



DAFTAR PUSTAKA

- Adibmoradi, M., B. Navidshad, J. Seifdavati, and M. Royan. 2006. Effect of dietary garlic meal on histological structure of small intestine in broiler chickens. *Journal of Poultry Science.* 43: 387-383.
- Ahmadi, F., Y. Ebrahimnezhad, N.M. Sis, and J.G. Ghalehkandi. 2013. The effects of zinc oxide nanoparticles on performance, digestive, organs and serum lipid concentrations in broiler chickens during starter period. *International Journal of Biosciences.* 3: 23-29.
- Ali, S., S. Masood, H. Zaneb, H.F. Rehman, M.R. Khan, S.K. Tahir, H. Rehman. 2017. Supplementation of zinc oxide nanoparticles has beneficial effects on intestinal morphology in broiler chicken. *Pakistan Veterinary Journal.* 37: 335-339.
- Artana, W.D., S. Suraatmaja, K.N. Aryasa, I.K.G. Suandi. 2005. Peran suplementasi mineral mikro seng terhadap peran suplementasi mineral mikro seng terhadap kesembuhan diare. *Sari Pediatri.* 7: 15-18.
- AOAC. 2005. Official Methods of Analysis. 18th edition. Association of Agricultural Chemists International, Gaithersburg, MD.
- Awad, W., K. Ghareeb and J. Böhm. 2008. Intestinal structure and function of broiler chickens on diets supplemented with a probiotic containing *Enterococcus faecium* and oligosaccharides. *Journal of Molecular Science.* 9: 2205-2216
- Bami, M.K., M. Afsharmanesh and M. Salarmoini. 2018. Effect of zinc oxide nanoparticles and *Bacillus coagulans* as probiotic on growth, histomorphology of intestine, and immune parameters in broiler chickens. *Comparative Clinical Pathology.* 27: 399–406.
- Baurhoo, B., L. Phillip and C.A. Ruiz-Feria. 2007. Effects of purified lignin and mannan oligosaccharides on intestinal integrity and microbial populations in the ceca and litter of broiler chickens. *Poultry Science.* 86: 1070-1078.
- Borosova, D., J. Mocak, E. Beinrohr, and P. Miskovic. 2002. Validation and quality assurance of arsenic determination in urine by GFAAS after toluene extraction. *Polish Journal of Environmental Studies.* 11: 617-623.
- Bratz, K., G. Golz, C. Riedel, P. Janezyk, K. Nockler, and T. Alter. 2013. Inhibitory effect of high-dosage zinc oxide dietary supplementation on *Campylobacter coli* excretion in weaned piglets. *Journal of Applied Microbiology.* 115: 1194-1202.
- Brown, E.M., M. Sadarangani, and B.B. Finlay. 2013. The role of immune system in governing host-microbe interactions in the intestine. *Nature Immunology Journal.* 14: 660-667.
- Brugger, D. and W.M. Windisch. 2016. Subclinical zinc deficiency impairs pancreatic digestive enzyme activity and digestive capacity of weaned piglets. *British Journal of Nutrition.* 116: 425-433.



- Buckley, W.T. 2000. Trace Element Dynamics. In: Farm Animal Metabolism and Nutrition. D'Mello, J.P.F. (Ed.). CAB International Publishing, New York.
- Bunglaven, S.J., A.K. Garg, R. S. Dass, and S. Shrivastava. 2014. Use of nanoparticles as feed additives to improve digestion and absorption in livestock. *Livestock Research International*. 2: 36-47.
- Buzea, C., I. I. P. Blandino, and K. Robbie. 2007. Nanomaterial and nanoparticles: sources and toxicity. *Biointerphases*. 2: 170-172.
- Chen, Z., H. Meng, G. Xing, C. Chen, and Y. Zhao . 2007. Toxicological and biological effects of nanomaterials. *Journal of Nanotechnology*. 4: 79-96.
- Choct, M. 2009. Managing gut health through nutrition. *British Poultry Science*. 50: 9-15.
- Cowieson A.J., T. Acamovic, M.R. Bedford. 2006. Phytic acid and phytase: Implications for protein utilization by poultry. *Poultry Science Journal*. 85:878-885.
- Díaz-Gómez, N.M., E. Doménech, F. Barroso, S. Castells, C. Cortabarria, and A. Jiménez. 2003. The effect of zinc supplementation on linear growth, body composition, and growth factors in preterm infants. *American Academy of Pediatrics Journal*. 111: 1002-1009
- Dono, N. D. 2012. Nutritional strategies to improve enteric health and growth performance of poultry in the post antibiotic era. Ph.D. Thesis. University of Glasgow, Glasgow.
- El-Katcha, M., M. A. Soltan, and M. El-badry. 2017. Effect of dietary replacement of inorganic zinc by organic or nanoparticles sources on growth performance, immune response and intestinal histopathology of broiler chicken. *Alexandria Journal of Veterinary Sciences*. 55: 129-145.
- Ezzati, M.S., M. H. Bozorgmehrifard, P. Bijanzad, S. Rasoulinezhad, H. Moomivand, S. Faramarzi, A. Ghaedi, H. Ghabel, and E. Stabraghi. 2013. Effects of different levels of zinc supplementation on broilers performance and immunity response to Newcastle disease vaccine. *European Journal of Experimental Biology*. 3: 497-501.
- Fathi, M. , M. Haydari and T. Tanha. 2016. Effects of zinc oxide nanoparticles on antioxidant status, serum enzymes activities, biochemical parameters and performance in broiler chickens. *Journal of Livestock Science and Technologies*. 4: 7-13.
- Ferket, P.R., and A.G. Gernat. 2006. Factors that affect feed intake of meat birds: a review. *International Journal of Poultry Science*. 5: 905-911
- Gangadoo, S., D. Stanley, R. J. Hughes, R. J. Moore, and J. Chapman. 2016. Nanoparticles in feed: progress and prospects in poultry research. *Trends in Food Science & Technology*. 58: 115-126.
- Gao, J., H. Zhang, S. Yu, S. Wu, I. Yoon, J. Quigley, Y Gao and G. Qi. 2008. Effect of yeast culture in broiler diets on performance and immunomodulatory functions. *Journal of Poultry Science*. 87: 1377-1384.
- Geyra, A., Z. Uni and D. Sklan. 2001. Enterocyte dynamics and mucosal development in the posthatch chick. *Poultry Science*. 80: 776–782.



- Ghazanfari, S., M.A. Moradi, and M.M. Bardzardi. 2014. Intestinal morphology and microbiology of broiler chicken fed diets containing myrtle (*Myrtus communis*) essential oil supplementation. Iranian Journal of Applied Animal Science. 4: 549-554.
- Hafez, A., S.M. Hegazi, A.A. Bakr and H.EL. Shishtawy. 2017. Effect of zinc oxide nanoparticles on growth performance and absorptive capacity of the intestinal villi in broiler chickens. Life Science Journal. 14: 125-129.
- Hedemann, M.S., B.B. Jensen, and H.D. Poulsen. 2006. Influence of dietary zinc and copper on digestive enzyme activity and intestinal morphology in weaned pigs. Journal of Animal Science. 84: 3310–3320.
- Hernández, F.V. García, J. Madrid, J. Orengo, P. Catalá, and M.D. Megías. 2007. Effect of formic acid on performance, digestibility, intestinal histomorphology and plasma metabolite levels of broiler chickens. British Poultry Science. 47: 50-56.
- Hoet, P.H.M., B. Hohlfeld, and O.V. Salata. 2004. Nanoparticles - known and unknown health risks. Journal of Nanobiotechnology. 2: 12-27.
- Hosseini, S.M., H. Nazaridah, S. Ahani, and M.V. Azghandi. 2016. Effects of mannan oligosaccharide and *Curcuma xanthorrhiza* essential oil on the intestinal morphology and stress indicators of broilers subjected to cyclic heat stress. Archives Animal Breeding Journal. 59: 285–291.
- Hu, C., J. Song, Z. You, Z.S. Luan, and W. Li. 2012. Zinc oxide–montmorillonite hybrid influences diarrhea, intestinal mucosal integrity, and digestive enzyme activity in weaned pigs. Biological Trace Element Research. 35:178-185
- Hu, C.H., L.Y. Gu, Z.S. Luan, J. Song, and K. Zhu. 2012. Effect of montmorillonite-zinc oxide hybrid on performance, diarrhea, intestinal permeability and morphology of weanling pigs. Animal Feed Science and Technology. 177: 108-115.
- Hu, C.H., Z.C. Qian, J. Song, Z.S. Luan, and A.Y. Zuo. 2013. Effect of montmorillonite-zinc oxide hybrid on growth performance, intestinal structure and function of broiler chicken. Poultry Science 92: 143-150.
- Hu, X. and Y. Guo. 2008. Corticosterone administration alters small intestinal morphology and function of broiler chickens. Asian-Australasian Journal of Animal Sciences. 21: 1773-1778.
- Heugten, E.V., J.W. Spears, E.B. Kegleg, J.D. Ward, M.A. Qureshi. 2003. Effect of organic form of zinc on growth performance, tissue zinc distribution and immune respons of weanling pigs. Journal of Animal Science. 81:2063-2073.
- Hung, T.A., S. Lins, T. Yang, C. Chou, H. Liu, J. Lu, B. Wang, S. Chen, and T. Lien. 2012. Effect of *Bacillus coagulans* ATCC 7050 on growth performance, intestinal morphologi, and microflora composition in broiler chickens. Animal Production Science. 52(9): 874-879.
- Ibrahim, D., H. A. Ali, and S. A. M. El-Mandrawy. 2017. Effects of different zinc sources on performance, bio distribution of minerals and expression of



- genes related to metabolism of broiler chickens. Zagazig Veterinary Journal. 45: 292-304.
- Iskandar, S. 2014. Buku Panduan Budidaya Ayam Kampung. Balai Penelitian Ternak, Ciawi, Bogor.
- Jin, T., D. Sun, J. Y. Su, H. Zhang, and H. J. Sue. 2009. Antimicrobial efficacy of zinc oxide quantum dots against *Listeria monocytogenes*, *Salmonella enteritidis*, and *Escherichia coli* O157:H7. Journal of Food Science. 74: M46-M52.
- Jing, M.Y., J.Y. Sun, and X.Y. Weng. 2007. Insights on zinc regulation of food intake and macronutrient selection. Biological Trace Element Research. 15:187-194.
- Kavoi, B.M., D.W. Gakuya, P.N. Mbugua, and S.G. Kiama. 2016. Effect of dietary *Moringa oleifera* leaf meal supplementation on chicken intestinal structure and growth performance. Journal of Morphological Science. 33(4): 186-192.
- Kurnia, F., M. Suhardiman, L. Stephani, dan T. Purwadaria. 2012. Peranan nano-mineral sebagai bahan imbuhan pakan untuk meningkatkan produktivitas dan kualitas produk ternak. Wartazoa. 22: 187-193.
- Lagana, C., A.M.L. Ribeiro, A.M. Kessler, L.R. Kratz, and C.C. Pinheiro. 2007. Effect of the supplementation of vitamins and organic minerals on the performance of broilers under heat stress. Brazilian Journal of Poultry Science. 9: 39-43.
- Lai, P.W., J. B. Liang, L. C. Hsia, T. C. Loh, and Y. W. Ho. 2010. Effects of varying dietary zinc levels and environmental temperatures on the growth performance, feathering score and feather mineral concentrations of broiler chicks. Asian-Australasian Journal of Animal Sciences. 23: 937-945.
- Lestari, R., A. Darmawan, and I. Wijayanti. Suplementasi mineral Cu dan Zn dalam pakan terhadap organ dalam dan lemak abdomen ayam broiler. Jurnal Ilmu Nutrisi dan Teknologi Pakan. 18: 74-80.
- Lin, W., Y. Xu, C. Huang, Y. Ma, K.B. Shanon, and D. Chen. 2009. Toxicity of nano- and micro- sized ZnO nanoparticles in humans epithelial cells. Journal of Nanoparticle Research. 11: 25-39.
- Lina T., J. Jianyang, Z. Fenghua, R. Huiying, and L. Wenli. 2009. Effects of nano-zinc oxide on the production and dressing performance of broiler. Chinese Agricultural Science Bulletin. 2002–2009
- Liu, Z.H., L. Lu, S. F. Li, L.Y. Zhang, L. Xi, K.Y. Zhang, and X.G. Luo. 2011. Effects of supplemental zinc source and level on growth performance, carcass traits, and meat quality of broilers. Poultry Science. 90: 1782–1790.
- Lubis, F. N. L., R. Alfianty, and E. Sahara. 2015. Pengaruh suplementasi selenium organik (Se) dan vitamin E terhadap performa Itik Pegagan. Jurnal Peternakan Sriwijaya. 4:28-34.
- Mahfudz, L. D., T. A. Sarjana and W. Sarengat. 2010. Efisiensi penggunaan protein pakan yang mengandung limbah destilasi minuman beralkohol



(LDMB) oleh burung puyuh (*Coturnix coturnix japonica*) jantan. Prosiding Seminar Nasional Teknologi Peternakan dan Veteriner. Fakultas Peternakan Universitas Diponegoro, Semarang. Hal: 887-894.

- Naz, S., M. Idris, M. Khalique, I. Alhidary, M. Abdelrahman, R. Khan, N. Chand, U. Farooq, and S. Ahmad. 2016. The activity and use of zinc in poultry diets. World's Poultry Science Journal. 72: 159-167.
- Neto, J.B. 1995. The essential role of zinc in growth. Nutrition Research Journal. 15: 335-358.
- Neto, M.T., B.H.C. Pachoco, R. Albuquerque, E.A Schammass, and L.J.C Rodriguez. 2011. Dietary effect of chelated zinc supplementation and lysine levels in ISA Brown laying hens on early and late performance, and egg quality. Poultry Science. 90: 2837-2844.
- Neves, D.P., T. M. Banhazi, dan I. A. Naas. 2014. Feeding behaviour of broiler chickens: a review on the biomechanical characteristics. Brazilian Journal of Poultry Science. 16: 1-16.
- Nova, K., T. Kurtini, dan Riyanti. 2002. Panduan Manajemen Usaha Ternak Unggas. Universitas Lampung. Bandar Lampung.
- Park, S., Y. S. Birkhod, L. Kubena, D. Nisbet, and S. Ricke. 2004. Review the role of dietary zinc in poultry nutrition, immunity, and reproduction. Biological Trace Element Research.. 101: 147-163.
- Pathak, S. S., K. V. Reddy and S. Prasoon S. 2016. Influence of different sources of zinc on growth performance of dual purpose chickens. Journal of Bio Innovation. 5: 663-672.
- Prakatur, I., M. Miskulin, M. Pavic, K. Marjanovic, V. Blazicevic, I. Miskulin, and M. Domacinovic. 2019. Intestinal Morphology in Broiler Chickens Supplemented with Propolis and Bee Pollen. Animals. 9: 301-322.
- Qi-you, X., L. Li-bo, H. Feng-yu, W. Jia-lan, D. Zhen-guo, B. Hui-ju, and S. An-shan. 2007. Effects of nanometer zinc oxide on the biochemical index of broilers. Chinese Journal of Animal Nutrition. 2001–2007
- Pramual, P., K. Meeyen, K. Wongpakam, and U. Klinhom. 2013. Genetic diversity of Thai native chicken inferred from mitochondrial DNA sequences. Tropical Natural History. 13: 97-106.
- Rinttila, T. And J. Apajalahti. Intestinal microbiota and metabolites implication for broiler chickens health and performance. Journal of Applied Poultry Research. 22:647-658.
- Rosi, N.L. and C. A. Mirkin. 2005. Nanostructures in biodiagnostics. Chemical Review. 105: 1547-1562.
- Sahoo, A., R. Swain, S. K. Mishra, and B. Jena. 2014. Serum biochemical indices of broiler birds fed on inorganic, organic and nano zinc supplemented diets. Journal of Recent Scientific Research. 5: 2078-2081.
- Sari, K. A., B. Sukamto, and B. Dwiloka. 2014. Efisiensi penggunaan protein pada ayam broiler dengan pemberian pakan mengandung tepung daun kayambang (*Salvinia molesta*). Agripet. 4: 76-83.



- Sari, M. L., S. Tantalo, and K. Nova. 2017. Performa ayam KUB (Kampung Unggul Balitnak) periode grower pada pemberian ransum dengan kadar protein kasar yang berbeda. Jurnal Riset dan Inovasi Peternakan. 1: 36-41.
- Sartika, T. H. Resnawati, S. Iskandar, M. Purba, D. Zainuddin, and A. Unadh. 2014. Panduan Teknik Formulasi Ransum Ayam KUB Berbasis Bahan Pakan Lokal. Badan Penelitian dan Pengembangan Peternakan, Bogor.
- Scott, T. A. 2005. Variation in feed intake of broiler chickens. Proceedings of The Recent Advances in Animal Nutrition in Australia. Faculty of Veterinary Science, Sydney University, Sydney. Page 237-244.
- Sinurat, A. P., C. Hidayat, T. Wardhani, dan T. Sartika. 2017. Pemberian enzim BS4 untuk meningkatkan performa ayam KUB masa pertumbuhan. Prosiding Seminar Nasional Teknologi Peternakan dan Veteriner. Balai Penelitian Ternak, Ciawi, Bogor. Hal. 400-406.
- Siswohardjono, W. 1982. Beberapa metode pengukuran energi metabolismis bahan makanan ternak pada itik. Institut Pertanian Bogor. Bogor. (Makalah Seminar Fakultas Pasca Sarjana).
- Situmorang, N. A., L. D. Mahfudz, dan U. Atmomarsono. 2013. Pengaruh pemberian rumput laut (*Gracilaria verrucosa*) dalam ransum terhadap efisiensi penggunaan protein ayam broiler. Animal Agricultural Journal. 2: 49-56.
- Sugito, M., W. Astuti, D. A. Handharyani dan Chairul. 2007. Morfometrik usus dan kinerjan ayam broiler yang diberi cekaman panas dan ekstrak n-heksana kulit batang 'jaloh' (*Salix tetrasperma* Rozb). Media Peternakan. 30: 198-206.
- Sunder, G.S., A.K. Panda, N.C.S. Gopinath, S.V.R. Rao, M.V.L.N. Raju, M.R. Reddy, and C.V. Kumar. 2008. Effects of higher levels of zinc supplementation on performance, mineral availability, and immune competence in broiler chickens. Journal of Applied Poultry Research. 17:79–86.
- Szabo, J., M. Hegedus, G. Bruckner, E. Kosa, E. Andrasofszky, and E. Berta. 2004. Large doses of zinc oxide increases the activity of hydrolases in rats. Journal of Nutritional Biochemistry. 15:206–209
- Tang, Z., C. Wen, P. Li, T. Wang, Y. Zhou. 2014. Effect of zinc-bearing zeolite clinoptilolite on growth performance, nutrient retention, digestive enzyme activities, and intestinal function of broiler chickens. Biological Trace Element Research. 158:51–57
- Tillman, A.D., H. Hartadi, S. Reksohadiprodjo, S. Prawirokusumo, dan S. Lebdosukojo. 1998. Ilmu Makanan Ternak Dasar. Cetakan ke-4. Gadjah Mada University Press, Yogyakarta
- Tsiritsikos, P., K.Fegeros, A. Kominakis, C. Balaskas and K.C. Mountzouris. 2012. Modulation of intestinal mucin composition and mucosal morphology by dietary phytogenic inclusion level in broilers. Journal of Animal Bioscience. 6: 1049– 1057.



- Underwood, E.J. and N.F. Suttle. 2001. The Mineral Nutrition of Livestock. CABI Publishing, New York.
- Urfa, S., H. Indrijani, and W. Tanwirah. 2017. Model kurva pertumbuhan ayam Kampung Unggul Balitnak (KUB) umur 0-12 minggu. Jurnal Ilmu Ternak. 17: 59-66.
- Vinus S. and N. Sheoran. 2017. Role of nanotechnology in poultry nutrition. Internasional Journal of Pure & Applied Bioscience. 5: 1237-1245.
- Wawrzyniak, A., M. Kapica, D. Stępień-Pyściak, R. Szewerniak, A. Olejarska, and Ł. Jarosz. 2017. Effect of feeding transcarpathian zeolite on gastrointestinal morphology and function in broiler chickens. Brazilian Journal of Poultry Science. 19: 737-746.
- Widhyari, S.D. 2012. Peran dan dampak defisiensi zinc (Zn) terhadap sistem tanggap kebal. Jurnal Wartazoa. 22: 141-148.
- Wijaya, Y., E. Suprijatna, dan S. Kismiti. (2017). Penggunaan limbah industri jamu dan bakteri asam laktat (*Lactobacillus sp.*) sebagai sinbiotik untuk aditif pakan terhadap kualitas interior telur ayam ras petelur. Jurnal Peternakan Indonesia. 19: 47-54.
- Wijnhoven, S., C. Herberts, W. Hagens, A. Omen, E. Heugene, and B. Roszek. 2009. Nano silver-a review of available data knowledge gaps. Report 360003001/2008 National Institute for Public Health and the Environment (RIVM), Bilthoven.
- Xia, T., M. Kovochi, M. Liong, L. Madler, B. Gilbert, and H. Shi. 2008. Comparison of the mechanism of toxicity of zinc oxide and cerium oxide nanoparticles based on dissolution and oxidative stress properties. American Chemical Society. 2: 21-34.
- Xu, Z. R., C. H. Hu, M. S. Xia, X. A. Zhan, and M. Q. Wang. 2003. Effects of dietary fructooligosaccharide on digestive enzyme activities, intestinal microflora and morphology of male broilers. Poultry Science. 82:1030–1036.
- Yazdani, A., S.L. Poorbaghi, and H. Habibi. 2013. Dietary *Berberis vulgaris* extract enhances intestinal mucosa morphology in the broiler chicken (*Gallus gallus*). Comparative Clinical Pathology. 22: 611-615.
- Yu, Y., L. Lu, R. L. Wang, L. Xi, X. G. Luo, and B. Liu. 2010. Effects of zinc source and phytate on zinc absorption by *in situ* ligated intestinal loops of broilers. Poultry Science. 89: 2157-2165.
- Yuniasri E.E. and A. Candra. 2016. Pengaruh suplementasi seng dan zat besi terhadap berat badan balita usia 3-5 tahun di kota semarang. Journal of Nutrition College. 5: 381-387.
- Zha, L.Y., Z.R. Xu, M.Q. Wang, and L.Y. Gu. 2008. Chromium nanoparticle exhibits higher absorption efficiency than chromium picolinate and chromium chloride in Caco-2 cell monolayers. Journal of Animal Physiology and Animal Nutrition. 92: 131-140.



Zhang, H. D. Li, L. Liu, L. Xu, M. Zhu, X. He and Y. Liu. 2019. Cellular composition and differentiation signaling in chicken small intestinal epithelium. *Animals*. 9: 870-882.

Zhao, C. Y., S. X. Tan, S. X. Qiu, J. Q. Pan, and Z. X. Tang. 2014. Effect dietary zinc oxide nanopartikel on growth performance and antioxidative status in broilers. *Biological Trace Element Research*. 160: 361-367