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# The Effects of the Addition of Rubber Leaf (*Hevea brasiliensis*) Flour in Rations on Dry Matter Consumption, Weight Gain and Feed Conversion Ratio of Native Chickens

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## ABSTRACT

The purpose of the study was to find out the effect of adding rubber leaf (*Hevea brasiliensis*) flour containing tannin compounds in standard rations on the production performance of native chickens. The materials used were 64 native chickens (32 males and 32 females) aged 8 weeks, rubber leaf flour and non-AGP commercial ration with 21% protein content. The experiment was designed using Randomized Group Design with 4 treatments and 8 repetitions. Grouping was based on sex, and each repetition unit consists of 2 chickens. The treatment given was the addition of rubber leaf flour by 0% (P0), 3% (P1), 6% (P2) and 9% (P3) in 100% of commercial ration given to native chickens raising in individual battery cages for 6 weeks of trial period. The observed variables were consumption of dry matter (DM), weight gain (WG) and feed conversion ratio (FCR). Data were analyzed by Analysis of variance using General Linear Model procedures. The results of statistical analysis showed that the feeding trials affected non-significantly (P >0.05) on all variables observed. DM consumption, Weight Gain and FCR of P0, P1, P2 and P3 treatment group were respectively: 3279, 3260, 3274 and 3355g/head/week; 106.22, 105.15, 99.95 and114.43 g/head/week; 4.88, 5.02; 5.32 and 4.66. Based on the results, it can be concluded that rubber leaf flour can be used up to a level of 9% as alternative to synthetic antibiotic growth promoter (AGP), and produce the same production performance as native chicken production given non-AGP commercial rations.

**Keywords:** Alternative-AGP, *Hevea brasiliensis*, Native Chicken, Performance, Rubber leaves.

## INTRODUCTION

Native chicken is one of the poultry commodities that contribute greatly to meeting the needs of animal protein for the community (Hidayat and Asmarasari, 2015). Native chicken is generally maintained with the aim of producing hatched eggs consumption and chicken meat. In efforts to support their growth in intensive rearing system native chicken was usually fed commercial feed containing growth promoter agents such as antibiotic growth promoter (AGP)

and coccidiostat synthetic. Those feed additives in feed were fed to control the infestation of endemic-pathogen bacteria and coccidian in the lower intestinal tract of native chicken or they use as bacterial/coccidian prophylactic agents.

However, long-term use of synthetic antibacterial/ coccidial agents has been widely reported to cause the incidences of antibiotic residues in chicken products and subsequently to promote drug-resistance of the pathogen bacteria in chickens as well as in community-consuming chicken products. Therefore Indonesian Government has established a regulation that prohibits the use of synthetic antibiotic/ anticoccidial agents as AGP/ coccidiostats in the poultry industry since January 2018.

The new regulation, in one way, has a positive effect in protecting the health of the community who consume chicken products, but in the other way, it has also a negative impact on the productivity of chickens that are raised under high humidity (> 20%) and high temperatures (22-32$^{o}$ C), such as a climatic environment such as in Jambi and another region in Indonesia. The combination of high humidity and high temperature will predispose to the development of various pathogenic gastro-intestinal bacteria and parasites (Richard, 2017), and without applying a good environmental control management a good rearing system, and/or giving a prophylactic agent. The pathogens will multiply and develop uncontrollably and hence, it increases the potential hazard of causing diseases in chickens.

Since chemo-prophylactic agents given as feed additives in chickens have been had an important role in maintaining the health of the chickens in the chicken industry for long time practices. Therefore, prohibition in their use should be replaced by more safe prophylactic agents, and it is usually had by secondary metabolites contained in herbal plants or tanniferous plants. One of the candidates of herbal prophylactic is tannin compounds that have been reported to have antibacterial and anti-parasitic gastro-intestinal activities (Williams *et al*., 2014; Klongsiriwet *et al*., 2015; Wigati *et al.*, 2015; Wigati *et al*., 2016; Wigati and Manin, 2019).

Rubber leaves (*Hevea brasiliensis*) have been reported to contain tannin compounds, and have good potencies as herbal nutrients (Wigati *et al.*. 2014), which means that they can be used as animal feed or animal forage as well as a herbal prophylactic agent. The previous research showed that rubber leaves had feed chemical composition as followed: 40.4% DM; 87.9% OM; 19.5% CP; 6.22%; EE and 27.0% CF, and that rubber leaves also contained 2.5% total tannin,

and 2.3% condensed tannins (Wigati *et al.,* 2014). Furthermore, it is also reported that rubber leaf in the form of whole leaves extracts and leaf flour have an anthelmintic activity in vitro (Wigati *et al*., 2015) and in vivo (Wigati *et al*., 2016) and anticoccidial in animals, including in native chickens (Wigati et al., *2016*; Wigati and Manin, 2019).

The research was conducted to analyze the effects of adding rubber leaf flour containing tannin compounds as an alternative to synthetic antibiotic growth promoters (AGP) in standard rations on the consumption of dry matter (DM), weight gain (WG), and feed conversion ratio (FCR) as indicators of production performance of native chickens.

## MATERIALS AND METHODS

### Research Materials

The research was conducted in Experimental Chicken Cage Farm of Animal Husbandry Faculty, Jambi University for six weeks feeding trial period. The materials used were 64 native chickens (32 males and 32 females) in their grower phase (8 weeks old). Feed commercial added rubber leaf flour with a non-AGP commercial ratio with 21% crude protein content. The equipment used was a set of battery cages with feeding and drinking equipment grinder and digital scales.

### Research Methods

**Feeding trial.** The feed treatment given was the addition of different levels of rubber leaf flour to non-AGP commercial ration with feed composition as followed:

T0 = 0% Rubber leaf flour + 100% Commercial ration
T1 = 3% Rubber leaf flour + 100% Commercial ration
T2 = 6% Rubber leaf flour + 100% Commercial ration
T3 = 9% Rubber leaf flour + 100% Commercial ration

The feed chemical composition of the feed stuff and trial diet are presented in Tables 1 and 2.

Table 1. Feed chemical composition of the feedstuffs composting the treatment diets

| Feedstuffs | Composition (%)* | | | | |
|---|---|---|---|---|---|
| | DM | OM | CP | EE | CF |
| Rubber leaf flour | 93.28 | 94.78 | 19.73 | 6.19 | 25.83 |
| Commercial ration | 91.14 | 93.74 | 21.00 | 7.83 | 3.79 |

Note : * Resulted from proximate analysis in Laboratory of Animal Feed and Nutrition, Animal Science Faculty. Jambi University in 2019. DM=Dry Matter, OM=Organic Matter, CP=Crude Protein, EE=Extract Ether, CF=Crude Fiber.

Table 2. Feed chemical composition of treatment diets

| Composition** | Treatment Diet | | | |
|---|---|---|---|---|
| (%) | T0 | T1 | T2 | T3 |
| Dry Matter (DM) | 91.14 | 91.20 | 91.26 | 91.32 |
| Organic Matter (OM) | 93.74 | 93.77 | 93.80 | 93.83 |
| Crude Protein (CP) | 21.00 | 20.96 | 20.93 | 20.90 |
| Extract Ether (EE) | 7.83 | 7.78 | 7.74 | 7.69 |
| Crude Fibre (CF) | 3.79 | 4.43 | 5.03 | 5.61 |

Note: ** Resulted by calculating the composition of treatment diets with the feed chemical composition of the feedstuffs in Table 1. T0= Control diet (0% rubber leaf flour); T1=Diet with addition of 3% rubber leaf flour; T2=Diet with addition of 6% rubber leaf flour; T3=Diet with addition of 9% rubber leaf flour

During the feeding trial period, 64 native chickens were raised in 64 individual battery cages. Treatment diets were fed ad libitum for 6 weeks feeding trial period, and drinking water was also given ad libitum during feeding the trial period.

**Chicken weighing**. Chickens were weighed for the first time to get data of body weights for allocated into the treatment group. They were adapted for cage conditions and diet for 3 days. The second weighing was carried out on the day the feeding trial commenced, and weighing was repeated in a one-week interval. Data of body weights were used to calculate body weight and body weight gain of native chickens.

**Recording of feed and feed leftover**. The diets given were weighed and recorded every week, and the feed leftover was also weighed and recorded every week. The difference between the diet given and the feed leftover during a period of measurement (24 hours or a week) was used to calculate the feed consumption of the native chicken. Samples of treatment feed and

treatment feed leftover were collected to be analyzed for dry matter (DM) content by using proximate analysis (AOAC)

**Experimental design**. A Randomized Block Design (RBD) with 4 treatments and 8 replications was employed to test the effects of treatment diets on the production performance of natives chickens. The grouping was based on sex and each replication unit consisted of 2 chickens.

**Variables observed.** The variables observed were feed consumption including fed consumption (FC) and dry matter (DM) consumption, body weight gain (BWG), and feed conversion ratio (FCR).

**Statistical Analysis.** Data was analyzed by Analysis of variance (ANOVA) using General Linear Model (GLM) procedures. Any significant differences between treatments will be tested using the LSD-test (SPSS, 16.0).

## RESULTS AND DISCUSSION

### Dry Matter and Tannin Consumptions

Dry matter (DM) consumption was measured to be used as an estimate of the quantity of tannin consumed by native chickens in each treatment. Rubber leaf flour has a total tannin content of 2.5% and condensed tannins of 2.3% on a DM basis (Wigati et al., 2014). Tannins in rubber leaf flour are expected to be able to become herbal supplements as a substitute for synthetic AGP and coccidiostats, and hence they can be acted as an herbal prophylactic agent for controlling pathogens in chickens. The effect of adding rubber leaf flour to commercial rations on dry matter consumption and estimation of tannin consumption is presented in Table 3.

The results of statistical analysis of the data presented in Table 3 showed that the level of addition of rubber leaf flour had no significant effect ($P>0.05$) on the dry matter consumption of native chickens. Based on Table 3, also shows that the DM consumption of rubber leaf flour and estimates of total tannin consumption are still in accordance with the level of treatment. It means that consumption of tannins increased as the addition level of rubber leaf flour was increased.

Table 3. The average ± Sd of dry matter (DM) consumption and estimated consumption of tannin contained in the diets of native chickens aged 8 weeks given treatment diets for 6 weeks feeding trial period

| Treatment | DM Consumption | | Estimated Tannin Consumption | |
|---|---|---|---|---|
| | Diets (g/head/week) | Rubber leaf flour (g/head/week) | Quantity (g/head/week) | Percentage (%) |
| T0 | 3279±385.2 | 0.00 | 0.00 | 0.00 |
| T1 | 3260±305.7 | 98.4 | 2.46 | 0.08 |
| T2 | 3274±337.5 | 195.7 | 4.89 | 0.15 |
| T3 | 3355±269.9 | 302.0 | 7.55 | 0.23 |

Note: The result of ANOVA on DM consumption showed no significant differences (P>0.05).
T0= Control diet (0% rubber leaf flour); T1=Diet with addition of 3% rubber leaf flour; T2=Diet with addition of 6% rubber leaf flour; T3=Diet with addition of 9% rubber leaf flour

The estimated total tannin consumed between is 0.08 - 0.23% of the DM diets consumed by native chickens. It was still within the tolerance limit. According to Akmal and Mairizal (2013), 0.42% tannin content in a broiler diet containing Sengon leaves (*Albizzia falcataria*), had no effect on feed consumption, since its quantity was still within the tolerance limit for livestock. Fuller *et al.* (1967) and Zain (1993) stated that the content of 1% tannin of feed in the ration would affect the growth of the chickens, but no effect if it was only 0.5%. Dietary TA supplementation can be applied as a biological antioxidant for poultry nutrition in hot climatic conditions (Ebrahim *et al*., 2015).

Hence, the level of the addition of rubber leaf flour up to 9% is expected to have no anti-nutritive effects on native chickens, and is expected to have mainly herbal prophylactic effect in controlling pathogens in a lower tract of the intestine of the native chicken

**Production Performance**

The effects of the addition of rubber leaf flour to standard commercial ratio on production performance of native chickens can be indicated by the effects of the treatment diets on feed (as fed) consumption, body weight gain (BWG) and feed conversion ratio (FCR) of the observed native chickens. The average feed (as fed) consumption, body weight gain (BWG) and feed conversion ratio (FCR) resulted from the research are presented in Table 4.

Table 4. The average ± Sd of feed (*as fed*) consumption, body weight gain (BWG) and feed conversion ratio (FCR) of native chickens aged 8 weeks given treatment diets for 6 weeks feeding trial period

| Variable | Treatment | | | |
|---|---|---|---|---|
| | T0 | T1 | T2 | T3 |
| Feed Consumption (g/head/week) | 504.7±66.5 | 495.4±47.4 | 495.4±52.6 | 509.9 ±45.3 |
| BWG (g/head/week) | 106.2±26.8 | 105.2 ±32.4 | 100.0 ±32.8 | 114.4±31.4 |
| FCR | 4.9 ±0.6 | 5.0±1.3 | 5.3±1.3 | 4.7 ±0.9 |

Note:The result of ANOVA on all variables observed showed no significant differences (P>0.05).
T0= Control diet (0% rubber leaf flour); T1=Diet with addition of 3% rubber leaf flour; T2=Diet with addition of 6% rubber leaf flour; T3=Diet with addition of 9% rubber leaf flour

**Feed Consumption.** The results of variant analysis (ANOVA) showed that the treatment diets had no significant effect (P>0.05) on feed consumption. It means that the addition of rubber leaf flour into the standard commercial ratio did not decrease feed consumption of native chickens, hence, rubber leaf flour can be used up to 9% in the chicken diet as a source of tannin-additive feed.

The average feed (diet) consumptions in the native chickens given treatments using rubber leaf flour in this study were between 495.40 -509.88 g/head/week. Those feed consumptions are still higher than the standard feed consumption of native chickens as stated by Sarwono (2003), i.e. 50-60 g/head/day or 350–420 g/head/week for chickens aged 2-3-5 months. When compared to other studies, feed consumption in this study are also still higher than those resulted by Bawole *et al*. (2020), i.e. 330.05- 368.13 g/head/week. Bawole *et al*. (2020) used Super-native chickens aged 8 weeks, and were raised in battery cages, and were given treatment using the addition of coconut cake flour in the basal diet. According to Wahyu (2004), feed consumption can be affected by many factors such as the environment, chicken breed, cage temperature, production stage as well as energy in rations.

High feed consumption in this study may imply the effect of tannin contained in rubber leaf flour in controlling the health of the intestinal tract of the native chickens. However, there is a possibility that the high feed consumption may have resulted from combining effects of the

rearing system using individual battery cages, the use of high protein diets, and the tannin-prophylactic effect on intestinal pathogens.

**Body Weight Gain.** The results of variant analysis (ANOVA) showed that the treatment diets had no significant effect (P>0.05) on body weight gain (BWG) of native chickens observed. The body weight gains of the native chickens were in accordance with the feed consumptions in this study, showed that the addition of tannin contained in rubber leaf flour to standard ratio had no negative effect on native chicken growths.

The average body weight gain in native chickens given treatment feed using rubber leaf flour in this study was between 105.2 – 114.4 g/head/week. The average BWGs of native chickens in this study was higher than the normal body weight gain of native chickens, according to Astuti *et al*. (1979), i.e. 79.6 – 90.5 g/head/week, and of KUB chickens of Zurriyati *et al.* (2020), i.e. 85.4 – 106.7 g/head/week. However, the average BWGs of native chickens in this study was relatively the same as those of Hasyim *et al*. (2020) which used KUB chickens aged 8 – 11 weeks and given mixed feed (commercial ration mixed with local feedstuff), i.e. 79.9 - 139.9 g/head/week.

The presence of tannin content in the diets has not shown negative effects on the BWG of the native chickens. It is thought that lower content (< 1%) of tannin in the diets can be tolerated well by native chickens in their second grower phase. It is also thought that the prophylactic effect of tannin on pathogenic bacteria and coccidia, as reported by Wigati and Manin (2019 ), has promoted the growth of native chickens.

**Feed Conversion Ratio.** The results of the analysis of variance (ANOVA) showed that the feed treatment had no significant effect (P>0.05) on the feed conversion ratio (FCR) of native chickens. The addition of rubber leaf flour had no significant effect (P > 0.05) on the conversion of free-range chicken rations. This shows that the addition of rubber leaf flour has not been able to reduce FCR, this result is in line with feed consumption and WBG of native chickens which are also not significantly affected by the treatment ration.

The FCR of native chickens in this study ranged from 4.7 to 5.3. The FCR value is still close to the FCR standard range according to Sulandari *et al*. (2007), namely 4.9-6.4 for native chickens that are intensively reared and given rations for native chickens. However, the FCR is still higher than the results of Bawole *et al.* (2020), which is 2.67–3.02 in 8-week-old native chickens. Differences in FCR values resulting from different studies can be influenced by several

factors such as protein content, energy content, environmental temperature, and growth rate (Widodo *et al*., 2017). Furthermore, the FCR of chickens aged 10-20 weeks fed using a ratio with a protein content of 18%, and an energy content at the level of 2900 can further increase the FCR value between 7.43-9.39 (Takdir *et al.*, 2019) .

## CONCLUSION

Rubber leaf flour can be used up to 9% as an alternative to synthetic antibiotic growth promoter (AGP) with the same product performance results as the production of free-range chicken fed non-AGP commercial rations.

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