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Effect Of Fermented Corn Cob Meal With Effective Microorganisms (Em4) In The Diet On Carcass Weight Of Native Chickens

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ABSTRACT

BACKGROUND AND OBJECTIVES

Local chicken production has significant economic potential; however, its development is constrained by low productivity and inadequate feed quality. Native chicken farming plays an important role in supporting the livelihoods of small-scale farmers, yet productivity remains limited due to dependence on conventional feed ingredients such as rice bran, whose availability and quality are often inconsistent. The utilization of agricultural by-products as alternative feed ingredients represents an innovative approach to improving efficiency and sustainability in native chicken production systems. Corncob is an abundant agricultural residue, but its utilization is limited by high crude fiber content and low nutrient digestibility. Fermentation using Effective Microorganisms (EM4) has the potential to enhance the nutritional quality of corncobs, making them more suitable for use as a feed ingredient. This study aimed to evaluate the use of EM4-fermented corncob meal as a substitute for rice bran in native chicken diets and to assess its effects on feed intake, slaughter weight, carcass weight, and carcass percentage. The findings of this study are expected to contribute scientific insights into the development of sustainable, agricultural waste-based alternative feeds that are practical and applicable for small-scale native chicken farming systems.

METHODS

The study was conducted at the Livestock Production and Forage Laboratory, Faculty of Animal Science, University of Jambi, for a period of eight weeks using 200 day-old native chickens. The experiment employed a Completely Randomized Design (CRD) with five dietary treatments and four replications. The treatments consisted of different inclusion levels of fermented corncob meal (FCM) in the diet, namely P0 = 0%, P1 = 4%, P2 = 8%, P3 = 12%, and P4 = 16%. The observed parameters included feed intake, slaughter weight, absolute carcass weight, and relative carcass weight. Data were analyzed using analysis of variance (ANOVA), and when a significant effect was detected ($P < 0.05$), Duncan's Multiple Range Test was applied for mean comparison.

FINDINGS

The results of this study indicate that corncob meal fermented using EM4 can be utilized as a substitute for rice bran in native chicken diets. The inclusion of this feed ingredient allows normal feed intake to be maintained and is able to sustain slaughter weight and carcass weight of native chickens.

CONCLUSION
It can be concluded that fermented corncob meal can be included at levels up to 16% in native chicken diets without adversely affecting production performance.

Keywords: Carcas Weight; Corn Cob; EM4; Fermented; Native Chicken;

INTRODUCTION

Native chicken farming represents a promising business opportunity due to the continuously increasing market demand for its meat. Native chickens are one of the most potential indigenous poultry types in Indonesia (1). However, according to (2), native chicken production is characterized by a relatively long rearing period and low productivity. To achieve optimal growth, native chickens require nutritionally balanced diets containing adequate levels of protein, energy, fiber, minerals, and vitamins (3). Feed quality is strongly influenced by the feed ingredients used in diet formulation (4), with rice bran being one of the most commonly used ingredients.

Rice bran is widely utilized in poultry diets as an energy source and contains 82–90% dry matter, 13.43–14.75% crude protein, 8.72–21.16% crude fiber, and metabolizable energy ranging from 1,514 to 2,612 kcal/kg (5). Nevertheless, rice bran has several limitations, particularly its inconsistent nutritional quality due to variations in milling equipment, rice varieties, and non-standardized production processes, especially at small-scale milling units and rural areas such as Jambi City. In addition, rice bran contains relatively high levels of crude fiber and anti-nutritional factors, which can reduce nutrient digestibility in poultry, leading to low feed utilization efficiency and increased nutrient excretion through feces, potentially contributing to environmental pollution (4). These conditions may negatively affect poultry performance due to suboptimal nutrient intake (6). As an alternative, corncob has potential to be used as a substitute feed ingredient for rice bran, particularly for small-scale farmers. Corncob is an abundant agricultural by-product generated after kernel removal, yet its utilization remains limited, and it is often burned or used as household fuel, contributing to environmental pollution (7). Compared to rice bran, which competes with human food and the food industry, corncob offers advantages in terms of availability, lower cost, and lack of competition with human food needs, making it more suitable for smallholder farming systems. Chemically, corncob consists mainly of cellulose (41%), hemicellulose (36%), and lignin (16%) (8), with a nutrient composition of approximately 90% dry matter, 2.8% crude protein, 0.7% crude fat, 1.5% ash, and 32.7% crude fiber (9).

Despite its higher crude fiber content compared to rice bran, corncob has considerable potential for nutritional improvement through processing, particularly fermentation. Fermentation can reduce crude fiber fractions and enhance nutrient digestibility, enabling corncob to be utilized as an alternative energy source in poultry diets. The use of fermented corncob not only has the potential to reduce feed costs but also improves the efficiency of agricultural waste utilization, which is highly relevant for small-scale farmers with limited access to commercial feed ingredients. However, the use of corncob as a poultry feed ingredient remains suboptimal and requires further investigation, particularly regarding safe and effective inclusion levels in poultry diets (10). Fermentation using Effective Microorganisms 4 (EM4) is a relatively simple, affordable,

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and easily applicable processing method, making it suitable for small-scale farmers. EM4 contains a consortium of microorganisms capable of producing cellulolytic enzymes that hydrolyze cellulose in corncobs, resulting in fiber softening and increased nutrient availability (11). During fermentation, complex organic compounds are converted into simpler forms that are more digestible by poultry, thereby improving the nutritional quality of the feed ingredient (12).

In practice, corncob fermentation can be conducted using simple equipment commonly available to farmers, such as closed plastic containers, water, and EM4, without requiring advanced technology or high costs. Dried corncobs are ground into meal, mixed with an EM4 solution, and fermented for several days until a softer material suitable for incorporation into native chicken diets is obtained. This approach provides practical education for farmers, demonstrating that locally available agricultural waste can be processed into valuable alternative feed ingredients, helping to reduce feed costs and enhance the sustainability of smallholder poultry production. Therefore, EM4-fermented corncob represents a relevant and applicable feed processing solution for small-scale native chicken farmers.

Carcass yield has high economic value in native chicken production and is a primary target in poultry management systems. According to (13), carcass weight is determined by weighing all carcass components and is directly influenced by slaughter weight or final body weight, which reflects the output of farming or agricultural production subsystems (14). In native chickens, carcass weight refers to the edible portion after slaughter and dressing, including the removal of the head, neck, feet, feathers, blood, and internal organs. The carcass consists of major meat cuts such as the breast, thighs, and wings (15). Native chickens at 11 weeks of age have been reported to exhibit a relative carcass yield of approximately 68.40% (16).

Previous studies on the utilization of agricultural waste-based feed ingredients in native chickens have generally focused on conventional feed ingredients or other fiber sources, while studies examining the use of EM4-fermented corncob meal as a substitute for rice bran in native chicken diets remain limited, particularly those evaluating its effects on slaughter weight and carcass characteristics. Therefore, this study focuses on the utilization of EM4-fermented corncob as a locally available, waste-based alternative feed ingredient suitable for smallholder farming systems, while evaluating its effects on slaughter weight, carcass weight, and relative carcass yield in native chickens. This study aimed to determine the effects of various inclusion levels of EM4-fermented corncob meal in the diet on slaughter weight, carcass weight, and relative carcass yield of native chickens, as a basis for developing efficient, low-cost, and sustainable alternative feeds for small-scale poultry farmers.

RESEARCH METHOD

This study was conducted at the Livestock Production and Forage Laboratory, Faculty of Animal Science, University of Jambi. The experiment lasted for eight weeks, from August to October 2025. The chickens used in this study were ULU native chickens (*Unggas Lestari Unggul*). A total of 200 one-day-old chicks (DOC) were used as experimental animals and reared throughout the experimental period.

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The chickens were housed in individual cages and allocated into five dietary treatments with four replications, resulting in 20 experimental units, with each unit consisting of 10 birds. Data on the nutritional composition of each feed ingredient were prepared using uniform basal materials and treatment formulations. The nutritional requirements of native chickens used as the reference in this study are presented in Table 1, which summarizes the nutrient requirements of native chickens.

Table 1. Nutrient Requirements of Native Chickens

NO	Age (weeks)	Crude Protein (min) (%)	Crude Fat (min) (%)	Crude Fiber (max) (%)	Ash (max) (%)	Metabolizable Energy (min) (kcal/kg)
1.	0-4	19	3	7	8	2,900
2.	4-20	14	3	8	8	2,500

Source: (BSN, 2013)

The nutrient composition of the experimental diets is presented in Table 2.

Table 2. Nutrient Composition of the Experimental Diets

No.	Feed Ingredients	DM (%)	Ash (%)	CP (%)	CF (%)	Fat (%)	NFE (%)	GE (g/kal)
1.	Corn	87.83	1.44	15.77	5.31	2.59	62.72	4,858
2.	Coconut Meal	92.69	4.54	16.67	7.62	7.80	56.06	5,482
3.	Rucah Fish							
	Meal	91.36	28.28	56.15	3.00	3.40	0.53	3,722
4.	Soybean Meal	87.45	7.62	49.08	0.31	2.22	28.22	5,001
5.	Rice Bran							
6.	Fermented Corn	90.89	16.20	12.27	17.91	0.70	43.81	4,318
	Cobs	91.97	4.70	19.29	12.46	3.69	51.83	5,095
7.	Vegetable Oil	-	-	-	-	-	-	8,600

Source: Laboratory analysis conducted at the Faculty of Animal Science, University of Jambi, 2025.

The composition of feed ingredients for the experimental diets is presented in Table 3.

Table 3. Composition of Feed Ingredients in the Experimental Diets (%)

No.	Feed Ingredients	P0	P1	P2	P3	P4
1.	Corn	43	43	43	43	43
2.	Coconut meal	12	12	12	12	12
3.	Rucah Fish Meal	12	12	12	12	12
4.	Soybean meal	12.5	12.5	12.5	12.5	12.5

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5.	Rice Bran	16	12	8	4	0
6.	Fermented Corn Cobs	0	4	8	12	16
7.	Vegetable oil	2	2	2	2	2
8.	Lysin	0.5	0.5	0.5	0.5	0.5
9.	Methionin	0.5	0.5	0.5	0.5	0.5
10.	Premix Herbal Growth	1	1	1	1	1
11.	$CaCO_3$	0.5	0.5	0.5	0.5	0.5
	Total	**100**	**100**	**100**	**100**	**100**

Source: The herbal premix was produced by PT Cipta Ternak Sehat Indonesia, Kediri, Indonesia, and contained amino acids, multivitamins, Languatis rhizoma, Curcuma rhizoma, Andrographidis herba, Alstoniae cortex, Zingiberis rhizoma, and garlic. P0 = diet containing 0% fermented corncob meal (FCM); P1 = diet containing 4% FCM; P2 = diet containing 8% FCM; P3 = diet containing 12% FCM; P4 = diet containing 16% FCM.

The nutrient composition of the treatment diets is presented in Table 4.

Table 4. Nutrient Composition of the Treatment Diets

No.	Nutrients	P0	P1	P2	P3	P4
1.	DM (%)	85.33	85.37	85.41	85.46	85.50
2.	Ash (%)	8.10	7.64	7.18	6.72	6.26
3.	CP (%)	23.62	23.90	24.18	24.46	24.74
4.	CF (%)	6.46	6.24	6.02	5.81	5.59
5.	Fat (%)	2.85	2.97	3.08	3.20	3.32
6.	NFE (%)	44.30	44.62	44.94	45.26	45.58
7.	GE (Kal/g)	4,681.43	4,712.51	4,743.59	4,774.67	4,805.75
8.	ME	3,394.03	3,416.57	3,439.10	3,461.63	3,484.17

Source: Calculated based on the multiplication of data presented in Tables 2 and 3.

The study employed a Completely Randomized Design (CRD) consisting of five dietary treatments with four replications, where each replication consisted of 10 chickens. The levels of fermented corncob meal (FCM) inclusion in the diets were arranged as follows:
P0: diet containing 16% rice bran and 0% FCM;
P1: diet containing 12% rice bran and 4% FCM;
P2: diet containing 8% rice bran and 8% FCM;
P3: diet containing 4% rice bran and 12% FCM;
P4: diet containing 0% rice bran and 16% FCM.

The observed parameters included feed intake, slaughter weight, absolute carcass weight, and relative carcass weight. Feed intake (g/bird) was measured weekly by calculating the difference between the total feed offered at the beginning of the week and the remaining feed at the end of the week, divided by the number of birds to obtain average weekly feed intake. Slaughter weight was defined as the actual body weight of the chickens after an 8-hour fasting

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period prior to slaughter to ensure that the digestive tract was empty and body weight was not influenced by gut contents.

Absolute carcass weight was determined as the body weight after slaughter excluding blood, feathers, head, shanks, and internal organs, except for the kidneys and lungs, which remain attached to the vertebral column. Absolute carcass weight was expressed in grams per bird. Relative carcass weight was calculated as the ratio of absolute carcass weight to slaughter weight and expressed as a percentage.

Data were analyzed using analysis of variance (ANOVA) based on the Completely Randomized Design. When a significant treatment effect was detected ($P < 0.05$), Duncan's Multiple Range Test was applied to determine differences among treatments.

RESULTS AND DISCUSSION

Feed Intake

The average feed intake of native chickens fed diets containing EM4-fermented corncob meal as a substitute for rice bran is presented in Table 5.

Table 5. Average Feed Intake (g/bird/week, ± SD)

No.	Treatment	Feed Intake
1.	P0	322.37 ± 3.63
2.	P1	311.06 ± 28.47
3.	P2	325.38 ± 28.18
4.	P3	327.25 ± 20.07
5.	P4	321.62 ± 28.79

Note: P0 = diet containing 16% rice bran and 0% fermented corncob meal (FCM); P1 = diet containing 12% rice bran and 4% FCM; P2 = diet containing 8% rice bran and 8% FCM; P3 = diet containing 12% rice bran and 12% FCM; P4 = diet containing 0% rice bran and 16% FCM.

Based on the analysis of variance, the inclusion of EM4-fermented corncob meal as a substitute for rice bran in the diet did not significantly affect feed intake of native chickens ($P > 0.05$). The average feed intake ranged from 311.06 to 327.25 g/bird/week. The absence of significant differences in feed intake among treatments was presumably due to the diets being formulated with relatively similar crude protein and metabolizable energy contents (iso-protein and iso-energy), allowing the nutritional requirements of native chickens to be met in a balanced manner. In addition, the similar physical form of the diets across treatments resulted in relatively uniform palatability. According to (17), the physical form of feed strongly influences feed intake, where mash diets are easily consumed although they may be less preferred due to their dusty nature.

The feed intake observed in this study was higher than that reported by (18), who found that feed intake of native chickens fed diets substituted with fermented rice bran ranged from 297.41 to 310.16 g/bird/week. This difference may be attributed to variations in fermentation materials, diet composition, and environmental rearing conditions. The present findings are consistent with

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a study conducted in Nigeria (19), which reported that the inclusion of fermented corncob meal in broiler diets did not significantly reduce feed intake when the diets were formulated to be iso-energy and iso-protein. This similarity indicates that corncob fermentation is capable of maintaining diet palatability. Feed intake is influenced by both environmental and dietary factors, including palatability, aroma, color, crude fiber, and crude fat content of the feed.

Slaughter Weight

The average slaughter weight of native chickens fed diets containing EM4-fermented corncob meal as a substitute for rice bran is presented in Table 6.

Table 6. Average Slaughter Weight (g/bird, ± SD)

No.	Treatment	Cut weight (g/bird)
1.	P0	858.1 ± 59.6
2.	P1	812.5 ± 127.1
3.	P2	905.9 ± 122.6
4.	P3	863.8 ± 44.6
5.	P4	864.4 ± 372.0

Note: P0 = diet containing 16% rice bran and 0% fermented corncob meal (FCM); P1 = diet containing 12% rice bran and 4% FCM; P2 = diet containing 8% rice bran and 8% FCM; P3 = diet containing 12% rice bran and 12% FCM; P4 = diet containing 0% rice bran and 16% FCM.

The analysis of variance indicated that the inclusion of EM4-fermented corncob meal in the diet did not significantly affect the slaughter weight of native chickens ($P > 0.05$), with average slaughter weights ranging from 812.5 to 905.9 g/bird. The absence of significant differences among treatments was presumably due to the relatively similar crude protein and metabolizable energy contents of the diets, which allowed normal growth of the chickens. Fermentation of corncob using EM4 is known to improve feed digestibility through the hydrolysis of cellulose and hemicellulose, as reported by (11) and (20).

The slaughter weights obtained in this study were lower than those reported by (21), who found slaughter weights of native chickens fed diets supplemented with coconut meal ranging from 970.50 to 1,033.75 g/bird. This difference may be attributed to variations in dietary energy and fat sources, as coconut meal contains higher energy content compared to corncob meal. At the international level, (22) reported that the inclusion of high-fiber ingredients such as corncob meal in broiler diets tends to reduce slaughter weight when used at high levels, even after fermentation. The discrepancy between these findings and the present study may be explained by differences in chicken type, as native chickens generally exhibit better adaptability to high-fiber diets than broiler chickens. Nevertheless, excessive inclusion levels of fermented corncob meal may reduce dietary energy density and palatability, thereby potentially decreasing final body weight.

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Absolute and Relative Carcass Weight

The average absolute and relative carcass weights of native chickens fed diets containing EM4-fermented corncob meal as a substitute for rice bran are presented in Table 7.

Table 7. Average Absolute and Relative Carcass Weights

No.	Treatment	Absolute Carcass Weight (g/bird)	Relative Carcass Weight (g/bird)
1.	P0	545.3 ± 35.3	63.6 ± 0.6
2.	P1	517.0 ± 114.6	63.3 ± 4.3
3.	P2	555.0 ± 82.6	62.6 ± 1.1
4.	P3	541.3 ± 42.0	62.6 ± 1.7
5.	P4	543.8 ± 84.6	62.7 ± 2.6

Note: *P0 = diet containing 16% rice bran and 0% fermented corncob meal (FCM); P1 = diet containing 12% rice bran and 4% FCM; P2 = diet containing 8% rice bran and 8% FCM; P3 = diet containing 12% rice bran and 12% FCM; P4 = diet containing 0% rice bran and 16% FCM.*

The inclusion of EM4-fermented corncob meal as a substitute for rice bran did not significantly affect the absolute or relative carcass weight of native chickens ($P > 0.05$). The average absolute carcass weight ranged from 517.0 to 555.0 g/bird, while relative carcass weight ranged from 62.6 to 63.6%. The absence of significant differences among treatments was attributed to the uniformity of feed intake and slaughter weight across treatments. According to (23), carcass weight is strongly influenced by slaughter weight; therefore, similar slaughter weights tend to result in comparable absolute and relative carcass yields.

The absolute carcass weights obtained in this study were higher than those reported by (24), who observed an average carcass weight of 468.75 g/bird in native chickens, and by (25), who reported carcass weights ranging from 452.28 to 486.28 g/bird in super native chickens fed diets with different protein and enzyme levels. According to (26), carcass weight is closely related to slaughter weight as a consequence of live body weight gain. These findings are consistent with a study conducted in China (27), which reported that the use of fermented feeds was able to maintain poultry carcass percentage through improved nutrient digestibility and enhanced energy metabolism efficiency. However, the magnitude of carcass response is highly dependent on the type of fermentative microorganisms and the substrate used. Carcass weight was determined after removal of feathers, head, shanks, and internal organs (including the digestive tract, heart, spleen, liver, and intestines), after which the cleaned carcass components—such as breast, thighs, drumsticks, wings, back, and neck—were weighed using a digital scale (28).

The carcass percentage obtained in this study was lower than that reported by (16), who found a carcass percentage of approximately 68.40% in 11-week-old native chickens, but higher than that reported by (29), who observed an average carcass percentage of 55.87% at 8 weeks of age. The relatively uniform relative carcass weights indicate that the proportions of body parts,

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such as breast, thighs, and wings, were not affected by variations in the inclusion level of fermented corncob meal. According to (30), the main factors influencing relative carcass weight are age, sex, and physiological condition of the chickens. Since all treatments involved chickens of the same age, differences in dietary treatments did not result in significant effects on carcass proportion. Furthermore, (31) stated that carcass percentage is closely related to growth rate, where increases in body weight influence slaughter weight and, consequently, carcass yield. Variations in carcass percentage will subsequently affect the proportion of individual carcass components (32).

CONCLUSION

Based on the results of this study, the use of EM4-fermented corncob meal as a partial substitute for rice bran in native chicken diets did not have a significant effect on feed intake, slaughter weight, absolute carcass weight, or relative carcass yield. The relatively uniform feed intake among treatments indicates that diets formulated to be iso-protein and iso-energy were able to maintain the production performance of native chickens despite the substitution of feed ingredients. These findings directly address the research objectives and questions, demonstrating that EM4-fermented corncob meal can be utilized as an alternative feed ingredient to replace rice bran without compromising final body weight and carcass performance of native chickens. The results also suggest that the fermentation process improves the nutritional quality of corncobs, allowing more efficient utilization by native chickens. From a practical perspective, this study has important implications for small-scale native chicken farmers, as the use of EM4-fermented corncob meal represents a cost-effective and easily applicable alternative feed based on locally available agricultural waste. Future studies are recommended to evaluate more specific inclusion levels, their effects on meat quality, and the economic efficiency of using fermented corncob meal in native chicken production systems. This study has certain limitations, as the observed parameters were limited to production performance and carcass characteristics, and the experiment was conducted under relatively homogeneous rearing conditions. Therefore, further studies under more diverse field conditions are needed to strengthen the applicability of these findings.

RECOMMENDATIONS

Based on the results of this study, fermented corncob meal using Effective Microorganisms 4 (EM4) can be recommended as a feasible and practical alternative feed ingredient for small-scale native chicken farmers, particularly as a partial replacement for rice bran, as its inclusion did not adversely affect feed intake or carcass performance. The fermentation process of corncob meal using EM4 can be carried out with simple equipment that is easily applicable at the household farm level, thereby offering an opportunity to reduce feed costs while efficiently utilizing locally available agricultural by-products in a sustainable manner. For future development, further studies are recommended to determine the maximum inclusion level of fermented corncob meal beyond 16% that remains safe and optimal for the performance of native chickens. In addition, it is suggested that future research explore the combination of EM4 fermentation with local energy and protein sources, such as rice bran, ground corn, or plant-based protein meals, to maintain nutritional balance in the diet and enhance the practical applicability and sustainability of this feeding strategy for small-scale poultry production systems.

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