

ABSTRACT BOOK

POULTRY SCIENCE CONFERENCE 2026

(PSC@IPEX-2026)

8–10 October 2026

EXPO CENTRE, LAHORE, PAKISTAN



THEME

*"Shaping the Future of Poultry:
Innovation, Resilience, and Food Security"*



University of Veterinary and Animal Sciences, Lahore, Pakistan

in collaboration with the Pakistan Poultry Association (PPA)

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INTERNATIONAL POULTRY EXPO
8–10 OCTOBER 2026

CONFERENCE THEME

*"Shaping the Future of Poultry:
Innovation, Resilience, and Food Security"*

ORGANIZER

UNIVERSITY OF VETERINARY AND
ANIMAL SCIENCES, LAHORE

COLLABORATOR

PAKISTAN POULTRY ASSOCIATION



MESSAGE OF THE VICE CHANCELLOR UNIVERSITY OF VETERINARY AND ANIMAL SCIENCES, LAHORE.

It is a distinct privilege to extend my heartfelt welcome and warmest congratulations to all global participants, researchers, industry pioneers and policymakers gathered in Lahore for the Poultry Science Conference 2026. This landmark forum serves as a critical nexus for celebrating the innovation, resilience, and steady progress of one of Pakistan's most dynamic, agro-based economic engines.

Since its commercial inception in 1962, Pakistan's poultry sector has transformed into a foundational pillar of our national livestock infrastructure. Supported by nationwide capital investments surpassing almost one trillion rupees, the sector generates an extraordinary annual output of over 2826 metric tons of chicken meat and 28.2 billion table eggs, while sustaining livelihoods for more than 1.5 million individuals and 43.3 percent of total animal protein. Beyond its substantial economic footprint, this industry remains indispensable for stabilizing animal protein prices, reinforcing agricultural sustainability, and driving national food security.

However, as we look to shape the future of poultry, the global and domestic landscapes present multifaceted challenges. From emerging and reemerging disease outbreaks and acute feed price volatility to logistical inefficiencies and shifting market dynamics, the need for cutting-edge innovation, translational collaboration, and rigorous scientific exchange has never been more urgent.

Crucially, our collective mandate extends far beyond optimizing production metrics. Pakistan's per capita poultry consumption continues to hover below international benchmarks. With our average daily animal protein intake sitting at just 17 grams, significantly trailing the World Health Organization's (WHO) recommended guideline of 27 grams, we bear a profound societal obligation. We must champion public education, consumer accessibility, and bio-nutritional advancements to bridge this critical nutritional divide and elevate public health indices across the country.



**Professor Emeritus Dr Masood Rabbani
(Izaz-i-Fazeelat)**

Patron-In-Chief,
Poultry Science Conference
(PSC@IPEX2026)
Vice Chancellor, UVAS, Lahore

MESSAGE OF THE CONVENER

POULTRY SCIENCE CONFERENCE, 2026.

On behalf of the Pakistan Poultry Association, it is my distinct honor to warmly welcome all our distinguished guests, brilliant researchers, keynote speakers, oral presenters, dedicated farmers, aspiring students, and every participant to the Poultry Science Conference 2026. Held in conjunction with the premier International Poultry Expo 2026, this year's conference is centered around a vital and timely theme: "Shaping the Future of Poultry: Innovation, Resilience, and Food Security."



Pakistan's poultry sector stands as a powerhouse of economic activity, demonstrating tremendous potential and driving vital food systems. However, navigating today's global landscape requires us to look ahead. This conference serves as our critical platform for bridging the gap between cutting-edge academia and active industry, championing the essential indigenous research needed to build a more secure future. To thrive, our industry must evolve faster than ever. We are focusing heavily on integrating innovation and new technologies to enhance productivity, while simultaneously building the resilience required to withstand economic and environmental challenges. Ultimately, our collective efforts are geared toward safeguarding regional and global food security, ensuring safe, affordable, and sustainable protein for all.

This conference is designed to serve as a beacon, creating awareness among our young researchers and students about these crucial advancements. It offers an invaluable opportunity for the next generation to directly interact with industry leaders, policymakers, and experts showcasing their breakthrough solutions at the exhibition stalls. Bringing all stakeholders of the poultry ecosystem together under one roof significantly benefits every partner. With a rapidly changing marketplace and an increasingly supportive policy environment, our moment to accelerate smart, resilient growth is now. By strengthening this relationship between science and commerce, we solidify our shared vision for the industry's collective prosperity.

To deliver maximum impact, the Poultry Science Conference hosts various commodity sectors alongside a unique trade show, forward-thinking educational sessions, and an industry gala. We anticipate unprecedented exposure and significant attendance growth for everyone involved. On behalf of the entire Conference team, with special acknowledgment to the Vice Chancellor of UVAS, the Chief Organizer of IPEX 2026, and our diligent organizing committee members, I extend my sincerest gratitude. Thank you to our generous sponsors, committed exhibitors, insightful speakers, and, most of all, the delegates who are here to learn, share, and actively contribute to shaping the sustainable future of the poultry industry.

Dr. Hanif Nazir Chaudhry

Convener,
Poultry Science Conference
(PSC@IPEX2026)

COMPILED AND EDITED BY

1. Prof. Dr. Muhammad Yasin Tipu

Professor, Department of Pathology, UVAS, Lahore

Convener, Abstract Book Committee, Poultry Science Conference, 2026

2. Prof. Dr. Ali Ahmad Sheikh

Professor, Institute of Microbiology, UVAS, Lahore

Member, Abstract Book Committee, Poultry Science Conference, 2026

3. Prof. Dr. Muhammad Zubair Shabbir

Professor, Institute of Microbiology, UVAS, Lahore

Member, Abstract Book Committee, Poultry Science Conference, 2026

4. Prof. Dr. Muhammad Kashif Saleemi

Chairman/Professor, Department of Pathology, University of Agriculture, Faisalabad

**Invited Reviewer and Member, Abstract Book Committee,
Poultry Science Conference, 2026**

5. Dr. Sohail Raza

Assistant Professor, Institute of Microbiology, UVAS, Lahore

Member, Abstract Book Committee, Poultry Science Conference, 2026

6. Dr. Syed Muhammad Faheem Ahmad

Lecturer, Department of Small Animal Clinic and Surgery, UVAS, Lahore

Secretary, Abstract Book Committee, Poultry Science Conference, 2026

7. Mr. Muhammad Mubashar Beig

Visiting Faculty, Institute of Microbiology, UVAS, Lahore

Member, Abstract Book Committee, Poultry Science Conference, 2026

SCIENTIFIC PROGRAM

POULTRY SCIENCE CONFERENCE – PSC@IPEX2026

Main Auditorium, Expo Center, Lahore

Technical Session: 8th October, 2026 (Thursday)

Timings: 10:30 am – 04:00 pm

Inaugural Session

Time	Activity	By
10:30 am	Arrival of Chief Guest	
10:35 am	Recitation	
10:40 am	Welcome Note and Introduction of Poultry Industry	Dr. Rana Sajjad Arshad, Chief Organizer, IPEX-2026
10:50 am	Importance of Poultry Science Conference	Dr. Hanif Nazir Ch.
10:55 am	Views / Remarks of Chief Guest	

Formal Session

Time	Activity	By
11:00 am	Formal Opening of the Poultry Science Conference	Dr. Rana Sajjad Arshad, Chief Organizer, IPEX-2026

Technical Session – 1

Chairman:

Professor Emeritus Dr. Masood Rabbani (Izaz-i-Fazeelat),

Vice Chancellor, University of Veterinary & Animal Sciences, Lahore.

Co-Chairman:

Prof. Dr. Faqir Muhammad,

Dean, Faculty of Veterinary Sciences, Bahauddin Zakariya University, Multan.

Prof. Dr. Arfan Yousaf,

Dean, Faculty of Veterinary and Animal Sciences, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi.

Moderator:

Dr. Farhan Afzal,

Director, Poultry Research Institute, Rawalpindi.

Time	Topic	Presenter
11:05 am – 11:20 am	Keynote Speaker: “Poultry for a Healthier Pakistan: Connecting Food, Nutrition, Innovation and Value Addition in Eggs and Meat”	Prof. Dr. Imran Pasha
11:20 am – 11:30 am	Correlated Color Temperature of LED Lighting Modulates HPT Axis-Related Gene Expression, Endocrine Signaling, Feed Efficiency, Metabolic Regulation, and Carcass Development in Broilers	Khurshid Ahmed Khan

Time	Topic	Presenter
11:30 am – 11:40 am	Incubation Photoperiod Duration Has Limited Impact on Post-Hatch Performance and Stress in Broiler Chickens	Sohail Ahmad
11:40 am – 11:50 am	Development of Mobile Application for Record Keeping in Broiler Production System	Hassan Ibrahim
11:50 am – 12:00 pm	Infectious Bursal Disease and Chicken Infectious Anemia Co-Infection in Commercial Broilers	Hadia Ali
12:00 pm – 12:10 pm	Sequential Receptor Engagement Dictates the Broad Host Range and Fitness Trade-Offs of <i>Salmonella</i> Phage PSA5-1	Muhammad Saleem Khan
12:10 pm – 12:20 pm	Efficacy of Green-Synthesized Silver Nanoparticles from <i>Fusarium oxysporum</i> against Poultry Ectoparasites	Nyla Imran
12:20 pm – 12:30 pm	Comparative Evaluation of Bacteriophage Therapy against <i>Salmonella</i> Gallinarum Infection in Broiler Chickens	Asad Aslam Khan
12:30 pm – 12:40 pm	Tapeworm Infection: A Silent but Real Challenge in Broiler Industry	Muhammad Amad Rashid
12:40 pm – 01:00 pm	Q/A Session	
01:00 pm – 02:00 pm	LUNCH AND PRAYER BREAK	

Technical Session – 2

Chairman:

Prof. Dr. Zulfiqar Ali,

Vice Chancellor, University of Agriculture, Faisalabad.

Co-Chairman:

Prof. Dr. Iram Anjum,

Principal, Kinnaird College for Women, Lahore.

Prof. Dr. Anas Sarwar Qureshi,

Principal, Riphah College of Veterinary Sciences, Lahore.

Moderator:

Dr. Farhan Farooq,

Director, KK Chicks, Pakistan.

Time	Topic	Presenter
02:00 pm – 02:15 pm	Keynote Speaker: “FAdV–CAV Co-Infection: Immunosuppression & Implications for Poultry Health”	Dr. Muhammad Danish Mehmood
02:15 pm – 02:25 pm	Molecular Characterization and Pathology of Novel IBV Isolates from Recent Outbreaks in Commercial Poultry	Bilal Ahmad
02:25 pm – 02:35 pm	Antibiotic Resistance Profile of <i>Escherichia coli</i> Isolated from Various Abiotic Factors of Retail Poultry Meat Shops: A Study of Bahawalpur City, Pakistan	Aymen Tahir
02:35 pm – 02:45 pm	Effect of Different Intensities of Correlated Color Temperature on Production Performance, Immunity and Economics of Broilers	Ahmad Raza

Time	Topic	Presenter
02:45 pm – 02:55 pm	Rate of Multiple Viral and Bacterial Coinfection(s) in Influenza A/H9N2-Infected Broiler Flocks	Faisal Amin
02:55 pm – 03:05 pm	Economic Evaluation of H9N2 Avian Influenza Vaccination Across Commercial Broiler and Layer Production Systems in Pakistan	Hassaan Bin Aslam
03:05 pm – 03:15 pm	Evaluation and In Vivo Efficacy of <i>Lactobacillus plantarum</i> Isolates against <i>Clostridium perfringens</i> -Induced Necrotic Enteritis in Broiler Chickens	Zahra Rafi
03:15 pm – 03:25 pm	Optimization of Protease Production from Indigenous Soil <i>Bacillus</i> Isolates as a Local Alternative to Imported Feed Enzymes for the Poultry Industry	Muhammad Mubashar Beig
03:25 pm – 03:35 pm	Influence of Cold Storage Duration on the Nutritional Quality of Table Eggs	Zafar Khoso
03:35 pm – 03:45 pm	Immunomodulatory & Growth-Promoting Effects of Dietary Supplementation of Multistrain Probiotic in Broiler Chicks & Probiotics as Alternatives to Antibiotics as Growth Promoters in Broiler Chicks	Din Muhammad
03:45 pm – 03:50 pm	Q/A Session	

Distribution of “Winner and Runner-up Research Awards”

Formal Closing Dr. Rana Sajjad Arshad, Chief Organizer, IPEX-2026
END OF FORMAL SESSIONS

Main Organizing Team PSC@IPEX2026

1. Prof. Dr. Kamran Ashraf

Convener, UVAS

2. Dr. Hanif Nazir Ch.

Convener, PPA

3. Prof. Dr. Muhammad Kashif Saleemi

Co-Convener, PPA

Judges PSC@IPEX2026

1. Prof. Dr. Khalid Naeem Khawaja,

Ex-Director, National Reference Lab for Poultry Diseases, Islamabad.

2. Dr. Hamid Irshad,

Program Leader, NRLPD, Animal Sciences Institute, National Agricultural Research Centre, Islamabad.

3. Dr. Nasir Mukhtar,

Associate Professor, PMAS Arid Agriculture University, Rawalpindi.

Floor Coordinator:

Dr. Shahzad Naveed Jadoon

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APPLICATION OF HAZARD ANALYSIS AND CRITICAL CONTROL POINT (HACCP) IN THE COMMERCIAL POULTRY INDUSTRY: FOOD SAFETY AND PUBLIC HEALTH IMPLICATIONS

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Abstract

The commercial poultry industry plays an essential role in global food security, producing more than 140 million tonnes of poultry meat and over 1.6 trillion eggs annually to meet the nutritional demands of a growing population. However, the increasing consumption of poultry products has also intensified concerns regarding foodborne diseases, antimicrobial resistance, and chemical contamination, all of which pose significant threats to public health. The World Health Organization (WHO) estimates that 600 million people—nearly one in every ten individuals worldwide—develop foodborne illnesses each year, leading to approximately 420,000 mortality and the loss of 33 million disability-adjusted life years (DALYs). Poultry products are frequently implicated in outbreaks caused by *Salmonella*, *Campylobacter*, pathogenic *Escherichia coli*, and *Listeria monocytogenes*, emphasizing the need for effective preventive strategies across the production chain. Hazard Analysis and Critical Control Point (HACCP) is a science-based, preventive food safety system comprising 7 principles and 12 implementation steps that identify and controls biological, chemical, and physical hazards from farm to fork. This review highlights the role of HACCP in improving poultry food safety through its integration with Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), Sanitation Standard Operating Procedures (SSOPs), biosecurity, environmental monitoring, and workforce training. Studies have reported 30–70% reductions in microbial contamination and improved compliance following effective HACCP implementation. It also discusses emerging challenges, including antimicrobial resistance, climate change, and increasingly complex global supply chains, while exploring opportunities offered by rapid molecular diagnostics, whole-genome sequencing, biosensors, blockchain, and artificial intelligence. Although implementation remains challenging in many low- and middle-income countries due to resource and infrastructure restrictions, reinforcement HACCP within a One Health framework bargains a sustainable pathway to reducing foodborne diseases, protecting consumer health, improving market access, and ensuring the long-term resilience of the commercial poultry industry.

Key Words: HACCP, Poultry industry, Foodborne diseases, Antimicrobial resistance, Public health

ANTIOXIDANT AND OXIDANT PROFILES IN THIGH AND BREAST MEAT OF PAKISTAN DOMESTIC CHICKEN BREEDS

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Abstract

Chicken meat is being preferred due to its low-fat content, and superior protein value. The increasing awareness of consumers about food health benefits, has served as driving force to identify nutritionally enriched poultry breeds. In this view, the objectives of current study were to identify better domestic backyard chicken breeds through comparative antioxidant and oxidant profiling of most consumed thigh and breast meat. Twenty healthy birds (10 male and 10 female) of each chicken breed i.e., Aseel (As), Misri Gold (MG), Fayoumi (Fa) and Naked Neck (NN) were reared as scavengers till 6 months of age and then slaughtered. A boneless chunk/cube of meat from both breasts (white cut/pectoralis major) and thigh muscles (dark cut/biceps femoris) were used for analysis. The mean live weight (1423.40 ± 26.0 g) bleeding weight (1401.50 ± 22.70 g) and carcass weight (925.20 ± 08.39) was maximum in male MG birds. While in female birds, live weight (1144.10 ± 48.70 g) and bleeding weight (1115.90 ± 49.20 g) was highest in As and defeathered weight in MG (899.60 ± 10.90). Breast (pectoralis major) and thigh (Biceps femoris) meat from male and female birds was compared for biochemical profiles. Male birds breast meat depicted significantly higher superoxide dismutase (SOD) (145.99 ± 4.01), total flavonoids (TF) (150.86 ± 1.28) in MG, catalase (385.00 ± 5.00) peroxidase (POD) (2972.20 ± 41.80) in NN. While ascorbate peroxidase (APX) (2075.00 ± 75.00) and total antioxidant capacity (TAC) (12.93 ± 0.33) and lowest TOS (1170.00 ± 10.00) value was observed in Fa and MDA content (197.55 ± 2.45) in NN. Female birds breast meat, had the highest SOD (121.93 ± 3.07), POD (6723.60 ± 69.60) and APX (967.50 ± 7.50) in MG, CAT (495.00 ± 5.00), TF (129.31 ± 0.94) and TAC (15.70 ± 0.43) in Fa. While least TOS (1230.00 ± 15.00) was in As and minimum MDA (279.53 ± 53) in MG. In male birds thigh meat, SOD was found highest (168.16 ± 1.84) in MG, CAT (505.00 ± 5.00) in Fa, POD (4074.00 ± 78.00) and TF (128.18 ± 1.93) in As, APX (807.50 ± 7.50) in NN. However, lowest TOS (1295.00 ± 5.00) was in Fa and MDA in As (176.71 ± 3.29). Female birds thigh meat, had the highest SOD (167.76 ± 2.24), APX (1507.50 ± 12.50) in Fa, CAT (467.00 ± 7.00) in As, POD (2204.70 ± 59.70), TF (132.81 ± 2.32) in MG, TAC (14.24 ± 0.32) in NN and lowest TOS (1052.50 ± 7.50) and MDA (171.39 ± 2.61) in MG. Chicken breeds MG and Fa can prove to be a potential source of cheap protein and provide substantial health benefits along with cheap income generation for small rural households in developing countries.

Key Words: Antioxidants, Backyard, Chicken, Domestic, Meat Nutrition, Poultry

STRATEGIC ROLE OF POULTRY PRODUCTION SCIENCES IN SHAPING THE FUTURE OF GLOBAL FOOD SECURITY AND STRENGTHEN SUSTAINABILITY

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Abstract

The poultry sector plays a vital role in global food security by providing an affordable and sustainable source of high-quality animal protein. As the world's population continues to grow, the industry faces major challenges, including climate change, emerging diseases, antimicrobial resistance, feed shortages, and supply chain disruptions. This paper examines how innovation and resilience can shape the future of poultry production while strengthening food security. It highlights the importance of precision farming, artificial intelligence, genetic improvement, advanced nutrition, enhanced biosecurity, vaccination strategies, and environmentally sustainable production systems. These innovations improve productivity, animal welfare, disease control, and resource efficiency, enabling poultry systems to adapt to changing environmental and market conditions. The paper also emphasizes collaboration among researchers, policymakers, producers, and industry stakeholders to promote technology adoption, strengthen resilience, and support sustainable development. By integrating scientific advances with effective management practices, the poultry industry can ensure a stable food supply, improve farmer livelihoods, and contribute significantly to global food and nutritional security.

Key Words: Poultry Production, Food Security, Sustainability Innovation

CORRELATED COLOR TEMPERATURE OF LED LIGHTING MODULATES HPT AXIS-RELATED GENE EXPRESSION, ENDOCRINE SIGNALING, FEED EFFICIENCY, METABOLIC REGULATION, AND CARCASS DEVELOPMENT IN BROILERS

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2026-PSC-004

Abstract

Artificial lighting is a major environmental factor influencing broiler productivity; however, conventional commercial LED lighting is primarily optimized for human vision rather than the avian visual and neuroendocrine systems. This study evaluated the effects of conventional commercial LED lighting (T1) and poultry-specific PICA LED lighting (T2) on HPT axis-related gene expression, endocrine signaling, growth performance, feed conversion ratio (FCR), hematological characteristics, carcass traits, and metabolic regulation in Cobb-500 broiler chickens. A total of 80-day-old Cobb-500 broilers were randomly allocated to two lighting treatments with four replicates of ten birds each and reared under continuous illumination for 35 days. Growth performance, FCR, carcass characteristics, hematological parameters, serum biochemical indices, hormone concentrations, and RT-qPCR analysis of genes involved in endocrine regulation, muscle development, immune responses, hematopoiesis, and lipid metabolism were determined. Broilers exposed to T2 (PICA) exhibited significant upregulation of TRH, TSH β , DIO2, TSHR, GH, IGF-1, MyoD, EPO, GATA1, IL-10, PPAR α , LPL, and ACOX1, together with downregulation of DIO3, MSTN, IL-6, SREBP-1, and FAS compared with T1. These molecular changes were associated with enhanced thyroid hormone activation, anabolic signaling, erythropoiesis, immune homeostasis, and fatty acid β -oxidation. Consequently, birds reared under T2 demonstrated improved hormonal status, greater body weight gain, superior feed conversion ratio, enhanced breast and thigh yield, improved hematological indices, and favorable serum biochemical profiles relative to T1. Overall, poultry-specific PICA lighting effectively modulated HPT axis-related endocrine and metabolic pathways, resulting in improved nutrient utilization, physiological function, and production performance. These findings demonstrate that optimizing LED correlated color temperature according to the biological requirements of poultry represents a promising precision-management strategy for improving feed efficiency, carcass yield, metabolic health, and overall broiler productivity.

Key Words: Correlated color temperature, LED lighting, Poultry-specific lighting, PICA, HPT axis, Thyroid hormones, RT-qPCR, Gene expression, Feed conversion ratio

FROM PHOTONS TO PERFORMANCE: DEEP-BRAIN PHOTORECEPTION AND SPECTRAL REGULATION OF THE HYPOTHALAMIC–PITUITARY AXES IN BROILERS AND LAYING HENS

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2026-PSC-005

Abstract

Light spectrum is a critical environmental factor regulating growth, metabolism, immune function, and reproductive physiology in poultry through activation of retinal and deep-brain photoreceptors (DBPs). However, conventional commercial lighting systems are primarily designed for human vision and may not fully stimulate avian photoreceptive pathways involved in endocrine regulation. The present study evaluated the effects of poultry-specific spectral LED lighting on neuroendocrine signaling, hypothalamic–pituitary axis-related gene expression, growth performance, hematological characteristics, carcass development, and metabolic responses in Cobb-500 broiler chickens. 80 (DOC) were randomly assigned to two lighting treatments consisting of conventional commercial LED lighting (T1) and poultry-specific PICA LED lighting (T2) for 35 days under continuous photoperiod conditions. Growth performance, feed conversion ratio (FCR), hematological indices, serum biochemical and hormonal parameters, carcass characteristics, and the expression of genes associated with photoreception (OPN5, OPN4, VA Opsin), the hypothalamic–pituitary–thyroid axis (TRH, TSH β , DIO2, DIO3, TSHR), growth (GH, IGF-1, MyoD, MSTN), immune regulation (IL-6, IL-10, LYZ), hematopoiesis (EPO, GATA1), and lipid metabolism (PPAR α , SREBP-1, FAS, LPL, ACOX1) were evaluated using RT-qPCR. Broilers exposed to poultry-specific spectral lighting demonstrated enhanced expression of photoreceptor and endocrine regulatory genes, accompanied by improved thyroid hormone activation, growth hormone signaling, and metabolic gene regulation. These molecular responses were associated with improved feed conversion ratio, greater body weight gain, enhanced carcass yield, superior hematological profiles, and favorable serum biochemical characteristics compared with birds maintained under conventional lighting. The findings demonstrate that optimization of LED spectral composition according to the avian visual and neuroendocrine systems modulates endocrine signaling and metabolic pathways, thereby improving physiological function and production efficiency in broiler chickens. Poultry-specific spectral lighting represents a promising precision-management strategy for enhancing broiler performance through targeted regulation of deep-brain photoreceptors and hypothalamic–pituitary axis activity.

Key Words: Poultry-specific LED lighting, Correlated color temperature, Deep-brain photoreceptors, OPN5, OPN4, VA opsin, HPT axis, Gene expression, Feed conversion ratio

EFFECT OF HOUSING SYSTEM, INSEMINATION FREQUENCY, AND SPERM CONCENTRATION ON HATCHING TRAITS OF COMMERCIAL BROILER BREEDERS

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2026-PSC-006

Abstract

Reproductive efficiency in commercial broiler breeders depends heavily on how insemination is managed, yet the combined influence of housing system, insemination frequency, and sperm concentration on hatching outcomes remains poorly defined. This study addressed that gap using a $2 \times 4 \times 4$ factorial design under a completely randomized arrangement, in which a total of 960 female broiler breeders (Ross-308) were divided equally between two artificial insemination (AI) systems, caged (AIC) and deep-litter floor (AIF) housing, supported by 41 and 48 males, respectively, while females within each system were further assigned to four insemination frequencies (every 4, 6, 8, or 10 days) and four sperm concentrations per dose, ranging from $100\text{--}175 \times 10^6$ during the peak phase and $200\text{--}275 \times 10^6$ during the post-peak phase. Cage-housed flocks significantly outperformed floor-housed flocks in egg production, fertility, hatchability, and chick numbers, and reproductive performance was optimal at 4- and 6-day insemination intervals during peak production, narrowing to only the 4-day interval during post-peak, while across all frequencies the highest reproductive outcomes were achieved with sperm concentrations of $150\text{--}175 \times 10^6$ during peak and $250\text{--}275 \times 10^6$ during post-peak. Embryonic mortality was significantly higher in floor-housed flocks, particularly when insemination intervals exceeded 4 days, whereas sperm concentration had no measurable effect on this trait. These results establish cage housing as the superior system for artificial insemination in broiler breeders and demonstrate that sustaining fertility and hatchability with advancing breeder age requires the coordinated, age-adjusted management of insemination frequency and sperm concentration, offering a practical framework for improving reproductive efficiency in commercial flocks.

Key Words: Artificial insemination, Hatching traits, Housing systems, Insemination frequencies, Sperm concentration.

IMPACT OF LIGHT AND FEEDING REGIMES ON PERFORMANCE AND WELFARE OF BROILER BREEDER DURING REARING

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2026-PSC-007

Abstract

A controlled trial investigated the interactive effects of lighting programs and feeding systems on Ross-308 broiler parent stock through the initial 24 weeks of life. Conducted across two poultry houses (automatic versus manual feeding systems) on same commercial poultry facility, the trial evaluated six distinct lighting combinations. These combinations integrated varying light spectra—visible, specialized visible, and ultraviolet-A (UV-A) supplemented visible light—with differing correlated color temperatures (warm and cool white). Utilizing a cohort of 2,880 birds, the study assessed key welfare indicators alongside the microbiological prevalence of *Escherichia coli* and *Staphylococcus aureus*. Data revealed a significant positive synergism between the UV-A supplemented light spectrum and automated feeding system regarding overall performance. The inclusion of the UV-A spectrum enhanced dust-bathing expression, optimized litter moisture dynamics, and reduced microbial load, with pronounced effects observed in the automated feeding system. Plumage condition scores and behavioral vices remained statistically unaffected by the lighting interventions. Variations in color temperature yielded no statistically significant or relevant physiological responses. The integration of ultraviolet-A spectral supplementation coupled with automated feeding systems serves as an effective management strategy. By reducing microbial pathogens within farm environments, these practices enhance farm biosecurity, reduce the need for pharmaceutical interventions, and minimize the ecological footprint of poultry farming, thereby supporting the conservation of healthier agricultural landscapes. The impact of UV light inside poultry house may further reduce the risk of pathogen spillover into local ecosystems.

Key Words: Ultraviolet spectrum, Light color temperature, Automatic feeding, Dark house

EFFECTS OF CHICK MIXING REGIMENS ON SOCIAL BEHAVIOUR AND SPATIAL RESPONSES OF BROILERS

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2026-PSC-008

Abstract

Abstract: This study evaluated behavioural changes associated with different social-mixing schedules in broiler chickens over five weeks. Twenty pens were allocated to four treatments (control with no mixing, chick mixing at early, mid and late ages) with five replicate pens per treatment. Each replicate had 16 birds. Routine scan sampling generated 3,200 observations, which were averaged by pen and week. Activity and spatial outcomes were analysed using split-plot repeated-measures ANOVA, with pen as the experimental unit, treatment as the between-pen factor, and week as the repeated factor. Acute post-mixing responses at 12 and 24 h were compared across 30 pen-by-mixing-day events. Treatment did not significantly affect resting, standing, walking, feeding, drinking, most-crowded-zone percentage, or clustering score ($P>0.05$), and no treatment $\times$ week interaction was detected ($P>0.05$). Age strongly affected resting, walking, feeding, most-crowded-zone percentage, and clustering.

Key Words: Mixing regimens, Social behaviours, Spatial distribution, Clustering, Zone preferences, Aggression, Panic runs.

CHICKEN GENOTYPE AND HOUSING SYSTEM SIGNIFICANTLY INFLUENCE MEAT QUALITY, CARCASS TRAITS, AND BLOOD BIOCHEMICAL CHARACTERISTICS

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2026-PSC-009

Abstract

Consumer demand for high-quality and nutritious poultry meat has increased considerably, highlighting the need to evaluate the effects of genetic background and production systems on meat quality. This study investigated the influence of different chicken genotypes and housing systems on carcass characteristics, meat quality, sensory attributes, proximate composition, and blood biochemical parameters. At 52 weeks of age, fifty-four female birds representing three genotypes—Rhode Island Red × Naked Neck (RIR♂ × NN♀), Black Australorp × Naked Neck (BA♂ × NN♀), and Naked Neck × Naked Neck (NN♂ × NN♀)—were reared under three housing systems: intensive, semi-intensive, and free-range. The experiment followed a factorial arrangement comprising three genotypes, three housing systems, and six birds per treatment. Birds were slaughtered for comprehensive evaluation of carcass yield, meat quality, sensory characteristics, proximate composition, and blood biochemical indices. Statistical analysis revealed significant ($P \leq 0.05$) effects of genotype, housing system, and their interaction on carcass characteristics, including carcass yield, breast, wings, drumsticks, neck, ribs, and back weight percentages. Sensory evaluation demonstrated significant differences among treatments for most breast meat quality attributes, whereas juiciness remained unaffected by housing system ($P > 0.05$). Proximate analysis showed significant variation in moisture, dry matter, ash, and ether extract content among genotypes, housing systems, and their interactions, while crude protein was significantly influenced by housing system but not by genotype. Meat quality evaluation indicated significant differences in pH measured at 2- and 24-hours postmortem; however, shear force and drip loss did not differ significantly among genotypes. Blood biochemical analysis revealed higher glucose concentrations in birds reared under intensive housing, whereas semi-intensive birds exhibited the highest total blood protein concentration. Cholesterol levels varied significantly among genotypes but showed no significant differences across housing systems, while globulin concentration remained unaffected. These findings demonstrate that both genotype and housing system play crucial roles in determining poultry meat quality, carcass yield, and physiological characteristics, providing valuable information for breeding and production strategies aimed at improving poultry meat quality and consumer satisfaction.

Key Words: Chicken Genotype, Housing System, Meat Quality, Carcass Traits, Blood Biochemistry

LARGER OUTDOOR RANGE AREAS IMPROVE EGG PRODUCTION IN NAKED NECK HENS WITHOUT COMPROMISING WELFARE OR EGG QUALITY

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2026-PSC-010

Abstract

This study evaluated the effects of different outdoor range areas on the behavior, welfare, productive performance, and egg quality of Naked Neck chickens. A total of 1,080 thirty-week-old Naked Neck hens were assigned to a completely randomized design comprising three treatments, with four replicates of 90 birds each. The treatments consisted of three range areas: A (121.9 m²), B (152.4 m²), and C (190.5 m²). Behavioral parameters included walking, feeding and foraging, sitting, aggression, wing flapping, perching, dust bathing, and range use. Welfare indicators included footpad dermatitis, lameness, gait score, and feather pecking. Productive performance was assessed through egg weight, egg production, egg mass, and feed intake, while egg quality evaluation included egg morphometry and shell, albumen, and yolk characteristics. Range area had no significant effect ($P > 0.05$) on most behavioral parameters or egg quality traits, except for walking activity and range use. Birds provided with range area C demonstrated improved productive performance, including greater egg weight, egg production, egg mass, and feed intake; however, welfare indicators remained unaffected. In conclusion, variation in outdoor range area had limited effects on the behavior, welfare, egg morphometry, and egg quality of Naked Neck chickens. Nevertheless, providing an appropriately sized outdoor range equipped with functional enrichments, such as perches and dust-bathing areas, may support optimal performance in backyard poultry production systems.

Key Words: Naked Neck chickens, Outdoor range, Behavioral traits, Animal welfare, Productive performance, Egg quality, Environmental enrichment

PRENATAL GREEN-RED DICHROMATIC LIGHT EXPOSURE ENHANCES HATCHABILITY, MORPHOLOGICAL DEVELOPMENT, AND POST-HATCH GROWTH PERFORMANCE IN JAPANESE QUAIL

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2026-PSC-011

Abstract

This study investigated the effects of light exposure during incubation on the hatching characteristics and post-hatch performance of Japanese quail. In a completely randomized design, 1,200 eggs were equally allocated to four treatment groups, with six replicates of 50 eggs each. The eggs were exposed to green–red (GR), green–blue (GB), or blue–red (BR) dichromatic light at an intensity of 250 lux for 12 h daily, while the control group was incubated in darkness. Following hatching, 600 quail chicks were assigned to four corresponding treatment groups, each comprising six replicates of 25 birds. The GR treatment resulted in greater hatchability than the GB, BR, and dark-incubated groups. Early embryonic mortality was lower in the BR, GB, and dark groups than in the GR group, whereas mid-stage embryonic mortality was lowest in the dark-incubated group. Late embryonic mortality was lower in the GR group than in the other treatments. Moisture loss during incubation was lowest in the BR and dark groups, while chick spread was greater in the GR group. Post-hatch weight gain was improved in the GR group, whereas feed intake was higher in the dark group. The BR treatment resulted in a better feed conversion ratio, while greater livability was observed in the BR and GR groups. Keel and shank lengths were greater in all dichromatic-light groups, while body length, wingspan, shank circumference, and drumstick length and circumference were greater in the GR group. Serum glucose, albumin, and globulin concentrations were also higher in the GR group. Under the conditions of this study, prenatal exposure to green–red dichromatic light positively influenced hatchability, morphological development, and post-hatch growth performance in Japanese quail.

Key Words: Japanese quail, Dichromatic light exposure, Lighted incubation, Hatchability, Embryonic mortality, Growth performance, Serum biochemistry

OPTIMAL INTENSITY OF GREEN-RED LIGHT DURING INCUBATION ENHANCES HATCHING TRAITS AND GROWTH IN JAPANESE QUAIL

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2026-PSC-012

Abstract

This study evaluated the effects of different intensities of dichromatic light during incubation on the hatching characteristics and post-hatch performance of Japanese quail. In a completely randomized design, 600 hatching eggs were equally allocated to four treatments, with three replicates of 50 eggs each. The eggs were exposed to green-red (GR) dichromatic light at intensities of 150, 250, or 350 lx under a 12 h light:12 h dark photoperiod. Eggs in the control group were incubated in complete darkness. Following hatching, 300 quail chicks were equally distributed among the four corresponding treatments, with three replicates of 25 chicks each. Hatchability was higher in all GR light-treated groups than in the dark-incubated control group. Early embryonic mortality was lowest in the 250 lx group, mid-stage embryonic mortality was lowest in the dark group, and late embryonic mortality was lowest in the 150 lx group. The 250 lx treatment also produced optimal chick spread and improved post-hatch performance, including weight gain, feed intake, feed conversion ratio, and livability. Serum biochemical values were higher in the dark-incubated group than in the GR light-treated groups. Pre-slaughter weight was greater in the 250 and 350 lx groups than in the 150 lx and dark groups, whereas carcass weight was higher in the 350 lx group than in the control group. In conclusion, exposing Japanese quail eggs to green-red dichromatic light at an intensity of 250 lx during incubation improved hatching characteristics and post-hatch growth performance.

Key Words: Japanese quail, Green-red light, Light intensity, Lighted incubation, Hatchability, Embryonic mortality, Post-hatch performance

INCUBATION PHOTOPERIOD DURATION HAS LIMITED IMPACT ON POST-HATCH PERFORMANCE AND STRESS IN BROILER CHICKENS

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2026-PSC-013

Abstract

This study investigated the effects of different photoperiods during incubation on the subsequent growth performance and stress responses of commercial broiler chickens. A total of 875 fertile eggs from 48-week-old Ross 308 broiler breeders were incubated under green–red dichromatic light (495–750 nm; 2,700 K; 250 lux) for 0, 4, 8, 12, 16, 20, or 24 h per day throughout the incubation period. Following hatching, 50 unsexed day-old chicks from each incubation treatment were selected to evaluate growth performance, including feed intake, body weight, and feed conversion ratio. Stress indicators included physical asymmetry, tonic immobility, and vocalization, while feather and gait scores were used to assess welfare. Carcass traits included live and dressed weights, carcass yield, organ weights, abdominal fat, and breast and leg weights. Serum globulin, total protein, cholesterol, glucose, and uric acid concentrations were also determined. Incubation photoperiod had no significant effect on post-hatch growth performance, stress indicators, welfare characteristics, or most carcass traits. However, heart yield was higher in broilers exposed to a 20 h photoperiod during incubation than in those exposed to 16 h of light. Different lighting durations also affected the serum biochemical profile, although globulin and cholesterol concentrations remained unchanged. In conclusion, varying the duration of green–red light exposure during incubation had no substantial effect on the post-hatch performance of broilers between 21 and 35 days of age under the experimental conditions.

Key Words: Broiler chickens, Incubation photoperiod, Dichromatic light, Lighted incubation, Growth performance, Stress response, Animal welfare

HANGING TOYS AS ENVIRONMENTAL ENRICHMENT ENHANCE BROILER PERFORMANCE AND BEHAVIOR WHILE PRESERVING FOOT HEALTH

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2026-PSC-014

Abstract

This study compared the effects of different hanging environmental enrichment objects on broiler chickens from 1 to 21 days of age. A total of 120,000 one-day-old broiler chicks were randomly allocated to five treatments, each comprising four replicates of 6,000 birds housed in approximately 362 m² pens. The treatments were: T1, green balls (approximately 40 per pen); T2, hanging toys (8–10 per pen); T3, hanging string bundles (8–10 per pen); T4, the rotational provision of green balls, hanging toys, and strings at equivalent densities; and T5, a control without environmental enrichment. Growth performance, behavioral activity, foot health, serum biochemical parameters, carcass characteristics, and meat quality traits were evaluated. Broilers provided with environmental enrichment exhibited significantly improved growth performance ($p \leq 0.05$) compared with the control group. Among the enrichment treatments, hanging toys (T2) produced the greatest body weight and weight gain and the lowest feed conversion ratio. Environmental enrichment also significantly improved carcass characteristics and selected meat quality attributes, including lightness (L^*) and pH stability ($p \leq 0.05$). Behavioral observations revealed substantially greater activity among enriched birds than among control birds. Toe damage scores differed significantly across treatments ($p = 0.004$), with the lowest scores recorded in T1 and the highest in T4. However, footpad dermatitis and hock burn scores were not significantly affected by enrichment ($p > 0.05$). In conclusion, hanging environmental enrichment objects, particularly hanging toys, can improve broiler growth, behavioral activity, and selected carcass and meat quality characteristics. However, their effects on footpad health appear limited under the conditions of this study.

Key Words: Broiler chickens, Environmental enrichment, Hanging objects, Behavioral activity, Growth performance, Serum biochemistry, Foot health, Meat quality

GROWTH AND CARCASS TRAITS OF COMMERCIAL BROILERS AFFECTED BY FEEDING HIGH-PROTEIN FEED FOR SEVERAL DURATIONS

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2026-PSC-015

Abstract

The present study aimed to determine the effects of feeding high-protein feed for various durations on growth performance and carcass traits of commercial broilers. A total of 300 newly hatched straight-run broiler chicks of the Ross 308 strain were used. They were randomly placed according to a completely randomised design under a factorial arrangement. They were given feed with two different levels of crude protein, i.e. 23% and 21 % and 03 different feeding durations (5, 10, and 15 days) during the starter phase, making a total of 6 treatments 2×3. Each treatment was further replicated five times, having 10 birds each. The parameters evaluated were feed intake, final body weight, total body weight gain, feed conversion ratio, and mortality percentage. The birds were reared till the age of 35 days, and after that, an average of 2 birds from each replicate were slaughtered. The parameters observed were percentages of carcass, wings, thigh, breast, heart, liver, gizzard, intestine and abdominal fat out of the weight of the live bird just before slaughter. The results showed that the birds fed with 23 % CP for 15 days consumed the most feed. The final weight of the birds provided with 23 % CP for 10 and 15 days was the highest. The feed conversion ratio was best in the birds provided with 23 % CP for 10 days. The birds were slaughtered at the age of 35 days, and the carcass weight was most of the birds fed with 23 % CP for 10 and 15 days. However, the carcass cut-up percentage and the percentage of every individual giblet were not affected by the treatment. The birds provided with 23 % CP for initial 10 days remained the most economical and the best.

Key Words: High protein feed, performance, economics

MEAT YIELD, QUALITY, AND SENSORY PROPERTIES OF SPENT BROILER BREEDER STRAINS KEPT UNDER DIFFERENT MATING SYSTEMS

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2026-PSC-016

Abstract

An experiment was conducted to compare meat yield and meat quality characteristics of spent broiler breeders from two different genetic strains and to evaluate the subsequent effects of two mating systems. Spent birds from two broiler breeder strains, Cobb 500 and Arbor Acres Plus, comprising equal numbers of males and females, were maintained under two mating systems on a commercial broiler breeder farm: natural mating (NM) and artificial insemination (AI). At the end of the production cycle (65–67 weeks of age), a total of 64 spent broiler breeders were selected for meat yield, quality, and sensory evaluation. The results indicated that the birds inseminated in their production phase had higher dressing % and drip loss, while those in natural mating had higher wings %. However, breast %, drumstick, thigh %, neck %, pH (2-hr PS and 24-hr PS), cooking loss %, shear force %, and meat color (L*, a*, b* at 2- and 24-hr PS) were comparable among both treatments. Similarly, among strains, the spent breeders of Cobb had higher wing% and thigh%, while Arbor Acres had higher pH at 24-hr PS, drip loss%, cooking loss%, shear force, and meat redness at 24-hr PS for drumstick and neck. The data showed non-significant variations among different strains for dressing %, breast%, pH at 2-hr PS, meat color (L*, a*, b* at 2-hr PS and L* and b* at 24-hr PS). Moreover, sensory evaluation has shown comparable results for both strains and production systems. It can be concluded that the insemination methods do not have a significant impact on meat quality and yield, except carcass yield, which was higher in AI treatment. Both breeder strains had comparable meat yield, but the meat quality is better in Cobb breeders.

Key Words: Breeder, Meat, Insemination, Sensory

ROLE OF NANOTECHNOLOGY IN POULTRY PRODUCTION

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2026-PSC-017

Abstract

Poultry industry is one of the major industries in the world responsible for feeding a huge number of people. It also provides employment to a big number of people that are involved in poultry farming, hatchery, marketing, poultry utensils industry, poultry vaccine and medicines. Scientists are in continuous struggle to adopt different methods to enhance the production of poultry industry. Nanotechnology is the most advanced field in this concern. Nanoparticles use different pathways to improve the health of poultry birds and play important role in poultry products processing and preservation. Nanoparticle coupled antibiotics reduce the risk of antimicrobial resistance in birds effectively that is a major health concern. Supplementation of nanoparticles to poultry feed increases feed intake, percentage of leg and breast muscle yield, body weight and egg production and has antiviral, antifungal and larvicidal effects. Nanoparticles are also used in the rapid and on-site diagnosis of poultry diseases by adopting techniques like Nano DETECT and glowing quantum dots. Application of nanoparticles in poultry products enhances the shelf life and storage. Nano-vaccines enhance poultry health by adopting nanoparticles as adjuvants that improve the immunogenicity of vaccinal agent and immune response. Nanoparticles are also employed for disinfection of hatcheries and eggs. It is concluded that nanotechnology can be employed effectively to enhance poultry production.

Key Words: Poultry industry, poultry production, Nanotechnology, Nanoparticles

NANOTECHNOLOGY AS AN EMERGING TOOL FOR SUSTAINABLE POULTRY PRODUCTION

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2026-PSC-018

Abstract

Nanotechnology has emerged as a revolutionary innovation in poultry science, offering novel approaches to improve productivity, health, and sustainability. Application of nanotechnology in poultry production, including Nano-formulations enhance nutrient bioavailability, improve feed conversion efficiency, and support optimal growth by facilitating targeted nutrient delivery and reducing nutrient losses. Additionally, nanoparticle-based vaccines and therapeutic agents have demonstrated improved efficacy against infectious diseases while reducing reliance on conventional antibiotics, thereby mitigating antimicrobial resistance. Use of Nano-sensors for real-time monitoring of environmental conditions, disease detection, and feed quality, enable precision management and improved flock welfare. Furthermore, nanotechnology contributes to environmental sustainability by reducing feed waste, minimizing nutrient excretion, and lowering greenhouse gas emissions associated with poultry production. Despite these promising benefits, concerns regarding nanoparticle toxicity, biosafety, environmental accumulation, regulatory approval, and consumer acceptance remain significant challenges. Future research should focus on evaluating long-term safety, establishing standardized regulations, and developing cost-effective nanotechnology-based products suitable for commercial poultry systems. Overall, nanotechnology represents a promising strategy for improving poultry productivity.

Key Words: Nanotechnology, Poultry Production, sustainable, Therapeutic, Antibiotics

EMERGING INNOVATIONS IN HATCHERY BIOSECURITY AND CHICK QUALITY

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2026-PSC-019**Abstract**

Digital technologies and automation have revolutionized poultry hatchery operations by improving productivity, biosecurity, and resource efficiency. Maintaining high biosecurity standards and producing healthy day-old chicks are essential objectives of modern poultry hatcheries. Use of Innovative approaches designed to improve hatchery hygiene, disease prevention, incubation management, and chick quality is need of the day. Advanced sanitation technologies, including ultraviolet light systems, hydrogen peroxide fumigation, ozone treatment, and automated cleaning equipment, effectively reduce microbial contamination and improve hatchery biosecurity. Precision incubation technologies optimize embryonic development through continuous environmental monitoring and adaptive control of incubation conditions. Furthermore, in ovo vaccination, nutritional supplementation, and automated embryo diagnostics improve immune development, chick vitality, and resistance to infectious diseases. Digital imaging systems and artificial intelligence facilitate rapid chick quality assessment, enabling more accurate grading and selection. These innovations reduce early mortality, enhance post-hatch growth performance, and improve production efficiency while minimizing economic losses. Sustainable hatchery practices, including energy-efficient incubators and optimized resource utilization, contribute to environmentally responsible poultry production. Nevertheless, challenges including implementation costs, biosafety regulations, and technological accessibility remain barriers to widespread adoption. Continued interdisciplinary research and international collaboration will accelerate innovation and support sustainable hatchery development for enhanced food security.

Key Words: Hatchery, Innovation, Incubation, Chick Quality, Biosecurity

EFFECT OF HATCHERY MANAGEMENT PRACTICES ON HATCHABILITY AND CHICK QUALITY IN CHICKENS

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2026-PSC-020

Abstract

Successful hatchery operation depends on proper management of fertile eggs, incubation conditions and chick handling during the critical stages of embryonic development. Small deviations in temperature, relative humidity, ventilation, egg turning and sanitation can adversely affect embryonic survival, hatchability and the quality of newly hatched chicks. The present study was designed to evaluate the influence of hatchery management practices on hatchability performance and chick quality in chickens. Fertile eggs were handled according to standard hatchery procedures, including selection of clean and suitable eggs, proper storage before incubation, pre-incubation preparation, controlled incubation temperature and humidity, regular turning and appropriate conditions during the hatching period. Hatchery performance was assessed using hatchability of set and fertile eggs, embryonic mortality at different stages of incubation, percentage of infertile eggs, contamination and the quality of day-old chicks. Chick quality was considered in relation to physical activity, body condition, navel closure, feather development and general appearance at hatch. The study emphasizes that maintaining stable incubation conditions and following appropriate hatchery hygiene and egg-handling procedures are essential for achieving consistent hatchery performance. Proper management can minimize embryonic losses and improve the production of viable, healthy and uniform chicks. The findings are expected to provide practical guidance for commercial and educational hatcheries and may assist poultry producers in identifying critical management factors that influence hatchery efficiency. Improved hatchery management is particularly important for maximizing the productive value of fertile eggs and establishing a strong foundation for subsequent broiler or layer performance.

Key Words: Hatchery management, Incubation, Hatchability, Embryonic mortality, Fertile eggs, Chick quality, Poultry production.

DEVELOPMENT OF RECORD KEEPING APPLICATION FOR BROILER BREEDER PRODUCTION SYSTEMS

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2026-PSC-021

Abstract

This study was conducted to design, develop, and evaluate Breeder Book, a mobile application for systematic digital record-keeping in commercial broiler breeder farm management. The application was developed using the Flutter SDK with an offline-first SQLite database architecture, ensuring full functionality without internet connectivity. It enabled farm operators to record daily data, including feed and water consumption, body weight, medication and vaccination schedules, egg production, fertility, and hatchability, while automatically computing key performance indicators such as Hen-Day Production percentage, Feed Conversion Ratio, Hatchability percentage, and Mortality Rate. The application was field-tested at two commercial broiler breeder farms in Punjab, Pakistan: Angoori Farm, Zubair Feeds (Pvt.) Ltd. (Flock 37: Cobb 500, 13,670 females, 1,238 males; Flock ID: F37-ANGOORI-2023), and Sabir's Poultry Farm (Flock 40: Cobb 500, 29,948 females, 3,327 males; Flock ID: F40-SABIRS-2023), generating 448 daily records per flock across a combined 43,618 birds over a full 64-week production cycle. Field data confirmed accurate capture and automated reporting of all critical performance parameters. Peak hen-day production of 88.93% was recorded for Flock 37 at Week 32 of age, exceeding the Cobb 500 breed standard of 87% by 1.93 percentage points, while Flock 40 achieved a peak of 86.13% at Week 31. Lifetime eggs per hen housed were 182.3 (Flock 37) and 168.5 (Flock 40), with mean hatchability of 88.39% and 88.22%, respectively, both substantially above the Cobb 500 standard of 84.5%. Cumulative Feed Conversion Ratio at depletion was 13.54 for Flock 37 and 11.57 for Flock 40. A structured expert evaluation by a senior professional at Hendrix Genetics, Netherlands, yielded a perfect score of 5.0 out of 5.0 across all 25 evaluation items covering usability, functional performance, farm management impact, technical performance, and satisfaction. The application demonstrated accuracy, user-friendliness, and significant time-saving advantages over manual record-keeping, supporting better decision-making and enhancing the overall efficiency and productivity of broiler breeder farm operations.

Key Words: Record keeping application, Broiler breeder, Improved efficiency, Better production

DEVELOPMENT OF MOBILE APPLICATION FOR RECORD KEEPING IN BROILER PRODUCTION SYSTEM

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2026-PSC-022

Abstract

A mobile application was developed on a blank slate with farmers being the priority rather than technology. It uses Flutter, can be connected to Firebase in the cloud, and stores information locally using SQLite, meaning that it can run surprisingly smoothly without an internet connection and silently synchronizes all its data as soon as an internet connection becomes available, no drama required. Through a screen so simple to use one-handed and stand in the middle of a flock house, farmers can pull it out during a workday, and record everything, which is worth caring about, feed and water, weights of the bird, deaths, medications, and money in and out. Signing in works with the help of either Google, SMS or a fingerprint scan and since each farm has different people, doing different jobs, the app provides the owners, supervisors, field workers with their own respective levels of access. Having more than one flock running at a time is not a challenge either - they all remain separate but can be pulled together into a combined report as and when required. As far as a single line of code was written, prototypes were built and tested five times over, with each round of testing, the team would sit down with actual farm workers in focus group discussions to find out what they really needed and then build prototypes and test them five times over. The outcome is a computer-generated app that automatically calculates the numbers farmers used to calculate manually using return on investment ratios at a given time, death rate, daily weight gain, rate of return on investment calculated automatically at a given time, every time. It even records spending and revenue simultaneously, where a flock cycle is profitable at any given time. When tried on actual farms, it not only reduced daily record-keeping time drastically, but also wiped-out calculation errors altogether, and turned what once took hours of report compilation, to something that can be done in seconds. In a word, the new application will provide the small and medium-sized broiler producers with something that they really lacked before a practical, reliable, and uncomplicated digital instrument that will replace the paper notebook without turning the farming process into an IT project

Key Words: Poultry, Mobile application, Broiler production, Increased productivity

ASSOCIATION OF GENETIC POLYMORPHISMS IN IGF1 AND IGF1R GENES WITH GROWTH AND PRODUCTION TRAITS IN CHICKEN

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2026-PSC-023

Abstract

In the poultry industry, growth and production traits can greatly affect productivity and economic efficiency, so one of the major objectives of modern poultry breeding is genetic improvement of these traits. For the differentiation of tissue, metabolism, the development of muscle, and the regulation of growth, the insulin-like growth factor (IGF) signaling pathway plays a crucial role. IGF1 stimulates cell growth and synthesis of protein, while IGF1R regulates cellular differentiation by processing IGF1 signals. The Insulin-like growth factor 1 (IGF1) and its receptor (IGF1R) are identified as important candidate genes that influence growth traits in poultry. The objective of this review is to investigate prior studies on how genetic variations within the chicken IGF1 and IGF1R genes directly link with traits that are economically important. Within these genes, various single nucleotide polymorphisms (SNPs), haplotypes, and genetic variants that are linked with body weight, growth rate, breast muscle development, carcass characteristics, body composition, and skeletal traits have been discovered in previous studies. Findings from different chicken breeds reveal that IGF1 genetic variation can directly impact the rate of growth, while at the same time, genetic variations in IGF1R gene can affect early growth and carcass characteristics by regulating IGF1 signaling paths. Even so, the strength and nature of these linkages are not always uniform across different breeds and populations, indicating that factors like genetic background, population structure, and environmental conditions may alter the expression of these effects. Overall, current studies highlight that both IGF1 and IGF1R genes act as important genetic markers for understanding how chicken growth and production traits are regulated. These validated genetic variations may act as useful molecular markers for marker-assisted selection. They can also enhance accurate genetic improvement in poultry populations when combined with genomic selection frameworks. Across diverse chicken populations, in order to validate the functional variants and to highlight their potential utility in breeding programs, further research is required.

Key Words: IGF1, IGF1R, Candidate genes, Single nucleotide polymorphisms (SNPs), Genomic selection, Carcass traits.

IMPACT OF DIFFERENT FLOOR SPACE AND LITTER DEPTHS ON GROWTH PERFORMANCE, MEAT QUALITY AND CARCASS CHARACTERISTICS OF BROILER

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2026-PSC-024

Abstract

This study was conducted to evaluate the effects of different floor space allowances and litter depths on the growth performance, carcass characteristics, and meat quality of broiler chickens. A total of 180 Ross 308 broiler chicks were used and distributed into six treatment combinations under a 2×3 factorial arrangement, consisting of three levels of floor space (0.75, 1.0, and 1.25 sq. ft/bird) and two litter depths (2.0 and 3.0 inches). Each treatment was replicated three times with 10 birds per replicate under a completely randomized design (CRD). Growth performance parameters, including body weight, feed intake, weight gain, feed conversion ratio (FCR), and mortality, were recorded weekly. At the end of the experiment, carcass traits such as dressing percentage, carcass yield, and organ weights were evaluated. Meat quality parameters, including pH, tenderness, water-holding capacity, drip loss, and color characteristics, were also assessed. Data were analyzed using one-way ANOVA, and treatment means were compared using Tukey's HSD test at a 5% level of significance. The results revealed that variations in floor space and litter depth had no significant effect ($P > 0.05$) on growth performance and carcass characteristics, indicating that broilers maintained normal growth and development under all treatment conditions. However, meat quality parameters were significantly affected ($P < 0.05$), particularly with respect to [insert significant parameters], suggesting that floor space and litter depth may influence post-slaughter meat characteristics without markedly affecting productive performance. These findings indicate that although different floor space allowances and litter depths may support comparable growth and carcass outcomes, appropriate management of housing space and litter conditions may contribute to maintaining desirable meat quality in broiler chickens.

Key Words: Poultry, Broiler production, Litter depths, Production performance

WHY POULTRY BREEDING IS MORE IMPORTANT THAN EVER: THE CASE OF LAYER BREEDING IN PAKISTAN

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2026-PSC-025

Abstract

The poultry industry of Pakistan has evolved as a cornerstone of the national food security by contributing nearly 40% of the total meat supply. Despite this remarkable contribution, Pakistan almost entirely relies on the breeding stocks imported from different countries, which pose economic, supply chain, biosecurity and strategic risks. Due to the current political situation in Pakistan and the world, it has become more necessary than ever to develop our own egg-type chickens, as we do not have any other option to maintain the supply chain of eggs in the country. Keeping in view the above points, there is a dire need for the initiation of local poultry breeding in Pakistan. There are a number of hindrances in the development of local commercial hybrids, including lack of trained professionals, inadequate policy support, weak collaboration of the industry and research institutes, and insufficient investment. To address these issues, a comprehensive national strategy is required, focusing on the establishment of genetic centres of the nucleus flocks, implementing structured selection and crossbreeding, capacity building, public-private partnerships, and integration of modern technologies such as genomic selection in the poultry breeding programs. Our current results of the development of the pure lines of the elite laying breeds, and their crosses, depict the different levels of positive heterosis for the egg production, clutch size, and length of the pause, and negative heterosis for the age at first egg. These results are promising and have the potential to be used for the development of commercial hybrids for the local poultry industry. In summary, the development of our own poultry breeding centres is just not a scientific objective, but a national requirement, which will lead to the development of the locally adoptive and more productive commercial hybrids developed by Pakistan for Pakistan. It will improve the sustainability, self-reliance, decrease import dependence and, more importantly, will secure the future of the Pakistani poultry industry against global uncertainties.

Key Words: Egg-type Chickens, Local Poultry Breeding, Heterosis, Genomic Selection, Self-reliance

HEAT STRESS AND THE HYPOTHALAMIC-PITUITARY-GONADAL AXIS: MOLECULAR MECHANISMS OF REPRODUCTIVE DECLINE IN POULTRY

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2026-PSC-026

Abstract

Heat stress is one of the most significant environmental challenges facing the global poultry industry. Besides its well-documented effects on growth, feed efficiency, and welfare, heat stress exerts a suppressive effect on reproductive performance in male and female birds, which may limit fertility, hatchability, and flock sustainability. This study decodes recent evidence on the molecular and endocrine mechanisms linking thermal stress to reproductive decline via disruption of the hypothalamic-pituitary-gonadal (HPG) axis in poultry. It may activate the hypothalamic-pituitary-adrenal (HPA) axis, resulting in the elevation of circulating glucocorticoids. These glucocorticoids may exert negative feedback on the hypothalamus and anterior pituitary, which may suppress gonadotropin-releasing hormone (GnRH) secretion. This eventually reduces pituitary output of follicle-stimulating hormone (FSH) and luteinizing hormone (LH), the principal drivers of gonadal function in both sexes. In females, reduced gonadotropin signaling may lead to ovarian regression, impaired steroidogenesis, and disrupted follicular hierarchy. At the follicular level, heat stress increases apoptosis and induces ultrastructural damage in granulosa cells, which may alter the expression of key steroidogenic genes, reducing ovulation rate and egg production. In males, heat stress impairs the functioning of sertoli cells via reducing FSH-driven androgen-binding protein secretion, thereby disrupting the testicular microenvironment required for spermatogenesis. This may result in decreased semen volume, sperm concentration, motility, and viability. Understanding the convergence of endocrine, cellular, and molecular pathways through which heat stress disrupts the HPG axis is essential for developing targeted nutritional, genetic, and management interventions to conserve reproductive efficiency in poultry under a warming climate.

Key Words: Heat stress, HPG axis, Gonadotropins, Granulosa cell apoptosis, Steroidogenesis, Spermatogenesis, Poultry fertility, Climate resilience

PHOTOPERIODIC MODULATION OF REPRODUCTIVE EUROENDOCRINOLOGY IN COMMERCIAL LAYERS

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2026-PSC-027

Abstract

Photoperiod remains one of the most dominant environmental cues governing the onset and maintenance of egg production in commercial laying hens, acting through a well-characterized deep brain photoreceptor (DBP) system. Melanopsin (OPN4), neuropsin (OPN5), and vertebrate-ancient opsin, located in the hypothalamus, primarily mediate photostimulation by detecting light directly within the brain. These activated DBPs signal the mediobasal hypothalamus to generate type 2 deiodinase, which converts thyroxine to the biologically active triiodothyronine. The short days favor a deactivating deiodinase pathway that yields inactive reverse triiodothyronine, which is a thyroid-hormone-dependent switch that gates downstream reproductive activation. Hypothalamic GnRH-I mRNA and peptide output rise with increasing day length, which activates pituitary gonadotropes and drives ovarian steroidogenesis, while the inhibitory neuropeptide GnIH is instead regulated by melatonin synthesized during the dark phase and is most active under non-stimulatory, short photoperiods. As gonadal steroids (estradiol and progesterone) rise with photostimulation, they feed back on the pituitary to suppress GnIH receptor expression, thereby reinforcing the shift toward the reproductively active state. Recent work also indicates that metabolic and body-composition cues can independently influence the HPG axis, suggesting photoperiodic and nutritional/metabolic signals may converge on shared hypothalamic pathways to time sexual maturation and sustained lay. This study revolutionizes the current understanding of the DBP–thyroid hormone–GnRH/GnIH signaling cascade that underlies photoperiodic control of reproduction in commercial layers.

Key Words: Layer, Neuroendocrinology, GnRH, Reproduction

KNOWLEDGE, ATTITUDES AND PRACTICES REGARDING DISINFECTION AND BIOSECURITY AMONG COMMERCIAL POULTRY FARMS IN PUNJAB, PAKISTAN

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2026-PSC-028

Abstract

Effective disinfection is a critical component of biosecurity in commercial poultry production, but its effectiveness depends on adequate knowledge, appropriate attitudes and consistent adherence to recommended practices. This study assessed knowledge, attitudes and practices (KAP) regarding farm disinfection and identified gaps that may compromise biosecurity. A structured KAP survey was conducted among 170 commercial poultry farms in Punjab, Pakistan, comprising broiler (141), layer (15), hatchery (6), breeder (4), and mixed broiler-layer (2) operations. Farm capacities ranged from 18,000 to 450,000 birds. Information was collected on knowledge of disinfectants and procedures, attitudes towards disinfection and training, and reported disinfection and biosecurity practices. Overall KAP was assessed on an 18-point scale. The mean KAP score was 13.7/18 (range: 4–18), with 102 respondents (60.0%) scoring ≥ 14 . Mean knowledge and attitude scores were 4.54/6 and 4.33/5, respectively. Only 91/170 (53.5%) respondents knew which hydrogen peroxide formulation was more effective, the lowest-scoring knowledge item, while 103/170 (60.6%) reported formal staff training in disinfection SOPs. For attitudes, 133/170 (78.2%) supported training farm supervisors by experts. Important practice gaps included disinfectant use on live birds (90/170; 52.9%), adherence to stringent biosecurity measures (115/168; 68.5%), recommended disinfectant contact time (117/170; 68.8%), and use of disinfectant soon after preparation (117/170; 68.8%). Despite a generally favourable overall KAP score, important gaps remain in disinfectant selection, staff training and application practices. Targeted training, standardized SOPs and improved awareness of appropriate disinfectant selection and application are recommended to strengthen biosecurity in commercial poultry farms.

Key Words: Commercial poultry, Disinfection, Knowledge, Practices

SMART AND SUSTAINABLE POULTRY PRODUCTION: INTEGRATING PRECISION NUTRITION, DIGITAL TECHNOLOGIES, AND HEALTH MANAGEMENT FOR FOOD SECURITY

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2026-PSC-029

Abstract

The rapidly evolving poultry industry is facing the dual challenge of meeting increasing demand for animal protein while maintaining production efficiency, animal health, environmental sustainability, and economic resilience. Addressing these challenges requires a transition from conventional production practices toward integrated and technology-driven poultry management systems. This abstract explores the potential of precision nutrition, innovative feed resources, artificial intelligence, digital monitoring, and preventive health management to shape the future of poultry production. Precision nutrition can optimize the supply of energy, amino acids, minerals, vitamins, and functional nutrients according to the physiological requirements of birds, thereby improving feed utilization, growth performance, and production efficiency. Emerging alternatives such as insect-based proteins, agricultural by-products, fermented feed ingredients, probiotics, prebiotics, enzymes, and phytochemical compounds may further improve nutrient utilization while reducing dependence on conventional feed resources. Meanwhile, artificial intelligence, computer vision, Internet of Things (IoT) sensors, and automated monitoring systems provide new opportunities for real-time assessment of bird behavior, growth, environmental conditions, and early health abnormalities. Combining these technologies with strong biosecurity, vaccination, welfare-oriented management, and sustainable farming practices can reduce production losses and improve resilience against disease outbreaks, climate-related stress, and market pressures. A data-driven and integrated production model can ultimately enhance productivity while minimizing resource consumption and environmental impacts. Such innovations have the potential to transform poultry farming into a more efficient, resilient, sustainable, and food-secure sector, contributing substantially to the future availability of affordable and nutritious animal protein.

Key Words: Animal Health, Sustainable Poultry Production, Technology-driven poultry management systems

ANTIBIOTIC RESISTANCE IN POULTRY PRODUCTION: CAUSES AND SOLUTIONS

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2026-PSC-030

Abstract

The poultry industry plays a vital role in providing animal protein and economic growth. However, the inappropriate and unusual use of antibiotics in poultry production has been contributed to emergence of antibiotic resistance bacteria. Antibiotics are commonly used to treat diseases, prevent infections and sometime promote growth in poultry flocks. Excessive use of these drugs can lead to development of resistance microorganisms that no longer respond to standard treatments. Antibiotics resistance poses significant risks to animal and human health. Resistance bacteria can spread through poultry products, farm environments and direct contact with farm animals. Several strategies can help in antibiotic resistance such as implementing farm hygiene, proper vaccines and schedules and using of probiotics and their alternatives. Causes of Antibiotic Resistance Overuse of antibiotics in poultry farms for disease prevention and growth promotion. Incorrect dosage or improper administration of antibiotics. Incomplete treatment courses, allowing some bacteria to survive and develop resistance. Use of antibiotics without veterinary supervision. Poor biosecurity and farm hygiene, leading to frequent disease outbreaks and increased antibiotic use. Continuous use of the same antibiotic, which encourages bacteria to adapt and become resistant. Solutions to Antibiotic Resistance Use antibiotics responsibly and only under veterinary guidance. Improve biosecurity measures to prevent disease entry and spread. Implement effective vaccination programs to reduce the need for antibiotics. Maintain proper farm hygiene and sanitation. Use probiotics, prebiotics, and other alternatives to support bird health. Monitor and regulate antibiotic use in poultry production. Educate farmers and farm workers about antimicrobial resistance and proper drug use.

Key Words: Causes, Solution, Antimicrobial resistance, Poultry production

SEQUENTIAL RECEPTOR ENGAGEMENT DICTATES THE BROAD HOST RANGE AND FITNESS TRADE-OFFS OF SALMONELLA PHAGE PSA5-1

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2026-PSC-031

Abstract

The global rise of multidrug-resistant (MDR) *Salmonella* spp. in poultry production poses a significant threat to animal health, food safety, and public health, necessitating the development of alternative antimicrobial strategies. Here, we characterize PSA5-1, a T4-like bacteriophage isolated from poultry-associated *Salmonella*, and decipher the hierarchical two-step receptor recognition governing its infection of *Salmonella enterica*. We demonstrate that PSA5-1 utilizes the outer-membrane porin C (OmpC) as an essential primary receptor for reversible adsorption, while the lipopolysaccharide (LPS) inner core is required for productive infection. Selection for PSA5-1 resistance reveals distinct evolutionary trajectories: whereas ompC deletion confers resistance with minimal fitness costs, disruption of the LPS core (rfaF) triggers profound physiological remodeling and enhanced biofilm formation. Comparative genomics further indicates that host susceptibility is governed by OmpC sequence conservation and O-antigen diversity, with additional contributions from intracellular defense systems. By mapping the interplay between receptor engagement and resistance-associated trade-offs, our findings provide a mechanistic framework for the rational development of phage-based interventions to control *Salmonella* in poultry production systems.

Key Words: *Salmonella enterica*, Bacteriophage, Phage–host interaction, Phage receptors

VACCINE ADJUVANTS IN POULTRY IMMUNIZATION: MECHANISMS AND ADVANCEMENTS

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2026-PSC-032

Abstract

Vaccination is still one of the most effective prevention measures for infectious diseases in poultry and is also an effective means to achieve sustainable production. The efficacy of vaccines, however, can often rely on the presence of adjuvants that modulate and target immune responses to a particular pathogen. Vaccine adjuvants are substances which enhance antigen presentation, activate innate immunity and promote long-lasting adaptive immune responses. Their use has become greater and greater in recent years in disease control programmes for poultry, particularly in the control of Newcastle disease, avian influenza, infectious bronchitis and infectious bursal disease. In recent years, new immunization technologies have emerged for the development of new adjuvant systems, including nanoparticles, liposomes, cytokine-based adjuvants, agonists to toll-like receptors, and plant-derived immunostimulants. The innovative strategies boost vaccine effectiveness by stimulating specific immune pathways, delivering the antigen more effectively, and triggering the humoral and cellular immune response. Further, there is potential in modern adjuvants to decrease vaccine doses and extend the period of immunity. The work is currently aimed at the formulation of safe and effective adjuvants specific to the poultry species and production system. To optimize vaccine performance, it is important to understand the molecular mechanisms which underlie the adjuvant activity. The continued progress in adjuvants technology will aid in the creation of next generation poultry vaccines leading to better disease management, poultry health, and global food security.

Key Words: Vaccine; NDV; Infectious Bursal Disease; Immunostimulant; TLRs; Food Security

MOLECULAR DIAGNOSTICS OF MYCOPLASMA INFECTIONS IN POULTRY: CRISPR PERSPECTIVES

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2026-PSC-033

Abstract

Mycoplasma infections are one of the most important bacterial diseases of the world poultry industry that affect the respiratory system of birds, leading to such disease states as respiratory disorders, growth performance problems, egg production and significant economic losses. The pathogen *Mycoplasma gallisepticum* and *Mycoplasma synoviae* pose the greatest threat and can be transmitted quickly within a flock and can be very hard to detect in the initial stages of infection. Therefore, it is crucial to make an accurate and timely diagnosis to enable effective disease management and prevention. The traditional diagnostic tools, such as culture assays and serology testing, are commonly used but are time-consuming and may not be sensitive enough for early detection. The molecular diagnosis of *Mycoplasma* infections has undergone a dramatic change in recent years, based on the polymerase chain reaction (PCR), quantitative PCR and nucleic acid amplification technologies. One of these innovations is clustered regularly interrupted short palindromic repeats (CRISPR) based diagnostic platforms, which have the potential to detect pathogens quickly and selectively. The CRISPRs and associated proteins can recognize genetic sequences with a high degree of specificity, which allows detection of low pathogen loads in clinical samples. Research is ongoing to bring about the integration of the CRISPR technology with portable diagnostic devices to allow real-time disease surveillance in poultry farms. Finally, molecular diagnostics using CRISPR technology is a breakthrough in the field of detection and control of *Mycoplasma* infections, which will contribute to better poultry health, biosecurity, and sustainable production.

Key Words: CRISPR; *Mycoplasma*; PCR; Respiratory Disorders; Outbreaks; Birds

PREBIOTICS AND GUT IMMUNE MODULATION IN POULTRY: CURRENT EVIDENCE

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2026-PSC-034**Abstract**

The gastrointestinal system (GIT) is a major site in poultry health because of its function in the absorption of nutrients and the development of the immune system. Prebiotics are considered alternatives to antibiotic growth promoters because they are a non-digestible component of the feed that selectively stimulates gut microbiota. Fructooligosaccharides, mannan-oligosaccharides and inulin are prebiotics that promote the growth of beneficial bacteria like the species of lactobacillaceae and bifidobacteriaceae. These microbial changes lead to greater barrier integrity of the gut, decreased levels of colonizing pathogenic bacteria, and increased production of short-chain fatty acids that are important for immune regulation. In addition, prebiotics have been shown to affect the innate and adaptive immune system, with effects that include enhancing mucosal immunity, boosting antibody responses, and regulating the expression of cytokines. Experimental trials have revealed increased feed conversion efficiencies, a decrease in enteric infections and improved vaccine response in broiler chickens with prebiotic dietary supplementation. But variation in response within the batches resulting from the dosage, composition of the diet, age of the birds, and environmental conditions is still a problem. Moreover, synergistic action of prebiotics and probiotics (synbiotics) is now increasingly being investigated for their additional beneficial effects on gut health. Finally, it can be concluded that prebiotics are a potential method of gut immune modulation in poultry. More work needs to be done to standardise formulations and application methods and fully realise their potential in antibiotic-free poultry production systems.

Key Words: Symbiotic; Prebiotics; Cytokines; Immunity; Gut Health; GIT

EMERGING TRENDS IN CRISPR-BASED DIAGNOSTICS FOR POULTRY VIRAL AND BACTERIAL DISEASES

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2026-PSC-035

Abstract

The poultry industry facing threats from bacterial and viral pathogens including avian influenza (AIV), Newcastle disease virus (NDV), Infectious bronchitis virus (IBV), infectious bursal disease virus (IBDV), and salmonella spp. in diagnostic platforms. Conventional methods like real-time PCR (sensitive and specific) are increasingly supplemented or replaced by CRISPR-Cas-based system specifically Cas12 and Cas13, which offer comparable sensitivity with greater probability. The 2023 study shows that CRISPR-Cas 13a can detect H1-H16 AIV subtypes with a limit of detection of 69 copies/μl which represents 100% consistent relationship with RT-PCR and no cross-reactivity with IBDV, NDV, or IBV. Similarly, RRA-CRISPR-Cas 13a lateral flow dipstick (LFD) assay achieved a sensitivity with 1000-fold higher than conventional PCR-agarose electrophoresis which shows 98.75% clinical coincidence rate and a total time of approximately one hour. The development in CRISPR tools designed via AI and multiplexing platforms that can detect multiple pathogens have led to more creators being able to use CRISPR and multiplexed testing around diagnostic testing directly out in the field. By creating "sample to result" systems paired with AI-assisted guide RNA optimizations represent a new frontier and new opportunities for the bio-surveillance community in terms of the veterinary space. Harmonizing regulations and field validating systems across many different geographical areas with different climatic conditions remain as major barrier to the general adoption of CRISPR in the bio-surveillance community.

Key Words: NDV; IBDV; CRISPR; Bio-Surveillance; PCR; IBV

PHYLOGENETIC EVOLUTION OF IBDV AND ITS IMPLICATIONS FOR VACCINE DEVELOPMENT

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2026-PSC-036

Abstract

Infectious bursal disease virus (IBDV) has a high degree of phylogenetic heterogeneity, including mutation, genomic reassortment, and recombination, which represent serious problems for vaccine efficacy in the global production of poultry. Recent phylogenetic analysis of the sequences of VP2 gene of 31 IBDV isolates in South China during 2023 revealed three different phenotypes including 8 very virulent strains, 11 classical strains, and 12 novel mutant strains with nucleotide identities ranging from 90.7 to 100%, showing characteristic amino acid substitutions at positions 252I, 254N, 262Y, 299S, and 318D that form a distinct lineage and diverge from the previously prevalent variants Variant E and GLS. In China, a 2023-2024 epidemiological survey was carried out, which revealed four strains of coexisting strains of IBDV, with very virulent IBDV (vvIBDV) at 16.1%, attenuated IBDV (attIBDV) at 8.6%, classic IBDV (cIBDV) at 5.4%, and novel variant IBDV (nVarIBDV) at 69.9% of strains. The IBDV was confirmed in 91.4% of broiler and 90.2% of layer samples from Turkish flocks in 2024-2025 period. Antigenic drift variants arise with continual amino acid changes in the VP2 hypervariable region of a vaccine strain resulting in vaccine failure due to the immune selection pressure. The novel VP2 substitutions found in field isolates (A222V and D279H) are not found in commonly used vaccine strains and VP2 dual-segment genotyping system (A1-A9 and B1-B5) offer better clarity in classifications. It is important to continue the development of genotype-matched and multi-valent vaccine formulations and constant phylogenetic surveillance to achieve a continued control of the IBDV.

Key Words: IBDV, VP2, Strain, Phylogenetic, Surveillance, Vaccine

NANOTECHNOLOGY APPLICATIONS IN POULTRY VACCINE DELIVERY SYSTEMS: A REVIEW

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2026-PSC-037

Abstract

Nanotechnology-enabled vaccine delivery system is a promising paradigm shift in improving immunogenicity and efficacy in poultry immunization. Nanoparticles provide the potential for high absorption and bioavailability. Polymeric and lipid nanoparticles, self-assembling proteins, and other nonmaterial are successfully being used as more effective and safer vaccines against devastating diseases such as foot-and-mouth disease, porcine epidemic diarrhea, and pseudorabies. One of the leading platforms is chitosan nanoparticles (CS-NPs) that enhanced antigen uptake at mucosal surfaces in poultry and activated both humoral and cellular immunity by activating cytotoxic T cells, synthesis of cytokines and secretion of immunoglobulins at mucosal surfaces. The levels of blood immunoglobulin G (IgG), interleukin-4 (IL-4) and interferon-gamma (IFN- γ) in chickens vaccinated with N-2-HACC-CMC containing ND and IBV vaccines were significantly higher, exceeding 2-fold of commercial vaccines on day 7 post-vaccination. IFN- γ . Encapsulated Newcastle disease virus in chitosan nanoparticles gave greater protection to specific pathogen free chicken than the live LaSota Newcastle disease vaccine and inactivated Newcastle disease vaccine formulations. Hybrid lipid-polymer nanoparticles are polymeric nanoparticles (e.g., poly (lactic-co-glycolic acid) (PLGA)) coated with lipids to improve their biocompatibility, and lipids-coated gold or silica nanoparticles are used to enhance imaging, thermal responsiveness and modulation of reactive oxygen species. Mucosal immunization routes and optimizing adjuvants are still key to next generation deployment of avian vaccines.

Key Words: ND; IBV; Immunoglobulins; Nanoparticles; Mucosal Immunity; Birds

ADVANCES IN PROBIOTIC APPLICATIONS FOR ENHANCING POULTRY IMMUNE RESPONSE

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2026-PSC-038

Abstract

The growing pressure on producing poultry without using antibiotics has prompted scientists to conduct extensive research on the use of probiotics as sustainable replacements in boosting the health and immune system of birds. Probiotics are live bacteria that, upon administration at sufficient concentrations, provide health benefits to the host by affecting gut microbial population, improving digestion, and stimulating immune system response. Modern research in the field of nutrition and microbiology of poultry reveals the importance of probiotics in developing both innate and acquired immunity in birds. Probiotic genera commonly used for poultry include *Lactobacillus*, *Bifidobacterium*, *Bacillus*, *Enterococcus*, and *Saccharomyces*. Probiotics improve the gut health of poultry by ensuring microbial balance, enhancing the gut barrier function, and preventing pathogenic bacterial growth using the mechanism of competitive exclusion and secretion of antimicrobial substances. In addition to this, probiotics help activate the functions of immune cells, improve the action of macrophages and lymphocytes, encourage cytokine formation, and improve antibody production after immunization. Several studies have shown that probiotics increase immunity against common poultry diseases such as *Salmonella*, *E. coli*, *Clostridium perfringens*, and *Campylobacter* spp. Some of the new advances include the creation of multi-strain probiotics, advanced probiotics, encapsulated formulations, and synbiotics, all of which contribute to better survival and effectiveness of microorganisms in commercial settings. These have yielded positive outcomes in terms of improving disease resistance, decreasing intestinal inflammation, and decreasing the negative impact of stress factors on the environment and management. In light of increasing concerns over antimicrobial resistance, probiotic intervention represents an efficient and environmentally friendly way to boost the immune system of poultry.

Key Words: Probiotics, Poultry Immunity, Gut Health, Disease Resistance, Symbiotic, Sustainable Poultry Production

ROLE OF BACTERIOPHAGES IN CONTROLLING BACTERIAL PATHOGENS IN POULTRY PRODUCTION

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2026-PSC-039

Abstract

The rising levels of resistance in bacteria against antibiotics have necessitated the development of new approaches to deal with infections in poultry. Phages are viruses that can selectively target and kill bacterial cells; they are emerging as potential biological means of managing bacterial infections in poultry. Their specific ability to target bacteria, replication capacity, and minimal effects on helpful bacteria make them promising candidates to replace antibiotics. Advances in the field of phage biology have generated renewed interest in using phages in poultry industry. Phages have shown high effectiveness in combating bacteria associated with chickens, such as *Salmonella* spp., *Escherichia coli*, *Campylobacter* spp., *Clostridium perfringens*, and *Staphylococcus aureus*. With the help of bacteriophage treatment, colonization of bacteria in the intestinal tract can be reduced, shedding of pathogens prevented, and contamination of meat and eggs from chickens minimized. Moreover, phage intervention can be used in various aspects of production, including addition to feed, provision in water, cleaning of the environment, and decontamination of processing plants. These advances include the development of phage cocktails, phage formulation in capsules, and the genetic modification of bacteriophages, which have helped improve the efficacy of therapy and increased the range of their antimicrobial properties. However, there still exist some difficulties associated with the development of resistance to bacteriophages by bacteria, their environmental stability, regulatory issues, and large-scale application. In spite of that, the technology of bacteriophages is an extremely promising and environmentally friendly way to fight bacterial diseases and to decrease the use of antibiotics.

Key Words: Bacteriophages, Poultry Production, Antimicrobial Resistance, *Salmonella*, *Escherichia coli*, Food Safety

METAGENOMICS OF POULTRY VIROME: INSIGHTS INTO VIRAL DIVERSITY AND DISEASE

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2026-PSC-040

Abstract

The avian virome is an unprecedentedly complex, unexplored reservoir of great diversity and dynamics of viral genomes. Next generation sequencing (NGS) in a metagenomics (mNGS) format is a culture independent, determining complete viral communities found in individual gastrointestinal tract, respiratory tract and systemic fluid samples from healthy birds as well as from birds with a variety of diseases. The studies utilize mNGS on whole and concentrated samples. Samples analyzed come from all species of domestic birds at all stages of production from commercial as well as from backyard flocks. Results show that all major groups of animal viruses are present in the gastrointestinal tract, the respiratory tract and in the systemic fluids of healthy domestic birds as well as in those suffering from disease. A number of the viruses identified fall into new genera being proposed, and evidence of recombination has been discovered for both the well-known pathogenic viruses and newly identified ones. The analysis of the correlations between viral communities and various disease conditions provide solid evidence for polymicrobial interactions, enteric dysbiosis and for role of the avian virome in causing runting-stunting syndrome (RSS). Longitudinal analysis also allowed for the identification and validation of several markers for mNGS that enable distinction between healthy and infected birds. Several new surveillance schemes will play a key role in future outbreak control, and will also provide much-needed evidence for or against known host/virus/microbiome interactions that are known to contribute to numerous well-established poultry diseases.

Key Words: Metagenomics; Poultry Virome; Next generation sequencing; Avian disease; viral diversity

BACTERIOPHAGE APPLICATIONS IN CONTROLLING SALMONELLA IN POULTRY ENVIRONMENTS

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2026-PSC-041

Abstract

The presence of *Salmonella* spp. in all stages of poultry production is a long-standing issue in food safety and a zoonotic risk, and other control measures are needed as antimicrobial resistance increases and consumer concerns about chemical usage in food products also grow. Bacteriophages are obligate parasitic viruses of bacteria, species specific, that have the ability to lyse *Salmonella* spp. by lytic or lysogenic routes of action, with the ability to self-amplify. Phage therapy has several mechanisms of action, such as the direct lysis of bacterial cells, disruption of biofilms via polysaccharide depolymerase enzymes, and the alteration of the expression of virulence factors. Oral, drinking water, and spray administration of lytic bacteriophages resulted in significant reductions across all strains of *Salmonella* in broilers and layers depending on the phage-host strain pairing, timing of administration, and environmental conditions. These are important features: fast acting, persistence in the environment in farm situations, no systemic uptake and integration with existing biosecurity and vaccination strategies. However, there are also significant challenges in rapid emergence of phage-resistant *Salmonella* variants, phage stability over temperature and pH ranges and the limited host range of phages for application to a broad range of serovars, and regulatory uncertainty on the use of phages as therapeutic products and feed additives. Characterization of phage resistance mechanisms by genome sequencing, and the creation of new engineered phages that have a wider host range are appealing options.

Key Words: *Salmonella* spp, Bacteriophage, Poultry, Phage-resistance, Food safety

ISOLATION OF MULTIDRUG-RESISTANT KLEBSIELLA PNEUMONIAE FROM POULTRY FARMS: EVALUATION OF ANTIBIOTIC SYNERGISTIC COMBINATIONS

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2026-PSC-042

Abstract

Klebsiella pneumoniae (*K. pneumoniae*) is a significant multidrug-resistant (MDR) pathogen affecting humans and animals, and is a main cause of nosocomial infections with high fatality rates due to limited available treatments. This study aimed to assess the frequency of MDR *K. pneumoniae* strains isolated from poultry farms in the Faisalabad district, assess their antimicrobial susceptibility, and evaluate the synergistic effects of antibiotic combinations. Chicken cloacal swabs (50) were taken randomly and cultured on MacConkey agar and CHROMagar™ for the selective isolation of *K. pneumoniae*. Isolates were further confirmed by Gram staining and biochemical tests (catalase and IMViC). Antimicrobial susceptibility testing (AST) against the antibiotic's imipenem, amoxicillin, ceftriaxone, ceftazidime, meropenem, and fosfomycin was performed using the Kirby-Bauer disc diffusion method. The synergistic effect of 28 antibiotic combinations was tested by the microdilution method, interpreted by the Fractional Inhibitory Concentration (FIC) index. Most strains of *K. pneumoniae* were resistant to multiple drugs, except for Imipenem, meropenem, and fosfomycin. The MICs of the following drugs, gentamicin, amoxicillin, meropenem, and ceftriaxone, were calculated through the micro-dilution method as 64µg/ml, 128µg/ml, and 256µg/ml, respectively. To assess synergistic effects, FIC values were calculated, and 28 drug combinations were evaluated. Out of these combinations, 4 combinations showed synergism that can be useful in the treatment of MDR *K. pneumoniae*. The result shows a high prevalence of MDR in poultry farms and synergistic combinations with potential therapeutic uses.

Key Words: *K. pneumoniae*, Poultry, MDR, FIC index

CRISPR-CAS DIAGNOSTICS FOR MYCOPLASMA DETECTION IN POULTRY

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2026-PSC-043

Abstract

Chronic respiratory disease and reproductive disorders are important economic losses in commercial poultry caused by mycoplasma species. Current diagnostic techniques are not rapid and need special laboratory facilities, restricting point-of-care detection capability. CRISPR-Cas diagnostics can provide sensitive and specific and fast detection alternatives for field-deployable applications in low resource settings. A conserved 16S rRNA sequence was targeted to develop a CRISPR-Cas13 diagnostic platform for *Mycoplasma gallisepticum* and *Mycoplasma synoviae*. A set of crRNA-tracrRNA constructs was designed and synthesized, and Cas13 protein was expressed in *Escherichia coli*. The assay used isothermal amplification (RT-LAMP) and detection using a fluorescently-labeled RNA reporter system. The diagnostic performance was tested against 180 clinical samples (oropharyngeal swabs, serum) with conventional PCR and culture as reference methods. Specificity was evaluated using non-*Mycoplasma* avian pathogens. The sensitivity of the CRISPR-Cas13 assay in detecting *M. gallisepticum* was 96.7% and the specificity was 98.3%, with a detection time of No cross reactivity was seen with *M. synoviae*, Newcastle Disease Virus or avian influenza when tested on the platform. LOQ: ~10 copies/μL. The assay was tested under a variety of sample types and environmental conditions and performed reliably without the need of sophisticated laboratory equipment. CRISPR-Cas13 based diagnostics offer a quick, sensitive, low cost detection method to detect *Mycoplasma* that could be used for on-farm surveillance in commercial poultry enterprises, allowing timely action and biosecurity measures to be taken.

Key Words: CRISPR-Cas13, *Mycoplasma gallisepticum*, Poultry, Diagnostic, Rapid detection

MOLECULAR DETECTION OF MYCOPLASMA GALLISEPTICUM IN LAYER FARMS

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2026-PSC-044

Abstract

M. gallisepticum is one of the foremost respiratory pathogens, leading to the financial loss in layer production. In this molecular epidemiological study, 312 tracheal swabs and 156 serum samples were collected from 28 commercial layer farms in 2023. PCR of *M. gallisepticum* based on 16S rRNA gene sequences was carried out on samples and a total of 104 samples (23.1%) resulted positive. Geographical analysis showed the prevalence of four spatial clusters of *M. gallisepticum* where highly frequent sites were identified at the locations that relied on common water sources and suffered from faulty biosecurity procedures. Serological analysis with an ELISA yielded antibody-positive results in 156 of the 392 samples tested (39.8%), the optical densities of which were observed to be proportional to PCR result. The RFLP of the amplified PCR product showed the existence of two prominent types, designated as type A (64%) and type B (36%) strain. The sequence analysis of these types showed numerous polymorphic sites at variable surface antigen region (VSA), indicating continued antigenic drift. Positive farms for naturally occurring infection also had raised inflammatory marker concentrations in serum: increased CRP (3.2-fold) and SAA (2.8-fold). Performance data of layers reported the average reduction in egg production rate (18-24%), increase in FCR (12%) and decrease in egg quality criteria (7-9%) for birds that had suffered naturally incurred infections with *M. gallisepticum*. The results call for strengthening of monitoring systems and enhancing the biosecurity measures in layer farms.

Key Words: *Mycoplasma gallisepticum*, PCR, Layer farms, Respiratory disease, Molecular epidemiology

DEVELOPMENT OF RECOMBINANT VACCINE CANDIDATE AGAINST NEWCASTLE DISEASE VIRUS

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2026-PSC-045

Abstract

The recombinant vaccines can be utilized to develop a safer and more effective Newcastle disease vaccine. This study involved the design and testing of a recombinant NDV vaccine candidate in the baculovirus expression system. Recombinant NDV fusion protein and hemagglutinin-neuraminidase proteins were expressed separately in *Spodoptera frugiperda* insect cells with 2.1 mg/L and 1.8 mg/L, respectively. Enzyme-linked immunosorbent assays showed that the recombinant proteins had native epitopes, and the NDV-positive sera recognized these proteins at levels of 1:1024 to 1:4096. Immunogenicity studies were done in specific-pathogen-free chickens on different vaccine formulations, including recombinant protein adjuvanted with oil-emulsion, alum or MF59-equivalent adjuvants. The mean log₂ 4-weekly HAI titres were 256 for oil, 128 for alum, and 512 for MF59-equivalent. Challenge studies with virulent NDV genotype VII at day 42 demonstrated a 92% protection rate in the vaccinated birds in comparison to 85% of deaths among the controls. The severity of clinical signs was reduced by 72-78% and virus shedding in tracheal swabs was reduced by 68-74% in protected birds. Doses of immunity showed strong immunity for 16 weeks after vaccination. The lyophilized recombinant formulations had demonstrated a >85% antigenicity after 12 months when stored at 37°C by thermostability analysis. Initial dose optimization studies indicated a 50µg dose of recombinant protein to be optimal, and not to be associated with any adverse effects. The results are encouraging towards field trials and commercialization.

Key Words: Recombinant vaccine, Newcastle disease virus, Baculovirus expression system, Immunogenicity, Vaccine development

CRISPR-BASED DIAGNOSTIC ASSAY FOR RAPID DETECTION OF AVIAN INFLUENZA VIRUS

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2026-PSC-046

Abstract

A method was developed to detect the conserved sequences of the matrix protein-1 gene of avian influenza viruses using a CRISPR-Cas13 diagnostic system to detect them quickly. Bioinformatic analysis of the 847 influenza sequences from GenBank was used to guide the design of guide RNA. The assay also proved to be 10² genome copy sensitive, whereas conventional RT-PCR were 10¹ copies sensitive. Clinical validation was conducted against 156 samples, 89 avian influenza positive, 42 Newcastle disease positive and 25 other pathogens, with 96.6% sensitivity and 97.6% specificity, and a 65% reduction in turnaround time compared to RT-PCR of 2–3 hours. Point-of-care format was used, with lateral flow visualization, which did not require specialized equipment. By using multiplex analysis, it was possible to target the neuraminidase and hemagglutinin genes simultaneously, allowing the detection of subtype differentiation. Analytical validation showed that calibration was linear in the range of 7 log (R²>0.98). A total of 324 respiratory samples were collected from 12 poultry operations, of which 47 were positive (14.5%) and 94.1% were concordant with the RT-PCR test. The cost analysis showed that the CRISPR-based testing is cheaper than the RT-PCR at USD 3.20 per sample compared to USD 8.50 per sample. The data are useful for developing on-site surveillance and decision-making tools for poultry disease management via CRISPR diagnostics.

Key Words: CRISPR-cas13, Avian influenza virus, Rapid diagnosis, Molecular diagnostics, Point-of-care testing

NANO-ENCAPSULATED VACCINES FOR ENHANCED POULTRY IMMUNITY

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2026-PSC-047

Abstract

The poultry sector is constantly confronted with problems associated with infectious diseases, which affect the welfare, productivity, and economic value of birds. Traditional immunization approaches have effectively contributed towards reducing the disease burden; nevertheless, their inefficiencies like poor antigen stability, rapid degradation, and inadequate immune responses require innovative vaccine delivery methods. Nano-vaccines are an effective means to increase the effectiveness of vaccines and provide sustained immunity in poultry. Nanoparticles act as excellent carriers for vaccines that protect antigens from any type of environmental degradation, offer targeted delivery of vaccine antigens, and allow controlled antigen release. All these factors contribute to efficient antigen uptake by immune cells and activate both humoral and cellular immunity. Liposome, polymeric, chitosan and lipid nanoparticles have shown immense promise in delivering viral, bacterial, and recombinant antigens for the major poultry diseases including Newcastle disease, avian influenza, infectious bursal disease, and salmonellosis. Moreover, there are various other modes of administering vaccines due to nano-encapsulation that include oral and intranasal modes of delivery, which helps minimize stress on handling and make vaccinations more effective in large populations of chickens. There have been many reports indicating increased antibody titers, improved mucosal immunity, and longer immune response after administering vaccines with nanoparticles. Although there are many advantages of using such vaccines, the problems associated with their large-scale production, cost-effectiveness, biosafety assessment, and regulatory approval should not be overlooked.

Key Words: Nano-encapsulation, Poultry immunity, Vaccine delivery systems, Nanoparticles, Avian diseases, Immunization

EFFICACY OF GREEN-SYNTHESIZED SILVER NANOPARTICLES FROM *FUSARIUM OXYSPORUM* AGAINST POULTRY ECTOPARASITES

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2026-PSC-048

Abstract

Pakistan's poultry industry contributes approximately 1.8% to the national GDP and 40% of the total meat production, yet ectoparasitic infestations continue to impose substantial economic losses through reduced productivity, poor feed conversion efficiency, anemia, decreased egg production, and transmission of infectious agents. The widespread emergence of acaricide resistance and concerns regarding chemical residues have intensified the need for environmentally sustainable alternatives. In this study, an indigenous isolate of *Fusarium oxysporum* was employed for the extracellular biosynthesis of silver nanoparticles (AgNPs) as a green nanobiotechnological approach for the control of the poultry ectoparasites *Argas persicus* and *Dermanyssus gallinae*. The fungal isolate was molecularly confirmed through ITS sequencing, and AgNP synthesis was optimized across a pH range of 4–9. Successful nanoparticle formation was confirmed by a characteristic surface plasmon resonance peak at 428 nm using UV–Visible spectroscopy. X-ray diffraction analysis demonstrated the crystalline nature of the nanoparticles, while scanning and transmission electron microscopy revealed predominantly spherical and well-dispersed particles with diameters ranging from 18 to 42 nm (mean 27.6 ± 5.8 nm). Dynamic light scattering analysis showed a mean hydrodynamic diameter of 34.8 ± 7.1 nm with a polydispersity index of 0.29, whereas zeta potential measurements (-28.4 ± 2.3 mV) indicated good colloidal stability. Fourier-transform infrared spectroscopy confirmed the presence of fungal proteins and phenolic compounds acting as natural reducing and capping agents. Laboratory bioassays demonstrated significant acaricidal activity of the biosynthesized AgNPs against both ectoparasite species. AgNPs synthesized at acidic pH (4–5) produced $96.8 \pm 2.1\%$ mortality of adult *A. persicus* and $94.2 \pm 2.8\%$ mortality of *D. gallinae* within 24 h, significantly higher than nanoparticles synthesized at neutral or alkaline pH (P *A. persicus* and 21.5 µg/mL for *D. gallinae*, while the corresponding LT₅₀ values were 8.6 h and 10.2 h, respectively. Comparative evaluation with commercial cypermethrin demonstrated equivalent acaricidal efficacy, whereas no detectable silver residues above permissible analytical limits were observed in eggs or muscle tissue following preliminary safety assessment. These findings suggest that myco-synthesized AgNPs derived from indigenous *F. oxysporum* represent a promising eco-friendly acaricidal candidate for integrated management of poultry ectoparasites.

Key Words: *Fusarium oxysporum*, Silver nanoparticles, Green synthesis, Poultry ectoparasites

EFFECTS OF AFLATOXIN B₁-INDUCED TOXICITY ON GROWTH PERFORMANCE, IMMUNE RESPONSE, ANTIOXIDANT CAPACITY, IMMUNE ORGAN WEIGHTS, AND HEPATIC FUNCTION IN JAPANESE QUAILS

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Abstract

This study investigated the dose-dependent effects of dietary Aflatoxin B₁ (AFB₁) on growth performance, immune function, antioxidant status, lymphoid organ development, and hepatic function in Japanese quails over a 28-day feeding trial. A total of 400 day-old quail chicks were randomly assigned to four dietary treatments (T₁–T₄) in a completely randomized design, with five replicates of 20 birds each. Birds in the control group (T₁) were fed a basal diet without AFB₁, whereas birds in the treatment groups (T₂, T₃, and T₄) received the basal diet supplemented with AFB₁ at concentrations of 1, 2, and 4 mg/kg, respectively. Growth performance indices, immune response parameters, antioxidant biomarkers, lymphoid organ weights, and hepatic function indicators were evaluated across all experimental groups. Dietary exposure to AFB₁ resulted in significant, dose-dependent reductions in feed intake and body weight gain, alongside impaired feed conversion ratios and increased mortality. Humoral immune responses progressively declined with rising AFB₁ levels, accompanied by marked atrophy of the bursa and thymus, whereas spleen weight significantly increased. Oxidative stress was evident from elevated malondialdehyde levels and marked suppression of key antioxidant enzymes, including superoxide dismutase and glutathione peroxidase. Furthermore, hepatic injury was confirmed by significant elevations in serum alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, and total bilirubin levels, along with concurrent reductions in serum albumin and total protein concentrations. Taken together, these findings demonstrate that dietary AFB₁ exerts profound, dose-dependent negative effects on growth performance, immune competence, antioxidant defenses, and hepatic function in Japanese quails, underscoring the critical need for rigorous mycotoxin surveillance and effective mitigation strategies to protect quail health and maintain production efficiency.

Key Words: Aflatoxin B₁, Japanese quail, Growth performance, Immune response, Hepatic function

COMPARATIVE EVALUATION OF INFECTIOUS BRONCHITIS VACCINES IN BROILERS: IMPACT ON GROWTH PERFORMANCE, MORTALITY, AND IMMUNE RESPONSE

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2026-PSC-050

Abstract

This study evaluated the effects of three commonly used imported infectious bronchitis (IB) vaccines on the health and production of broilers. Two-hundred-and-forty-day-old Ross-308 broiler chicks were randomly allotted to four groups (six replicates of ten birds each). The control group received no vaccine administration, while groups IB4-91, IBMa5C, and IBH-120 were vaccinated against IB vaccines on days 7 and 21. The vaccine used in Group IB4-91 was from Nobilis®, Vety-Care Pvt Ltd, in group IBMa5 from Nobilis®, and in group IBH-120 from Medivac, Hilton Pharma. Growth performance parameters (feed intake, body weight gain, feed conversion ratio) were not significantly different ($p>0.05$) among the groups throughout the 35-day trial. However, immune response and mortality were significantly influenced by vaccine type. Group IB4-91 showed a significantly higher antibody titer ($p=0.032$) and achieved 0% mortality, which was significantly lower ($p=0.030$) than the other groups. In contrast, control, IBMa5, and IBH-120 all displayed 3.33% mortality and exhibited mild to moderate respiratory symptoms, with post-mortem findings revealing tracheal and lung congestion. It is concluded that while the tested imported vaccines did not impact growth, the IB4-91 vaccine provided superior protection, as evidenced by the highest antibody titers and the complete absence of mortality.

Key Words: Broiler, FCR, Immunity, Mortality, Vaccine.

SUBVERTING AVIAN IMMUNITY: CELLULAR RESPONSES OF AVIAN PBMCS TO *SALMONELLA GALLINARUM* Δ PURB REVEALED THROUGH ROS PRODUCTION, APOPTOSIS, CELL CYCLE AND CELLULAR PROLIFERATION ASSAYS

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Abstract

Salmonella enterica subspecies *enterica* serovar Gallinarum causes fowl typhoid and continues to threaten poultry health and productivity worldwide. The development of attenuated strain provides a potential strategy for vaccine design; however, how these genetically modified strains influence host cellular responses remain vital. This study aimed to decipher the effects of *purB* on host immune cell dynamics using an in vitro poultry peripheral blood mononuclear cells (PBMCs) model. PBMCs were infected with *Salmonella* Gallinarum wild type (SG-WT) and *Salmonella* Gallinarum Δ purB (SG- Δ purB) and flow cytometry analysis were performed to assess ROS production, apoptosis, cell cycle progression and cellular proliferation. Data from control and infected groups were compared statistically to determine whether the *purB* gene alter the host immune response that is associated with bacterial virulence. Results showed that SG-WT showed above 80% ROS production level and SG- Δ purB show 60-65%. However, there was no statistically significant difference observed between these two bacterial strains. SG-WT induced 36% apoptosis and compared with 38% by the SG- Δ purB indicating no significant difference. Similarly, cell cycle analysis revealed no significant changes across the G0/G1, S and G2/M phases. PBMC proliferation increased progressively in uninfected control over time, whereas SG-WT and its Δ purB mutant infection significantly inhibited proliferation at all-time points. These findings indicate that the deleted *purB* gene does not markedly influence PBMCs survival. Future studies may include other gene deletions to improve these immunofindings for production of better vaccines of poultry industry.

Key Words: *Salmonella Gallinarum*, Poultry, PBMCs, ROS, Apoptosis, Cell cycle, Cellular proliferation, Flow cytometry.

PHYTOCHEMICAL-PATHOGEN INTERACTION: MOLECULAR MECHANISMS UNDERLYING THE MODULATION OF CLOSTRIDIUM PERFRINGENS PATHOGENESIS IN POULTRY

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Abstract

Phytochemicals are the bioactive substances found in plants and have been discussed as having potential in replacing the use of antibiotics in the treatment of bacterial infections and as a way of enhancing health in animals. The issue of antimicrobial resistance, as well as the prohibition of antibiotic growth promoters, has made the necessity to find an alternative, natural approach to poultry production more urgent. Necrotic enteritis (NE) which is mainly due to *Clostridium perfringens* and commonly aggravated by *Eimeria* infections and mycotoxins is a significant economic and welfare threat. Recent studies have noted the possibility of plant derived substances like tannins, flavonoid, saponins, alkaloids and essential oils to prevent the paths of pathogen bacteria, to regulate microbiota in the gut and to boost host immunity. The phytochemicals have multimodal biological effects such as antimicrobial, antioxidant, anti-inflammatory and immunomodulatory. Experimental research shows that phytochemicals interfere with bacterial cell membranes, toxin production and intestinal inflammation, and as such, inhibit NE and alleviate the performance of poultry. Their usage also helps to promote gut integrity and nutrient absorption, which is comparable to the traditional antimicrobial growth promoters, and they do not lead to resistance. Although promising, standardization of composition, stability and standardization of dosages are key issues. This is a review of existing knowledge about the antibacterial and immunomodulatory effects of phytochemicals and their effectiveness in the management of clostridial infections, formulation approaches and research gaps. The use of phytochemicals is one of the plausible sustainable poultry production and disease control methods in the post-antibiotic era.

Key Words: Necrotic enteritis, Herbs, Phytochemicals, Enteric, Poultry

POULTRY CONSUMPTION PATTERNS AND PUBLIC PERCEPTIONS DURING COVID-19 IN TEHSIL SHAKARGARH, PUNJAB, PAKISTAN: PUBLIC HEALTH IMPLICATIONS

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Abstract

This study assessed poultry consumption practices, knowledge, and perceptions among residents of Tehsil Shakargarh, Punjab, Pakistan. Primary data were collected from five randomly selected households in each of 285 localities, resulting in a total sample of 1,425 respondents. Face-to-face interviews were conducted using a structured questionnaire, while geographic coordinates were recorded with a Garmin eTrex device alongside relevant meteorological information. Regarding commercial broilers, 38.8% of respondents demonstrated basic knowledge, whereas 61.2% had an intermediate level of understanding. Misconceptions were common: 70.3% believed that hormones or antibiotics were added to poultry feed, 0.2% were misinformed about leg weakness in broilers, and 17.3% held both misconceptions, while 12.2% reported neither. Egg consumption was preferred by 97.6% of participants; among them, 51.7% favored commercial chicken eggs and 48.3% preferred eggs from domestic chickens. White eggs were slightly more popular than brown eggs (51.5% versus 48.5%). Only 1.3% of respondents considered poultry consumption a possible cause of COVID-19, while 65.7% rejected this belief and 33.0% were uncertain. Almost all participants (99.9%) recognized the role of dietary protein in supporting immunity, and 65% specifically associated these benefits with poultry meat and eggs. Moreover, 99.7% experienced no difficulty obtaining poultry products during lockdowns. However, only 46.3% believed that properly cooked and safely handled poultry meat could be consumed safely during disease outbreaks. These findings highlight poultry meat and eggs as accessible and valuable nutritional resources during the COVID-19 pandemic, particularly in populations vulnerable to protein deficiency. Strengthening commercial poultry production and improving public awareness may help maximize the nutritional and public health benefits of poultry products.

Key Words: Poultry consumption; Consumer perceptions; Broiler chickens; Egg consumption; COVID-19; Food safety; Public health; Protein nutrition

BIOCONSORTIUM OF BACILLUS SUBTILIS AND SACCHAROMYCES CEREVISIAE AS A NOVEL ALTERNATIVE TO BENTONITE AND SYNTHETIC MYCOTOXIN BINDERS FOR AMELIORATION OF AFLATOXIN B1 TOXICITY IN BROILERS

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Abstract

Aflatoxin B1 (AFB1) contamination in poultry feed remains a significant challenge to broiler production, necessitating cost-effective biological mitigation strategies. The present study was designed to investigate the ability of a *Bacillus subtilis*-*Saccharomyces cerevisiae* bioconsortium to ameliorate and provide in-vivo protection against AFB1 challenge, compared with a commercial synthetic binder and bentonite clay. In-vitro AFB1 detoxification assays showed that the bioconsortium adsorbed up to 83.6% of AFB1 in 30 min, compared with 56.1% for the *B. subtilis* monoculture and 59.8% for the *S. cerevisiae* monoculture. A total of 150-day-old broiler chicks were assigned to six groups and raised for 35 days: (A) AFB1 + bioconsortium, (B) AFB1 + commercial binder, (C) AFB1 + bentonite clay, (D) AFB1 only, (E) mycotoxin-free feed, and (F) bioconsortium only. Supplementation with the bioconsortium restored the feed conversion ratio (FCR) to 1.25 by week 5, not significantly different from the unchallenged control group (1.40), whereas birds challenged with AFB1 alone continued to worsen (1.63). Biochemical and haematological indices in bioconsortium-supplemented birds remained comparable to healthy controls. Notably, serum residual AFB1 in the bioconsortium-supplemented group remained below the assay's limit of detection (3 µg/L) throughout the trial. In contrast, birds receiving synthetic toxin binders showed measurable AFB1 breakthrough by day 28 while (51.4-46.8 µg/L) by day 35. Histopathological examination showed minimal lesions in bioconsortium-supplemented birds, in contrast to extensive hepatic necrosis, haemorrhagic sinusoidal congestion, and intestinal villus atrophy in AFB1-challenged birds. These findings indicate that the *B. subtilis* and *S. cerevisiae* bioconsortium is a promising biological alternative to synthetic toxin binders for broiler chicks consuming AFB1-contaminated poultry feed.

Key Words: *Bacillus subtilis*, *Saccharomyces cerevisiae*, Aflatoxin B1, Synthetic toxin binders, Poultry

GENETIC OUTLOOK OF COLISTIN RESISTANT *SALMONELLA ENTERICA* SEROVAR TYPHIMURIUM RECOVERED FROM POULTRY-ENVIRONMENT INTERFACE: A ONE HEALTH STANDPOINT

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2026-PSC-055

Abstract

Salmonellosis is a significant public health concern globally, primarily caused by the consumption of environmentally driven contaminated food and water. *Salmonella enterica* has the ability to infect human and animals via associated environment, that makes this bacterium one of the potential one health pathogens. Regrettably, irrational antimicrobial use (AMU) in food producing animals (FPAs) like poultry creates selection pressure that leads to the emergence of resistance against critically important antibiotics for human medicine such as colistin. In this study, *Salmonella enterica* serovar Typhimurium isolates were recovered from poultry and their associated environments. Confirmation and antibiotic resistance profiling of the isolates was done through standard microbiological procedures and clinical and laboratory standards institute (CLSI) guidelines. Whole-genome sequencing (WGS) was employed to assess the genomic features of the *S. enterica* isolates, with a focus on identifying antimicrobial resistance and virulence genes. Phylogenetic relationships were analyzed through comparative genomics and whole-genome multi-locus sequence typing (wgMLST). The results revealed a significant distribution (23%) of *S. Typhimurium*, whereas 8% among them were colistin resistant. The isolated strain exhibited unique genetic outlook compared to previously reported genomic characteristics. Notably, unlike other *S. enterica* genomes from poultry-related environments, this isolate contained a complete phage (Sal3) integrated into its genome. Several virulence genes and antibiotic resistance genes (ARGs) were identified, responsible for the distinct pathogenic ability of *S. enterica*. The present study displayed a detailed genomic vista of *S. enterica*, that may be useful for the future interventions to control the infections caused by this one health pathogen.

Key Words: *Salmonella enterica*, WGS, Virulence Genes, Comparative Genomics, Pathogen, Poultry, Environment

IMPACT OF T-2 TOXIN EXPOSURE ON POULTRY HEALTH IMMUNITY AND PRODUCTION PERFORMANCE

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Abstract

T-2 toxin is a highly toxic type A trichothecene mycotoxin produced mainly by *Fusarium* species and is frequently associated with contaminated cereals and poultry feed. Poultry are particularly susceptible to T-2 toxin, which can adversely affect feed intake, growth, feed efficiency, immune function, and overall production performance. The primary cellular mechanism of T-2 toxin toxicity involves inhibition of protein synthesis, which may subsequently induce oxidative stress, apoptosis, and cellular damage. In poultry, T-2 toxin exposure has been associated with cytotoxic, immunotoxic, hepatotoxic, gastrointestinal, renal, reproductive, skeletal, and neurological effects. Common clinical manifestations include reduced feed consumption, weight loss, oral lesions, gastrointestinal irritation, dermatitis, abnormal feather development, and reduced egg production. Dietary concentrations of 2–6 mg/kg have been reported to reduce feed consumption, body weight gain, and feed efficiency, while concentrations of 0.5–1 mg/kg may induce oral lesions. T-2 toxin exposure may also cause proventricular mucosal necrosis, gizzard erosion, tibial dyschondroplasia, poor egg quality, and ovarian regression in laying birds. Its immunosuppressive effects include leukopenia, regression of the bursa of Fabricius, and increased susceptibility to infections such as *Salmonella*. Collectively, these effects can compromise poultry health, welfare, and productive efficiency. Therefore, regular monitoring of T-2 toxin contamination and effective mitigation strategies are essential for maintaining poultry health, ensuring feed safety, and supporting sustainable poultry production.

Key Words: T-2 Toxin, Tricothecene, Poultry Feed

GUT MICROBIOME MODULATION AS AN INNOVATIVE STRATEGY FOR ENHANCING RESILIENCE AND FOOD SECURITY IN INDIGENOUS POULTRY PRODUCTION

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2026-PSC-057

Abstract

Background: As global food security increasingly depends on resilient and sustainable livestock systems, the poultry sector faces mounting pressure to reduce antibiotic dependency while maintaining productivity and disease resistance. The gut microbiome, a key driver of nutrient utilization and immune competence, offers a promising yet underexplored avenue for building resilient indigenous poultry systems, particularly in resource-limited backyard farming contexts that contribute substantially to household food security. **Objectives:** This study aimed to characterize the gut microbiota composition of indigenous poultry birds and to assess its association with growth performance and disease resistance, with the goal of identifying microbiome-informed strategies to strengthen poultry resilience and sustainable production. **Methodology/Study Design:** A cross-sectional study was conducted on indigenous poultry flocks in District Bahawalpur, Pakistan. Fecal and cecal content samples were collected from healthy and clinically affected birds across varying age groups and management systems. Bacterial isolation and identification were performed using standard culture-based methods, supplemented by molecular profiling of dominant taxa, including *Lactobacillus*, *Escherichia coli*, *Salmonella*, and *Clostridium* species. Flock management, dietary practices, and health records were analyzed to identify correlations between microbiome composition and disease susceptibility. **Results/Findings:** Gut microbial diversity differed significantly with management practices and health status. Beneficial *Lactobacillus* populations were reduced in birds exhibiting enteric disease, while pathogenic taxa were more prevalent in poorly managed flocks, indicating a clear link between microbiome balance and flock resilience. **Significance:** These findings position gut microbiome management as an innovative, low-cost tool for enhancing disease resistance and productivity in indigenous poultry systems. Integrating microbiome-based interventions, such as targeted probiotics, into backyard poultry practices can strengthen production resilience and support long-term food security in resource-limited farming communities.

Key Words: Gut microbiome, Indigenous poultry, Resilience, Food security, *Lactobacillus*, Sustainable production

EVALUATION OF BIOTECH-GOLD AS A NATURAL ALTERNATIVE TO ANTIBIOTIC GROWTH PROMOTERS IN BROILERS

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2026-PSC-058

Abstract

The restriction of antibiotic growth promoters (AGPs) in poultry production has increased the need for natural feed additives that maintain broiler health and productivity. The present study evaluated Biotech-Gold, a commercial yeast-based supplement containing yeast cell metabolites, fermented molasses, organic acids, glucose, and yeast culture, as an alternative to a conventional AGP. A total of 120 day-old commercial broiler chicks were randomly allocated to three groups with four replicates per group and reared for 35 days. Group A received a basal diet without additives, Group B received lincomycin at 1 g/L drinking water, and Group C received Biotech-Gold at 1 mL/L drinking water. Growth performance, feed conversion ratio (FCR), antibody responses against infectious bursal disease (IBD) and Newcastle disease (ND), relative immune-organ weights, jejunal histomorphology, and serum catalase (CAT) and superoxide dismutase (SOD) activities were assessed. Biotech-Gold improved feed efficiency, producing the lowest mean FCR (0.82 ± 0.42) compared with the AGP (0.90 ± 0.46) and control (0.92 ± 0.47) groups. At day 35, the Biotech-Gold group showed the highest reported ND antibody-titer score (6.3 ± 0.33), thymus weight ($0.95 \pm 0.04\%$), bursa of Fabricius weight ($0.60 \pm 0.03\%$), and spleen weight ($0.26 \pm 0.01\%$). Jejunal villus height was greatest in the Biotech-Gold group ($1358.33 \pm 17.10 \mu\text{m}$), compared with the AGP ($1068.33 \pm 17.56 \mu\text{m}$) and control ($859.67 \pm 23.46 \mu\text{m}$) groups. Serum CAT and SOD activity also showed the highest values in Biotech-Gold-supplemented birds at the end of the trial. These findings indicate that Biotech-Gold may support feed efficiency, intestinal development, immune-associated indices, and antioxidant status in broiler chickens and has potential as a natural alternative to AGPs under the conditions of this study.

Key Words: Broilers, Biotech-Gold, Yeast metabolites, Antibiotic growth promoters, Intestinal morphology, Antioxidant enzymes

INFECTIOUS BURSAL DISEASE AND CHICKEN INFECTIOUS ANEMIA CO-INFECTION IN COMMERCIAL BROILERS

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Abstract

Pakistan is an agro-livestock based economy and poultry industry is major segment of livestock based agricultural GDP. Poultry industry is fast-growing sector of livestock with annual growth rate of 8-10%. Intensive poultry production is facing many challenges among these infectious diseases of poultry is a major challenge faced by national poultry industry. Among these infectious diseases, immunosuppressive diseases leading to heavy economic losses. At present infectious bursal disease (IBD) and chicken infectious anemia (CIA) are major devastating viral immunosuppressive diseases. The current study was planned to investigate the coinfection of infectious bursal disease and chicken infectious anemia in commercial broilers from Pakistan. To investigate the current outbreak of IBD and its coinfections a total of 300 samples suspected for IBD were collected from different broiler farms of Central Punjab Province of Pakistan which is poultry hub of Pakistan. Liver was used to extract DNA (CIA) by using Gene JET genomic DNA purification kit of thermos scientific® and bursa of fabricius was used for RNA (IBD) extraction using Gene JET RNA purification kit of thermos scientific®, commercially available, cDNA was prepared from RNA by using RevertAid First Strand cDNA synthesis kit by thermos scientific®. These samples were subjected to PCR and RTPCR to detect CIAV and IBDV. Gross lesions on visceral organs were observed and tissues were subjected to histopathological examination by paraffin embedding technique. The results of PCR indicated 195/300 (65%) were found positive for IBD. Among these 195 positive samples for IBD, 101 samples were also positive for CIA which indicated high level of coinfection of IBD and CIA. As both of these are immunosuppressive diseases their coinfection lead to high mortality. At necropsy birds showed severe nephritis, haemorrhagic lesions in bursa and subcutaneous and intramuscular haemorrhages, cheesy material in bursa lumen along with haemorrhages at junction of proventriculus and gizzard. The birds suffering with coinfection of IBD and CIA showed haemorrhages on heart, pale bone marrow and blue wings. Microscopically lymphocytic depletion was present both in cortex and medulla of bursa and thymus. Acute tubular necrosis was also present indicting severe nephritis. Inflammatory zones, cellular infiltration and severe congestion was present in renal and hepatic parenchyma. Interfollicular connective tissue was more and cavities were also present in cortex and medulla in bursa. The results of current investigations may be concluded that coinfection of IBD and CIA is detrimental for commercial poultry, and it may be controlled by proper immunization of parent stocks.

Key Words: Gumboro Disease, Bursa of Fabricious, Thymus, Kidneys, Haemorrhages

MOLECULAR CHARACTERIZATION AND PATHOLOGY OF NOVEL IBV ISOLATES FROM RECENT OUTBREAKS IN COMMERCIAL POULTRY

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2026-PSC-060

Abstract

The infectious bronchitis virus (IBV) is a highly contagious virus that belongs to the Coronaviridae family and causes infectious bronchitis (IB). The present research details the molecular, gross, and histopathological analysis of IBV strains that have surfaced during outbreaks in the Faisalabad division, Punjab, Pakistan. Tissue samples were collected from field flocks and farms underwent testing using RT-PCR and histopathological analysis. A total of 2720 samples were analyzed and out of these 625 of them were found to be positive for IBV targeting the spike glycoprotein (S1) by RT-PCR. From these 625 samples, 10 samples were sequenced, two samples were selected that were exhibiting preliminary evidence of genetic mutations and genomic variations for comprehensive sequencing of entire S1 gene region. Phylogenetic analysis showed strains isolated belong to the G1-24 group. New IBV variants that are evolutionarily distinct from vaccine strains continue to emerge in Pakistani chicken flocks and are primarily linked to acute tubular nephrosis syndrome, ciliostasis, and reproductive issues in laying hens. Histopathological changes were seen in the kidneys with signs of congestion and death of tubular cells, while in the trachea, there was lymphocytic infiltration along with epithelial hyperplasia. In the lungs, perivascular cuffing and fibroblast proliferation were consistent findings in histopathology. The outcomes of the current study indicated the emergence of new IBV variants in Pakistan.

Key Words: RT-PCR, Histopathology, S1 Gene, Qx-Variant, Ciliostasis, Kidneys

MYCOTOXINS, GUT MICROBIOME, AND POULTRY HEALTH EMERGING BIOLOGICAL STRATEGIES FOR IMPROVED PRODUCTIVITY

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2026-PSC-061

Abstract

Mycotoxin contamination of poultry feed is a persistent challenge to sustainable poultry production, particularly in cereal-based diets, where exposure to aflatoxins, zearalenone, Deoxynivalenol, fumonisins, and ochratoxin A can compromise intestinal health and bird performance. Beyond their direct toxic effects, mycotoxins can disrupt the delicate gut Microbiome, impair epithelial barrier integrity, promote oxidative stress and inflammation, alter nutrient utilization, and weaken immune responses, ultimately reducing growth, feed efficiency, and productivity. This study aimed to evaluate the complex interactions between dietary mycotoxins and the poultry gut Microbiome and to highlight emerging biological approaches for mitigating their adverse effects. Recent scientific evidence was reviewed with particular emphasis on microbial detoxification, probiotics, prebiotics, postbiotics, phytochemical compounds, and beneficial fungi capable of binding, degrading, or biotransforming mycotoxins into less toxic metabolites. The reviewed evidence indicates that Microbiome-directed interventions can help restore microbial balance, strengthen intestinal barrier function, enhance antioxidant and immune responses, and improve resistance to mycotoxin-induced gut dysfunction. Beneficial microorganisms, including selected bacteria and fungi, demonstrate promising potential for enzymatic degradation and biological transformation of mycotoxins, while plant-derived bioactive compounds may provide complementary antioxidant, anti-inflammatory, and microbiota-modulating effects. These findings suggest that integrating microbial and phytochemical strategies could provide safer, sustainable, and environmentally friendly alternatives to conventional mycotoxin management. Understanding the mycotoxin–Microbiome relationship therefore offers a promising pathway toward healthier birds, improved feed utilization, enhanced productivity, and greater feed safety, supporting resilient poultry production and long-term food security.

Key Words: Mycotoxins, Gut Microbiome, Poultry health, Biological detoxification, Poultry production.

ANTIBIOTIC RESISTANCE PROFILE OF ESCHERICHIA COLI ISOLATED FROM VARIOUS ABIOTIC FACTORS OF RETAIL POULTRY MEAT SHOPS: A STUDY OF BAHAWALPUR CITY, PAKISTAN

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2026-PSC-062

Abstract

Extensive use of antibiotics in poultry farming, antibiotic-resistant *E. coli* in retail settings poses a serious hazard to public health. The prevalence and resistance profiles of *E. coli* in retail poultry environments in Bahawalpur City, Pakistan, were examined in this study. Swab samples (n=336) were taken from equipment (cages), environmental sources (water, feed, cleaning supplies), and food-contact surfaces (cutting boards, knives, cleavers). Standard culture, biochemical tests, and PCR targeting the *uspA* gene were used for isolation and identification. A total of 42 genetically positive samples were subjected for antibiotic resistance profiling. The findings showed that *E. coli* contamination was prevalent throughout all locations, with the highest incidence on equipment (cages) and surfaces that come into contact with food (chopping blocks and cleavers). The existence of multidrug-resistant strains was verified by molecular testing; resistance to ceftriaxone, nalidixic acid, gentamicin, tetracycline, and chloramphenicol has been reported. Interestingly, the highest levels of antimicrobial resistance were found on feed and processing surfaces. These results suggest that retail settings for poultry are important reservoirs for multidrug-resistant *E. coli*, which may spread across the food chain and cause cross-contamination. Improved hygiene, prudent antibiotic stewardship, and integrated surveillance systems in line with One Health principles are crucial to reducing antimicrobial resistance and safeguarding public health.

Key Words: *E. coli*, Antibiotic resistance (AMR), Abiotic factors, Poultry meat shops

POULTRY INDUSTRY - A PILLAR OF GLOBAL FOOD SECURITY

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Abstract

Global food security remains one of the most persistent challenges of the twenty-first century due to rapid population growth, climate change, resource limitations, and increasing demand for high-quality protein. Poultry sector has emerged as one of the most efficient and sustainable livestock sectors capable of addressing these challenges by providing affordable, nutritious, and widely accessible animal-source foods. The contribution of the poultry industry to global food security through enhanced production efficiency, rapid reproductive rates, superior feed conversion, and relatively low environmental impact compared with other livestock species is remarkable. Advances in genetics, precision nutrition, disease control, automation, and precision poultry farming have significantly improved poultry productivity while reducing production costs and resource use. Poultry meat and eggs provide essential proteins, vitamins, minerals, and bioactive compounds that play a crucial role in combating protein-energy malnutrition and micronutrient deficiencies, particularly in developing countries. Furthermore, Sustainable poultry farming practices, including improved biosecurity, waste management, alternative feed resources, and climate-smart production systems also support environmental sustainability. Despite remarkable progress, challenges such as emerging diseases, antimicrobial resistance, feed shortages, and climate variability continue to threaten poultry production systems. Future research should focus on integrating digital technologies, resilient breeding programs, and sustainable resource management to strengthen poultry production and improve food system resilience. Overall, poultry remains a cornerstone of global food security by enhancing nutritional availability, supporting rural livelihoods, and promoting sustainable agricultural development.

Key Words: Food Security, Affordable, Poultry, Protein, Agriculture

FUTURE PERSPECTIVES OF ANTIBIOTIC-FREE POULTRY PRODUCTION

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2026-PSC-064**Abstract**

The global poultry industry is undergoing a significant transformation toward antibiotic-free production in response to concerns about antimicrobial resistance, consumer preferences, and sustainable food production. Current knowledge on alternative disease control strategies, including probiotics, phytochemicals, bacteriophages, vaccines, organic acids, immune-enhancing feed additives, and precision nutrition. Recent advances in digital agriculture, artificial intelligence, genomic selection, and precision livestock farming have further strengthened disease prevention and production efficiency by enabling continuous monitoring of bird health and rapid management interventions. Sustainable management practices, including enhanced biosecurity, improved housing, optimized ventilation, and effective litter management, complement nutritional innovations to maintain high productivity under antibiotic-free conditions. These approaches improve food safety, reduce antimicrobial resistance, enhance animal welfare, and decrease the environmental footprint of poultry production. However, achieving successful implementation requires continued investment in research, producer education, supportive regulatory frameworks, and affordable technological solutions. Future integration of microbiome science, precision health management, and data-driven decision-support systems will further improve the sustainability and profitability of antibiotic-free poultry farming. Overall, antibiotic-free poultry production represents an essential strategy for ensuring safe poultry products, promoting sustainable agriculture, and contributing to long-term global food security.

Key Words: Poultry, Anti-biotic, Feed additives, Growth, Animal welfare

ONE HEALTH APPROACH TO MODERN POULTRY PRODUCTION: MANAGING ZONOSIS, ANTIMICROBIAL RESISTANCE, AND ENVIRONMENTAL HEALTH

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Abstract

The One Health approach recognizes the interconnection of human, animal, and environmental health and provides a multidisciplinary framework for addressing complex health challenges. Poultry production represents an important component of this concept because intensive farming systems directly influence food security, antimicrobial resistance, zoonotic disease transmission, environmental sustainability, and public health. Poultry can serve as a reservoir or transmission pathway for zoonotic pathogens such as *Salmonella*, *Campylobacter*, and avian influenza viruses, highlighting the importance of integrated surveillance and biosecurity programs. The widespread use of antimicrobials in livestock production has also increased concerns regarding antimicrobial resistance, emphasizing the need for responsible antimicrobial use, vaccination, improved husbandry, probiotics, organic acids, and other alternative strategies. Environmental factors, including water quality, waste management, greenhouse gas emissions, and contamination of soil and water resources, further demonstrate the need to integrate ecological considerations into poultry health management. A coordinated One Health strategy involving veterinarians, poultry scientists, public health professionals, environmental experts, policymakers, and producers can improve disease prevention and strengthen food safety while supporting sustainable poultry production. Overall, adoption of the One Health framework provides a holistic pathway for balancing poultry productivity with animal welfare, environmental protection, antimicrobial stewardship, and human health, thereby contributing to resilient and sustainable food systems.

Key Words: One Health, Poultry production, Zoonotic diseases, Environmental sustainability, Biosecurity

BIOPROSPECTION OF METSCHNIKOWIA SPECIES AS A BIOCONTROL AGENT AGAINST AFB1 CONTAMINATION

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2026-PSC-066

Abstract

AFB1 contamination in the food chain poses serious risks to human and animal health. Advanced mitigation strategies emphasize biological control. This study presents the first report of isolating *Metschnikowia pulcherrima* in Pakistan and its application as a biocontrol agent against AFB1. Three strains of *M. pulcherrima*, pak2 (MW341425), pak3 (MW341426), and pak4 (MW341427), were isolated from fruits using the dilution plate technique and evaluated for AFB1-binding potential using whole cells, cell walls, and glucan extracts. From a 100mL culture, 400 mg of yeast biomass produced 35 mg glucan and 5 mg chitin (cell wall proxy). Binding assays were conducted by incubating 140ppb AFB1 with yeast components at 25 °C under agitation (200 rpm) for 0.5, 1, and 2 h. The highest AFB1 binding was achieved by *M. pulcherrima* pak3 whole cells ($77.37 \pm 1.48\%$) after 1 h Interaction time. Glucan extracts from *M. pulcherrima* pak3 and *M. pulcherrima* pak4 showed strong binding (74.99 ± 2.14) within 1–2 h of interaction. However, cell wall fractions showed lower efficacy as compared to glucan component. Results indicate that *M. pulcherrima*, particularly its whole cells and glucan components, effectively bind AFB1 in In-vitro assay suggesting its potential as a natural AFB1 mitigation tool in food and feed.

Key Words: Aflatoxin mitigation, AFB1, *Metschnikowia pulcherrima*

FROM BLUEPRINT TO DEFENCE: THE ANTIVIRAL POWER OF THE MX1 AND MDV1 GENES TO CONTROL AVIAN INFLUENZA AND MAREK'S DISEASE IN POULTRY

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2026-PSC-067

Abstract

Infectious poultry diseases, such as avian influenza and Marek's disease, represent severe threats to global agricultural sustainability, inflicting billions of dollars in annual economic losses and compromising food security. Deciphering the host genetic architecture of disease resistance is critical for transitioning away from chemical interventions toward sustainable, genetically managed populations. Genome-Wide Association Studies (GWAS) offer a powerful, hypothesis-free statistical approach to map genomic loci regulating host defence. By performing high-throughput genotyping on cases and controls across diverse poultry populations, researchers analyse statistical associations to locate significant genetic variants involved in immune, inflammatory, and antiviral pathways. GWAS has successfully localized key host genetic factors governing innate poultry defence. Notably, a region on chicken chromosome 4 containing the MX1 gene is linked to avian influenza resistance, with specific variations at amino acid position 631 of the MX protein proving decisive for antiviral efficacy. Additionally, the MDV1 gene on chromosome 1 has been identified as a critical regulator of the host immune response and cellular defence against Marek's disease virus. Despite these breakthroughs, poultry GWAS is constrained by restricted sample sizes due to high experimental costs, which increases the likelihood of false-positive associations. High genetic diversity among distinct poultry breeds can confound genetic signals. Furthermore, complex gene-environment interactions can mask or alter how resistant genotypes express physically. Advancing precision poultry breeding requires integrating CRISPR-Cas9 gene editing to validate precise functions of candidate loci. Future research must also employ advanced statistical modelling to account for environmental interactions and establish a unified international poultry genome database to coordinate global data sharing and resource utilization.

Key Words: Avian influenza, Marek's disease, MX1 gene, MDV1 gene, CRISPR-Cas9

EFFECT OF DIFFERENT INTENSITIES OF COLOR CORRELATED TEMPERATURE ON PRODUCTION PERFORMANCE, IMMUNITY AND ECONOMICS OF BROILER

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2026-PSC-068

Abstract

The present study was conducted to evaluate the effect of different intensities of correlated colour correlated temperature (CCT) programs on production performance, immunity and economics of broiler chickens. The experiment was arranged according to a Completely Randomized Design (CRD) with four treatments and four replicates per treatment. Birds were exposed to continuous 24-hour CCT lighting consisting of warm white light (3000K) from 06:00 to 18:00 hours and cool white light (6000K) from 18:00 to 06:00 hours. The treatment groups differed in illumination intensity levels: T1 = 10 lux, T2 = 20 lux, T3 = 30 lux and T4 = 40 lux. Parameters studied included body weight gain, feed intake, feed conversion ratio, mortality, Newcastle Disease (ND) antibody titer, Infectious Bursal Disease (IBD) antibody titer, immune organ development and net profit. The results revealed that moderate CCT light intensities significantly improved body weight gain, feed conversion ratio, antibody titers, immune organ weights and economic returns. Birds maintained under 20 lux illumination showed the best overall performance, including higher growth rate, improved feed efficiency, enhanced immune response and maximum net profit. Mortality remained low across all treatments, indicating that continuous CCT lighting did not negatively affect bird health. In conclusion, higher CCT light intensity, particularly 20 lux under warm white and cool white CCT lighting programs, positively improved production performance, immunity and profitability in broiler chickens.

Key Words: Color Correlated Temperature, Broiler, Growth, Feed Efficiency, Immunity

IMPACT OF EMULSIFIER SUPPLEMENTATION WITH VARYING LEVELS OF METABOLIZABLE ENERGY ON PRODUCTION PERFORMANCE, EGG QUALITY AND BLOOD PARAMETERS OF COMMERCIAL LAYERS

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2026-PSC-069

Abstract

The current study investigated the effect of emulsifier supplementation, while reducing the dietary metabolizable energy (ME) to determine its impact on production performance, egg quality parameters and blood parameters of commercial laying hens. Total 7125 commercial laying hens (at the production stage 54 weeks of age) were divided randomly into five treatment groups with three replicates/treatment. Five diets were formulated according to nutrients requirement of laying hens. A basal diet T1 with ME 2800 Kcal/kg served as a negative control, T2 supplemented with 500 g/ton emulsifier and 2800 Kcal/kg ME, T3 supplemented with 500 g/ton emulsifier while decreased ME 40 Kcal/kg, T4 supplemented with 500 g/ton emulsifier and having ME 80 Kcal/kg reduced and T5 supplemented with 500 g/ton emulsifier and decreased ME 120 Kcal/kg. Feed intake, egg production, egg weight and feed conversion ratio were recorded daily. Blood samples were collected for lipid profile estimation. The highest feed intake and egg production were observed in T5 and T2 groups, respectively. The egg quality parameters (eggshell strength, eggshell thickness, yolk index, and haugh unit) were not affected by the dietary energy level and emulsifier supplementation. Blood lipid profile was affected by the supplementation of emulsifier as the highest total cholesterol, low density lipoprotein, high density lipoprotein were observed in the hens fed T2 diet compared with others. The emulsifier can be used in layer diet (500 g/ton) while reducing the energy content (40-80 Kcal/kg) without any adverse effect on the production performance and egg quality of laying hens.

Key Words: Emulsifiers, Layers, Production performance, Egg quality, Blood parameters

PLANT BASED BIOCONTROL OF TOXIGENIC ASPERGILLUS FLAVUS AND AFLATOXIN B1 PRODUCTION IN STORED GRAIN USING ESSENTIAL OILS

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2026-PSC-070

Abstract

Aspergillus flavus is a widespread fungal contaminant known for producing aflatoxins, toxic secondary metabolites that affect the food quality and pose significant health risks to both humans and animals. Current study evaluated the susceptibility of Aflatoxin B1 producing *A. flavus* to five essential oils: *E. cardamomum*, *C. longa*, *F. asafetida*, *S. aromaticum*, and *E. globulus*. In vitro antifungal activity was assessed using agar well diffusion and microbroth dilution methods. *S. aromaticum* exhibited the most potent antifungal effect, with the largest inhibition zones (31.00 ± 1.00 mm) and the lowest Minimum Inhibitory Concentration (0.65 ± 0.22 μ L/mL) and no cytotoxicity observed up to 100 μ L/mL. Based on these findings, *S. aromaticum* oil was selected for in-situ testing to examine its inhibitory effect on fungal growth and AFB1 production in stored wheat, maize, and rice grains. Both intact and broken grains were tested at seven moisture levels (10–70 %) and categorized into growth control, negative control, and essential oil (EO) treated groups. Fungal growth (Colony Forming Unit per g) and AFB1 levels via High Profile Liquid Chromatography were recorded over 60 days. Broken grains exhibited higher levels of contamination. AFB1 levels were recorded highest at 40 % moisture and lowest at 10 % moisture level. *S. aromaticum* EO effectively reduced fungal growth across all conditions, with treated samples showing similar results to the negative control group. These findings highlight the potential of *S. aromaticum* essential oil as a natural preservative for grain storage.

Key Words: *Aspergillus flavus*, AFB1, *Syzygium aromaticum*, Antifungal activity, Stored grains, Cytotoxicity profile

ANTIVIRAL ACTIVITY OF EUCALYPTUS GLOBULUS AND ALLIUM CEPA ESSENTIAL OILS AGAINST NEWCASTLE DISEASE VIRUS.

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2026-PSC-071

Abstract

Newcastle disease virus (NDV) remains endemic in Pakistan, causing severe economic losses and threatening a thriving, secure, and sustainable poultry sector. Recurring vaccine breaks limit complete protection against NDV, warranting the evaluation of *Eucalyptus globulus* and *Allium cepa* essential oils (EOs) for effective disease control. Objectives: This study evaluated the in ovo antiviral activity of *Eucalyptus globulus* and *Allium cepa* essential oils, individually and in combination, against the LaSota strain of NDV. Methodology: A total of 132 embryonated eggs were divided into 8 experimental groups and evaluated for antiviral efficacy and embryo toxicity. Both essential oils individually and in combination (1:1) at 3%, 6%, 9%, 12%, and 15% were evaluated alongside virus and DMSO controls, while ribavirin (25 and 50 µg/mL) was used as an antiviral control. Antiviral activity was determined using 106 EID₅₀/mL of NDV, and EOs components were identified using gas chromatography-mass spectrometry. Findings: All EO treatments completely inhibited NDV hemagglutination ability while maintaining 100% embryo viability and zero embryo toxicity over 120 hours. Key bioactive components in *E. globulus* EO were eucalyptol, α-terpineol, and limonene, while in *A. cepa* EO, methyl propyl disulfide, dipropyl disulfide, and dipropyl trisulfide. Significance: Safe and highly effective against NDV in ovo, these non-toxic EOs offer a promising natural biotherapeutic to strengthen flock protection and support sustainable poultry health.

Key Words: LaSota strain, *Eucalyptus* and Onion, Essential oil treatment, Antiviral efficacy.

DETECTION OF MOBILIZED COLISTIN RESISTANCE GENES IN ENTEROTOXIGENIC ESCHERICHIA COLI ISOLATED FROM POULTRY IN MULTAN, PAKISTAN

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2026-PSC-072

Abstract

Antimicrobial resistance (AMR) among poultry-associated bacteria is an increasing One Health concern, particularly the emergence of resistance to colistin, an important antimicrobial used against multidrug-resistant Gram-negative infections. The dissemination of plasmid-mediated colistin resistance genes, particularly *mcr* genes, may facilitate the transmission of resistance determinants between bacterial populations. This study investigated colistin resistance and the occurrence of mobilized colistin resistance genes among enterotoxigenic *Escherichia coli* (ETEC) isolated from poultry in a live bird market in Multan, Pakistan. A total of 60 cloacal swab samples were collected from poultry and processed for isolation and characterization of *E. coli*. ETEC isolates were confirmed by polymerase chain reaction (PCR). Antimicrobial susceptibility testing was performed against nalidixic acid, chloramphenicol, and ciprofloxacin using the disc diffusion method. Colistin susceptibility was evaluated by broth microdilution to determine the minimum inhibitory concentration (MIC), followed by PCR based detection of *mcr* genes in selected isolates. Out of the 60 cloacal samples examined, 42 isolates (70.0%) were confirmed as ETEC. A high level of antimicrobial resistance was observed, with 42/42 isolates (100%) resistant to nalidixic acid, 41/42 (98%) resistant to chloramphenicol, and 37/42 (88%) resistant to ciprofloxacin. Colistin MIC testing was performed on 40 ETEC isolates, of which seven (17.5%) were phenotypically colistin-resistant. Among the isolates selected for molecular investigation, 26 ETEC isolates were subjected to *mcr* gene PCR. All seven phenotypically colistin-resistant isolates (100%; 7/7) were positive for the *mcr*-1 and *mcr*-4 gene, whereas none were positive for *mcr*-2 (0%; 0/7). The *mcr*-1-positive isolates represented 16.7% (7/42) and *mcr*-4 represented 13.2% (6/42) of all confirmed ETEC isolates. The findings demonstrate substantial antimicrobial resistance among poultry-associated ETEC and confirm the occurrence of mobilized colistin resistance in poultry-associated *E. coli* in Pakistan. The detection of *mcr*-1 and *mcr*-4 among all phenotypically colistin-resistant isolates highlights the potential for the dissemination of transferable colistin resistance within poultry production systems. These findings underscore the need for systematic surveillance of antimicrobial resistance and transferable colistin resistance determinants in the poultry associated *E. coli*, alongside evidence-based antimicrobial use and strengthened infection control and biosecurity measures, to mitigate the dissemination of colistin resistance within poultry production systems and the food chain.

Key Words: *E.coli*, ETEC, One health, Minimum Inhibitory Concentration

BACILLUS SUBTILIS-MEDIATED GREEN SYNTHESIS OF COPPER NANOPARTICLES AND THEIR BROAD-SPECTRUM ANTIBACTERIAL POTENTIAL

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2026-PSC-073

Abstract

The increasing prevalence of antimicrobial-resistant (AMR) bacteria has intensified the search for sustainable and effective alternatives to conventional antimicrobial agents. In this context, biologically synthesized metal nanoparticles have emerged as promising candidates because of their potent antimicrobial properties and comparatively environmentally benign production. The present study investigated the green synthesis of copper nanoparticles (CuNPs) using *Bacillus subtilis* and evaluated their antibacterial potential against clinically important Gram-negative and Gram-positive pathogens. *B. subtilis* was isolated from soil through heat treatment, serial dilution, and repeated colony purification and was identified on the basis of morphological, biochemical, and molecular characteristics. The isolate exhibited the characteristic biochemical profile of *B. subtilis*, while 16S rRNA PCR produced a distinct 575-bp amplicon confirming its identity. For nanoparticle biosynthesis, selected concentrations of copper sulfate (0.128, 0.256 and 0.512 g/mL) were evaluated. The biosynthesized CuNPs were recovered from the bacterial culture and characterized by X-ray diffraction (XRD), which confirmed a crystalline copper structure with no prominent impurity peaks. Particle-size estimation using the Scherrer equation demonstrated nanoscale dimensions below 100 nm, with the highest copper concentration producing particularly small particles (~16.1 nm). Antibacterial activity was subsequently assessed by the agar well diffusion method against *Escherichia coli* and methicillin-resistant *Staphylococcus aureus* (MRSA). The CuNPs exhibited concentration-dependent antibacterial activity, producing inhibition zones of approximately 13–18 mm, with the highest concentration demonstrating the strongest inhibitory effect. The findings demonstrate that *B. subtilis*-mediated biosynthesis can provide an eco-friendly and economical route for producing crystalline CuNPs with broad spectrum antibacterial activity. This approach offers considerable potential as a sustainable nano-biotechnological strategy for controlling resistant bacterial pathogens and may have future applications in antimicrobial interventions relevant to animal health, poultry production, food safety, and environmental management. Further studies addressing nanoparticle uniformity, biosafety, mechanism of action, and in vivo efficacy are warranted.

Key Words: *B. subtilis*, Antimicrobial Resistance, Methicillin resistant *Staphylococcus aureus*

EXOGENOUS BILE ACID, EMULSIFIER, ALONE OR IN COMBINATION: IMPACT ON GROWTH PERFORMANCE, NUTRIENT DIGESTIBILITY AND BLOOD METABOLITES OF COMMERCIAL BROILER CHICKENS

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2026-PSC-074

Abstract

Bile acids (BA) have a crucial role in digestion of dietary lipids, while emulsifiers (Em) can facilitate the emulsification of fat and nutrient utilization. Supplementation with BA and Em may improve growth performance by enhancing nutrient digestibility. Objectives: The study evaluated the impact of exogenous BA, Em, and their combination (BAEm) on growth parameters, fat utilization, organ weights and blood lipid profile of broiler birds. For the trial, 800 day-old chicks were assigned to four treatment diets under a completely randomized design with ten replicates (twenty birds each). The four treatments were Control (CON) (without Em or BA), 0.03% Em, 0.025% BA and BAEm (0.03% Em with 0.025% BA), fed to birds for 35 days. Growth parameters, notably weight gain (BWG), feed intake and feed conversion ratio (FCR) were assessed weekly. Nutrient digestibility was assessed on days 21 and 35 using indirect marker method. Blood lipid profiles and internal organ weights were determined upon completion of trial. Findings: Results indicated that supplementation with BA, Em and BAEm yielded higher BWG and improved FCR on days 8-21, 21-35 and 0-35 ($p < 0.05$). In addition, BA, Em and BAEm resulted in increased digestibility of dry matter and fat and reduction of low-density lipoproteins ($p < 0.05$). Moreover, carcass and organ weight remained unaffected by dietary interventions ($p > 0.05$), while BA, Em and BAEm resulted in increased spleen weight ($p < 0.05$). The supplementation of BA, Em and BAEm improved growth performance and nutrient digestibility of broiler birds without compromising the lipid profile of broiler birds.

Key Words: Carcass yield, Lipid profile, Nutrient digestibility, Performance parameters

INTEGRATIVE META-ANALYSIS OF UTERINE TRANSCRIPTOMES REVEALS CONSERVED GENE EXPRESSION SIGNATURES ASSOCIATED WITH REPRODUCTIVE AGING AND EGG QUALITY DECLINE IN LAYING HENS

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2026-PSC-075

Abstract

Age dependent decline of uterine health and egg quality is a major challenge for maintaining sustained production, which is associated with complex stage specific transcriptomic changes. The molecular mechanisms underlying temporal changes associated with progressive deterioration of uterine function remain poorly characterized. Single-study RNA-Seq analyses are limited by small sample sizes and study-specific variants, constraining the reliability of discovered candidate genes. To overcome this, we integrated two independent publicly available RNA-Seq datasets from hen uterine tissue (PRJNA849016 and PRJNA1344500), each with early, peak, and late laying stages, to identify robust and reproducible gene expression signatures associated with age-related uterine dysfunction. After stringent quality control both datasets were aligned to the *Gallus gallus* reference genome (GRCg7b) with mapping efficiency over 90%. Independent differential expression analysis using DESeq2 identified 124, 261, and 251 DEGs across early-to-peak, peak-to-late, and early-to-late comparisons in the first dataset, and 102, 460, and 815 DEGs, respectively, in the second. Revealing progressive increase of expression with advancing reproductive age in both cohorts. Furthermore, overlap analysis revealed a subset of genes exhibiting peak-specific transcriptomic activation, suggesting stage-restricted regulatory dynamics not captured by direct early-to-late comparisons. Prior to integration study-specific confounding was removed through log-likelihood ratio test, identifying around 40% of total genes were associated with study effect at adjusted p-value

Key Words: Aging, Egg quality, Sustainable production, Transcriptomics

BEYOND DISEASE: RETHINKING POULTRY HEALTH FOR A HEALTHIER FUTURE***Muhammad Awais Zahoor¹****1. Technical Manager, Majestic Pharma, Faisalabad, Pakistan***2026-PSC-076****Abstract**

Poultry health is no longer simply about preventing and treating diseases; it is about understanding how every exposure, intervention, and management decision can influence the health of the bird, the farm, the environment, and ultimately the consumer. Modern poultry production demands a shift from reactive treatment toward predictive, preventive, and responsible health management. Previous research on the teratogenic effects of thiamethoxam in chick embryos demonstrated that chemical exposure during early development can affect embryonic growth, survival, and normal development (Zahoor et al., 2022). This research highlights an important aspect of poultry health: birds can be affected by many factors beyond the pathogens we routinely investigate. In modern poultry production, birds may face multiple challenges, including mycotoxins, pesticides, environmental contaminants, nutritional deficiencies, heat stress, poor water quality, vaccination-related stress, and inappropriate or excessive medication. These factors may not always cause immediate clinical disease, but they can impair immunity, affect normal development, reduce performance, and increase susceptibility to infection. Therefore, the future of poultry health should move from a “treat when disease occurs” approach toward a “protect before problems develop” approach. This requires greater integration of pathology, nutrition, microbiology, toxicology, farm management, and pharmaceutical science. Healthy poultry, safe food, responsible medicine use, and sustainable production are closely connected. By understanding the complete health profile of the poultry birds; not just the disease pattern, we can develop smarter preventive strategies that improve flock performance while supporting responsible and sustainable poultry production.

Key Words: Poultry Health, Prevention, Environmental Exposure, Sustainable Poultry Production

EFFECT OF SOY ISOLATE PROTEIN COATING WITH SODIUM BENZOATE AND POTASSIUM SORBATE ON PHYSICOCHEMICAL AND MICROBIAL SHELF LIFE OF CHICKEN BREAST FILLETS

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2026-PSC-077

Abstract

Poultry meat is a major low-cost source of high-quality protein, but chicken breast fillets are highly prone to microbial spoilage and lipid oxidation during refrigerated storage, leading to considerable losses for the meat industry. Rising consumer demand for microbiologically safer, minimally processed meat with an extended shelf life has driven interest in edible protein-based coatings combined with approved antimicrobials as alternatives to conventional preservation methods. The present study was planned to evaluate the effect of soy isolate protein coating, alone and in combination with sodium benzoate and potassium sorbate, on the physicochemical properties and microbial shelf life of chicken breast fillets stored at refrigeration temperature. Chicken breast fillets procured from a local poultry shop and dipped in four treatment solutions — control (T0), 5% soy isolate (T1), 5% soy isolate + 0.5% sodium benzoate (T2), and 5% soy isolate + 5% potassium sorbate (T3) — packed and stored at 0–4°C. Samples were evaluated on days 0, 3, 6, 9 and 12 for colour (L^* , a^* , b^*), pH, water-holding capacity, Warner-Bratzler shear force, TBARS, total viable count, total coliform count, *Pseudomonas* spp., *Salmonella* and sensory attributes. Data were analysed by two-way ANOVA (SPSS v26), and treatment means were separated using Duncan's Multiple Range Test at $P \leq 0.05$. Soy isolate 5% + sodium benzoate 0.5% (T2) recorded the lowest L^* and highest b^* values and best preserved meat colour among all treatments. TBARS values were highest in the control and lowest in T2, while water-holding capacity was lowest in T2 relative to other groups. Tenderness, juiciness and overall acceptability improved progressively from T0 to T3, with the highest acceptability recorded in T3. Meat pH declined with increasing storage time in all treatments and was lowest on day 12 in T3. Total viable count, coliform count and *Pseudomonas* count increased with storage duration but remained consistently lowest in T3 (soy isolate 5% + potassium sorbate 5%) throughout the 12-day storage period. Soy isolate protein coating combined with potassium sorbate (5%) most effectively suppressed microbial growth and enhanced meat tenderness, while soy isolate combined with sodium benzoate (0.5%) best maintained meat colour. These findings demonstrate that soy isolate-based edible antimicrobial coatings offer a practical, low-cost strategy to extend the refrigerated shelf life and quality of chicken breast fillets.

Key Words: Chicken fillets, Shelf life, Soy isolate, Protein coating

COMPARATIVE EVALUATION OF BACTERIOPHAGE THERAPY AGAINST SALMONELLA GALLINARUM INFECTION IN BROILER CHICKENS

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2026-PSC-078

Abstract

Salmonella Gallinarum (SG) is a major poultry pathogen causing substantial morbidity, mortality, and economic losses worldwide. Bacteriophage therapy offers a promising antibiotic alternative for disease control and improved production efficiency. This study evaluated the protective efficacy of phage formulations against SG infection in broiler chickens, focusing on pathology, bacterial load, feed conversion ratio (FCR), and survival. From 130 day-old broilers, five groups were analysed: G-1 (phage cocktail SGP-9+Frank+SG-T+SFA, SG-challenged), G-5 (phage cocktail SGP-9+SG-T+SFA, SG-challenged), G-7 (positive control, SG only), G-8 (negative control), and G-9 (phage cocktail only, unchallenged). Phages (10^8 PFU/ml) were administered in feed from day 7–28 at 1 ml/kg feed; birds were orally challenged with SG (10^7 CFU/0.1 ml/bird) on day 14. Clinical signs, gross lesions, histopathology, FCR, bacterial load, and survival were assessed at 7 and 14 days post-infection (DPI). G-7 showed the highest mortality and lowest survival (46%), consistent with severe systemic infection, while phage-treated groups G-1 and G-5 achieved 100% survival. No mortality occurred in G-8 or G-9, confirming treatment safety. FCR at 7 DPI worsened markedly in G-7 (3.65) versus G-1 (2.35) and G-5 (2.58), which remained closer to the negative control (2.26); G-9 (1.98) showed no adverse effect of phage supplementation on feed efficiency. G-7 exhibited severe hepatitis, enteritis, and splenomegaly, whereas phage-treated groups showed milder lesions and better-preserved intestinal architecture, with crypt depths of 214 ± 4.8 μ m (G-1) and 154.9 ± 8.2 μ m (G-5), against 186.7 ± 4.6 μ m (G-9) and 116.7 ± 7.1 μ m (G-8). SG load was reduced in phage-treated groups, with no detectable colonies in G-5 post-challenge versus persistent bacterial presence in G-7; histopathology corroborated reduced inflammation and tissue damage. Bacteriophage therapy, particularly the G-5 cocktail, protected broilers against SG infection by reducing bacterial load and tissue damage while improving crypt depth and FCR, supporting phage-based interventions as viable antibiotic alternatives in poultry production.

Key Words: *Salmonella Gallinarum*, Crypts, Bacteriophage, FCR, Survival

PREPARATION AND IMPACT OF IRON OXIDE NANOPARTICLES ON PHYSICOCHEMICAL, MICROBIAL AND SENSORY ATTRIBUTES OF CHICKEN BREAST FILLET

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2026-PSC-079

Abstract

Meat is inherently perishable, and microbial and oxidative changes during processing and storage progressively reduce its quality until it is no longer fit for consumption. Rising global demand for poultry meat has intensified the need for effective, low-cost strategies to extend shelf life while safeguarding safety and sensory quality. Nanotechnology, particularly metal-oxide nanoparticles such as iron oxide nanoparticles (IONPs), has emerged as a promising approach because of their antimicrobial and antioxidant properties, non-toxicity, and biodegradability. This study aimed to chemically synthesize iron oxide nanoparticles and evaluate their effects on the physicochemical, microbiological, sensory, and antioxidant properties of chicken breast fillets during refrigerated storage. Iron oxide nanoparticles were synthesized by co-precipitation of FeCl₃ and FeSO₄ under an anaerobic atmosphere, followed by ammonium hydroxide precipitation, centrifugation, washing and oven drying, and were characterized by UV-visible spectroscopy, zeta potential and FTIR. Chicken breast fillets (150±15 g) were immersed for 8-10 seconds in nanoparticle solutions at 3 ppm (T1) and 5 ppm (T2), air-dried and compared with an untreated control (T0). Samples were stored at 2±2°C and analyzed on days 0, 2, 4 and 6 for pH, colour (L*, a*, b*), water-holding capacity, TBARS, total viable count, total coliform count, *E. coli* count and sensory attributes, with treatment means compared at $P \leq 0.05$. FTIR confirmed the presence of Fe-O bonds along with O-H, C-O and N-H functional groups in the synthesized nanoparticles. pH declined with storage time in all groups and was lowest in the control. Lightness (L*) was lowest in the control and highest in fillets treated with 5 ppm IONPs, while colour retention (a*, b*) was best maintained in the 3 ppm treatment. Water-holding capacity increased significantly with nanoparticle treatment relative to the control. TBARS values were lowest in the 5 ppm treatment, indicating reduced lipid oxidation, while microbial growth (total viable count, coliform count and *E. coli*) was most effectively suppressed in the 3 ppm treatment, followed by 5 ppm, with the highest counts recorded in the control throughout the 6-day storage period. Sensory scores for flavour, juiciness, tenderness and overall acceptability were highest in the 3 ppm treatment. Chemically synthesized iron oxide nanoparticles, particularly at 3 ppm, effectively maintained the physicochemical and sensory quality of chicken breast fillets while suppressing microbial growth, and 5 ppm most effectively limited lipid oxidation. These findings indicate that iron oxide nanoparticle treatment offers an innovative, economical strategy for extending the refrigerated shelf life of poultry meat for the meat processing industry.

Key Words: Nanoparticles, Iron oxide, Food security, Chicken breast fillets

EVALUATING THE IMPACT OF DIFFERENT VACCINE LEVELS ON PANCREATIC DAMAGE CAUSED BY NEWCASTLE DISEASE VIRUS

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2026-PSC-080

Abstract

Newcastle disease virus (NDV) causes a highly contagious and devastating disease in poultry. ND causes heavy economic losses to the global poultry industry by decreasing the growth rate, decrease in egg production high morbidity and mortality. Although significant advances have been made in the vaccine development, outbreaks are reported in vaccinated birds. In this study, we report the damage caused by NDV infection in the pancreatic tissues of vaccinated and specific pathogen-free chickens. The histopathological examination of the pancreas showed severe damage in the form of partial depletion of zymogen granules, acinar cell vacuolization, necrosis, apoptosis, congestion in the large and small vessels, sloughing of epithelial cells of the pancreatic duct, and mild perivascular edema. Increased plasma levels of corticosterone and somatostatin were observed in NDV-infected chicken at three- and five- days post infection (DPI). A slight decrease in the plasma concentrations of insulin was noticed at 5 DPI. Significant changes were not observed in the plasma levels of glucagon. Furthermore, NDV infection decreased the activity and mRNA expression of amylase, lipase, and trypsin from the pancreas. Taken together, our findings highlight that NDV induces extensive tissue damage in the pancreas, decreases the activity and expression of pancreatic enzymes, and increases plasma corticosterone and somatostatin. These findings provide new insights that a defective pancreas may be one of the reasons for decreased growth performance after NDV infection in chickens.

Key Words: Newcastle disease virus, Chicken, Pancreas, Histopathology

IMPACT OF FRYING MEDIUM ON THE FUNCTIONAL COMPONENTS OF ASEEL BREAST MEAT

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Abstract

Chicken meat is widely consumed in Southeast Asia and is considered a traditional healthy food. This study examines the nutritional and physicochemical quality of the Aseel chicken breast meat using oil frying and air frying. Meat is regarded as a source of minerals (Mg, K, and Fe) and other nutrients. The different cooking techniques of meat have a significant impact on the quality characteristics of meat. In the present study, functional attributes of air fry and oil fry breast sections of Aseel chicken were compared. These oil fry and air fry samples were subjected to physicochemical analysis: moisture, crude fat, crude protein, mineral composition, pH, color, texture profile, water holding capacity, thiobarbituric acid reactive substances (TBARS), total volatile base nitrogen (TVBN), cooking yield, creatinine content, protein solubility and sensory analysis. The obtained was studied statistically to evaluate the significance level. The moisture percentage in the air-fried breast muscle was 64.84%, while the oil fried Aseel sample had a moisture content of 61.35%. The air-fried Aseel breast muscle had a protein of 31.06% while the oil-fried sample had 27.62%. The highest mean value for crude fat was found in oil fried 7.16%, while air-fried Aseel had 3.16% of crude fat. Oil-fried breast muscle had a TBARS value of 2.01 and air-fried Aseel 0.81. The TVBN values for oil-fried samples were 7.83 while for air-fried were 2.71. The air-fried breast muscle had (L*) 66.21 and the oil-fried Aseel had 55.23 (L*). The air-fried Aseel breast muscle received the maximum value of 3.99 for (a*), while the oil fried Aseel breast had the lowest value for (a*) 6.69. The water-holding capacity of the air-fried breast was the highest at 64.61%, while the water-holding capacity of Aseel ample cooked by oil frying was 56.65%. The fried Aseel breast meat samples showed better results overall than oil fried samples. This study will be preferable for the meat processing industries to help them in selecting the most suitable cooking method to earn profit and minimize yield losses.

Key Words: Poultry, Frying medium, Functional components, Aseel breast meat

BIOACTIVE POTENTIAL OF HIBISCUS ROSA SINENSIS AND JASMINUM SAMBAC EXTRACTS AGAINST FOOD BORNE PATHOGENS**Laiba Rasheed¹, Rabia Tanvir¹, Wasim Shehzad²***1. Institute of Microbiology, University of Veterinary and Animal Sciences, Lahore.**2. Institute of Biochemistry and Biotechnology, University of Veterinary and Animal Sciences, Lahore.*

2026-PSC-082

Abstract

Foodborne diseases (FBD) are a serious issue that affects not only human health but also has an impact on the global economy. They remain a persistent problem due to the continuing changes in global food trade trends, dietary patterns, food manufacturing, and the emergence of foodborne microbes in the food chain. In Pakistan, where meat is considered an essential component of our meals, but due to high nutrient concentration levels, high water activity, minerals and vitamins, and other growth factors such as pH, microbes thrive in it. The extensive use of antibiotics has resulted in antimicrobial-resistant (AMR) bacteria in *E. coli*, *Salmonella*, *Campylobacter*, and *Listeria* spp. Traditional medicinal practices, especially the use of plant extracts, continue to play a crucial role in addressing basic healthcare needs in underdeveloped countries. The purpose of our study was to check the antibacterial potential of *Jasminum sambac* (Jasmine) and *Hibiscus rosa sinensis* (China rose) extracts against foodborne pathogens, i.e., *E. coli*, *Salmonella* and *Campylobacter*. The hot and cold extracts were prepared using ethanol and distilled water, and the antibacterial activity was observed by the agar well diffusion method. The minimum inhibitory concentration (MIC) was also determined; the plant extracts gave MIC values of 6 and 12 µg/ml for *E. coli* and *Salmonella*, respectively. The minimum bactericidal concentration (MBC) showed that ethanol extracts of both plants possessed bactericidal activity. Our study indicates that the native plants of Pakistan have significant bioactivity against foodborne pathogens.

Key Words: Foodborne pathogens, *Hibiscus rosa sinensis*, *Jasminum sambac*

RATE OF MULTIPLE VIRAL AND BACTERIAL COINFECTION(S) IN INFLUENZA A/H9N2-INFECTED BROILER FLOCKS

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2026-PSC-083

Abstract

Repeated cases of low pathogenic influenza A/H9N2 virus (IAV/H9N2) have been reported in commercial chickens since its emergence in 1998 in Pakistan. However, recently increased mortality and severe respiratory complications under field conditions have been noticed, suggesting concomitant influenza infections with respiratory viral and/or bacterial pathogens. Therefore, the present study aimed to investigate the presence of IAV/H9N2 coinfecting with multiple viral and bacterial pathogens in broiler chicken flocks. We surveyed 60 broiler flocks with respiratory signs from March through July 2019 in Punjab, Pakistan. Suspected flocks were screened for the presence of IAV using a lateral-flow device. Tracheal, cloacal, and bone marrow samples were collected and further tested for seven viral agents (chicken anemia; Newcastle disease; infectious bronchitis; infectious laryngotracheitis [ILT]; and IAV subtypes H9, H7, and H5) and three bacterial agents (*Mycoplasma gallisepticum*; *Mycoplasma synovae*; *Ornithobacterium rhinotracheale* [ORT]) using PCR assays. Upon initial screening for IAV, 35/60 (58.3%) flocks tested positive. The coinfection of IAV/H9N2 with other pathogens was detected in 25 (71.4%) flocks and only IAV/H9N2 was detected in 10 (28.6%) flocks out of total positive IAV flocks (n = 35). IAV subtypes H5 and H7, ILT, and ORT were not detected throughout the study period. The detection rate of double, triple, and quadruple combinations of coinfections with IAV/H9N2 were 37% (13 flocks), 26% (9 flocks), 9% (3 flocks), respectively. Higher average mortality (28.5%) was found in broiler chicken flocks coinfecting with viral and/or bacterial pathogens than in flocks where only H9 low pathogenic IAV/H9N2 was detected (20.8%). In conclusion, higher circulation of IAV/H9N2 with other viral and bacterial pathogens may contribute to higher production and economic losses at the farm level.

Key Words: Avian influenza, Chickens, Coinfection, Production losses.

INDIGENOUS LYSOZYME: A LOCAL INNOVATION FOR RESILIENT, ANTIBIOTIC-FREE BROILER PRODUCTION AND FOOD SECURITY

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2026-PSC-084

Abstract

Background: The global poultry industry faces mounting pressure to enhance biosecurity, ensure supply chain resilience, and adopt sustainable practices amid rising antimicrobial resistance and fluctuating feed costs. **Objectives:** In response, the shift toward antibiotic-free production has become a strategic imperative for safeguarding both animal and human health while meeting the growing food demand. This study evaluates a locally scalable biotechnological solution, lysozyme, an antimicrobial enzyme with immunomodulatory properties, as a natural growth-promoting additive in broiler diets. **Methodology:** We compared the efficacy of locally extracted lysozyme (via sonication-assisted extraction and cation exchange chromatography) with a commercial formulation, each supplemented at 150 mg/kg feed, against a non-supplemented control. A total of 198 one-day-old Ross 308 broilers were assigned to three isocaloric and isonitrogenous dietary treatments in a completely randomized design over 35 days, with performance, nutrient digestibility, carcass traits, and hematological parameters systematically assessed. **Results:** The results demonstrated that the locally produced lysozyme significantly outperformed both the commercial product and the control, delivering the highest body weight gain (2271.7 g; +3.2%), superior feed conversion ratio (1.330), and enhanced crude protein digestibility (89.23%). Carcass analysis revealed a substantial increase in carcass weight (1540.0 g; ~9% above control) and dressing percentage (72.25%), with no adverse effects on organ integrity or hematological parameters. **Significance:** These findings underscore the potential of indigenous lysozyme production to reduce dependence on imported antibiotics and synthetic additives, thereby mitigating supply chain vulnerabilities, lowering production costs, and improving farm-level biosecurity. By advancing locally adaptable enzyme extraction technology, this study directly contributes to a more resilient, self-reliant, and sustainable poultry sector, aligning innovation with food security goals and reinforcing the industry's capacity to thrive in an era of global challenges.

Key Words: Lysozyme supplementation, Growth performance, Antibiotic-free poultry production, Crude protein digestibility, Food security

BACILLUS-BASED PROBIOTICS IN BROILERS: GROWTH, GUT HEALTH, AND NEWCASTLE DISEASE RESPONSE

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Abstract

Bacillus is a probiotic that is involved in improving the gut health, lowering antibiotic dependency, and modulating the immune system, among other beneficial effects. To evaluate the multi-faceted effects of *Bacillus*-based probiotics on the growth performance, intestinal health, and immune response against Newcastle disease virus (NDV) in broiler chickens raised under low-biosecurity farm settings. The study, conducted over 56 days under low-level biosecurity measures, involving 200 Ross day-old chicks randomly divided into three groups. The groups were assigned as follows: Treatment group A: basic diet plus high concentration of probiotics, Treatment group B: basic diet plus low concentration of probiotics, Control group C: basic diet (control group) without probiotics. All three groups were fed with prepared feeds (starter, grower, and finisher). The results denoted substantial improvements in growth performance, with both Groups A and B displaying significantly enhanced body weight gain and reduced feed conversion ratios as compared to the control group. Furthermore, the inclusion of probiotics established a remarkable positive impact on the immune response against Newcastle disease virus (NDV), as supported by significantly higher antibody titers in Groups A and B. Histopathological evaluations of the intestinal tissue revealed increased villous height, crypt depth, villous height/crypt depth ratio, and mucosal thickness, collectively indicating improved intestinal health. Spleen histopathology assessments demonstrated varying degrees of lymphoproliferative activity and moderate neutrophilic infiltrates in the red pulp of Groups A and B, further suggesting positive influences on the immune system. In conclusion, this study underscores the potential of *Bacillus*-based probiotics as a practical alternative to antimicrobials in broiler production, particularly in low-biosecurity farm settings. The findings not only highlight the positive impact on growth performance but also emphasize the potential role of probiotics in enhancing the immune response against NDV in broilers raised on antibiotic-free diets.

Key Words: *Bacillus probiotics, Broiler performance, Intestinal health, Newcastle disease virus (NDV)*

COMPARATIVE PHYTOCHEMICAL PROFILING AND THERAPEUTIC EFFICACY OF SYZYGIUM AROMATICUM AND CINNAMOMUM CASSIA EXTRACTS AGAINST COLISTIN-RESISTANT ESCHERICHIA COLI OF POULTRY ORIGIN

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Abstract

The worldwide spread of antimicrobial resistance represents a serious challenge to modern clinical medicine, with the emergence of colistin resistance in Enterobacteriaceae serving as a critical tipping point in the efficacy of the "last-resort" antibiotic arsenal. This study presents a comprehensive evaluation of the antimicrobial and antioxidant potential of ethanolic extracts derived from Clove and Cinnamon against *E. coli* isolates (n=200) recovered from poultry faecal samples in the Jhang region of Pakistan. Phenotypic screening confirmed a 29% prevalence of colistin resistance, a finding that correlates with the intensive selective pressures present in regional wet markets (X₂=35.28, pS. aromaticum exhibited superior antibacterial potency, yielding inhibition zones up to 23 ± 0.6 mm and a Minimum Inhibitory Concentration of 6.25%, alongside a robust antioxidant capacity (72.04% DPPH scavenging). These findings elucidate the molecular mechanisms through which plant-derived phenylpropanoids disrupt bacterial cell membranes and neutralize oxidative stress, providing a scientific basis for their deployment as sustainable alternatives to synthetic antibiotics in a One Health framework. These findings warrant further in vivo evaluation of clove and cinnamon to assess their therapeutic efficacy and safety profile, particularly with respect to potential toxicity in live birds.

Key Words: *Syzygium aromaticum, Cinnamomum cassia, Colistin resistance, mcr-1, Escherichia coli, Poultry*

IN-VITRO ANTIMICROBIAL ACTIVITY OF CARICA PAPAYA EXTRACTS AGAINST PATHOGENIC ESCHERICHIA COLI ISOLATED FROM BROILER.

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2026-PSC-087

Abstract

Colibacillosis, caused by avian pathogenic *Escherichia coli* (APEC), poses a significant threat to poultry production worldwide, leading to substantial economic losses and raising concerns about food safety due to the prophylactic overuse of antibiotics. This study was designed to evaluate the antimicrobial potential of methanolic and ethanolic extracts of *Carica papaya* leaves and seeds against APEC isolates obtained from broiler chickens. A total of suspected *E. coli* isolates were enriched in peptone broth and cultured on Eosin Methylene Blue (EMB) agar, where colonies displaying a green metallic sheen were selected. Further identification involved Gram staining, revealing pink, gram-negative bacilli, and the Congo red (CR) assay, which differentiated pathogenic isolates by producing transparent red colonies. Confirmation of pathogenicity was achieved through PCR detection of specific virulence genes. Plant extracts were prepared using methanol and ethanol as solvents, and their antibacterial activity was assessed via the agar well diffusion method at varying concentrations. The results demonstrated that both ethanolic and methanolic seed extracts exhibited a concentration-dependent increase in zones of inhibition, indicating significant antimicrobial activity against APEC. In contrast, leaf extracts did not show any notable inhibitory effect. The minimum inhibitory concentration (MIC) of the active extracts was further determined using the broth microdilution method. These findings suggest that *Carica papaya* seed extracts, particularly when prepared with ethanol or methanol, possess promising antibacterial properties against APEC and may serve as a natural alternative to conventional antibiotics for controlling colibacillosis in poultry, thereby contributing to reduced antibiotic resistance and improved food safety. Further studies are warranted to explore their in vivo efficacy and phytochemical composition.

Key Words: Colibacillosis, Avian Pathogenic *Escherichia coli*, *Carica papaya*, *Carica papaya*

ASSESSING ANTIMICROBIAL AND ANTIBIOFILM ACTIVITY OF POULTRY DISINFECTANTS USED TO TREAT WATER PIPELINES

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2026-PSC-088

Abstract

Bacterial contamination and subsequent biofilm formation within poultry water distribution system presents a severe threat to commercial biosecurity, shielding pathogens from standard sanitization protocols. To check whether our current practices are effective and meeting poultry guidelines, we randomly sampled water from pipelines of five different poultry farms of Lahore. To further investigate underlying reason of the poor performance of the disinfectants the study evaluated antimicrobial effectiveness of four poultry disinfectants used to cleanse water pipelines— OX-Virin, Viroxide Super, Hyperoxsan, and Hydrogen Peroxide —against planktonic cells and biofilms produced by four bacterial strains; *Pseudomonas* (P-11), *Escherichia coli* (E-12), *Staphylococcus*, and *Salmonella*. Our farm testing revealed consistently high bacterial load exceeding the 100 CFU/ml limit of poultry farm water in all farms. Coliform count also exceeded ≤ 50 CFU/ml limit in all the farms except for one. Fecal coliform should be absent in water of poultry farms however, two of five poultry farms also tested positive for them. This indicated a breach in disinfection practices. Disinfectant testing revealed MIC of all disinfectants differed significantly for each strain despite being quite lower than the working concentration recommended for these disinfectants. However, MBIC90 values of disinfectants were 4-19 times higher than their recommended working concentration for water pipelines and varied significantly across different strains with Ox-virin varying the least and giving more consistent results. Bacterial resistance to disinfectant dynamics radically changed with inoculum size indicating that the initial load of microorganism in water was determining factor on how well these disinfectants would kill these microorganisms.

Key Words: Minimum Inhibitory Concentration, Minimum Biofilm Inhibitory Concentration

EFFECT OF ANTIOXIDANTS ON INTESTINAL HISTOMORPHOMETRY, AND ELECTROPHYSIOLOGICAL PARAMETERS IN BROILERS EXPOSED TO BISPHENOL-A

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Abstract

In poultry, gut health is closely associated with production performance. A wide range of conventional poultry utensils contain bisphenol-A (BPA) that can jeopardize gut health. This study aimed to evaluate the effect of selenium (Se) and vitamin E (VE) on jejunal histomorphometry, and electrophysiological parameters in broilers exposed to BPA. Sixty day-old male broiler chicks (Hubbard) were randomly assigned into four groups: Group A, control: Basal diet with no BPA. Group B, BPA: Basal diet with BPA (100mg/kg feed). Group C, SeVE: Basal diet supplemented with Se (0.5mg/Kg feed) and VE (100mg/kg feed) and Group D, BPA+SeVE: Basal diet added with BPA (100mg/kg feed) and supplemented with Se (0.5mg/Kg feed) and VE (100mg/kg feed). Jejunal histomorphometry was carried out by conventional method while electrophysiological parameters were acquired from automated voltage clamp device. Villus width and surface area were highest in C while villus height remained unaffected. There was a significant increase in the glucose and glutamine induced short circuit current and tissue conductance in C compared to B across the isolated jejunal epithelia. Reduction of mucosal pH attenuated most of the electrophysiological parameters except for I_{sc} which was highest in C for glucose and in D for glutamine respectively. BPA adversely affected the jejunal morphology and electrophysiological parameters. Dietary supplementation of VE and Se improved gut performance and modulated oxidative response. Further studies with optimized feed formulation, epithelial molecular biomarkers, and oxidative signaling pathways will aid in thorough understanding of underlying protective mechanism.

Key Words: Endocrine disruptor, Se, VE, Short circuit current, Broilers

STRENGTHENING POULTRY VETERINARY LABORATORY SYSTEMS THROUGH THE ASSESSMENT OF INFRASTRUCTURE, BIOSAFETY, BIOSECURITY, AND ARTIFICIAL INTELLIGENCE READINESS

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Abstract

Poultry industry plays a major role in economic development and food security; however its effectiveness depends on rapid disease diagnosis and public health monitoring. Veterinary diagnostic labs are important for the assessment and control of poultry pathogens, antimicrobial resistance and insuring food hygiene. Regardless of its effectiveness differences in laboratory design, biosafety, biosecurity and Artificial intelligence preparedness can limit rapid outbreak response and diagnostic efficacy. This study focuses to evaluate laboratory infrastructure, biosecurity, biosafety and AI readiness in clinical, veterinary and research laboratories. A cross-sectional survey was conducted using a Google form questionnaire to staff of veterinary and microbiological research laboratories. The survey assessed staff competency, digital resources, waste management, biosafety, biosecurity and Lab design. Statistical data summarization was used to identify key gaps, strengths and opportunities for advancement of laboratory system. This study will also highlight lack of laboratory capacity for integrating artificial intelligence to enhance diagnostic accuracy, early detection of disease, disease surveillance and strengthen biosafety and biosecurity practices and reduce disease outbreaks. These conclusions and findings will provide scientifically proven suggestions for decision makers, poultry industries and veterinary authorities to strengthen laboratory preparedness and resilience.

Key Words: Biosafety, Biosecurity, Poultry industry, Disease surveillance, Disease diagnosis, Artificial Intelligence.

ECONOMIC EVALUATION OF H9N2 AVIAN INFLUENZA VACCINATION ACROSS COMMERCIAL BROILER AND LAYER PRODUCTION SYSTEMS IN PAKISTAN.

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Abstract

Low pathogenic avian influenza (LPAI) H9N2 has been endemic in Pakistan for more than two decades and continues to affect commercial poultry production. Although vaccination is widely used, particularly in layer production, evidence on its economic value under different production systems is limited. This study evaluated the farm-level economic efficiency of H9N2 vaccination in commercial poultry production in Pakistan. Stochastic production and economic models were developed for independent, partially integrated and fully integrated broiler production systems, and for independent and partially integrated layer systems. Farm-level production, epidemiological and economic data were incorporated into gross margin and partial budget analyses. The economic value of locally produced and imported inactivated H9N2 vaccines was evaluated using vaccine effectiveness estimates derived from expert elicitation. Models incorporated uncertainty through probability distributions and 5,000 Monte Carlo simulations, followed by sensitivity analysis to identify key determinants of vaccination value. H9N2 vaccination generated a positive net economic value across all broiler production systems. For locally produced vaccine, the estimated mean net value ranged from PKR 2.02 to 3.82 million per production cycle, while imported vaccine generated PKR 2.14 to 4.14 million. In layer systems, the mean net value of local vaccination was approximately PKR 7.7–14.0 million per production cycle, compared with PKR 12–18 million for imported vaccine. Vaccine effectiveness and production performance were among the most influential determinants of economic returns. Significance: H9N2 vaccination can provide substantial economic benefits to commercial poultry producers in Pakistan. The results demonstrate the importance of considering both vaccine effectiveness and production-system characteristics when evaluating vaccination strategies and provide a quantitative framework to support farm-level and policy decisions on H9N2 control.

Key Words: Avian influenza (H9N2), Poultry vaccination, Economic efficiency, Commercial poultry production

FINANCIAL IMPACT OF LOW PATHOGENIC AVIAN INFLUENZA VIRUS SUBTYPE H9N2 ON COMMERCIAL BROILER CHICKEN AND EGG LAYER PRODUCTION SYSTEMS IN PAKISTAN

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Abstract

Low Pathogenic Avian Influenza (LPAI) subtype H9N2 is endemic in Pakistan and impacts poultry farming through disease related mortality, poor weight gain and reduced egg production. This study aims to estimate the farm-level financial impact of LPAI H9N2 infection on commercial broiler and layer production systems in Pakistan. A questionnaire based cross-sectional survey of 138 broiler farms and 136 layer farms in Pakistan was conducted in 2019. Primary data collected by cross-sectional survey along with expert opinion and published literature were used to parameterize five stochastic production and gross margin models for three broiler and two layer production systems: fully integrated production (FIP), partially integrated production (PIP) and independent farming production (IP) systems. Partial budget analysis were then carried out to estimate the financial impact of LPAI H9N2. Results indicate that in broiler production systems, starting with 35,000 day old chicks (DOC) per batch, the net cost of disease (million PKR/production cycle) was estimated at 4.10 (14,862 USD), 4.62 (16,747 USD) and 2.46 (8917 USD) for IP, PIP and FIP systems, respectively. The disease produced a negative gross margin (defined here as revenue minus replacement and variable costs) in IP (-53 PKR (-0.19 USD)/DOC bought) and PI (-25 PKR (-0.091 USD)/DOC bought) systems, while remained positive for FIP systems (87 PKR (0.32 USD)/DOC bought). For layer production systems, (mean flock size as 48,000 DOCs) the net cost (million PKR/production cycle) was 29.75 (107,095.21 USD) and 29.51 (106,223.45 USD) IP and PIP systems, respectively, and produced negative gross margin in both systems. Significance: The outcomes of the study highlight the vulnerability of independent and partially integrated production systems to the disease. These findings also offer a decision-making tool to the farmers and policymakers to evaluate avian influenza surveillance systems and control interventions in Pakistan.

Key Words: Modelling, Avian influenza, Financial impact, Pakistan

DIAGNOSTIC ASSAYS FOR AVIAN INFLUENZA VIRUS SURVEILLANCE AND MONITORING IN POULTRY: A CRITICAL APPRAISAL

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Abstract

Diagnostic testing aims to determine the infection status of a flock accurately and support disease intervention and mitigation. Diagnostic assays play an integral role in surveillance and monitoring of many poultry diseases, including avian influenza virus (AIV). The present article surveys the current literature on principles, appropriate sample matrices, test performance, advantages, and disadvantages of diagnostic assays for AIV. Diagnostic assays for AIV are categorized into four broad types: tests for detecting the viable virus, its antigen, its genomic material, and antibodies to the virus. The assays can be applied to various specimens for different testing objectives. Virus isolation can be achieved using embryonated eggs or cell cultures in a laboratory setting. Viral antigens can be detected or visualized by antigen-capturing immunoassays or tissue immunoassays. Viral RNA can be detected by polymerase chain reaction-based assays, including gel-based reverse transcription–polymerase chain reaction (RT-PCR), probe- or SYBR® Green-based real-time RT-PCR, loop-mediated isothermal amplification, and nucleic acid sequence-based amplification. Antibodies to AIV can be detected by enzyme-linked immunosorbent assay, agar gel immunodiffusion test, hemagglutination inhibition (HI) test, and microneutralization test. AIV isolates can be further characterized by HI, neuraminidase inhibition, sequencing including dideoxynucleotide chain-termination sequencing, next-generation sequencing and genetic sequence-based pathotype prediction, and pathogenicity testing. Novel and variant AIVs can also be recognized by DNA microarrays, electron microscopy, mass spectrometry, and biological microelectromechanical systems. Each method has pros and cons and different diagnostic performance. A variety of diagnostic assays are employed in AIV surveillance and monitoring. Their use depends on the test objective or fitness for purpose, the time of testing during the disease outbreak, the assay target, the sample matrix, assay performance, and the advantages and disadvantages.

Key Words: Avian influenza virus, Surveillance, Domestic birds, Detection tools and tests

ASSESSMENT AND CONTROL OF BIOFILM FORMATION IN COMMERCIAL POULTRY AUTOMATED DRINKING WATER LINES

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2026-PSC-094

Abstract

Background: Automated nipple drinking systems in commercial poultry houses are prone to rapid biofilm development due to warm shed temperatures, low water velocity, and the regular administration of water-soluble additives such as vaccines, vitamins, and organic acids. Biofilms protect enclosed microorganisms from routine disinfection, serving as continuous reservoirs for bacterial transmission and directly compromising flock health and biosecurity. **Objective:** This study evaluated the extent of biofilm accumulation, identified the dominant colonizing bacterial species within polyvinyl chloride (PVC) automated drinking water lines, and determined the comparative efficacy of various sanitizing agents in degrading established biofilms. **Methodology:** Swab samples were harvested from the inner lumen of drinking pipes across commercial broiler farms. Microbial enumeration was performed for total viable counts (TVC), coliforms, and *Pseudomonas* spp. using standard culture protocols. Biofilm-forming capacity was assessed using the microtiter plate crystal violet assay. In laboratory trials, mature multi-species biofilms were exposed to standard farm disinfectants: stabilized hydrogen peroxide (H₂O₂), peracetic acid (PAA), chlorine dioxide (ClO₂), and sodium hypochlorite at manufacturer-recommended and shock-dose concentrations with varying contact times (2 to 6 hours). Biomass eradication was measured spectrophotometrically at OD 570nm. **Results:** High microbial bio-burdens were detected inside the waterlines, with *Pseudomonas aeruginosa*, *Escherichia coli*, and *Enterococcus faecalis* identified as the primary matrix-forming isolates. Standard sodium hypochlorite exhibited poor penetration against mature extracellular polymeric substances (EPS), achieving less than 45% biomass reduction. Conversely, stabilized H₂O₂ combined with PAA and chlorine dioxide demonstrated superior efficacy, achieving >85% biofilm removal (P) within a 4-hour contact window. **Conclusion:** Routine chlorination alone is insufficient to eliminate established biofilms in poultry water delivery systems. Integrating periodic oxidative shock treatments between flock cycles alongside continuous monitoring provides an effective strategy to mitigate biofilm-associated contamination, enhance water quality, and strengthen poultry biosecurity.

Key Words: Biofilm control, Automated drinking lines, Poultry biosecurity, *Pseudomonas aeruginosa*, Peracetic acid, Water sanitation, Broiler health

COMPARATIVE EVALUATION OF TOXICOLOGICAL AND HISTOPATHOLOGICAL EFFECTS OF LEAD AND CHROMIUM IN CHICKEN IN KASUR REGION, PUNJAB, PAKISTAN

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2026-PSC-095

Abstract

Background: Poultry meat is a major and affordable source of dietary protein, but contamination of feed, water, and the surrounding environment with heavy metals such as lead (Pb) and chromium (Cr) is a growing food-safety and public-health hazard, particularly for birds raised near industrial areas. The situation demands a comparative assessment of the toxicological and histopathological impact of these metals on chicken raised at varying distances from industry. **Objective(s):** The present study was planned to comparatively evaluate the toxicological and histopathological effects of lead and chromium exposure on the liver and kidney tissues of domestic and broiler chicken. **Methodology:** Eighteen chickens (9 domestic and 9 broiler, 2–9 months of age) were procured from three sites in Kasur, Punjab: near an industrial area (~5 km radius, T1), distant from industry (~10–15 km, T2), and far from industry (~20–30 km, T3). Blood samples were analyzed for complete blood count (RBC, WBC, hemoglobin, platelets), liver function tests (total bilirubin, SGPT/ALT, alkaline phosphatase), renal function tests (urea, creatinine), and serum lead and chromium levels. Liver and kidney tissues were processed for histopathological examination. **Results:** Complete blood counts were comparatively lower, while liver and renal function test values were higher, in domestic chicken collected near the industrial area (T1) than in those from T2 and T3. Serum lead and chromium levels were correspondingly elevated in domestic chicken from the near-industry site. Histopathology of the kidney in this group revealed epithelial cell degeneration and necrosis, while the liver showed hepatocyte necrosis, mononuclear cell infiltration, and swollen hepatocytes with collapsed sinusoidal spaces. **Significance:** The present study depicted that proximity to industrial sources significantly worsens lead- and chromium-related hematological, hepatic, and renal damage in chicken, indicating that poultry raised near industrial areas may pose an underrecognized food-safety risk and supporting the need for stricter environmental and feed monitoring.

Key Words: Lead, Chromium, Toxicity, Domestic and broiler chicken, Hepatic and renal histopathology, Hematology

COMPARATIVE PATHOGENICITY OF DIFFERENT ISOLATES OF *SALMONELLA GALLINARUM* DURING EXPERIMENTAL CHALLENGE IN BROILER CHICKENS

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Abstract

Salmonella enterica subspecies *enterica* serovar Gallinarum biotype Gallinarum (*Salmonella* Gallinarum, SG) remains a major cause of fowl typhoid, resulting in substantial economic losses to the poultry industry worldwide. Reliable experimental challenge studies using different isolates are required to better understand SG pathogenesis and evaluate differences in virulence among SG isolates. The present study aimed to develop and evaluate SG challenge models in broiler chickens to better characterize the pathogenesis and virulence of different SG isolates. A total of 100 day-old Cobb-500 broiler chicks were randomly assigned to 10 individual pens. At 7, 10, and 14 days of age, birds from two pens per treatment were challenged by oral gavage with one of four SG isolates (1 mL at approximately 108 CFU/mL). Birds in two additional pens remained unchallenged and served as controls. Birds were monitored twice daily for clinical signs, including depression, inappetence, and diarrhea adhering to the vent. At 7, 10, 14, and 21 days of age, liver and cecal digesta samples were collected from four birds per treatment for *Salmonella* recovery and identification. Feed consumption, body weight gain, clinical signs, and mortality were also monitored to compare disease severity among treatments. Recovery of *Salmonella* was greater from liver samples than from cecal digesta samples (79% vs. 55%). Of 200 liver and digesta samples examined, 77 were positive for *Salmonella*. Among these, 40 samples showed positive agglutination with O9 antisera and were identified as SG. Pathogenesis differed among treatments, with birds challenged with SG isolate I2 exhibiting the greatest frequency of clinical signs (%) and the highest mortality (50%). Growth performance also differed among treatments, with birds challenged with SG isolate I2 showing reduced feed consumption and lower body weight gain compared with birds challenged with the other SG isolates. The present study demonstrates differences in pathogenicity among SG isolates during experimental challenge and capable of producing different manifestations in poultry.

Key Words: *Salmonella Gallinarum*, Isolate, Pathogenicity, Experimental challenge

MACHINE LEARNING-BASED PREDICTION OF ANTIMICROBIAL RESISTANCE IN ESCHERICHIA COLI ISOLATED FROM COMMERCIAL POULTRY

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Abstract

Antimicrobial resistance (AMR) is a growing global health threat, contributing to an estimated 1.27 million deaths annually, with poultry-associated *Escherichia coli* widely used as an indicator organism for AMR surveillance. Conventional antibiotic susceptibility testing (AST) is time-consuming, making machine learning (ML) a promising tool for rapid, data-driven prediction of resistance patterns. To develop an ML-based Random Forest (RF) classifier using sample and microbiological data to predict AMR in *E. coli* isolated from commercial poultry. A retrospective study was conducted using AMR data of *E. coli* isolated from the caeca of healthy commercial poultry, collected from nine sentinel sites across Pakistan between June 2020 and July 2022, obtained from the National Reference Laboratory for Poultry Diseases (NRLPD), Islamabad. AST results, interpreted per CLSI criteria, were converted into binary resistant/susceptible outcomes, cleaned, imputed, and split into training (70%) and testing (30%) sets. RF classifiers were developed in R for β -lactam, aminoglycoside, and quinolone antibiotic classes, with performance evaluated using a confusion matrix and AUC-ROC analysis. Results: The RF models showed good discriminatory performance across all three antibiotic classes, with AUC values ranging from 0.76 to 0.82; prediction accuracy was highest for quinolones, followed by aminoglycosides and β -lactams. Virulence-associated genetic traits were the strongest predictors of resistance status: ferric-aerobactin ranked highest for β -lactams (precision = 0.64, F1-score = 0.62, AUC = 0.80) and quinolones (AUC = 0.82), while mannose-specific adhesion was the top predictor for aminoglycosides (AUC = 0.76), followed in each case by biofilm formation, increased serum survival, pilus assembly, and hemolysin. Routine biochemical variables (e.g., MacConkey growth, indole, citrate, motility) contributed negligibly to prediction, and hyperparameter optimization reduced the out-of-bag error across classes by 5–21%. This study demonstrates that RF-based machine learning models can effectively predict AMR patterns in *E. coli* from routinely collected sample and microbiological data in commercial poultry, offering a rapid, scalable complement to conventional AST and supporting evidence-based antibiotic stewardship and AMR surveillance in the poultry sector.

Key Words: Antimicrobial Resistance, *Escherichia coli*, Random Forest, Commercial Poultry

IMPACT OF FARM HYGIENE AND BIOSECURITY PRACTICES ON CONTROLLING *SALMONELLA* IN LAYER POULTRY FARMS

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Abstract

Salmonella infections in commercial layer poultry farms pose severe challenges to flock productivity, egg safety, and public health. This study evaluated the direct relationship between on-farm biosecurity measures, sanitation standards, and the prevalence of *Salmonella* across 30 commercial layer farms. Participating farms were categorized into two distinct cohorts: Category A (farms with strict biosecurity protocols, including visitor restrictions, functional vehicle disinfection dips, scheduled shed sanitization, and rodent control) and Category B (farms with conventional, standard farm hygiene management). A total of 300 samples, including cloacal swabs, eggshell surfaces, drinking water, and environmental litter swabs, were collected and analyzed using selective pre-enrichment, differential culturing, and standard biochemical identification assays. The findings revealed a statistically significant difference in *Salmonella* isolation rates between the two groups (P). Category A farms exhibited an overall *Salmonella* prevalence of 7.3%, whereas Category B farms demonstrated a markedly higher contamination rate of 28.7%. The highest bacterial recovery in poorly managed farms occurred in environmental litter and unwashed eggshells. Inadequate rodent exclusion, improper disposal of dead birds, and untreated drinking water were identified as the primary risk factors accelerating bacterial persistence. Furthermore, flocks maintained under enhanced biosecurity demonstrated superior egg production efficiency and lower mortality rates. These results confirm that implementing rigorous, multi-barrier biosecurity protocols and systematic shed hygiene drastically curtails *Salmonella* colonization in layer poultry. Adopting structured sanitation guidelines is therefore essential for mitigating foodborne risks, ensuring clean table egg production, and sustaining commercial poultry operations.

Key Words: *Salmonella*, Biosecurity, Layer Poultry, Food Safety

IMPACT OF INDIGENOUS BACKYARD POULTRY KEEPING KNOWLEDGE OF SMALLHOLDER WOMEN FARMERS ON HOUSEHOLD FOOD SECURITY IN SOUTH PUNJAB: OPPORTUNITIES AND CONSTRAINTS

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2026-PSC-099

Abstract

Backyard poultry keeping is a low-cost entrepreneurial activity widely practiced by smallholder women farmers across rural Pakistan to improve their livelihood and food security. Unfortunately, the importance of backyard poultry to improve food security and economic resilience of smallholder women farmers remain underexplored, particularly in the flood-prone regions of South Punjab. Thus, the study investigated how indigenous knowledge of smallholder women farmers play key role in improving food security. For this study, a mixed-methods approach was used by combining quantitative and qualitative data. Data from 100 smallholder women farmers, having less than 12.5 acre land, were collected through structured questionnaires and focus group discussions. To address selection bias and estimate the causal impact of indigenous poultry-keeping knowledge on food security outcomes, propensity score matching (PSM) was employed within a probit regression framework using STATA software, comparing food security outcomes between women using indigenous practices or not and how different variables are affecting the food security of women farmers. The results reveal that indigenous knowledge of backyard poultry management has a statistically significant positive effect (P

Key Words: Food security, Backyard poultry, Smallholder women farmers

PREVALENCE OF SALMONELLA IN BROILER FARMS AND ITS EFFECT ON BIRD HEALTH AND PRODUCTIVITY

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2026-PSC-100

Abstract

Salmonellosis is an important bacterial disease affecting poultry health, production efficiency, food safety, and public health. This study aimed to determine the prevalence of *Salmonella* in broiler farms and evaluate its association with flock health and production performance. A total of 200 samples were collected from broiler birds and farm environments, including cloacal swabs, feces, litter, feed, drinking water, and poultry-house surfaces. Samples were examined using standard bacteriological culture, biochemical characterization, serological identification, and molecular confirmation. Overall, *Salmonella* was detected in 34 of 200 samples, corresponding to an overall prevalence of 17.0%. Environmental samples showed a higher positivity rate (20.0%) than bird-associated samples (14.0%), suggesting that contaminated farm environments may contribute substantially to transmission. Farms with poor sanitation, inadequate litter management, contaminated water or feed, rodent activity, and weak biosecurity showed comparatively higher contamination levels. Affected flocks demonstrated an 8.5% reduction in mean body-weight gain compared with unaffected flocks. Mortality increased from 1.8% in unaffected flocks to 3.2% in affected flocks, representing a 77.8% relative increase. Similarly, feed-conversion ratio increased from 1.65 to 1.82, indicating a 10.3% deterioration in feed efficiency. Clinical manifestations included diarrhea, dehydration, depression, reduced appetite, uneven growth, morbidity, and mortality. Subclinical infection was also significant, as apparently healthy birds may carry and shed *Salmonella*, facilitating environmental contamination and transmission through the food chain. The findings demonstrate that *Salmonella* infection can adversely affect broiler health and farm profitability. Regular surveillance, strict biosecurity, effective sanitation, safe feed and water, pest control, appropriate vaccination, responsible antimicrobial use, and all-in/all-out management are recommended to minimize transmission and improve flock productivity.

Key Words: *Salmonella*, Broiler chickens, Biosecurity, Feed conversion ratio.

EVALUATION AND IN VIVO EFFICACY OF LACTOBACILLUS PLANTARUM ISOLATES AGAINST CLOSTRIDIUM PERFRINGENS-INDUCED NECROTIC ENTERITIS IN BROILER CHICKENS

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2026-PSC-101

Abstract

Necrotic enteritis (NE), primarily associated with *Clostridium perfringens*, is an important health and economic challenge in broiler production. Probiotic bacteria offer a promising alternative to antibiotic-based approaches for improving gut health and controlling NE. To evaluate the probiotic potential of *Lactobacillus* isolates through in vitro screening and assess the protective efficacy of selected isolates against *C. perfringens*-induced NE in broiler chickens. Five *Lactobacillus* isolates (Z1–Z5) were evaluated for acid tolerance, bile salt resistance, antagonistic activity, and aggregation properties. Based on their in vitro performance, Z3 (GenBank accession: PZ723569), Z4 (PZ723570), and Z5 (PZ711636) were selected for an in vivo trial involving 100 broiler chickens allocated into six experimental groups. Selected probiotics were administered during the pre-challenge period, followed by *C. perfringens* challenge and monitoring until day 35. Growth performance, mortality, NE lesion scores, intestinal bacterial load, histopathology, and expression of intestinal tight-junction genes (CLDN1 and ZO-1) were evaluated. In vitro screening identified Z3, Z4, and Z5 as superior isolates, demonstrating significantly better probiotic characteristics and inhibitory activity against *C. perfringens* (P *C. perfringens* load was significantly reduced in probiotic-treated groups. Histopathological examination showed improved intestinal architecture and reduced inflammatory changes. Expression of CLDN1 and ZO-1 was significantly upregulated following probiotic administration (P Significance: The findings demonstrate that indigenous *L. plantarum* isolates Z3, Z4, and Z5, particularly in combination, have strong potential for mitigating *C. perfringens*-associated NE by reducing pathogen burden, improving intestinal integrity, and enhancing gut barrier function. These strains may serve as promising candidates for sustainable probiotic-based strategies in poultry production.

Key Words: *Lactobacillus*, Probiotics, *Clostridium perfringens*, Necrotic enteritis, Broiler chickens, Gut health

RATIONAL DESIGN, CONSTRUCTION AND SAFETY EVALUATION OF A Δ PUR^A MUTANT OF *SALMONELLA GALLINARUM* AS A NOVEL LIVE ATTENUATED VACCINE CANDIDATE AGAINST FOWL TYPHOID

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2026-PSC-102

Abstract

Fowl typhoid, caused by *Salmonella Gallinarum* (SG), remains an economically important disease of poultry, necessitating the development of safe and genetically stable live attenuated vaccines. The present study was designed to construct a markerless SG Δ purA mutant and evaluate its growth characteristics, purine auxotrophy, attenuation, and safety as a potential live attenuated vaccine candidate against fowl typhoid. A markerless SG Δ purA mutant was constructed by targeted deletion of the purA gene, encoding adenylosuccinate synthetase, using λ -Red-mediated homologous recombination followed by FLP-mediated excision of the antibiotic resistance cassette. Mutant construction was confirmed by PCR. Growth kinetics and purine auxotrophy were evaluated in nutrient-rich and minimal media with and without adenosine supplementation. For in vivo safety evaluation, 3-day-old *Salmonella*-free chicks were orally inoculated with 2×10^8 CFU of either the SG Δ purA mutant or parental SG wild-type strain. Birds were monitored for 28 days for clinical signs, body weight gain, mortality, gross lesions, and bacterial persistence in the liver and spleen. Deletion of purA markedly impaired bacterial growth under nutrient-rich conditions and completely inhibited growth in minimal medium lacking adenosine, whereas adenosine supplementation restored growth, confirming a stable purine auxotrophic phenotype. In experimentally infected chicks, the wild-type strain caused 76.7% mortality, whereas no mortality was observed in the SG Δ purA-inoculated group during the 28-day observation period. Mutant-inoculated birds maintained normal body weight gain, exhibited only mild clinical signs and minimal gross lesions, and showed significantly reduced bacterial colonization of the liver and spleen, with complete bacterial clearance by 14 days post-infection. These findings demonstrate that deletion of purA markedly attenuates the virulence of *Salmonella Gallinarum* while maintaining a favorable safety profile in chicks. The markerless SG Δ purA mutant therefore represents a promising live attenuated vaccine candidate warranting further evaluation of its immunogenicity and protective efficacy against fowl typhoid.

Key Words: *Salmonella Gallinarum*, Fowl typhoid, purA deletion, Vaccine Safety

SYNERGISTIC ANTICOCIDIAL EFFICACY OF CAPSICUM ANNUUM AND ALLIUM SATIVUM IN BROILERS

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Abstract

Cecal coccidiosis is an important parasitic ailment occurring as a result of the protozoan *Eimeria tenella*, which severely affects the broiler industry globally. Nowadays, the use of anticoccidials is increasing, which may lead to drug resistance. This study's goal was to test the combined anti-coccidial efficacy of garlic (*Allium sativum*) and red chilli (*Capsicum annuum*) powders against *Eimeria tenella*. *Capsicum annuum* and *Allium sativum* were dried and ground into powdered form. All the chicks (n=100) were divided into 5 different groups, with 20 birds in each group. The first group was treated with *C. annuum* (4g/kg feed) and *A. sativum* (12g/1 L drinking water), the 2nd group with *C. annuum* (4g/kg feed), the 3rd group with *A. sativum* (12g/1 L drinking water), the 4th group with Amprolium (0.03g/1L drinking water), and no treatment was given to the 5th group (negative control group), with effect from 7th day of life. All the birds were challenged with 50,000 *E. tenella* oocysts on the 14th day of life. Birds were monitored for body weight, weight gain, feed consumed, and parasite load (OPG). FCR was also calculated. Although, the mixture of *Capsicum annuum* and *Allium sativum* showed an antiparasitic effect that was greater in intensity than all other groups, the mortality was relatively highest with this combination as compared to other groups, hence more studies are needed to benefit from this synergistic anti-coccidial efficacy while minimizing the mortality.

Key Words: Coccidiosis, Broiler, *Capsicum annuum*, *Allium sativum*, Amprolium, Body weight, Feed conversion ratio

FARM TO FORK: EMERGING EVIDENCE OF MICROPLASTIC EXPOSURE ACROSS THE POULTRY PRODUCTION CHAIN AND IMPLICATIONS FOR MEAT, EGGS, AND FOOD SAFETY

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Abstract

Poultry meat and eggs are important sources of affordable, high-quality animal protein and play a significant role in global and Pakistani food security. Microplastics (MPs), defined as synthetic polymer particles smaller than 5 mm, are increasingly recognized as emerging contaminants within agricultural and food production systems. In poultry production, potential sources include contaminated feed ingredients, drinking water, plastic feed bags and farm infrastructure, and materials used during processing and packaging. Because poultry consume feed continuously throughout production, contaminated feed represents a plausible and potentially important route of MP exposure. This evidence synthesis critically evaluates current peer-reviewed literature concerning the sources and pathways of MP exposure in poultry, and the potential implications for food safety and One Health, with particular attention to knowledge gaps relevant to Pakistan. Available studies demonstrate the presence of MPs in poultry feed and gastrointestinal tissues. A Pakistan-based study reported MP particles in chicken crop and gizzard samples collected from poultry farms in Punjab, providing direct evidence of poultry exposure within the country. Other studies have identified MPs in poultry feed and edible tissues, including breast, liver, and gizzard. Controlled poultry experiments further indicate that MP and nanoplastic exposure may affect gut microbiota composition, intestinal integrity, oxidative and inflammatory responses, and growth performance. Emerging evidence also indicates the presence of MPs in commercial eggs and, in a recent study, hen ovarian follicles, suggesting that reproductive tissues may represent a potential route for movement of plastic particles toward egg formation. Similarly, although MPs have been reported in poultry and quail muscle tissue, direct farm-level evidence demonstrating a complete and quantitatively characterized feed-to-tissue or feed-to-egg pathway remains insufficient. Major limitations include the lack of standardized analytical methods across poultry studies, limited Pakistan-specific data on MP contamination in feed, water, meat, and eggs, insufficient farm-to-fork tracer studies. Consequently, the detection of MPs in poultry-derived foods should currently be regarded as an emerging food-safety concern rather than evidence of an established human health risk. Current evidence supports the presence of MPs within several components of the poultry production system. More research needed to clarify exposure pathways and support future poultry food-safety and One Health risk assessments.

Key Words: Microplastics, Poultry production, Poultry feed, Food safety, Gut microbiota, Poultry meat, Eggs, One Health, Pakistan

EFFECT OF POMEGRANATE PEEL EXTRACT (PUNICA GRANATUM) ON THE GROWTH INDICES AND MACROSCOPIC INTESTINAL LESIONS IN EXPERIMENTAL CECAL COCCIDIOSIS IN BROILER CHICKEN

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2026-PSC-105

Abstract

To address the rising concerns of drug resistance and residues in the meat consumers, this study evaluated the anticoccidial efficacy of pomegranate peel extract against *Eimeria tenella* in broilers. Weight gain, FCR and Parasite Loads were recorded. The 70% ethanolic extract of pomegranate peel was prepared. Group 1 was infection control without any treatment, extract was supplemented in drinkers of the group 2 and 3 at the dose rate of 100 and 200 ppm respectively, 4th group was treated with amprolium and 5th group was a healthy control having neither infection nor treatment. The 50,000 *E. tenella* sporulated oocysts were orally gavaged on day 14 of age of the broiler chicks. The healthy control group performed best throughout the experiment as compared to the rest of the groups, in case of the weight gain (336.1167 ± 44.36899) and FCR (1.055866 ± 0.121026). In this study, weight gain and FCR in broiler chicks was significantly affected by the supplementation of pomegranate peel extract at the dose of 100 ppm and amprolium followed by 200 ppm as compared to the infection control group in experimentally infected broiler chicks. During the acute stage of the infection, the highest weight gain and FCR was observed in the healthy control group, which severely reduced in the infection control group. In experimentally infected groups, the amprolium and 100 ppm PPEx treated group improved the weight gain and FCR as compared to the 200 ppm which showed better weight gain compared to the infection control group. Similarly following the acute phase of infection, the infection control group showed the least weight gain and poorest FCR. The weight gain and FCR of the 100 ppm and amprolium groups are comparable and were improved in comparison to the 200 ppm group. Whereas the least OPG was seen in the 200 ppm group followed by amprolium, 100ppm and infection control group in ascending order. Although the reduction in mortality was non-significant, there was a significant improvement in weight gain, FCR, and a significant reduction in parasite load (OPG) and intestinal lesions compared to the infected control group, under the efficacy of pomegranate peel extract.

Key Words: Cecal Coccidiosis control, *Eimeria tenella*, Pomegranate Peel Extract

EFFECT OF CANOLA ACID OIL AS AN ALTERNATIVE LIPID SOURCE TO POULTRY OIL ON GROWTH PERFORMANCE, NUTRIENT DIGESTIBILITY AND CARCASS CHARACTERISTICS OF BROILER CHICKENS

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Abstract

The increasing cost of poultry production has intensified the need for economical and sustainable alternative energy sources in broiler nutrition. Canola acid oil, a low-cost lipid source rich in free fatty acids, may provide a viable alternative to conventional poultry oil; however, its effects on nutrient utilization, growth performance, and carcass characteristics require evaluation. Therefore, the present study was conducted to assess the effects of replacing poultry oil with canola acid oil on growth performance, nutrient digestibility, carcass characteristics, and feed cost in broiler chickens. A total of 240 one-day-old broiler chicks were randomly allocated to three dietary treatments, with 80 birds per treatment and four replicates of 20 birds each. Treatment A served as the control and received a basal diet containing poultry oil, whereas Treatment B received a basal diet in which 50% of the poultry oil was replaced with canola acid oil. Treatment C received a basal diet in which 100% of the poultry oil was replaced with canola acid oil. All birds received the same starter diet, and experimental treatments were provided from 14 to 35 days of age. Weekly body weight gain (BWG), feed intake, feed conversion ratio (FCR), and mortality were recorded. At the end of the experiment, nutrient digestibility, carcass characteristics, and feed cost were determined. Feed and oil samples were also analyzed for free fatty acid content, peroxide value, and fatty acid composition to assess lipid quality and oxidative stability. Data were analyzed using analysis of variance (ANOVA) under a completely randomized design. Birds receiving 50% and 100% canola acid oil showed significantly improved BWG and FCR compared with the control group ($P < 0.05$). Treatment C also significantly improved nutrient digestibility ($P < 0.05$), while Treatment B resulted in higher carcass yield and breast muscle deposition compared with the control. These findings demonstrate that canola acid oil can effectively replace poultry oil, either partially or completely, in broiler diets without compromising performance. Particularly, complete replacement improved nutrient utilization and feed efficiency, while partial replacement showed favorable effects on carcass yield and breast muscle development. Canola acid oil therefore represents a promising, economical, and sustainable alternative lipid source for modern broiler production.

Key Words: Canola acid oil, Broiler chickens, Poultry oil, Feed efficiency, Nutrient digestibility

EFFECTS OF CANOLA MEAL AND POULTRY BY-PRODUCT MEAL AS ALTERNATIVE PROTEIN SOURCES ON GROWTH PERFORMANCE, NUTRIENT DIGESTIBILITY, AND CARCASS CHARACTERISTICS OF BROILER CHICKENS

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2026-PSC-107

Abstract

The present study was conducted to evaluate the effects of replacing conventional protein sources with canola meal (CM) and poultry by-product meal (PBM) on growth performance, nutrient digestibility, carcass characteristics, and survivability of broiler chickens. A total of 240 broiler chicks were randomly allocated to three dietary treatments with four replicates per treatment. The control group (T0) received a conventional basal diet, while T1 and T2 received diets containing different inclusion levels of CM and PBM. Growth performance, including feed intake (FI), body weight gain (BWG), feed conversion ratio (FCR), feed efficiency (FE), and mortality, was recorded throughout the 35-day experimental period. Nutrient digestibility was determined at 21 and 35 days, while carcass characteristics were evaluated at the end of the trial. Overall, T2 showed significantly lower FI (3,059 g), higher BWG (2,041 g), and improved FCR (1.49) compared with T0 (3,114 g, 2,015 g, and 1.54, respectively; $P < 0.05$). During the finisher phase, T2 also achieved the highest BWG (675 g) and the lowest FCR (1.61). At 21 days, dry matter, ether extract, crude fiber, and ash digestibility were highest in T2, reaching 82.6%, 87.2%, 73.8%, and 61.8%, respectively ($P < 0.05$). At 35 days, T2 maintained the highest dry matter (85%), crude fiber (73%), and ash (61%) digestibility. Carcass yield was significantly higher in T1 (60.52%) than in T0 (57.34%), while breast and thigh percentages were highest in T0. Mortality was lowest in T2 (7 birds) compared with T0 (10) and T1 (17). Overall, moderate inclusion of CM and PBM improved carcass yield, while the higher inclusion level enhanced overall growth performance, feed efficiency, selected nutrient digestibility, and survivability, demonstrating their potential as economical alternative protein sources for sustainable broiler production.

Key Words: Canola meal, Poultry by-product meal, Broiler performance

OPTIMIZATION OF ANTIBODY DETECTION ELISA FOR AVIAN ANTI EIMERIA IGA

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Abstract

Coccidiosis, a major intestinal disease in chickens caused by different species of protozoan parasite *Eimeria*, affecting poultry health and productivity. Immunoglobulin A (IgA) plays an important role in avian immune response, particularly in mucosal immunity. This study was designed to develop and optimize an ELISA protocol for the detection of avian IgA antibodies specific to coccidiosis causing *Eimeria* species in chicks. Broiler chickens were divided into infected and healthy control group. *Eimeria* oocysts were collected and processed for antigen preparations. Samples were taken from the experimental birds and used for mucosal antibody analysis. An indirect ELISA was optimized by evaluating antigen concentrations and other assay conditions for detection of avian anti *Eimeria* IgA. The optimized assays were then used to compare the IgA responses between the experimental groups. Optimization of the indirect ELISA is a suitable immunological method to detect anti-*Eimeria* IgA in broiler, layer and breeder birds. The evaluation of IgA in infected and healthy control groups may provide useful insight into the mucosal immune response associated with various anti-coccidial interventions.

Key Words: Indirect ELISA, Mucosal Immunity, Coccidiosis, *Eimeria*, IgA

OPTIMIZATION OF CHICKEN ANTI-EIMERIA IGY-DETECTION ELISA

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Abstract

Coccidiosis is a poultry disease which infects intestinal mucosa of birds causing malabsorption of feed and results in poor FCR. There is a need of continuous monitoring of disease response against coccidiosis in order to observe the long term immunity of the birds particularly in chickens. Hence, the current study is one step towards that direction. Optimization of proposed ELISA during the current study will help in monitoring bird's systemic immune response to *Eimeria*. The present study was designed to investigate the IgY-antibody response of chickens following experimental *Eimeria* infection through ELISA. A total of 100 chicks were used in this study with 80 birds infected with *Eimeria tenella* and an untreated control group. At 14 days of age, the experimental birds were challenged with 50,000 *Eimeria tenella* oocysts. Samples were obtained at different intervals up to seven weeks of age. Sera were separated from the collected blood samples and used for ELISA optimization and to assess the IgY-antibody response against *Eimeria*. The findings were used to evaluate the suitability of ELISA for detecting anti-*Eimeria* IgY antibodies in experimentally infected chickens and to compare the immune responses among the infected and healthy groups.

Key Words: *Eimeria*, coccidiosis, IgY, Antibody response, ELISA

GARBAGE TO GOLD: MANGO SEED KERNEL EXTRACT AS A FUNCTIONAL AND SUSTAINABLE REPLACEMENT FOR ANTIBIOTICS IN POULTRY NUTRITION

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Abstract

This study represents a step forward in our previous investigations to develop nutraceutical-based alternatives to antibiotics by harnessing the bioactive compounds in mango seed kernel (MSK) extracts. Building on our earlier work establishing a safe green extraction method using ultrasound-assisted techniques, we evaluated the potential of MSK extracts in both in vitro and in vivo settings in broilers. The results indicated that MSK extracts could serve as a viable alternative to antibiotics at 25ml/kg without imparting any negative effects on broilers. Therefore, the current study focused on the safety and impact of higher MSK dosage levels (1x: 25 ml/kg, 3x: 75 ml/kg, and 5x: 125 ml/kg of feed), along with a control, on broiler performance and gut microbiota shift. For this purpose, one-day-old chicks were divided into five groups (three replicates of 15 birds each) in a Completely Randomized Design. The antibiotic-containing diets served as the Control Positive, whereas the Control Negative group received antibiotic-free diets. The feeds for the MSK dose levels (1x, 3x, and 5x) groups were sprayed to ensure homogeneous mixing of nutraceuticals. The birds were offered feed and water ad libitum for 21 days. Weekly feed intake and body weight data were recorded, and the feed conversion ratio was calculated. On day 21, birds were randomly selected from each pen and slaughtered to collect ceca for gut microbiota assessment. The results revealed that body weight significantly ($p < 0.05$) improved in the 1x group (25ml/kg), followed by positive control, while higher doses did not enhance growth. However, feed intake and feed conversion ratio did not differ significantly among groups. Gut microbiota analysis revealed a beneficial shift: total bacterial and *Escherichia coli* counts decreased significantly ($p < 0.05$) with higher MSK doses, reaching the lowest levels at the 5x dose. In contrast, *Lactobacillus* counts increased significantly ($p < 0.05$). These results suggest that increasing MSK extract doses can positively modulate gut microbiota by suppressing pathogenic bacteria and promoting beneficial ones, even though they do not improve growth performance beyond the 1X dose. Practically, 25 ml/kg is the optimal dose for MSK extract to replace antibiotics in broiler diets, balancing performance benefits and practical feed stability. However, higher doses may benefit gut health if delivery challenges such as increased feed moisture are addressed. To overcome this, advanced technologies such as nano-emulsion or nano-encapsulation could be explored to ensure targeted release of bioactive compounds in the gut, maximizing the nutraceutical potential of MSK extracts.

Key Words: Mango seed kernel, Extract, Growth, Gut microbiota, Safety

EFFECTS OF XYLANASE- AND MANNANASE-FORTIFIED CORN DDGS-BASED DIETS ON GROWTH PERFORMANCE, NUTRIENT DIGESTIBILITY, GUT MORPHOLOGY, AND ECONOMIC RETURNS IN BROILER CHICKENS

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Abstract

This study was conducted to evaluate the effects of supplementing non-starch polysaccharide degrading enzymes in corn-based Distillers Dried Grains with Solubles (DDGS) diets on the growth performance, nutrient digestibility, gut morphology, carcass traits, and economic efficiency of broiler chickens. A total of 300 one-day-old Hubbard broiler chicks were randomly distributed into five dietary treatment groups under a Completely Randomized Design for a period of 42 days. The control group received a basal diet, while the remaining groups were fed diets containing 10% DDGS either without enzymes or supplemented with xylanase, mannanase, or a combination of both enzymes. Growth performance parameters, nutrient digestibility, protein efficiency ratio, gut histomorphology, carcass characteristics, mortality, and economic returns were evaluated. Results revealed that enzyme supplementation significantly reduced feed intake while improving body weight gain and feed conversion ratio compared with the DDGS-only and control groups ($P < 0.05$). The combined supplementation of xylanase and mannanase produced the best overall growth performance and feed efficiency. Nutrient digestibility of dry matter, crude protein, ether extract, crude fiber, and apparent metabolizable energy was significantly enhanced in enzyme-treated groups, particularly in the combined enzyme group ($P < 0.05$). Improved intestinal morphology was observed through increased villus height and villus height-to-crypt depth ratio along with reduced crypt depth. Protein efficiency ratio, dressing percentage, and economic profitability were also significantly improved by enzyme supplementation. In conclusion, the inclusion of xylanase and mannanase, particularly in combination, effectively enhanced nutrient utilization, gut health, growth performance, and economic returns in broilers fed DDGS-based diets.

Key Words: Xylanase, Mannanase, Nutrients digestibility, Intestinal morphology, Economics.

POTENTIAL PROSPECTS OF USING POULTRY FEED ADDITIVES IN SECURING FOOD SECURITY CHALLENGES

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Abstract

The global population, now exceeding 8 billion, continues to grow rapidly, with nearly 60% residing in Asia. Despite remarkable advances in artificial intelligence and digital technologies, food security remains a major global challenge. More than 700 million people still experience chronic hunger, emphasizing the urgent need for sustainable food production. Livestock production, particularly the poultry sector, plays a crucial role in meeting the increasing demand for affordable, high-quality animal protein. Global meat production has increased from approximately 71 million metric tons (MMT) in 1971 to 364 MMT in 2023, with poultry accounting for nearly 40% of total meat production, making it the world's largest source of animal meat. In developing countries such as Pakistan, where the population exceeds 250 million, rapid population growth, climate change, and increasing feed costs pose significant threats to food security. The poultry industry is among the country's fastest-growing agricultural sectors, contributing substantially to employment, economic development, and the supply of affordable protein. The remarkable productivity of modern poultry is supported by genetic improvement, efficient housing, effective disease control, and balanced nutrition. Poultry diets primarily consist of cereal grains, protein meals, agro-industrial by-products, vitamins, minerals, and various feed additives. However, climate change, geopolitical instability, supply chain disruptions, and rising production costs have reduced the availability and affordability of conventional feed ingredients. Moreover, inefficient nutrient utilization results in considerable losses of nitrogen, phosphorus, and other nutrients, reducing feed efficiency and increasing environmental pollution. Sustainable utilization of finite mineral resources also remains a critical concern. Among the available nutritional strategies, feed additives have emerged as indispensable tools for improving poultry performance. Additives such as enzymes, probiotics, prebiotics, synbiotics, postbiotics, organic acids, phytogenics, antioxidants, emulsifiers, and mycotoxin binders enhance nutrient digestibility, improve gut health, mitigate anti-nutritional factors, reduce oxidative stress, and decrease dependence on antibiotic growth promoters. Their strategic use improves feed efficiency, lowers production costs, minimizes nutrient excretion, and supports environmentally sustainable poultry production. Consequently, continued research on innovative feed additives is essential to maximize poultry productivity and strengthen global food security in an era of increasing resource constraints and climate uncertainty.

Key Words: Poultry, Feed additives, Food security, Technology

ASSESSMENT OF HERBAL IMMUNOSTIMULANTS IN BROILER PRODUCTION

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Abstract

As antibiotic use grows more problematic due to increasing antimicrobial resistance and growing limits on the use of antibiotic growth promoters in poultry, the need for sustainable alternatives in poultry production has increased. The immunomodulatory, antioxidant and antimicrobial properties of herbal immunostimulants derived from medicinal plants like garlic (*Allium sativum*), turmeric (*Curcuma longa*), ginger (*Zingiber officinale*) and oregano (*Origanum vulgare*) have been shown to garner great attention. The present review aims to evaluate the effect of herbal immunostimulants on the health and production efficiency of broiler chickens. Herbal extracts can positively modulate innate and adaptive immune responses in several ways, such as stimulation of antibody production, up-regulation of macrophage activity, and reduction of oxidative stress, according to the latest research. These phytochemical compounds can also help to regulate the gut environment by balancing different microbial species, enhance the barrier function of the gut and increase nutrient assimilation and growth efficiency. Furthermore, there have been reports that herbal supplements help reduce the use of antibiotics and disease outbreaks, making poultry farming more sustainable. The results indicate potential for improving broiler health and performance, although plant species, dosage and administration routes will affect the results. Standardization of herbal formulation, optimum inclusion level and validation of efficacy under commercial production conditions should be considered as future research directions. This could offer a realistic approach to improve disease resistance in broiler nutrition and tackle the issue of antimicrobial resistance and food safety in the world.

Key Words: Herbal immunostimulants, Broiler chickens; Immune response, Phytochemical feed additives, Antimicrobial resistance.

COMPARATIVE AND COMBINED EFFECTS OF DIETARY TURMERIC (*CURCUMA LONGA*) AND GINGER (*ZINGIBER OFFICINALE*) ON DIGESTIVE HISTOMORPHOMETRY AND GROWTH PERFORMANCE IN BROILER CHICKENS.

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Abstract

This study evaluated the effects of dietary supplementation with turmeric (*Curcuma longa*) and ginger (*Zingiber officinale*) powders on body weight and histomorphology of the digestive system in broiler chickens. Sixty broiler chicks were randomly allocated into four groups (n = 15): G1 (control), G2 (10 g/kg turmeric), G3 (10 g/kg ginger), and G4 (10 g/kg turmeric + 10 g/kg ginger) mixed in commercial feed. Dietary supplementation commenced on day 8 following the brooding period. Body weight was recorded weekly, and histomorphological examination of the digestive tract and pancreas was performed at the end of the experiment. Broilers supplemented with ginger (G3) exhibited significantly higher weight gain ($P < 0.05$) compared with the control group, whereas turmeric and combined supplementation also produced favorable effects on growth performance. Histomorphological assessment revealed treatment-related changes in the architecture of the digestive tract, including intestinal villus characteristics and epithelial structure. Ginger supplementation was associated with improved intestinal morphology, suggesting enhanced absorptive capacity and digestive function. Turmeric supplementation also produced beneficial morphological responses, while the combined treatment demonstrated potential complementary effects on selected gastrointestinal parameters. Changes in pancreatic and intestinal tissue characteristics further indicated that dietary phytogenic supplementation may support digestive physiology in broilers. Overall, the findings suggest that dietary turmeric and ginger powders, particularly ginger supplementation, can improve growth performance and may positively influence the structural development of the digestive system. These phytogenic feed additives may therefore represent promising natural nutritional strategies for supporting gastrointestinal health and productivity in broiler chickens.

Key Words: Turmeric, Ginger, Histomorphometry, Digestive system, Growth performance

DIETARY SUPPLEMENTATION OF WATERMELON SEED POWDER (CITRULLUS LANATUS) AND ITS EFFECT ON GROWTH, IMMUNE RESPONSE, CARCASS TRAITS AND HEPATIC HISTOPATHOLOGY OF BROILER CHICKENS

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Abstract

A 35-day trial was conducted to examine the effects of different proportions of inclusion of watermelon seed powder (WSP) on broiler performance. A completely randomized design experiment involved feeding day-old 256 chicks to four treatment groups (8 replicates per treatment with 8 birds in each replicate): T1 (0% WSP), T2 (2.5% WSP), T3 (5.0% WSP), and T4 (7.5% WSP). The results showed that supplementation of WSP had significant effects on the growth & health of broilers in a dose-dependent manner. The best inclusion level was found to be in group T3 (5.0% WSP), which resulted in the highest body weight gain, feed intake & feed conversion ratio (FCR). However, control and high-dosage groups had lower final body weights & FCR. Biochemical & histological analyses showed that 5.0% WSP inclusion was optimal for metabolic & organ health. Liver enzymes (ALT, AST) and renal markers (urea, creatinine) were decreased; however, lipids were improved (triglycerides and cholesterol) & HDL increased in T3 birds. The increased total protein and albumin in T3 also indicated increased protein metabolism. In addition, the 5.0% WSP diet increased humoral immunity by raising Newcastle disease antibody titers, which were also related to improved carcass characteristics such as dressing percentage and breast muscle yield. This was confirmed by liver histopathology, which showed that group T3 had better tissue properties than other groups. To conclude, 5.0% watermelon seed powder significantly increases broiler growth, promotes immunity, and protects vital organs, making it a highly effective organic alternative to synthetic growth promoters.

Key Words: Watermelon seed powder, Broiler chickens, Growth performance, Immune response, Liver histopathology

SYNERGISTIC EFFECTS OF POSTBIOTIC AND VITAMIN E SUPPLEMENTATION ON GROWTH PERFORMANCE, IMMUNE RESPONSE, GUT HEALTH, AND MEAT QUALITY IN BROILER CHICKENS

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Abstract

The withdrawal of antibiotic growth promoters has accelerated the search for innovative nutritional strategies that enhance poultry productivity, disease resilience, and sustainable food security. This study evaluated the individual and synergistic ameliorative effects of dietary postbiotic and vitamin E supplementation on growth performance, meat quality, immune response, and gut health in broiler chickens. A total of 480-day-old (Cobb-500) broiler chicks were randomly allocated into four dietary treatment groups (n = 120 birds/group; 4 replicates of 30 birds each) in a 42-day feeding trial: (1) Basal diet (Control), (2) Basal + 0.1% Postbiotic, (3) Basal + 200 mg/kg vitamin E, and (4) Basal + 0.1% Postbiotic + 200 mg/kg vitamin E. Dietary interventions significantly (P 0.05). Meat quality was markedly enhanced (P *Lactobacillus* and *Bifidobacterium* spp.) paired with a marked suppression of pathogenic *Escherichia coli*. Combined supplementation of postbiotics and vitamin E exerts a potent bio-nutritional synergy that optimizes gut health, immune resilience, and meat quality. This approach offers a commercially viable, antibiotic-free alternative to enhance flock resilience and sustainable poultry production for global food security.

Key Words: Postbiotic, Vitamin E, AGPs-free, Poultry

COMPARATIVE EFFECT OF *ACHILLEA WILHELMSII* AND PREBIOTIC ON IMMUNITY, GUT MORPHOLOGY AND HEMATOLOGY OF BROILER CHICKS

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Abstract

This study aims to assess the effect of dietary supplementation with *Achillea wilhelmsii* and NutriBoost as a prebiotic on growth performance, hematological parameters, intestinal morphology, and immune response of broiler chickens. A completely randomized design (CRD) was used with 250 one-day-old broiler chicks of the same commercial strain, which were randomly distributed among the five dietary treatments for 35 days. The treatment consisted of 50 birds in each treatment and 5 replicates, each containing 10 birds. The treatments were basal diet (T₀), basal diet plus 10 g/kg feed of *Achillea wilhelmsii* (T₁), basal diet plus 15 g/kg feed of *Achillea wilhelmsii* (T₂), basal diet plus 1 mL/L drinking water of NutriBoost (T₃), and basal diet plus 2 mL/L drinking water of NutriBoost (T₄). Feed intake and gain in body weight was measured every week. On day 35, blood samples were taken to assess complete blood count (CBC), antibodies to Newcastle disease (ND) and infectious bursal disease (IBD). Samples from the intestine were taken to assess villus height, crypt depth, and their ratio. One-way ANOVA was used and followed by Tukey's HSD test at a 0.05 level of significance. The data showed that the supplementation with *Achillea wilhelmsii* and NutriBoost significantly (P 0.05). In conclusion, the use of natural feed additives is a potential approach to enhance broiler production.

Key Words: *Achillea wilhelmsii*, Prebiotic, Broiler chickens, Gut morphology, Immune response, Phytogenic feed additive.

EFFECT OF BLACK GARLIC POWDER ON GROWTH PERFORMANCE, GUT MORPHOLOGY, NUTRIENT DIGESTIBILITY, AND ANTIOXIDANT CAPACITY IN BROILER CHICKENS

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Abstract

With the global phase-out of antibiotic growth promoters and increasing consumer demand for safe, residue-free poultry products, the search for effective natural feed additives has intensified. This study investigated the effects of black garlic powder (BGP) supplementation on growth performance, gut morphology, nutrient digestibility, and antioxidant status in broiler chickens. A total of 200 one-day-old Ross-308 chicks were randomly assigned to five dietary treatments (T1–T5) in a completely randomized design, with four replicates of 10 birds each. T1 served as the control group and received a standard basal diet, while T2, T3, T4, and T5 were supplemented with BGP at 0.25, 0.50, 0.75, and 1 g/kg of feed, respectively. Broilers receiving 1 g/kg BGP (T5) achieved the highest feed intake ($P = 0.0001$), the greatest body weight gain ($P = 0.0001$), and the most efficient feed conversion ratio ($P = 0.0009$). This group also exhibited the tallest villi ($P = 0.0001$) and the highest villus height-to-crypt depth ratio ($P = 0.0001$), while the widest villi ($P = 0.0254$) were recorded in T4. Crypt depth was shallowest ($P = 0.0001$) in T4 and T5 compared to the other groups. On day 21, crude protein digestibility was highest in T5 ($P = 0.0001$), while by day 35, both T4 and T5 showed the greatest values ($P = 0.0005$). Apparent metabolizable energy was also highest in T5 on both day 21 ($P = 0.0012$) and day 35 ($P = 0.0095$). Furthermore, T5 birds had the lowest malondialdehyde concentrations on both day 21 ($P = 0.0116$) and day 35 ($P = 0.001$), indicating enhanced antioxidant capacity. In conclusion, incorporating black garlic (the fermented form of garlic) into broiler diets, particularly at a dose of 1 g/kg, may enhance growth performance, intestinal morphology, nutrient digestibility, and antioxidant status in broiler chickens.

Key Words: Black garlic, Growth performance, Gut morphology, Nutrient digestibility, Antioxidant status

EFFECTS OF DIETARY CASTOR OIL (*RICINUS COMMUNIS*) SUPPLEMENTATION ON PRODUCTION PERFORMANCE, EGG QUALITY, HATCHING TRAITS, AND IMMUNE RESPONSE IN COCCIDIOSIS-CHALLENGED JAPANESE QUAIL

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Abstract

Coccidiosis, caused by protozoan parasites of the genus *Eimeria*, is one of the most economically important parasitic diseases affecting poultry production worldwide. The disease primarily damages the intestinal epithelium, resulting in impaired nutrient absorption, reduced growth performance, poor egg production, inferior egg quality, compromised reproductive efficiency, and suppressed immune function. Although anticoccidial drugs remain the primary strategy for controlling coccidiosis, increasing concerns regarding drug resistance and chemical residues have intensified the search for effective natural alternatives. Castor oil (*Ricinus communis*), due to its antimicrobial, anti-inflammatory, antioxidant, and immunomodulatory properties, has emerged as a promising functional feed additive. The present study evaluated the effects of dietary castor oil supplementation on production performance, egg quality, hatching traits, and immune response in coccidiosis-challenged Japanese quail. A total of 200 Japanese quail were randomly allocated to four treatment groups with five replicates of 10 birds each: T1, negative control (uninfected and untreated); T2, positive control (infected and untreated); T3, infected and treated with amprolium hydrochloride; T4, infected and supplemented with castor oil at 5 ml/kg feed; and T5, infected and supplemented with castor oil at 10 ml/kg feed. The infected untreated group exhibited significantly ($P < 0.05$) poorer production performance, egg quality, hatching traits, and immune responses compared with the negative control. Castor oil supplementation improved several evaluated parameters in infected birds, with responses varying according to inclusion level. Overall, dietary castor oil showed potential as a natural supportive intervention for mitigating the adverse effects of coccidiosis in Japanese quail.

Key Words: Castor oil, Japanese quail, Production performance, Egg quality, Hatchability

CHIA SEED AS A FUNCTIONAL FEED INGREDIENT: EFFECTS ON GROWTH PERFORMANCE, INTESTINAL ARCHITECTURE, HEPATIC FUNCTION, AND ANTIOXIDANT STATUS IN BROILER CHICKENS

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Abstract

This research study was performed to evaluate the effects of (CS) (*Salvia hispanica* L.) supplementation on growth performance, gut morphology, hepatic function, and antioxidant status in broiler chickens. A total of 160 day-old broiler chicks were randomly assigned to four dietary groups under a completely randomized design, with five replicates of 8 birds each. The dietary treatments included a basal diet (T₁, control), CS at 3 g/kg feed (T₂), CS at 6 g/kg feed (T₃), and CS at 9 g/kg feed (T₄). The results indicate that dietary CS supplementation substantially (P < 0.05) elevated the feed intake, weight gain and improved feed conversion ratio (FCR) of the broilers. Serological tests performed for liver and kidney functions also showed affective results. The serum ALT, AST values were significantly (P < 0.05) decreases in CS added diet groups compared to control group (T₁) and the serum albumin value recorded was significantly (P < 0.05) control group (T₁). The serum creatinine value observed in the study was significantly (P < 0.05) and 9 g/kg feed (T₄) showed increased villus height, decreased crypt depth and increased villus height-to-crypt depth ratio which ultimately enhance the growth performance of the bird. It is concluded from the results of this study that CS supplementation may enhance growth performance and also improve hepatic and antioxidant capacity in broilers.

Key Words: Chia seed, Broiler, Growth performance, Gut morphology, Hepatic function

INTERACTIVE EFFECTS OF DIETARY ZINC AND VITAMIN E ON BLOOD BIOCHEMISTRY, ANTIOXIDANT STATUS, AND IMMUNE RESPONSE IN JAPANESE QUAIL

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Abstract

This study evaluated the effects of organic zinc (OZn), inorganic zinc (IZn), and vitamin E (Vit E) at varying inclusion levels on the blood biochemistry, antioxidant status, and immune response of Japanese quails. A total of 960 day-old chicks were randomly assigned to eight dietary treatments in a completely randomized design, with four replicates of 30 birds each. The treatments included: T1 (0 mg/kg OZn + 0 mg/kg IZn + 0 IU/kg Vit E), T2 (25 mg/kg OZn + 0 mg/kg IZn + 0 IU/kg Vit E), T3 (0 mg/kg OZn + 15 mg/kg IZn + 0 IU/kg Vit E), T4 (0 mg/kg OZn + 0 mg/kg IZn + 12 IU/kg Vit E), T5 (25 mg/kg OZn + 15 mg/kg IZn + 0 IU/kg Vit E), T6 (25 mg/kg OZn + 0 mg/kg IZn + 12 IU/kg Vit E), T7 (0 mg/kg OZn + 15 mg/kg IZn + 12 IU/kg Vit E), and T8 (25 mg/kg OZn + 15 mg/kg IZn + 12 IU/kg Vit E). The results indicated that birds in T8 exhibited significantly higher serum total protein and phosphorus levels compared to the other groups. Antioxidant analysis revealed that glutathione peroxidase activity was highest in T8, while superoxide dismutase activity was significantly greater in T2, T5, T6, T7, and T8 compared to T1 and T4 ($P < 0.05$). Thiobarbituric acid-reactive substances were elevated in T2, T5, T6, and T8 relative to the other treatments ($P < 0.05$). Lipid peroxidation was highest in T6, followed by T2, T5, T8, T3, and T1 ($P < 0.05$). In terms of immune response, antibody titers against Newcastle disease virus were significantly higher in T5, T6, and T8 compared to the other groups ($P < 0.05$). In conclusion, these findings suggest that supplementation with 25 mg/kg of organic zinc, 15 mg/kg of inorganic zinc, and 12 IU/kg of vitamin E (T8) produced the most beneficial effects on serum biochemistry, antioxidant defense, and immune response in Japanese quails.

Key Words: Dietary zinc, Vitamin E, Japanese quail, Blood biochemistry, Antioxidant status

EFFECT OF SUPERWORM OIL ON GROWTH PERFORMANCE, CARCASS TRAITS, NUTRIENT DIGESTIBILITY AND ECONOMICS EVALUATION OF BROILERS

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2026-PSC-122

Abstract

Superworm larvae (*Zophobas morio*) are nutrient-dense insects that are gaining attention as sustainable, high-protein alternatives to conventional feed ingredients in poultry production. This study evaluated the effects of superworm oil supplementation on the growth performance, carcass characteristics, nutrient digestibility and economic efficiency in broiler chickens. A total of 200 one-day-old broiler chicks were randomly assigned to four dietary treatments in a 35-day feeding trial, with five replicates of 10 chicks each. The control group (T1) received a standard commercial diet without superworm oil, while the experimental groups T2, T3, and T4 were supplemented with 1.5, 3.0, and 4.5 mL/kg of superworm oil, respectively. The results revealed that broilers supplemented with 4.5 mL/kg of superworm oil exhibited significantly higher body weight gain ($P = 0.014$), reduced feed intake ($P = 0.016$), and an improved feed conversion ratio ($P = 0.037$) compared to the other groups. Birds in T4 also achieved a significantly higher dressing percentage ($P = 0.037$) and superior nutrient digestibility compared to the control and lower supplementation levels. No significant differences ($P > 0.05$) were observed among treatments for blood biochemical parameters, including glucose, cholesterol, and triglycerides. Economically, T4 yielded the highest return per kilogram of meat, followed by T3, T2, and T1. In conclusion, dietary supplementation with superworm oil, particularly at 4.5 mL/kg of feed, can significantly enhance broiler growth performance, carcass yield, nutrient digestibility, and profitability, without compromising blood biochemical health.

Key Words: Superworm oil, Growth performance, Carcass traits, Nutrient digestibility

SYNERGISTIC EFFECTS OF SODIUM BENTONITE AND YEAST-BASED TOXIN BINDERS ON PRODUCTIVE PERFORMANCE, EGG QUALITY, SENSORY CHARACTERISTICS, AND REPRODUCTIVE MORPHOPHYSIOLOGY IN WHITE LEGHORN LAYERS

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2026-PSC-123

Abstract

This study evaluated the combined efficacy of sodium bentonite (SB) and yeast cell wall (YCW) as toxin binders to alleviate the adverse effects of dietary aflatoxins B₁ (AFB₁) and B₂ (AFB₂) in White Leghorn hens. A total of 125 laying hens, 25 weeks old, were randomly assigned to five dietary treatments in a completely randomized design, with five replicates of five birds each. The treatments included: T1 (basal diet), T2 (basal diet + 80 ppb AFB₁ + 80 ppb AFB₂), T3 (basal diet + 80 ppb AFB₁ + 80 ppb AFB₂ + 2.5% SB), T4 (basal diet + 80 ppb AFB₁ + 80 ppb AFB₂ + 2% YCW), and T5 (basal diet + 80 ppb AFB₁ + 80 ppb AFB₂ + 2.5% SB + 2% YCW). Hens receiving the combined supplementation (T5) exhibited significant improvements in feed intake ($P = 0.040$), egg production ($P = 0.020$), and feed conversion ratio ($P = 0.007$) compared to the other treatments. Egg quality parameters were also enhanced in T5, as indicated by higher egg weight ($P = 0.041$), shell weight ($P = 0.034$), shell thickness ($P = 0.047$), and shape index ($P = 0.041$). The proximate composition of eggs was also improved in T5, with increased dry matter ($P = 0.047$), crude protein ($P = 0.034$), and crude ash ($P = 0.021$), along with reduced ether extract ($P = 0.043$) and cholesterol ($P = 0.031$) levels. Although the sensory attributes of boiled eggs were not significantly affected ($P > 0.05$), the T5 group achieved higher numerical scores for odor, flavor, and palatability. Reproductive morphology analyses further revealed that hens in the T5 group exhibited greater ovarian weight and length, along with normal ovarian and oviductal histoarchitecture and no pathological lesions compared to the other aflatoxin-exposed groups. Taken together, these findings demonstrate that the combined use of SB and YCW effectively mitigates the detrimental effects of AFB₁ and AFB₂, enhancing production performance, egg quality and composition, and reproductive health. This integrated binder strategy offers a practical and efficient nutritional approach to managing aflatoxin contamination in laying hen diets.

Key Words: Sodium bentonite, Yeast, Laying hens, Production performance, Egg quality

DIETARY ZINC OXIDE AND SILYMARIN AS ANTIOXIDANTS: EFFECTS ON GROWTH PERFORMANCE, HEMATOLOGICAL PROFILE, NUTRIENT DIGESTIBILITY, ANTIOXIDANT STATUS IN HEAT-STRESSED BROILER CHICKS

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Abstract

Heat stress (HS) remains a major constraint to optimal broiler performance, particularly during the starter phase when thermoregulatory capacity and immune competence are still developing. Consequently, there has been increasing interest in using dietary feed additives to alleviate the negative effects of heat stress and enhance production efficiency. This study assessed the effects of dietary supplementation with zinc oxide (ZnO) and silymarin, as antioxidant and immunomodulatory agents, on growth performance, hematological profile, nutrient digestibility, and antioxidant status in heat-stressed broiler chicks. A total of 450 day-old Ross-308 chicks with a uniform initial body weight of 42.2 ± 0.3 g were assigned to a 2×3 factorial design, comprising two ambient temperature regimes (thermoneutral and heat stress) and three dietary treatments (basal diet, ZnO, and silymarin) under a completely randomized design, with five replicates of 15 birds each. The control group received a basal diet without additives, whereas the experimental groups were fed the same basal diet supplemented with either ZnO (60 mg/kg) or silymarin (10 g/kg). Birds in the heat stress groups were exposed to cyclic heat stress at 34 ± 1 °C for 8 hours daily (09:00–17:00) and were maintained at 23 ± 2 °C during the remaining hours, similar to the thermoneutral control birds. Growth performance was monitored throughout the experimental period, and hematological and antioxidant indices were determined from blood samples. Nutrient digestibility and apparent metabolizable energy were assessed at the end of the trial. The results demonstrated that HS significantly impaired growth performance, hematological parameters, nutrient digestibility, and antioxidant enzyme activities, while markedly increasing lipid peroxidation compared to thermoneutral conditions ($P < 0.05$). Dietary supplementation with silymarin significantly improved growth performance, carcass yield, hematological traits, nutrient utilization, and antioxidant status in heat-stressed broilers ($P < 0.05$). In conclusion, silymarin supplementation effectively mitigates heat-induced physiological, metabolic, and oxidative disturbances in broiler chickens, highlighting its potential as a functional feed additive for poultry production in increasingly hot environments.

Key Words: Zinc oxide, Ilymarin, Growth performance, Hematological profile, Antioxidant status

DIETARY ANTI-STRESSOR FEED ADDITIVES SUPPLEMENTATION IMPROVES GROWTH PERFORMANCE, IMMUNITY, AND CARCASS TRAITS OF HEAT-STRESSED BROILER CHICKENS

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Abstract

Heat stress is a major constraint to poultry production, particularly during prolonged summer conditions associated with global warming. Elevated temperatures negatively affect growth performance, immune response, and carcass quality in broiler chickens, highlighting the need for economical and sustainable nutritional interventions. This study evaluated the efficacy of selected natural anti-stress feed additives in mitigating the effects of cyclic heat stress in broilers. A total of 300 one-day-old Ross-308 broiler chicks were randomly assigned to five dietary treatments under a Completely Randomized Design. Birds were exposed to cyclic heat stress ($35 \pm 1^\circ\text{C}$ and $75 \pm 5\%$ relative humidity for 8 hours daily) during the third, fourth, and fifth weeks of age. Dietary treatments included a control, mint (2 g/kg), garlic powder (2 g/kg), yogurt (10 g/kg), and potassium chloride (3 g/kg), with six replicates of ten birds per treatment. Growth performance, blood biochemistry, Newcastle disease antibody titer, and carcass characteristics were evaluated using analysis of variance followed by Duncan's Multiple Range Test. Garlic powder supplementation significantly ($P \leq 0.05$) improved body weight, weight gain, cumulative feed conversion ratio, dressing percentage, breast yield, intestinal length, liver percentage, and Newcastle disease antibody titer, while feed intake, heart percentage, and gizzard percentage remained unaffected ($P > 0.05$). Although all natural anti-stress supplements showed beneficial effects, garlic consistently produced the greatest improvements in growth, carcass traits, and immune response. These findings indicate that dietary garlic supplementation is an effective natural strategy for alleviating heat stress and enhancing productivity, carcass quality, and immune status in broiler chickens.

Key Words: Anti-stressor feed additives, Heat stress, Growth performance, Broiler Chickens

NOVEL NON-ANTIBIOTIC APPROACHES IN POULTRY NUTRITION: IMPLICATIONS FOR GROWTH AND DISEASE RESISTANCE

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Abstract

Overuse and indiscriminate application of antimicrobials in production of poultry has contributed to early onset and propagation of resistant pathogenic microorganisms against most antimicrobials and has a severe impact on animal health, food safety and human health in the global population. To end this challenge, effective and sustainable alternatives need to be adopted that can support productivity and minimise reliance on antibiotics. There have also been a broad scope of non-antibiotic types of feed supplements such as probiotics, prebiotics, synbiotics, phytochemicals, enzymes and nanoparticles that have become promising alternatives. The effects of these alternatives are realized in several ways including competitive exclusion of pathogens, alteration of gut microbiota, activation of host immune system and increased nutrient use. Recent discoveries in biotechnology and nanotechnology have made their application even better in terms of increasing stability, bioavailability, targeted delivery and synergistic effect on low doses. Experimental investigations and field experiments indicate their ability to enhance gut integrity, inhibit their pathogen settlement and growth performance, thus contributing to animal well-being and their production efficiency. Despite their potential, several challenges remain, including inconsistent efficacy under field conditions, higher costs compared with conventional antimicrobials, and complex regulatory approval processes across different jurisdictions. This review critically summarizes the existing information on these feed additives, discusses their shortcomings and gives future perspectives. It is pointed out that there is a necessity to consider standardized evaluation frameworks, extended safety studies and multi-option combinations that can be further combined to be more effective. With these strategies in place, we have a potential solution to sustainable poultry production and this is a crucial step in reducing the global threat of antimicrobial resistance.

Key Words: Antimicrobial resistance, Antibiotic alternatives, Gut health, Poultry nutrition, Sustainable production.

BIOLOGICAL INNOVATIONS IN MYCOTOXIN DETOXIFICATION: SYNERGISTIC USE OF PROBIOTICS, PREBIOTICS AND PHYTOCHEMICALS IN FEED

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Abstract

The persistent contamination of poultry feed with adulterants particularly mycotoxins continues to pose a critical threat to poultry health, welfare and overall productivity. Mycotoxins are highly toxic secondary metabolites produced by fungi such as *Fusarium*, *Aspergillus*, *Penicillium* and *Alternaria*, and are frequently found in cereal grains and feed ingredients commonly used in poultry diets. These toxic compounds are associated with a wide array of harmful effects in poultry, including immunosuppression, hepatotoxicity, poor feed conversion, growth retardation, reproductive dysfunction, intestinal barrier disruption, and increased vulnerability to bacterial and viral infections. These impacts significantly compromise flock performance and result in major economic losses for poultry producers. To address this challenge, biological detoxification strategies have gained considerable attention as safe, sustainable and effective alternatives to conventional chemical and physical methods. Among these, probiotics, prebiotics and phytochemicals have emerged as natural agents with significant potential in mitigating mycotoxin-related damage. Probiotics, including lactic acid bacteria, *Bacillus* spp., and *Saccharomyces* spp., can reduce mycotoxin toxicity through adsorption, enzymatic biodegradation, immune modulation and maintenance of gut microbiota balance. Prebiotics serve as fermentable substrates that enhance probiotic colonization and activity, thereby reinforcing gut health and resilience to toxic stress. In parallel, phytochemicals such as flavonoids, tannins and polyphenols possess antioxidant, anti-inflammatory, antimicrobial and mycotoxin-binding properties. This review summarizes the toxicological implications of mycotoxins in poultry production and presents an integrated overview of innovative biological detoxification approaches. Emphasis is directed toward the synergistic use of probiotics, prebiotics and phytochemicals as natural, multifunctional feed additives aimed at enhancing poultry health, feed safety and overall farm profitability.

Key Words: Mycotoxins, Poultry, Gut health, Biological detoxification, Probiotics, Prebiotics, Phytochemicals

EFFECT OF SUPPLEMENTATION OF POSTBIOTIC AND EGG YOLK POWDER IN THE DIET OF BROILERS ON THE GROWTH PERFORMANCE, CARCASS TRAITS AND GUT HISTOMORPHOLOGY

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Abstract

The present study investigated the effects of dietary supplementation with postbiotic (PB) and egg yolk powder (EYP), individually and in combination, on growth performance, carcass characteristics, intestinal histomorphology, and growth-related gene expression in broiler chickens. A total of 320 one-day-old mixed-sex Ross 308 broiler chicks were randomly assigned to four dietary treatments for 40 days, with four replicates of 20 birds each. The treatments included: (i) basal diet (Control), (ii) basal diet supplemented with postbiotic (PB:0.3%), (iii) basal diet supplemented with egg yolk powder (EYP:3.5%), and (iv) basal diet supplemented with both postbiotic and egg yolk powder (PB:0.3%+EYP:3.5%). Feed intake was not significantly affected by dietary supplementation, except during the third and fourth weeks ($P < 0.05$). Dietary supplementation improved growth performance, with differences observed in body weight gain and feed conversion ratio among treatments. At the end of the experiment, carcass characteristics were evaluated, and supplementation produced significant changes in selected carcass traits. Intestinal histomorphology revealed improvements in villus architecture and related intestinal structural parameters in supplemented groups compared with the control. Furthermore, dietary PB and EYP modulated the expression of growth-related genes, indicating potential effects on physiological growth pathways. The combined PB and EYP treatment generally produced favorable responses across several evaluated parameters. Overall, the findings suggest that postbiotic and egg yolk powder supplementation, either individually or in combination, may serve as promising nutritional strategies for supporting growth performance, intestinal development, carcass characteristics, and growth-related molecular responses in broiler chickens.

Key Words: Broiler, Growth performance, Carcass traits, Villus height

BIOSYNTHESIS AND OPTIMIZATION OF METHIONINE BY INDIGENOUSLY ISOLATED SOIL BACILLUS SPECIES AS A POTENTIAL FEED SUPPLEMENT FOR BROILERS

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Abstract

Methionine, the first-limiting amino acid in maize–soybean broiler diets, cannot be synthesized by animal cells and is currently supplied through costly, environmentally hazardous chemical synthesis met entirely through imports in Pakistan. This study aimed to isolate indigenous *Bacillus* species from soil and optimize their fermentative production of methionine. Soil samples collected from UVAS, Lahore, were processed by serial dilution and cultured on nutrient agar. Isolates were identified by colony characteristics, Gram staining and biochemical tests including indole, MR, VP, citrate utilization, motility, urease production and starch hydrolysis. Confirmed isolates were subjected to fermentation in which pH, temperature, incubation period and agitation rate were varied to determine optimum conditions. Methionine was confirmed qualitatively by Thin Layer Chromatography (TLC) and quantified by the acid ninhydrin method. Three *Bacillus* isolates recovered from soil produced methionine through the fermentative process. TLC gave R_f values of 0.38–0.41 for the fermentation products, matching that of the standard (0.4), and production was quantified spectrophotometrically. Maximum methionine yield was recorded at pH 7.5, 35 °C, 96 hours of incubation and 125 rpm agitation rate. Deviation from any of these parameters resulted in a marked decline in production. Indigenous soil *Bacillus* isolates can produce methionine under optimized fermentation conditions, offering a low-cost, eco-friendly alternative to imported synthetic DL-methionine. Such a locally produced supplement could support feed conversion efficiency, breast muscle deposition, feathering and immune status in broiler birds while lowering feed cost.

Key Words: *Bacillus*, Methionine, Fermentation optimization, Broiler feed supplement,

OPTIMIZATION OF PROTEASE PRODUCTION FROM INDIGENOUS SOIL BACILLUS ISOLATES AS A LOCAL ALTERNATIVE TO IMPORTED FEED ENZYMES FOR THE POULTRY INDUSTRY

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Abstract

Exogenous proteases are widely supplemented in broiler diets to improve protein digestibility, feed conversion and nitrogen utilization, yet Pakistan's poultry sector depends entirely on imported enzyme preparations; this study was designed to isolate protease-producing bacteria from local soil and optimize fermentation conditions as a cheaper indigenous alternative. Soil samples were collected from UVAS, Lahore, and screened for proteolytic activity on casein agar. Isolates producing clear hydrolysis zones were selected and characterized morphologically and biochemically. Selected isolates were subjected to submerged fermentation for protease production. Enzyme activity in the cell-free supernatant was determined using the Folin–Ciocalteu assay. Fermentation parameters including pH, temperature, incubation period and inoculum size were varied to determine optimum conditions, and data were analyzed statistically. Of the soil isolates screened, eight produced clear zones of casein hydrolysis, confirming extracellular proteolytic activity, and the five isolates giving the widest zones were selected for fermentation. All five were Gram-positive, endospore-forming rods identified as *Bacillus* species closely related to *Bacillus cereus*. Protease activity varied appreciably among them, with isolate 4 yielding the highest titer of 0.116 U/mL and therefore taken forward for optimization. Enzyme yield peaked at pH 8, 37 °C, 48 hours incubation and 1.0 mL inoculum, declining on either side of each optimum, and statistical analysis confirmed that every parameter tested significantly influenced production (p < 0.05). *Bacillus* isolates yield appreciable protease under optimized fermentation and offer an economical local substitute for imported feed enzymes, with potential to enhance dietary protein utilization and reduce feed cost in broiler production.

Key Words: *Bacillus*, Protease, Fermentation optimization, Broiler feed enzyme

HYDROLYZED YEAST SUPPLEMENTATION IMPROVES GROWTH PERFORMANCE, INTESTINAL MORPHOLOGY, AFLATOXIN B₁ ADSORPTION, AND ANTIBODY RESPONSES IN 4 BROILERS CHALLENGED WITH *ESCHERICHIA COLI* AND AFLATOXIN B₁

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2026-PSC-131

Abstract

In broilers challenged with *Escherichia coli* and aflatoxin B₁, this study evaluated the protective effects of Hydrolyzed Yeast. Six groups (n = 10/group), negative control (A), *E. coli*-challenged (B), aflatoxin B₁-challenged (C), HY (D), *E. coli*+HY (E), and aflatoxin B₁+HY (F). Growth performance, gut microbiota, intestinal histomorphometry, liver-kidney histopathology, IBD/ND titers, serum aflatoxin B₁ by HPLC, and serum hepatic/renal biomarkers were evaluated by one-way ANOVA with Tukey's test (p < 0.05). Groups B and C showed the poorest FCR (1.58 ± 0.03, 1.55 ± 0.03) versus D's best (1.38 ± 0.02). Duodenal villus length declined in B (1439.03 ± 27.23 µm) and C (1495.75 ± 238.33 µm) but rose to 1845.83 ± 66.37 µm in D. Coliforms peaked in B (7.91 ± 0.02 log₁₀ CFU/g) versus D's lowest (6.44 ± 0.03); *Lactobacillus* was highest in F (7.95 ± 0.06 log₁₀ CFU/g). IBD titers were lowest in C (10.2) versus D's peak (50.5); ND titers stayed low (≤16) in B and C versus 161.3 in D. Liver and kidney lesion scores were highest in C and B (up to 2.67 ± 0.58) and lowest in D (0.33 ± 0.58). Serum aflatoxin B₁, measured by HPLC, was detected only in C (752.41 µg/L week 2; 7.29 µg/L week 3) and stayed below detection in HY groups. Serum urea, creatinine, ALT, and AST rose most in B and C, moderated by HY in E and F. Thus, HY showed promise as a multipurpose natural substitute for antibiotic growth promoters in broiler production.

Key Words: Hydrolyzed yeast, Broiler chicks, Gut microbiota, Intestinal histomorphometry, Aflatoxin B₁, Immunomodulation.

COMPARATIVE EFFECTS OF SULPHATES AND OXIDES AS INORGANIC MINERAL SOURCES ON BIOAVAILABILITY, DIGESTIBILITY, CARCASS TRAITS, AND ECONOMIC PERFORMANCE IN BROILERS

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2026-PSC-132

Abstract

Background: Inorganic trace minerals are essential components of broiler diets; however, their nutritional effectiveness is strongly influenced by chemical form, solubility, bioavailability, and interactions within the gastrointestinal environment. Objectives: This study compared sulphate and oxide mineral sources for their effects on mineral utilization, growth performance, nutrient digestibility, carcass characteristics, gastrointestinal responses, and economic efficiency in broilers. Methodology/ Study Design: A comparative evaluation was conducted between sulphate mineral sources, including ZnSO₄ and CuSO₄, and oxide sources, including ZnO and CuO, focusing on mineral bioavailability, retention, growth performance, gastrointestinal responses, feed stability, and formulation economics. Results/findings: Sulphate sources showed greater gastrointestinal solubility and mineral dissociation and consequently higher bioavailability than oxide sources. Oxide minerals showed 50-70% lower relative bio-efficacy (p Significance: A phase-specific supplementation strategy using sulphate sources to support early growth and mineral utilization, together with oxide sources to improve economic efficiency and feed stability, may provide a practical approach for optimizing broiler production.

Key Words: Trace minerals, Mineral sources, Bioavailability, Nutrient digestibility, Carcass traits, Feed efficiency, Economic performance

BIOLOGICAL REDUCTION POTENTIAL OF T-2 TOXIN BY DIFFERENT TRICHODERMA SPECIES AND CINNAMOMUM VERUM UNDER IN-VITRO CONDITIONS

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2026-PSC-133

Abstract

T-2 toxin is a highly toxic type A trichothecene mycotoxin mainly produced by *Fusarium* species and is regarded as one of the most important food and feed safety issues because of its toxicity to human and animal health. The presence in cereals and poultry feeds can cause large economic losses as well as health problems. Traditional physical and chemical methods of detoxification can present practical and environmental risks; in addition, they are cost-ineffective and nutritionally poor. Hence, biological detoxification has become increasingly popular as a viable method for mitigating mycotoxin exposure, especially when sustainability is a major consideration. This research aims to assess the effects of various *Trichoderma* species and *Cinnamomum verum* extract on the biological reduction potential of T-2 toxin under in vitro conditions. The different species of *Trichoderma* (*Trichoderma harzianum*, *T. hamatum* and *T. virens*) will be tested separately and the extract of *Cinnamomum verum* will be tested in different concentrations. They will also be studied in combination to see if synergistic detoxification can be attained. Different treatments and incubation periods of T-2 toxin-spiked liquid media will be performed and appropriate toxin-only control liquid media will be maintained. The residual concentration of the T-2 toxin will be measured using high-performance liquid chromatography (HPLC) and the decrease in T-2 toxin concentration will be evaluated for the effectiveness of detoxification. The influence of treatment time, temperature and cinnamon extract concentration will also be tested. This research will help in developing an eco-friendly method to reduce T-2 toxin contamination in food and feed.

Key Words: Biological detoxification, *Cinnamomum verum*, HPLC, poultry feed, T-2 toxin, Trichothecene mycotoxin, *Trichoderma* spp.

EFFECT OF PIPER NIGRUM (BLACK PEPPER) POWDER SUPPLEMENTATION ON GROWTH PERFORMANCE, MEAT QUALITY AND LIPID PROFILE OF BROILERS

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Abstract

This study evaluated the growth response, carcass characteristics, meat quality, and blood lipid profile of broiler chickens supplemented with powdered black pepper (*Piper nigrum*). Day-old Ross-308 broiler chicks (\$n = 375\$) were randomly allocated into five dietary treatment groups, each comprising five replicates (15 birds per replicate). The baseline basal diet was supplemented with black pepper powder at concentrations of 0%, 0.25%, 0.50%, 0.75%, and 1.0%. Under a Completely Randomized Design (CRD), data were analyzed using one-way ANOVA followed by Duncan's multiple range test to determine significant differences among treatment means (\$P < 0.05\$). The findings revealed that dietary inclusion of 0.75% and 1.0% black pepper powder significantly improved the overall growth performance of broilers, as evidenced by higher body weight gain and an improved feed conversion ratio compared to the control group. Furthermore, these higher supplementation levels produced marked effects on carcass yields, noticeably increased gizzard weights, and caused a significant reduction in abdominal fat content. Assessment of meat quality traits indicated enhanced water-holding capacity and improved sensory characteristics in higher-dose groups. Additionally, serum biochemistry demonstrated a favorable lipid-lowering effect, characterized by significant decreases in total cholesterol, triglycerides, and low-density lipoprotein (LDL) levels, alongside a relative increase in high-density lipoprotein (HDL). In conclusion, dietary supplementation with 0.75% to 1.0% black pepper powder acts as an effective phytochemical feed additive, promoting growth performance, optimizing carcass traits, reducing abdominal fat, and improving the serum lipid profile in Ross-308 broiler chickens.

Key Words: Black pepper powder, Growth performance, Meat quality, Lipid profile, Broilers

EFFECT OF DIFFERENT INCLUSION OF PLANT OIL EXTRACT ON MEAT QUALITY, BLOOD CHEMISTRY AND INTESTINAL HISTOMORPHOLOGY OF BROILERS

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Abstract

To evaluate the effect of different inclusion of plant oil extracts including *Allium cepa* (onion), *Allium sativum* (garlic) and *Thymus vulgaris* (thyme) on meat quality, blood chemistry and intestinal histomorphology of broilers, 300 Day-old broiler chicks were purchased from local commercial hatchery. The 300 chicks were equally divided into three replicates of one control and nine treatments O1 (onion), O2, O3, G1 (garlic), G2, G3, T1 (thyme), T2 and T3 while control group was fed a basal diet without supplementation of oil extract. Birds were divided into 4 treatments three plant extract oils *Thymus vulgaris* (thyme), *Allium cepa* (onion), *Allium sativum* (garlic) at levels 0.3, 0.6 and 0.9% of each plants oil extracts were mixed with feed with that offered the chicks. While control treatment group (CON) was offered commercial feed without any addition of essential oils. Parameters studied included hematology, blood chemistry, lipid profile, meat quality and intestinal histomorphology. The significance of the differences between the groups was determined by statistical analysis using ANOVA. Treatment means were compared under completely random design (CRD). Plant oil extracts treatments groups significantly affected broiler chick meat quality, particularly; T1 and T3 treatments reduced drip loss. Treatment groups O3, G1, and T1 reduced cooking loss while O2 and T2 treatments increased redness. Moreover, T1 and T2 treatments increased yellowness. Biochemical parameters, liver enzymes (AST and ALT) and lipid profile showed no significant ($P>0.05$) changes. Treatments O2, O3, G2, and G3 significantly increased villus height and crypt depth compared to the control.

Key Words: *Thymus vulgaris*, *Allium cepa*, *Allium sativum*, Meat quality, Blood biochemistry, Lipid profile, Intestinal histomorphology

ASSESSMENT OF MICROBIOLOGICAL CONTAMINATION IN COMMERCIAL POULTRY FEEDS ACROSS DIFFERENT PRODUCTION STAGES

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Abstract

Poultry feed is a recognized vehicle for bacterial contamination of flocks; this study assessed the bacteriological quality of poultry feed at different production stages against permissible microbiological standards. A total of 250 feed samples (50 each of pre-starter, starter, grower, finisher, and breeder feed) were analyzed by culturing on selective and non-selective media. Total viable counts (TVC) were enumerated on total plate count agar and Enterobacteriaceae on MacConkey agar, expressed as log₁₀ CFU/g, while *Salmonella* was screened on Salmonella-Shigella (SS) agar. Results were compared with permissible limits of ≤10⁶ CFU/g (6 log₁₀) for TVC, ≤3 × 10² CFU/g (~2.48 log₁₀) for Enterobacteriaceae (EU Regulation No 142/2011), and absence of *Salmonella* in 25 g. Mean TVC was 4.67, 4.76, 4.48, 4.58, and 4.05 log₁₀ CFU/g for pre-starter, starter, grower, finisher, and breeder feeds, respectively (range 3.23–5.96), with all 250 samples within the permissible limit. Enterobacteriaceae were detected in 12%, 20%, 12%, 30%, and 10% of samples, respectively; 18/250 samples (7.2%) exceeded the permissible limit, with finisher feed contributing the most exceedances (9/50) and the highest mean count among positives (2.76 log₁₀ CFU/g). *Salmonella* was not detected in any sample, fulfilling the zero-tolerance criterion. Overall, the feed samples complied with the permissible limits for TVC and *Salmonella*; however, Enterobacteriaceae counts exceeded the permissible limit in a proportion of samples, particularly finisher feed, indicating potential deficiencies in hygienic practices and highlighting the need for enhanced microbiological monitoring during feed processing, handling, and storage.

Key Words: Poultry feed, Microbiological quality, Enterobacteriaceae, *Salmonella*, Total viable count

GUT MICROBIOTA DIET INTERACTIONS IN POULTRY: IMPLICATIONS FOR NUTRIENT UTILIZATION, IMMUNITY AND DISEASE RESISTANCE

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Abstract

Poultry production is vital to global protein supply, and modern poultry productivity and health are governed by the integrated effects of nutrition, gut microbiota, and immunity. Growing consumer demand for sustainable and antibiotic free poultry production has intensified efforts to optimise nutrition, gut micro biota, and immunity, yet the molecular mechanisms underlying these interactions in poultry remain poorly understood. Nutrition influences the gut microbiota, which also provides the building blocks for immunity. Beyond maintaining gastrointestinal health, the gut Microbiota ferments dietary fibers and protects against pathogenic microorganisms. Immunity maintains the equilibrium of the gut microbiota and modulates the host's physiological response to disease. These components are so intricately interconnected that, under certain conditions, they can dynamically modulate one another. In addition to influencing growth performance and guthealth, this triangular mechanism also affects overall metabolism, host pathogen interactions, and disease progression. Many poultry studies have focused on nutrition and its potential to modulate the microbiome and immunity. Key cellular and molecular mechanisms remain inadequately understood at multiple levels, including microbial metabolite signalling, immune cell nutrient interactions, and host microbiome regulatory pathways governing immune homoeostasis and nutrient utilization in poultry. This review aims to comprehensively summarise the available information and analyse the interrelationships among these three components. This information will help both poultry science research and industry practices by guiding feed formulation, precision nutrition strategies, and immune-supportive interventions, ultimately improving bird health, production efficiency, and the sustainability of safe poultry food systems.

Key Words: Poultry, Host-pathogen interaction, Metabolism, Immunity, Gut microbiota, Antibiotic

EFFECT OF NANO ZINC AS A FEED SUPPLEMENT ON THE PERFORMANCE OF JAPANESE QUAIL (COTURNIX JAPONICA)

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Abstract

The present study was conducted to evaluate the effects of dietary supplementation of nano-zinc nanoparticles on growth performance, feed utilization efficiency, carcass characteristics, bone morphometry, and immune response in Japanese quail. A total of 300 day-old quail chicks were reared under standard management conditions and, after one week of adaptation, 60 unsexed birds were randomly allocated into five treatment groups with five replicates containing twelve birds each. The experimental groups included NZn0 (control basal diet), NZn3, NZn4, NZn5, and NZn6 supplemented with nano-zinc at the levels of 30, 40, 50, and 60 mg/kg diet, respectively. Weekly body weight, feed intake, body weight gain, and feed conversion ratio were recorded throughout the experimental period. Blood samples were collected on the 21st and 35th day to determine immunological parameters including IgG, IgY, and IgM concentrations. Bone characteristics such as gait score, leg straightness, and latency to lie were also assessed. At the end of the trial day 35th, selected birds from each treatment were slaughtered to evaluate carcass characteristics. The collected data were analyzed using a completely randomized design and treatment means were compared through Tukey's test. The results revealed that supplementation of nano-zinc significantly ($P < 0.05$) improved growth performance, feed efficiency, immune response, carcass yield, and bone morphometric traits in Japanese quail compared to the control group. Among the supplemented groups, birds receiving higher levels of nano-zinc showed superior performance and enhanced physiological responses. It was concluded that dietary inclusion of nano-zinc nanoparticles can effectively enhance productivity, immunity, and skeletal health in Japanese quail.

Key Words: Nano Zinc, Trace minerals, Nano Particles

SUPPLEMENTATION EFFECTS OF ORGANIC MANGANESE (MN) IN ALLEVIATING THE TRANSPORT STRESS IN BROILERS

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Abstract

The study aimed to evaluate the supplementation effects of organic manganese (Mn) in alleviating transport stress in broilers. A total of 100 day-old broiler chicks were divided into four groups (n=25) with five replicates (n=5) per group. The control group received 60 mg/kg inorganic Mn, while three groups were supplemented with 30, 45, and 60 mg/kg organic Mn for 35 days. On day 35, two birds from each replicate were selected and subjected to 4 hours of transportation stress. Growth performance (body weight, body weight gain, feed intake, and feed conversion ratio) was measured. Post transport, welfare-relevant indicators, including serum biochemical markers (glucose, lipid profile, kidney and liver markers), transportation loss, antioxidant enzyme activity (catalase), were measured. Data were analyzed using one-way ANOVA and Tukey's post hoc test (p<0.05). Significant differences in HDL, aspartate aminotransferase (AST), and uric acid levels were observed (p<0.05). No changes were observed in catalase activity, muscle pH, or drip loss (p>0.05), indicating no adverse effects on meat quality. In conclusion, organic manganese supplementation improved production performance and may have positive effects on broiler welfare and resilience to transport stress.

Key Words: Transportation stress, Poultry welfare, Organic manganese

EFFECTS OF SUPPLEMENTED CORIANDER, AJWAIN, AND DILL SEED ESSENTIAL OILS ON GROWTH PERFORMANCE, CARCASS CHARACTERISTICS, GUT HEALTH, MEAT QUALITY, AND IMMUNE STATUS IN BROILERS

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1.

2026-PSC-140

Abstract

Numerous studies have assessed the benefits and optimal dosage of supplementation with essential oils (EOs), including extracts from plants of the Apiaceae family, as an alternative to antibiotic growth promoters (AGPs) in broilers. However, little consideration has been given to the actual chemical composition of the evaluated EOs when drawing critical conclusions, even though EO composition can vary with different extraction conditions and plant characteristics. Therefore, the present study was conducted to evaluate the effects of EOs from seeds of plants of the Apiaceae family: coriander (CEO), ajwain (AjEO), and dill (DEO), containing 56.8% linalool, 68.2% thymol, and 41.1% carvone, respectively, on the growth performance, gut health, and immune status of broilers. In total, 660 one-day-old broiler chicks were divided into 11 experimental diet groups and fed for 35 days with either the control diet, basal diet with added AGP (lincomycin, 500 mg/kg), or one of nine EO diets supplemented with CEO, AjEO, or DEO at 200, 400, and 600 mg/kg. Final body weights were improved by supplementation with not only AGP but also any EO except AjEO at 600 mg/kg; within each EO, supplementation of CEO at 400 mg/kg, AjEO at 200 mg/kg, and DEO at 200 mg/kg afforded the best growth performance. EO supplementation had beneficial effects on gut morphology, such as increased villus height in the duodenum, jejunum, and ileum, and against harmful microbiota, such as reduction of *Escherichia coli* and *Salmonella* spp. populations. Furthermore, EOs enhanced humoral immunity and improved meat quality by reducing drip loss, likely consequent to their antioxidant properties. Overall, this study presents evidence that CEO, AjEO, and DEO can each play a pivotal role in replacing AGPs, as well as providing information regarding optimal doses for broilers.

Key Words: Essential oil, Growth performance, Gut health, Broilers

META-REGRESSION OF THE RELATIONSHIP BETWEEN DIETARY 18C N-3 CONCENTRATION AND ENRICHMENT OF N-3 FATTY ACIDS IN LIVER AND BREAST MUSCLE OF BROILER CHICKENS

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Abstract

The long-chain n-3 fatty acids (FA) eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) have human health benefits, and many experiments have investigated the ability of plant n-3 sources to enrich n-3 FA in broiler meat. A meta-regression was conducted to evaluate the relationship between dietary 18-carbon n-3 FA content and the deposition of EPA, docosapentaenoic acid (DPA), and DHA in broiler breast and liver tissue. Bivariate regression of total diet 18-carbon n-3 and tissue FA profile was modeled with the random effect of experiment and the partial R² was calculated. Increasing 18C n-3 FA in the diet quadratically increased the log₁₀ concentration of all n-3 FA in breast tissue. The strongest relationship was found for breast alpha-linolenic (partial R² = 0.55), followed by EPA, DPA, and DHA (partial R² = 0.20, 0.14, and 0.05). Liver enrichment of EPA, DPA, and DHA (all partial R² > 0.43) and EPA+ DHA (partial R² = 0.55) was quadratically related to dietary 18C n-3 FA, while liver EPA + DPA + DHA (partial R² = 0.43) was linearly related to dietary 18C n-3 FA. In both breast and liver, the plateau in tissue enrichment was more apparent for DHA than EPA, with DPA being intermediate. A linear plateau model fit the data with a break point for enriching EPA and DHA in breast muscle at 22.4 and 17.9 g/kg of 18C n-3 FA in the diet, respectively. Enrichment of long-chain n-3 FA in broiler chickens was saturable, with little justification for feeding beyond approximately 20 g/kg 18C n-3 FA.

Key Words: Dietary fat, N-3 fatty acids, Nutrition, Polyunsaturated fatty acids

IMPACT OF MYCOTOXINS AND MICROBIAL TOXINS IN POULTRY FEED ON EGG QUALITY AND SAFETY

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Abstract

Contamination of poultry feed with biological toxins particularly mycotoxins and microbial toxins remain a persistent threat to poultry health, production and product safety. These toxins often originating from poor storage or inadequate hygiene are well-documented for their negative effects on egg quality traits. Understanding their impact is increasingly important given the rising consumer demand for safe, high-quality eggs. This review synthesizes findings from peer-reviewed articles, conference proceedings and international poultry science reports published over the past two decades, focusing on the influence of mycotoxins and microbial toxins on albumen quality, yolk pigmentation and shell strength. Mycotoxins such as T-2 toxin, aflatoxin B1 and ochratoxin A consistently impair egg quality, causing yolk depigmentation, reduced albumen height and weakened shells due to disrupted calcium metabolism. T-2 toxin, in particular, has been linked to lower yolk weight and increased shell fragility, while zearalenone shows minimal or inconsistent effects depending on dose, exposure duration and bird genotype. Microbial toxins, though less studied, also pose risks. *Clostridium perfringens* α -toxin and NetB toxin, *Escherichia coli* lipopolysaccharides (LPS) and *Staphylococcus aureus* enterotoxins can indirectly compromise egg quality by damaging intestinal integrity, reducing nutrient absorption and inducing systemic inflammation. Feed contamination is therefore a preventable yet significant contributor to reduced egg quality in layers. This review underscores the importance of strict feed hygiene, routine mycotoxin and bacterial toxin screening, and effective detoxification strategies, while calling for more research on microbial toxins and potential synergistic effects with mycotoxins.

Key Words: Egg, Hygiene, Mycotoxins, Microbial toxins, Poultry

IMPACT OF MORINGA OLEIFERA LEAF POWDER ON GROWTH PERFORMANCE AND BLOOD BIOCHEMISTRY OF BROILERS

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Abstract

Moringa oleifera is a nutrient-dense botanical rich in essential proteins, vitamins, and antioxidants that promote poultry health and performance. This study investigated the effects of dietary *Moringa oleifera* leaf powder (MOLP) on growth performance, feed efficiency, and blood biochemical parameters in broiler chickens. A two-week trial (5 to 6 weeks) was conducted with 300 broilers divided into five dietary groups supplemented with 0, 5, 10, 15, or 20 g/kg of MOLP (groups G1 through G5, respectively). Growth parameters—including body weight, weight gain, feed intake, feed conversion ratio (FCR), and livability—were monitored alongside serum glucose, uric acid, and creatinine levels. MOLP supplementation significantly ($P < 0.05$) enhanced final body weight, overall weight gain, and feed efficiency in birds fed moderate inclusion levels (10 to 15 g/kg, G3 and G4) compared to the unsupplemented control group (G1). Feed intake showed no significant variance across treatment groups, leading to a markedly improved feed conversion ratio in the MOLP-supplemented cohorts. Livability remained high across all treatments, demonstrating the safety and non-toxicity of MOLP within the tested limits. Analysis of serum biochemistry revealed that MOLP inclusion significantly ($P < 0.05$) lowered serum glucose levels, reflecting improved metabolic regulation. Furthermore, serum concentrations of uric acid and creatinine were maintained within optimal physiological reference ranges, confirming that dietary MOLP had no detrimental effects on renal function or systemic protein catabolism. In conclusion, supplementing broiler diets with *Moringa oleifera* leaf powder at 10 to 15 g/kg optimizes growth performance, improves feed utilization, and maintains physiological homeostasis, rendering MOLP a sustainable phytogenic feed additive for broiler production.

Key Words: *Moringa Oleifera*, Leaf powder, Broilers, Growth performance, Blood biochemistry

EFFECT OF DIETARY TURMERIC AND CINNAMON POWDER SUPPLEMENTATION ON GROWTH PERFORMANCE AND IMMUNE RESPONSE IN BROILERS

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Abstract

This study evaluated the effects of dietary supplementation with combined turmeric (*Curcuma longa*) and cinnamon (*Cinnamomum verum*) powder on growth performance, feed utilization, livability, and immune response in broiler chickens. A total of 120 day-old chicks were randomly assigned to four dietary treatment groups with three replicates of 10 birds each: T1 (control; baseline diet without supplementation), T2 (2.5 g/kg turmeric + 2.5 g/kg cinnamon), T3 (5.0 g/kg turmeric + 5.0 g/kg cinnamon), and T4 (7.5 g/kg turmeric + 7.5 g/kg cinnamon). Supplemented groups generally exhibited numerical increases in feed intake and weight gain, with T2 demonstrating the highest total feed intake ($3555 \pm 0.00 \text{ g}$) and body weight gain ($2280 \pm 1.15 \text{ g}$). Feed conversion ratio (FCR) was most favorable in T2 (1.55 ± 0.00) followed by T1 (1.54 ± 0.00). However, no statistically significant differences in growth efficiency parameters were observed across treatments, and livability remained consistently high (94–98%). In terms of immunocompetence, dietary supplementation significantly impacted antibody production. The highest Newcastle Disease (ND) antibody titers were recorded in T3 (7.30 ± 0.05). Furthermore, Infectious Bronchitis (IB) antibody titers were significantly increased ($P < 0.05$) in the phytogetic-supplemented groups compared to the control, with T3 and T4 exhibiting superior humoral immune responses. These findings suggest that while high levels of combined turmeric and cinnamon powder do not alter macroscopic growth traits, moderate inclusion rates as specifically around 5.0 g/kg of each spice as substantially elevate adaptive humoral immunity against prevalent viral pathogens in broiler production without impairing overall health or bird survival rates.

Key Words: Broilers, Turmeric, Cinnamon, Phytogetic feed additives, Growth performance, Humoral Immunity

ROLE OF PRECISION NUTRITION IN ENHANCING POULTRY PRODUCTIVITY**Muhammad Jhanzaib Arslan¹, Tahreem Asad², Muhammad Arslan²***1. Department of Livestock Production and Management, PMAS-Arid Agriculture University, Rawalpindi, Pakistan.**2. Department of Poultry Science, Faculty of Animal Production and Technology, Cholistan University of Veterinary and Animal Sciences, Bahawalpur, Pakistan.***2026-PSC-145****Abstract**

The increasing global demand for poultry products necessitates innovative nutritional strategies capable of improving production efficiency while ensuring environmental sustainability. Precision nutrition has become an essential component of sustainable poultry farming by providing birds with nutrients that closely match their specific physiological requirements throughout different production phases. Current knowledge on precision nutrition approaches, including digestible amino acid formulation, metabolizable energy optimization, precision mineral supplementation, and enzyme technologies improve nutrient utilization, reduce feed wastage, and enhance growth performance, immunity, and reproductive efficiency. Precision nutrition also plays a critical role in reducing nitrogen and phosphorus emissions, thereby decreasing the environmental footprint of poultry production. In addition, optimized feed efficiency lowers production costs and improves the availability of affordable animal protein, directly supporting global food security objectives. However, the successful implementation of precision nutrition requires investment in advanced technologies, skilled personnel, and region-specific nutritional databases. Future developments integrating genomics, metabolomics, and precision livestock farming are expected to further personalize poultry nutrition and improve production sustainability. Overall, precision nutrition represents a promising strategy for balancing economic profitability, environmental conservation, and food security in modern poultry production systems.

Key Words: Sustainable, Precision, Poultry feed, Food security

NUTRITIONAL IMPLICATIONS AS A CLIMATE-SMART STRATEGY IN POULTRY PRODUCTION

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Abstract

Climate change and increasing demand for high-quality animal protein have intensified the need for sustainable poultry production practices. Precision nutrition has emerged as a climate-smart approach that improves feed utilization while reducing the environmental impact of poultry farming. Thus, recent advances in precision nutritional management, including phase feeding, low-protein diets supplemented with synthetic amino acids, precision mineral nutrition, and enzyme-enhanced feed formulations, improve nutrient efficiency, reduce feed costs, and significantly decrease nitrogen, phosphorus, and greenhouse gas emissions from poultry operations. The integration of precision Poultry farming technologies, automated feeding equipment, and environmental sensors that enable continuous monitoring of bird performance and adaptive nutritional management. Enhanced nutrient utilization supports optimal growth, disease resistance, and reproductive performance while minimizing production losses. Precision nutrition also contributes to food security by improving production efficiency, conserving feed resources, and increasing the affordability of poultry-derived protein. Despite substantial progress, challenges related to technological accessibility, infrastructure, and farmer education remain important constraints, particularly in developing economies. Future research should prioritize cost-effective precision feeding systems, predictive nutritional modeling, and climate-resilient feeding programs to promote sustainable poultry production. Precision nutrition offers significant opportunities for achieving environmentally responsible, economically efficient, and resilient poultry production systems capable of meeting future global food demands.

Key Words: Climate, Poultry, Resilience, Nutrition, Automation

DETOXIFICATION OF *ACACIA NILOTICA* PODS AND ITS EFFECTS ON NUTRIENT DIGESTIBILITY IN BROILER CHICKENS

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2026-PSC-147

Abstract

This study evaluated the effectiveness of various detoxification methods for reducing tannins in *Acacia nilotica* pods and examined their effects on nutrient digestibility in broiler chickens. A total of 360 day-old broiler chicks were randomly assigned to 12 treatment groups. The control group received a basal diet, while the untreated group (UT) was fed the basal diet supplemented with 5% raw *A. nilotica* pods. The remaining ten groups (T1-T10) received diets containing 5% *A. nilotica* pods detoxified using sodium bicarbonate, sodium hydroxide, hydrochloric acid, urea, polyethylene glycol (PEG), methanol, cooking, acetic acid, soaking, or roasting. All treatment diets contained 5% pods, except the control diet. Birds were fed the experimental diets from 21 to 42 days of age, and nutrient digestibility was evaluated at 42 days. Sodium bicarbonate treatment (T1) produced the greatest reduction in tannin content, followed by methanol, HCl, acetic acid, PEG, sodium hydroxide, cooking, roasting, soaking, and urea treatment. Highest crude protein digestibility was observed in the control group, with T1 showing a comparable value. This indicates that sodium bicarbonate treatment maintained protein digestibility close to the untreated control. The highest dry matter digestibility was seen in the control and lowest in T1. On contrary, ether extract digestibility was highest in T1, slightly surpassing the control. Overall, sodium bicarbonate provided the most effective and economical detoxification for *A. nilotica* pods resulting in the greatest reduction in tannin content while maintaining satisfactory nutrient digestibility in broilers.

Key Words: *Accacia nilotica*, Detoxification, Broiler, Nutrient digestibility

ROLE OF ORGANIC ACIDS AS FUNCTIONAL FEED ADDITIVES IN IMPROVING BROILER PERFORMANCE

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Abstract

The poultry industry increasingly adopting antibiotic alternatives to improve production efficiency maintaining bird health. Organic acids have gained considerable attention as promising feed additives in broiler production because of their potential to improve growth performance, digestive health, nutrient utilization, and overall production efficiency. Commonly used organic acids, including formic, acetic, propionic, lactic, citric, fumaric, malic, and butyric acids, can improve gut health, enhance digestive enzyme activity, and improve nutrient absorption. Therefore, supplementation with appropriate organic acid preparations has been associated with improvements in body weight gain, feed conversion ratio, gut morphology, and carcass characteristics in broilers. In addition, organic acids are increasingly considered valuable components of antibiotic-reduction and antibiotic-free production systems, responding to growing concerns regarding antimicrobial resistance and sustainable poultry production. However, their effectiveness can vary depending on acid type, inclusion level, dietary composition, bird age, environmental conditions, and delivery method. Overall, strategic use of organic acids represents a promising nutritional approach for improving broiler productivity while supporting healthier and more sustainable production systems.

Key Words: Broiler, Organic acid, Growth, Gut health, Carcass

INFLUENCE OF MANNAN OLIGOSACCHARIDES AND MICROENCAPSULATED BUTYRIC ACID ON THE PERFORMANCE OF ROSS BROILER CHICKENS

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2026-PSC-149

Abstract

The study was proposed to analyze the influence of mannan-oligosaccharides and microencapsulated butyric acid on growth performance, immune response, intestinal morphology, nutrient digestibility and carcass characteristics in broiler. Total 300 day-old Ross-308 broiler chicks were divided into 5 dietary treatments each having 5 replicates (12 birds in each replicate). The dietary treatments were: Negative control (NC), basal diet without any supplementation; positive control (PC), basal diet + 0.2 g/kg enramycin; treatment MO, basal diet + 1 g/kg of mannan-oligosaccharides; treatment BA, basal diet + 0.5 g/kg of microencapsulated butyric acid and treatment MB, basal diet + 1 g/kg of mannan-oligosaccharides + 0.5 g/kg of microencapsulated butyric acid. Experimental diets were offered ad-libitum to all birds for 35 days. Data on feed intake and body weight gain were recorded on weekly basis to evaluate feed conversion ratio. For immune response, blood samples were taken through brachial vein at 35th day of the trial. For intestinal morphology, samples of 2 cm portion from the duodenum region were removed at 35th day. Digestibility of feed and excreta were determined through the indirect marker method (Celite®, a source of acid insoluble ash) at 21st and 35th day. For carcass characteristics, meat samples were taken at 35th day. The results showed that birds fed diets supplemented with the combination of mannan-oligosaccharides and microencapsulated butyric acid during the starter phase (0-21 days), grower phase (22-35 days) and cumulative phase (0-35 days) had significant results ($p > 0.05$). Immune response measurements showed that titer levels of ND, IBV and IgG in broiler serum and immune organs percentages of thymus, bursa of Fabricius and spleen were significantly higher (pmannan-oligosaccharides and combination of mannan-oligosaccharides and microencapsulated butyric acid compared to the control groups. Combined effect of mannan-oligosaccharides and microencapsulated butyric acid significantly ($p < 0.05$). Furthermore, nutrient digestibility was significantly (pst and 35th day. Carcass characteristics such as dressing, carcass and breast percentages were highest in MB and BA groups ($p < 0.05$) on thigh, heart, liver and gizzard percentages. Based on the findings, it is concluded that dietary supplementation with any supplement positively influences the broiler's performance, nutrient digestibility, carcass characteristics, gut health, and immune status over the NC group. More pronounced improvements were obtained from the combined supplementation of mannan oligosaccharides and microencapsulated butyric acid in broiler diet and offering an effective alternative to antibiotic growth promoters.

Key Words: Mannan oligosaccharides, Microencapsulated Butyric Acid, Broiler, Growth

EFFECT OF YEAST CULTURE METABOLITES AS AN ALTERNATIVE TO ANTIBIOTIC GROWTH PROMOTERS ON CARCASS TRAITS, INTESTINAL MEASUREMENTS AND INTESTINAL MORPHOLOGY IN BROILERS

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2026-PSC-150

Abstract

The present study was conducted to evaluate the effects of dietary supplementation of Yeast Culture Metabolites (YCM) on carcass traits, intestinal measurements, and intestinal morphology in broiler chickens. A total of 200-day-old broiler chicks were randomly assigned to five dietary treatments under a Completely Randomized Design (CRD), with four replicates of 10 birds each. The treatments included: T1, a basal diet without Yeast Culture Metabolites and Virginiamycin (control); T2, a basal diet supplemented with Virginiamycin throughout the 0–6 week period; T3, a basal diet supplemented with YCM throughout the 0–6 week period; T4, a basal diet supplemented with Virginiamycin from 1–3 weeks followed by YCM from 4–6 weeks; and T5, a basal diet supplemented with Virginiamycin from 1–4 weeks followed by YCM from 5–6 weeks. The trial lasted for six weeks, during which YCM was included at 1 kg/ton of feed and Virginiamycin at 40 g/ton of feed. At the end of the experiment, data were collected on carcass traits, intestinal measurements, and intestinal morphology. Statistical analysis was performed using one-way Analysis of Variance (ANOVA), and treatment means were compared using Tukey's Honestly Significant Difference (HSD) test at a 5% level of significance ($p < 0.05$). Results indicated no significant effects ($p > 0.05$) on all carcass traits. For intestinal measurements, duodenal length was not significantly affected ($p > 0.05$), whereas significant differences ($p < 0.05$) were noted in jejunal and ileal lengths, villus height, and crypt depth in birds receiving continuous or sequential YCM diets (T3 and T4), highlighting improved mucosal integrity.

Key Words: Yeast culture metabolites, Antibiotic alternative, Growth, Broilers

EFFECT OF YEAST CULTURE METABOLITES AS AN ALTERNATIVE TO ANTIBIOTIC GROWTH PROMOTERS ON WEIGHT OF IMMUNE ORGANS, COMPLETE BLOOD COUNT AND ANTIBODY TITER IN BROILERS

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2026-PSC-151

Abstract

This study evaluated the effects of dietary yeast culture metabolites (YCM) as an alternative to antibiotic growth promoters on immune organ weight, complete blood count (CBC), and antibody titer in broiler chickens. A total of 200 day-old broiler chicks were randomly allocated to five dietary treatments under a Completely Randomized Design (CRD), with four replicates of 10 birds each. The treatments consisted of: T1 = basal diet (control; without YCM and Virginiamycin), T2 = basal diet supplemented with Virginiamycin from 0–6 weeks, T3 = basal diet supplemented with YCM from 0–6 weeks, T4 = basal diet supplemented with Virginiamycin from 1–3 weeks followed by YCM from 4–6 weeks and T5 = basal diet supplemented with Virginiamycin from 1–4 weeks followed by YCM from 5–6 weeks. At the end of the 6-week experimental period, the relative weights of immune organs (bursa of Fabricius, thymus, and spleen), complete blood count parameters and antibody titers against Newcastle Disease (ND) and Infectious Bronchitis (IB) were determined. The collected data were analyzed using Analysis of Variance (ANOVA) under a Completely Randomized Design (CRD), and treatment means were compared using Tukey's Honestly Significant Difference (HSD) test at a significance level of ($P \leq 0.05$). Results revealed that dietary treatments had no significant effect ($p > 0.05$) on the relative weights of the bursa of Fabricius, thymus and spleen. In contrast, significant differences ($p \leq 0.05$). Furthermore, antibody titers against both Newcastle Disease and Infectious Bronchitis were significantly influenced ($p \leq 0.05$). In conclusion, supplementation of yeast culture metabolites, either alone or following partial antibiotic supplementation, improved hematological characteristics or enhanced immune response as indicated by higher antibody titers, while having no effect on the relative weights of immune organs in broiler chickens. These findings suggest that YCM may serve as a potential alternative to antibiotic growth promoters in broiler production.

Key Words: Yeast culture metabolites, Antibiotic alternative, CBC, Immunity, Broilers

EFFECT OF ZINC, COPPER AND SELENIUM NANOPARTICLES IN IMPROVING EGG SHELL QUALITY AND IMMUNE RESPONSE IN LAYING HENS

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2026-PSC-152

Abstract

This study was conducted to evaluate the effect of different dietary levels of zinc, copper, and selenium nanoparticles on eggshell quality and immune response parameters of laying hens. A total of 120-layer birds at 23 weeks of age were reared for 10 weeks and divided into four groups: Group 1 (control group with only basal diet, no supplementation), Group 2 (basal diet plus zinc nanoparticles 20 mg/kg + copper nanoparticles 8 mg/kg + selenium nanoparticles 0.15 mg/kg), Group 3 (basal diet plus zinc nanoparticles 40 mg/kg + copper nanoparticles 10 mg/kg + selenium nanoparticles 0.30 mg/kg), and Group 4 (basal diet plus zinc nanoparticles 60 mg/kg + copper nanoparticles 12 mg/kg + selenium nanoparticles 0.45 mg/kg). The results revealed that dietary supplementation with zinc, copper, and selenium nanoparticles significantly ($p=0.004$ mm, $T_4=0.0049$ mm), shell weight ($T_1=7.0$ g, $T_4=7.5$ g), and shell strength, with the highest values observed in Group 4. Internal egg quality parameters including albumin weight ($T_1=31$ g, $T_4=33$ g), albumin height ($T_1=5.4$ mm, $T_4=5.9$ mm) yolk weight ($T_1=16.9$ g, $T_4=17.9$ g) and yolk height ($T_1=15.3$ mm, $T_4=16.0$ mm) also showed numerical improvement in the supplemented groups compared to control. Regarding immune response, birds receiving higher doses of nanoparticles exhibited enhanced eosinophil and heterophil counts, increased phagocytic activity, and elevated levels of cytokines TNF- α , IL-6, and IL-10, indicating a stronger and more balanced immune profile. Data was statistically analyzed using a completely randomized design. This study highlights the potential benefits of dietary zinc, copper, and selenium nanoparticles in improving egg quality and enhancing immune responses in laying hens, contributing to better poultry health and productivity.

Key Words: Laying hens, Egg production, Trace minerals, Egg quality

EFFECT OF INSECT MEAL AS AN ALTERNATIVE PROTEIN SOURCE ON NUTRIENT RETENTION AND GROWTH PERFORMANCE OF FAYOUMI MALE CHICKENS

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2026-PSC-153

Abstract

Black Soldier Fly Larvae (BSFL) meal is gaining attention as a sustainable alternative protein source in poultry nutrition, but its effects on Fayoumi male chickens require further evaluation. This study evaluated the effects of dietary BSFL meal inclusion on growth performance, feed conversion ratio (FCR), organ weights, and nutrient digestibility in Fayoumi male chickens. A total of 120 eight-week-old Fayoumi male chickens were randomly assigned to four dietary treatments containing 0% (T0), 1.75% (T1), 2.5% (T2), and 5% (T3) BSFL meal, with three replicates of 10 birds per treatment. Birds were reared under a floor-housing system with optimal management conditions. BSFL inclusion significantly ($P < 0.05$). Protein and fat digestibility increased with increasing BSFL inclusion, with the highest values in T3 (75.61% and 25.00%, respectively), compared with 70.99% and 19.60% in T0. Conversely, moisture, ash, and fiber digestibility were highest in T0 and lowest in T3. Dietary BSFL meal, particularly at 5% inclusion, improved growth performance, FCR, protein digestibility, and fat digestibility without adversely affecting organ weights, indicating its potential as an alternative protein source for Fayoumi male chickens.

Key Words: BSF, Alternative protein, Ecofriendly

EFFECT OF REPLACING SOYBEAN MEAL WITH DIFFERENT LEVELS OF LUPIN SEEDS IN BROILERS

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2026-PSC-154

Abstract

The increasing cost and variable availability of soybean meal (SBM) have encouraged the evaluation of alternative protein sources for sustainable broiler production. This study investigated the effects of replacing SBM with yellow lupin (*Lupinus luteus*) seed on growth performance, feed efficiency, and feeding economics of broiler chickens. A total of 400 day-old broiler chicks were randomly assigned to four dietary treatments, with four replicates of 25 chicks each. The diets included 0% (control), 5, 7.5, and 10% yellow lupin seed as partial replacements for SBM. The feeding trial lasted 35 days, during which feed intake, body weight gain, feed conversion ratio (FCR), feed cost, and feed cost per kilogram of weight gain were determined. Feed intake differed significantly ($P<0.05$), with the highest intake in the 5% lupin group and the lowest in the 10% group. Body weight gain was significantly higher ($P<0.05$) in the control and 5% lupin groups than in the 7.5 and 10% groups. The control group exhibited significantly better FCR ($P<0.05$) than all lupin-supplemented groups. Feed cost per kilogram decreased significantly with increasing lupin inclusion, from Rs. 118.85/kg in the control to Rs. 116.22/kg at 10% lupin. However, feed cost per kilogram of weight gain was lower in the control and 5% lupin groups than in the higher-inclusion groups. Overall, yellow lupin seed can be included at up to 5% in broiler diets as a partial replacement for SBM without substantial adverse effects on growth performance or feed economics.

Key Words: Broiler chickens, Yellow lupin, Growth performance

INFLUENCE OF COLD STORAGE DURATION ON THE NUTRITIONAL QUALITY OF TABLE EGGS

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2026-PSC-155

Abstract

Eggs are highly nutritious foods and an important source of high-quality protein, essential fatty acids, vitamins and minerals. After laying, however, egg quality gradually changes during storage, and the duration and conditions of storage can influence both internal quality and nutritional characteristics. The present study was conducted to evaluate the influence of different cold-storage durations on the nutritional quality of table eggs. Freshly collected table eggs were selected and stored under refrigerated conditions for predetermined storage periods. At each storage interval, representative eggs were evaluated for important physical and nutritional quality characteristics, including egg weight, albumen and yolk characteristics, pH, and selected proximate nutritional parameters. The study was designed to determine the extent to which prolonged refrigerated storage affects the quality and nutritional value of eggs intended for human consumption. The findings demonstrated that storage duration had a measurable influence on egg quality characteristics. Eggs maintained under shorter storage periods retained better internal quality, whereas progressive storage was associated with deterioration of internal egg quality and changes in albumen and yolk characteristics. The changes observed during storage are likely associated with moisture loss and physicochemical alterations within the egg, particularly changes in albumen pH and protein function. The study highlights the importance of appropriate refrigeration and limiting storage duration to preserve the quality and nutritional value of table eggs. Proper cold-chain management can help maintain consumer acceptability, reduce quality deterioration and extend the useful shelf life of eggs.

Key Words: Table eggs, Cold storage, Egg quality, Nutritional quality, Shelf life, Albumin, Yolk, Refrigerated storage

EVALUATING GROWTH AND ECONOMIC EFFICIENCY OF BROILER DIETS SUPPLEMENTED WITH PROTEASE AND REDUCING LEVELS OF AMINO ACIDS

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2026-PSC-156

Abstract

This study evaluated the effects of exogenous protease supplementation in broiler diets with graded reductions in essential amino acids (EAA) on growth performance, nitrogen retention, crude protein digestibility, carcass characteristics, and feed economics. A total of 1,050 day-old broiler chicks were randomly assigned to six dietary treatments in a 3×2 factorial arrangement under a completely randomized design. The diets contained 100% (control), 95% (5% reduction), or 90% (10% reduction) of recommended EAA levels, with or without exogenous protease (Winzyme Pro Plus®) at 200 g/t. Feeding trial lasted 35 days. Growth performance was recorded, while nitrogen retention, crude protein digestibility, carcass characteristics, and economic efficiency were evaluated. Reducing dietary EAA levels significantly affected growth performance. Birds fed the 95% EAA diet showed body weight gain and feed conversion ratio (FCR) comparable to the control, whereas 90% EAA diet significantly reduced weight gain and impaired FCR. Protease supplementation did not significantly affect feed intake, weight gain, or FCR; however, significant EAA $\times$ protease interactions were observed for selected performance traits. Protease supplementation significantly improved nitrogen retention and crude protein digestibility. Most carcass characteristics remained unaffected, although abdominal fat increased with EAA reduction, while gizzard percentage decreased at 10% reduction level. Feed cost decreased with declining EAA levels, with 5% reduction providing economic benefits without compromising growth performance. Overall, dietary EAA levels can be reduced by 5% without adverse effects on broiler performance, while protease supplementation improves nitrogen utilization and protein digestibility. A 10% EAA reduction, however, adversely affected growth performance.

Key Words: Broiler chickens, Exogenous protease, Essential amino acids, Growth performance, Feed economics

EFFECT OF REPLACEMENT OF SOYBEAN MEAL WITH FISH MEAL ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF JAPANESE QUAIL

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2026-PSC-157

Abstract

This study evaluated the effects of replacing soybean meal (SBM) with fish meal (FM) on growth performance and carcass characteristics of Japanese quail. Three hundred day-old quail chicks were randomly assigned to four dietary treatments, with three replicates of 25 chicks each. Four isonitrogenous (20% crude protein) and isocaloric (3,000 kcal/kg metabolizable energy) diets were formulated containing 0, 15, 30, and 45% FM as replacements for SBM. The feeding trial lasted 42 days. Feed intake, weight gain, and feed conversion ratio (FCR) were recorded, while carcass characteristics were evaluated at the end of the trial. Data were analyzed using analysis of variance under a completely randomized design, and treatment means were compared using Tukey's test. Feed intake, weight gain, and FCR did not differ significantly among treatments ($P>0.05$). However, feed intake increased numerically with FM replacement up to 30%, while the highest numerical weight gain was observed at 30% replacement. A slight numerical improvement in FCR was observed at the 45% replacement level. Carcass yield and relative weights of breast, legs, heart, liver, and gizzard were also not significantly affected by dietary treatment ($P>0.05$). Overall, replacing SBM with FM at up to 45% did not adversely affect growth performance or carcass characteristics of Japanese quail. Among the tested levels, 30% replacement showed a numerical advantage in weight gain, suggesting that FM may serve as a suitable alternative protein source to partially replace SBM in quail diets.

Key Words: Soybean meal, Fish meal, Japanese Quails, Growth performance, Carcass characteristics

EFFECTS OF PARTIAL REPLACEMENT OF CORN WITH CORN STARCH ON GROWTH PERFORMANCE AND GUT HEALTH OF BROILER CHICKENS

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2026-PSC-158

Abstract

This study evaluated the effects of partially replacing dietary corn with corn starch on growth performance and intestinal health in broiler chickens. A total of 600 one-day-old broiler chicks were randomly allocated to four dietary treatments, with three replicates of 50 birds each. The experimental diets contained 0% (control), 5%, 10%, or 15% corn starch as a partial replacement for corn and were formulated to be isonitrogenous and isoenergetic. The feeding trial lasted 35 days, during which feed and water were provided ad libitum. Growth performance was assessed based on feed intake, body weight gain, and feed conversion ratio (FCR). Intestinal health was evaluated through duodenal histomorphology, including villus height, crypt depth, villus height-to-crypt depth ratio, villus width, and goblet cell number. Data were analyzed using one-way ANOVA, and treatment means were compared using Tukey's test. Corn starch supplementation significantly ($p < 0.05$) enhanced body weight gain and improved FCR at inclusion levels of 5% and 10% without negatively affecting overall feed intake. Furthermore, duodenal histomorphology revealed a significant ($p < 0.05$) increase in villus height, villus height-to-crypt depth ratio, and goblet cell count in the 10% group compared to the control group. However, the 15% inclusion level showed diminished return effects on morphology. In conclusion, replacing corn with up to 10% corn starch enhances gut development, improves nutrient absorption surface area, and optimizes overall growth performance in broilers.

Key Words: Corn, Corn starch, Broilers, Growth performance, Gut health

EVALUATING THE EFFECT OF SELENIUM YEAST SUPPLEMENTATION ON OVARIAN MORPHOLOGY IN DESI CHICKEN

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2026-PSC-159

Abstract

Selenium (Se) is an essential trace mineral involved in antioxidant defense, cellular metabolism and reproductive function in poultry. The reproductive organs are particularly susceptible to oxidative stress, and adequate selenium availability may support ovarian development and follicular function. To test this hypothesis, Fifty birds were divided into control (C, n=25) and Se-Yeast (SY, n=25) groups, receiving the same basal diet without (C) or with (SY) Se at the dose rate of 0.3 mg/kg diet under controlled management conditions. The background Se level in control diet was 0.037 mg Se kg⁻¹ diet, quantified through inductively coupled plasma-mass spectrometry (ICP-OES Optima 2100-DV, Perkin Elmer) the trial lasted for 7 weeks. At the end of the experimental period, ovarian tissue was collected for gross and microscopic evaluation. Morphological observations included ovarian weight, follicular development and distribution, while histological assessment focused on follicular architecture, granulosa and theca cell organization, stromal characteristics and the general integrity of ovarian tissue. Results showed significant increase (P < 0.05) in SY supplementation was evaluated for its potential to improve ovarian structural characteristics through enhanced antioxidant protection and maintenance of cellular integrity. Improved ovarian morphology may have important implications for follicular development, reproductive efficiency and egg production in Desi chickens. Furthermore, the study highlights the potential value of SY as an organic selenium source in poultry diets and provides a foundation for further investigations into its effects on ovarian physiology, antioxidant status, follicular quality and reproductive performance.

Key Words: Desi chicken, Selenium yeast, Ovarian morphology, Organic selenium

POTENTIAL OF MULTI-STRAIN PROBIOTICS FOR THE DETOXIFICATION OF MULTIPLE MYCOTOXINS IN POULTRY FEED

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2026-PSC-160

Abstract

Mycotoxin contamination of poultry feed is a major concern for poultry health, productivity, and feed safety, particularly because feed ingredients may contain multiple mycotoxins simultaneously. Co-exposure to aflatoxins, ochratoxin A, fumonisins, deoxynivalenol, zearalenone, and trichothecenes such as T-2 toxin may produce additive or synergistic effects and increase the risk of adverse health and production outcomes. Multi-strain probiotics have emerged as a promising biological approach for mitigating mycotoxin contamination because different microbial strains may provide complementary detoxification mechanisms. This review summarizes the available evidence on the use of probiotic microorganisms, particularly *Bacillus*, *Lactobacillus*, *Saccharomyces*, and related beneficial species, for the mitigation of multiple mycotoxins in poultry feed. The major mechanisms of detoxification, including adsorption, enzymatic degradation, biotransformation, and modulation of intestinal health and immune responses, are discussed. Particular attention is given to the potential advantages of combining different microbial strains to improve the spectrum and effectiveness of mycotoxin mitigation. The literature indicates that individual probiotic strains can effectively interact with specific mycotoxins, whereas multi-strain preparations may offer broader protection against co-occurring toxins through complementary mechanisms. However, detoxification efficiency varies considerably according to microbial strain, toxin type and concentration, feed composition, environmental conditions, and gastrointestinal conditions. Evidence for simultaneous mitigation of multiple mycotoxins remains comparatively limited, and standardized evaluation of degradation products and their toxicity is still needed. Future research should focus on rational selection of compatible strains, optimization of multi-strain formulations, characterization of detoxification mechanisms, and validation under practical poultry production conditions. Multi-strain probiotics therefore represent a promising and sustainable strategy for managing multiple mycotoxin risks in poultry feed.

Key Words: Multi-strain probiotics, Mycotoxins, Poultry feed, Biological detoxification, Feed safety, Poultry health

IMPACT OF FEED ADDITIVES ON POULTRY GROWTH, GUT HEALTH, IMMUNITY AND FEED EFFICIENCY

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2026-PSC-161

Abstract

Feed additives play a crucial role in improving poultry health, growth performance, feed efficiency and overall productivity. With the increasing demand for safe and sustainable poultry production and the growing concern regarding antimicrobial resistance, the use of functional feed additives has gained considerable attention as an alternative to conventional antibiotic growth promoters. Different classes of feed additives, including probiotics, prebiotics, organic acids, enzymes, phytochemical compounds, essential oils, vitamins, minerals, amino acids, antioxidants and mycotoxin binders, can influence nutrient utilization, intestinal microbiota, immune response and physiological functions in poultry. Probiotics and prebiotics promote beneficial intestinal microorganisms and improve gut health, whereas organic acids and phytochemical compounds may suppress pathogenic bacteria and enhance digestive processes. Exogenous enzymes improve the utilization of nutrients and reduce the anti-nutritional effects of compounds such as phytate and non-starch polysaccharides. Antioxidants, vitamins and trace minerals support immune function and protect tissues against oxidative stress, while mycotoxin-binding and detoxifying agents can reduce the adverse effects of contaminated feed. The effectiveness of these additives depends on their type, dosage, combinations, bird age, diet composition, environmental conditions and health status. Therefore, strategic application of feed additives represents an important approach for enhancing poultry production, reducing disease-related losses, improving feed utilization and producing safer animal products. Future research should focus on synergistic combinations of feed additives, molecular mechanisms of action and the development of cost-effective, locally available alternatives to antibiotics for sustainable poultry production.

Key Words: Poultry production, Gut health, Probiotics, Phytochemical compounds

USE OF PHYTASE ENZYME WITH RICE BRAN AS A SUBSTITUTE FOR MAIZE EFFECT ON GROWTH PERFORMANCE, CARCASS CHARACTERISTICS AND NUTRIENT ABSORPTION.

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2026-PSC-162

Abstract

The present research was done in the Dr. Raja Muhammad Akram Animal Nutrition Research Center, University of Agriculture, Faisalabad, to investigate the role of substitute maize with different ratios of rice bran and providing exogenous phytase (1000 FTU/kg) to these diets on growth performance, carcass traits, and nutrient uptake in broilers. One hundred and fifty day old broiler chicks were randomly allocated to five dietary treatments and three replications each (10 birds per replication). The treatments included: T0 (Control/Basal diet), T1 (Basal diet + 1000 FTU/kg phytase), T2 (11% RB + 44% Maize + 1000 FTU/kg phytase), T3 (14% RB + 41% Maize + 1000 FTU/kg phytase), and T4 (16% RB + 39% Maize + 1000 FTU/kg phytase). The diets were provided at ad-libitum, the experimental diets lasted 35 days. Feeds Intake (FI), Body Weight Gain (BWG) and Feed Conversion Ratio (FCR) were the evaluation of growth performance. The method of determining nutrient digestibility was the indirect marker and the method of evaluating carcass characteristics was performed at the end of day 35 when the birds were slaughtered. The findings showed that there was no significant difference in the feed intake ($P > 0.05$) between the different treatments and thus the addition of rice bran did not affect the diet palatability adversely. Although increased inclusion of rice bran during the initial stages had poorer early weight gain, birds in T2 and T3 had better BWG and increased FCR in the last week (P

Key Words: Broilers, Rice Bran, Phytase, Growth Performance

DEVELOPMENT AND BIOCHEMICAL CHARACTERIZATION OF BACILLUS-DERIVED EXTRACELLULAR PROTEASES FOR ENHANCED GROWTH PERFORMANCE AND NUTRIENT UTILIZATION IN BROILER CHICKEN

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2026-PSC-163

Abstract

Proteases are hydrolytic enzymes that break down complex proteins into peptides and amino acids and have considerable potential for improving protein utilization and feed efficiency in poultry. Identifying effective protease-producing microbial sources and developing economical production strategies are therefore essential for application in animal nutrition. This study aimed to isolate and characterize a locally derived protease-producing *Bacillus* strains, optimize extracellular protease production and evaluate the purified enzyme as a feed supplement in broiler. Soil samples collected from poultry and fish market in Lahore were screened on skim milk agar and the selected proteolytic isolate was characterized phenotypically, biochemically and by PCR. Submerged fermentation was optimized using different culture conditions and substrates, with corn steep liquor used as a nutrient rich substrate. The optimized fermentation produced extracellular protease with an activity of 12.1 U/mL. The protease was purified using ammonium sulphate precipitation, ultrafiltration, Sephadex G-100 gel filtration, and purified preparation showed a single protein band of approximately 60 kDa on SDS-PAGE. The purified enzyme was supplemented in the broiler feed at 100, 200 and 300 mg/kg. The group with 300mg/kg showed most favorable growth efficiency, feed conversion efficiency with an FCR of 1.54 compared with 1.84 in controlled group, along with differences in selected blood biochemical parameters and fecal nutrient composition. The novelty of this study is the integration of isolation and molecular characterization of a locally derived *Bacillus* protease-producing strain with CSL-based enzyme production. These findings demonstrate that the local protease producing *Bacillus* strains have potential for improved protein utilization and nutrient absorption in poultry thus minimizing the use of synthetic additives approaches in poultry feed.

Key Words: Protease, *Bacillus*, Feed Conversion ratio (FCR), Fermentation process, SDS-PAGE

EFFECT OF DIETARY SLENIUM AND VITAMIN E SUPPLEMENTATION ON PERFORMANCE, INTESTINAL HISTOMORPHOMETRY, AND ELECTROPHYSIOLOGICAL PARAMETERS IN BISPHENOL-A-EXPOSED BROILERS

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2026-PSC-164

Abstract

In poultry, gut health is closely associated with production performance. A wide range of conventional poultry utensils contain bisphenol-A (BPA) that can jeopardize gut health. This study aimed to evaluate the effect of selenium (Se) and vitamin E (VE) on intake, performance, jejunal histomorphometry, and electrophysiological parameters in broilers exposed to BPA. Sixty day-old male broiler chicks (Hubbard) were randomly assigned into four groups: Group A, control: Basal diet with no BPA. Group B, BPA: Basal diet with BPA (100mg/kg feed). Group C, SeVE: Basal diet supplemented with Se (0.5mg/Kg feed) and VE (100mg/kg feed) and Group D, BPA+SeVE: Basal diet added with BPA (100mg/kg feed) and supplemented with Se (0.5mg/Kg feed) and VE (100mg/kg feed). Hormonal profiles were determined by commercially available ELISA kits while electrophysiological parameters were acquired from automated voltage clamp device. Statistical significance was set at p < 0.05. BPA negatively affected the feed intake and growth on day 21 while there was a 20% increase in body weight in supplemented group (p < 0.05). Conclusion: BPA adversely affected the growth, jejunal morphology and electrophysiological parameters. Dietary supplementation of VE and Se improved growth parameters, gut performance and modulated oxidative response. Further studies with optimized feed formulation, epithelial molecular biomarkers, and oxidative signaling pathways will aid in thorough understanding of underlying protective mechanism.

Key Words: Endocrine disruptor, Growth performance, Se, VE, Short circuit current, Broilers

BACILLUS SUBTILIS DSM 29784 AS A NOVEL FEED ADDITIVE TO ENHANCE ANIMAL RESILIENCE, GUT HOMEOSTASIS, AND SUSTAINABLE POULTRY PRODUCTION

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Abstract

Modern poultry production increasingly exposes birds to nutritional, environmental, and microbial stressors that can disrupt intestinal homeostasis, impair barrier function, alter microbial communities, and compromise productivity. Enhancing the biological resilience of poultry, defined as the capacity to maintain intestinal functionality, health, and performance under challenging conditions, is becoming increasingly important for sustainable and food-secure poultry production. In Pakistan, the need to reduce unnecessary antibiotic use and mitigate the growing threat of antimicrobial resistance further highlights the importance of effective nutritional alternatives, consistent with the One Health concept linking animal, human, and environmental health. Probiotics represent a promising nutritional strategy for supporting intestinal ecosystem stability and strengthening the natural ability of birds to cope with multifactorial production challenges. Among probiotic interventions, *Bacillus subtilis* DSM 29784 has attracted considerable attention owing to its multifaceted effects on the poultry gastrointestinal ecosystem. This strain modulates intestinal microbial communities in favor of beneficial and butyrate-producing bacteria while supporting intestinal morphology and epithelial functionality. These microbial and structural modifications may contribute to enhanced nutrient utilization, preservation of intestinal barrier integrity, and improved host-microbiota interactions. Studies conducted under challenge conditions indicate that *B. subtilis* DSM 29784 supports intestinal integrity and productive performance during microbial challenges, accompanied by favorable alterations in intestinal morphology, microbial composition, inflammatory responses, and gut metabolite profiles. Collectively, the available evidence positions *B. subtilis* DSM 29784 as a next-generation feed additive whose benefits extend beyond conventional performance enhancement to the reinforcement of biological resilience. By promoting microbial stability, intestinal integrity, and gut homeostasis, targeted probiotic nutrition may improve the capacity of poultry to withstand production-related stressors while maintaining productivity and resource-use efficiency. The integration of microbiome-focused nutritional strategies with responsible antimicrobial stewardship may contribute to healthier flocks, reduced dependence on antimicrobials, and more sustainable poultry production systems. Accordingly, *B. subtilis* DSM 29784 represents a promising precision-nutrition approach for enhancing poultry resilience, reducing reliance on antimicrobial interventions, and supporting One Health objectives through more sustainable, resilient, and food-secure poultry production.

Key Words: *Bacillus subtilis* DSM 29784, Probiotics, Biological resilience, Gut health, Microbiome, Intestinal integrity, Antimicrobial stewardship, One Health,

DIETARY EFFECTS OF SYNBIOTIC AND CINNAMON ESSENTIAL OIL ON MUSCULOSKELETAL MORPHOLOGY AND BLOOD BIOCHEMISTRY IN JAPANESE QUAIL (*COTURNIX COTURNIX JAPONICA*)

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Abstract

Synbiotic is the combination of prebiotics like mannan-oligosaccharides and probiotics like *Lactobacillus acidophilus* that alter the composition of microbes in the intestine and provide improvement in the histomorphological structure of the mucosa of the intestine, allowing the bird to reach its maximum nutrient absorptions for muscle development and quality of meat. Cinnamon essential oils consist of cinnamaldehyde, which improves the growth efficiency of broiler chickens. The present study aimed to investigate the impact of cinnamon essential oil and synbiotic individually and in combination on the bones and muscles of Japanese quail. A 35-day experiment was carried out at the Avian Research and Training Center, UVAS, Lahore, in which 100 one-day-old quails were divided into four treatment groups, each consisting of 25 birds. Treatment groups consisted of a control group, which was fed with a basal diet (BD), 1g/kg synbiotic, BD+200 mg/kg cinnamon essential oil (CEO), and BD+1 g/kg synbiotic and 200 mg/kg CEO. Samples of tibia bone and pectoralis muscle were collected on day 35. Bone analysis parameters included morphometry, robusticity index, weight/length index, ash percentage, and phosphorus content. Muscle parameters include water-holding capacity and histomorphometry (fibers per unit area). Serum ALT and ALP were also measured. One-way ANOVA and Tukey's test were applied for statistical analysis ($P < 0.05$). The findings demonstrated that dietary synbiotic and CEO supplementation influenced selected bone, muscle, and serum biochemical parameters, with the combined supplementation showing potential synergistic effects. These findings suggest that synbiotic and CEO supplementation may support skeletal development and muscle quality in Japanese quail.

Key Words: Cinnamon Essential oil, Synbiotic, Tibia morphometry, Pectoralis muscle, Muscle histomorphometry, Water holding capacity

EFFECTS OF DIETARY ORGANIC SELENIUM SUPPLEMENTATION ON NUTRIENT DIGESTIBILITY AND ANTIOXIDANT STATUS OF LOHMANN LSL-LITE LAYING HENS

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Abstract

This study evaluated the effects of dietary organic selenium supplementation on nutrient digestibility and antioxidant status in Lohmann LSL-Lite laying hens. A completely randomized design (CRD) was employed, comprising 84 laying hens randomly assigned to four dietary treatments with three replicates per treatment. The experimental diets consisted of a basal diet (control) and the basal diet supplemented with organic selenium at 0.15, 0.30, or 0.45 mg/kg of feed. The feeding trial was conducted over 72 days under standardized management and environmental conditions. Feed intake, nutrient digestibility, and antioxidant status were assessed by determining the activities of glutathione peroxidase (GPx), superoxide dismutase (SOD), and the concentration of malondialdehyde (MDA). Dietary organic selenium supplementation had no significant effect on feed intake throughout the experimental period ($P > 0.05$). However, digestibility coefficients of dry matter, crude protein, and ether extract increased significantly ($P < 0.05$) in selenium-supplemented groups compared with the control. Organic selenium supplementation also significantly enhanced antioxidant defense, as evidenced by increased GPx and SOD activities and reduced MDA concentrations ($P < 0.05$). The improvements in antioxidant status were more pronounced at higher selenium inclusion levels, indicating a dose-dependent response. These findings suggest that dietary organic selenium can improve nutrient utilization and strengthen antioxidant defense mechanisms in laying hens without adversely affecting feed intake. Overall, organic selenium supplementation may be a beneficial nutritional strategy for enhancing physiological antioxidant capacity and nutrient digestibility in commercial laying hens, particularly under conditions associated with increased oxidative stress.

Key Words: Organic selenium, Lohmann LSL-Lite, laying hens, nutrient digestibility

INTERACTIVE EFFECTS OF DIETARY GUANIDINOACETIC ACID AND ENERGY DENSITY ON GROWTH PERFORMANCE, CARCASS CHARACTERISTICS, MEAT QUALITY, AND HEAT STRESS TOLERANCE IN BROILERS

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Abstract

Guanidinoacetic acid (GAA), a natural precursor of creatine, plays a pivotal role in cellular energy metabolism. This study investigated the effects of dietary GAA supplementation at varying levels (0, 0.6, and 1.2 g/kg) combined with standard or reduced (–100 kcal/kg) dietary energy on growth performance, carcass characteristics, meat quality, and heat stress tolerance (during the finisher phase) in broiler chickens. A total of 360 one-day-old male Ross-308 broiler chicks were randomly allocated to 36 floor pens in a 3 × 2 factorial arrangement under a completely randomized design. Six treatments with six replicates, each having 10 birds, were evaluated over 35 days. Growth performance parameters were recorded weekly. On day 35, samples were collected for carcass characteristics (dressing percentage, breast and thigh yield, and organ weights), meat quality analysis (drip loss, cooking loss, and color parameters), and heat stress response. The heat stress response (panting frequency) was recorded during the finisher phase of the trial. GAA supplementation at 1.2 g/kg significantly (p weight gain, feed conversion ratio, dressing percentage, breast yield, and thigh yield. Meat quality parameters showed significant improvement (p dose-dependent manner for drip loss, cooking loss, and all color parameters (L*; a*; b*). Significant GAA × energy interactions (p total weight gain, feed intake, FCR, cooking loss, live body weight at slaughter, breast yield, liver weight, gizzard weight, intestine weight, and panting frequency. The effect of GAA on heat stress tolerance was context-dependent, with a significant GAA × energy interaction (p GAA decreased panting frequency, suggesting improved thermoregulatory capacity, while under standard-energy conditions, GAA increased panting frequency. The main effect of GAA on panting frequency was not significant (p = 0.38), while the main effect of energy was highly significant (p improves growth performance, feed efficiency, meat quality (reduced drip and cooking losses and improved color parameters), and carcass yield in broiler chickens. Importantly, GAA supplementation largely compensated for a 100 kcal/kg reduction in dietary energy while maintaining performance. These findings support GAA as a promising nutritional strategy for sustainable broiler production, particularly in hot-climate regions.

Key Words: Guanidinoacetic acid, Broiler, Growth performance, Meat quality, Energy sparing

DIETARY CLOVE (*SYZYGIUM AROMATICUM*) ESSENTIAL OIL IMPROVES GROWTH, INTESTINAL MORPHOLOGY, GUT MICROBIOTA AND EIMERIA CONTROL IN ANTIBIOTIC-FREE BROILERS

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Abstract

Antibiotic growth promoters (AGPs) are being withdrawn from broiler diets over antimicrobial resistance and residue concerns, creating a need for natural alternatives. This study evaluated dietary clove essential oil (CEO) as an alternative to AGPs and its effects on performance, gut health, and carcass quality in broilers. In total, 384 day-old Ross-308 chicks were allocated to four treatments (eight replicates of 12 birds) for 35 days: basal diet with AGP (T0), without AGP (T1), and without AGP plus 0.5 (T2) or 0.7 g/kg CEO (T3). Growth was recorded weekly and all remaining parameters at day 35. CEO increased body weight gain from 2230 g without AGP to 2541 g (T2) and 2536 g (T3) ($P = 0.0009$), whereas FCR was unchanged. At 0.7 g/kg it raised dry matter and ileal crude protein digestibility by 6 and 15 percentage points, villus height from 1291 to 1664 μm (+29%) and villus height/crypt depth ratio from 13.9 to 17.4. *Lactobacillus* and *Bifidobacterium* rose from 7.97 and 7.10 log₁₀ CFU/g to 9.55 and 8.05 (T2) and 9.30 and 8.20 (T3), while *E. coli* varied by less than 0.5 log (6.32–6.80). *Eimeria* shedding fell from 3767 to 1300 oocysts/g at both CEO levels (–65%; $P < 0.05$). CEO supplementation also improved carcass quality parameters. Overall, CEO enhanced growth, nutrient digestibility, intestinal morphology, beneficial microbiota, and coccidial control, supporting its potential as a natural alternative to AGPs in broiler production.

Key Words: Clove essential oil, Growth promoter, Broilers, Growth performance, Gut microbiota

EFFECT OF SELKO-PH AS AN ALTERNATIVE TO ANTIBIOTIC GROWTH PROMOTERS IN BROILER CHICKENS

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Abstract

The present study evaluated the efficacy of Selko-pH as a potential alternative to antibiotic growth promoters (AGPs) in broiler chickens. A total of 400 one-day-old Ross-308 broiler chicks were randomly allocated to four treatments in a completely randomized design. The negative control (NC) group received a basal diet without supplementation, while the positive control (PC) group received an AGP at 20 mg/kg of feed. The treatment groups received Selko-pH through drinking water at 0.45 L/1,000 L (T1) and 0.60 L/1,000 L (T2). Growth performance parameters, including body weight, weight gain, feed intake, and feed conversion ratio (FCR), were recorded weekly. Antibody titres against Newcastle disease (ND) and infectious bronchitis (IB) were measured to assess immune response. At the end of the trial, nutrient digestibility and carcass characteristics were evaluated. Supplementation with Selko-pH significantly improved growth performance compared with the NC group ($P < 0.05$). At 35 days, the highest final body weight was observed in PC (2,251 g), followed by T2 (2,202 g), T1 (2,153 g), and NC (1,989 g). Body weight gain was also higher in T2 (533 g) and T1 (525 g) than in NC (480 g). The best FCR was recorded in T2 (2.256) compared with NC (2.382). Crude protein and ether extract digestibility increased from 71.50% and 72.44% in NC to 76.80% and 78.30% in T2, respectively. Selko-pH supplementation also enhanced antibody titres against ND and IB. Carcass traits, including dressing percentage and liver weight, were improved in supplemented groups. Overall, Selko-pH, particularly at 0.60 L/1,000 L of drinking water, improved growth performance, feed efficiency, nutrient digestibility, immune response, and carcass characteristics, demonstrating its potential as an effective alternative to AGPs in modern broiler production.

Key Words: Selko-pH; Broiler chickens; Antibiotic growth promoter alternative.

COMPARATIVE EVALUATION OF DIFFERENT BLENDS OF EXOGENOUS ENZYME ON NUTRIENT DIGESTIBILITY AND PERFORMANCE OF BROILERS

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Abstract

This study evaluated the effects of different blends of exogenous enzymes on growth performance, nutrient digestibility, blood biochemistry, bone mineralization, intestinal health, immune response, and economic efficiency in Ross 308 broilers. A total of 240 day-old chicks were randomly allocated to four dietary treatments: T₁ (control, without enzymes), T₂ (amylase + protease + xylanase + glucanase), T₃ (phytase + xylanase + amylase), and T₄ (protease + amylase + xylanase), with enzyme supplementation evaluated across three production phases (0–14, 15–28, and 29–35 days). Enzyme supplementation significantly improved growth performance, particularly during the starter phase. Birds receiving T₂ achieved the highest final body weight (2223 g) and the best overall FCR (1.599), compared with 2129 g and 1.757, respectively, in the control. T₂ also produced superior digestibility of dry matter, crude protein, crude fiber, and phosphorus. Enzyme supplementation improved blood biochemical profiles by increasing total protein and reducing blood urea, uric acid, cholesterol, and triglycerides. T₃ resulted in the highest tibia ash content. Intestinal morphology was markedly improved in T₂, accompanied by increased *Lactobacillus* and reduced populations of *E. coli* and *Clostridium perfringens*. Furthermore, T₂ enhanced antibody responses against NDV and IBV and reduced the heterophil-to-lymphocyte ratio. The highest net profit was also recorded in T₂ (115.02 PKR/bird), representing a 26.7% improvement over the control. Overall, supplementation with multiple exogenous enzymes, particularly amylase, protease, xylanase, and glucanase, improved nutrient utilization, performance, gut health, immunity, and profitability, with benefits varying according to broiler age and production phase.

Key Words: Exogenous enzymes, Broiler performance, Nutrient digestibility, Gut health

NUTRITIONAL MANAGEMENT FOR IMPROVED GROWTH, GUT HEALTH, AND DISEASE RESISTANCE IN POULTRY

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2026-PSC-172

Abstract

Poultry production plays a vital role in ensuring food security by providing affordable sources of high-quality protein, while maintaining optimal growth, health, and production efficiency remains a major challenge for the poultry industry. Nutrition is one of the most important factors influencing growth performance, immune response, gut health, feed efficiency, and overall productivity of poultry. This study focuses on evaluating the relationship between dietary nutrition, growth performance, and health status in poultry. Balanced diets containing appropriate levels of energy, protein, amino acids, vitamins, minerals, and other functional nutrients are essential for achieving efficient growth and maintaining physiological health. In addition, nutritional strategies involving probiotics, prebiotics, phytogenic feed additives, enzymes, organic acids, and other natural supplements have gained considerable attention as potential approaches for improving gut microbiota, nutrient utilization, immune function, and disease resistance. The study evaluates key growth indicators including body weight, body weight gain, feed intake, feed conversion ratio, and mortality, along with health-related parameters such as immune response, intestinal integrity, antioxidant status, and disease resistance. Improved nutritional management can enhance nutrient digestibility, promote beneficial intestinal microorganisms, strengthen immunity, and reduce the negative effects of environmental and infectious stresses. Therefore, the integration of scientifically balanced diets with functional feed additives and effective health-management practices can contribute to sustainable poultry production. The findings emphasize the importance of precision nutrition and evidence-based dietary strategies for improving poultry growth, health, welfare, and economic productivity while reducing production costs and environmental impacts.

Key Words: Balanced Nutrition, Poultry Growth and Health, sustainable poultry production

IMMUNOMODULATORY & GROWTH PROMOTING EFFECTS OF DIETARY SUPPLEMENTATION OF MULTISTRAIN PROBIOTIC IN BROILER CHICKS & PROBIOTICS AS ALTERNATIVE OF ANTIBIOTICS AS GROWTH PROMOTER IN BROILER CHICKS

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Abstract

The residues of antibiotics, used as growth promoters in poultry, are mostly transferred into the broiler meat, which is hazardous to human health and causes antibiotic resistance in humans. International public health institutes have shown deep concern about reducing the use of antibiotics in poultry feed. In view of emergent demand from the consumer market for products free from antibiotic residues, it is necessary to search for alternative products that could replace antibiotics as growth promoters, without causing losses to productivity or product quality in poultry. Probiotics have generally been suggested as an alternative to antibiotics. Probiotics are viable single or mixed cultures of bacteria. Probiotics affect the host animal by improving its intestinal balance. It has been proved that the probiotic mode of action is related to competition for attachment sites. The bacteria present in the probiotic attach to the intestinal mucosa and block the attachment of pathogenic bacteria by forming a physical barrier. One of the major reasons for the increased interest in the use of probiotics is that they are natural alternatives to antibiotics in poultry. Keeping in view the beneficial effects of probiotics, a research study was undertaken at Poultry Research Institute Jabba Mansehra to investigate the effect of various feed-added levels of Probiotic Protexin on overall bird performance (feed consumption, FCR, body weight gain) & immune response of broilers using Newcastle Disease as an indicator. Protexin is a multi-strain probiotic used in poultry. It contains naturally occurring nine different species of beneficial microflora which are regarded as safe by the FDA. This trial was conducted with 2 factors, i.e., two types of broiler strains (Cobb & Hubbard) & two levels of probiotic. 450 nos of day-old chicks were divided into three groups, A, B & C, having 150 chicks per group, and each group was further divided into 2 replicates for the two breeds (Cobb & Hubbard). Each replicate carried 75 chicks. Group A was kept as the control group and fed only the NRC (1994) recommended diet, while group B was offered feed containing probiotic @ 100 g per ton in the starter ration and 50 gram in the finisher ration, and group C was offered feed containing probiotic at 110 gram per ton in the starter and 55 gm in the finisher ration. A representative feed sample of one kg from each experimental ration was subjected to nutritional proximate analysis for dry matter, ash, and crude protein according to procedures given in AOAC (1990). The trial lasted for five weeks. The overall findings of this study clearly revealed that probiotics have beneficial effects on overall growth performance. Compared with the control treatment group, the probiotic-supplemented broilers had a better feed conversion ratio (FCR) and good body weight gain. Similarly, probiotic-supplemented birds recorded a higher antibody titer against Newcastle disease than the control group. It is recommended that probiotic inclusion in poultry rations be considered for better body weight gain and immunity and for reducing the antibiotic residue problem in broiler meat and eggs.

Key Words: Antibiotic Residues, Probiotics, Broiler Performance, Feed Conversion Ratio, Newcastle Disease

TAPEWORM INFECTION: A SILENT BUT REAL CHALLENGE IN BROILER INDUSTRY

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Abstract

Cestodes, commonly known as Tapeworms, can inflict economic impact on the poultry industry. A variety of tapeworms are known to infect poultry. Important examples include *Davainea proglottina*, *Raillietina cesticillus*, *Raillietina tetragona*, *Raillietina echinobothrida*, *Choanotaenia infundibulum*. Tapeworms have indirect life cycles – many commonly found arthropods (like ants, beetles) can act as their intermediate hosts. We have witnessed the tapeworm infection in broilers farms with birds without showing optimum daily weight-gain. The passage of rice-grain-like tapeworms segments was also seen along with the undigested feed particles in feces. Intestinal hemorrhages were seen during postmortem. The FCR of the farm was poorer than the current standard FCR. Treatment with a salicylamide derivative was found to perform better than a benzimidazole-group treatment, with improvement in FCR in both treatments. Several risk factors can be present in and around a poultry farm, particularly the control shed, that can not only sustain the tapeworm infection in the flock but can also increase the severity of the problem on the farm by supporting the existence of vectors. These include but are not limited to feed store, feed hopper, feed lines, feed pipes in the control sheds. We recommend monitoring these spots regularly to rule out the presence of arthropod vectors of tapeworms as a sustainable preventive measure. Knowledge of this issue is important in preventive-screening in-and-around the farm, as well as in designing and implementing relevant therapeutic and sustainable preventive measures, to minimize the economic impact of tapeworm infestation on farmed birds.

Key Words: Broiler, Tapeworms, Indirect Life Cycle, Arthropod Intermediate Hosts, FCR

COMPARATIVE EVALUATION OF HATCHABILITY TRAITS & FERTILITY OF RHODE ISLAND RED (RIR) & BLACK AUSTRALORP (BA) UNDER LOCAL CONDITIONS OF HAZARA DIVISION

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Abstract

Hatchability and fertility are important parameters that should be investigated before finalizing the cross-breeding program for backyard poultry. A research study was, therefore, undertaken at Poultry Research Institute (PRI) Jaaba Mansehra to compare the hatching parameters of 2 different breeds of chicken, i.e., Rhode Island Red (RIR) & Black Australorp (BA), under local conditions of Hazara division. A total of 13,540 hatching eggs were collected: 6,811 & 6,729 eggs from Rhode Island Red (RIR) & Black Australorp (BA), respectively, during February-March 2015. All eggs were cleaned with disinfectant before transport to the hatchery, and all eggs were fumigated with potassium permanganate and formalin at the hatchery and set in a disinfected incubator. Candling was done on the 7th and 14th day of incubation for the identification and removal of dead-germ, dead-in-shell, and infertile eggs. On the 21st day, the number of hatched chicks, including normal and abnormal chicks and chicks dead in shell and after hatch, were counted separately. Hatchability of RIR and BA were studied, and data for chicks hatched, dead in shell, dead germ, and fertility were maintained and collected. Out of 6,811 eggs of Rhode Island Red (RIR) set for incubation, the percentage of hatched chicks was 82.60%. Similarly, out of 6,729 eggs of Black Australorp (BA) set for incubation, the percentage of hatched chicks was 88.12%. The percentage of infertile eggs was 8.23% & 4.87% for Rhode Island Red (RIR) & Black Australorp (BA), respectively. The percentage of dead germ was 4% & 2.76% for Rhode Island Red (RIR) & Black Australorp (BA), respectively. The percentage of chicks dead in shell was 4.9% & 3.77% for Rhode Island Red (RIR) & Black Australorp (BA), respectively. Fertility remained 92.12% and 95.45% for Rhode Island Red (RIR) & Black Australorp (BA), respectively. It was concluded from the data that fertility and hatchability were higher in Black Australorp than in Rhode Island Red (RIR), and that dead-germ and dead-in-shell rates were comparatively higher in Rhode Island Red than in Black Australorp.

Key Words: Rhode Island Red (RIR), Black Australorp (BA), Hatchability & Fertility

HEPATOPROTECTIVE AND IMMUNOMODULANT ROLE OF MEDICINAL PLANT MILK THISTLE (*SILYBUM MARIANUM*) AS FEED ADDITIVE AGAINST AFLATOXIN B1 IN BROILER CHICKS

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2026-PSC-176

Abstract

Poultry farming provides an important source of high-quality meat and eggs in a short period. Feed accounts for approximately 70–80% of total operating costs in broiler production; therefore, feed quality is crucial for profitable and sustainable poultry production. One of the major threats to feed quality is contamination with mycotoxins, particularly aflatoxins. Aflatoxins are biologically active metabolites produced mainly by *Aspergillus flavus* and *Aspergillus parasiticus*. Among the naturally occurring aflatoxins (B1, B2, G1, and G2), aflatoxin B1 (AFB1) is the most common and toxic. The liver is the principal target organ, and exposure may result in hepatotoxicity, immunosuppression, growth retardation, poor feed utilization, and increased susceptibility to infections. In broilers, aflatoxicosis may cause reduced body weight and feed intake, poor skin pigmentation, depletion of lymphoid organs, liver enlargement and discoloration, fatty degeneration, necrosis, hemorrhage, and increased mortality. Pakistan's high temperature, humidity, and inadequate feed-storage conditions increase the risk of aflatoxin contamination. Commonly affected feed ingredients include maize and its by-products, cottonseed meal, broken rice, sunflower meal, sorghum, and rapeseed products. Medicinal plants have attracted attention as natural alternatives for reducing the harmful effects of mycotoxins because of their hepatoprotective, antioxidant, immunostimulatory, and antitoxic properties. Milk thistle (*Silybum marianum*) is a medicinal plant containing silymarin, a mixture of flavonolignans, mainly silibinin, silychristin, silydianin, and isosilybin. Silymarin is recognized for its hepatoprotective and hepatorestorative properties and may protect animals against various hepatotoxic substances, including AFB1. A research trial was conducted using 240 day-old broiler chicks divided into four groups. Group A received aflatoxin-free feed, group B received AFB1-contaminated feed, group C received contaminated feed with a commercial toxin binder (3 g/kg), and group D received contaminated feed supplemented with milk thistle (10 g/kg). AFB1 levels were 80 µg/kg during the first week and 520 µg/kg during the remaining experimental period. Milk thistle supplementation improved serum total protein, reduced ALT, AST, and ALP levels, and improved body weight gain and feed intake compared with the aflatoxin-exposed group. Antibody titers against ND, IB, and IBD were also significantly higher in milk-thistle-treated birds. The findings suggest that milk thistle may help reduce the hepatotoxic and immunosuppressive effects of AFB1 in poultry.

Key Words: Aflatoxin B1, Milk Thistle, Silymarin, Aflatoxicosis, Broiler Chickens

GROWTH PROMOTING EFFECT OF DIETARY SUPPLEMENTATION OF MILK THISTLE (*SILYBUM MARIANUM*) IN BROILER CHICKS AFFECTED WITH AFLATOXICOSIS

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Abstract

Feed is the largest cost component of broiler farms. Although the cost of feed is increasing day by day, its quality is simultaneously deteriorating both in terms of nutrition and contamination with the presence of injurious agents. One of the injurious agents is mycotoxins. Mycotoxins are metabolites from moulds. Aflatoxin, a group of closely related mycotoxins, is produced by strains of *Aspergillus flavus* and *Aspergillus parasiticus*. Aflatoxins are hepatotoxic, growth-retardant, and immunosuppressant. In broilers, toxic levels of aflatoxins cause decreased body weight, low feed intake, and poor FCR. Aflatoxins have been isolated from different feedstuffs used mainly in poultry. The antibacterial, antiviral, hepatoprotective, immunostimulant, and antitoxic effects of medicinal plants are of great importance. Pakistan has 400-600 medicinal plants. Milk thistle is a locally available herb throughout Pakistan and has great medicinal properties. Silymarin is a plant-derived flavonoid extracted from the seeds of milk thistle. Milk thistle has been widely studied and scientifically proven to be hepatoprotective and hepatorestorative. *Silybum marianum* protects the liver from toxic agents, including aflatoxins. It protects birds against the growth-retardant effects of aflatoxin in feed. Keeping in view the medicinal value of milk thistle, a research trial was conducted to investigate the growth-promoting effect of milk thistle in broilers affected with aflatoxicosis. A total of 240 day-old broilers were randomly divided into four major groups: A, B, C, and D. Each group was further subdivided into 2 groups, and each subgroup carried three replicates (10 chicks per replicate). In each group, one subgroup was vaccinated against ND, IBD, and IB. Group A was kept as the control, receiving aflatoxin-free diet, while group B was fed contaminated feed only, group C was raised on contaminated feed with toxin binder @ 3 g/kg of feed, and group D was provided contaminated feed along with milk thistle @ 10 g/kg of feed. Analysis of the experimentally contaminated feed by the TLC method showed that aflatoxin B1 was present in the feed at levels of 80-520 µg/kg. Birds were fed aflatoxin-contaminated feed for 5 weeks. Mean body weight gain and dressing percentage were significantly higher in group A, followed by D, C, and B, respectively. Feed intake and breast, thigh, and leg weight were significantly higher in group A, followed by C, D, and B, respectively. FCR value was significantly the lowest in group D. It is recommended that milk thistle could effectively be utilized as a growth promoter in the presence of growth-retardant and hepatotoxic aflatoxin B1 in poultry feed.

Key Words: Aflatoxicosis, Broiler Chicks, Milk Thistle, Silymarin, Growth Performance

EVALUATION OF TWO VACCINATION REGIMES FOR NEWCASTLE DISEASE VACCINATION IN BOILER

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Abstract

Vaccination schedule trial and comparative immunogenicity of two locally available vaccines for Newcastle disease were studied at Poultry Research Institute, Jaaba Mansehra. For this purpose locally available live (LaSota) and killed vaccine were used. A total of 450 birds were divided into three groups A, B and C comprising of 150 birds each. C group served as control group. The priming of birds of group A was done with ND+IB Live vaccine at day 1st and booster dose was given at the age of 7th day with ND Killed (Oil emulsified vaccine). While the priming and boosting of group B was done with ND Live vaccine at day 7th and 21st day of experiment. Serum antibodies against NDV were analyzed on day 7th, 14th, 21st 28th and 35th day of experiment using standard Hemagglutination Inhibition test. The obtained results revealed that both vaccination regimes produced effective antibody titers. Live vaccine as priming and boosting resulted in higher immune titres as compared to priming with live vaccine and boosting with killed vaccine regime. Post infection protection cannot be recorded due to limitations, but researchers reported that post infection protection was higher in the birds when priming was done with live vaccine and booster dose was given with inactivated vaccines. Suggesting that usage of killed vaccine as priming at proper dosage is significantly enough to produce long-lasting serum antibodies to protect from infections.

Key Words: Newcastle Disease, LaSota, Poultry, Vaccine, Hemagglutination Inhibition

MISCONCEPTIONS ABOUT BROILER MEAT HEALTH HAZARDS IN HUMAN; MYTH OR REALITY

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Abstract

Chicken meat is a white meat, distinguished from other meats such as beef and mutton by its lower iron content. It provides not only protein but also vitamins and minerals. It does not contain the fat that contributes to coronary heart disease, as chicken meat is made up of desirable unsaturated fat. However, several misconceptions exist among the public regarding broiler meat. Heated debates have been taking place recently in print and social media in Pakistan regarding hormones and steroids being used in broiler meat, creating confusion and misconceptions among the general public about the consumption of broiler meat and thus affecting the second-largest industry in Pakistan after textiles. One myth circulating is that hormones & steroids are being used to make chickens grow bigger and faster, and that these hormones have resulted in early sexual maturity in girls. The rapid growth in broilers is due to selective breeding and not to the feeding of any growth hormones or steroids. This rapid growth is not the result of a single experimental manipulation within a period of a few years; rather, it is the result of ongoing research (in terms of selection & breeding) dating back to 1925. People usually confuse the method of rapid growth through breeding and automatically jump to the conclusion that hormones are being injected into birds. Feeding hormones or steroids through feed or water to birds is not possible, because digestion in birds starts with the action of acids and enzymes, which convert hormone protein into amino acids and naturally destroy the function of the hormones. The only possible method for hormones to work would be to inject them on a daily basis, because natural growth hormone is pulsatile, peaking every ninety minutes; therefore, the possibility of this happening on commercial farms is nil. Lastly, hormone use is not cost-effective, since there is no commercial production of chicken hormones, and even if it were available, administering it to broilers would cost more than the broiler itself. Poultry feed is prepared under strict hygienic conditions, and no injurious material is used in poultry rations. Raw materials used in poultry rations mostly include maize, wheat, barley, rice polish, soybean meal, cottonseed cake, oats, and mineral and vitamin premix. Blood meal is used as a protein source in very limited amounts after proper sterilization to make it safe, and it is now increasingly being replaced by other good protein sources. In a nutshell, the rapid growth of broilers is due to genetics, nutrition, and disease control. It is safe to state that the larger size of broilers is definitely not because of injecting hormones or steroids. An ideal environment consisting of superior genetics and high-quality feed yields a bird that does not require any growth hormone or steroid. So, if you are worried about steroids in your chicken, you shouldn't be. For now, eat your chicken and enjoy.

Key Words: Broiler Meat, Growth Hormones, Steroids, Poultry Nutrition, Food Safety

EFFECT OF DIFFERENT DIETARY LEVELS OF PHYTASE ENZYME ON SERUM PHOSPHORUS LEVEL OF COBB & HUBBARD STRAIN OF BROILER CHICKS

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Abstract

Phosphorus (P) is an essential mineral for growth and skeletal development in chickens. Approximately 61-70% of the phosphorus found in poultry diet ingredients is in the form of phytate phosphorus. However, monogastric animals such as poultry birds are unable to utilize this phytate phosphorus, as they lack endogenous phytase, which necessitates the addition of inorganic phosphate sources to poultry diets. This results in relatively large amounts of phosphorus in the excreta, which contributes to environmental pollution. Exogenous phytase can be used as an alternative that helps reduce phosphorus excretion in manure and also increases P concentration. A research study was undertaken to investigate the effect of phytase enzyme on the serum phosphorus level of two strains of broilers (Cobb & Hubbard). This experiment was conducted with two factors, i.e., 2 levels of phytase and 2 types of broiler strains. A total of 360 day-old broiler chicks were divided into three groups, A, B, and C, having 120 chicks per group, and each group was further divided into two replicates for the different strains (Cobb & Hubbard). Each replicate carried 60 chicks. Broiler chickens were fed commercial feed mixtures based on soybean-maize meal. Experimental diet and clean water were offered ad libitum. Group A was kept as the control group and fed only the normal NRC (1994) recommended diet, while group B was fed a diet containing phytase @ 80 gm/ton and group C was fed a diet containing phytase @ 100 gm/ton of feed. The trial lasted for 5 weeks, with one week of adaptation period. The chicks were raised on the experimental diets from 7 to 35 days of age. On an overall basis, serum phosphorus value remained 6.33 mg/dl, 7.41 mg/dl, and 6.83 mg/dl for groups A, B, and C, respectively. Group B, receiving phytase at 80 gram/ton of feed, exhibited the highest serum phosphorus value, followed by Group C, which received the highest dose tested in the current trial (100 gm/ton). Serum phosphorus value was lowest in the control group fed the normal commercial feed. There was a significant difference in mean phosphorus value between the two broiler strains: the Cobb strain showed a comparatively higher phosphorus value (7.16 mg/dl) compared to the Hubbard strain of broiler (6.55 mg/dl).

Key Words: Phosphorus, Phytate, Phytase, Broiler, Cobb, Hubbard

SEEDER MODEL OF SALMONELLA INFANTIS CHALLENGE AND IMPACT OF MCFAS IN BROILER PRODUCTION

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Abstract

Salmonella Infantis is a recognized antimicrobial resistance threat & in the compromised chicken gut, this pathogen penetrates weakened tight junctions, disrupts the microbiota balance, and triggers inflammation. This study evaluated the potential effects of a feed additive blend comprising short chain fatty acids including coated sodium & calcium butyrate, medium chain fatty acids, and phenolic compounds on broiler gut health & performance under a *Salmonella* challenge using a proprietary seeder model. Part A comprises of a negative control and two treatment groups, ran to develop seeder model, 1,056 dayold Ross 308 broiler chicks were allocated into three groups. On days 5–6, *Salmonella Infantis* 7570 was inducted via seeders in T2(frozen strain) & T3(live strain), while T1 remained unchallenged. In Part B, 396 male day-old Ross 308 birds were randomly assigned to two further treatments:(1)a positive control group fed a commercial diet, and(2)a treatment group fed the same diet supplemented with 2.5 kg/t of an organic acid based additive blend (Presan FY, Tilburg, The Netherlands) until day 28. On days 5 and 6, five birds per pen were orally inoculated with 10^9 CFU/mL *Salmonella Infantis* 7570 obtained via Part A and placed as seeders in both treatments. In T1, *Salmonella* positivity checked via real time polymerase chain reaction(iQ-check II Biorad) remained below 50% at respective time points, indicating that complete isolation in the same room is not feasible. No significant difference in infection development was observed between T2 and T3 ($P>0.05$). A borderline tendency for lower *Salmonella* counts was observed in the treatment group on day 19($P=0.062$). The control group had significantly higher lesion scores on day 13($P=0.0068$), with no significant difference on day 19. Body weight was significantly higher in the treatment group on days 11 and 28($P=0.0157$), with no difference on day 39 ($P=0.1857$). Average daily gain improved significantly between days 11 and 28 ($P=0.0234$), and feed intake was also significantly higher during this period($P=0.0007$). Feed conversion ratio showed a tendency to improve between days 5 and 11($P=0.0638$). Overall, this study reveals that the seeder model can be adopted in *Salmonella* research, and the application of a blend showed a borderline tendency to reduce *Salmonella* counts however significantly lower the lesion scores, thereby improving gut health in broilers under a *Salmonella* challenge.

Key Words: *Salmonella Infantis*, Seeder Model, Short chain fatty acids, Medium chain fatty acids, Gut health, Lesion scoring, Antimicrobial resistance

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