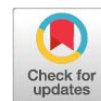


## Research Article



# Growth Performance of Java Super Chickens Fed Fermented Rice Bran during the Starter Phase

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**Abstract** | Rice bran is an agricultural byproduct commonly used up to 10% in chicken feed. However, its high crude fiber content (about 24.43%) and phytic acid content (about 6.63%) limit its use in animal feed. A reduction in crude fiber and phytic acid content in rice bran has been reported in our previous research when combined with 10% palmyra sap and fermented for six days. This research was conducted to determine the effect of feeding fermented rice bran on the growth performance of Java Super chickens. The study employed a completely randomized design with four treatments and six replications. The treatments were as follows: T0, which was feed without fermented rice bran; T1, which was feed with 10% fermented rice bran; T2, which was feed with 20% fermented rice bran; and T3, which was feed with 30% fermented rice bran. Each replication used seven chickens, and the chickens were reared for 28 days. The data obtained indicated that the utilization of fermented rice bran with palmyra sap significantly increased ( $p < 0.05$ ) feed intake and body weight gain while maintaining a favorable feed conversion ratio. It was concluded that fermented rice bran can be used up to 20% in the feed for Java Super chickens during the starter phase.

**Keywords** | Body weight gain, Java super chicken, Feed consumption, Feed conversion, Fermented rice bran

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## INTRODUCTION

Rice bran is one of the byproducts of agricultural processing and is commonly used as feed material, with utilization of up to 10% in chicken feed (Ahmad *et al.*, 2019). It is continuously available at a relatively low cost. The limited use of rice bran is due to its high content of crude fiber 14-26% (Ikhwanuddin *et al.*, 2018) and phytic acid 6.9% (Novita *et al.*, 2017). The high crude fiber content leads to a reduction in nutrient digestibility, while

phytic acid binds minerals such as phosphorus and calcium, as well as proteins, thereby lowering protein digestibility (Wibawa *et al.*, 2015). The reduction of crude fiber and phytic acid can be achieved through the fermentation process (Azrinnahar *et al.*, 2021; Lamid *et al.*, 2014).

The fermentation process requires a carbon source as energy for microorganisms, and one such source is palmyra sap. Palmyra sap contains fructose at 4.0% (Naiola, 2008), sucrose ranging from 36-78.86%, and glucose at 1.66-

3.50% (Vengadaramana *et al.*, 2016; Vengaiah *et al.*, 2017). Palmyra sap is a liquid tapped from the male flowers of the toddy palm tree, containing sugars in the range of 10-15% (Irmayuni *et al.*, 2018). Additionally, it has crude protein at 0.52%, and its metabolizable energy reaches 3557 kcal/kg (Jehemat *et al.*, 2010). Palmyra sap contains 10.00-16.50% sucrose, and if left untreated, it undergoes fermentation by microorganisms such as *Saccharomyces cerevisiae* and lactic acid producing bacteria (Savji *et al.*, 2011). Lactic acid bacteria, such as *Lactobacillus plantarum*, *Lactobacillus fermentum*, and *Lactobacillus brevis* are present in palmyra sap (Sornsenee *et al.*, 2021). The high sugar content makes palmyra sap a readily soluble carbohydrate, serving as a carbon source in the fermentation process.

The anaerobic fermentation process using additives produces higher nutrient content compared to without readily soluble carbohydrates (Utomo *et al.*, 2016). The use of palmyra sap as an additive has been proven to increase protein content from 3.70% to 6.72% and decrease crude fiber from 18.70% to 11.55% in banana peel fermented with 20% palmyra sap for 6 days (Koni *et al.*, 2022). Fermentation with 15% palmyra sap has been shown to enhance the nutrient content of goat and chicken manure and can be utilized up to 22.50% in the feed for local chickens (Helda and Sabuna, 2012). Previous research findings (Koni *et al.*, 2023) indicate that fermenting bran with 10% palmyra sap for six days can reduce crude fiber and phytic acid in rice bran. It is expected that the reduction in crude fiber and phytic acid will enhance the utilization of rice bran in the feed for Java super chickens.

The objective of this research is to examine the use of fermented rice bran as a feed ingredient on feed intake, body weight gain, and feed conversion ratio in Java Super chickens during the starter phase.

## MATERIALS AND METHODS

### BIRDS AND STUDY LOCATION

In this study, 168 day-old unsexed (male and female) Java Super chickens were used. Java Super (Joper) is a cross-bred chicken resulting from the mating of male Kampung chickens with female laying hens (Lohmann Brown) (Rusli *et al.*, 2019). The average initial body weight of the one-day-old Joper chickens used in this study was 40.54 g.

Nutrient requirements for the ration are based on the needs of native chickens as outlined in the Indonesian National Standard for Native Chickens (SNI 7783.2:2013) (BSNI, 2013). The implementation of this research follows poultry rearing regulations set by the Regulation of the Minister of Agriculture of the Republic of Indonesia, Number 31/Permentan/OT.140/2/2014. This research was conducted

in the Liliba Sub-district, Oeobo District, Kota Kupang Regency, East Nusa Tenggara, Indonesia.

### FERMENTATION OF RICE BRAN AND FEED PREPARATION

Rice bran used in this study was purchased from a rice bran distributor in Oebobo, Kupang City. Palmyra sap was obtained from tappers in Lasina Kupang. Before being used for fermentation, the rice bran was analyzed for dry matter content to determine the percentage of palmyra sap used in this study, which was 10% of the dry matter of the rice bran. The effects of fermentation over six days were observed (Koni *et al.*, 2022). The procedure for fermenting rice bran with palmyra sap follows previous research (Koni *et al.*, 2021), with the fermentation process involving all fermentable materials prepared to a moisture content of 40%. In this study, 10% of the dry matter of rice bran was made up of palmyra sap. The rice bran was mixed with palmyra sap and water until the moisture content reached 40%. After mixing it homogeneously, the mixture was placed in five plastic containers, each with a capacity of 20 kg. The mixture was compacted, and the surface was covered with transparent plastic. The containers were then sealed with lids, and the outer part of the lids was covered with insulation to ensure airtightness. The containers were stored in a room away from direct sunlight and incubated for six days. After the six-day storage period, the containers were opened and inspected for mold. If mold was detected, it was separated from the rice bran, which was then dried for three hours and ready to be used in the feed mixture. The nutritional components of rice bran before and after fermentation with palmyra sap are presented in Table 1.

**Table 1: Nutrient composition of rice bran before and after fermentation with palmyra sap.**

| Nutrient              | Rice bran           |                    |
|-----------------------|---------------------|--------------------|
|                       | Before fermentation | After fermentation |
| Dry matter (%)        | 89.41               | 40.21±2.07         |
| Crude protein (%)     | 8.69                | 8.97±0.64          |
| Crude fiber (%)       | 29.43               | 25.55±4.01         |
| Crude fat (%)         | 7.90                | 4.50±2.56          |
| Ash (%)               | 13.13               | 13.74±0.16         |
| Phosphorus (%)        | 0.22                | 0.91±0.05          |
| Calcium (%)           | 0.0062              | 0.026±0.001        |
| Phytic acid (mg/100g) | 7.30                | 2.29±0.09          |

The feed formulation adheres to the BSNI, (2013) and is presented in Table 2. Chicken maintenance involves data collection over 28 days, with the treatment feed being tested from day 1 to day 28.

### EXPERIMENTAL DESIGN

This research is an experimental study using a completely

randomized design (CRD) with four treatments and six replications. Four treatments were T0: feed without fermented rice bran, T1: feed with 10% fermented rice bran, T2: feed with 20% fermented rice bran, and T3: feed with 30% fermented rice bran.

**Table 2:** Formulation and nutrient composition of treatment diets.

| Feed Ingredients         | Treatments* |         |         |         |
|--------------------------|-------------|---------|---------|---------|
|                          | T0          | T1      | T2      | T3      |
| Fermented rice bran      | 0.00        | 10.00   | 20.00   | 30.00   |
| Yellow Corn              | 47.00       | 43.67   | 40.33   | 37.00   |
| Polard                   | 20.00       | 13.33   | 6.67    | 0.00    |
| Meat bone meal           | 10.00       | 10.00   | 10.00   | 10.00   |
| Soybean meal             | 15.35       | 15.35   | 15.35   | 15.35   |
| Vegetable oil            | 4.00        | 4.00    | 4.00    | 4.00    |
| Premix                   | 0.25        | 0.25    | 0.25    | 0.25    |
| Methionine               | 0.30        | 0.30    | 0.30    | 0.30    |
| L-Lysin HCL              | 0.60        | 0.60    | 0.60    | 0.60    |
| Dicalcium phosphate      | 2.00        | 2.00    | 2.00    | 2.00    |
| NaCl                     | 0.50        | 0.50    | 0.50    | 0.50    |
| Total                    | 100.00      | 100.00  | 100.00  | 100.00  |
| Dry Matter (%)           | 82.43       | 82.36   | 82.30   | 82.24   |
| Metabolic Energy Kcal/kg | 2903.87     | 2871.00 | 2838.14 | 2805.27 |
| Crude Protein (%)        | 19.22       | 18.95   | 18.68   | 18.41   |
| Crude Fat (%)            | 7.82        | 7.83    | 7.83    | 7.84    |
| Crude Fiber (%)          | 4.37        | 5.90    | 7.43    | 8.97    |
| Calcium (%)              | 1.54        | 1.53    | 1.52    | 1.52    |
| Phosphorus (%)           | 1.13        | 1.08    | 1.03    | 0.98    |

**T0:** feed without fermented rice bran; **T1:** feed with 10% fermented rice bran; **T2:** feed with 20% fermented rice bran; **T3:** feed with 30% fermented rice bran.

The chickens were raised for 28 days. The research parameters include feed consumption, obtained by calculating the difference between the amount of feed given and the remaining feed (grams per bird per week) (Wahju, 2015). Body weight gain was determined by finding the difference in body weight at the end of the week and the body weight from the previous week (grams per bird per week) (Dei *et al.*, 2008). Feed conversion ratio was obtained by dividing the amount of feed consumed by the body weight gain (Ahmad *et al.*, 2019).

### STATISTICAL ANALYSIS

Data collected were presented as mean  $\pm$  standard deviation and analyzed by the analysis of variance and then the differences between treatments were analyzed by the Duncan's Multiple Range Test. Data analysis was performed with the SPSS statistical software for Windows Version 21.

## RESULTS AND DISCUSSION

### FEED INTAKE

The average feed intake of crossbred native chickens reared for four weeks in this study was 182.14 grams/bird/week. The feed intake of the experimental chickens is shown in Table 3. Based on the analysis of variance, the level of use of fermented rice bran with palmyra sap has significant effect ( $P < 0.05$ ) on feed intake of Java Super chickens.

The increase in the use of fermented rice bran in Java Super chicken feed was followed by an increase in feed intake. This may be because the fermented rice bran in this study has better palatability and has a fragrant aroma so that chickens consume more of it than unfermented bran. A previous study has also found that increase in feed consumption on broiler chickens fed rice bran fermented with Effective Microorganism 4 (EM<sub>4</sub>) (Ali *et al.*, 2019). The feed consumption in this study ranged from 173.39-202.79 g/bird/week which is in the range of feed consumption of Java Super chickens fed with fermented rice bran ranging from 195.76-198.95 g/bird/week (Munira *et al.*, 2016).

### BODY WEIGHT GAIN

Table 3 presents the initial bird weight was approximately similar each treatment group. The effect of fermented rice bran on body weight gain of Java Super chickens. Based on the analysis of variance, the administration of fermented rice bran with palmyra sap significantly influences ( $P < 0.05$ ) the body weight gain of Java Super chickens in the starter phase. According to Duncan's multiple range test, treatment T0 (control) is not significantly different ( $P > 0.05$ ) from treatment T1 but significantly different ( $P < 0.05$ ) from treatments T2 and T3. There is no significant difference ( $P > 0.05$ ) between treatments T1, T2, and T3. The increase in body weight gain in Java Super chickens fed fermented bran was caused by the increase in crude protein content and reduces antinutrients such as phytic acid (Table 1) in fermented rice bran. The results of previous research also showed an increase in body weight as reported by Munira *et al.* (2016) that Java Super chickens were fed 10% fermented rice bran have weight gain 72.02 g/week. It is evident that providing fermented rice bran results in higher body weight gain compared to the control feed. This is due to the increased feed consumption in chickens given fermented rice bran. With increased consumption, more nutrients are absorbed by the body for growth, as indicated by the increased body weight of chickens provided with fermented bran (Table 3). The use of fermented rice bran increases body weight gain, possibly due to the increased feed consumption, and it's likely that the digestibility of the feed containing fermented rice bran also improves. Shuvo *et al.*, (2022) reported that nutrient availability in feed through the activity of different enzymes and organic



acids produce fermented products that increase the weight gain of chicken, supporting our findings of weight gain in fermented rice bran groups.

The average body weight gain in this study is 56.36 g/bird/week, falling within the range of the average body weight gain for Java Super chickens in the starter phase, which is 48.53 – 71.83 g/bird/week (Trisiwi, 2016).

### FEED CONVERSION RATIO

Based on the analysis of variance, fermented rice bran with palmyra sap significantly influences ( $P < 0.05$ ) the feed conversion ratio (Table 3). It is observed that the use of rice bran up to 20% has a feed conversion ratio that is not significantly different ( $P > 0.05$ ) from the 10% level and the control feed. However, the use of 30% has a significantly higher feed conversion ratio than other fermented bran treatments.

**Table 3:** Effect of feeding fermented rice bran on feed intake, body weight gain, and feed conversion of Java Super chickens.

| Parameters                 | Treatments*                   |                               |                               |                               | P-value |
|----------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|---------|
|                            | T0                            | T1                            | T2                            | T3                            |         |
| Initial weight (g/ bird)   | 40.08<br>±1.25 <sup>ns</sup>  | 41.25<br>±1.79 <sup>ns</sup>  | 39.93<br>±2.70 <sup>ns</sup>  | 40.92<br>±1.63 <sup>ns</sup>  | 0.582   |
| Final weight (g/ bird)     | 248.92<br>±16.00 <sup>a</sup> | 266.49<br>±12.46 <sup>b</sup> | 276.68<br>±12.83 <sup>b</sup> | 271.89<br>±13.94 <sup>b</sup> | 0.013   |
| Feed intake (g/bird/ week) | 173.39<br>±9.41 <sup>a</sup>  | 173.79<br>±6.47 <sup>a</sup>  | 178.59<br>±11.16 <sup>a</sup> | 202.79<br>±12.28 <sup>b</sup> | 0.000   |
| Weight gain (g/bird /week) | 52.21<br>±3.88 <sup>a</sup>   | 56.31<br>±3.00 <sup>ab</sup>  | 59.19<br>±3.35 <sup>b</sup>   | 57.74<br>±3.77 <sup>b</sup>   | 0.016   |
| Feed Conversion Ratio      | 3.34<br>±0.15 <sup>ab</sup>   | 3.09<br>±0.09 <sup>a</sup>    | 3.03<br>±0.14 <sup>a</sup>    | 3.52<br>±0.10 <sup>b</sup>    | 0.038   |

\*T0: feed without fermented rice bran; T1: feed with 10% fermented rice bran; T2: feed with 20% fermented rice bran; T3: feed with 30% fermented rice bran. Mean ± Standard Deviation, which is followed by the same letter in the same column shows no significant difference ( $P > 0.05$ ).

The high feed consumption in the T3 treatment was not followed by a high increase in body weight, causing the feed conversion value to be poor. The feed conversion value influences the amount of feed costs incurred for raising livestock. The differences in the feed conversion ratio are caused by variations in body weight gain in Java Super chickens. The feed conversion ratio is influenced by age, feed quality, temperature, and the condition of the chickens (Wahju, 2015). In this study, the best feed conversion value was the use of 20% fermented rice bran in the feed, namely 3.03. This feed conversion ratio value falls within the range observed for Java Super chickens fed fermented cocoa pod shells, which is between 2.58 and 3.24 (Pakaya et al., 2019).

## CONCLUSIONS AND RECOMMENDATIONS

Based on the results and discussion, it can be concluded that fermented rice bran can be used up to 20% in the feed for Java Super chickens.

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## NOVELTY STATEMENTS

Previous research has found improvements in rice bran nutrients after fermentation using palmyra sap, but the fermentation results in feed have not been used. Therefore, our research is new because it uses rice bran fermented with sap in Java Super chicken feed.

## AUTHOR'S CONTRIBUTIONS

Theresia Nur Indah Koni contributed to creating the research idea, designing experiments, analyzing data, and writing this article. Asrul, Agustinus Paga, contributed data collection, and manuscript review, Antonius Jehemat, Gregorius Gehi Batafor and Oswilda Henyati, Tri Anggarini Yuniwati Foenay contributed to data analysis, and corrected the article.

## CONFLICT OF INTEREST

There was no conflict of interest in this research with other parties, both individuals and organizations.

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