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DAFTAR PUSTAKA

Almatsier S. 2002. Prinsip Dasar Ilmu Gizi. Gramedia Pustaka Utama. Jakarta

Amanullah, S.M., D.H. Kim, D.H.V. Paradhipta, H.J. Lee, Y.H. Joo, S.S. Lee, E.T. Kim, dan S.C. Kim. 2021. Effects of essential fatty acid supplementation on in vitro fermentation indices, greenhouse gas, microbes, and fatty acid profiles in the rumen. *Frontiers in Microbiology*. *12:* 1-11.

Amir, A., Purwanto, B. P., & I. G. Permana. 2017. Respon Termoregulasi Sapi Perah Pada Energi Ransum Yang Berbeda (Thermoregulation Response of Dairy Cows on Different Energy Content). *Jurnal Ilmu dan Teknologi Peternakan*, *5*(2), 72-79.

Anggorodi, R. 1995. Nutrisi Aneka Ternak Unggas. PT. Gramedia Pustaka Utama. Jakarta.

Anggraeni, V.D. 2015. Laporan Umum Praktik Kerja Lapangan PT. Indo Acidatama Tbk, Kemiri, Kebakkramat, Karanganyar. Yogyakarta: Jurusan Kesehatan Lingkungan Politeknik Kesehatan.

AOAC. 2005. Official Method of Analysis of The Association of Official Analytical Chemists. Published by the Association of Official Analytical Chemists, Maryland.

Aparamarta, H., D. Anggraini, D. Istianingsih, D. Susanto, A. Widjaja, Y. Ju, dan S. Gunawan. 2017. Fatty acid fragmentation of triacylglycerol isolated from crude nyamplung oil. , 1840, 060004. https://doi.org/10.1063/1.4982284.

Ariani, A. P. 2014. Aplikasi Metodologi Penelitian Kebidanan Kesehatan Reproduksi. Yogyakarta.

Arora, S. P. 1989. Pencernaan Mikroba pada Ruminansia. Gajah Mada University Press. Yogyakarta.

Avilés-Nieto, J., C. Márquez-Mota, A. Romero-Pérez, J. Talamantes-Gómez, E. Castillo-Gallegos, J. Jarillo, dan L. Corona. 2019. PSXIV-12 Effect of the addition of canola oil on digestibility, rumen fermentation and methane emissions in beef cattle in the Mexican tropic. *Journal of Animal Science*, 97, 440-441. https://doi.org/10.1093/jas/skz 258.872.

UNIVERSITAS GADJAH MADA
PENGARUH PEMBERIAN MINYAK BIJI NYAMPLUNG (CALOPHYLLUM INOPHYLLUM L.) PADA LEVEL YANG BERBEDA
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Bach, A., M. Baudon, G. Elcoso, J. Viejo, dan A. Courillon. 2023. Effects on rumen pH and feed intake of a dietary concentrate challenge in cows fed rations containing pH modulators with different neutralizing capacity.. *Journal of dairy science*. https://doi.org/10.3168/jds. 2022-22734.

Badr, O., S. Probert, dan P. O'callaghan. 1991. Atmospheric methane: Its contribution to global warming. *Applied Energy*, 40, 273-313. https://doi.org/10.1016/0306-2619(91)90021-O.

Bakar, M.A., J. McKimm, S. Haque, M. Majumder, dan M. Haque. 2018, Chronic Tonsillitis and Biofilms: A Brief Overview of Treatment Modalities, Journal of inflammation research. Dove Medical Press, 11, 329–337.

Baker, S.K. 1999. Rumen metanogens and inhibition of methanogenesis. *J. Exp. Agric*. 48: 21-27.

Beauchemin, K. A., E. Ungerfeld, A. Abdalla, C. Álvarez, C. Arndt, P. Becquet, C. Benchaar, A. Berndt, R. Mauricio, T. McAllister. 2022. INVITED REVIEW: Current enteric methane mitigation. J. Dairy Sci.

Cassandro, M., M. Mele, dan B. Stefanon. 2013. Genetic aspects of enteric methane emission in livestock ruminants. Italian Journal of Animal Science, 12(3), 450–458.

Castillejos, L., S. Calsamiglia, A. Ferret, dan R. Losa. 2007. Effects of dose and adaptation time of a specific blend of essential oil compounds on rumen fermentation. *Animal Feed Science and Technology*, 132, 186-201. https://doi.org/10.1016/J.ANIFEEDSCI.2006.03.023.

Cobellis, G., M. Trabalza-Marinucci, dan Z. Yu. 2016. Critical evaluation of essential oils as rumen modifiers in ruminant nutrition: A review. Sci. Total Environ. 545–546:556–568.

Debut, M., C. Berri, C. Arnould, D. Guemené, V. Santé-Lhoutellier, E. Baéza, N. Jehl, Y. Jégo, C. Beaumont, dan E. Le BihanDuval. 2005. Behavioral and physiological responses of three chicken breeds to pre-slaughter shackling and acute heat stress. Br. Poult. Sci. 46:527-535.

Dey, M.D., S. Das, R. Kumar, R., Doley, S.S. Bhattacharya, dan R. Mukhopadhyay. 2017. Vermiremoval of methylene blue using Eisenia fetida: a potential strategy for bioremediation of synthetic dye-containing effluents. Ecol. Eng. 106, 200–208.

UNIVERSITAS GADJAH MADA
PENGARUH PEMBERIAN MINYAK BIJI NYAMPLUNG (CALOPHYLLUM INOPHYLLUM L.) PADA LEVEL YANG BERBEDA TERHADAP KARAKTERISTIK FERMENTASI DAN EMISI GAS METANA DALAM RUMEN SECARA IN VITRO MENGGUNAKAN RANSUM LOW ENERGY
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Djatmiko, F. A. 2024. Pengaruh level pemberian minyak biji nyamplung (*Calophyllum inophyllum* L.) terhadap kecernaan, fermentasi, dan produksi gas metana dalam rumen secara *in vitro* pada ransum sapi *high energy.* Skripsi. Fakultas Peternakan. Universitas Gadjah Mada. Yogyakarta.

Frandson, R.D. 1996. Anatomi dan Fisiologi Ternak. Gajah mada University Press. Yogyakarta.

Freitas, D., S. Terry, R. Ribeiro, L. Pereira, T. Tomich, F. Machado, M. Campos, P. Corrêa, A. Abdalla, R. Maurício, dan A. Chaves. 2018. Unconventional Vegetable Oils for a Reduction of Methanogenesis and Modulation of Ruminal Fermentation. *Frontiers in Veterinary Science*, 5. https://doi.org/10.3389/fvets.2018.00201.

Goel, G., H. P. S. Makkar, dan K. Becker. 2008. Effects of *Sesbania sesban* and *Carduus pycnocephalus* leaves and fenugreek (*Trigonella foenum-graecum* L.) seeds and their extracts on partitioning of nutrients from roughage- and concentrate-based feeds to methane. Anim. Feed Sci. Technol., 147 (1-3): 72-89

Hasibuan, H. A., H. Y. Rahmadi, R. Faizah, Y. Yenni, T. Herawan, dan D. Siahaan. 2013. Panduan Analisa Kadar Minyak dan Kernel Buah Sawit (Spikelet Sampling). 30(1), Penerbit Pusat Penelitian Kelapa Sawit, Medan.

Harbone, 1987. *Metode Fitokimia* : *Penuntun Cara Modern Menganalisis Tumbuhan.* Cetakan kedua. Penerjemah :Padmawinata, K. dan I. Soediro. Bandung. Institut Teknologi Bandung.

Hartadi, H., S. Reksohadiprodjo, dan A. D. Tillman. 2005. Tabel Komposisi Pakan untuk Indonesia. Cetakan ke-5. Gadjah Mada University Press. Yogyakarta.

Hess, H. D., L. M. Monsalve, C. E. Lascano, J. E. Carulla, T. E. Diaz, dan M. Kreuzer. 2003. Supplementation of a tropical grass diet with forage legumes and *Sapindus saponaria* fruits: effects on *in vitro* ruminal nitrogen turnover and methanogenesis. Aust. J. Agric. Res., 54 (7): 703-713

Hristov, A.N., J. Oh, F. Giallongo, W.T. Freederick, T.M. Harper, L.H. Weeks, F.A. Branco, J.P. Moate, H.M. Deighton, O.R. Williams, M. Kinderman, dan S. Duval. 2017. An inhibitor persistently decresed enteric methane emission from dairy cows with no negative effect on milk production. *PNAS*. 112:10663-10668.

UNIVERSITAS GADJAH MADA
PENGARUH PEMBERIAN MINYAK BIJI NYAMPLUNG (CALOPHYLLUM INOPHYLLUM L.) PADA LEVEL YANG BERBEDA
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Kraus, T. E. C., A. D. Randy, dan J. Z. Robert. 2003. Tannins in Nutrient Dynamics of Forest Ecosystemsa review. Plant and Soil, 256(1): 41-66.

Jayanegara, A. 2008. Reducing methane emissions from livestock: nutritional approaches. Proceedings of Indonesian Students Scientific Meeting (ISSM), Institute for Science and Technology Studies (ISTECS) European Chapter, 13-15 May 2008, Delft, the Netherlands: 18-21.

Jeremiah, K., H. Nyako, I. Malgwi, M. Yahaya, dan I. Mohammed. 2015. Nutrient evaluation of total mixed rations used in ruminant feeding using maize bran, cowpea husk, poultry litter and groundnut haulms in a semi-arid environment of Nigeria. Annals of Biological Research, 6, 14-18.

Jouany, J.P. 1991. Defaunating of the Rumen. In. J.P. Jouany (Edit) Rumen Microbial metabolism and Ruminal Digestion. INRA. Paris

Julia Q. F., M. C. Honan, B. M. Roque, J. M. Tricarico, dan E. Kebreab. 2022. Enteric Methane Mitigation Interventions. Oxford University Press. 6 (2):1-16.

Kamal, M., 1994. Nutrisi Ternak I. Fakultas Peternakan Universitas Gadjah Mada Yogyakarta.

Krehbiel, C. R., dan J.R. Russell. 1999. "Rumen microbial population dynamics and dietary influence on rumen fermentations." Journal of Animal Science, 78(E-Suppl), E149-E171

Kumar, S., P.K Choudhury, M.D. Carro, G.W. Griffith, S. Dagar, M.Puniya, S. Calabro, S.R. Ravella, T. Dhewa, R.C Upadhyay, S.K. Sirohi, S.S. Kundu, M. Wanapat, dan K. Puniya. 2014. Newaspects and strategies formethane mitigation from ruminants. *Appl Microbiol Biotechno*l. 98:31-44

Kusbiantoro, D., dan Y. Purwaningrum. 2018. Pemanfaatan Kandungan metabolit sekunder pada tanaman kunyit dalam mendukung peningkatan pendapatan masyarakat. Jurnal Kultivasi Vol. 17 (1) : 544-549

Laabouri F. Z., A. Guerouali, S. Alali, A. Remmal, dan M. Ajbilou. 2017. Effect of a natural food additive rich in thyme essential oil on methane emissions in dairy cows. Rev. Mar. Sci. Agron. Vét, 5 (3) 287-292.

UNIVERSITAS GADJAH MADA
PENGARUH PEMBERIAN MINYAK BIJI NYAMPLUNG (CALOPHYLLUM INOPHYLLUM L.) PADA LEVEL YANG BERBEDA TERHADAP KARAKTERISTIK FERMENTASI DAN EMISI GAS METANA DALAM RUMEN SECARA IN VITRO MENGGUNAKAN RANSUM LOW ENERGY
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Leksono, B. 2008. Nyamplung (*Callophyllum inophyllum* L.) sumber energi biofuel yang potensial. Balai Penelitian dan Pengembangan Kehutanan. Jakarta.

Leksono, B., E. Windyarini, dan T.M. Hasnah. 2014. Budidaya tanaman Nyamplung (*Callophylum inophyllum L.)* untuk bioenergi dan prospek pengamatan lainnya. *IPB Press*. Jakarta.

Lintangrino, M. C. dan R. Boedisantoso. 2016. Inventarisasi emisi gas rumah kaca pada sektor pertanian dan peternakan di Kota Surabaya. Jurnal Teknik ITS, 5(2), D53-D57.

Liu, C., Q. Meng, Y. Chen, M. Xu, M. Shen, R. Gao, dan S. Gan. 2017. Role of Age-Related Shifts in Rumen Bacteria and Methanogens in Methane Production in Cattle. *Frontiers in Microbiology*, 8. https://doi.org/10.3389/fmicb.2017.01563.

Li, Yanqun., K. Dexin, F. Ying, M. R. Sussman, dan H. Wu. 2020. The Effect of Developmental and Environmental Factors on Secondary Metabolites in Medicinal Plants. Plants Physiology and Biochemistry, 148(1): 80-89

Mao, H.L., J.K. Wang, Y.Y. Zhou, dan J.X. Liu. 2010. Effect of addition of tea saponins and soybean oil on methane production, fermentation and microbial population in the rumen of growing lambs. Livestock Sci. 129: 56-62.

Martin, A., J. Swarbrick, dan A. Cammarata. 2008. Farmasi Fisik. Edisi Ketiga. Penerbit UI Press. Jakarta.

Mc Donald, P., R. A. Edwards, J. F. D. Greenhalgh, dan C. A. Morgan. 2002. Animal Nutrition. 5 th Edition. Longman Scientific and Technical. New York.

Moriel, P. 2017. RUMINANT NUTRITION SYMPOSIUM: Improving the efficiency of nutrient utilization to optimize livestock performance. *Journal of animal science,* 96 2, 751 . https://doi.org/10.1093/jas/sky013.

Niu, M., W. Liang, dan F. Wang. 2018. Methane biotransformation in the ocean and its effects on climate change: A review. *Science China Earth Sciences*, 61, 1697-1713. https://doi.org/10.1007/s11430-017-9299-4.

Noor, Y. R., M. Kazali, dan I.N.N. Suryadiputra. 1999. Panduan pengenalan mangrove di Indonesia. Wetland International Indonesia Programme.

UNIVERSITAS GADJAH MADA
PENGARUH PEMBERIAN MINYAK BIJI NYAMPLUNG (CALOPHYLLUM INOPHYLLUM L.) PADA LEVEL YANG BERBEDA
TERHADAP KARAKTERISTIK FERMENTASI DAN EMISI GAS METANA DALAM RUMEN SECARA IN VITRO MENGGUNAKAN
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Olijhoek, D., A. Hellwing, S. Noel, P. Lund, M. Larsen, M. Weisbjerg, dan C. Børsting. 2022. Feeding up to 91% concentrate to Holstein and Jersey dairy cows: Effects on enteric methane emission, rumen fermentation and bacterial community, digestibility, production, and feeding behavior.. Journal of dairy science. https://doi.org/10.3168/jds.2021-21676.

Patra, A. K. dan J. Saxena. 2010. A new perspective on the use of plant secondary metabolites to inhibit methanogenesis in the rumen. J. Phytochemistry. 71: 1198± 1222.

Pen B., C. Sar, B. Mwenya, K. Kuwaki, R. Morikawa, dan J. Takahashi. 2006. Effects of Yucca schidigera and Quillaja saponaria extracts on in vitro ruminal fermentation and methane emission. J. Anim. Feed Sci. and Tech. 129: 175–186

Phillipson, A., M. Dobson, T. Blackburn, dan M. Brown. 1962. The assimilation of ammonia nitrogen by bacteria of the rumen of sheep. *British Journal of Nutrition*, 16, 151 - 166. https://doi.org/10.1079/BJN19620016.

Plaizier, J.C., D.O. Krause, G.N. Gozho, dan B.W. McBride. 2008. "Subacute ruminal acidosis in dairy cows: The physiological causes, incidence and consequences." *The Veterinary Journal*, 176(1), 21-31

Pratama, B. C., M. N. Innayah, dan A. Darmawan. 2021. Pendampingan Umkm Dan Pedagang Kaki Lima (Pkl) Terdampak Pandemi Covid-19 Di Area Kampus Universitas Muhammadiyah Purwokerto Dalam Menjalankan Contactless Business. BUDIMAS : JURNAL PENGABDIAN MASYARAKAT, 3(1), 7.

Qiao, J., Z. Tan, dan M. Wang. 2014. Potential and existing mechanisms of enteric methane production in ruminants. *Scientia Agricola*, 71, 430-440. https://doi.org/10.1590/0103-9016-2013-0423.

Russell, R.W. dan S.A. Gahr. 2000. Glucose availability and associated metabolism. In: Farm Animal Metabolism and Nutrition. J.P.F. D'Mello (Ed.) CAB Intl. Publ., Wallingford, Oxon, UK., p. 121147.

Safrina, U., W. Wardiyah, dan G. Murtini. 2020. Phytochemical Screening and Antioxidant Activity of Nyamplung Seed Oils (Calophyllum Inophyllum L.). , 11, 256-268. https://doi.org/10.36525/SANITAS.2020.24.

UNIVERSITAS GADJAH MADA
PENGARUH PEMBERIAN MINYAK BIJI NYAMPLUNG (CALOPHYLLUM INOPHYLLUM L.) PADA LEVEL YANG BERBEDA TERHADAP KARAKTERISTIK FERMENTASI DAN EMISI GAS METANA DALAM RUMEN SECARA IN VITRO MENGGUNAKAN RANSUM LOW ENERGY
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Santoso, B. dan B.T. Hariadi. 2007. Effect of supplementation of Acacia mangium Willd in Pennisetum purpureum on fermentation characteristic and methane production in vitro. Med. Pet. 30(2):106-113.

Saputro, B. A. 2024. Pengaruh penambahan *tamanu* (*Calophyllum inophyllum* L.) *crude oil* sebagai aditif pada ransum *low energy* terhadap karakteristik fermentasi rumen secara *in vitro.* Skripsi. Fakultas Peternakan. Universitas Gadjah Mada. Yogyakarta.

Setyanto P. 2004. Mitigasi gas metan dari lahan sawah, Tanah Sawah dan Teknologi Pengelolaannya. Bogor (ID) : Pusat Penelitian dan Pengembangan Tanah dan Agroklimat.

Shen, J., W. Zheng, Y. Xu, dan Z. Yu. 2023. The inhibition of high ammonia to in vitro rumen fermentation is pH dependent. *Frontiers in Veterinary Science*, 10. https://doi.org/10.3389/fvets.2023.1163021.

Suharti S., D. A. Astuti, dan E. Wina, T. Toharmat. 2011. *Rumen microbial in the in vitro fermentation of different rations of forage and consentrate in the presence of whole lerak (Sapidus rerak) fruit extract. Asian-Aust. J. Anim. Sci.* 24(8):1086-1091

Suparjo. 2008. Saponin Peran dan Pengaruhnya Bagi Ternak dan Manusia. Fakultas Peternakan. Universitas Jambi: Jambi.

Susanto, I., M. Rahmadani, K. Wiryawan, E. Laconi, dan A. Jayanegara. 2023. Evaluation of Essential Oils as Additives during Fermentation of Feed Products: A Meta-Analysis. *Fermentation*. https://doi.org/10.3390/fermentation9070583.

Sutardi ,T. 1979. Ketahanan Protein bahan Makanan terhadap Degradasi oleh Mikroba Rumen dan Manfaatnya bagi Peningkatan Produktivitas Ternak. Pros. Seminar Penelitian dan Penunjang Peternakan. LPP Bogor.

Suwandyastuti, S.N.O. dan E.A. Rimbawanto. 2015. Produk Metabolisme Rumen pada Sapi Perah Laktasi (Rumen Metabolism Product on Lactating Dairy Cattle). Agripet. 15 (1): 1-6.

Takahashi, K. dan S. Yamanaka. 2006. Induction of pluripotent stem cells from mouse embryonic and adult fibroblast cultures by defined factors. 126 : 663-676.

Tan H. Y., C. C. Sieo, N. Abdullah, J. B. Liang, X. D. Huang, dan Y. W. Ho. 2011. Effects of condensed tannins from Leucaena on methane

PENGARUH PEMBERIAN MINYAK BIJI NYAMPLUNG (CALOPHYLLUM INOPHYLLUM L.) PADA LEVEL YANG BERBEDA
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production, rumen fermentation and populations of methanogens and protozoa in vitro. J. Anim. Feed Sci. and Tech. 169: 185–193.

Tan, Z., dan M. Murphy. 2004. Ammonia production, ammonia absorption,and urea recycling in ruminants. A review. *Journal of Animal and Feed Sciences*, 13, 389-404. https://doi.org/10.22358/JAFS/67425/2004.

Tavendale, M., L. Meagher, D. Pacheco, N. Walker, G. Attwood, dan S. Sivakumaran. 2005. Methane production from in vitro rumen incubations with Lotus pedunculatus and Medicago sativa, and effects of extractable condensed tannin fractions on methanogenesis. Animal Feed Science and Technology, 88(1), 1–6.

Tenzin Tseten T., R. A. Sanjorjo, M. Kwon, dan S.W. Kim. 2022. Strategies to Mitigate Enteric Methane Emissions from Ruminant Animals. J. Microbiol. Biotechnol. 32(3):269–277.

Thalib A. 2008. Buah lerak mengurangi emisi gas metana pada hewan ruminansia. Warta PPP. 30 (2).

Tian, H., C. Lu, P. Ciais, A.M. Michalak, J.G. Canadell, E. Saikawa, D.N, Huntzinger, K.R. Gurney, S. Sitch, dan B. Zhang. 2016. The terrestrial biosphere as a net source of greenhouse gases to the atmosphere. *Nature*. 531: 225–228.

Tillman, D.A., H. Hartadi, S. Reksohadiprodjo, dan S. Lebdosoekojo. 1991. Ilmu Makanan Ternak Dasar. Gadjah Mada University Press. Fakultas Peternakan UGM, Yogyakarta.

Utomo, N. M. 2005. Pengaruh Tanin Ampas Teh Terhadap Kecernaan Protein Pakan dan Populasi Protozoa Rumen secara In Vitro. Universitas Diponegoro, Semarang.

Vargas, J., Andrés, S., López-Ferreras, L., Snelling, T., Yáñez-Ruiz, D., García-Estrada, C., dan López, S. (2020). Dietary supplemental plant oils reduce methanogenesis from anaerobic microbial fermentation in the rumen. *Scientific Reports*, 10. https://doi.org/10.1038/s41598-020-58401-z.

Weimer, P. (2022). Degradation of Cellulose and Hemicellulose by Ruminal Microorganisms. *Microorganisms*, 10. https://doi.org/10.3390/microorganisms10122345.

Widyobroto B. P., S. P. S. Budhi dan A. Agus. 2007. Pengaruh Aras Undegraded Protein dan Energy Terhadap Kinetik Fermentasi

UNIVERSITAS
GADJAH MADA
PENGARUH PEMBERIAN MINYAK BIJI NYAMPLUNG (CALOPHYLLUM INOPHYLLUM L.) PADA LEVEL YANG BERBEDA TERHADAP KARAKTERISTIK FERMENTASI DAN EMISI GAS METANA DALAM RUMEN SECARA IN VITRO MENGGUNAKAN RANSUM LOW ENERGY
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Rumen dan Sintesis Protein Mikroba pada Sapi. Journal Indonesian Tropic Animal Agriculture 32 (3): 194-200.

Wina, E., S. Muetzel, E. Hoffmann, H.P.S. Makkar, dan K. Becker. 2005. Saponin containing methanol extract of Sapindus rarak effect.

Wuebbles, D., dan K. Hayhoe. 2002. Atmospheric methane and global change. *Earth-Science Reviews*, 57, 177-210. https://doi.org/10.1016/S0012-8252(01)00062-9.

Zain, M., U. Tanuwiria, J. Syamsu, Y. Yunilas, R. Pazla, E. Putri, M. Makmur, U. Amanah, P. Shafura, dan B. Bagaskara. 2024. Nutrient digestibility, characteristics of rumen fermentation, and microbial protein synthesis from Pesisir cattle diet containing non-fiber carbohydrate to rumen degradable protein ratio and sulfur supplement. Veterinary World, 17, 672 - 681. https://doi.org/10.14202/vetworld.2024.672-681.