

DAFTAR PUSTAKA

- Abadi, E.I.K., A.M. Tahmasbi, M.D. Mesgaran, and R. Valizadeh. 2011. Influence of Protein Sources with Different of Digestibility on Performance, Ruminal Fermentation, Blood Metabolites, and Protozoal Population in Lactating Dairy Cows. *J. Anim. Vet. Adv.* 10(1): 43-49.
- Abdullah, L., D. Apriastuti, and T. Apdini. 2012. Protein Source in Dairy Goat Ration. *Proc. Asia Dairy Goat Conference.* 71-72.
- Adrial. 2010. Potensi Sapi Pesisir dan Upaya Pengembangannya di Sumatera Barat. *Jurnal Penelitian dan Pengembangan Pertanian.* 29(2): 66-72.
- Akhtar, M., M. Ali, Z. Hayat, Z., M. Yaqoob, and M. Sarwar. 2016. Effect of varying levels of dietary ruminal undegradable protein on feed consumption and growth performance of growing Kajli lambs. *Int. J. Agric. Biol.* 18(5): 969-974.
- Akhtar, M., Nisa, M., and A. Javaid. 2017. Effect of Varying Levels of Dietary Rumen Undegradable. *Gomal Univ. J. Res.* 33(2): 58-67.
- Aluwong, T., P.I. Kobo, and A. Abdullahi. 2010. Volatile fatty acids production in ruminants and the role of monocarboxylate transporters: A review. *Afr. J. Biotechnol.* 9(38): 6229–6232.
- Anggraeni, A.S., H. Herdian, A. Sofyan, A. Jayanegara, and N.S. Aulia. 2020. Rumen Fermentation Characteristic and In Vitro Digestibility of King Grass Silage Supplemented with Shredded Coconuts Pulp. *Jurnal Veteriner.* 21 (3): 389-401.
- AOAC. 2005. *Official Methods of Analysis.* 18th ed. In Association of Official Analytical, Chemists International, Maryland, USA (Issue February).
- Atkinson, R.L., C.D. Toone, T.J. Robinson, D.L. Harmon, and P.A. Ludden. 2007. Effects of supplemental ruminally degradable protein versus increasing amounts of supplemental ruminally undegradable protein on nitrogen retention, apparent digestibility, and nutrient flux across visceral tissues in lambs fed low-quality forage. *J. Anim. Sci.* 85(12). 3331-3339.
- Bach, A., S. Calsamiglia, and M.D. Stern. 2005. Nitrogen metabolism in the rumen. *Journal of Dairy Science.* 88(S): E9–E21.
- Bahrami-Yekdangi, M., G.R. Ghorbani, M. Khorvash, M.A. Khan, and M.H. Ghaffari. 2016. Reducing crude protein and rumen degradable protein with a constant concentration of rumen undegradable protein in the diet of dairy cows: Production performance, nutrient digestibility, nitrogen efficiency, and blood metabolites. *J. Anim. Sci.* 94 (2): 718-725.

- Behan, A.A., T.C. Loh, S. Fakurazi, U. Kaka, A. Kaka, and A.A. Samsudin. 2019. Effects of supplementation of rumen protected fats on rumen ecology and digestibility of nutrients in sheep. *Animals*. 9(400): 1–18.
- Belanche, A., G. de la Fuente, J.M. Moorby, and C.J. Newbold. 2012. Bacterial protein degradation by different rumen protozoal groups. *J. Anim. Sci.* 90: 4495-4504.
- Brock, F.M., C.W. Forsberg, and J.G. Buchanan-Smith. 1982. Proteolytic activity of rumen microorganisms and effects of proteinase inhibitors. *Appl. Environ. Microbiol.* 44(3): 561-569.
- Brooks, M.A., R.M. Harvey, N.F. Johnson, and M.S. Kerley. 2012. Rumen degradable protein supply affects microbial efficiency in continuous culture and growth in steers. *J. Anim. Sci.* 90 (13): 4985-4994.
- Buckner, C.D., T.J. Klopfenstein, K.M. Rolfe, W.A. Griffin, M.J. Lamothe, A.K. Watson, J.C. MacDonald, W.H. Schacht, and P. Schroeder. 2013. Ruminally undegradable protein content and digestibility for forages using the mobile bag in situ technique. *J. Anim. Sci.* 91(6). 2812-2822.
- Bugaut, M. 1987. Occurrence, absorption and metabolism of short chain fatty acids in the digestive tract of mammals. *Comp. Biochem. Physiol. B.* 86(3): 439-472.
- Canfield, R.W., C.J. Sniffen, and W.R. Butler. 1990. Effects of Excess Degradable Protein on Postpartum Reproduction and Energy Balance in Dairy Cattle. *J. Dairy Sci.* 73(9): 2342-2349.
- Cappelozza, B.I. 2019. Protein Nutrition for Cattle. Oregon State University. <https://extension.oregonstate.edu/animals-livestock/beef/protein-nutrition-cattle-0> Diakses 18 April 2021.
- Chandrasekharaiah, M., A. Thulasi, K.P. Suresh, and K.T. Sampath. 2011. Rumen degradable nitrogen requirements for optimum microbial protein synthesis and nutrient utilization in sheep fed on finger millet straw (Eleusine coracana) based diet. *Anim. Feed Sci. Technol.* 163(2-4): 130-135.
- Chen, X.B., F.D. Howell, D.E. Orskov, and Brower. 1990. Excretion of purine derivatives by ruminants: effect of exogenous nucleic acid supply on purine derivative excretion by sheep. *Br J Nutr.* 63: 131-142.
- Chen, X.B. and M.J. Gomes. 1995. Estimation of microbial protein supply to sheep and cattle based on urinary excretion of purine derivatives -an overview of the technical details. International Feed Resources Unit. Rowett Research Institute, Bucksburn Aberdeen AB29SB, UK. (Issue January).
- Chen, X.Z., F. Fan, L. Qin-hua, and Z. Jian-guo. 2014. Degrading Mimosine and Tannins of *Leucaena Leucocephala* by Ensiling. *Appl. Mechanics and Materials.* 618:349-353.

- Chumpawadee, S., K. Sommart, T. Vongpralub, and V. Pattarajinda. 2006. Effects of synchronizing the rate of dietary energy and nitrogen release on ruminal fermentation, microbial protein synthesis, blood urea nitrogen and nutrient digestibility in beef cattle. *Asian Australas. J. Anim. Sci.* 19: 181-188.
- Conway, B.E.J. and E.O'Malley. 1942. Microdiffusion Methods: Ammonia and Urea Using Buffered Absorbents (Revised Methods for Ranges Greater than 10 µg N). *Biochem. J.* 36: 655-661.
- Corea, E.E., J. Castro-Montoya, M.V. Mendoza, F.M. L'opez, A. Martinez, M.E. Alvarado, C. Moreno, G.A. Broderick, and U. Dickhoefer. 2020. Effect of forage source and dietary rumen-undegradable protein on nutrient use and growth in dairy heifers. *Anim. Feed Sci. Tech.* 269: 1-10.
- Damry. 2008. Landasan Biologis Upaya Pemenuhan Kebutuhan Protein Ternak Ruminansia. *Prosiding Seminar Nasional Sapi Potong.* 225-232.
- Das, L.K., S.S. Kundu, D. Kumar, and C. Datt. 2014. Metabolizable protein systems in ruminant nutrition: A review. *Vet. World.* 7(8): 622-629.
- Dehority, B. 1993. Laboratory manual for classification and morphology of rumen ciliate protozoa. CRC Press Taylor and Francis Group. Boca Raton.
- DiaSys. Diagnostic System. 2020. Urea FS. Diagnostic reagent for quantitative in vitro determination of urea in serum, plasma or urine on photometric. Manufacturer DiaSys Diagnostic Systems. Germany.
- Dinas Peternakan dan Kesehatan Hewan Sumatera Barat. 2016. Statistika Peternakan Provinsi Sumatera Barat.
- Dipendra, K. 2015. Effect of Bypass Protein on Growth Performance of Khari Goats in Nepal. Norwegian University of Life Sciences (NMBU).
- Direktorat Jenderal Peternakan dan Kesehatan Hewan. 2020. Statistik Peternakan dan Kesehatan Hewan 2020.
- Fauzyah, A., P. Panjono, A. Agus, I.G.S. Budisatria, dan B.P. Widyobroto. 2017. The Effect of Rumen Undegradable Protein Level of Concentrate With Rice Straw As Basal Diet on Growth Performance of Sumba Ongole Beef Cattle. *Buletin Peternakan.* 41(2): 142.
- Filho, S. C. V., D.S. Pina, M.L. Chizzotti, and R.F.D. Valadares. 2016. Ruminal Feed Protein Degradation And Microbial Protein Synthesis. Nutrient Requirements of Zebu and Crossbred Cattle. In BR-CORTE. 3rd Edition Publisher: Suprema Gráfica LTDA.
- General Laboratory Prosedure, 1996. Departement of Dairy Science, University of Wisconsin.
- Gidlund, H. 2017. Domestic protein feeds in dairy production. Potential of Rapeseed Feeds and Red Clover. Doctoral Thesis. Faculty of Veterinary Medicine and Animal Science. Department of Agricultural Research for

Northern Sweden. Swedish University of Agricultural Sciences.

- Ginting, S.P. 2005. Sinkronisasi degradasi protein dan energi dalam rumen untuk memaksimalkan produksi protein mikrobia. *Wartazoa*. 15(1): 1–10.
- Givens, D.I., E. Owen, and A.T. Adesogan. 2000. Current procedures, future requirements and the need for standardization. In *Forage Evaluation in Ruminant Nutrition* pp. Cabi Publishing, Wallingford. p449–474.
- Goering, H.K., and P.J. Van Soest. 1970. Forage Fiber Analyses. (Apparatus, Reagents, Procedures, and Some Applications). In *Agriculture Handbook No. 379*. United States Department of Agriculture, Washington, DC (Issue 379).
- Gosselink, J.M., C. Poncet, J.P. Dulphy, and J.W. Cone. 2003. Estimation of the duodenal flow of microbial nitrogen in ruminants based on the chemical composition of forages : A literature review. *Anim. Res.* 52(3): 229-243.
- Griswold, K.E., G.A. Apgar, J. Bouton, and J.L. Firkins. 2003. Effects of Urea Infusion and Ruminant Degradable Protein Concentration on Microbial Growth Digestibility and Fertation in Continuous Culture. *J. Anim. Sci.* 81 (1): 329-336.
- Hackmann, T.J. and J.L. Firkins. 2015. Maximizing efficiency of rumen microbial protein production. *Front. Microbiol.* 6(465): 1-16.
- Hanun, L., A. Muktiani, dan L.K. Nuswantara. 2018. Kecernaan Protein dan Retensi Nitrogen pada Domba yang diberi Silase Pakan Komplit Berbahan Eceng Gondok dengan Starter *Lactobacillus plantarum* tle. *Jurnal Pengembangan Penyuluhan Pertanian*. 15(27): 41-47.
- Hao, X. Y., X.G. Diaoa, S.C. Yu, N. Ding, C.T. Mu, J.X. Zhao, and J.X. Zhang. 2018. Nutrient digestibility, rumen microbial protein synthesis, and growth performance in sheep consuming rations containing sea buckthorn pomace. *J. Anim. Sci.* 96(8): 1-26.
- Haryanto, B. 2014. Manipulating Protein Degradability in the Rumen to Support Higher Ruminant Production. *Wartazoa*. 24(3): 131–138.
- Hassen, A., N.F.G. Rethman., W.A. Van Niekerk, and T.J. Tjelele. 2007. Influence of season/year and species on chemical composition and in vitro digestibility of five *Indigofera* accessions. *J. Anim. Feed Sci. Tech.* 136: 312–322.
- Hendri, Y. 2013. Dinamika Pengembangan Sapi Pesisir Sebagai Sapi Lokal Sumatera Barat. *Jurnal Penelitian dan Pengembangan Pertanian*. 32(1): 39-45.
- Herawaty, N. Jamarun, M. Zain, Arnim and R.W.S. Ningrat. 2013. Effect of Supplementation *Sacharomyces cerevisiae* and *Leucaena leucocephala* on Low Quality Roughage Feed in Beef Cattle Diet. *Pakistan Journal of*

Nutrition. 12(2): 182-184.

- Herdiawan, I. and R. Krisnan. 2014. Produktivitas dan Pemanfaatan Tanaman Leguminosa Pohon *Indigofera zollingeriana* pada Lahan Kering. *Wartazoa*. 24(2): 7582.
- Hermon. 1993. Senyawa Nitrogen dalam Ransum Ternak Ruminansia. Fakultas Peternakan Universitas Andalas. Padang.
- Hermon, H., S. Suryahadi, K.G. Wiryawan, and S. Hardjosoewignjo. 2008. Nisbah Sinkronisasi Suplai N-Protein dan Energi dalam Rumen Sebagai Basis Formulasi Ransum Ternak Ruminansia. *Media Peternakan*. 31(3): 186-194.
- Hermon, H. 2009. Indeks Sinkronisasi Pelepasan N-Protein dan Energi dalam Rumen sebagai Basis Formulasi Ransum Ternak Ruminansia dengan Bahan Lokal. Sekolah Pascasarjana. Institut Pertanian Bogor. Bogor.
- Hidayah, N. 2016. Pemanfaatan Senyawa Metabolit Sekunder Tanaman (Tanin dan Saponin) dalam Mengurangi Emisi Metan Ternak Ruminansia. *Wartazoa*. 11(2): 89-98.
- Hristov, A.N., T. A. McAllister, and K.J. Cheng. 1998. Effect of Dietary or Abomasal Supplementation of Exogenous Polysaccharide-Degrading Enzymes on Rumen Fermentation and Nutrient Digestibility. *J. Anim. Sci.* 76:3146-3156.
- Javaid, A., M.A. Shahzad, M. Nisa, and M. Sarwar. 2011. Ruminant dynamics of ad libitum feeding in buffalo bulls receiving different level of rumen degradable protein. *Livest. Sci.* 135(1): 98-102.
- Jayanegara, A. and A. Sofyan. 2008. Penentuan Aktivitas Biologis Tanin Beberapa Hijauan secara *in Vitro* Menggunakan 'Hohenheim Gas Test' dengan Polietilen Glikol Sebagai Determinan. *Media Peternakan*. 31(1): 44-52.
- Jayanegara, A., H.P.S. Makkar, dan K. Becker. 2009. Emisi Metana dan Fermentasi Rumen *in Vitro* Ransum Hay yang Mengandung Tanin Murni pada Konsentrasi Rendah. *Media Peternakan*. 32(3): 184-194.
- Jayanegara, A., B. Novandri, N. Yantina, and M. Ridla. 2017. Use of black soldier fly larvae (*Hermetia illucens*) to substitute soybean meal in ruminant diet: An *in vitro* rumen fermentation study. *Vet. World*. 10(12): 1439-1446.
- Kand, D., I.B. Raharjo, J. Castro-Montoya, and U. Dickhoefer. 2018. The effects of rumen nitrogen balance on *in vitro* rumen fermentation and microbial protein synthesis vary with dietary carbohydrate and nitrogen sources. *Anim. Feed Sci. Tech.* 241: 184-197.
- Kaufman, J.D. 2016. Effect of Varying Rumen Degradable and Undegradable Protein on Milk Production and Nitrogen Efficiency in Lactating Dairy Cows under Summer Conditions. Master's Thesis, University of

Tennessee.

- Khasrad, K. and R. Rusdimansyah. 2012. Pengaruh Imbangan Konsentrat-Jerami Padi Amoniasi dan Lama Penggemukan terhadap Bobot Badan dan Kualitas Fisik Daging Sapi Pesisir. *JITV*. 17(2): 152-160.
- Kumar, M.R., D.P. Tiwari, and A. Kumar. 2005. Effect of undegradable dietary protein level and plane of nutrition on lactation performance in crossbred cattle. *Asian-Australasian J. Anim. Sci.* 18(10): 1407-1413.
- Kustantinah. 1992. Kecernaan Global Fraksi Nitrogen untuk 11 Bahan Makanan Ternak. *Buletin Peternakan*. 16(1): 106-114.
- Lascano, G. J., L.E. Koch, and A.J. Heinrichs. 2016. Precision-feeding dairy heifers a high rumen-degradable protein diet with different proportions of dietary fiber and forage-to-concentrate ratios. *J. Dairy Sci.* 99(9): 7175-7190.
- Lima, P.R., T. Apdini, A.S. Freire, A.S. Santana, L.M.L. Moura, J.C.S. Nascimento, R.T.S. Rodrigues, J. Dijkstra, A.F.G. Neto, M.A.A. Queiroz, and D.R. Menezes. 2019. Dietary supplementation with tannin and soybean oil on intake, digestibility, feeding behavior, ruminal protozoa and methane emission in sheep. *Anim. Feed. Sci. Tech.* 249: 10-17.
- Lin, X., Hu, Z., Zhang, S., Cheng, G., Hou, Q., Wang, Y., Yan, Z., Shi, K., and Wang, Z. (2020). A Study on the Mechanism Regulating Acetate to Propionate Ratio in Rumen Fermentation by Dietary Carbohydrate Type. *Advances in Bioscience and Biotechnology*. 11(08): 369-390.
- Lowry, O.H., N.J. Rosebrough, A.L. Farr, and R.J. Randall. 1951. Protein measurement with the Folin reagent. *J. Biol. Chem.* 193(1): 265-275.
- Mahyuddin, P. 2004. Compensatory Growth in Ruminants. *Anim. Prod.* 6(2): 125-135.
- Makmur, M., M. Zain, F. Agustin, R. Sriagtula, and E.M. Putri. 2020a. In vitro rumen biohydrogenation of unsaturated fatty acids in tropical grass-legume rations. *Vet. World*. 13(4): 661-668.
- Makmur, M., M. Zain, Y. Marlida, K. Khasrad, and A. Jayanegara. 2020b. In vitro ruminal biohydrogenation of C18 fatty acids in mixtures of *Indigofera zollingeriana* and *Brachiaria decumbens*. *J. Indones. Trop. Anim. Agric.* 45(2): 124-135.
- May, D., J.F. Calderon, V.M. Gonzalez, M. Montano, A. Plascencia, J. Salinas-Chavira, N. Torrentera, and R.A. Zinn. 2014. Influence of ruminal degradable intake protein restriction on characteristics of digestion and growth performance of feedlot cattle during the late finishing phase. *J. Anim. Scie. Tech.* 56 (14): 1-7
- McDonald, P., R.A. Edwards, J.F.D. Greenhalgh, C.A. Morgan, L.A. Sinclair, and R.G. Wilkinson. 2002. Animal nutrition 6th edition. In Prentice Hall.

London.

- McDougall, E.I. 1947. Studies on ruminant saliva. 1. The composition and output of sheep's saliva. *Biochem. J.* 43(1): 99-109.
- Menteri Pertanian. 2011. Penetapan Rumpun Sapi Pesisir. Keputusan Menteri Pertanian nomor 2908/Kpts/OT.140/6/2011. Menteri Pertanian, Jakarta.
- Miltko, R., J.A. Rozbicka-Wieczorek, E. Więsyk, and M. Czauderna. 2016. The influence of different chemical forms of selenium added to the diet including carnosic acid, fish oil and rapeseed oil on the formation of volatile fatty acids and methane in the rumen, and fatty acid profiles in the rumen content and muscles of lambs. *Acta Vet. Beogr.* 66(3): 373-391.
- Mohammed, Y. H. I. 2016. Isolation and Characterization of Tannic Acid Hydrolysing Bacteria from Soil. *Biochem. Analytic. Biochem.* 5(1): 1-6.
- Moradi kor, N. and J.B. Zadeh. 2013. Synchronization of Energy and Protein on Supply Synthesis Microbial Protein. *International journal of Advanced Biological and Biomedical Research* ISSN: 2322 – 4827. 1 (6): 594-600.
- Moss, A.R., J.P. Jouany, and J. Newbold. 2000. Methane Production by ruminants: its contribution to global warming. *Ann. Zootechnol.* 49(3): 231-253.
- Mutsvangwa, T., K.L. Davies, J.J. McKinnon, and D.A. Christensen. 2016. Effects of dietary crude protein and rumen-degradable protein concentrations on urea recycling, nitrogen balance, omasal nutrient flow, and milk production in dairy cows. *J. Dairy Sci.* 99(8): 6298-6310.
- National Research Council. 1985. Ruminant Nitrogen Usage. In Washington DC, The National Academies Press.
- National Research Council. 2000. Nutrient Requirements of Domestic Animals. Nutrient Requirements of Beef Cattle. 7th Revised Edition. National Academy Press.
- Nienaber, H. 2008. Effect of roughage to concentrate ratio on ruminal fermentation and protein degradability in dairy cows. Department of Animal and Wildlife Sciences. Faculty of Natural and Agricultural Sciences. University of Pretoria. Pretoria.
- Ningrat, R.W.S., M. Zain, Erpomen, E.M. Putri, and M. Makmur. 2019. Effects of *Leucaena leucocephala* supplementation to total mixed ration based on ammoniated rice straw on fiber digestibility and rumen fermentation characteristics in vitro. *Int. J. Adv. Sci. Eng. Inf. Tech.* 9 (3): 916-921.
- Nisa, M.U., A. Javaid, M.A. Shahzad, and M. Sarwar. 2008. Influence of varying ruminally degradable to undegradable protein ratio on nutrient intake, milk yield, Nitrogen balance, conception rate and days open in early lactating Nili-Ravi buffaloes (*Bubalus bubalis*). *Asian-Aust. J. Anim. Sci.* 21(9): 1303-1311.

- Palmquist, D.L. 1994. The Role of Dietary Fats in Efficiency of Ruminants. *J. Nut.* 124(8 Suppl): 1371S-1382S.
- Pathak, A.K. 2008. Various factors affecting microbial protein synthesis in the rumen. *Vet. World.* 1(6): 186–189.
- Paula, E.M., H.F. Monteiro, L.G. Silva, P.D.B. Benedeti, J.L.P. Daniel, T. Shenkoru, and A.P. Faciola. 2017. Effects of replacing soybean meal with canola meal differing in rumen-undegradable protein content on ruminal fermentation and gas production kinetics using 2 in vitro systems. *J. Dairy Sci.* 100(7): 5281-5292.
- Pazla, R., N. Jamarun, M. Zain, and Arief. 2018. Microbial protein synthesis and in vitro fermentability of fermented oil palm fronds by *phanerochaete chrysosporium* in combination with tithonia (*Tithonia diversifolia*) and elephant grass (*Pennisetum purpureum*). *Pakistan Journal of Nutrition*, 17(10): 462-470.
- Pichard, D.G. dan P.J. Van Soest. 1977. Protein Solubility of Ruminant Feeds. *Proc. Cornell Nutr. Conf.* p 91. Ithaca, New York.
- Piluzza, G., L. Sulas, and S. Bullitta. 2013. Tannins in forage plants and their role in animal husbandry and environmental sustainability: A review. *Grass Dan Forage Science. J. Br. Grassl. Soc.* 69(1): 1-17.
- Polyorach, S. and M. Wanapat. 2014. Improving the quality of rice straw by urea and calcium hydroxide on rumen ecology, microbial protein synthesis in beef cattle. *J. Anim. Phys. Anim. Nut.* 99: 449-456.
- Pond, W.G., D.E. Church, and K.R. Pond. 1995. *Basic Animal Nutrition and Feeding*. 4th Ed. John Willey and Sons, New York.p: 128-145.
- Prasetyono, B.W.H.E. 2008. *Rekayasa Suplemen Protein pada Ransum Sapi Pedaging Berbasis Jerami dan Dedak Padi*. Disertasi. Sekolah Pascasarjana. Institut Pertanian Bogor. Bogor.
- Puniya, A.K., R. Singh, and D. Kamra. 2015. *Rumen Microbiology: From Evolution to Revolution*. In *Rumen Microbiology: From Evolution to Revolution*. Springer.
- Rad, M., Y. Rouzbehan, and J. Rezaei. 2016. Effect of dietary replacement of alfalfa with urea-treated almond hulls on intake, growth, digestibility, microbial nitrogen, nitrogen retention, ruminal fermentation, and blood parameters in fattening lambs. *J. Anim. Sci.* 94(1): 349-358.
- Ramaiyulis. 2018. *Manipulasi Fermentasi Rumen dengan Suplementasi Ampas Daun Gambir untuk Meningkatkan Efisiensi Ransum dan Performa Sapi Bali*. Disertasi. Fakultas Peternakan Universitas Andalas.
- Rira, M., D.P. Morgavi, H. Archimède, C. Marie-Magdeleine, M. Popova, H. Bousseboua, and M. Doreau. 2015. Potential of tannin-rich plants for

- modulating ruminal microbes and ruminal fermentation in sheep. *J. Anim. Sci.* 93: 334–347.
- Russell, J.B. dan R.B. Hespell. 1981. Microbial Rumen Fermentation. *J Dairy Sci.* 64: 1153-1169.
- Russell, J.B., J.D. O Connor, D.G. Fox, P.J. Van Soest, and C.J. Sniffen. 1992. A net carbohydrate and protein system for evaluating cattle diets: IV. Predicting amino acid adequacy. *J. Anim. Sci.* 70(11): 3551-3561.
- Sairullah, P., S. Chuzaemi, and H. Sudarwati. 2016. Effect of Flour and Papaya Leaf Extract (*Carica papaya L*) in Feed to Ammonia Concentration, Volatile Fatty Acids and Microbial Protein Synthesis In Vitro. *J. Ternak Tropika.* 17(2): 66-73.
- Sakudo, A. and T. Onodera. 2016. Bovine Spongiform Encephalopathy. Molecular Detection of Animal Viral Pathogens Journal, p901-912.
- Saladin, R. 1983. Penampilan Sifat-sifat Produksi dan Reproduksi Sapi Lokal Pesisir Selatan di Provinsi Sumatera Barat. Disertasi. Fakultas Pascasarjana Institut Pertanian Bogor.
- Sannes, R.A., M.A. Messman, and D.B. Vagnoni. 2002. Form of rumen-degradable carbohydrate and nitrogen on microbial protein synthesis and protein efficiency of dairy cows. *J. Dairy Sci.* 85(4): 900-908.
- Santos, F.A.P., J.E.P. Santos, C.B. Thesurer, and J.T. Hubber, 1998. Effects of Rumen-Undegradable Protein on Dairy Cow Performance: A 12-Year Literature Review. *J. Dairy Sci.* 81(12): 3182-3213.
- Sari, R. dan R. Prayudyaningsih. 2015. Rhizobium: Pemanfaatannya sebagai Bakteri Penambat Nitrogen. *Info Teknis EBONI.* 12(1): 51–64.
- Savari, M., M. Khorvash, H. Amanlou, G.R. Ghorbani, E. Ghasemi, and M. Mirzaei. 2018. Effects of rumen-degradable protein: rumen -undegradable protein ratio and corn processing on production performance, nitrogen efficiency, and feeding behavior of Holstein dairy cows. *J. Dairy Sci.* 101: 1–12.
- Schwab, C.G., T.P. Tylutki, R.S. Ordway, C. Sheaffer, and M.D. Stern. 2003. Characterization of proteins in feeds. *J Dairy Sci.* 86(SUPPL.1): 86-103.
- Sharif, M., H. Qamar, and A.A. Wahid. 2019. Effect of Rumen Degradable Protein Concentrations on Nutrient Digestibility, Growth Performance and Blood Metabolites in Beetal Kids. *Concepts Dairy Vet. Sci.* 2(5): 249-253.
- Shibata, M. and F. Terada. 2010. Factors affecting methane production and mitigation in ruminants. *Anim. Sci. J.* 81: 2-10.
- Silva, A.L., E. Detmanna, L.N. Rennóá, A.M. Pedroso, M.M.S. Fontesa, V.C. Morais, A.L.L. Sguizzatoa, M.B. Abreua, P.P. Rottaa, and M.I. Marcondes. 2018.. Effects of rumen undegradable protein on intake,

digestibility and rumen kinetics and fermentation characteristics of dairy heifers. *Anim. Feed Sci. Tech.* 244: 1-10.

- Sinclair, L.A., P.C. Garnsworthy, J.R. Newbold, and P.J. Buttery. 1993. Effect of synchronizing the rate of dietary energy and nitrogen release on rumen fermentation and microbial protein synthesis in sheep. *J. Agr. Sci.* 120(2): 251-263.
- Singh, M., K. Sharma, N. Dutta, P. Singh, A.K. Verma, U.R. Mehra. 2007. Estimation of rumen microbial protein supply using urinary purine derivatives excretion in crossbred calves fed at different levels of feed intake. *Asian-Aust. J. Anim. Sci.* 20(10): 1567–1574.
- Sirait, J., K. Simanihuruk, and R. Hutasoit. 2012. The Potency of *Indigofera* Sp. as Goat Feed: Production, Nutritive Value and Palatability. In: Proceeding of International Seminar on Forage Based Feed Resources. Bandung, 3-7 Agustus 2009. Taipei (Taiwan): Food and Fertilizer Technology Centre (FFTC) ASPAC, Livestock Research Centre-COA, ROC and IRIAP. p. 4-7.
- Sniffen, C.J., J.D. O'Connor, P.J. Van Soest, D.G. Fox, and J.B. Russell. 1992. A net carbohydrate and protein system for evaluating cattle diets: IV. Predicting amino acid adequacy. *J. Anim. Sci.* 70(5): 3562-3577.
- Sodiq, A. dan D.P. Yuwono. 2016. Pola Pengembangan dan Produktivitas Sapi Potong Program Kemitraan Bina Lingkungan di Kabupaten Banyumas dan Cilacap Propinsi Jawa Tengah. *Agripet.* 16(1): 56–61.
- Solehudin, A.S. Mubarak, M. Syawal, dan S.P. Ginting. 2019. Pemenuhan Nutrisi Ternak dari Legum *Indigofera* dan Rumput Gajah Kerdil di Lokasi Demfarm Kabupaten Langkat Sumatera Utara. *Media Kontak Tani Ternak. Media Kontak Tani Ternak.* 1(2): 16-20.
- Suardin, N. Sandiah, dan R. Aka. 2014. Kecernaan Bahan Kering dan Bahan Organik Campuran Rumpul Mulato (*Brachiaria hybrid.cv.mulato*) dengan Jenis Legum Berbeda menggunakan Cairan Rumen Sapi. *JITRO.* 1(1): 16-22.
- Sultan, J.I., A. Javaida, M. Nadeem, M.Z. Akhtar, and M.I. Mustafa. 2009.. Effect of varying ruminally degradable to ruminally undegradable protein ratio on nutrient intake, digestibility and N metabolism in Nili Ravi buffalo calves (*Bubalus bubalis*). *Livest. Sci.* 122: 130-133.
- Sun, F., M.J. Aguerre, and M.A. Wattiaux. 2019. Starch and dextrose at 2 levels of rumen-degradable protein in iso-nitrogenous diets: Effects on lactation performance, ruminal measurements, methane emission, digestibility, and nitrogen balance of dairy cows. *J. Dairy Sci.* 102(2): 1281-1293.
- Suryani, H. 2017. Ransum Ternak Sapi Potong Melalui Suplementasi Direct Fed Microbials (DFM) dan Pereduksi Emisi Metan. Disertasi. Fakultas Peternakan. Universitas Andalas.

- Susilo, E., L.K. Nuswantara, dan E. Pangestu. 2019. Evaluasi Bahan Pakan Hasil Samping Industri Pertanian Berdasarkan Parameter Fermentabilitas Ruminan secara In Vitro. *Jurnal Sain Peternakan Indonesia*. 14(2): 128-136.
- Sutardi. 1980. *Landasan Ilmu Nutrisi*. Departemen Ilmu Nutrisi dan Makanan Ternak. Fakultas Peternakan IPB. Bogor.
- Suwandyastuti, S.N.O. 2013. Produk Metabolisme Rumen pada Sapi Peranakan Ongole Fase Tumbuh. *Agripet*. 13(1): 31-35.
- Swanek, S.S. 2007. *Ruminal protein degradation in beef cattle*. Dissertation. Oklahoma State University.
- Syafrizal, Y. 2021. Pessel Tingkatkan Populasi Ternak Sapi Melalui Inseminasi Buatan, Tahun 2020 Terealisasi Sebesar 106 Persen. <https://berita.pesisirselatankab.go.id/berita/detail/-pessel-tingkatkan-populasi-ternak-sapi-melalui-inseminasi-buatan-tahun-2020-teralisasi-sebesar-106>. Diakses 7 April 2021.
- Syaiful, F. dan F. Agustin. 2019. Diseminasi Teknologi Pakan Komplit Berbasis Bahan Baku Lokal Pada Sapi Potong Di Daerah Kinali, Pasaman Barat. *Jurnal Hilirisasi IPTEKS*. 2(1): 79-87.
- Syamsi, A.N., L. Walidi, dan T.P. Rahayu. 2018. Profil Asam Lemak Rantai Cabang Cairan Rumen Yang Disuplementasi Leguminosa Dalam Ransum Berbasis Indeks Sinkronisasi Protein-Energi. *J. Livest. Sci. Prod*. 2(1): 50-55.
- Syapura, S., M. Bata, dan W.S. Pratama. 2013. Peningkatan Kualitas Jerami Padi dan Pengaruhnya Terhadap Kecernaan Nutrien dan Produk Fermentasi Rumen Kerbau dengan Feces Sebagai Sumber Inokulum. *Agripet*. 13(2): 59-67.
- Tacoma, R., J. Fields, D. B. Ebenstein, Y.W. Lam, and S. L. Greenwood. 2017. Ratio Of Dietary Rumen Degradable Protein to Rumen Undegradable Protein Affects Nitrogen Partitioning but Does Not Affect The Bovine Milk Proteome Produced By Mid-Lactation Holstein Dairy Cows. *J. Dairy Sci*. 100: 7246-7261.
- Tamminga, S. 1977. Protein degradation in the forestomachs of ruminants. *J. Anim. Sci*. 49: 1615-1630.
- Tandon, M., R.A. Siddique, and T. Ambwani. 2016. Role of bypass proteins in ruminant production. *Dairy Planner*. 4(10): 11-14.
- Tarigan, A. dan S.P. Ginting. 2011. Pengaruh Taraf Pemberian Indigofera sp . terhadap Konsumsi dan Kecernaan Pakan serta Pertambahan Bobot Hidup Kambing yang Diberi Rumput *Brachiaria ruziziensis*. *Jurnal Ilmu Ternak dan Veteriner*. 3: 25-32.
- Tedeschi, L.O., D.G. Fox, M.A. Fonseca, and L.F.L. Cavalcanti. 2015. Models of

protein and amino acid requirements for cattle. *Rev. Bras. de Zootec.* 44(3): 109-132.

Teti, N., R. Latvia, I. Hernaman, B. Ayuningsih, D. Ramdani, dan Siswoyo. 2018. Pengaruh Imbangan Protein dan Energi terhadap Kecernaan Nutrien Ransum Domba Garut Betina. *Jurnal Ilmu dan Teknologi Peternakan.* 6(2): 97-101.

Tilley, J.M. and R.A. Terry. 1963. A Two-Stage Technique for the in Vitro Digestion of Forage Crops. *J. Br. Grassland Soc.* 18 (2): 104-111.

Tillman, A.D., H. Hartadi, S. Reksohadiprodjo, S. Prawirokusumo, dan S. Lebosoekojo. 1991. *Ilmu Makanan Ternak Dasar.* Gadjah Mada University Press. Yogyakarta.

Uddin, M.J., K.Z. Haque, K.M. Jasimuddin, and K.M.M. Hasan. 2015. Dynamics of microbial protein synthesis in the rumen - A Review. *Ann. Vet. Anim. Sci.* 2(5): 116-131.

Valizadeh, A., Kazemi-Bonchenari, M., Khodaei-Motlagh, M., Moradi, M.H., Salem, A.Z.M. 2021. Effects of different rumen undegradable to rumen degradable protein ratios on performance, ruminal fermentation, urinary purine derivatives, and carcass characteristics of growing lambs fed a high wheat straw-based diet. *Small Ruminant Res.* 197: 1-8.

Verite, R. and J.L. Peyroud. 1989. The PDI Systems. In: R. Jarrige (Ed), *Ruminant Nutrition.* INRA. Paris. PP 33-46.

Van Soest, P.J., C.J. Sniffen, D.R. Mertens. D.G. Fox, P.H. Robinson, and U.C. Krishnamoorthy. 1981. A Net Protein System for Cattle: The Rumen Submodel For Nitrogen. In: F.N. Owens (Ed.) *Protein Requirements For Cattle: Proceedings Of An International Symposium.* MP-109. p 265. *Fiv. Of Agric., Oklahoma State Univ. Stillwater.*

Van Soest, P.J. 1982. *Nutritional Ecology of the Ruminant : Ruminant Metabolism, Nutritional Strategies the Cellulolytic Fermentation and the Chemistry of Forages and Plant Fibers.* Cornell University O and B Books Inc. USA

Wahyuni, I. M., A. Muktiani, dan M. Christiyanto. 2014. Kecernaan bahan kering dan bahan organik dan degradabilitas serat pada pakan yang disuplementasi tanin dan saponin. *Agripet.* 2(2): 115-124.

Wanapat, M. 2009. Potential uses of local feed resources for ruminants. *Trop. Anim. Health and Prod.* 41(7): 1035-1049.

Wanapat, M., D.O. Erickson, and W.D. Slinger. 1982. Nitrogen metabolism in sheep fed protein sources of various solubilities with low quality roughages. *J. Anim. Sci.* 54(3): 625-631.

Warly, L., A. Fariani, O.P. Mawuenyegah, T. Matsui, T. Fujihara, T. Harumoto. 1994. Studies on Utilization of Rice Straw by Sheep. III. Effect of

- Soybean Meal and Barley Supplementation on Voluntary Intake, Digestibility and Ruminal Fermentation. *Asian-Aust. J. Anim. Sci.* 7(2): 265-271.
- Warly, L., A. Kamaruddin, Hermon, R.W.S. Ningrat, dan Elihasridas. 1998. Sintesis Protein Mikroba pada Sapi Pesisir yang Mengonsumsi Jerami Padi Amoniasi. *Jurnal Peternakan dan Lingkungan.* 4 (3): 30-43.
- Webb, D.W., E.E. Bartley, and R.M. Meyer. 1972. A comparison of nitrogen metabolism and ammonia toxicity from ammonium acetate and urea in cattle. *J. Anim. Sci.* 35: 1263–1270.
- Widyobroto, B.P., S. Padmowijoto, dan R. Utomo. 1995. Degradasi Bahan Organik dan Protein secara in sacco Lima Rumput Tropik. *Buletin Peternakan.* 19: 45-55.
- Wilson, J.R. and R.D. Hatfield. 1997. Structural and chemical changes of cell wall types during stem development: Consequences for fibre degradation by rumen microflora. *Aust. J. Agric. Res.* 48: 165180.
- Wiradarya, T.R. 1991. Usaha meningkatkan produksi daging ternak domba dan kambing melalui peningkatan kadar protein ransumnya. *J. Ilmu. Pet. Ind.* 1(1): 37-45.
- Wiryawan, K.G., A. Saefudina, A.M. Fuah, R. Priyanto, L. Khotijaha, dan S. Suharti. 2017.. Fermentation characteristics and nitrogen retention of madura cattle fed complete rations containing soybean pod and by-products. *Media Peternakan.* 40(1): 28-34.
- Wiyatna, M.F., E. Gurnadi, and K. Mudikdjo. 2012. Produktivitas Sapi Peranakan Ongole pada Peternakan Rakyat di Kabupaten Sumedang (Productivity of Peranakan Ongole Cattle on traditional farm system in Sumedang Region). *Jurnal Ilmu Ternak.* 12(2): 22–25.
- Yang, C., S. Bing-Wen, D. Qi-Yu, J. Hai, Z. Shu-Qin, and T. Yan. 2016. Rumen fermentation and bacterial communities in weaned Chahaer lambs on diets with different protein levels. *J. Integr. Agric.* 15 (7): 1564-1574.
- Yasothai, R. 2014. Importance of Protein on Reproduction in Dairy Cattle. *Int. J. Sci. Environ. Tech.* 3(6): 2081-2083.
- Yetmaneli. 2018. Potensi Pengembangan Sapi Pesisir di Sumatera Barat. Disertasi. Sekolah Pascasarjana. Institut Pertanian Bogor. Bogor.
- Zadeh, J.B., Z. Moradi, Z., and N. Moradi. 2013. Synchronization of energy and protein on supply synthesis microbial protein. *Int. J. Adv. Bio. Biomedic. Res.* 1(6): 594-600.
- Zahera, R., D. Anggraeni, Z.A. Rahman, dan D. Evvyernie. 2020. Pengaruh Kandungan Protein Ransum yang Berbeda terhadap Kecernaan dan

Fermentabilitas Rumen Sapi Perah secara In vitro. *Jurnal Ilmu Nutrisi Dan Teknologi Pakan* 18(1): 1-6.

Zain, M. 1999. Substitusi Rumput dengan Sabut Sawit dalam Ransum Pertumbuhan Domba: Pengaruh Amoniasi, Defaunasi dan Suplementasi Analog Hidroksi Metionin serta Asam Amino Bercabang. Disertasi. Institut Pertanian Bogor. Bogor.

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.

Zain, M., R.W.S. Ningrat, Erpomen, E.M. Putri, and M. Makmur. 2019. The effects of leguminous supplementation on ammoniated rice straw based completed feed on nutrient digestibility on in vitro microbial protein synthesis. *IOP Conference Series: Earth and Environmental Science.* 287(1).

Zain, M., E.M. Putri, R.W.S. Ningrat, Erpomen, and M. Makmur. 2020. Effects of supplementing *Gliricidia sepium* on ration based ammoniated rice straw in ruminant feed to decrease methane gas production and to improve nutrient digestibility (in-vitro). *Int. J. Adv. Sci. Eng. Inf. Tech.* 10(2): 724-729.

Zhang, H.L., C.Y. Chen, X.L. Xu, and Y.X. Yang. 2013. Effects of Branched-chain Amino Acids on In vitro Ruminant Fermentation of Wheat Straw. *Asian-Aust. J. Anim. Sci.* 26(4): 523-528.

