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Graded Replacement of Corn Cob Meal on Rice Bran Supplementation with and Without Cellulase for Broiler Chicken

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Abstract

This study evaluated the effects of graded levels of rice bran and corn cob meal with or without cellulase supplementation on the growth performance, carcass characteristics, meat quality, and economic efficiency of broiler chickens. Anchored on the Nutrient Utilization Theory and Enzyme Supplementation Theory, the study aimed to determine whether cellulase could improve nutrient utilization and performance in broilers fed high-fiber alternative feed ingredients. A 2 × 5 factorial experiment in a Completely Randomized Design (CRD) was employed using 150 Cobb 500 broiler chicks distributed into ten dietary treatments with three replications. The treatments consisted of different ratios of rice bran and corn cob meal with and without cellulase supplementation. Data on growth performance, carcass traits, meat quality, and economic returns were analyzed using two-way analysis of variance (ANOVA). Results revealed that dietary composition significantly affected growth performance. Broilers fed the 100% rice bran diet achieved the highest final body weight, daily gain, and feed efficiency, while increasing levels of corn cob meal negatively affected nutrient utilization and feed conversion ratio due to high fiber content. Cellulase supplementation did not significantly improve growth performance or carcass characteristics; however, it significantly enhanced meat quality traits such as tenderness, texture, juiciness, and overall acceptability. The 50:50 rice bran and corn cob meal diet with cellulase supplementation produced the best sensory quality, while the 100% rice bran diet with cellulase supplementation generated the highest profitability and return on capital. The study concluded that rice bran is a more suitable alternative feed ingredient than corn cob meal for broiler production, while cellulase functions more effectively as a meat quality enhancer than as a direct growth promoter in high-fiber diets. The study supports SDG 2 (Zero Hunger) by promoting sustainable and efficient poultry production using alternative feed resources, and SDG 12 (Responsible Consumption and Production) through the productive utilization of agricultural by-products. The findings contribute to sustainability by encouraging cost-effective feed strategies, reducing agricultural waste, and improving resource efficiency in poultry production systems.

Keywords: Agricultural By-Products, Broiler Chickens, Cellulase Supplementation, Corn Cob Meal, Feed Efficiency, Meat Quality, Nutrient Utilization, Rice Bran, Sustainable Poultry Production

1. Introduction

Poultry production plays a significant role in food security by providing an affordable source of animal protein for the growing population. Broiler production, in particular, is recognized for its efficient feed-to-meat conversion, contributing substantially to the poultry industry and the agricultural economy in the Philippines. However, the increasing cost of conventional feed ingredients such as corn and soybean meal presents a major challenge to sustainable broiler production. Feed expenses account for approximately 60–70% of total production costs (Domingo et al., 2022), encouraging the exploration of alternative and locally available feed resources such as rice bran and corn cob meal. Rice bran and corn cob meal are agricultural by-products with potential as low-cost and sustainable feed ingredients. Rice bran provides moderate crude protein and energy, while corn cob meal serves as a fibrous energy source. However, their high fiber content limits nutrient digestibility and feed efficiency in poultry due to the inability of broilers to effectively digest complex polysaccharides (Shah et al., 2025). Enzyme supplementation, particularly cellulase, has emerged as a strategy to improve fiber degradation and nutrient utilization by breaking down cellulose into simpler sugars (Juan, 2024). Although previous studies reported improvements in feed efficiency, growth performance, and carcass yield through enzyme supplementation (Attia et al., 2023), limited evidence exists regarding the combined use of rice bran and corn cob meal with cellulase under Philippine production conditions. Furthermore, the effects of these dietary combinations on meat quality attributes remain insufficiently explored. This study evaluates the effects of graded levels of rice bran and corn cob meal, with or without cellulase supplementation, on growth performance, carcass characteristics, meat quality, and economic efficiency in broiler chickens.

1.1 Background of Rice Bran and Corn Cob Meal with Cellulase Supplementation in Broiler Production

Broiler production contributes significantly to food security, rural livelihoods, and national agricultural productivity. However, increasing feed costs continue to threaten profitability and sustainability in poultry production. Conventional feed ingredients such as corn and soybean meal have become increasingly expensive due to competition with human consumption and limited supply (Domingo et al., 2022). Consequently, agricultural by-products such as rice bran and corn cob meal have gained attention as alternative feed ingredients because they are inexpensive, renewable, and locally available. Rice bran contains moderate levels of crude protein, fat, and minerals, making it a potential substitute for conventional feed ingredients (Nguyen et al., 2021). Corn cob meal, although lower in protein and energy, contains structural carbohydrates that can function as a fiber source in poultry diets (Singh et al., 2021). Despite these benefits, the high fiber content and non-starch polysaccharides (NSPs) in these ingredients reduce nutrient digestibility and energy availability in broilers because poultry lack endogenous cellulase enzymes (Shah et al., 2025). To address these limitations, enzyme supplementation has been proposed as an effective nutritional strategy. Cellulase enhances the degradation of cellulose and fibrous carbohydrates, improving nutrient release, feed efficiency, and growth performance (Juan, 2024). Previous studies demonstrated that exogenous enzymes improve metabolizable energy, feed conversion ratio, and nutrient retention in broilers fed high-fiber diets (Bamigboye, 2012; Holland et al., 2020; Chen et al., 2025). However, limited studies have investigated the combined use of rice bran and corn cob meal with cellulase supplementation under local production conditions.

1.2 Themes and Insights on Rice Bran, Corn Cob Meal, and Cellulase Supplementation in Broiler Diets

Related literature highlights the nutritional potential of rice bran and corn cob meal as alternative feed ingredients in poultry production. Rice bran contains crude protein, crude fat, crude fiber, and essential minerals that support growth and metabolism in poultry (Nguyen et al., 2021). Corn cob meal provides cellulose, hemicellulose, and lignin, which contribute functional fiber but also reduce digestibility when included at high levels (Bayaua et al., 2025). Processing methods such as drying, grinding, fermentation, and enzymatic treatment improve the nutritional value of these fibrous by-products. Stabilization and grinding of rice bran preserve nutrient quality and improve feed mixing efficiency (Rashid et al. (2022). Similarly, drying and grinding corn cobs enhance digestibility and reduce microbial spoilage (Ojeda, 2023). Fermentation and enzymatic treatment further reduce crude fiber content and improve nutrient availability (Bayaua et al., 2025; Bamigboye, 2012). The literature also emphasizes the negative effects of NSPs and fibrous carbohydrates on nutrient utilization. Cellulose, hemicellulose, and arabinoxylans encapsulate nutrients within plant cell walls and increase digesta viscosity, reducing nutrient absorption and feed efficiency in broilers (Nguyen et al., 2021; Singh et al., 2021). Because poultry lack endogenous cellulase enzymes, these carbohydrates remain largely indigestible unless supplemented with exogenous enzymes (Bedford & Schulze, 1998; Choct, 2006). Studies consistently demonstrate the benefits of exogenous enzymes in poultry diets. Enzymes such as cellulase, xylanase, and β-glucanase hydrolyze complex carbohydrates, release trapped nutrients, reduce digesta viscosity, and improve metabolizable energy (Groff et al., 2025). Cellulase supplementation specifically improves feed conversion efficiency, nutrient retention, and growth performance in broilers fed high-fiber diets (Chen et al., 2025; Bamigboye, 2012). Moreover, enzyme supplementation supports sustainable poultry production by reducing dependence on costly conventional feed ingredients and promoting the use of agricultural residues (Holland et al., 2020).

1.3 Local, National, and Global Context of Alternative Feed Ingredients in Broiler Production

Globally, the poultry industry continues to seek sustainable and cost-effective feed alternatives due to rising feed ingredient prices and increasing demand for animal protein. Agricultural by-products such as rice bran and corn cob meal are increasingly recognized as viable feed resources because of their availability, affordability, and environmental benefits. Nationally, poultry meat production contributes significantly to the Philippine agricultural economy and food supply. However, high feed costs remain a major production challenge, accounting for 60–70% of broiler production expenses (Domingo et al., 2022). The utilization of local agricultural by-products may reduce feed costs while supporting sustainable poultry production and rural livelihoods. Locally, rice bran and corn cob meal are abundant agricultural residues that are often underutilized or discarded. Their incorporation into broiler diets may reduce agricultural waste and improve feed sustainability. However, their fibrous nature limits their direct use without processing or enzyme supplementation. Consequently, evaluating their combined use with cellulase supplementation under local production conditions is necessary to determine their effects on broiler performance and meat quality.

1.4 Theoretical and Conceptual Basis of Cellulase Supplementation and Nutrient Utilization in Broilers

This study is anchored on the Nutrient Utilization Theory and the Enzyme Supplementation Theory. The Nutrient Utilization Theory explains that optimal dietary fiber levels improve nutrient digestibility, intestinal morphology, and growth performance in poultry. Efficient nutrient utilization enhances feed efficiency and supports better carcass development. The Enzyme Supplementation Theory proposed by Munawar et al., (2025) explains that exogenous enzymes such as cellulase break down non-starch polysaccharides and structural carbohydrates in fibrous feed ingredients. Cellulase hydrolyzes cellulose into simpler sugars, releasing nutrients trapped within plant cell walls and improving energy and protein availability. These theories collectively suggest that cellulase supplementation in diets containing rice bran and

corn cob meal enhances fiber degradation, nutrient absorption, feed efficiency, growth performance, carcass traits, and meat quality in broiler chickens.

1.5 Research Gaps and Rationale on the Combined Use of Rice Bran, Corn Cob Meal, and Cellulase in Broiler Diets

Although previous studies demonstrated the benefits of rice bran, corn cob meal, and enzyme supplementation individually, limited research has investigated their combined application in broiler diets. Existing studies mainly focused on independent use of rice bran or corn cob meal, while evidence regarding their combined effects with cellulase supplementation remains limited (Attia et al., 2023). Furthermore, studies examining the effects of these dietary combinations on carcass characteristics and sensory meat quality attributes such as aroma, taste, tenderness, texture, juiciness, and overall acceptability are insufficient. There is also limited evidence under Philippine production conditions regarding the optimal inclusion levels of rice bran and corn cob meal with cellulase supplementation. Therefore, this study addresses the existing research gap by evaluating the interaction between graded levels of rice bran and corn cob meal with or without cellulase supplementation on growth performance, carcass characteristics, meat quality, and economic efficiency in broilers.

1.6 Alignment of Rice Bran and Corn Cob Meal Utilization in Broiler Production with Relevant Sustainable Development Goals (SDGs)

This study aligns with several Sustainable Development Goals (SDGs). It supports SDG 2 – Zero Hunger by promoting sustainable poultry production and improving the efficiency of animal protein production through alternative feed resources. The study also aligns with SDG 8 – Decent Work and Economic Growth by helping reduce feed costs and improving the profitability of poultry farming, which may support rural livelihoods and agricultural productivity. The utilization of rice bran and corn cob meal supports SDG 12 – Responsible Consumption and Production through the recycling and productive use of agricultural by-products that might otherwise become waste. In addition, the study contributes to SDG 13 – Climate Action by promoting sustainable feed strategies that reduce agricultural waste and dependence on resource-intensive conventional feed ingredients.

1.7 Importance of Rice Bran, Corn Cob Meal, and Cellulase Supplementation Research to Multidisciplinary Sustainability

This study contributes to socio-economic sustainability by identifying cost-effective feed alternatives that may improve profitability in broiler production. Reduced feed costs can support small-scale poultry producers and strengthen rural economic stability. The study also contributes to environmental sustainability through the utilization of agricultural by-products such as rice bran and corn cob meal, reducing waste accumulation and promoting resource efficiency. Furthermore, the research supports agricultural and technological sustainability by exploring enzyme-enhanced feed formulations that improve nutrient utilization and production efficiency. From a policy and institutional perspective, the findings may support sustainable feeding programs and encourage the adoption of locally available feed resources in poultry production systems. The study additionally contributes to food security and community sustainability by promoting efficient and sustainable broiler production practices that can enhance the availability of affordable animal protein.

2. Material and methods

2.1 Research Design

The study employed a 2 × 5 factorial experiment in a Completely Randomized Design (CRD) to determine the main and interaction effects of cellulase supplementation and graded rice bran and corn cob meal levels on broiler performance, carcass traits, and meat quality. Two factors were considered: cellulase supplementation consisting of diets with and without cellulase, and five ratios of rice bran and corn cob meal consisting of 100% rice bran:0% corn cob meal, 75% rice bran:25% corn cob meal, 50% rice bran:50% corn cob meal, 25% rice bran:75% corn cob meal, and 0% rice bran:100% corn cob meal. These combinations resulted in ten dietary treatments. The experiment lasted for 45 days and was divided into booster, starter, and finisher phases. Birds were fed a common commercial booster diet from day 0 to 12, while the feeding trial using experimental diets was conducted during the starter and finisher phases. Diets were formulated to meet or exceed broiler nutrient requirements according to Aviagen (2025) and Cobb-Vantress (2022), differing only in the inclusion levels of rice bran, corn cob meal, and cellulase supplementation.

2.2 Locale of the Study

The study was conducted at the Animal Science Experimental Area of JRMSU–TC, ZNAC, Tampilisan, Zamboanga del Norte. The experimental area was secured and maintained under conditions suitable for broiler production. Thirty cages were prepared to accommodate the ten dietary treatments with three replications each. The area and equipment were cleaned and disinfected before chick placement, and all management conditions were maintained uniformly throughout the study to ensure that observed differences were due only to dietary treatments.

2.3 Respondents of the Study

The subjects of the study were one hundred fifty (150) day-old Cobb 500 commercial broiler chicks obtained from JM Poultry and Livestock Supply, Inc. – Ipil Branch. The chicks were vaccinated according to hatchery records and inspected upon arrival for health and uniformity. Chicks with deformities or signs of illness were excluded from the experiment. The broilers were housed in wire-screen cages providing adequate space and ventilation according to recommended broiler standards (Aviagen, 2025). Standard brooding, housing, sanitation, and biosecurity practices were implemented throughout the experiment. Brooding temperature was maintained at 32–33 °C during the first week and gradually reduced to 24–26 °C by day 15. Birds were provided feed and clean water ad libitum, and lighting programs were adjusted according to age to support growth and feed intake.

2.4 Sample and Sampling Procedure

The 150 broiler chicks were randomly distributed into ten dietary treatments with three replications per treatment and five birds per replicate, resulting in 30 experimental units. Prior to treatment allocation, the chicks underwent an adaptation period and were fed a booster diet until day 12. Initial body weights were recorded individually before the feeding trial commenced. Experimental diets were prepared using locally sourced feed ingredients, including rice bran and corn cob meal, with or without cellulase supplementation. Cellulase was added at the manufacturer's recommended rate of 50 g per 100 kg of feed. The enzyme was accurately weighed and thoroughly mixed into the diets to ensure uniform distribution. Feeds were manually mixed using clean equipment and stored properly to prevent contamination and moisture absorption. The birds were monitored daily for feed intake, health status, mortality, and overall performance. Mortality records and possible causes of death were documented throughout the study. At the end of the feeding trial, one bird per replicate nearest to the mean body weight was selected for slaughter and carcass evaluation to ensure representative sampling for carcass traits and meat quality assessment.

2.5 Research Instrument

The instruments used in the study were designed to measure growth performance, carcass traits, and meat quality of broiler chickens receiving diets with graded levels of rice bran and corn cob meal, with or without cellulase supplementation. Growth performance data sheets recorded body weight gain, average daily gain, feed intake, and feed conversion ratio. Carcass evaluation sheets were used to assess dressing percentage, breast yield, thigh yield, abdominal fat, drumstick yield, wing yield, back yield, neck yield, feet yield, and head yield. The sensory evaluation form for meat quality was adapted from Rivera et al., (2022) and modified to suit the study objectives. The evaluation included aroma, taste, tenderness, texture, juiciness, and overall acceptability using hedonic scales. The sensory evaluation instrument was reviewed and refined with the assistance of a local food technology expert to ensure validity and appropriateness. All measuring tools and evaluation sheets were reviewed by experts to ensure accuracy, reliability, and alignment with the objectives of the study.

2.6 Data Gathering Procedure

Upon arrival, the broiler chicks were inspected, weighed, and placed in disinfected cages under controlled brooding conditions. Feed and water were provided ad libitum throughout the experiment. Biosecurity protocols, including restricted access, footbaths, and hygiene practices, were strictly implemented. Experimental diets containing different rice bran and corn cob meal ratios, with or without cellulase supplementation, were prepared manually and distributed according to treatment assignments. Feed offered and feed refusals were recorded daily to determine feed intake and feed conversion ratio. Daily observations were conducted to monitor bird health, mortality, and environmental conditions. Growth performance parameters such as body weight gain, average daily gain, feed intake, and feed conversion ratio were measured during the feeding trial. At the end of the experiment, selected birds were slaughtered for carcass evaluation. Dressing percentage, breast yield, thigh yield, abdominal fat, drumstick yield, wing yield, back yield, neck yield, feet yield, and head yield were determined using standard calculations based on live and carcass weights. For meat quality assessment, meat samples were roasted and presented on coded plates to a tasting panel for evaluation of aroma, taste, tenderness, texture, juiciness, and overall acceptability using corresponding sensory scales.

2.7 Data Analysis Techniques

Data gathered from growth performance, carcass characteristics, and meat quality evaluation were analyzed using two-way analysis of variance (ANOVA) appropriate for a 2 × 5 factorial experiment in a Completely Randomized Design (CRD). The analysis evaluated the main and interaction effects of cellulase supplementation and graded rice bran and corn cob meal levels on broiler performance and meat quality. Growth performance parameters included body weight gain, average daily gain, feed intake, and feed conversion ratio. Carcass parameters included dressing percentage, breast yield, thigh yield, abdominal fat, drumstick yield, wing yield, back yield, neck yield, feet yield, and head yield. Meat quality evaluation included aroma, taste, tenderness, texture, juiciness, and overall acceptability.

2.8 Ethical Considerations

The study involved only broiler chickens and did not include human participants. Prior to the conduct of the experiment, the research protocol was submitted to the Research Ethics Committee of Jose Rizal Memorial State University for approval to ensure compliance with institutional and national ethical standards. Upon approval, the study proceeded under approved ethical guidelines.

3. Results and Discussion

3.1 Growth Performance of Broiler Chickens Fed Rice Bran and Corn Cob Meal Diets

3.1.1 Effects of Cellulase Supplementation on Growth Performance

The results showed that cellulase supplementation numerically improved final weight, gain weight, and daily gain of broiler chickens. Birds supplemented with cellulase achieved a higher final weight of 2370.32 g and daily gain of 63.29 g compared to birds without cellulase. However, these differences were not statistically significant ($P > 0.05$). Feed intake also remained statistically similar between treatments, while feed conversion ratio was nearly identical between groups. These findings indicate that cellulase supplementation alone was insufficient to produce a significant improvement in overall biological efficiency under the conditions of the study. This supports previous findings that enzyme supplementation does not always significantly improve broiler growth performance when nutrient limitations persist within the diet (BMC Veterinary Research, 2021). Although cellulase may enhance nutrient breakdown, its effects appear dependent on the quality and composition of the dietary fiber source.

3.1.2 Effects of Rice Bran and Corn Cob Meal Ratios on Growth Performance

The dietary ratios significantly affected final weight, gain weight, daily gain, and feed conversion ratio. Birds fed the 100% rice bran diet exhibited the highest final weight of 2516.40 g and daily gain of 67.20 g, while birds receiving the 100% corn cob meal diet recorded the lowest final weight of 2183.30 g and daily gain of 56.49 g. Feed intake remained statistically similar across treatments, averaging approximately 4100–4200 g. However, feed conversion ratio progressively worsened as corn cob meal levels increased, rising from 2.11 in the 100% rice bran diet to 2.52 in the 100% corn cob meal diet. The results suggest that increasing corn cob meal levels reduced nutrient digestibility and feed utilization efficiency due to the higher indigestible fiber content of corn cob meal. This finding agrees with studies reporting that high-fiber feed ingredients reduce nutrient utilization and negatively affect feed conversion efficiency in broilers (Sari et al., 2019). The superior performance of rice bran-based diets indicates that rice bran provided a more digestible energy and nutrient source for broiler growth.

3.1.3 Interaction Between Cellulase Supplementation and Dietary Ratios on Growth Performance

The interaction between cellulase supplementation and dietary ratios showed that the best-performing treatment was the 100% rice bran diet with cellulase supplementation, which achieved the highest final weight of 2600.80 g and daily gain of 70.46 g. In contrast, the lowest growth performance was observed in the 100% corn cob meal diet with cellulase supplementation, which recorded a final weight of 2143.80 g. Feed conversion ratio was lowest in treatments with higher rice bran inclusion and progressively increased as corn cob meal levels increased. These results demonstrate that dietary ratio remained the dominant factor affecting growth performance. Although cellulase provided numerical improvements, it did not fully compensate for the low nutritional value and high fiber content of corn cob meal. This observation supports Ravindran (2018), who reported that increased feed intake without corresponding improvements in nutrient digestibility negatively affects feed conversion efficiency in high-fiber diets. The findings further confirm that rice bran-based diets maximize broiler growth and feed efficiency, while excessive corn cob meal inclusion decreases production performance regardless of enzyme supplementation.

3.2 Carcass Characteristics of Broiler Chickens

3.2.1 Effects of Cellulase Supplementation on Carcass Traits

The results showed that cellulase supplementation did not significantly affect dressing percentage, breast yield, thigh yield, drumstick yield, wing yield, back yield, neck yield, head yield, or abdominal fat content ($P > 0.05$). Dressing percentage remained statistically similar between birds without cellulase (75.12%) and those supplemented with cellulase (75.57%). Breast and thigh yields also showed minimal variation between treatments. These findings indicate that cellulase supplementation did not alter carcass composition or the distribution of major commercial cuts. The results agree with Hosseini et al., (2020), who reported that enzyme supplementation and dietary modifications often have limited effects on carcass yield under standard production conditions. Although cellulase improved some growth parameters numerically, carcass structure remained stable across treatments.

3.2.2 Effects of Rice Bran and Corn Cob Meal Ratios on Carcass Traits

Different rice bran and corn cob meal ratios did not significantly affect dressing percentage or carcass cut yields. Birds fed the 100% rice bran diet had a dressing percentage of 76.05%, while birds fed the 100% corn cob meal diet had a slightly lower value of 73.87%, although the difference was not statistically significant. Breast, thigh, wing, drumstick, and back

yields remained relatively consistent across all dietary treatments. The results suggest that carcass characteristics are relatively resistant to dietary fiber variation. Despite reductions in growth performance at higher corn cob meal levels, carcass composition remained largely unaffected. This indicates that broilers maintained standard carcass conformation regardless of dietary treatment, allowing producers to use alternative feed ingredients without significantly affecting carcass yield.

3.2.3 Interaction Between Cellulase Supplementation and Dietary Ratios on Carcass Traits

The interaction analysis revealed that most carcass traits remained statistically unaffected by the combined effects of cellulase supplementation and dietary ratios. Dressing percentage ranged from 73.05% to 76.97%, while breast, thigh, drumstick, wing, and back yields showed no significant differences across treatments. Only neck yield showed a significant difference ($P = 0.0133$), with the 50:50 rice bran and corn cob meal diet without cellulase recording the lowest value. These findings support previous reports that carcass yield is generally less sensitive to dietary fiber variation and enzyme supplementation compared to growth performance parameters (Olukosi et al., 2016). The lack of significant changes in major carcass traits suggests that broiler carcass composition remains stable despite changes in dietary fiber sources and cellulase supplementation.

3.3 Meat Quality of Broiler Chickens

3.3.1 Effects of Cellulase Supplementation on Descriptive Meat Quality

Cellulase supplementation significantly improved tenderness, texture, and juiciness of broiler meat. Birds supplemented with cellulase obtained higher tenderness, texture, and juiciness scores compared to birds without cellulase. However, aroma and taste were not significantly affected. These results indicate that cellulase supplementation improved the physical qualities of meat, possibly through enhanced nutrient utilization and better muscle development. The findings support Yaqoob et al., (2022), who reported that enzyme supplementation improves meat quality traits associated with tenderness and moisture retention in poultry.

3.3.2 Effects of Rice Bran and Corn Cob Meal Ratios on Descriptive Meat Quality

The dietary ratios significantly affected tenderness and juiciness. The 50:50 rice bran and corn cob meal diet achieved the highest tenderness and juiciness scores, while diets containing 75% corn cob meal recorded significantly lower scores. Aroma and taste remained statistically similar across treatments. The findings suggest that moderate inclusion of corn cob meal can maintain acceptable meat quality, but excessive inclusion negatively affects tenderness and juiciness. High fiber levels likely influenced muscle moisture retention and meat texture, reducing consumer desirability at higher corn cob meal levels.

3.3.3 Interaction Between Cellulase Supplementation and Dietary Ratios on Descriptive Meat Quality

The interaction between cellulase supplementation and dietary ratios significantly affected juiciness ($P = 0.004818$), while aroma, taste, tenderness, and texture showed no significant interaction effects. The highest juiciness scores were observed in the 50:50 rice bran and corn cob meal diet with cellulase supplementation and the 100% rice bran diet with cellulase. The lowest juiciness score occurred in the 25:75 rice bran and corn cob meal diet without cellulase. These results indicate that cellulase supplementation improved the moisture-related characteristics of meat, particularly in diets with moderate fiber inclusion. The findings further suggest that cellulase acted as a stabilizing factor by reducing the negative effects of high-fiber diets on meat tenderness and juiciness.

3.4 Acceptability of Broiler Meat

3.4.1 Effects of Cellulase Supplementation on Meat Acceptability

Cellulase supplementation significantly improved aroma, taste, tenderness, texture, juiciness, and overall acceptability of broiler meat. Birds receiving cellulase consistently obtained higher sensory scores than birds without cellulase, with tenderness and juiciness showing the highest statistical significance. These findings demonstrate that cellulase improved the overall eating quality of broiler meat. This supports Perim et al., (2024), who reported that exogenous enzymes improve nutrient digestibility and positively influence meat quality traits, particularly texture-related characteristics.

3.4.2 Effects of Rice Bran and Corn Cob Meal Ratios on Meat Acceptability

The dietary ratios significantly affected taste and general acceptability. The 50:50 rice bran and corn cob meal diet achieved the highest taste and overall acceptability scores, while the 25:75 rice bran and corn cob meal diet received the lowest ratings. The results suggest that a balanced combination of rice bran and corn cob meal produced more desirable sensory qualities. Excessive corn cob meal inclusion negatively affected consumer preference, likely due to reduced tenderness and juiciness associated with high-fiber diets.

3.4.3 Interaction Between Cellulase Supplementation and Dietary Ratios on Meat Acceptability

The interaction analysis showed significant effects on tenderness and texture acceptability. The 50:50 rice bran and corn cob meal diet with cellulase supplementation consistently obtained the highest scores for taste, tenderness, texture, and

general acceptability. In contrast, the 25:75 rice bran and corn cob meal diet without cellulase received the lowest acceptability scores. These findings indicate that cellulase supplementation improved the acceptability of high-fiber diets by enhancing tenderness and texture. The results suggest that cellulase allowed the use of alternative fiber sources without substantially compromising consumer perception of meat quality.

3.5 Return Analysis

The return analysis showed that the 100% rice bran diet with cellulase supplementation produced the highest dressed weight, sales, net income, and return on capital. This treatment generated the highest net income and achieved a return on capital of 66.08%. In contrast, the 100% corn cob meal diet with cellulase supplementation recorded the lowest profitability and the lowest return on capital. These findings demonstrate that cellulase supplementation improved economic returns, particularly when combined with nutritionally superior feed ingredients such as rice bran. Although corn cob meal may reduce feed costs, excessive inclusion negatively affected feed efficiency and growth performance, ultimately lowering profitability. The results confirm that the combination of rice bran and cellulase supplementation provides the most biologically and economically efficient feeding strategy for broiler production.

4. Conclusion & Recommendations

The study concluded that dietary composition was the primary factor influencing broiler growth performance, with rice bran proving superior to corn cob meal in supporting higher final body weight, average daily gain, and feed efficiency. Increasing corn cob meal levels reduced nutrient utilization and worsened feed conversion ratio due to its high fiber content. Although cellulase supplementation did not significantly improve growth performance, it enhanced meat quality by improving tenderness, juiciness, and overall acceptability. Carcass traits remained generally unaffected by both dietary ratios and cellulase supplementation, indicating stability in carcass yield despite dietary modifications. Economically, the most profitable treatment was the 100% rice bran diet with cellulase supplementation, while the 50:50 rice bran and corn cob meal ratio with cellulase produced the best sensory quality. Overall, cellulase functioned more effectively as a meat quality enhancer than as a direct growth promoter in high-fiber broiler diets.

It is recommended that poultry producers use a diet containing 10% rice bran with cellulase supplementation to maximize growth performance, feed efficiency, and economic return. For improved meat quality and consumer acceptability, a 50:50 rice bran and corn cob meal ratio with cellulase supplementation may be utilized. High levels of corn cob meal should be avoided due to their negative effects on growth performance and feed conversion efficiency. Cellulase supplementation may also be incorporated in fibrous diets to improve nutrient utilization and sensory characteristics of broiler meat. Future studies may further evaluate different enzyme combinations, optimal inclusion levels of corn cob meal, and the long-term effects of high-fiber diets on broiler meat composition and productivity.

The study was limited to the use of rice bran and corn cob meal as alternative fiber sources with a single cellulase enzyme supplementation level under a specific broiler production condition. The experiment was conducted within a limited feeding period and focused only on Cobb 500 broiler chickens, which may restrict the generalization of the findings to other poultry breeds, enzyme systems, environmental conditions, or longer production cycles. Additionally, the study evaluated only selected growth performance, carcass traits, sensory characteristics, and economic parameters.

Compliance with ethical standards

This study evaluated the effects of graded levels of rice bran and corn cob meal, with or without cellulase supplementation, on the growth performance, carcass characteristics, meat quality, and economic efficiency of broiler chickens under controlled experimental conditions. Standard brooding, housing, sanitation, and biosecurity practices were implemented throughout the study to ensure animal welfare, proper management, and reliable data collection.

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