilla, A. Viso, M. Vazquez-Anon, dan A. Bach. 2016. Influence of mixture of cinnamaldehyde and garlic oil on rumen fermentation, feeding behavior and performance of lactating dairy cows. *Anim. Feed Sci. Technol.* 219:313-323.
- Busquet, M., S. Calsamiglia, A. Ferret, and C. Kamel. 2004. Effects of different doses of plant extracts on rumen microbial fermentation. *J. Dairy. Sci.* 87(Suppl. 1):213.
- Busquet, M., S. Calsamiglia, A. Ferret, P. W. Cardozo, dan C. Kamel. 2005. Effects of cinnamaldehyde and garlic oil on rumen microbial fermentation in a dual flow continuous culture. *J. Dairy Sci.* 88(7):2508-2516.
- Busquet, M., S. Calsamiglia, A. Ferret dan C. Kamel. 2006. Plant extract affects *in vitro* rumen microbial fermentation. *J. Dairy Sci.* 89:761-771.
- Calsamiglia, S., M. Busquet, P. W. Cardozo, L. Castillejos, dan A. Ferret. 2007. Invited review: Essential oils as modifiers of rumen microbial fermentation. *J. Dairy Sci.* 90(6):2580-2595.
- Cardozo, P. W., S. Calsamiglia, A. Ferret, dan C. Kamel. 2004. Effects of natural plant extracts on ruminal protein degradation and fermentation profiles in continuous culture. *J. Anim. Sci.* 82(11):3230-3236.
- Cardozo, P. W., S. Calsamiglia, A. Ferret, dan C. Kamel. 2005. Screening for the effects of natural plants extracts ad different pH on *in vitro* rumen microbial fermentation of high-concentrate diet for beef cattle. *J. Anim. Sci.* 83(11):2572-2579.
- Carrasco, J. M. D., C. Cabral, L. M. Redondo, N. D. P. Viso, D. Colombatto, M. D. Farber, dan M. E. F. Miyakawa. 2017. Impact of chestnut and quebracho tannins on rumen microbiota of bovines. *BioMed. Res. Int.* 2017(3):1-11.
- Castro, S. I. B., L. E. Philip, H. Lapierre, P. W. Jardon, dan R. Berthiaume. 2007. Ruminant degradability and intestinal digestibility of protein and amino acids in treated soybean meal products. *J. Dairy Sci.* 90:810-822.

- Chalupa, W. 1975. Rumen bypass and protection of proteins and amino acids. *J. Dairy Sci.* 58(8):1198-1218.
- Chapman, C. E., S. B. Ort, K. M. Aragona, R. G. Cabral. and P. S. Erickson. 2019. Effect of cinnamaldehyde on feed intake, rumen fermentation, and nutrient digestibility, in lactating dairy cows. *J. Anim. Sci.* 97(4):1819–1827.
- Chaudhry, A. S., M. Mehedi, and H. Khan. 2012. Impacts of different spices on in vitro rumen dry matter disappearance, fermentation and methane of wheat or ryegrass hay based substrates. *Livest. Sci.* 146:84–90.
- Chaves, A. V., K. Stanford, L. L. Gibson, M. E. R Dugan, T. A. McAllister, F. Van Herk, and C. Benchaar. 2008. Effects of cinnamaldehyde, garlic and juniper berry essential oils on rumen fermentation, blood metabolites, growth performance and carcass characteristic of growing lambs. *Livest. Sci.* 117(2):215-224.
- Chaves, A. V., K. Stanford, M. E. R. Dugan, L. L. Gibson, T. A. McAllister, F. Van Herk, dan C. Benchaar. 2011. A dose of cinnamaldehyde supplementation on intake, ruminal fermentation, blood metabolites, growth performance and carcass characteristics of growing lambs. *Livest. Sci.* 141:213-220.
- Cheeke, P. R and E. S. Dierenfeld. 2010. *Comparative Animal Nutrition and Metabolism*. CAB International, Wallingford, UK.
- Chen, X. B. 1994. *An Excel Application Programme for Processing Feed Degradability Data: User Manual*. Rowett Research Institute, UK.
- Chen, X. B., dan M. J. Gomes. 1992. Estimation of Microbial Protein Supply to Sheep and Cattle Based on Urinary Excretion of Purine Derivatives. An overview of the Technical Details. Rowett Research Institute, Bucksburn, Aberdeen, UK.
- Cheng K J., C. W. Forsberg, H. Minao, dan J. W. Costerton. 1989. Microbial ecology and physiology of feed degradation within the rumen. Pages 595-624 in *Proc. of the Seventh International Symposium on Ruminant Physiology*, Sendai, Japan.
- Cheng, Y. F., J. E. Edwards, G. G. Allison, W. Y. Zhu, and M. K. Theodorou. 2009. Diversity and activity of enriched ruminal cultures of anaerobic fungi and methanogens grown together on lignocellulose in consecutive batch culture. *Bioresour. Technol.* 100(20):4821–4828.
- Choudhury, P. K., A. Z. M. Salem, R. Jena, S. Kumar, R. Sign, and A. K. Puniya. 2015. Rumen Microbiology: An Overview. Pages 3-16 In *Rumen Microbiology: From Evolution to Revolution..* A. K. Puniya, R. Singh, and D. N. Kamra, ed. Springer, New Delhi.
- Comlekcioglu, U., I. Akyol, E. Ozkose, B. Kar, dan M. S. Ekinci. 2008. Carboxymethylcellulase production by the anaerobic rumen fungus *Neocallimastix* sp. GMLF7. *Ann. Microbiol.* 58(1):115-119.

- Devant, M., A. Ferret, S. Calsamiglia, R. Casals, and J. Gasa. 2007. Effect of nitrogen source in high-concentrate, low-protein beef cattle diets on microbial fermentation studied in vivo and *in vitro*. *J. Anim. Sci.* 79(7):1944–1953.
- Dicksved, J., H. Floistrup, A. Bergstrom, M. Rosenquist, G. Pershagen, A. Scheynius, S. Roos, S. Johan, L. Engstrand, C. B. Fahrlander, dan E. V. Mutius. 2007. Molecular fingerprinting of the fecal microbiota of children raised according to different lifestyles. *Appl Environ Microbiol.* 73:2284–2289.
- Dijkstra, J., J. L. Ellis, E. Kebreab, A. B. Strathe, S. López, J. France, and A. Bannink. 2012. Ruminal pH regulation and nutritional consequences of low pH. *Anim. Feed Sci. Technol.* 172(1):22–33.
- Dunbar, J., L. O. Ticknor dan C. R. Kuske. 2001. Phylogenetic specificity and reproducibility of 16S rRNA genes from bacterial communities. *Appl Environ Microbiol.* 67(1):190-197.
- El-Fallal, A., M. A. Dohara, A. El-Sayed, and N. Omar. 2012. Carbohydrates Comprehensive Studies on Glycobiology and Glycotechnology. Starch and Microbial  $\alpha$  Amylases: From Concepts to Biotechnological Applications. C. Chang (ed.). Intech. London. pp 459-488.
- Ferre, D., M. Banjac, S. Calsamiglia, M. Busquet, C. Kamel, dan G. Avgustin. 2004. The effects of plant extracts on microbial community structure in a rumen-simulating continuous-culture system as revealed by molecular profiling. *Folia Microbiol.* 49(2):151-155.
- Ferrero, M., M. E. Farías, dan F. Siñeriz. 2004. Preliminary characterization of microbial communities in high altitude wetlands of northwestern Argentina by determining terminal restriction fragment length polymorphisms. *Rev. Latinoam Microbiol.* 46(3-4):72–80.
- Filípek, J., and R. Dvořák. 2009. Determination of the volatile fatty acid content in the rumen liquid: Comparison of gas chromatography and capillary isotachopheresis. *Acta Vet. Brno.* 78(4):627-633.
- France, J., and J. Dijkstra. 2005. Volatile Fatty Acid Production and Metabolism. Pages 157-175 in *Quantitative Aspects of Ruminant Digestion and metabolism Second*. 2nd ed. J. Dijkstra, J. M. Forbes, and J. France, ed. CABI Publ., Cambridge, USA.
- Fraser, G. R., A. V. Chaves, Y. Wang, T. A. McAllister, K. A. Beauchemin, and C. Benchaar. 2007. Assessment of the effects of cinnamon leaf oil on rumen microbial fermentation using two continuous culture systems. *J. Dairy Sci.* 90(5):2315– 2328.
- Gonzalez, A. R. C., M. E. B. Barraza, J. D. Viveros, and A. C. Martinez. 2014. Rumen microorganisms and fermentation. *Arch. Med. Vet.* 46(3): 349-361.
- Gordon, G. L., dan M. W. Phillips. 1998. The role of anaerobic gut fungi in ruminants. *Nutr. Res. Rev.* 11(1):133-168.

- Günel, M., B. Pinski, and A. A. AbuGhazaleh. 2017. Evaluating the effects of essential oils on methane production and fermentation under in vitro conditions. *Ital. J. Anim. Sci.* 16(3):500–506.
- Gurung, N., S. Ray, S. Bose, and V. Rai. 2013. A broader view: Microbial enzymes and their relevance in industries, medicine, and beyond. *BioMed Res. Int.* 11: 1-18.
- Hackmann, T. J., and J. L. Firkins. 2015. Maximizing efficiency of rumen microbial protein production. *Front. Microbiol.* 6(465):1–16.
- Halliwell, G., dan J. Lovelady. 1981. Utilization of carboxymethylcellulose and enzyme synthesis by *Trichoderma koningii*. *J. Gen. Microbiol.* 126(1):211-217.
- Hartadi, H., S. Reksohadiprojo, dan A. D. Tilman. 1997. Tabel Komposisi Pakan untuk Indonesia. Cetakan Keempat. Universitas Gadjah Mada Press, Yogyakarta.
- Harun, N. 2010. Karakteristik minyak kayu manis (*Cinnamomum burmanni* Blume) berdasarkan letak kulit pada batang dan ukuran bahan pada proses penyulingan. *SAGU.* 9(2): 28-32.
- Harwanto, L. M. Yusiati, dan R. Utomo. 2014. Pengaruh kayu manis (*Cinnamomum burmanni* Ness ex Bl) sebagai sumber sinamaldehyd terhadap parameter fermentasi dan aktivitas mikrobial rumen secara *in vitro*. *Buletin Peternakan* 38(2): 71-77.
- Helander, I. M., H. Alakomi, K. Latva-Kala, T. Mattila-Sandholm, I. Pol, E. J. Smid, L. G. M. Gorris, and A. Wright. 1998. Characterisation of the action of selected essential oil components on gram-negative bacteria. *J. Agric. Food Chem.* 46:3590-3595.
- Hespell, R. B. 1988. Microbial digestion of hemicelluloses in the rumen. *Microbiol. Sci.* 5(12):362-365.
- Hobson, P. N., dan C. S. Stewart. 1997. *The Rumen Microbial Ecosystem*. 2<sup>nd</sup> ed. Blackie Academic & Professional, London.
- Hu, C., L. Liu, and S. Yang. 2012. Protein enrichment, cellulase production and in vitro digestion improvement of pangolagrass with solid state fermentation. *J. Microbiol. Immunol. Infect.* 45(1)-7-14.
- Huang, X. D., H. Y. Tan, R. Long, J. B. Liang, dan A. G. Wright. 2012. Comparison of methanogen diversity of yak (*Bos grunniens*) and cattle (*Bos taurus*) from the Qinghai-Tibetan plateau, China. *BMC Microbiol.* 12(237):1–10.
- Ishlak, A., M. Günel, and A. A. AbuGhazaleh. 2015. The effects of cinnamaldehyde, monensin and quebracho condensed tannin on rumen fermentation, biohydrogenation and bacteria in continuous culture system. *Anim. Feed Sci. Technol.* 207 31–40.
- Jahani-Azizabadi, H., M. D. Mesgaran, A. R. Vakili, dan K. Rezayazdi. 2014. Effect of some plant essential oils on *in vitro* ruminal methane production and on fermentation characteristic of a mid-forage diet. *J. Agr. Sci. Tech.* 16:1543-1554.

- Jannah, S. N., A. Dinoto, K. G. Wiryawan, dan I. Rusmana. 2016. Molecular diversity pattern of intestinal lactic bacterial in Cemani chicken, Indonesian native chicken, as revealed by terminal restriction fragment length polymorphisms. *Malays. J. Microbiol.* 12:102-111.
- Joch, M., J. Mrazek, E. Skrivanova, L. Cermak, dan M. Marounek. 2018. Effects of pure plants secondary metabolites on methane production, rumen fermentation and rumen bacteria populations *in vitro*. *J. Anim. Physiol. Anim. Nutr.* 00:1-13.
- Johnson, M. C., A. A. Devine, J. C. Ellis, A. M. Grunden, dan V. Fellner. Effects of antibiotics and oil on microbial profiles and fermentation in mixed cultures of ruminal microorganism. *J. Dairy Sci.* 92:4467-4480.
- Juven, B. J., J. Kanner, F. Schved, and H. Weisslowicz. 1994. Factors that interact with the antibacterial action of thyme essential oil and its active constituents. *J. Appl. Bacteriol.* 76:626-631.
- Kamalak, A., O. Canbolat, dan Y. Gurbuz. 2005. Protected protein and amino acids in ruminant nutrition. *J. Sci. Eng.* 8(2): 84-88.
- Kaplan, C. W., J. C. Astaire, M. E. Sanders, B. S. Reddy, and C. L. Kitts. 2001. 16S ribosomal DNA terminal restriction fragment pattern analysis of bacterial communities in faeces of rats fed *Lactobacillus acidophilus* NCFM. *Appl. Environ. Microbiol.* 67(4):1935–1939.
- Kearl, L. C. 1982. Nutrient Requirements of Ruminant. Pages 82 in *Developing Countries*. International Feedstuff Institute, Utah State University, Logan, Utah.
- Keidane, D., and E. Birgele. 2003. The efficacy of feed on the intra ruminal and intra abomasal pH dynamics in goats. *Veterinarija IR Zootechnika* 22(44): 58-61.
- Koul, O., S. Walia, dan G. S. Djaliwal. 2008. Essential oil as green pesticides: Potential and constraints. *J. Biopectic Int.* 4(1):63-84.
- Krause, K. M., and D. K. Combs. 2003. Effects of forage particle size, forage source, and grain fermentability on performance and ruminal pH in midlactation cows. *J. Dairy Sci.* 86:1382–1397.
- Kumar, K., L. C. Chaudhary, and S. Kumar. 2014. Exploitation of tannins to modulate rumen ecosystem and ruminants performance: A review. *Indian J. Anim. Sci.* 84(6):609–618.
- Kumari, R. dan K. Kumar. 2015. Roasting and formaldehyde method to make bypass protein for ruminants and its importance: A review. *Indian J. Anim. Sci.* 85(3):223-230.
- Li, Y., M. He, C. Li, R. Forster, K. A. Beauchemin, dan W. Yang. 2012. Effects of wheat dried distillers' grains with solubles and cinnamaldehyde on *in vitro* fermentation and protein degradation using the Rusitec technique. *Arch. Anim. Nutr.* 66(2):131-148.



- Liu, W. T., T. L. Marsh, H. Cheng, dan L. J. Forney. 1997. Characterization of microbial diversity by determining terminal restriction fragment length polymorphisms of genes encoding 16S rRNA. *Appl Environ Microbiol.* 63(11):4516–4522.
- Lourenco, M., P. W. Cardozo, S. Calsamiglia, dan V. Fievez. 2008. Effects of saponins, quercetin, eugenol, and cinnamaldehyde on fatty acid biohydrogenation of forage polyunsaturated fatty acids in dual-flow continuous culture fermenters. *J. Anim. Sci.* 86(11):1-31.
- Macheboeuf, D., D. P. Morgavi, Y. Papon, J. L. Mousset, and M. A. Schaan. 2008. Dose response effects of essential oil on in vitro fermentation activity of the rumen microbial population. *Anim. Feed Sci. Technol.* 145(1): 335-350.
- Makkar, H. P. S., and C. S. McSweeney. 2005. *Methods in Gut Microbiol Ecology for Ruminants*. Springer, Netherlands.
- Mateos, I., M. J. Ranilla, M. L. Tejido, C. Saro, C. Kamel, dan M. D. Carro. 2013. The influence of diet type (dairy versus intensive fattening) on the effectiveness of garlic oil and cinnamaldehyde to manipulate in vitro ruminal fermentation and methane production. *Anim. Prod. Sci.* 53(4):299-307.
- Mathe, A. 2009. Rumen Essential oils-Biochemistry, Production and Utilisation. Pages 1-18 In *Phytogenics in Animal Nutrition. Natural Concepts to Optimize Gut Health and Performance*. Steiner, T. Nottingham University Press, Nottingham, UK.
- Maynard, L. A., J. K. Loosli, H. F. Hintz, dan R. G. Warner. 2005. *Animal Nutrition*. 7<sup>th</sup> ed. McGraw-Hill Book Company, New York.
- McDonald, P., R. A. Edwards, J. F. D. Greenhalgh, C. A. Morgan, L. A. Sinclair, dan R. G. Wilkinson. 2011. *Animal Nutrition*. 7<sup>th</sup> ed. Pearson, UK.
- McGuffey, R. K., L. F. Richardson, dan J. I. D. Wilkinson. 2001. Ionophores for dairy cattle: current status and future outlook. *J. Dairy Sci.* 84:194-203.
- McIntosh, F. M., P. Williams, dan R. Losa. 2003. Effects of essential oils on ruminal metabolism and their protein metabolism. *Appl. Environ. Microbiol.* 69:5011–5014.
- McSweeney, C., dan R. Mackie. 2012. Microorganism and ruminant digestion: State of knowledge, trends and future prospects. *Commissions on Genetics Resources for Food and Agriculture. Background study paper No. 61*. Food Agric. Org. United Nations, Rome, Italy.
- Mehta, D., dan T. Satyanarayana. 2016. Bacterial and Archeal  $\alpha$ -Amylase: Diversity and Amedioration of the Desirable Characteristics for Industrial Applications. *Front. Microbiol.* 7:1-21.
- Membrive, C. M. B. 2016. Rumenology: Anatomy and Physiology of the Rumen. Pages 1-38 in *Rumenology*. D. D. Millen, M. D. B. Arrigoni, R. D. L. Pacheco, ed. Springer, Switzerland.
- Mendag RI. 2011. Peraturan Menteri Perdagangan RI Nomor 23 Tahun 2011 tentang Pengadaan, Distribusi dan Pengawasan Bahan Berbahaya.

- Menke, K. K., dan H. Steinngas. 1988. Estimastion of energetic feed value obtained from chemical analysis and in vitro gas production using rumen fluid. *Anim. Res. Dev.* 28(2):7-55.
- Mikolajczyk, K., E. P. Kielb, and A. Zachwieja. 2019. Impact of the volume and the profile of volatile fatty acids in the rumen fermentation on cow productivity and milk composition. *Dairy.* 69(4):222-228.
- Min, B. R., G. T. Attwood, W. C. McNabb, A. L. Molan, dan T. N. Barry. 2005. The effect of condensed tannins from *Lotus corniculatus* on the proteolytic activities and growth of rumen bacteria. *Anim. Feed Sci. Technol.* 121(1-2):45-58.
- Moran, J. 2005. How the rumen works. Pages 41-49 in *Tropical Dairy Farming: Feeding Management for Small Holder Dairy Farmers in the Humid Tropics*. Landlinks Press, Victoria.
- Munasinghe, D. M. S., T. Ohkubo, dan T. Sakai. 2005. The lipid peroxidation induced changes of protein in refrigerated yellowtail minced meat. *Fish. Sci.* 71(2): 462-464.
- Muller, G. 2002. A field study into the nutritional intake of horses fed grass silage or hay as roughage including factors influencing faecal consistency. Ph.D. Disertations. Tierarztliche Hochschule Hannover, Hannover.
- Nelson, D. L., dan M. M. Cox. 2008. *Lehninger Principles of Biochemistry*. 4th ed. WH Freeman and Company, New York.
- Nigam, P. S. 2013. Microbial enzymes with special characteristics for biotechnological applications. *Biomol.* 3(3):597-611.
- Nikaido, H. 1994. Prevention of drug access to bacterial targets: Permeability barriers and active efflux. *Science* 264:382-388.
- Nolan, J. V., and R. C. Dobos. 2005. Nitrogen transactions in ruminants. Pages 177-206 in *Quantitative Aspects of Ruminant Digestion and Metabolism*. 2nd ed. J. Dijkstra, J. M. Forbes, and J. France, Wageningen University, Netherlands.
- Okuda, K., I. Urabe, Y. Yamada, and H. Okada. 1991. Reaction of glutaraldehyde with amino and thiol compounds. *J. Ferment. Bioeng.* 71(2):100-105.
- Osborn, A. M., E. R. B. Moore, dan K. N. Timmis. 2000. An evaluation of terminalrestriction fragment length polymorphism (T-RFLP) analysis for the study of microbial structure and dynamics. *Appl Environ Microbiol.* 2(1):39-50.
- Owens, F. N., dan M. Basalan. 2016. Ruminant Fermentation. Pages 63-102 in *Rumenology*. Millen, D., D. Beni, M. Arrigoni, Lauritano, R. Pacheco. Springer, Cham.
- Owoleke, O. E., B. K. Tanimomo, T. Z. Adama, H. O. Akanya, I. C. Alemede, M. Abdulrahman, and V. O. Kolawole. 2016. Feed Evaluation and Growth Performance of Rabbits Fed Diets Containing Different Forages. *Vom J. Vet. Sci.* 11:101-111.



- Palevich, N., and S. J. Noel. 2018. Cultivation and sequencing of rumen microbiome members from the Hungate1000 collection. *Nature Biotechnol.* 36:359-367.
- Rey, M., F. Enjalbert, and V. Monteils. 2012. Establishment of ruminal enzyme activities and fermentation capacity in dairy calves from birth through weaning. *J. Dairy Sci.* 95(3):1500–1512.
- Ridwan, R., I. Rusman, Y. Widyastuti, K. G. Wiryawan, B. Prasetya, M. Sakamoto, and M. Ohkuma. 2015. Fermentation characteristics and microbial diversity of tropical grass-legumes silages. *Asian-Australas. J. Anim. Sci.* 28(4):511-518.
- Rodriguez, R., dan A. Sosa. 2007. Microbial protein synthesis in rumen and its importance to ruminants. *Cuban J. Agriculture Sci.* 41(4): 287-294.
- Rosochacki, S. J., E. W. Dzieciolowska, M. Zimowska, T. Sokowski, J. Polozynowicz, E. J. Kubiak, dan M. Gajewska. 2005. Skeletal muscle and liver protein degradation in mice divergently selected for low and high body weight over 108 generation. *Arch. Tierz. Dummerstorf.* 48(5):505-517.
- Rudi. 2017. Kinetika degradasi bahan kering beberapa bahan pakan ruminansia serta korelasinya dengan pencernaan nutrient secara *in vitro*. Tesis. Sekolah Pasca Sarjana. Institut Pertanian Bogor, Bogor.
- Russell, J. B., dan J. L. Rychlik. 2001. Factors that alter rumen microbial ecology. *Science.* 292:1119-1122.
- Sakamoto, M., Y. Huang, M. Umeda, I. Ishikawa dan Y. Benno. 2005. *Prevotella multiformis* sp. Nov., isolated from human subgingival plaque. *Int. J. Syst. Evol. Microbiol.* 55(2): 815-819.
- Samal, L., L. C. Chaudhary, N. Agarwal, and D. N. Kamra. 2016. Effects of plants containing secondary metabolites as feed additives on rumen metabolites and methanogen diversity of buffaloes. *Anim. Production Sci.* 56(3):472–481.
- Satter, L. D., dan L. L. Slyter. 1974. Effect of ammonia concentration on rumen microbial protein production *in vitro*. *Brit. J. Nutr.* 32(2):199-208.
- Schmidt, J., dan E. Zsedely. 2011. Nutrition of Ruminants. Agricultural and Food Science Non-profit Ltd., Kaposvar University. Hungaria.
- Shyu, C., T. Soule, S. J. Bent, J. A. Foster, and L. J. Forney. 2007. MiCA: A web-based tool for the analysis of microbial communities based on terminal-restriction fragment length polymorphisms of 16S and 18S rRNA genes. *Microb. Ecol.* 53(4):562–570.
- Silverman, R. B. 2002. *The Organic Chemistry of Enzyme-Catalyzed Reactions*. Academic Press, Austin.
- Singh, K. M., A. K. Tripathi, P. R. Pandya, S. Parnerkar, D. N. Rank, R. K. Kothari, and C. G. Joshi. 2012. Methanogen diversity in the rumen of Indian Surti buffalo (*Bubalus bubalis*), assessed by 16S rDNA analysis. *Res. Vet. Sci.* 92(3):451–455.

- Sirohi, S. K., N. Singh, dan S. S. Dagar. 2012. Molecular tools for deciphering the microbial community structure and diversity in rumen ecosystem. *Appl. Microbiol. Biotechnol.* 95:1135-1154.
- Sok, M., D. R. Ouellet, J. L. Firkins, D. Pellerin, dan H. Lapierre. Amino acid composition of rumen bacteria and protozoa in cattle. *J. Dairy Sci.* 100(7):1-9.
- Stackebrandt, E., dan B. M. Goebel. 1995. A place for DNA-DNA reassociation and 16S rRNA sequence analysis in the present species definition in bacteriology. *Int. J. Syst. Bacteriol.* 44: 846-849.
- Stiverson, J., M. Morrison, and Z. Yu. 2011. Populations of select cultured and uncultured bacteria in the rumen of sheep and the effects of diets and ruminal fractions. *Int. J. Microbiol.* 75 :165-174.
- Stoker, H. S. 2007. *General, Organic, and Biological Chemistry*. 4<sup>th</sup> ed. Houghton Mifflin Company, Boston.
- Suhartanto, B., R. Utomo, Kustantinah, I. G. S. Budisatria, L. M. Yusiati, dan B. P. Widyobroto. 2014. Pengaruh penambahan formaldehid pada pembuatan undegraded protein dan tingkat suplementasinya pada pellet pakan lengkap terhadap aktivitas mikroba rumen secara *in vitro*. *Buletin Peternakan.* 38(3):141-149.
- Suhendra, D., G. T. Anggiati, S. Sarah, A. F. Nasrullah, A. Thimoty, dan D. W. C. Utama. 2015. Tampilan kualitas susu sapi perah akibat imbalan konsentrat dan hijauan yang berbeda. *J. Anim Sci.* 25(1):42-46.
- Sutton, J. D., M. S. Dhanoa, S. V. Morant, J. France, D. J. Napper, dan E. Schuller. 2003. Rates of [roduction acetate, propionate, and butyrate in the rumen of lactating dairy cows given normal and low-roughage diet. *J. Dairy Sci.* 86(11):3620-3633.
- Suzuki, H. 2015. *How Enzymes Work: From Structure to Function*. CRC Press, Boca Raton.
- Tager, L. R., dan K. M. Krause. 2010. Effects of essential oils on rumen fermentation, milk production, and feeding behavior in lactating dairy cows. *J Dairy Sci.* 94(5):2455-2464.
- Thatcher, W. W., M. Binelli, D. Arnold, R. Mattos, L. Badinga, F. Moreira, C. R. Staples, dan A. Guzeloglu. 2001. Endocrine and physiological events from ovulation to establishment of pregnancy in cattle. *Occ. Publ. Br. Soc. Anim. Sci.* 26(1):81-92.
- Tilley, J., M. A., dan R. A. Terry. 1963. A two stage technique for the *in vitro* digestion of forage crops. *Grass Forage Sci.* 18(2):104-111.
- Ungerfeld, E. M., and R. A. Kohn. 2008. The Role of Thermodynamics in The Control of Ruminal Fermentation. Pages 55-87 in *Ruminant Physiology Digestion, Metabolism and Impact of Nutrition on Gene Expression, Immunology and Stress*. K. Sejrsen, T. Hvelplund, and M. O. Nielsen, ed. Wageningen Academic Publisher, Netherlands.

- Vakili, A. R., B. Khorrami, M. D. Mesgaran and E. Parand. 2013. The effects of thyme and cinnamon Essential oils on performance, rumen fermentation and blood metabolites in Holstein calves consuming high concentrate diet. *Asian-Australasian J. Anim. Sci.* 26(7):935–944.
- Van Eys, J. E., A. Offiner, dan A. Bach. 2004. Chemical Analysis. Manual of Quality Analysis of Soybean Products in the Feed Industry. American Soybean Association. [http://www.asa-europe.org/Library/library\\_e.htm](http://www.asa-europe.org/Library/library_e.htm). Diakses tanggal 5 Desember 2019.
- Vermorel, M. 1988. Nutrition energetique. Dans: Alimentation des Bovins, Ovins et Caprins. R. Jarrige ed. INRA Paris, Paris.
- Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. Manual of the Flowering Plants of Hawai'i. 2<sup>nd</sup> ed. University of Hawai'i and Bishop Museum Press, Honolulu.
- Wallace, R. J., N. R. McEwan, F. M. McInoch, B. Teferedegne, and J. Newbold. 2002. Natural products as manipulators of rumen fermentations. *Asian-Aust. J. Anim. Sci.* 15(10):1458-1468.
- Wanapat, M., S. Kang, P. Khejornsart, and S. Wanapat. 2013. Effects of plant herb combination supplementation on rumen fermentation and nutrient digestibility in beef cattle. *Asian Aust. J. Anim. Sci.* 26:1127–1136.
- Wang, H. T. and J. T. Hsu. 2005. Optimal protease production condition for *Prevotella ruminicola* 23 and characterization of its extracellular crude protease. *Anaerobe.* 11(3):155-162.
- Wang, Y., dan T. A. McAllister. 2002. Rumen microbes, enzymes and Feed Digestion- A Review. *Asian-Aust J. Anim. Sci.* 15(11): 1659-1676.
- Weibel, H and J. Hansen. 1989. Interaction of cinnamaldehyde (a sensitizer in fragrance) with protein. *Contact Dermatitis.* 20(3):161-166.
- Wendakoon, C. N., dan M. Sakaguchi. 1995. Inhibition of amino acid decarboxylase activity of *Enterobacter aerogenes* by active components in spices. *J Food Protect.* 58(3):280-283.
- Wiraswati, S. M. 2018. Analisis keragaman bakteri filosfer padi dengan metode T-RFLP. Tesis. Sekolah Pasca Sarjana. Institut Pertanian Bogor, Bogor.
- Yu, Y., C. Lee, J. Kim, dan S. Hwang. 2005. Group-Specific primer and probe sets to detect methanogenic communities using quantitative real-time polymerase chain reaction. *Biotechnol Bioeng.* 89(6):670–679.
- Zhou, M., Y. Chen, and L. L. Guan. 2015. Rumen Bacteria. Pages 79-96 in *Rumen Microbiology: From Evolution to Revolution*.vA. K. Puniya, R. Singh, and D. N. Kamra, editors. Springer, India.
- Zhu, R., L. Zacharias, K. M. Wooding, W. Peng, and Y. Mechref. 2017. Glycoprotein enrichment analytical techniques. *Proteomics in Biology, Part A.* Vol. 585. Academic Press, USA.
- Zoetendal, E. G., C. T. Collier, S. Koike, R. I. Mackie, dan H. R. Gaskins. 2004. Molecular ecological analysis of the gastrointestinal microbiota: a review. *J Nutr.* 134(2):465–72.

Zourob, M., S. Elwary, and A. Turner. 2008. Principles of Bacterial Detection: Biosensors Recognition Receptors and Micosystems. Springer Science, US.