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Effect of Substitution of Leaves and Seeds of Rubber (Hevea Brasilliensis) Fermentation with Soybean Meal on the Performance of Broilers

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Abstract: This study aims to determine the level of use of the leaves and seeds of the rubber fermentation (DBKF) as a 100% replacement for soybean meal in the ration of broiler chickens that do not interfere with the performance of broiler chickens. The study consisted of a series of field experiments. Experiments in the field/cage to test the response of biological production (percentage of body weight gain and carcass) and gross profit in broiler chickens aged 1 day as many as two hundred and forty tail Arbor Strain acres. The draft completely randomized design with six treatment is replacement of 0, 20, 40, 60, 80 and 100% of soybean meal protein in leaves and rubber seed fermentation and 4 replicates with 10 chickens for each box. Data were analyzed statistically using ANOVA and if it shows a marked influence followed by Duncans test/DMRT. Variables measured were feed intake, body weight gain, feed conversion, carcass percentage and income over feed cost (IOFC) of broiler chickens. The results showed that the production performance of broiler chickens mainly on feed intake, weight gain and feed conversion is not too much affected by the use of rubber seed leaves and fermentation (DBKF) in cattle rations. Soybean meal protein replacement level with leaves and rubber seed fermentation (DBKF) in the ration can be done up to 80% in broiler rations.

Key words: Leaves and seeds rubber (Hevea brasilliensis), fermentation, substitution, performance, broiler chickens

INTRODUCTION

In intensive poultry farm, nutritional needs must be provided by the breeder. In this system, the feed is the largest cost component of production. In business laying chicken feed costs are 80% of the variable costs (Nurtini, 1988), 73% in broiler chickens, broiler duck 53 and 61.6% laying ducks (Sinurat *et al*., 1992). High feed prices are the cause of losses in poultry breeding business in Indonesia. One cause of poultry feed prices are high because of high raw material prices are still mainly imported feed such as fish meal, soybean meal and corn.

Soybean meal is one of the feed material constituent of vegetable protein sources in poultry rations containing high protein and complete amino acid than other vegetable feed ingredients, on the other hand sometimes limited availability. In fact the demand of raw materials such as soybean meal is increasing along with the development effort poultry farm. The soybean meal needs more fulfilled by imports almost 100%, which is about 1.86204 million tons in 2012 (Central Bureau of Statistics, 2012). To reduce dependence on imported feed ingredients such as soybean meal is worth the effort to look for raw material feed soybean meal replacement with alternative feed ingredients. One thing that has not been widely used are the leaves and seeds of rubber trees (Hevea brasilliensis) which is agricultural waste. This plant has a high adaptability, can grow at an altitude of 0 to 1500 m. Rubber plant life into a plantation crop. According to the Central Bureau of Statistics (2012) extensive rubber plantations in Indonesia is 5,487,305 ha, is the largest rubber plantation in the world. Each 1 hectare rubber plantation planted 400-500 trees.

The low nutrient content and the presence of anti-nutritional substances in the diet resulted in their use is not maximized. The results of the analysis of the leaves and seeds of the rubber obtained crude protein content from 15.70 to 18.62%, 10.89% crude fat, metabolizable energy of 1762.95 to 2301.64 and nitrogen retention by 53.42 to 71.19 as well as fiber rough at 15.73 to 18.62 (Poultry Laboratory, 2013). According to Oluyemi *et al*. (1976) metabolizable energy gum leaves and seeds is around 4,835 Kcal/kg, gum leaves and seeds also contain various amino acids such as aspartic acid 10:25, 14.73 glutamic acid, lysine 2:55, 7:23 arginine, methionine 0.92 and trionin 2.65 of the total protein (Orok and Bowland, 1974). The main obstacle in the use of rubber leaves and seeds as animal feed is the high levels of hydrogen cyanide (HCN). According to Lauw *et al*. (1967) HCN content of the leaves and seeds of fresh rubber is 263 mg/100 gr. According to Syahruddin

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and Rita (2009) HCN content of the leaves and seeds of the rubber can be reduced or eliminated by the process of storage, extraction, drying, soaking or boiling in water, then it is said that the leaves and rubber seed soaked for 24 h to reduce the levels of HCN, whereas according to Toh and Chia (1977) leaves and seeds are boiled rubber at 160°C temperature can eliminate toxic HCN. Syahruddin research results and Rita (2010) showed that the leaves and seeds of fresh rubber supplied in the ration of broiler chickens excess of 9% in the diet can reduce weight gain and feed consumption. To anticipate processing needs to be done so that the quality of the leaves and seeds of the rubber can be increased. How is technology that can be used to ferment the leaves and seeds of the rubber with microbes (Trichoderma harzianum is able to increase the percentage of crude protein becomes 23.98%, according to Syahruddin and Rita (2012).

Studied aspect is determining how to influence product utilization and rubber seed leaf microbial fermentation with Trichoderma harzianum with biological experiments in the form of animal testing in broiler rations. Products processed rubber leaves and seeds will be used as a substitute as much as 0, 20, 40, 60, 80 and 100% protein soybean meal in livestock rations broiler.

MATERIALS AND METHODS

Biological experiments to determine the effect of replacing 100% of soybean meal protein in leaves and rubber seed fermentation in livestock rations broiler. The study was conducted at the Faculty of Animal Husbandry Unit, University of Andalas Limau Manis Padang. At the end of the study (8 weeks).

Material research: In this experiment used 240 tail doc Arbor Acres broiler strains. Used research cages shaped box. Rations own research compiled by adding leaves and rubber seed fermentation (DBKF). Ration treatment was arranged by isocaloric and isoprotein. Treatment is as follows:

R0 : DBKF much as 0% (control diet or without replacement of soybean meal)
R1 : Replacement of 20% protein soybean meal with DBKF
R2 : Replacement of 40% protein soybean meal with DBKF
R3 : Replacement of 60% protein soybean meal with DBKF
R4 : Replacement of 80% protein soybean meal with DBKF
R5 : Replacement of 100% protein soybean meal with DBKF

The composition of the ration treatments in cattle can be seen in Table 1, while the content of nutrients and metabolizable energy in Table 2.

Experimental design: Rationing in animal experiments conducted with broiler completely randomized design with 6 treatments and 4 replications. Variables measured were associated with response to growth, feed intake, weight gain, feed conversion, carcass percentage and income over feed cost (gross profit).

Processing and data analysis: All data were analyzed using analysis of Variance (ANOVA) of the completely randomized design according to Steel and Torrie (2012). Differences between treatments were tested by Duncan's Multiple Range Test (DMRT).

Table 1: Composition of rations for broiler chickens (PK 20% and EM 3000 kcal/kg)

	Stuffs treatment					
Ration food	R0	R1	R2	R3	R4	R5
Corn	55	54.13	53.26	52.39	51.52	50.65
Soybean	20	16	12	8	4	0
DBKF	0	5.87	11.74	17.61	23.48	29.35
Fine bran	7	6	5	4	3	2
Fish meal	16	16	16	16	16	16
Coconut oil	1	1	1	1	1	1
Bone flour	0.5	0.5	0.5	0.5	0.5	0.5
Top mix	0.5	0.5	0.5	0.5	0.5	0.5
Total	100	100	100	100	100	100

Table 2: Gynecology substances food and energy metabolic broiler rations

Components	R0	R1	R2	R3	R4	R5
Crude protein (%)	22.64	22.45	22.33	22.26	22.12	22.06
Fat (%)	3.77	3.78	3.79	3.80	3.81	3.82
Crude fiber (%)	3.23	4.46	4.80	5.17	5.55	5.92
Ca (%)	1.23	1.22	1.21	1.20	1.20	1.19
P total (%)	0.75	0.73	0.70	0.69	0.68	0.67
ME (Kkal/Kg)	3020.30	3017.46	3015.30	3012.30	3010.34	3004.43
Methionine (%)	0.465	0.464	0.456	0.462	0.458	0.455
Lysine (%)	1.58	1.52	1.46	1.41	1.34	1.27

Description: Result of the calculation

RESULTS AND DISCUSSION

Effect of treatment of ration consumption, body weight gain and feed conversion of broiler chickens: Mean feed consumption, body weight gain and feed conversion of broilers fed rations containing leaves and seeds of the rubber fermentation (DBKF) as a replacement for soybean meal protein can be seen in Table 3. Table 3 shows that feed intake ranged from 1808.45 to 1888.37 g/tail and weight gain ranged from 950.47 to 1074.68-g/tail, while feed conversion values ranged from 1.75 to 1.89. Results of analysis of variance showed that the replacement of soybean meal protein with DBKF up to and including 100% in broiler ration effect was not different ($p>0.05$) on feed consumption and feed conversion, but the effect was significantly different ($p<0.05$) to gain body weight.

Although the consumption levels in the ration of broiler DBKF high, reaching 29.35% instead of 100% protein soybean meal in the ration, did not affect the consumption of broiler chickens during the study. This is caused by DBKF has undergone changes and more palatable quality, in accordance with the opinion of Wahju (1992) who stated that palatability determines the amount of food consumed. This happens because DBKF processing through fermentation with fungi Trichoderma harzianum for 8 days with a temperature of 30°C conditions have better nutritional value than before fermentation because the enzymes produced by Trichoderma harzianum fungus can break down complex components into substances simpler and easier to digest. In addition, molds can produce aroma and flavor that is preferred (Winarno *et al*., 1982). In fact no different treatment of broiler feed consumption was also caused by the energy and protein content of the ration together, making chicken feed consumption by adjusting the amount of energy and protein in the ration (Wahju, 1992).

From Table 3 it can be seen that the higher the level of use of replacement DBKF protein soybean meal in the ration resulted in a decrease in body weight gain of broilers reared until the age of 4 weeks of treatment and were statistically significantly different effect ($p<0.05$) against body weight gain of broilers. DMRT test results further demonstrate that the treatment of R0, R1, R2, R3 and R4 did not differ significantly ($p>0.05$), but significantly ($p<0.05$) higher than R5 treatment.

Not differ significantly ($p>0.05$) treatment R0, R1, R2, R3 and R4 on body weight gain due to the same feed consumption at each treatment to produce the same body weight gain also at the end of the study. In addition, body weight gain were similar in each treatment also caused DBKF used to have optimum digestibility of the fermentation processing, so that the protein can be used as a substitute DBKF protein soybean meal in the ration. In addition, the growth rate is also determined by the level of nitrogen retention of a given material or ration digestibility due to high protein, so it will also be high nitrogen retention (Wahju, 1992).

Crude protein digestibility and nitrogen retention in DBKF products used in the test ration is equal to 76.77 and 74.19% and the critical amino acid lysine is methionine and 0.365 and 1.33%. The low weight gain R5 treatment compared with other treatments caused more DBKF administration (29.35%) resulted in a growing number of nucleic acid content in the diet (Kompiang *et al*., 1994), allegedly a high nucleic acid will affect the needs of Se in the body, because some cells Single Protein (PST) has a low content of Se (Garattini *et al*., 1979), consequently ration shortage Se. Dugaan Se deficiency in treatment research was supported by Succi *et al*. (1980) who stated that the substitution of soybean meal with yeast PST without Se supplementation showed a very slow growth of chickens at the age of 21 days.

In addition, the low body weight gain at 29.38% DBKF use 100% replacement of soybean meal protein in the diet due to the increasing crude fiber content of the ration is 5.92%. According to Soeharsono (1989), obtain optimum results the crude fiber in the ration of broiler chickens aged 4 weeks do not exceed 5.5%. Value of feed conversion ration usage indicates an achievement of a chicken, when the lower the value the more efficient use of feed conversion ration for the livestock. Feed conversion of broiler chickens in this study ranged from 1.75 to 1.89, statistically showed distinct differences are not significant ($p>0.05$). This is due to the same feed intake followed by the same body weight gain as well as feed conversion ratio of the number of rations consumed by broiler chickens body weight gain. Although the treatment R5 body weight gain ($p<0.05$) lower, but when viewed from the angle rate decreased feed consumption. This is due to the higher content of crude fiber are digested, so that the rate of food in the digestive tract becomes slow. Additionally voluminous DBKF nature will reduce consumption because space is not available to receive the feed.

Effect of treatment of carcass percentage and income over feed cost of broiler chickens: Mean percentage of carcass and income over feed cost of broiler chickens fed rations containing leaves and seeds of the rubber fermentation (DBKF) as a replacement for soybean meal protein can be seen in Table 4. Results of analysis of variance showed that the effect of different treatments was not significant ($p>0.05$) against the percentage of carcasses. This is due to the high weight resulted in higher carcass weight anyway (Wahju, 1992), so comparisons between carcass weight to live weight did not differ as a percentage ratio between carcass is the carcass weight multiplied by one hundred percent live weight (Siregar, 2001).

Carcass percentage obtained in this study is higher than the results of the study Kompiang *et al*., (1995), namely

Table 3: Average ration consumption, body weight gain and the feed conversion ratio of broilers chickens during the study (aged 0-8 weeks)

Treatment	Feed consumption (g/head)	Body weight gain (g/head)	Feed conversion ratio
R0	1882.49	1065.22[a]	1.76
R1	1888.37	1074.68[a]	1.75
R2	1872.26	1055.48[a]	1.78
R3	1875.33	1057.47[a]	1.78
R4	1867.78	1037.21[a]	1.79
R5	1808.45	950.47[b]	1.89
Average	1865.78	1040.07	1.79

Description: Different letters in the column indicate significantly different effect ($p<0.05$)

Table 4: Mean effect of treatment of percentage of carcass and income over feed cost of broiler chickens during the study (aged 0-8 weeks)

Treatment	Carcass (%)	Income over feed chick cost (Rp)
R0	64.75	1851.27
R1	66.98	2221.60
R2	66.20	2133.87
R3	66.55	2309.61
R4	65.73	2303.61
R5	65.92	1647.92
Average	65.855	2077.98

from 64.7 to 66.2% and in the range of percentage of broiler chickens ready for slaughter carcass is between 65-75% (Siregar, 2001). The amount of gross income need to be considered in an attempt to find out how much the benefits of the work done. Gross revenues obtained by the difference in sales revenue with the cost of broiler chicks rations and purchases.

In Table 4 it appears that the higher use of leaf and fermented bean gum (DBKF) in the ration, the higher the benefits. This is due to ration the use DBKF cheaper than soybean meal so as to reduce the cost of feed or production costs. However, the replacement rate of 100% soybean meal showed declining profits. This is due to the decline in live weight or carcass weight were obtained. The use DBKF to 75% replacement level of soybean meal protein in the diet can provide higher gain than the diet without DBKF amounting to Rp 370.33 (R1), USD 282.60 (R2), USD 458.34 (R3), Rp 452.34 (R4).

The low IOFC on the use of leaf and seed gum fermentation (DBKF) were higher at 100% replacement of soybean meal protein compared with other treatments due to the weight of the resulting lower life and this is achieved by the high feed conversion. The final results are expected from the use of leaf and seed gum fermentation (DBKF) is to increase profits, according to the opinion of Rasyaf (1994), that the crucial high and low prices of food rations is a source of protein.

Conclusion: Production performance of broiler chickens mainly on feed intake, weight gain and feed conversion is not too much affected by the use of rubber seed leaves and fermentation (DBKF) in cattle rations. Soybean meal protein replacement level with leaves and rubber seed fermentation (DBKF) in the ration can be done up to 80% in broiler rations.

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