

CONTENTS

Review Articles

- Laying hens in the U.S. market: An appraisal of trends from the beginning of the 20th century to present**
M. T. Kidd and K. E. Anderson 771
- Limb Health in Broiler Breeding: History Using Genetics to Improve Welfare**
P. B. Siegel, Kate Barger, and Frank Siewerdt 785
- Intelligent Packaging for Poultry Industry**
E. U. Chowdhury and A. Morey 791

Research Reports

- In-package Antimicrobial Treatment of Chicken Breast Meat with High Voltage Dielectric Barrier Discharge—Electric Voltage Effect**
H. Zhuang, M. J. Rothrock, Jr., K. L. Hiatt, K. C. Lawrence, G. R. Gamble, B. C. Bowker, and K. M. Keener 801
- Raw faba bean (*Vicia faba*) as an alternative protein source in laying hen diets**
Mahmoud Alagawany, Mohamed E. Abd El-Hack, Elwy A. Ashour, Ayman S. Salah, El-Sayed O. S. Hussein, Abdullah Al Alowaimier, Ayman A. Swelum, and Kuldeep Dhama 808
- Evaluation of the efficacy of a candidate turkey cellulitis/dermatitis oil emulsion vaccine on immune response and mortality under laboratory and commercial conditions**
B. D. Graham, K. M. Robbins, K. D. Teague, L. E. Graham, R. Merino-Guzman, G. Tellez, and B. M. Hargis 818
- Viscosity and growth response of broilers fed high fiber diets supplemented with a corn-produced recombinant carbohydrase**
V. E. Ayres, J. N. Broomhead, X. Li, R. M. Raab, and J. S. Moritz 826
- Measuring Peripheral and Some Mucosal Immune Cells to Better Understand Immunomodulation by T-2 Toxin in Broilers**
Astrid Koppenol, Breno Castello Branco Beirão, Max Ingberman, and Luiz Felipe Caron 837
- An assessment of the aggregation and probiotic characteristics of *Lactobacillus* species isolated from native (desi) chicken gut**
Ghazal Aziz, Hafiz Fakhar, Sajjad ur Rahman, Muhammad Tariq, and Arsalan Zaidi 846
- Feed Restriction Can Alter Gait but Does not Reduce Welfare in Meat Ducks**
L. Van Blois, A. Bentley, L. Porter, N. Prihoda, H. Potter, B. Van Wyk, D. Shafer, S. M. Fraley, and G. S. Fraley 858
- Reduction of dietary protein in broiler diets not only reduces n-emissions but is also accompanied by several further benefits**
Andreas Lemme, Peter Hiller, Mathias Klahsen, Venja Taube, Josef Stegemann, and Ingrid Simon 867

- Supplementation with green tea extract affects lipid metabolism and egg yolk lipid composition in laying hens**
 Jinbao Huang, Qing Hao, Qiushi Wang, Yijun Wang, Xiaochun Wan,
 and Yibin Zhou 881
- Response of Broiler Chickens to Dietary Supplementation of Enzymatically Hydrolyzed Glucan or Mannan Yeast Products**
 E. U. Ahiwe, A. A. Omede, M. E. Abdallah, E. P. Chang'a, M. Al-Qahtani,
 H. Gausi, H. Graham, and P. A. Iji 892
- Efficacy of *Bacillus subtilis* administered as a direct-fed microorganism in comparison to an antibiotic growth promoter and in diets with low and high DDGS inclusion levels in broiler chickens**
 C. A. Flores, T. Duong, N. Augspurger, and J. T. Lee 902
- Evaluating the Effect of replacing fish meal in broiler diets with either Soybean meal or poultry by-product Meal on Broiler Performance and total feed cost per kilogram of gain**
 Nana S. Frempong, Thomas N. N. Nortey, Chad Paulk, and Charles R. Stark 912
- Effect of Acidifier Product Supplementation in Laying Hens Challenged With *Salmonella***
 Ashley D. Markazi, Amanda Luoma, Revathi Shanmugasundaram,
 Raj Murugesan, Michaela Mohnl, and Ramesh Selvaraj 919
- Productivity and Well-Being of Broiler Chickens Supplemented With Probiotic**
 Ibiara Correia de Lima Almeida Paz, Ianê Correia de Lima Almeida,
 Leonardo Thielo de La Vega, Elisane Lenita Milbradt, Mariana Rodrigues Borges,
 Gustavo Henrique Coelho Chaves, Caio César dos Ouros,
 Marconi Italo Lourenço da Silva, Fabiana Ribeiro Caldara,
 and Raphael Lucio Andreatti Filho 930
- Evaluating the Response of Cobb MV × Cobb 500 Broilers to Varying Amino Acid Density Regimens for a Small Bird Program**
 R. A. Hirai, L. Mejia, C. Coto, J. Caldas, C. D. McDaniel, and K. G. S. Wamsley 943
- Effect of Conditioning Temperature on Pellet Quality, Diet Digestibility, and Broiler Performance**
 M. V. Teixeira Netto, A. Massuquetto, E. L. Krabbe, D. Surek, S. G. Oliveira,
 and A. Maiorka 963
- Dietary Metabolizable Energy Responses in Yellow-Feathered Broiler Chickens from 29 to 56 d**
 HebatAllah Kasem El-Senousey, Weiwei Wang, Yibing Wang, Qiuli Fan,
 Ahmed Mohamed Fouad, Xiajing Lin, Zhongyong Gou, Long Li,
 and Shouqun Jiang 974
- The Effects of Miscanthus Grass as a Bedding Source and the Dietary Inclusion of Unheated, Low-Trypsin Inhibitor Soybeans on the Performance of Commercial Tom Turkeys Reared to Market Age**
 C. E. Evans, J. D. Garlich, I. B. Barasch, C. R. Stark, A. C. Fahrenholz,
 and J. L. Grimes 982
- Effects of Linseed Expansion on its Dietary Molecular Structures, and on Broiler Chicks Digestive Enzymes Activity, Serum Metabolites, and Ileal Morphology**
 Amir Pirmohammadi, Saeed Khalaji, and Mojtaba Yari 997

- DL – methionine can be replaced partially by phyto-additive without affecting growth performance, fat metabolism, and serum biochemistry in broilers**
F. L. S. Castro and W. K. Kim 1013
- Selenium Yeast Supplementation for Broilers at Different Ages**
Vanessa A. Silva, Antônio G. Bertechini, Bernardo R. F. Nogueira,
Heloísa V. Ribeiro, Raquel Mencialha, and Eduardo M. Ramos 1021
- Effects of Dietary Sclerocarya Birrea Caffra (Marula) Nut Meal on the Growth Performance and Viscera Macromorphometry of Broiler Japanese Quail**
Bulelani E. Mazizi, Davison Moyo, Kennedy H. Erlwanger, and Eliton Chivandi 1028
- Evaluation of Increasing Manganese Hydroxychloride Level on Male Broiler Growth Performance and Tibia Strength**
A. Jasek, C. D. Coufal, T. M. Parr, and J. T. Lee 1039
- Effect of β -Mannanase Supplementation in Conventional Diets on the Performance, Immune Competence and Intestinal Quality of Broilers Challenged With *Eimeria* sp.**
L. B. Scapini, A. B. de Cristo, J. M. Schmidt, R. Buzim, L. K. Nogueira,
S. C. Palma, and J. I. M. Fernandes 1048
- The Intestinal Cinnamaldehyde Release and Antioxidative Capacity of Broiler Chickens Fed Diets Supplemented with Coated *Oleum Cinnamomi***
Qiang Cheng, Yi Xia, Dan Yi, Yongqing Hou, Rui Duan, Shuangshuang Guo,
and Binying Ding 1058
- Docosaehaenoic Acid Included in Layer Feed as an Unextracted *Aurantiochytrium limacinum* Biomass Is Efficiently Transferred to Eggs When Provided in Mash or Pellet Form**
J. D. Keegan, D. Currie, A. Knox, and C. A. Moran 1069
- Use of Whey Protein Concentrates in Broiler Diets**
Elwy A. Ashour, Mohamed E. Abd El-Hack, Mahmoud Alagawany,
Ayman A. Swelum, Ali O. Osman, Islam M. Saadeldin,
Mahmoud Abdel-Hamid, and El-Sayed O. S. Hussein 1078
- Evaluation of Biochar as a Litter Amendment for Commercial Broiler Production**
John E. Linhoss, Joseph L. Purswell, Jason T. Street, and Matthew R. Rowland 1089
- Positive Effects of Resveratrol on Egg-Laying Ability, Egg Quality, and Antioxidant Activity in Hens**
Caiyun Zhang, Xiangtao Kang, Tianyong Zhang, and Jin Huang 1099
- Semen Characteristics and Hematology of Nigerian Local Cocks Fed Varying Dietary Levels of Ethiopian Pepper Fruit Meal**
I. E. Uzochukwu, B. C. Amaefule, C. N. Aba, N. W. Nnajiolor, N. S. Machebe,
and H. N. Foleng 1106
- Effect of Dry and Wet Feed on Growth Performance, Carcass Traits, and Apparent Nutrient Digestibility in Geese**
Z. L. Liu, X. F. Huang, Y. Luo, J. J. Xue, Q. G. Wang, Y. M. Wang, and C. Wang 1115

- Effect of Lemongrass (*Cymbopogon citratus*) Essential Oil on the Survival of Multidrug-Resistant *Salmonella enterica* serovar Heidelberg in Contaminated Poultry Drinking Water**
C. Peichel, D. V. T. Nair, G. Dewi, A. M. Donoghue, K. M. Reed,
and A. Kollanoor Johny 1121
- Bigheaded Carp-Based Meal as a Sustainable and Natural Source of Methionine in Feed for Ecological and Organic Poultry Production**
I. Upadhyaya, K. Arsi, A. Fanatico, B. R. Wagle, S. Shrestha, A. Upadhyay,
C. N. Coon, M. Schlumbohm, J. Trushenski, C. Owens-Hanning, M. N. Riaz,
M. B. Farnell, D. J. Donoghue, and A. M. Donoghue 1131
- Effectiveness of Several Antimicrobials and the Effect of Contact Time in Reducing *Salmonella* and *Campylobacter* on Poultry Drumsticks**
Lei Zhang, Amit Morey, Sacit F. Bilgili, Shelly R. McKee, and Laura J. Garner 1143
- Xylanase, Glucanase, and Phytase in the Diet of Light Laying Hens**
Matheus R. de Lima, Fernando G. Perazzo Costa, Danilo V. G. Vieira,
Anilma S. Cardoso, Guilherme S. Lima, Danilo T. Cavalcante,
Sarah G. Pinheiro, Marcio L. Ceccantini, Baris B. Yavuz,
Roseane M. Bezerra, and Isabelle N. Kaneko 1150
- Nutritive Value of Expeller-Pressed Yellow Canola Meal for Broiler Chickens Following Enzyme Supplementation**
Dervan D. L. S. Bryan, Janice L. MacIsaac, Nancy L. McLean,
Bruce M. Rathgeber, and Derek M. Anderson 1156
- Digestible Valine Requirements of Growing-Finishing Ross 308 Broilers**
Karl Schedle, Jörg Bartelt, William Lambert, and Etienne Corrent 1168
- Effects of Direct Fed-Microorganisms and Enzyme Blend Co-Administration on Growth Performance in Broilers Fed Diets With or Without Antibiotics**
C. A. Flores, T. Duong, T. E. Askelson, Y. Dersjant-Li, K. Gibbs, A. Awati,
and J. T. Lee 1181
- Dry Residue of Cassava Associated With Carbohydrases in Diets for Broiler Chickens**
I. M. da Silva, J. Broch, L. Wachholz, C. de Souza, F. S. Dalolio, L. V. Teixeira,
C. Eyng, and R. V. Nunes 1189
- Supplemental Magnesium in Diets for Growing Pullets and Hens: Growth, Skeletal Development, and Egg Production**
M. S. Lilburn, E. E. M. Pierson, C. I. Robison, and D. Karcher 1202
- Effects of Increasing Phytase Inclusion Levels on Broiler Performance, Nutrient Digestibility, and Bone Mineralization in Low-Phosphorus Diets**
H. G. Walters, M. Coelho, C. D. Coufal, and J. T. Lee 1210
- The Effect of Standard Pelleting and More Thermally Aggressive Pelleting Utilizing a Hygieniser on Feed Manufacture and Reduction of *Enterococcus faecium*, a *Salmonella* Surrogate**
T. P. Boltz, J. W. Boney, C. Shen, J. Jaczynski, and J. S. Moritz 1226

- Effect of Different Dietary Electrolyte Balance Values at High Temperature Peaks on Performance and Egg Quality of Japanese Quail (*Coturnix coturnix japonica*)**
 Marcelo Tadeu Thomaz de Moraes, Chayane da Rocha, Tatiane Brandão Moreno, Diego Surek, Sebastião Aparecido Borges, and Alex Maiorka 1234
- Determination of the Toxic Level of Dietary Mercury and Prediction of Mercury Intake and Tissue Mercury Concentrations in Broiler Chickens Using Feather Mercury Concentrations**
 J. H. Kim, H. K. Lee, G. H. Park, H. S. Choi, S. Y. Ji, and D. Y. Kil 1240
- Glutamine Improves the Growth Performance, Serum Biochemical Profile and Antioxidant Status in Broilers Under Medium-Term Chronic Heat Stress**
 Xi Bai, Sifa Dai, Jiaqi Li, Shuangshuang Xiao, Aiyou Wen, and Hong Hu 1248
- Impact of Enrichment Media on H₂S-Negative *Salmonella* Isolated From Xylose-Lysine-Tergitol 4 Agar**
 Kurt E. Richardson, Nelson A. Cox, Douglas E. Cosby, Mark E. Berrang, Nicole L. Holcombe, and Cheryl E. Weller 1255
- Spectrum Lighting During Pullet Rearing and Its Impact on Subsequent Production Performance in Layers**
 K. Takeshima, C. Hanlon, B. Sparling, D. R. Korver, and G. Y. Bédécarrats 1262
- Effects of Glutamine Supplementation on Broiler Performance and Intestinal Immune Parameters During an Experimental Coccidiosis Infection**
 Jarred H. Oxford and Ramesh K. Selvaraj 1279
- Letrozole Administration as a New Way of Regulating Reproductive Activity in Female Quail**
 Nesar Zandi, Amjad Farzinpour, and Asaad Vaziry 1288
- Effect of Stocking Density on Growth Performance, Feather Quality, Carcass Traits, and Muscle Chemical Component of Geese from 49 to 70 Days of Age**
 C. Wang, Z. L. Liu, J. J. Xue, Y. M. Wang, X. F. Huang, and Q. G. Wang 1297
- Effect of Feeding Zero- or High-Tannin Faba Bean Cultivars and Dehulling on Growth Performance, Carcass Traits and Yield of Saleable Cuts of Broiler Chickens**
 M. Cho, M. N. Smit, L. He, F. C. Kopmels, and E. Beltranena 1305
- Infectious Laryngotracheitis Virus in Commercial and Backyard Chicken Production Systems in Central and South Ethiopia (First report) ILT in Ethiopian Poultry Production**
 Asamenew Tesfaye, Mesfin Sahle, Teshal Sori, Tadewos Kassa, Abebe Garoma, Tafese Koran, Chala Dima, Chala Guyassa, Hailemariam Hilu, Sintayehu Guta, and Fanose Tadesse 1324

Field Reports

- Serological Survey of Avian *Metapneumovirus* Infection in Chickens in Bangladesh**
 Md Zulfekar Ali, Jung-Eun Park, and Hyun-Jin Shin 1330

- Molecular Detection and Characterization of *Salmonella Gallinarum* From Poultry Farms in Brazil**
 N. S. Zanetti, S. De Carli, M. N. Souza, F. K. M. Lehmann, D. Kipper,
 K. K. R. Dias, A. S. K. Fonseca, V. R. Lunge, and N. Ikuta 1335
- Free-Range Rearing Density for Male and Female Milanino Chickens: Growth Performance and Stress Markers**
 Fabio Mosca, Luisa Zaniboni, Nicolaia Iaffaldano, Ahmad Abdel Sayed,
 Maria G. Mangiagalli, Grazia Pastorelli, and Silvia Cerolini 1342
- Free-range rearing density for male and female Milanino chickens: carcass yield and qualitative meat traits**
 Silvia Cerolini, Mauro Vasconi, Ahmad Abdel Sayed, Nicolaia Iaffaldano,
 Maria G. Mangiagalli, Grazia Pastorelli, Vittorio M. Moretti, Luisa Zaniboni,
 and Fabio Mosca 1349
- Characterization of an Air-to-Air Heat Exchanger for Manure Belt Drying Ventilation in an Aviary Laying Hen House**
 Y. S. M. Goselink and B. C. Ramirez 1359
- An Optimized Protocol for Molecular Screening of Avian Pathogenic *Escherichia Coli* From Broiler Chickens in South East Queensland, Australia**
 L. Awawdeh, C. Turni, J. Henning, R. E. Allavena, R. N. Cobbold, J. L. Mollinger,
 and J. S. Gibson 1370
- Factors Impacting Guinea Fowl (*Numida meleagris*) Production in Ivory Coast**
 G. F. Kouassi, G. A. Koné, M. Good, and M. Kouba 1382
- Longitudinal Response of Commercial Broiler Operations to Bio-shuttle Administration**
 E. A. Kimminau and T. Duong 1389
- Organic Acids and Nature Identical Compounds Can Increase the Activity of Conventional Antibiotics Against *Clostridium Perfringens* and *Enterococcus Cecorum In Vitro***
 G. Giovagnoni, B. Tugnoli, A. Piva, and E. Grilli 1398
- Corrigendum**
- Corrigendum to "Prevalence and characterization of plasmid mediated quinolone resistance genes and class 1 integrons among multidrug-resistant *Escherichia coli* isolates from chicken meat"**
 Kwang Won Seo and Young Ju Lee 1408