

DAFTAR PUSTAKA

- Abebe, F., H. Mulatu, and S. Kelemework. 2023. Review of factors affecting egg quality and its effect. *J. Anim. Health.* 3(2):17-32.
- Adu, O. A., O. J. Olarotimi, S. O. Olayode, and A. O. Adelowo. 2017. Effect of dietary supplementation of copper sulphate and copper oxide on some egg quality parameters of laying hen. *J. Anim. Sci.* 50(3):118-127.
- Alagawany, M., S.S. Elnesr, M. R. Farag, R. Tiwari, M.I. Yattoo, M. Karthik, I. Michalak and K. Dhama. 2021. Nutritional significance of amino acids, vitamins and minerals as nutraceuticals in poultry production and health – a comprehensive review. *J. Vet. Quart.* 41(1): 1-29.
- Alig, B. N., R. D. Malheiros, dan K. E. Anderson. 2023. Evaluation of physical egg quality parameters of commercial brown laying hens housed in five production systems. *Animals.* 13(4).
- Amrullah, I. K. 2003. *Nutrisi Ayam Petelur.* Satu Gunungbudi. Bogor.
- Arifin, H. 2016. Analysis on different phases cycle in production of laying hens. *CJAH.* 1(2):37-41.
- Bagheri, S., H. Janmohammadi, R. Maleki, A. Ostadrahimi, and R. Kianfar. 2019. Laying hen performance, egg quality improved and yolk 5-methyltetrahydrofolate content increased by dietary supplementation of folic acid. *J. Anim. Nutr.* 5:130-133.
- Baker, B. C., D. J. L. Hayes, and R. L. Jones. 2018. Effects of micronutrients on placental function: evidence from clinical studies to animal models. *J. Soc. Reprod. Fertil.* 156(3):69-82.
- Bakhsalinejad, R., S. Torrey, and E. G. Kiarie. 2025. Comparative efficacy of hydroxychloride and organic sources of zinc, copper, and manganese on hatching eggs, embryo and hatchlings attributes. *J. Poult. Sci.* 104.
- Bekele, B., B. Wolde, S. Abraham, D. H. Mesikel, W. Ayele, F. Tadesse, T. Lambore, and H. Abebe. 2023. Body weight performance, egg production and egg quality trait of Lohmann chicken genotype in Wachemo University Poultry Farm under intensive management system. *Uttar Pradesh J. Zool.* 44(8):29-39.
- Berwanger, E., S.L Vieira, C. R. Angel, L. Kindlein, A. N. Mayer, M. A. Ebbing, and M. Lopes. 2018. Copper requirements of broiler breeder hen. *J. Poult. Sci.* 97:2785-2797.
- BSN. 2023. *Telur ayam konsumsi.* SNI No. 3926 - 2023. Badan Standardisasi Nasional. Jakarta.

- Bortoluzzi C, Vieira BS dan Applegate TJ. 2020. Influence of dietary zinc, copper, and manganese on the intestinal health of broilers under eimeria challenge. *Fron. Vet. Sci.* 7:13.
- BPS. 2024. Populasi ayam ras petelur menurut provinsi (ekor). Badan Pusat Statistik. Jakarta.
- BPS. 2024. Rata-rata konsumsi perkapita seminggu menurut kelompok telur dan susu per kabupaten/kota (satuan komoditas). Badan Pusat Statistik. Jakarta.
- Braiterman, L. T., G. Arnab, C. Raghothama, R. N. Cole, and A. L. Hubbard. 2015. Communication between the N and C Termini is required for copper-stimulated Ser/Thr Phosphorylation of Cu(I)-ATPase (ATP7B). *J. Biol. Chem.* 290:8803-8819.
- Brodacki, A., J. Batkowska, A. Stepniowska, E. Blicharska, and K. Drabik. 2018. Quality and mineral composition of eggs from hens supplemented with copper-lysine chelate. *Arch. Anim. Breed.* 61:109-113.
- Brown, A. T., M. E. Lemons, K. Perryman, A. S. Kiess, and K. G. S. Wamsley. 2021. Determining the relationship between varying inclusions of *Bacillus licheniformis* and tribasic copper chloride on 42-day-old Ross 708 male broiler performance. *J. Appl. Poult.* 30:1-13.
- Cao, H. R., G. Hu, C. Li, J. Guo, J. Pan, and Z. Tang. 2016. In vivo effects of high dietary copper levels on hepatocellular mitochondrial respiration and electron transport chain enzymes in broilers. *J. Poult. Sci.* 57:63-70.
- Carvaliho, L., V. Limao, N.S. Fagundes, and E. Fernandes. 2018. Excretion Level of Trace Minerals in Broilers Fed Organic Mineral. *Braz. Anim. Sci.* 19:1-8.
- Carvaliho, L. S. S., D. R. V. Rosa, F. H. Litz, N. S. Fagundes, and E. A. Fernandes. 2015. Effect of the inclusion of organic copper, manganese, and zinc in the diet of layers on mineral excretion, egg production, and eggshell quality. *Braz. J. Poult. Sci.* 87-92.
- Celik, S., Z. Erdogan, S. Erdogan, and R. Bal. 2005. Efficacy of Tribasic Copper Chloride (TBCC) to reduce the harmful effects of aflatoxin in broilers. *Turk. J. Vet. Anim. Sci.* 29:909-916.
- Chen, L., M. Junxia. and W. Fudi. 2022. Copper homeostasis and cuproptosis in health and disease. *Signal Transduction and Targeted Therapy.* 7(378):1-16.
- Cholewinska, E., K. Ognik, B. Fotschki, Z. Zdunczyk, and J. Juskiwicz. 2018. Comparison of the effect of dietary copper nanoparticles and one copper (II) salt on the copper biodistribution and gastrointestinal and hepatic morphology and function in a rat model. *PLoS One.* 13(5).

- Coble, K. F., J. M. DeRouchey, M. D. Tokach, S. S. Dritz, R. D. Goodband, J. C. Woodworth, and J. L. Usry. 2017. The effects of copper source and concentration on growth performance, carcass characteristics, and pen cleanliness in finishing pigs. *J. Anim. Sci.* 95:4052-4059.
- Cromwell, G.L., T. S. Stahly, and H. J. Monegue. 1989. Effects of sources and level of copper on performance and liver copper stores in weanling pigs. *J. Anim. Sci.* 67: 2996-2998.
- Crosara, F. S. G., S. K. A. Santos, L. S. S. Silva, G. L. Carvaliho, F. H. Litz, and E. A. Fernandes. 2021. Organic copper, iron, manganese and zinc: digestibility, production parameters and egg quality of layers. *Arq. Bras. Med. Zootec.* 73(3):733-741.
- Deo, C., A. Biaswas, D. Sharma, and A. K. Tiwari. 2023. Effects of different concentrations of copper on performance, immunity and carcass traits in broiler Japanese quails. *Biol. Trace Elem. Res.* 201(9).4530-4537.
- Diaz, T. G., A. L. Teodoro, I. C. O. Rojas, A. F. P. Chitiva, and J. A. P. Guzman. 2015. . *Metabolismo do cobre na nutricao animal: Revisao.* *PubVet.* 9(6): 279-286.
- Dubey, P., V. Thakur, and M. Chattopadhyay. 2020. Role of mineral and trace elements in diabetes and insulin resistance. *Nutrients.* 12(6):1-17.
- El Sabry, M. I., F. K. R. Stino, and W. A. A. El-Ghany. 2021. Copper: Benefits and risks for poultry, livestock, and fish production. *Trop. Anim. Health Prod.* 53(5):487.
- El-Katcha, M. I., M. A. Soltan, S. M. El-Kassas, M. M. Arafa, E. R. Kawarei, and K. M. El-Naggar. 2022. The impact of alternative dietary replacement of inorganic copper salt with organic and nano form on productive performance and egg quality characteristics of laying hens. *Pakistan J. Zool.* :1-11.
- Elkhair, R. A., S. Selim, and E. Hussein. 2018. Effect of supplementing layer hen diet with phytogenic feed additives on laying performance, egg quality, egg lipid peroxidation and blood biochemical constituents. 4:394-400.
- Elnesr, S. S., B. Y. Mahmoud, P. G. D. S. Pires, P. Moraes, H. A. M. Elwan, N. A. El-Shall, M. S. El-Kholy, and M. Alagawany. 2024. Trace minerals in laying hen diets and their effects on egg quality. *Biol. Trace Elem. Res.* 202:5664-5679.
- Elsherif, H., A. Foud, S. Nassar, F. Wahba, A. Elsabagh, and K. El-Iraq. 2019. Effect of dietary copper sulphate on laying hen performance, egg quality, and oxidative stress in hot climate conditions. *Europ.J. Poult. Sci.* 83.

- Emami, A. K., U. Jung, B. Voy, and S. Dridi. 2020. Radical response: effects of heat stress-induced oxidative stress on lipid metabolism in the vian liver. *Antioxidants*. 10(35):1-15.
- European Food Safety Authority (EFSA). 2016. Revision of the currently authorized maximum copper content in complete feed. *EFSA Journal*. 14(8):4563.
- European Food Safety Authority. 2011. Scientific opinion on safety and efficacy of di copper chloride tri hydroxide (tribasic copper chloride, TBCC) as feed additive for all species. *EFSA Journal*. 9(9):23-55.
- Favero, A., S. L. Vieira, C. R. Angel, F. Bess, H. S. Cemin, and T. L. Ward. 2013. Reproductive performance of Cobb 500 breeder hens fed diets supplemented with zinc, manganese, and copper from inorganic and amino acid-complexed sources. *J. Appl. Poult.* 22:80-91.
- Fouad, A. M., Y. Li, W. Chen, D. Ruan, S. Wang, W. G. Xia, Y. C. Lin, and C. T. Zheng. 2016. Effects of dietary copper supplementation on laying performance, egg quality and plasma cholesterol fractions in laying ducks. *Pak. J. Nutr.* 15:878-82.
- Gou, Z., Q. Fan, L. Li, Y. Wang, X. Lin, X. Cui, J. Ye, F. Ding, Z. Cheng, K. Abouluezz, and S. Jiang. 2021. High dietary copper induces oxidative stress and leads to decreased egg quality and reproductive performance of Chinese Yellow broiler breeder hens. *J. Poult. Sci.*
- Hanusova, E., C. Hrnkar, A. Hanus, and M. Oravcova. 2015. Effect of breed on some parameters of egg quality in laying hens. *Acta Fytotechnica et Zootechnica*. 18(1):12-24.
- Hartini, S., E. K. Suawa, D. D. Rahardjo, dan A. E. Widodo. 2022. *Nutrisi Unggas*. Deepublish. Yogyakarta.
- Hassan, A. M., D. A. Mohammed, K. N. Hussein, and S. H. Hussen. 2017. Comparison among three lines of quail for egg quality characters. *Science Journal of University of Zakho*. 5(4):296-300.
- Hefnawy, A. E. and H. M. El-khaiat. 2015. The importance of copper and the effects of its deficiency and toxicity in animal health. *J. Livestock. Res.* 5(12).
- Hill, G.M. and M. C. Shannon. 2019. Copper and zinc nutritional issues for agricultural animal production. *Biol. Trace Elem. Res.* 188.148-159.
- Ibrahim, I. A., G. M. El-Gendi, A. A. Nihad, H. M. Okasha, and M. M. El-atrouny. 2022. Effect of different dietary copper forms and levels on carcass characteristics and meat quality traits of broilers chickens. *Annals. Agri. Sci. Moshtohor.* 60(4):1091-1102.
- Jankowski, J., K. Ognik, K. Kozłowski, A. Stepniowski, and Z. Zdunczyk. 2019. Effect of diferent levels and sources of dietary copper, zinc and

- manganese on the performance and immune and redox status of turkeys. *Animals (Basel)*. 9(11):883.
- Jegede, A. V., A. O. Osos, A. O. Fafiolu, R. A. Sobayo, O. M. O. Idowu, and O.O. Oduguva. 2015. Effects of dietary copper on performance, serum and egg yolk cholesterol and copper residues in yolk of laying chickens. *Slovak. J. Anim. Sci.* 48(1):29- 36.
- Kara, K., B. G. Kocaglu, M. Senturk, M. Eren, and E. Baytok. 2021. Effects of catechin and copper or their combination in diet on productive performance, egg quality, egg shelf-life, plasma 8-OHdG concentrations and oxidative status in laying quail (*Coturnix coturnix-japonica*). *J. Appl. Anim. Res.* 49(1):97-103.
- Kartikasari, L. R., B. S. Hertanto, D. Pranoto, W. N. Salim, and A. M. P. Nuhriawangsa. 2017. Exterior and interior physical quality of egg of laying hens fed diets containing different dietary purslane levels. *IOP Conf. Ser: Mater. Sci. Eng.* 193(1).
- Kaya, H., A. Kaya, M. Macit, and O. Kaynar. 2017. Effects of dietary copper supplementation on performance, egg quality parameters, yolk cholesterol and fatty acid profiles in laying hens. *Indian. J. Anim. Res.* 52(11):1623-1627.
- Khan, S., R. J. Moore, D. Stanley, and K. K. Chousalkar. 2020. The gutmicrobiota of laying hens and its manipulation with prebiotics and probiotics to enhance gut health and food safety. *Appl. Environ. Microbiol.* 86(3).
- Kim, J. W., and D. Y. Kil. 2015. Determination of relative bioavailability of copper in tribasic copper chloride to copper in copper sulfate for broiler chickens based on liver and feather copper concentrations. *Anim. Feed. Sci. Tech.* 210:138–143.
- Kim, J. J. W., J. H. Kim, J. E. Shin, and D. Y. Kil. 2016. Relative bioavailability of copper in tribasic copper chloride to copper in copper sulfate for laying hens based on egg yolk and feather copper concentrations. *J. Poult. Sci.* 95:1591-1597.
- Latypova, E and E. Shatkikh. 2024. The effect of phytobiotic preparations on the digestibility of macronutrients by laying hens. *BIO Web of Conferences.* 108.
- Lesson, S. and J. D. Summers. 2001. *Nutrition of The Chicken* 4th ed. Nottingham University Press. England.
- LI, W.X., Y.Q. Chen, L.H. Zhao, Q.G. Ma, J.Y. Zhang, and C. Ji. 2018. No copper supplementation in a corn-soybean basal diet has no adverse effects on late-phase laying hens under normal and cyclic high temperatures. *Poult. Sci.* 1-9.

- Liao, X., W. Li, Y. Zhu, L. Zhang, L. Lu, X. Li, and X. Luo. 2018. Effects of environmental temperature and dietary zinc on egg production performance, egg quality and antioxidant status and expression of heat-shock proteins in tissues of broiler breeders. *British Journal. Nutr.* 120:3-12.
- Lin, G., Y. Guo, B. Liu, R. Wang, X. Su, D. Yu, and P. He. 2020. Optimal dietary copper requirements and relative bioavailability for weanling pigs fed either copper proteinate or tribasic copper chloride. *J. Anim. Sci. Biotech.* 11(54): 1-15.
- Liu, Z., M. M. Bryant, and D. A. Roland. 2005. Layer performance and phytase retention as influenced by copper sulfate pentahydrate and triabasic copper chloride. *J. Poult. Sci.* 14:499-505.
- Lopulalan, M., T. N. Ralahu, dan W. M. Horhorouw. 2024. Pengaruh manajemen pakan terhadap kualitas eksternal telur pada beberapa peternakan ayam ras petelur di Pulau Ambo. *Jurnal Teknologi Pertanian.* 13(1)110-116.
- Luo, X. G., F. Ji, Y. X. Lin, F. A. Steward, L. Lu, B. Liu, and S. X. Yu. 2005. Effects of dietary supplementation with copper sulfate or tribasic copper chloride on broiler performance, relative copper bioavailability, and oxidation stability of vitamin E in feed. *J. Poult. Sci.* 84:888–893.
- Ma N., M. Liu, M. Song, S. Li, X. Lin, H. Jiao, X. Wang, J. Zhao, S. Sun, and H. Lin. 2022. The application of copper waterline on laying performance and gut health of aged laying hens. *J. Poult. Sci.* 5(3):223-232.
- Makarski, B., M. Gortat, J. Lechowski, W. Zukiewicz-Sobczak, P. Sobczak, and K. Zawislak. 2014. Impact of copper (Cu) at the dose of 50 mg on haematological and biochemical blood parameters in turkeys, and level of Cu accumulation in the selected tissues as a source of information on product safety for consumers. *Ann Agri Environ Med.* 21(3).
- Maltais. D., D. Desroches, M. Aouffen, M. A. Mateescu, R. Wang, and J. Paquin. 2013. The blue copper ceruloplasmin induces aggregation of newly differentiated neurons: A potential modular of nervous system organization. *Journal. of Neuroscience.* 121: 73-82.
- Mroczek, S. M., M. Tukasiewicz, A. Wunk, and E. Sawose. 2016. In ovo administration of copper nanoparticles and copper sulfate positively influences chicken performance. *J. Sci. Food. Agri.* 96(9):3058-3062.
- National Research Council. 1994. *Nutrient Requirements of Poultry (9th Edition)*. NRC, National Academy Press. Washington, DC, USA.
- Nawab, A., G. Li, W. Liu, R. Lan, J. Wu, Y. Zhao, K. Kang, B. Kieser, C. Sun, S. Tang, M. Xiao, and L. An. 2019. Effect of dietary curcumin on the

- antioxidant status of laying hens under high-temperature conditions. *Revista Brasileira de Ciencia Avicola*. 21(2):1-9.
- Neto, M. A. T., A, P, O, Saccomani, M. L.P Tse, and J. C. Dadalt. 2019. Effect of dietary chelated copper and methionine and cysteine on performance, egg quality, and nutrient balance in brown laying hens from 20 to 49 wk old. *J. Anim. Sci*. 99:283-295.
- Nguyen, H. T. T., N. Morgan, J. R. Roberts, R. A. Swick, and M. Toghyani. 2020. Copper hydroxychloride is more efficacious than copper sulfate in improving broiler chicken's growth performance, both at nutritional and growth promoting levels. *J. Poult. Sci*. 99(12):6964-6973.
- Nguyen, H. T. T., S. K. Kheravii, S. B. Wu, J. R. Roberts, R. A. Swick, and M. Toghyani. 2022. Sources and levels of copper affect liver copper profile, intestinal morphology and cecal microbiota population of broiler chickens fed wheat-soybean meal diets. *Scientific Reports*. 12:2249.
- Ognik, K., A. Stepniowska, E. Cholewinska, and K. Kozlowski. 2016. The effect of administration of copper nanoparticles to chickens in drinking water on estimated intestinal absorption of iron, zinc, and calcium. *J. Poult. Sci*. 95:2045-2051.
- Ojo, O. A., dan O. Olusanya. 2020. Biological control of aflatoxin on egg production performance of laying hens. *Asian J. Agric. Res*. 13-23.
- Olgun, O., A. Yildiz, and E. T. Senturk. 2020. The effect of supplementation of organic copper to commercial quail diets on performance, egg quality and haematological parameters. *Turkis J. Agri. Food. Sci. Tech*. 8:1517-1521.
- Olgun, O., E. T. Gul, G. Kilinc, F. Gokmen, A. Yildiz, V. Uygur, and A. S. Gracia. 2024. Comparative effects of including inorganic, organic, and hydroxy zinc sources on growth development, egg quality, mineral excretion, and bone health of laying quails. *Biol. Trace Elem. Res*. 202:5680-5689.
- Olukosi, O. A., S. J. A. V. Kujik, and Y. Han. 2019. Sulfate and hydroxychloride trace minerals in poultry diets– comparative effects on egg production and quality in laying hens, and growth performance and oxidative stress response in broilers. *J. Poult. Sci*. 98:4961-4971.
- Ozturk, E., F. Karadas, M. Salman, B. Genc, A. Darmawan, M. R. Karagecili, M. Waqas, N. M. Nastoh, E, Oguzhan, and S. Ozlu. 2024. *Vitamin and Minerals in Poultry*. Iksad publishing house. Turkiye.
- Palanisamy, V. P. S., L. Pineda, and Y. Han. 2023. Effect of supplementing hydroxy trace minerals (Cu, Zn, and Mn) on egg quality and

- performance of laying hens under tropical conditions. *Anim. Biosci.* 36(11):1709-1717.
- Park, J. A. and S. H. Sohn. 2018. The influence of hen aging on eggshell ultrastructure and shell mineral components. *Korean J. Fd. Sci. Anim. Resour.* 38(5):1080-1091.
- Pineda, L., E. Sawosz, K.P. Vadalasetty, and A. Chwalibog. 2013. Effect of copper nanoparticles on metabolic rate and development of chicken embryos. *J. Anim. Feed. Sci. Tech.* 186:125-129.
- Quan, C., Q. Xi, X. Shi, R. Han, Q. Du, F. Forghani, C. Xue, J. Zhang, and J. Wang. 2021. Development of predictive models for egg freshness and shelf-life under different storage temperatures. *Food Quality and Safety.* 5:1-7.
- Ramos, D., D. Mar, M. Ishida, R. Vargas, M. Gaité, A. Montgomery, and M. C. Linder. 2016. Mechanism of copper uptake from blood plasma ceruloplasmin by mammalian cells. *PLOS One.* 11(3):1-23.
- Rezaei, M., S. Zakizadeh, and N. Eila. 2019. Effects of pigments extracted from the marigold flower on egg quality and oxidative stability of the egg yolk lipids in laying hens. *Iran. J. Appl. Anim. Sci.* 9:541-547.
- Romah, J., N. A. Miranda, M. L. Marlina, and U. U. Fiya. 2021. Kandungan logam berat pada rambut petugas stasiun pengisian bahan bakar umum (SPBU) di Sidoarjo pada tahun 2021. *J. Med. Laboratory Sci.* 4(2):112-120.
- Rostagno, H. S., L. F. T. Albino, M. I. Hannas, J. L. Donzele, N. K. Sakomura, F. G. Perrazo, A. Saraiva, M. L. Texeira, P. B. Rodrigues, R. F. de Oliveira, S. L. D. T. Barreto, and C. O. Brito. 2017. Tabelas brasileiras para aves e suínos: composicao de alimentos e exigencias nutricionais. 4th ed. Universidade Federal de Vicosa, Brazil. P. 488.
- Ruiz, L. M., A. Libendinsky, and A. Elorza. 2021. Role of copper on mitochondrial function and metabolism. *Front. in Mol. Bio.* 8: 1-17.
- Saleh, A. A., M. A. Eltantawy, E. M. Gawish, H. Y. Younis, K. A. Amber, A. E. E. A. El-Moneim, and T. A. Ebeid. 2020. Impact of dietary organic mineral supplementation on reproductive performance, egg quality characteristics, lipid oxidation, ovarian follicular development, and immune response in laying hens under high ambient temperature. *Biol. Trace Elem. Res.* 514:195-506.
- Sarlak, S., S. A. Tabeidin, M. Toghyani, A. D. F. Shahraki, M. Goli, and M. Habibian. 2021. Effects of replacing inorganic with organic iron on performance, egg quality, serum and egg yolk lipids, antioxidant status, and iron accumulation in eggs of laying hens. *Biol. Trace Elem. Res.* 199:1986-1999.

- Sawosz, E., M. Lukasiewicz, A. Lozicki, M. Sosnowska, S. Jaworski, J. Niemiec, A. Scott, J. Jankowski, D. Józefiak, and A. Chwalibog. 2018. Effect of copper nanoparticles on the mineral content of tissues and droppings, and growth of chickens. *Archives of Animal Nutrition*.1-11.
- Scott, A., K. P. Vadalasetty, A. Chwalibog, and E. Sawosz. 2018. Copper nanoparticles as an alternative feed additive in poultry diet: a review. *Nanotechnol Rev*. 7(1):69-93.
- Sirri, F., M. Zampiga, A. Berardinelli, dan A. Meluzzi. 2018. Variability and interaction of some egg physical and eggshell quality attributes during the entire laying hen cycle. *J. Poult. Sci*. 97:1818-1823.
- Skrivan, M., V. Skrivanova, and M. Marounek. 2006. Effect of various copper supplements to feed of laying hens on Cu content in eggs, liver, excreta, soil, and herbage. *Archives of Animal Nutrition*. 65:366-375.
- Soomro, H., S. Khan, Z. Ahmed, and T. Aziz. 2024. Role of essential and non essential trace elements in human health and disease. *Acta Scientific Microbiology*. 7(8):30-35.
- Spears, J. W., E. B. Kegley, and L. A. Mullis. 2004. Bioavailability of copper from tribasic copper chloride and copper sulfate in growing cattle. *Anim. Feed Sci. Tech*. 116:1-13.
- Suttle. N. F. 2010. *Mineral Nutrition of Livestock*. 4th ed. CABI. Cambridge.
- Swain, P. S., S. Prusty, S. B. N. Rao, D. Rajendran, and A. K. Patra. 2021. *Advances in Poultry Nutrition Research*. IntechOpen. London.
- Tao, D., Y. Wang, J. Liu, R. Chen, M. Qi, and S. Xu. 2021. Mechanism of CuSO₄ cytotoxicity in goat erythrocytes after high-level in vitro exposure to isotonic media. *ELSEVIER*. (208):1-9.
- Toplan, S., N. Dariyerli, D. Ozcelik, and M. C. Akyolcu. 2005. The effects of copper application on oxidative and antioxidant systems in rats. *Trace Elem. Elect*. 22: 178-181.
- Tores, C. and D. Korver. 2018. Influences of trace mineral nutrition and maternal flock age on broiler embryo bone development. *J. Poult. Sci*. 97:2996-3003.
- Tougan, U. P., E. Y. Ladekan, A. M. Alassani, M. P. Adanlin, G. B. Koutinhoun, and M. M. Soumanou. 2019. : Influence of follar organic fertilizer dl grow on the physicochemical and nutritional characteristics of Lohman Brown eggs reared in Sokode. *International Journal of Progressive Sciences and Technologies*. 17(1).
- Uauy R., M. Olivares, and M. Gonzalez. 1998. Essentiality of copper in humans American. *Journal of Clinical Nutrition*. 67(5):952-959.

- Ulbad, T. P. and T. Andre. 2024. Factors affecting egg quality and functional properties. *J. Adv. Res.* 12(8):1235-1250.
- Vlckova, J., E. Tumova, K. Mikova, M. Englameirova, M. Okrouhla, and D. Chodova. 2019. Changes in the quality of egg during storage depending on the housing system and the age hens. *J. Poult. Sci.* 98(11):6187-6193.
- Wang, L., X. Hua, J. Shi, N. Jing, T. Ji, B. Lv, L. Liu, dan Y. Chen. 2022. Ochratoxin A: Occurrence and recent advances in detoxification. *Toxicon.* 210:11–18.
- Wu, D. W., L. C. Wang, C. Wen, D. M. Hooge, C. Liang, and Dr. Y. M. Zhou. 2013. . Effects of replacing a dietary antibacterial agent (zinc bacitracin) with copper salts in Cherry Valley Pekin meat ducks. *British. Poult. Sci.* 54:112-119.
- Yang, F., R. Pei, Z. Zhang, J. Liou, and N. Qiou. 2019. Copper induces oxidative stress and apoptosis through mitochondria-mediated pathway in chicken hepatocytes. *Toxicol. Vitro.* 54:310-316.
- Yelminaz, F. and A. Aatay. 2023. Changes in egg production, egg quality, blood and egg cholesterol levels with age in layer hen. *European J. Vet. Med.* 3(2): 6-11.
- Yenice, E., C. Mizrak, M. Gultekin, Z. Atik, and M. Tunica. 2015. Effects of dietary organic or inorganic manganese, zinc, copper and chrome supplementation on the performance, egg quality and hatching characteristics of laying breeder hens. *Ankara Univ. Vet. Fak. Derg.* 62:63-68.
- Zapata, N. K. R. 2016. Effect of increasing levels of dietary zinc (Zn), manganese (Mn), and copper (Cu) from organic and inorganic sources on egg quality and egg Zn, Mn, and Cu content in laying hens. Thesis. Graduate Program. The School of Animal Science, Louisiana State University and Agricultural and Mechanical College, Baton Rouge.
- Zhai, H., L. Gong, and Y. Ma. 2006. A comparison of copper methionine, tribasic copper chloride and copper sulfate as copper sources for swine. *J. Anim. Vet.* 5(8):623-628.
- Zhang, X., K. Y. Zhang, X. M. Ding, and S. P. Bai. Effect of dietary supplementation with copper sulfate or tribasic copper chloride on carcass characteristics, tissue nutrients deposition and oxidation in broilers. *Pakistan J. Nutr.* 8(8):1114-1119.
- Zhao, C. Y., S. X. Tan, X. Y. Xiao, S. X. Qiu, J. Q. Pan, and Z.X. Tang. 2014. Effects of dietary zinc oxide nanoparticles on growth performance and antioxidative status in broilers. *Biol. Trace Elem. Res.* 160:361-367.

Zheng, P., B. Pu, B. Yu, J. He, J. Yu, X. Mau, Y. Luo, J. Luo, Z. Huang, C. Luo, S. Wang, and D, Chen. The differences between copper sulfate and tribasic copper chloride on growth performance, redox status, deposition in tissues of pigs, and excretion in feces. *J. Anim. Sci.* 31(6):873-880.