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Provision of Fermented Coffee Skins as Additional Feed for the Growth of Goats

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A B S T R A C T

Coffee skin is one of the wastes generated from coffee bean processing, which is still potentially used as animal feed through fermentation, especially for goats as ruminants. Coffee skin fermentation using local micro-organisms (LMO) produces the best quality, and the provision of 10% substitution significantly affects the growth of pigs. This study aimed to determine the response to the appearance of prospective parent goats given fermented coffee husk waste as additional feed to their growth before the reproductive phase. The method used in achieving these objectives is the experimental design method using a Completely Randomized Design (CRD) with 4 treatments, namely: without additional coffee husk (Ko), giving coffee skin 5% (K1), 10% (K2), and 15% (K3) and each treatment was repeated 3 times. The basic feed given is forage mixed with grass and legumes, and coffee skin is given before being given forage. The results showed that giving fermented coffee skins additional feed had a significant effect (P<0.05) on body weight gain. The higher the level of fermented coffee peels the higher the average added weight until the level of 15% (K3) showed the best results with an additional body weight of 211g/day, but not significantly different (P> 0.05) with K1, and K2. From this study, it can be concluded that the provision of fermented coffee skin waste as additional feed significantly affects the additional body weight of goats up to a level of 15%.

1. INTRODUCTION

Arabica coffee is one of the leading agricultural products from Bangli Regency, especially in Catur Village, Kintamani District. Its area is 366.59 km2 with altitudes between 900 – 1,700 m and temperatures between 160C – 200C; with such agro-limit conditions, Arabica coffee production in Kintamani in 2020 will reach 2,249 tons (53.68%) of the total Arabica coffee production in the Province of Bali [1]. Meanwhile, Catur Village is estimated to produce 250 tons/year of coffee cherries for wet processing and 25 tons for dry processing (natural). Still, the wet process of coffee with fermentation produces better quality than other methods without fermentation [2]. Coffee processing at Catur Kintamani has implemented complete and good machine technology, starting from filler machines, huller machines, and roasting machines to get good quality coffee for domestic and several countries markets. From the coffee processing process, of course, it produces quite a lot of coffee skin waste, namely 40-45%, so with an estimated coffee production in Catur Village of 275 tons/year, it produces 124 tons/year of coffee skin waste. With that large amount of coffee skin waste, if left scattered in the open and exposed to rain and hot sun, it will be detrimental to the environment.

Many agricultural waste fermentation technologies have been developed, and one of the potential fermentation processes can be carried out on coffee skin waste as animal feed. Coffee skin waste still contains nutrients that livestock needs: 8.6 – 9.5% crude protein, 18.17% crude fiber content, and 1.97% fat content. Besides that, livestock also needs calcium and phosphorus content [3]. From the results of research [4] trials of coffee skin waste fermentation using several types of probiotics, namely EM-4, Bio Bali Tani, Aspergillus niger, and local micro-organisms (LMO) coffee skins concluded that fermentation of skin waste. This coffee can significantly improve the quality of coffee skin waste, especially the crude protein (CP) content. The best results were using coffee skin LMO probiotics with a protein content of 17.67%, significantly better than using EM4 probiotics (12.54%), Bio-Bali Tani (13.83%), and Aspergillus niger (11%).

The results of the substitution of fermented coffee skin waste in commercial feed for pigs in the growth phase found that the level of 10% significantly affected (P<0.05) the additional body weight for 2 months, reaching 12.76 kg, compared to the level of 5% (10, 38 kg), and without adding coffee skin (7.89 kg) [5].

Meanwhile, research on commercial feed substitution with fermented coffee skin on free-range chicken combined with alkaline water obtained a significantly different effect (P<0.05) by giving as much as 5% [6]. Therefore, this study wanted to determine the response and performance of goats given fermented coffee skin waste using coffee skin MOL as additional feed besides basic forage feed.

2. MATERIALS AND METHODS

His research was conducted in the Subak Pebunut Goat Livestock Group in Catur Village, Kintamani-Bangli District. Research activities were carried out for 3 months from May – July 2023. The design used in this experiment was a completely randomised design (CRD) with 4 treatment levels of fermented coffee husk waste, namely: Ko (control without coffee husk), K1 (given 5% coffee husk), K2 (granted 10% coffee husk), and K3 (granted 15% coffee husk waste). Each treatment was repeated 3 times so that the number of experimental units (mother pigs) used was 12 heads. Given coffee skins based on the average initial weight of goats in the form of dry matter (DM), the amount of fermented coffee skins is 175g (K1), 350g (K2), and 535g (K3). The coffee skin fermentation process uses local microorganisms (LMO) from coffee skins and molasses, with a ratio of 100 kg of coffee skins: 1 litre of LMO and 1 litre of molasses, and the fermentation time is carried out for 2 weeks. The variables measured were initial body weight, body weight after 1 and 2 months of treatment, and additional body weight. Data were analysed statistically using analysis of variance (ANOVA) according to the design used. If the treatment has a significant effect, proceed with the 5% BNT test. Data processing was carried out with the help of Microsoft Excel, Minitab, and SPSS Software Programs.

3. RESULT AND DISCUSSION

The table shows that the initial weight of experimental goats has the same weight with an average of 36.0 – 38.3 kg; the statistical difference is not real(P>0.05). In the test 1 month after treatment, the treatment without coffee husk (Ko) was statistically the lowest (P<0.05) with a body weight of 39.0 kg, compared to treatment K1 (42.67 kg), K2 (42, 67 kg) and K3 (43.0 kg). The more levels of additional fermented coffee peels, the higher the body weight, where the 15% level (K3) showed the highest body weight but was not significantly different (P>0.05) compared to the 10% level (K2) and 5 levels. % (K1). Whereas in weighing 2 months after treatment, the results were the same as weighing 1 month after treatment. There was no weight gain.

Based on the initial body weight and the final body weight of the study, the average body weight gain of goats still showed that the Ko treatment (without the addition of fermented coffee husks) was significantly (P<0.05) the lowest compared to K1, K2, and K3. Meanwhile, the difference between K1, K2, and K3 was insignificant (P>0.05), but still, K3 showed the highest average weight gain. Likewise, in the calculation of the additional daily weight gain, the Ko treatment (without adding fermented coffee husks) was significantly (P<0.05) the lowest compared to K1, K2, and K3, and the more levels of additional daily weight added the fermented coffee skins increased. a lot and highest in K3 treatment (211.0 g/day).

Table 1. Growth of Goats Given Additional Feed Fermented Coffee Skin Waste

Measurement Variables	Treatment			
	Ko	K_1	K_2	K_3
Initial body weight of the study (kg)	37.67a	37.67a	36.67a	36.67a
Weight 1 month after treatment (kg)	38.67a	42.67b	42.67b	43.00b
Weight 2 months after treatment (kg)	38.67a	42.67b	42.67b	43.00b
1 month weight gain (kg)	3.00a	5.00b	6.00b	6.33b
Daily weight gain (g)	100.00a	166.67b	200.00b	211.00b

Note: Different letters behind the numbers in the same row indicate a significant difference (P<0.05)
Ko: Without adding fermented coffee skin
K_1: Provision of 5% fermented coffee skin
K_2: Provision of 10% fermented coffee skin
K_3: Provision of 15% fermented coffee skin

Based on the description of the research results above, it shows that giving fermented coffee skins can meet the crude protein needs needed by goats for the formation of cells and tissues in the body to increase their growth. The crude protein content in coffee skins fermented using LMO increases the crude protein content from 8.6 – 9.5% to 17.67% [4], higher than forage grass and sufficient microelements. Meanwhile [7] states that the nutritional content of coffee skin fermented solidly contains nutrients including dry matter 97.987, protein 13.920, crude fiber 16.368, crude fat 6.179, organic matter 75.096, ash 23.051, and water content 2.013. This is supported by the statement [8] that to increase livestock's body weight gain is largely determined by the nutritional completeness factor in the feed. Research [9] found that fermented coffee skins, besides the relatively high N content, also contain many macro mineral elements, especially potassium. This element is needed by livestock as a component of cell formation so that the body weight gain of livestock is higher. Even though coffee skin contains several anti-nutritional substances such as caffeine, tannin, lignin, and polyphenols, after the fermentation process, these elements can be derived to become beneficial for livestock growth [10]. Goats, as ruminants, have a better ability to digest crude fiber and lignin than non-ruminants. Still, after being fermented, the bonds that make up the crude fibre and lignin can be broken down so they are easier to digest. According to Ref. [11], coffee husk waste has a dry matter digestibility of 44.51% and organic matter digestibility of 42.16% so that fermentation can be increased. Waste from coffee husks is used as a feed ingredient because it contains quite a high crude protein, namely 11.18% and 21.74% crude fiber so it can be used as a limiting factor [12]; [13]. In addition, coffee skin contains cellulose, hemicellulose, and lignin. The lignin

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contained in the coffee skin is a plant constituent bond that forms part of the structure and plant cells, there is a coffee skin content of 52.59%. Coffee skin contains high lignin and inhibits metabolic processes in livestock [12]; [14].

The more fermented coffee skins were given to goats, up to 15% as additional feed, the higher the body weight gain and the additional daily weight gain. This shows that the possibility of increasing body weight is higher if given more. In the histogram image, it can be seen that the tendency of additional body weight and daily weight gain is increasing, only further research is needed on what percentage is the highest limit for adding fermented coffee skin. The utilisation of fermented coffee peels in feed for livestock, besides being able to meet the nutritional needs needed, with mineral content, can increase metabolic processes so that the growth process is faster.

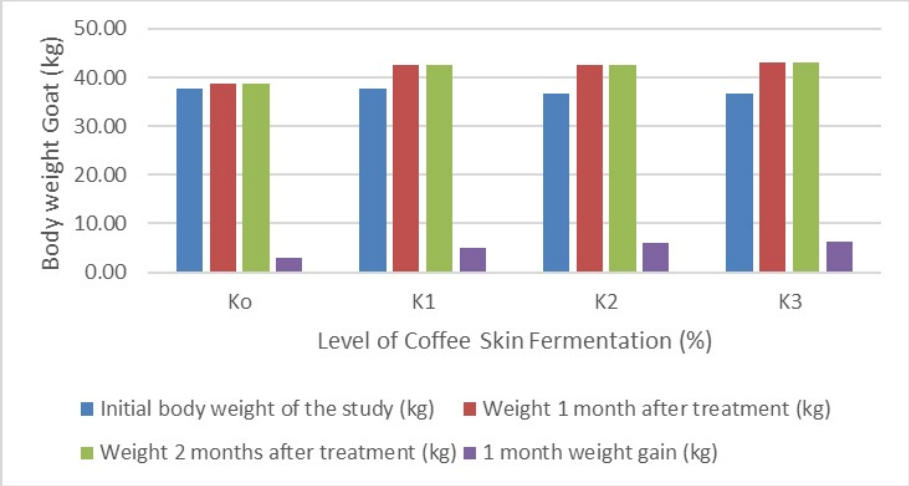

Figure 1. Histogram of Body Weight and Additional Body Weight of Fermented Coffee Skin Feeding to Goats.

Supplementation of energy and protein sources in the basal diet of corn tumpi and coffee husks provides easy weight gain in rams of 90 g/day [15]. According to [16], coffee husk waste fermented with local microorganisms positively affects feed consumption, body weight gain, and feed conversion. It can be used as an alternative feed ingredient up to 30% in Murrah buffalo concentrate. Coffee skin waste should be used at a level of 30% because it has a high palability value and low density and crumbs, making it easier for ruminants to consume it [17]. Research by Ref. [15] supplementation of energy and protein sources in the basal diet of corn tumpi and coffee husks gave rams an easy weight gain of 90 g/day. Giving additional feed in the form of fermented coffee husks plus rice bran, whether added with cassava or not, can increase the birth weight of Bali's calves by 17.70-18 kg [18] (Efendi and Sugandi, 2013). From research [19], administration of fermented coffee skin using Aspergillus niger in broiler feed can significantly increase ration consumption and gain weight. [20] stated that giving coffee husks at a level of 25% as a substitute for corn in chicken livestock can give good results. Meanwhile, applying fermented coffee skins using probiotics to local chickens up to 73.29% positively affected carcass composition. In the observation after 2 months of giving fermented coffee peels as additional feed, it turns out that the body weight of goats did not gain weight compared to 1 month after administration. This is because the animals in the study have experienced their peak adult body and are entering the reproductive phase, so there is no further increase in body weight. The table shows that the body weight remained the same, but the treatment with 15% fermented coffee skin (K3) still showed the highest. The same is true if measured by weight gain per day following body weight measurements.

4. CONCLUSION

The use of fermented coffee husk waste using local microorganisms (LMO) from coffee husks as additional feed for goats had a significant effect ($P<0.05$) on increasing growth up to a level of 15%. The higher the addition of fermented coffee husks to goat feed, the higher the body weight, so further research is needed at levels above 15%.

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