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Carcass Quality, Non-Carcass Component and Meat Cholesterol of Kacang Goat Fed with Fermented Cocoa Shell

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ABSTRACT

The experiment was conducted to investigate carcass quality, non-carcass component and meat cholesterol content of Kacang goat fed with fermented cocoa shell (FCS). Materials used in the experiment consisted of 9 male Kacang goat (6 - 9 months of age and ± 18,67 kg of body weight), corn straw, rice bran and FCS using three types of starters. The goat was divided into 3 groups of FCS fermentation of cocoa shell were carried out using 3 types of starters, i.e. cocoa shell fermentation 1) without additional starter (WAS FCS), 2) with Bioplus (Bioplus FCS, 3) with burger feed sauce (BFS FCS). All goats were fed corn straw and rice bran amounting to 70% and FCS amounting to 30% for 2 months. They were then slaughtered at Majeluk Slaughterhouse, Lombok. The data of carcass quality, non-carcass component, cholesterol content, and marbling were collected. The results showed that the carcass quality and non carcass component of Kacang goat were not significantly different among the feed treatments. However, the cholesterol content of meat was significantly different among the feed treatments ($P<0.05$). The average of carcass percentage, backfat thickness, rib eye area, fleshing index, cholesterol content and marbling of Kacang goat fed WAS FCS were 47.69%, 1.68 mm, 29.01cm^2, 0.85%, 30.13 mg/100g, and 0.16%; fed Bioplus FCS were 48.67%, 1.80 mm, 30.79 cm^2, 0.91%, 34.96 mg/100g and 0.05%; fed BFS FCS were 48.02%, 1.74 mm, 29.90 cm^2, 0.77%, 31.88 mg/100g, and 0.11%, respectively. Non-carcass component of Kacang goat was not significantly different among the feed treatments, it was 42.41±0.064% in average. Cholesterol content of meat of Kacang goat differed among the feed treatments ($P<0.05$). Kacang goat fed WAS FCS had the lowest cholesterol content (30.13 mg/100 g). It could be concluded that Kacang goat fed ration containing fermented cocoa shell with several starters produced similar carcass quality and non carcass component. However, FCS without additional starter resulted in lower cholesterol content of meat.

Key words: Additional, Carcass, Cocoa shell, Kacang goat, Meat cholesterol, Non-carcass component

Introduction

Indonesia has a high potential of cocoa waste since the large area of the cocoa plantation is about 1.852.900 Ha with 723.000 tons of cocoa production each year (BPS, 2013). Thus, it can produce about 3,5 million of cocoa waste every year. Cocoa waste is still under utilized by the farmers. In 2010, the data showed that there were 1.876.600 tons of cocoa waste and only 94.503 tons (5.04%) have been used as feed animal. Cocoa shell contains high nutrients about 6-12% of crude protein, 27-31% of cellulose, 10-13% of hemicelluloses and 12-19% of lignin (Amirroenas, 1990). The low utilization of cocoa shell as feed animal is caused by anti-nutritive content , especially theobromine which is poisonous for the animal (Indraningsih *et al.*, 2006). Furthermore cocoa shell should be -physically, chemically and biologically processed for a better result (Indraningsih and Sani, 2005).

Cocoa shell has been biologically processed or by fermentation using commercial starter such as EM4, urea, BIOFIT, yeast (*Rhizopus stolonifer* LAU 07) to increase protein content up to 16% (Lateef *et al.*, 2008), the use of *Aspergillus* spp can lower crude fiber of cocoa waste (crude fiber 33.00%, NDF 55.79%, and ADF 44.29%) (Alemawor *et al.*, 2009). Fermentation using *Aspergillus oryzae* can increase the content of protein about 8.74% (Munier, 2009). Some microorganisms are a presence in rumen: protozoa (76,33/ml), bacteria (2,3x10^8 CFU/g) and fungi (1,9x10^3 CFU/g) that help to digest low quality fiber in the feed (Purbowati *et al.*, 2014). According to Omed *et al.* (2000), there were several bacteria in the rumen, such as *Bacteriodes, Fusobacterium, Streptococcus, Eubacterium, Ruminococcus,* and

Lactobacillus. A number of research stated that adding rumen liquid could make fermentation process higher (Arora, 1992) and absolutely can be used as a starter for fermentation (Gamayanti *et al.*, 2012; Purbowati *et al.*, 2014).

The higher quality of feed can affect the growth of the animal, quality of carcass and meat production. Simple feed technology with fermentation using a Bioplus starter and BFS needs to be applied to reduce anti-nutritive theobromine. Fermentation processed is expected to increase the quality of cocoa shell, so that it can be utilized by the ruminant. Suryanto *et al.* (2014) reported that FCS could be given to Bali cattle and had no effect on its carcass and non-carcass quality. However, feeding cocoa shell to small ruminant had never been done. The experiment of FCS utilization is necessary to every out to difference its effect on carcass quality and cholesterol content of Kacang goat meat.

Materials and Methods

The experiment used nine male Kacang goats at 6-9 months of age, with initial weights of 18,33-19,33 kg, cocoa shells fermented using no additional starter, Bioplus, and burger feed sauce (BFS), rice bran and corn straw from crop waste.

Cocoa shells fermentation. Cocoa shells were chopped 2x3cm and dried beneath the sun for 2-3 days. Dried cocoa shells were milled into a powder. Cocoa shell powder mixed with 1.5% of rice bran, 0.5% of urea, starters (without additional starter, with 0.3% bioplus and 0.3% BFS) and water. The mixtures were put into a plastic bag and tied tightly to accelerate fermentation process. In the day 4, fermentation was finished, the plastic bags were opened and the fermented cocoa shell was allowed to air dry for a while before feeding let them opened before giving it to the goat.

Goat fattening. Nine male Kacang goats were divided into 3 groups. Group I was given ration 30% FCS without additional a starter (WAS FCS), group II was given ration 30% of FCS with bioplus (bioplus FCS) and group III was given ration 30% FCS with burger feed sauce (BFS FCS). Each group was also given 70% of corn straw and 0,25 kg of rice bran/head/day. These feeding treatments were carried out for 2 months and then at the end of the experiment, the goat were slaughtered with the Halal method in Majeluk Slaughterhouse, Mataram.

Carcass and meat quality evaluation. Carcass evaluation consisted of body weight, carcass weight, carcass percentage, back fat thickness, rib eye area and fleshing index of carcass. Besides that cholesterol content, marbling and non-carcass component were determined (Soeparno, 2015). Marbling was determined by visual appraisal using Loup (10x zoom). Meat samples were stored in the freezer for 12 hours before examined the fat. Marbling quality was calculated by some visible white fat present within the lean of *longissimus dorsi* muscle per weight of the sample in percent. Cholesterol content of meat was determined by using *Gas Chromatography* method (Helrich, 1990 *cit.* Thohari *et al.,* 2007).

The data were analyzed using analysis of variance (completely randomized design one-way) and any means different were analyzed using Duncan's new multiple range test (Steel and Torry, 1980).

Results and Discussion

Carcass quality of male Kacang goat

Carcass quality of male Kacang goat fed with different FCS is shown in Table 1. Statistical analysis showed that feeding male Kacang goat with different FCS did not affect the carcass percentage. The average carcass percentage of male Kacang goat was 48.12±0.28% (Table 1). This result was higher than carcass percentage of 2 years old Kacang goat reported by Sunarlim and Usmiati, 2006) (42.48%). Carcass percentage of kid goat that reported by Zimerman *et al.* (2008) *cit.* Sodiq (2011) was higher about 56%. On the other hand, Todaro *et al.* (2006) *cit.* Sodiq (2011) stated that carcass percentage of Girgentana is higher about 64.9%. Either Bioplus FCS and BFS FCS resulted in high sufficient carcass percentage and balance meat bone ratio. This was in agreement with the study of Sodiq (2011) that Kacang goat at 10-23,5 kg of weight produced carcass about 44.09±1.98%. Soeparno (2015) observed that the higher of body weight, weight of carcass would be increased.

Goat fed with FCS resulted back fat thickness in average about 1.74±0.17 mm. The use of FCS gave low percentage of back fat thickness. This study was appropriate to Yosita *et al.* (2011) reported that high percentage of back fat thickness on carcass was not good and could reduce profit meat producers since the high fat would be discarded.

Rib eye area is meat indicator which commonly used. However, it can not be used as sole indicator in estimating meat production, but instead complement indicator (Ransaleleh, 1998). Kacang goat given bioplus FCS produced rib eye area about 30.79±0.14 cm^2, higher than BFS FCS and WAS FCS. This result was similar to Field and Schonover (1967) *cit*. Ransaleleh (1998) reported that rib eye area was affected by weight live and had a positive correlation with carcass weight. Group of goat with Bioplus FCS has high carcass weight, after rib eye area (30.79±0.14 cm^2).

The fleshing index is one of the carcass characteristics or criteria of carcass scoring objectively to replace carcass conformation assessment visually subjectively. Wiyatna (2007) defined fleshing index was the ratio of carcass weight and carcass length. Thus the higher value of carcass percentage was not constantly followed by increased of the fleshing index, it can be caused by the length of the carcass. Fleshing

Table 1. Carcass quality of male Kacang goat fed with fermented cocoa shell

Parameter observed	Type of starter		
	WAS	Bioplus	BFS
Carcass weight (kg)^{ns}	9.31±0.58	10.29±067	9.97±0.90
Carcass percentage (%)^{ns}	47.69±0.37	48.67±0.90	48.02±0.80
Meat bone ratio^{ns}	2.07:1	2.48:1	2.28:1
Back fat thickness (mm)^{ns}	1.68±0.24	1.80±0.10	1.74±0.17
Rib eye area (cm^2)^{ns}	29.01±0.54	30.79±01	29.90±0.34
Fleshing index (%)^{ns}	0.85±0.05	0.91±0.05	0.77±0.07

^{ns} = not significant; WAS= without additional starter, BFS= burger feed sauce.

index of goat fed FCS without starter, Bioplus FCS and SBP FCS was ranged from 0.77±0.07 to 0.85±0.05% (below 1%). Wiyatna (2007) informed that livestock with carcass percentage above 50% resulted fleshing index higher than 1% (1.232%).

Non-carcass component of male Kacang goat

Results of non-carcass component percentage of male Kacang goat can be seen in Table 2. Non-carcass component of male Kacang goat fed with FCS without starter was about 42.44%, a group of FCS with Bioplus 42.34% and a group of FCS with SBP 42.46%. This study was inline with Soeparno (2015) reported that non-carcass component of the goat was about 45-47%.

Feed contained SBP could slightly lower percentage non-carcass component of Kacang goat. The decrease of non carcass component percentage would increase carcass proportion of Kacang goat. This condition could make the goat, and sheep breeders become happy. Their profit would be increased since the sale of livestock currently is based on the weight of life, the weight of carcass and meat produced by the livestock.

Content of cholesterol and marbling in Kacang goat

The cholesterol content and marbling of meat of Kacang goat fed with FCS can be seen in Table 3. Table 3 showed that feeding with FCS was significantly (P<0.05) affected cholesterol content of Kacang goat. The goat fed with WAS FCS had 30.13±0.66% of cholesterol, lower than Bioplus FCS and BFS FCS. These results were lower than the study conducted by Saidin (2000) and Suryanto *et al.* (2014). Meat produced by big-size and small-size cattle contained 65 mg/100g and 68 mg/100g of cholesterol respectively (Saidin, 2000), while Bali beef fed with FCS had 38.75 mg/100 g of cholesterol (Suryanto *et al.,* 2014). Low cholesterol content was due to the early age of goat slaughtered ranged from 6 to 9 months of age. Cholesterol content was influenced by feed (nutrition status) given through reared management. Goat fed with cereals were able to produce higher cholesterol and marbling content than fed with forage (Soeparno, 2015), it also had higher marbling percentage and tended to increase back fat thickness percentage. Grass/forage, feedstuff and cattle breed had

Table 2. Non-carcass component of male Kacang goat fed with fermented cocoa shell

Parameter (%)	Type of starter		
	WAS	Bioplus	BFS
Hide^{ns}	9.22±0.34	9.35±0.51	9.73±1.23
Head^{ns}	9.70±0.34	9.33±0.70	10.05±0.93
Blood^{ns}	4.35±0.41	4.28±0.22	4.43±0.32
Feet^{ns}	3.66±0.46	2.99±0.16	3.21±0.14
Liver^{ns}	1.88±0.31	1.87±0.47	1.60±0.52
Heart ^{ns}	0.42±0.05	0.42±0.01	0.42±0.04
Lymphe^{ns}	0.21±0.08	0.17±0.04	0.17±0.02
Lungs^{ns}	2.19±0.33	2.41±0.21	2.25±0.53
Digestive tract^{ns}	9.08±0.52	8.86±0.25	8.73±0.24
Reproductive organ^{ns}	1.73±0.18	2.66±0.39	1.87±0.27
Non carcass component	42.44±0.16	42.34±0.23	42.46±0.41

^{ns} = not significant; WAS= without additional starter, BFS= burger feed sauce.

Table 3. Cholesterol content and marbling of meat of goat fed with fermented cocoa shell

Parameter	Type of starter		
	WAS	Bioplus	BFS
Cholesterol (mg/100 g)*	30.13±0.66^{b}	34.96±2.27^{a}	31.88±1.44^{b}
Marbling (%)^{ns}	0.052±0.006	0.046±0.015	0.0391±0.025

* = significantly different in P<0,05; ^{ns} = not significant
WAS= without additional starter, BFS= burger feed sauce.

significant effect to the beef nutritional composition. Feeding with grass/forage typically resulted in leaner product (Van Elswyk and Mc Neill, 2014).

Conclusion

From the study, it could be concluded that Kacang goat fed ration containing fermented cacao shell with several starters produced similar carcass quality and non carcass component. However, fermented cacao shell without additional starter resulted in lower cholesterol content of meat.

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