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Wafer Nutrient with the Addition of Rubber Seed Flour (*Hevea brasiliensis*) and its Effect on Local Goat Performance

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ABSTRACT

Local goats are one of the ruminants that have several advantages, including being expose to extreme temperatures such as in the tropics and can withstand to various types of diseases. Information regarding studies for wafer with the addition of rubber seed for goat is still limited. This study aims to determine the performance of local goats which is given wafer addition of rubber seed flour (RSF). The research parameters measured for wafer nutrient including dry matter, crude protein, crude fiber, ether extract and ash, while the performance of local goats wafers included feed intake, bodyweight gain, and feed efficiency. Twelve local goats were selected and they were assigned to 4 groups of treatments of three each in a randomized complete block design (RCBD). The 4 diets treatment were wafers added with rubber seeds flour of 0%, 7%, 14% and 21%. The results showed that the addition of rubber seed flour in wafer had effect ($P<0.05$) on the dry matter, crude protein, crude fiber, ether extract and ash but no significant effect ($P>0.05$) the feed intake, bodyweight gain, and feed efficiency. It can be conclude that the use of wafers until 21% rubber seed flour can improve the nutrient content of wafers but can not improve the production performance of local goats.

Keywords: Bodyweight gain, Feed intake, Nutrient, Performance, Rubber seed

Introduction

Local goats is valuable livelihood of farmers for rural and urban communities to improve economic (Kaumbata *et al.,* 2020; Azis, 2010). Local goats are livestock that can live in all ecosystems both hard, cold and dry zones and have certain genetic characteristics so that they have the ability to work better tolerance to diseases and parasites as well as heat stress (Peacock, 2005). The Advantages of goats are high adaptability for various environmental conditions and high reproductive potential. Feed components nutrition to goats can be done with a model in a cage or grazing (Goetsch *et al*., 2010). Single forage given to goats can't increase optimal growth, this is because deficiency of nutrition. Therefore, it is necessary for feed resources that are cheap, easy obtain and good nutritional quality so that potential be used as alternative feed that can replace part or all of the forage and can reduce dependence on the used feed ingredients. One of them is rubber seed flour.

Rubber seeds are considered to have no economic value, they are only used as generative seeds for rubber trees. The rest is wasted, even though the rubber seeds contain high vegetable oil content. Proximate analysis of rubber seeds content nutrients of 3.99% moisture, 21.08% crude protein, 68.5% ether extract, 3.14% ash and 5.88% crude fiber (Udo *et al.,* 2016; Eka *et al.,* 2010; Suprayudi *et al.,* 2015). Udo *et al.* (2019) reported that the use of rubber seed flour rations on weaning goats with a mixture of cassava peels, palm kernel meal, bone meal and salt resulted in bodyweight gain of 38.21-41.60 g. The high nutritional content of rubber seeds, especially crude protein, makes it has the potential used as feed ingredient. However, the use of rubber seeds which produce cyanide acid which rubber seeds dangerous if it consumed by animals so that it needed wafer processing.

Wafers are feed processed using heat and pressure, process of drying, grinding, mixing, wafering with used heating temperature of 95-120°C for 10 to 15 minutes with a length and width of 5 x 5 cm which given to livestock (Retnani *et al.,* 2020). The advantages of wafer product that is compact, high density and has the complete nutritional content needed by livestock (Retnani *et al.,* 2020; Retnani *et al.,* 2010[a]). Mucra *et al.* (2020) reported that wafers with the addition of sago dregs level until 30% can increase dry matter 90.67-91.80% and reduce ether extract 3.26-2.10%. Complete feed that contains sufficient nutrients at certain physiological level which is formed and provided to the daily nutritional needs of livestock. Several research results use of

wafers on ruminant livestock have been carried out, including Retnani *et al*. (2014) reported that the treatment of 10% and 15% of wafers with the addition of *Lamtoro* leaves as a cattle supplement resulted in a higher daily weight gain compared to other treatments with value of 377.78 g/h/d. Furthermore, Retnani *et al*. (2019) stated that giving 10% wafer supplements with the addition of *Leucaena* leaves to the calves of the pasundan produces the best final bodyweight compared to conventional feeding. Adelina *et al*. (2020) also stated use of complete ration wafers with 30% sago pulp as ingredient in bali cattle can increase bodyweight gain betwen 0.00-0.455 kg/h/d. Retnani *et al*. (2014) also reported that sheep fed 100% complete wafers had body weigh 34 kg or 25.6% higher than sheep fed conventional feed. Therefore, this experiment was design to evaluate the effect of the addition of rubber seed flour on wafer for its nutritions content and local goat performance.

Materials and Methods

The materials used for wafers were rubber seed flour, rice bran, cornmeal, molasses, soybean meal and field grass. Twelve (12) 5-9 months old local goats (Kacang x PE), male and female were used with bodyweight ranged from 9-22 kg. The cages were adequate facilities for individual feeding. Goat were fed individually for maintained and growth at 3.5% bodyweight on dry matter basis (Table 1 and 2) for 5 weeks. The Proximate analyzed tools are porcelain dishes, electric ovens, analytical balances, kjeltec, erlenmeyer, 125 ml reservoirs, 25-50 mL capacitation burettes, beakers, crucible cups, soxtec, fibertec, aluminium cups, lead and erlenmeyer glass.

This research procedure includes: (1) processing of rubber seed flour, the rubber seeds were separated from the shells, then dried under the sun to reduce their moisture content, after drying the rubber seeds were ground using a grinder machine; (2) Making wafers, the feed ingredients are weighed and mixed according to the ration formulation (Table 2) that has been prepared, according to treatment needs, stirring until evenly distributed. Furthermore, pressing for 10 minutes at a temperature of 150ºC with a pressure of 200 kg/cm^2 and size of 20 x 20 cm^2; (3) Proximate measurement of wafers includes crude protein, crude fiber, moisture content, ether extract, ash, and Nitrogen Free Extract. Data from proximate were analyzed using analysis of variance (ANOVA) according to a completely randomized design (CRD). (4) Feeding trial: Goat were weight at day 0 to obtain the initial bodyweight and assigned into 4 dietary treatments and 3 groups. Treatments were T0: Wafers with the addition of 0% rubber seed flour; T1: Wafers with the addition of 7% rubber seeds flour; T2: Wafers with the addition of 14% rubber seeds flour; and T3: Wafers with the addition of 21% rubber seeds flour. Goat was fed for 5 weeks, in which 1 week as a preliminary period and 4 weeks for data collection. The fed (wafer and forages) was offered twice at 08.00 and 16.00 (wafer and forage was given separately) and recorded daily and feed refusal was weighted the next morning before feeding. Dry matter intake were determined from feef and feef refusal samples. Bodyweight gain were collected each animal every week during the experiment. Ad libitum access of water was maintained through the experiment. Parameter observed consisted of aveVrage dry matter intake (ADMI), average daily gain (ADG) and feed conversion. Data feeding trial were analized using analysis of variance (ANOVA) according to RCBD as described by Steel and Torrie (1993).

Results and Discussion

Nutrient content of wafers

The nutrient content of wafers with the addition of rubber seed flour is shown in Table 3.

Table 1. Nutrient requirement of fattening goat

Variable	TDN (%)	CP (%)	Ca (%)	P (%)
	60-65	10.9-18.00	0.20-0.30	0.20 – 0.30

Indonesian Minister of Agriculture Regulation, 2014.

Table 2. Composition nutrient content wafer of goats with the addition rubber seed

Ingredient	The addition of rubber seed flour			
	A (0%)	B (7%)	C (14%)	D (21%)
Field grass**	60.0	60.0	60.0	60.0
Cornmeal**	7.0	5.0	5.0	3.0
Rice Bran**	9.0	7.0	5.0	3.0
RSF*	0.0	7.0	14.0	21.0
Soybean meal**	18.0	16.0	13.0	11.0
Molasess**	6.0	5.0	3.0	2.0
	100.0	100.0	100.0	100.0
Nutrient composition				
CP %	11.13	11.14	11.04	11.05
TDN (%)	60.00	60.11	60.02	60.13
Ca %	0.30	0.29	0.28	0.27
P %	0.36	0.32	0.29	0.25

** Agricultural Product Analysis Laboratory, Faculty of Agriculture, Riau University, 2019

Wardeh (1981) : TDN = -14.8356 + 1.3310 (% CP) + 0.7923 (% NNFE) + 0.9787 (% FF) + 0.5133 (% CF). RSF = Rubber Seed Flour.

The highest dry matter content of rubber seed wafers in this study was in the addition of 21% rubber seed flour at 86.01% and the lowest in the addition of 0% rubber seed flour at 80.34%. This is because the rubber seeds have high dry matter value of 85.55%. Then the process of milling, pressing/compaction, heating when making wafers with a wafer machine so that this factor can reduce the moisture content. The lower the water content, the higher the dry matter content. The increase in crude protein in the wafer of rubber seed ration was suspected because at the time of the ration formulation the crude protein content value of rubber seeds in this study had a high value (16.10%). The crude protein content of complete rations with rubber seeds in this study ranged from 21.82% - 23.50%.

Crude fiber content of rubber seed wafers in this study was of 14% rubber seed flour (9.87%) and the lowest was of 0% rubber seed flour (7.10%). The high crude fiber in the 14% treatment is thought because the ingredients of the ration contained high crude fiber such as soybean meal, rice bran and rubber seed flour which have large proportion in the complete ration formulation. Rubber seed flour before pressing is carried out by boiling, drying, grinding until it becomes mash then the ration wafer-making process is carried out by leveling the rubber seed flour and printing it in a wafer machine at 120^0C. The highest crude fat content of rubber seed wafers in this study was in the provision of 21% rubber seed flour.

The increase of ether extract is to be due to the difference in the % level of rubber seed flour up to 21% which has an effect on the increase in ether extract. Whereas the ether extract content of rubber seed flour contain 22.30% ether extract of so that it will have an effect on the ether extract content of the ration wafers by giving the level of rubber seed flour. The highest ash content of rubber seed wafers in this study was in the addition of 0% rubber seed flour (6.66%) and the lowest was in the addition of 21% rubber seed flour (4.92%). This is because the ash content of the rubber seed flour has a low value (3.65%). This will have an effect on the ash content of the rubber seed flour wafers, so that the content of inorganic materials in the form of minerals produced is also different.

Performance of local goats

Performance of local goat include dry matter intake (DMI), bodyweight gain and feed efficiency presented Table 4. DMI of forage in the study ranged from 780.15-872.57 g/h/d. Forage intake was not significantly different between treatments, it was thought to be caused by the addition of relatively the same type of forage feed. The types of forage were in the form of fibrous forages and several types of legumes. This has an effect on consumption which is also relatively the same between all treatments. According to Riaz *et al*. (2014) ruminant feed intake is influenced by species and bodyweight, besides that the crude protein content and fiber fraction affect the high and low feed intake.

The results of dry matter intake of wafers for each treatment were 176.30 (g/h/d); 193.32 (g/h/d); 197.68 (g/h/d); and 186.00 (g/h/d) respectively. The analysis of variance showed that the addition of complete wafer rations with the addition of rubber seed flour had no significant effect on dry matter intake. This is because the intake of wafers is relatively the same in all treatments and is also influenced by palatability and digestibility are also relatively the same due to the same feed ingredients components. The dry matter intake of wafers increases due to increased digestibility. The increase in digestibility is due to better energy synchronization in the rumen, therefore giving wafers is better at increasing palatability than pellets (Argadiyasto *et al.,* 2015; Dianingtyasa *et al.,* 2016). The combined intake (forage + wafer) for each treatment were 980.43; 1065.89; 1017.25, and 966.15 (g/h/d), respectively. The combined intake the study (forage+wafer) ranged from 966.15 to 1065.89 g/h/d. Combined intake shows that goats have the same ability to consume fresh and dry feed.

The bodyweight gain for each treatment ranged 57.14 - 119.05 (g/h/d). The wafer of goats with rubber seed levels of 0%, 7%, 14%, 21% showed no significant effect on bodyweight gain performance. This is related to the intake of relatively the same ratio so that the

Table 3. Nutrient content of wafers with the addition of rubber seed

Level of Rubber Seed Flour	Parameters				
	DM (%)	CP (%)	CF (%)	EE (%)	Ash (%)
0%	80.34±3.18^a	19.35±1.25^a	7.10±0.44^a	2.23±0.27^a	6.66±0.35^c
7%	84.15±0.26^b	21.82±2.10^b	8.53±0.51^b	6.19±0.84^b	6.02±0.19^b
14%	85.70±0.44^b	21.65±0.19^b	9.87±0.72^c	10.73±0.47^c	5.61±0.19^b
21%	86.01±0.38^b	23.50±0.78^b	8.25±0.5^b	13.11±0.74^d	4.92±0.51^a

Data are mean ± Stdv ; *a-d Significant Value, CP = Crude Protein; DM = Dry Matter; CF= Crude Fiber; EE = Ether Extract

Tabel 4. Dry matter intake (g/head/day), bodyweight (g/head/day) and feed efficiency

Parameters	Treatment			
	A (0%)	B (7%)	C (14%)	D (21%)
Feed Intake of Forage	804.13±217.26	872.57±264.87	819.57±246.69	780.15±216.86
Feed Intake of Wafers	176.30±55.71	193.32±54.70	197.68±56.13	186.00±64.20
Feed Intake of Combine	980.43±272.88	1065.89±319.14	1017.25±302.00	966.15±280.87
BWG	57.14±18.90	119.05±33.75	78.57±39.77	64.28±12.37
FE	18.76±8.06	9.76±4.45	15.10±8.60	15.46±5.89

Data are mean ± Stdv, BWG = Bodyweight gain.

resulting bodyweight gain is not optimal. Overall, the daily bodyweight gain of local goats in this study was 79.76 (g/h/d). The results of this study were lower than those of Retnani *et al*. (2010[b]), with the addition of market vegetable waste wafers resulting in an average daily bodyweight gain of sheep 110.71-126 g/head/day.

The wafer on addition of 0%, 7%, 14%, and 21% rubber seed flour in goats showed no significant effect feed efficiency. This is because feed intake and bodyweight gain have no significant effect, so that the ratio between feed intake and bodyweight gain is high and causes the ability of livestock to convert feed into meat is relatively low.

Conclusions

The use of wafers with the addition of 21% rubber seed flour can improve the nutrient content of wafers but can not improve the performance of local goats.

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