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Retention of Dry Matter, Organic Matter and Nitrogen In Native Chicken Fed Non-AGP Rations Added by Rubber Leaf *(Hevea Brasiliensis)* Flour

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Abstract

The purpose of the study was to determine the effects of adding rubber leaf flour (*Hevea brasiliensis*) to non-antibiotic growth promoter (non-AGP) commercial rations on dry matter, organic matter and nitrogen retention in native chickens. The materials used were 64 native chicken (32 male and 32 female) aged 8 weeks, non-AGP commercial ration and rubber leaf flour. The experimental design used was a Randomized Block Design (RBD) with 4 treatments and 8 replications. Grouping based on sex, and each replication unit consisted of 2 chickens. The treatment given was the addition of rubber leaf flour by 0% (P0), 3% (P1), 6% (P2) and 9% (P3) in a 100% commercial ration. The observed variables were dry matter (DM), organic matter (OM) and nitrogen (N) retention. Data were analyzed using analysis of variance, and the results showed that the addition of rubber leaf flour in the rations had no significant effect (P>0.05) on the observed variables. Retention of Dry Matter, Organic Matter and Nitrogen in treatment groups of P0, P1, P2 and P3 were respectively: 75.40, 78.45, 77.54 and 77.64%; 77.92, 78.38, 78.84 and 77.48 %; and 53.67, 57.69, 54.53 and 56.45%. In conclusion, the use of rubber leaf flour up to the level of 9% can highly enhance the retention of DM, OM and Nin native chicken, and hence it will also open and facilitate its potency as herbal feed additive as alternative to synthetic- AGP.

Keywords : *Hevea brasiliensis*, native chicken, non-AGP rations, rubber leaves

INTRODUCTION

In Indonesia, there are 31 types of native (Hidayat dan Asmarasari, 2015) or local chickens (ecotype), each of which has its own advantages. According to Pramual *et. al*. (2013), native chickens in Indonesia come from the *Gallus gallus bankiva* sub-species originating from Lampung, Java and Bali. Native chickens or often called as free-range chickens are the result of domestication of partridges (*Gallus gallus*) and can be grouped into types of broilers, laying and dual-purpose chickens, or as ornamental or hobby chickens (Nataamijaya *et. al*., 2010). Native chickens have a slender body shape, are small in size and have high genetic diversity (Padhi, 2016; Van, 2020; Goto *et al.*, 2021; Rofii *et al.*, 2018). Native chickens have a very important role in people's lives (Moges *et al.*, 2010; Charoensin *et al*., 2021). Even in many areas, Native

chickens are the only source of cash income during the long dry season (Nataamijaya *et al*., 2010).

Now days, there is an increase trend in native chicken meat and egg demands, so it lead to the change of the rearing system of native chicken, i.e. from a free range system to an in cage rearing system (Dal Bosco *et al.,* 2021). To support the productivity of native chickens which are kept in cages, it is needed good quality feeds to meet the need of nutrition for better growth, and to increase their immune system. In the present days, many commercial native chicken feeds are available in the local poultry shops.

Prior to the issuance of a government ban on the use of synthetic antibiotics as feed addictive in feeds (RI Regulation No.14/PERMENTAN/PK.350/5/2017 concerning the classification of veterinary drugs and MOA 22/2017 concerning registration and distribution of feed), many commercial native chicken feed products contain feed additives such as coccidiostats and growth promoter antibiotics (AGP). Those synthetic feed additives in feed are given to control the development of disease germs that are already present in the livestock environment (endemic disease agents), such as bacteria and parasites that live in the gastro-intestinal tract, so they can promote better chicken growths. However, along with the prohibition on the use of AGP in commercial rations, the new commercial ration product that are sold without AGP (Non-AGP commercial rations) certainly have their own impact. By considering the climatic condition of the Jambi regions which have high temperature and humidity. It is inevitable will support the development of endemic diseases in livestock, so that the impact of the prohibition on the addition of AGP is a decrease in the poultry productivity.

Based on these problems, it is necessary to add an alternative feed additive that will not cause problems of drug residues and drug resistance as those of the government ban are concerned, for replacing the function of synthetic AGP or coccidiostat. One of the feedstuff that can be used for the purpose is rubber leaf *(Hevea brasiliensis*) flour. Rubber leafflours contains high crude protein content, and it also contains tannins compound that is proposed as herbal feed additive to control the health of the chicken's gastro-intestinal tract.

Rubber leaves (*Hevea brasiliensis*) have been reported to have potency as herbal nutrition (nutritive herbs), mean that its can be used as a source of good quality feedstuff as well as herbal medicine (Wigati *et al*., 2014; 2015; 2016). The potencies of rubber leaves as a source of feedstuffs and herbal medicines are indicated by the high quality nutrient content of the leaves and by the tannin content of the leaves which have gastro-intestinal anti-parasitic activity (Wigati *et. al*., 2014; 2015). Rubber leaves contain 40.4% dry matter (DM); 87.9% organic matter (OM); 19.5% crude protein (CP); 6.22% ether extract (EE); 27.0% crude fiber (CF). The potency of rubber leaves as a feedstuff and herbal medicine has been widely studied in small ruminants, but the use of rubber leaves as a feedstuff and herbal medicine in poultry has not been studied. Hence, the research was carried out to evaluate the effect of adding rubber leaf flour in non-AGP commercial rations on nutrient (DM, OM and nitrogen) retention of native chickens under in-cage rearing system.

MATERIALS AND METHODS

The research was carried out in Animal Science Faculty Farm and Business Jambi University. The materials used in the research were 64 native grower phase-chicken (32 male and 32 female) aged 8 weeks, rubber leaf flour and non-AGP commercial ration containing 21%

CP and 2.900-3.000 kcal ME/kg.The commercial chicken feed was NOVO 511 produced by PT Charoen Pokphan, and rubber leaves were obtained from the community's rubber plantation in Pondok Meja village, Jambi, Indonesia.

A total of 64 native chickens were randomized using a randomized block design (RBD) with 4 treatments and 8 replications. The treatments used were 100% commercial ration (P0), 100% commercial ration + 3% rubber leaf flour (P1), 100 % commercial ration + 6% rubber leaf flour (P2) and 100% commercial ration + 9% rubber leaf flour (P3). The feed chemical composition of the feedstuffs used in treatment rations was presented in Table 1, and the feed chemical (nutrient) composition of the treatment rations was presented in Table 2.

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

Feedstuffs	Feed chemical 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

*Analysis of dry matter (DM), organic matter (OM), crude protein (CP), extract ether (EE) and crude fiber (CF) was carried out by using proximate analysis in Laboratory of Animal Feed and Nutrition, Animal Science Faculty, Jambi University in 2019

Table 2. Feed chemical composition of the treatment rations

Treatment rations	Feed chemical composition (%)**				
	DM	OM	CP	EE	CF
P0	91.14	93.74	21.00	7.83	3.79
P1	91.20	93.77	20.96	7.78	4.43
P2	91.26	93.80	20.93	7.74	5.03
P3	91.32	93.83	20.90	7.69	5.61

** Resulted by calculating the composition of treatment rations with the feed chemical composition of the feedstuffs in Table 1. P0= Control ration (0% rubber leaf flour); P1=Ration with addition of 3% rubber leaf flour; P2=Ration with addition of 6% rubber leaf flour; P3=Ration with addition of 9% rubber leaf flour. DM: dry matter, OM: organic matter, crude protein (CP), extract ether (EE), and crude fiber (CF).

During the period of feeding treatment, 64 native chickens were placed in individual battery cages. The treatment rations, a long with drinking water, were given ad libitum for 6 weeks of feeding trial period.

Each of the treatment feeds, the left over feeds and the excreta (feces) were collected, weighed and recorded for 4 days consecutively at the fifth week of the feeding trial. The feed, left over feed and excreta collected were sampled and composited for each of the treatments, and were then subjected to proximate analysis (AOAC, 2002) to determine the contents of dry matter (DM), organic matter (OM), crude protein (CP) and nitrogen (N).

The variables observed in the research were dry matter (DM)) retention, organic matter (OM) retention and cages. The nitrogen (N) retention. The retention of DM, OM and N was determined by calculating the difference of the amount of DM, OM and N consumptions and the amount of DM, OM and N excretions. Consumption of dry matter, organic matter (OM) and

nitrogen (N) was determined by calculating the difference of the amount of DM, OM and N contained in the feed given and in the leftover feed. Excretion of DM, OM and N was determined by calculating the amount of DM, OM and N contained in the excreta (feces).

The data obtained were analyzed using analysis of variance (ANOVA) adjusted to the experimental design used (randomized block design). If any significant differences were continued subsequently tested with Duncan's Multiple Range Test (Bewick *et al*., 2004).

RESULTS AND DISCUSSION

The Retention of Dry Matter of the Treatment Feed in Native Chicken

In chicken, retention of dry matter (DM) is a reflection of the digestible DM in the digestive tract, and it is affected by several factors such as feed ingredients (feed chemical composition of the ration), the amount of ration consumed, the travel rate of feed in the digestive tract and the type of nutritional content contained in the ration (McDonald *et. al*., 2010). The average consumption, excretion and retention of feed dry matter in native chickens fed non-AGP commercial rations with the addition of rubber leaf flour with different levels in the research were presented in Table 3.

Table 3. The average consumption, excretion and retention of feed dry mattersin native chickens fed non-AGP commercial rations with the addition of rubber leaf flour from 8-14 weeks of age

Treatment	Variables observed		
	Dry Matter Consumption (g/head/day)	Dry Matter Excretion (g/head/day)	Dry Matter Retention (%)
P0	62.02±7.02	15.15±1.18	75.40±2.36
P1	65.95±7.08	14.17±1.50	78.45±1.83
P2	65.27±9.27	14.39±2.26	77.54±4.80
P3	68.31±7.66	15.20±1.74	77.64±2.37

Note: Analysis of variance: non-significant
P0=Control ration (0% rubber leaf flour); P1=Ration with addition of 3% rubber leaf flour; P2=Ration with addition of 6% rubber leaf flour; P3=Ration with addition of 9% rubber leaf flour.

The results displayed in Table 3, that the addition of rubber leaf flour had no significant effect (P>0.05) on dry matter consumption, dry matter excretion and dry matter retention of the treatment rations in the native chickens. The results indicated that the use of rubber leaf flour up to 9% in standard commercial rations did not have negative impacts on nutrient consumption and nutrient digestibility. The results also indicated that native chickens can well consume rubber leaf flour, so that, rubber leaf flour can be expected to be used as an alternative herbal supplementary feed to substitute AGP.

In the research, dry matter consumptions of the trial chickens fed rations with the addition of rubber leaf flour were 65.27-68.31 g/head/day. The dry matter consumptions resulted in the research were higher than the results of Noferdiman *et al*. (2017), i.e.58.86–60.59

g/head/day. Noferdiman *et al.* (2017) used native chickens aged 8 weeks fed a mixed ration of *Azolla microphyla* with *Pleurotusos treatus* fermentation in his research. According to Wulandari (2000), ration consumption is influenced by several factors, such as the age of livestock, the nutrient contents in the ration, genetics, body weight and disease (Mwangi *et al.*, 2019).

The dry matter excretion values obtained in this research were between 14.17 to 15.20 g/head/day. The values of those dry matter excretions were relatively the same as those of Noferdimandkk. (2017) which used 8-week-old native chickens fed a mixed ration of azolla with fermentation, i.e. 14.41 to 15.1 g/head/day.

The average of dry matter retentions of the native chickens fed non-AGP commercial rations with the addition of rubber leaf flour in the research were between 77.54 to 78.45%. In comparison with other previous research, the results had no significant differences which used native chickens aged 10 weeks and were fedusing banana peel rations (*Musa paradisiaca*), i.e.71.18 to 82.75%. This difference in the results was suggested to be caused by the nutrient contents of the ration consumed, such as crude fiber. Crude fiber content in ration can affect the dry matter excretion, and so that affect dry matter retention. Several factors that affected dry matter retention were the ability of livestock to digest feed and crude fiber content (Riswandi *et al*., 2015).

The Retention of Organic Matter of the Treatment Feed in Native Chicken

The retention of organic matter (OM) in chicken is an indication of the digestibility of the organic matter of the feed consumed in the digestive tract (Cerrate et al., 2019 (Melo-Duran *et al.*, 2021). Organic matters consist of organic material components such as carbohydrates, proteins, fats and crude fibers that serve as energy sources of the feed (McDonald *et. al*., 2010).The average consumption, excretion and retention of organic matter (OM) in native chicken fed non-AGP commercial rations with the addition of rubber leaf flour were presented in Table 4.

Table 4. The average consumption, excretion and retention of feed dry matters in native chickens fed non-AGP commercial rations with the addition of rubber leaf flour from 8-14 weeks of age

Treatment	Variables Observed		
	Organic Matter Consumption	Organic Matter Excretion	Organic Matter Retention
	(g/head/day)	(g/head/day)	(%)
P0	58.14±6.58	12.75±0.99	77.92±2.12
P1	55.61±6.40	11.97±1.27	78.38±1.88
P2	55.14±8.33	12.16±1.91	78.84±3.60
P3	57.91±6.90	12.96±1.49	77.48±2.46

Note: Analysis of variance: non-significant

P0 = Control ration (0% rubber leaf flour); P1=Ration with addition of 3% rubber leaf flour; P2=Ration with addition of 6% rubber leaf flour; P3=Ration with addition of 9% rubber leaf flour.

The results of the analysis of variance showed that the addition of rubber leaf flour had no significant effect (P>0.05) on the consumption, excretion and retention of Organic Matter (OM) in the native chickens. The results were in line with the consumption, excretion and retention of dry matter (DM) in this research. According to Sugiarto *et. al*. (2013), organic matter is directly proportional to dry matter, the higher the value of organic matter, the higher the value of dry matter. Furthermore, Sebrino (2016) stated that digestibility of organic matter is related to dry matter digestibility because most of the dry matter components consist of organic matter.

The average of the organic matter consumptions of the treatment rations resulted in this research were between 55.14 to 57.91 g/head/day. However, the OM consumptions resulted in this research were higher than those of Adreani (2017) which used native chickens aged 8 weeks fed with rations added by fermented azolla, i.e. 36.83 to 40.58 g/head/day.

The average of the organic matter excretion obtained was between 11.97 to 12.96 g/head/day. The OM excretion resulted in this research were not different significantly compared with those of Adreani (2017). This means that the addition of rubber leaf flour does not increase the excretion of organic matter from free-range chickens.

The average of the organic matter retention of the treatment rations resulted in this research were 77.48 to 78.84 %. The OM retentions resulted in this research were also higher than those of Adreani (2017) which used native chickens aged 8-12 weeks fed with rations added by fermented azolla,i.e.71.71 to 75.60%. The averages of the OM retentions in the native chicken fed with rations added by rubber leaf flour were no significant higher than that of the control (Table 4). The results showed that the increase of crude fiber composition in treatment rations added by rubber leaf flour from 3% up to 9% did not increase OM excretion, and did not also decrease OM retention. Hence, it can indicate that rubber leaf flour can be used as a feedstuff for native chicken rations, and in the sometime it can also be used as an herbal feed additive.

The Retention of Nitrogen in Native Chicken Fed with the Addition of Rubber Leaf Flour

A nitrogen (N) retention of a ration fed in chickens can be used as a measurement of a protein digestion (Latshaw and Zhao, 2011). Increased nitrogen retention is an indication that more protein is being digested (Fanani *et. al*., 2014). The average of nitrogen consumption, excretion and retention in native chickens fed non-AGP commercial rations with the addition of rubber leaf flour was presented in Table 5.

The results of the analysis of variance showed that the addition of rubber leaf flour had no significant effect (P>0.05) on consumption, excretion and retention of nitrogen (N) in native chickens. Based in the formulation of the treatment rations, the increase of the rubber leaf flour addition to the ration had shown a slight reduction in the crude protein contents in the treatment rations. According to Resnawati (2006), the nutritional feed contents will affect the value of nitrogen retention. However, the increase in the amount of rubber leaf flour in this research did not reduce the nitrogen retention.

The averages of the nitrogen retentions obtained in this research were between 54.53% to 57.69%. Those result were not much different from the results of Jonathan (2013) which used native chickens aged 12 weeks fed with a ration of Tilapia industrial waste flour, i.e.53,93% to 62.11%, and were higher than those of Irfan (2008) which used native chickens aged 12 weeks fed mixed rations with the addition of fish silage flour, i.e. 30.72% to 47.44%.

Table 5. The average consumption, excretion and retention of nitrogen in native chickens fed non-AGP commercial rations with the addition of rubber leaf flour from 8-14 weeks of age

Treatment	Variables Observed		
	Nitrogen Consumption	Nitrogen Excretion	Nitrogen Retention
	(g/head/day)	(g/head/day)	(%)
P0	2.08 ± 0.2	0.96 ±0.07	53.67 ± 4.45
P1	2.00 ± 0.2	0.84 ± 0.09	57.69 ± 3.6
P2	1.96 ± 0.3	0.87 ± 0.14	54.53 ± 1.,2
P3	2.04 ± 0.3	0.88 ± 0.10	56.45 ± 4.9

Note: Analysis of variance: non-significant
P0=Control ration (0% rubber leaf flour); P1=Ration with addition of 3% rubber leaf flour; P2=Ration with addition of 6% rubber leaf flour; P3=Ration with addition of 9% rubber leaf flour.

Data in Table 6 was showed that there was an increase in nitrogen retention of the treatment ration added by rubber leaf flour, although that increase was not significant. The Nitrogen retention of the rubber leaf flour diets were 7.5 to 8.1 g/head/week or 46,9 to 50.6 g/head/week of crude protein (CP) retentions. Furthermore, the CP consumption of the rubber leaf flour treatment rations were 18.7 to 19.0 % of the DM consumptions (Table 4). According to Ryan, *et al.* (2019), nitrogen retention can be influenced by several other factors, such as protein digestibility, protein consumption, ration consumption and nutrient balance substances in the ration.

The Nitrogen or CP consumptions and retentions of the rubber leaf flour treatment rations indicated that rubber leaf flour can be used as a feed supplementation up to the level of 9% in native chicken aged 8-14 weeks (the second grower-phase), and hence, the use of rubber leaf flour as feedstuff will also open and facilitate its potency as herbal feed additive as alternative to synthetic- AGP.

CONCLUSION

Based on the results of the research, it can be concluded that the use of rubber leaf flour as feed supplementation up to the level of 9% in standard commercial ration can highly enhance the retention of dry matter, organic matter and nitrogen in native chicken. Hence, It will also open the opportunity and also facilitate its potency as herbal feed additive as alternative to synthetic- AGP.

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