

DAFTAR PUSTAKA

- Akhadiarto, S., dan M. N. Rofiq. 2017. Estimasi emisi gas metana dari fermentasi enterik ternak ruminansia menggunakan metode tier-1 di Indonesia. *Jurnal Teknologi Lingkungan*. 18(1):1–8.
- Al-Arif, M. A., L. T. Suwanti, A. T. S. Estoepongastie, and M. Lamid. 2017. The nutrients contents, dry matter digestibility, organic matter digestibility, total digestible nutrient, and NH₃ rumen production of three kinds of cattle feeding models. Pages 338–343 in *The Veterinary Medicine International Conference 2017*. Faculty of Veterinary Medicine, Universitas Airlangga. Indonesia.
- Arigbede, O. M., U.Y. Anele, J.A. Olanite, I.O. Adekunle. O.A. Jolaosho and O.S. Onifade. 2006. Seasonal *in vitro* gas production parameters of three multi-purpose tree species in Abeokuta, Nigeria.
- Assakur, M. 2013. Degradasi Bahan Kering, Nilai pH dan Produksi Gas Sistem Rumen *In vitro* Terhadap kulit Buah Kakao (*Theobroma cacao*) yang Diberi Perlakuan berbeda. Makasar: Skripsi. Fakultas Peternakan Universitas Hassanudin.
- Azarfar, A. 2007. Fractions of Ruminant Feeds: Kinetics of Degradation *In vitro*. Thesis. PhD program of Wageningen Institute of Animal Sciences. Netherlands. pp 10-11.
- Bakkali, F., Averbeck, S., Averbeck, D., Idaomar, M. Biological effects of *essential oils*—A review. *Food Chem. Toxicol.* 2008, 46, 446–475.
- Benchaar, C. and Greathead, H. 2011. *Essential oils* and Opportunities to Mitigate Enteric Methane Emissions from Ruminants. *Animal Feed Science and Technology*, 166-167, 338-355.
- Benchaar, C., A. V. Chaves, G. R. Fraser, Y. Wang, K. A. Beauchemin, and T. A. McAllister. 2007. Effects of *essential oils* and their components on *in vitro* rumen microbial fermentation. *Can. J. Anim. Sci.* 87:413–419.
- Boangmanalu, R., T. H. Wahyuni, dan S. Umar. 2016. Kecernaan bahan kering, bahan organik dan protein kasar ransum yang mengandung tepung limbah ikan gabus pasir (butis amboinensis) sebagai substitusi tepung ikan pada broiler. *Jurnal Peternakan Integratif*. 4 (3) : 329-340.
- Bodas R, N Prieto, R García-González, S Andrés, FJ Giráldez, S López. 2012. Manipulation of rumen fermentation and methane production with plant secondary metabolites. *Anim Feed Sci Tech* 176, 78-93.
- Burt, S. 2004. *Essential oils* : their antibacterial properties and potential applications in foods — a review. *Int. J. Food Microbiol.* 94:223–253. doi:10.1016/j.ijfoodmicro.2004.03.022

- Cakra, I.G.L.O. 2016. Bahan Ajar Ruminologi. Fakultas Peternakan. Universitas Udayana. Denpasar
- Calsamiglia, S., M. Busquet., P. W. Cardozo., L. Castillejos dan A. Ferret. 2007. Invited review: *essential oils* as modifiers of rumen microbial fermentation. *Diary Sci.* 90:2580-2595.
- Castillejos, L., S. Calsamiglia and A. Ferret. 2006. Effect of *essential oil* active compounds on rumen microbial fermentation and nutrient flow in *in vitro* systems. *J. American Dairy Sci.* 89: 2649-2658.
- Castillejos, L., S. Calsamiglia, A. Ferret, and R. Losa. 2007. Effects of dose and adaptation time of a specific *blend* of *essential oil* compounds on rumen fermentation. *J. Anim. Feed Sci. Technol.* 132: 186-201.
- Castillejos, L., S. Calsamiglia., A. Ferret, dan R. Losa. 2005. Effects of a specific *blend* of *essential oil* compounds and the type of diet on rumen microbial fermentation and nutrient flow from a continuous culture system. *Anim. Feed. Sci. Tech.* . 119: 29-41.
- Chaves, A. V., K. Stanford, L. L. Gibson, T. A. McAllister, and C. Benchaar. 2008. Effects of carvacrol and cinnamaldehyde on intake, rumen fermentation, growth performance, and carcass characteristics of growing lambs. *Anim. Feed Sci. Technol.* 145:396–408.
- Chen, X. B. 1994. An Excel Application Programme for Processing Feed Degradability Data User Manual Rowett Research Institute. UK.
- Cobellis, G., M. Trabalza-Marinucci., dan Z. Yu. 2016. Critical evaluation of *essential oils* as rume modifiers in ruminant nutrition: A review. *Sci.Tot. Env.* 545: 556-568.
- Daning, D.A.R., C. Hanim., BP Widyobroto, dan LM Yusiati. 2020. Pemanfaatan *Essential oil* sebagai *Rumen Modifier* pada Sapi Perah. *WARTAZOA*, Vol. 30 No. 4:189-200
- Dewi, N. K., S, Mukodiningsih dan C. I. Sutrisno. 2012. Pengaruh fermentasi kombinasi jerami padi dan jerami jagung dengan naras isi rumen kerbau terhadap pencernaan bahan kering dan bahan organik secara *in vitro*. *J. Animal Agriculture.* 1 (2) : 134 – 140.
- Djajanegara, A. 1983. Tinjauan ulang mengenai evaluasi suplemen pada jerami padi. Dalam : Seminar Pemanfaatan Limbah Pangan dan Limbah Pertanian untuk Makanan Ternak. Lembaga Kimia Nasional, LIPI – Yogyakarta
- Dorman, H. J. D., and S. G. Deans. 2000. Antimicrobial agents from plants: antibacterial activity of plant volatile oils. *J. Appl. Microbiol.* 88: 308-316.

- Finlay, B. J., G. Esteban, K. J. Clarke, A. G. Williams, T. M. Embley, and R. P. Hirt. 1994. Some rumen ciliates have endosymbiotic methanogens. *EMS Microbial*. 117: 157-162.
- Firsoni, Ansori D. 2015. Manfaat urea molasses multinutrien blok (UMMB) yang mengandung tepung daun glirisidia (*Gliricidia sepium*) secara in-vitro. *Jurnal Ilmiah Aplikasi Isotop dan Radiasi*. 11(2): 61170.
- Firsoni, Fortuna C, Lisanti E. 2010. Uji pencernaan in-vitro dedak padi yang mengandung daun paitan (*tithonia diversifolia* (hemsl,) a gray) dan kelor (*Moringa oleifera*, Lamk), *JITV*. 15:182-187.
- Fitri, N. 2017. Pembuatan Briket Dari Campuran Kulit Kopi (*Coffea Arabica*) Dan Serbuk Gergaji Dengan Menggunakan Getah Pinus Sebagai Perekat. Skripsi Sarjana Kimia, Fakultas Sains dan Teknologi, Universitas Islam Negeri Alauddin. Makassar.
- Hariyani, O., & Chuzaemi, S. 2019. Pengaruh Lama Fermentasi Ampas Putak (*Corypha gebanga*) Terhadap Produksi Gas dan Nilai Kecernaan Secara *In vitro* Menggunakan *Aspergillus oryzae* *Jurnal Nutrisi Ternak Tropis*. 2 (1) 53-62
- Haryanto B, Thalib A. 2009. Emisi metana dari fermentasi enterik: Kontribusinya secara nasional dan faktor-faktor yang mempengaruhinya pada ternak. *Wartazoa*. 19:157-165
- Herliatika, A. dan Y. Widiawati. 2021. Mitigasi Emisi Metana Enterik melalui Modifikasi Pakan dan Manipulasi Rumen. *Wartazoa*. 31 (1): 1-12
- International Plant Nutrition Institute (IPNI). 2010. Nutrient Source Specifics: Potassium Nitrate. United State of America.
- Ismanto, A.W. 2018. Ekstraksi *Essential oil* dari Kayu Putih (*Melaleuca leucadendra* Linn.) dengan Metode Microwave Hydrodistillation dan Solvent . Tesis Program Magister Bidang Keahlian Teknologi Proses, Departemen Teknik Kimia, Fakultas Teknologi Industri ITS
- Iwamoto, M., N. Asanuma and T. Hino. 2001. Effects of pH and elektron donors on nitrate and nitrite reduction in ruminal microbiota. *Anim. Sci. J*. 72:117-125.
- Iwamoto, M., N. Asanuma, and T. Hino. 2002. Ability of *Selenomonas ruminantium*, *Veillonella parvula*, and *Wolinella succinogenes* to reduce nitrate and nitrite with special reference to the suppression of ruminal methanogenesis. *Anaerobe* 8: 209–215.
- Janssen, P. H. 2010. Influence of hydrogen on rumen methane formation and fermentation balances through microbial growth kinetics and fermentation thermodynamics. *Anim. Feed Sci. Technol*. 160:1–22.
- Jayanegara, A., Goel, G., Makkar, H.P.S., Becker, K. 2015. Divergence between purified hydrolysable and condensed tannin effect on methane

emission, rumen fermentation, and microbial population *in vitro*. Anim Feed Sci Tech J sci Direct. 209:60-68.

- Jayanegara A, Sofyan A, Makkar HPS, Becker K. 2009. Kinetika produksi gas, pencernaan bahan organik dan produksi gas metana *in vitro* pada hay dan jerami yang disuplementasi hijauan mengandung tanin. Media Peternak. 32:120-130.
- 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.
- Jayanegara, A., Sofyan, A., Makkar, H. P. S., & Becker, K. 2010. Kinetika produksi gas, pencernaan bahan organik dan produksi gas metana *in vitro* pada hay dan jerami yang disuplementasi hijauan mengandung tanin. Media Peternakan, 32(2), 120–129.
- Jouany, J. P. 1991. Defaunation of the rumen. In: J.P. Jounay (Ed). Rumen Microbial Metabolism and Ruminant Digestion. Institute Nationale De La recherche Agronomique, INRA.
- Juottonen, H., P. E. Galand, and K. Yrjälä. 2006. Detection of methanogenic Archaea in peat: comparison of PCR primers targeting the mcrA gene. Res. Microbiol. 157:914–921.
- Kahvand M, Malecky M. 2018. Dose-response effects of sage (*Salvia officinalis*) and yarrow (*Achillea millefolium*) *essential oils* on rumen fermentation *in vitro*. Ann Anim Sci, 18:125-142
- Kamra, D. N. 2005. Rumen microbial ecosystem. Special Section: Microbial Diversity. Current Science, Vol. 89 No. 1:124-135
- Khateri, N., O. Azizi dan H. J. Azizabadi. 2017. Effects of a specific *blend of essential oils* on apparent nutrient digestion, rumen fermentation and rumen microbial populations in sheep fed a 50: 50 alfalfa hay: concentrate diet. Asian-Australain. J. Anim. Sci. 30: 370.
- Klop, G., B. Hatew, A. Bannink, and J. Dijkstra. 2016. Feeding nitrate and docosahexaenoic acid affects enteric methane production and milk fatty acid composition in lactating dairy cows. J. Dairy Sci. 99:1161–1172.
- Kurniawati, A. 2007. Teknik Produksi Gas *In vitro* untuk Evaluasi Pakan Ternak : Volume Produksi Gas dan Pencernaan Bahan Pakan. J. Ilm. Apl. Isot. dan Radiasi. 3:40–49.
- Kurniawati, A., W. Widodo., W. T. Artama, dan L. M. Yusiati. 2018. Effects of four *essential oils* on nutriens digestibility of *in vitro* ruminal fermentation. Buletin Peternakan, 42: 122-126.

- Kurniawati, Asih. 2018. Kajian Molekuler Metanogen Rumen dan Evaluasi Produksi Metana Pada Ruminansia Pasca Penambahan Sumber *Essential oil* Asal Tanaman. Disertasi Program Studi Bioteknologi, Pasca sarjana UGM
- Kustantinah, A. 2012. Pengukuran Kualitas Pakan Sapi. PT. Citra Aji Parama. Yogyakarta
- Latham E.A., Anderson R.C., Pinchak W.E. and Nisbet D.J. 2016. Insights on Alterations to the Rumen Ecosystem by Nitrate and Nitrocompounds. *Front. Microbiol.* 7:228. doi: 10.3389/fmicb.2016.00228
- Makkar, H. P. S. 2004. Recent Advances in the *In vitro* Gas Method for Evaluation of Nutritional Quality of Feed Resources. Animal Production and Health Section, Vienna, Austria.
- Marisa, H. 1990. Pengaruh Ekstrak Daun pinus (*Pinus merkusii* Jungh. et de Vriese) terhadap Perkecambahan dan Pertumbuhan Vegetatif Tanaman Kedelai (*Glycine max* (L.) Merr.). Pasca Sarjana Biologi. Institut Teknologi Bandung. Bandung.
- Martawijaya, A., I. Kartasujana, Y.I. Mandang, S.A. Prawira, K. Kadir. 1989. *Atlas Kayu Indonesia*. Jilid II, 96. Badan Penelitian Hasil Hutan
- Mc Donald, P., R. A. Edwards, J. F. D. Greenhalgh and C. A. Morgan. 2002. Animal Nutrition. 5 th Edition. Longman Scientific and Technical. New York.
- Mc. Donald, P., R. A. Edwards, dan J. F. D. Greenhalg. 2011. Animal Nutrition, Fourth Edition, Longman London and New York.
- McAllister T.A., Bae H.D., Jones G.A. and Cheng K.J. 1994. Microbial attachment and feed digestion in the rumen. *J. Anim. Sci.* 72, 3004-3018
- McIntosh, F. M., P. Williams, R. Losa, R. J. Wallace, D. A. Beever and C. J. Newbold. 2003. Effects of *essential oils* on ruminal microorganisms and their protein metabolism. *J. Appl. Environ. Microbiol.* 69(8): 5011-5014.
- Mendoza, L., M. Wilkens, and A. Urzfla. 1997. Antimicrobial study of the resinous exudates and of diterpenoids and flavonoids isolated from some Chilean *Pseudognaphalium* (Asteraceae). *J. Ethnopharmacol.* 85–88.
- Menke, K.H. dan H. Steingass. 1988. Estimation of energetic feed value obtained from chemical analysis and *in vitro* gas production using rumen fluid. *Anim. Res. Develop.* 28: 7 - 55.
- Mirzaei Cheshmehgachi, S., Moeini, M. M., Hozhabri, F., & Nooryan Soroor, M. E. 2017. Effect of *essential oils* of *Zataria Multiflora*, *Eucalyptus*

- Globulus and their combination on fermentation parameters using Merghoz goat rumen liquor. *Iranian Journal of Applied Animal Science*, 7(1) : 53–59.
- Mosoni, P., C. Martin, E. Forano, D.P. Morgavi. 2011. Long-term defaunation increases the abundance of cellulolytic Ruminococci and Methanogens but does not affect the bacterial and methanogen diversity in the rumen of sheep. *J Anim Sci* 89, 783-791.
- Moss, A.R., J.P. Jouany, J. Newbold. 2000. Methane production by ruminants: its contribution to global warming. *Ann. Zootech.* 49: 231-253.
- Mukmin, A., Hendrawan, S., Kusmartono, & Mashudi. 2014. Produksi gas *in vitro* asam amino metionin terproteksi dengan serbuk mimosa sebagai sumber condensed tannin (CT). *TERNAK TROPIKA Journal of Tropical Animal Production*, 15(2), 36–43.
- Mulyadi, T., 2005, Studi pengelolaan kayu putih *Melaleuca leucadendron* Linn. Berbasis ekosistem di BDH Karangmojo, Gunung Kidul, Yogyakarta, tesis, Program Pascasarjana S2 Fakultas Kehutanan, Universitas Gadjah Mada, Yogyakarta.
- Nolan, J. V, and R. C. Dobos. 2005. Nitrogen transactions in ruminants. In: J. Dijkstra, J. M. Forbes, and J. France, editors. *Quantitative Aspects of Ruminant Digestion and metabolism* Second. 2 nd ed. p. 177–206
- O’Gara, E. A., D. J. Hill, and D. J. Maslin. 2000. Activities of garlic oil, garlic powder, and their diallyl constituents against *Helicobacter pylori*. *Appl. Environ. Microbiol.* 66:2269–2273.
- Olijhoek DW, Hellwing ALF, Brask M, Weisbjerg MR, Højberg O, Larsen MK, Dijkstra J, Erlandsen EJ, Lund P. Effect of dietary nitrate level on enteric methane production, hydrogen emission, rumen fermentation, and nutrient digestibility in dairy cows. *J Dairy Sci.* 2016 Aug;99(8):6191-6205
- Paramita, W., W. E. Susanto dan A. B. Yulianto. 2008. Konsumsi dan pencernaan bahan kering dan bahan organik dalam haylase pakan lengkap ternak sapi Peranakan Ongole. *J. Media Kedokteran Hewan.* 24 (1) : 59 – 62.
- Parrakasi, A. 1999. *Ilmu Nutrisi dan Makanan Ternak Ruminansia*. UI Press. Jakarta
- Partama, B.G. 2013. *Nutrisi dan Pakan Ternak Ruminansia*. Cetakan I. Udayana University Press. Denpasar.
- Patra AK, Yu Z. 2015. *Essential oils* affect populations of some rumen bacteria *in vitro* as revealed by microarray (RumenBactArray) analysis. *Front Microbiol.* 6:1–13.

- Patra, A. K., dan Z. Yu. 2012. Effects of *essential oils* on methane production and fermentation by, and abundance and diversity of, rumen microbial populations. *Appl. Environ. Microbiol.* 78(12) : 4271- 4280.
- Patra, A.K. 2011. Effect of *essential oils* on rumen fermentation, microbial ecology and ruminant production. *Asian. J. Anim. Vet. Adv.* 6: 416-428.
- Prayitno CH, Fitria R, Samsi M. 2014. Suplementasi heitchrose pada pakan sapi perah pre-partum ditinjau dari profil darah dan recovery bobot tubuh post-partum. *Agripet* Oktober 2014. 14 (2) : 89-95.
- Purbajanti, E. D., R. D. Soetrisno, E. Hanudin dan S. P. S. Budhi. 2011. Produksi, kualitas dan pencernaan *in vitro* tanaman rumput benggala (*Panicum maximum*) pada lahan salin. *Buletin Peternakan.* 35 (1) : 30 – 37.
- Rambet, V., J.F Umboh., Y. L. R. Tulung., dan Y. H. S. Kowel. 2016. Kecernaan Protein Dan Energi Ransum Broiler Yang Menggunakan Tepung Manggot (*Hermetia Illucens*) Sebagai Pengganti Tepung Ikan. *Jurnal Zootek* Vol. 36 No. 1 : 13-12
- Ramdani, D., M. Marjuki, dan S. Chuzaemi. 2017. Pengaruh perbedaan jenis pelarut dalam proses ekstraksi buah mengkudu (*Morinda citrifolia* L.) pada pakan terhadap viabilitas protozoa & produksi gas in-vitro. *Jurnal Ilmu-Ilmu Peternakan.* 27(2): 54–62.
- Ranjhan, S.K. 1980. *Animal Nutrition In The Tropics.* Vikas Publishing Hause P and TLtd., New Delhi.
- Rimbawanto, A., Kartikawati, N.K., Baskorowati, L., Susanto, M., Prastyono., 2009, *Status terkini pemuliaan Melaleuca cajuputi*, Hasil-hasil Penelitian Hal. 148-157, B2PBPTH, Yogyakarta.
- Rochfort, S., A. J. Parker, and F. R. Dunshea. 2008. Plant bioactives for ruminant health and productivity. *Phytochemistry.* 69:299–322.
- Rodríguez R., A. Sosa and Y. Rodríguez. 2007. Microbial protein synthesis in rumen and its importance to ruminants. *Cuban Journal of Agricultural Science.* 41(4):287- 294.
- Rodrigues, P. H. M. 2016. Control and manipulation of ruminal fermentation. In: D. D. Millen, M. D. B. Arrigoni, and R. D. L. Pacheco, editors. *Rumenology.* Springer International Publishing Switzerland. p. 157–187.
- Rukmana, H.R. 2001. *Silase dan Permen Ternak Ruminansia.* Penerbit Kanisius. Yogyakarta.

- Russell JB, RE Muck, PJ Weimer. 2009. Quantitative analysis of cellulose degradation and growth of cellulolytic bacteria in the rumen. *FEMS Microbiol Ecol* 67:183-197.
- Russell, B. J. dan R. B. Hespell. 1981. Microbial rumen fermentation. *J Dairy Science*. 61:1153-1169.
- Sakthivel, P.C., D.N. Kamra, N. Agarwal and L.C. Chaudhary. 2012. Effect of sodium nitrate and nitrate reducing bacteria on *in vitro* methane production and fermentation with buffalo rumen liquor. *Asian-Aust. J. Anim. Sci.* 25 (6): 812-817.
- Sastroutomo, S.S. 1990. *Ekologi Gulma*. Gramedia Pustaka Utama. Jakarta.
- Shaaban HAE, El-Ghorab AH, Shibamoto T. 2012. Bioactivity of *essential oils* and their volatile aroma
- Silalahi, R. E. 2003. Uji Feremntabilitas dan Kecernaan In-vitro Suplemen Zn Anorganik dan Zn Organik dalam Ransum Ruminansia
- Siregar, U.J & Diputra, I.M.M.M. 2013. Keragaman genetik *Pinus merkusi* Jungh. et de Vriese Strain Tapanuli berdasarkan penanda mikrosatelit. *J. Silvikultur Tropika* 4(02): 88–99.
- Soedomo-Reksohadiprodjo. 1992. Pendugaan konsumsi bahan kering , energy dan protein tercerna limbah pertanian untuk ternak ruminansia kecil. Disertasi. UGM. Yogyakarta
- Stoker, H. S. 2007. *General, Organic, and Biological Chemistry*. 4th ed. Houghton Mifflin Company. Boston. pp 649-651.
- Sukmawati, NMS. 2011. Produktivitas dan emisi metana pada kambing perah peranakan etawah yang disuplementasi kaliandra dan complete rumen modifier (CRM) [Tesis]. Bogor (ID) : Institute Pertanian Bogor
- Sutardi, T., 1980. *Landasan Ilmu Nutrisi*. Jilid I. Departemen Ilmu dan Makanan Ternak Fakultas Peternakan. Institut Pertanian Bogor, Bogor.
- Syawal, S., Garantjang, S., Natsir, A., Ako, A. 2020. The effect of katuk (*Sauropus androgynus*) and gamal (*Gliricidia sepium*) supplementation on the dry matter digestibility, organic matter digestibility, and milk quality of Friesian Holstein Proc. IOP Conf. Ser.: Earth Environ. Sci. 492 012017
- Taiz, L. and E. Zeiger. 1991. *Plant Physiology*. The Benjamin/Cummings Publishing Company, Inc. California.
- Tajkarimi, M. M., S. A. Ibrahim, and D. O. Cliver. 2010. Antimicrobial herb and spice compounds in food. *Food Control*. 21:1199–1218.
- Thalib, A. 2008. Isolasi dan identifikasi bakteri asetogenik dari rumen rusa

- dan potensinya sebagai inhibitor metanogenesis. *JITV* 13(3): 197 – 206.
- Theodorou, M.K., B.A. Williams., M.S. Danoa., A. B. McAllan dan J. France. 1994. A simple gas production method using pressure transducer to determine the fermentation kinetics of ruminant feed. *Anim. Feed. Sci and Tech.* 48: 185-197.
- Tillman, A. D., H. Hartadi, S. Reksohadiprodjo, S. Prawirokusumo dan S. Lebdoesoekojo. 1991. Ilmu Makanan Ternak Dasar Cetakan ke 5. Gadjah Mada University Press, Yogyakarta.
- Tillman, A. D., H. Hartadi, S. Reksohadiprodjo, S. Prawirokusumo, S. Lepdoesoekojo. 1998. Ilmu Makanan Ternak Dasar. Gadjah Mada University Press. Yogyakarta.
- Tomaszewska, M.W., I.M. Mastika., A. Djajanegara., Susan Gardiner., dan Tantan., R.W. 1993. Produksi Kambing dan Domba di Indonesia. Sebelas Maret University Press, Dirjen P.T; Australian International Development Assistance Bureau dan Small Ruminant Collaborative Research Support Program, Surakarta
- van Zijderveld, S. M., W. J. J. Gerrits, J. A. Apajalahti, J. R. Newbold, J. Dijkstra, R. A. Leng, and H. B. Perdok. 2010. Nitrate and sulfate: Effective alternative hydrogen sinks for mitigation of ruminal methane production in sheep. *J. Dairy Sci.* 93:5856–5866.
- Volden, H. 2011. NorFor-The Nordic Feed Evaluation System: Feed Fractions Characteristics. H. Volden (ed.). Wageningen Academic Publishers. Netherlands. pp 33-36
- Wallace, R. J., McEwan, N. R., McIntosh, F. M., Teferedegne, B., & Newbold, C. J. 2002. Natural products as manipulators of rumen fermentation. *Asian-Australasian Journal of Animal Sciences.*15(10): 1458-1468.
- Wang R, Wang M, Ungerfeld EM, Zhang XM, Long DL, Mao HX, Deng JP, Bannink A, Tan ZL. 2018. Nitrate improves ammonia incorporation into rumen microbial protein in lactating dairy cows fed a low-protein diet. *J Dairy Sci.* Nov;101(11):9789-9799
- Wati, N. E., Achmadi, J., & Pangestu, E. 2012. Degradasi nutrisi bahan pakan limbah pertanian dalam rumen kambing secara *in sacco*. *Animal Agriculture Journal.* 1(1):485–498.
- Wijayanti, E., F. Wahyono dan Surono. 2012. Kecernaan nutrisi dan fermentabilitas pakan komplit dengan level ampas tebu yang berbeda secara *in vitro*. *Anim. Agric. J.* 1 (1) : 167 – 179.
- Wiyono, B., S. Tachibana dan D. Tinambunan. 2006. Chemical composition of Indonesian *Pinus merkusii* Jung and de Vriese turpentine oils, gum

- oleoresins and rosins from Sumatra and Java. *Pakistan J. Bio. Sci.* 9: 7-14.
- Wright, A.D.G. and C. Pimm. 2003. Improved strategy for presumptive identification of methanogens using 16S riboprinting. *J. Microbiol. Methods.* 55: 337-349.
- Yang, C., Chowdhury, MAK, Hou, Y., Gong, J. 2015. Senyawa Fitogenik sebagai Alternatif Antibiotik In-Feed: Potensi dan Tantangan dalam Aplikasi. *Patogen* 2015. 4:137-156.
- Z. Bachruddin, S. Latiefah and L.M. Yusiati. 2019. Effect of the Addition of Sodium Nitrate in a Total Mixed Ration with Fermented Tofu Waste on Methane Production from the Rumen Fluid. *Pakistan Journal of Nutrition.* 18: 408-412.
- Zain, M., T. Sutardi, Suryahadi and N. Ramli. 2008. Effect of defaunation and supplementation methionine hydroxy analogue and branched chain amino acid in growing sheep diet based on palm press fiber ammoniated. *Pakistan J. Nut.* 7(6): 813 – 816.
- Zeng, Z.; Zhang, S.; Wang, H.; Piao, X. 2015. *Essential oil* dan tanaman aromatik sebagai aditif pakan dalam nutrisi non-ruminansia: Tinjauan. *J.Anim. Sci. Bioteknologi.* 2015, 6.
- Zhou, R., J. Wu, J., X. Lang., L. Liu., D. P. Casper., C. Wang., dan S. Wei. 2020. Effects of oregano *essential oil* on *in vitro* ruminal fermentation, methane production, and ruminal microbial community. *J. Diary. Sci.* 103: 2303-2314.