QUALITY OF CARCASS, BEEF MARBLING AND MEAT CHOLESTEROL CONTENT OF MALE BALI CATTLE FED WITH FERMENTED COCOA POD HUSK-BASED FEED

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Abstract

This research aimed to examine carcass quality, marbling and cholesterol content in beef of male Bali cattle fed with feed based on cocoa pod husk concentrate which fermented with Bioplus (CPHCFBio). The research conducted at the Teaching Farm Laboratory, Faculty of Animal Husbandry, University of Mataram. As many as 9 male Bali cattle aged 1.5 - 2 years were used with its initial weight of 142-172 kg. The experiment was arranged based on a completely randomized design in the same direction with 3 treatments: P1 = 30% CPHCFBio + 70% corn straw; P2 = 40% CPHCFBio + 60% corn straw and P3 = 50% CPHCFBio + 50% corn straw. The data of carcass and non-carcass percentage, fleshing index, dorsal fat thickness, rib eye area, marbling and cholesterol level of beef were analysed using analysis of variance with SAS software and continued with Duncan's Multiple Range Test at 95% of convidence level. Results showed that the use of CPHCFBio up to 50% of corn straw can produce carcass which are in accordance with Indonesian National Standard (SNI) as followed: carcass percentage 52%, non-carcass percentage 37%, fleshing index 0.843%, rib eye area 58.103 cm^2, dorsal fat thickness 2.66 mm, marbling score (3,337-3,717%) and cholesterol content (3,337-3,717%).

Key words: carcass, marbling, cholesterol content, fermented cocoa

1. Introduction

Cocoa pod husk (CPH) is one of plantation wastes which potential to be used as alternative feed for large ruminants such as cattle and small ruminants such as sheep (Kamalidin, et al., 2012) and Suparjo, et al. (2009). Statistical data showed that cocoa production in West Nusa Tenggara Province reached 2,101.90 tons per year with the amount of cocoa pods around 70%, so that in one year in this province there were 1,470.7 tons of CPH available (Indonesian Statistical Bureau, 2011). Anas et al. (2011) and Sari (2012) state that the use of CPH for cattle feed can reach 30-40% of feed needs, therefore the utilization of CPH can solve problems associated with limitation of animal feed and save labor in the supply of forage feed. Laconi (1998) and Aregheore (2000), stated that CPH contained high lignin and theobromelin, high crude fiber (40.03%) and low protein (9.71%). According to Ammirroenas (1990), CPH contains cellulose 36.23%, hemicellulose 1.14% and lignin 20% - 27.95%. High levels of lignin and low protein content of CPH can be managed by fermentation. CPH fermentation can enhance digestibility, reduce lignin content, increase protein levels, suppress the adverse effects of theobromeline toxins and increase the productivity of cattle. Several types of fermentors which have been used with varying results include: a combination of EM4 with Urea (Anas et al., 2011), biofit (Kamaliddin, 2012), *Aspergillus oryzae* (Munir, 2013), and *P.chrysosporium* species (Laconi, 1998, Murni et al., 2012) who can reduce lignin content by 18.36%, *Aspergillus niger* (Priyono, 2009), Trichoderma sp, can increase protein levels by 24%, and ash content by 7.52%, Koruria rosea can increase amino acid lysine level by 3.46%, histidine 0.94% and methionine levels of 0.69% (Aziz et al., 2011). The use of the Neurospora crassa mold (Nuraini and Maria Endo, 2009) can increase protein from 4.56% to 21.20% in a 60% mixed mixture of sago pulp with 40% tofu dregs, and some uses of a combination of Starbio + urea as a fermentor.

Carcass is the main product after cattle are slaughtered. The quality and quantity of carcass yielded is influenced not only by on farm factors such as quality of young cattle and feed technology but also affected by off farm factors especially post harvest handling of the products. Several common parameters of carcass quality assessment are carcass percentage, carcass length, fleshing index, rib eye area, back fat thickness, carcass obesity score, fat color score, flesh color score and meat pH value (Saka et al., 2011). In addition, assessment of meat quality according to the Indonesian National Standard (SNI) can be considered from the

physical quality and microbiological quality (Anonim, 2008). The physical quality of meat can be seen from the color of meat, fat color, marbling and texture. Marbling is the popular term for intramuscular fat. Marbling is visually seen as white fat grains scattered between meat fibers (Syamsir, 2011). It makes beef more delicious and tender when consumed. Beef marbling in addition to the innate factor, can also be influenced by feed factors. Cattles whose feed contains more grains (grain-fed-beef) or their feed contains high protein, the marbling is higher than that of cattle which are only fed with forage. In an effort to improve the quality of carcass and marbling of Bali beef, researchers examined a simple feed technology that was able to increase cattle feed protein by utilizing molten rumen as a non-commercial fermentor and commercial fermentor (bioplus, probion and starbio) in CPH fermentation that could CBC protein content and in the end it is expected to be able to increase the growth, carcass quality and marbling of Bali beef maintained by a group of cattle breeders in the cocoa fruit production center.

2. Material And Methods

We used 9 male Bali cattle aged between 2-2.5 years with initial weight about 142-172 kg. Concentrated of cocoa pod husk were made with anaerobic fermentation for 4 days using Bioplus inoculum. Fattening of the cattle was conducted at the Teaching Farm Laboratory, Faculty of Animal Husbandry, University of Mataram for 60 days. The experiment was arranged based on a completely randomized design in the same direction with 3 treatments: P1 = 30% CPHCFBio + 70% corn straw; P2 = 40% CPHCFBio + 60% corn straw and P3 = 50% CPHCFBio + 50% corn straw. The cattles were slaughtered in abattoir of Majeluk Mataram at live-weight of approximately 186.5 – 189.5 kg. The slaughtering process was done using method which approved by Indonesian Muslim Scholars Board. The cattles were fasted for 12 hours prior to the slaughter. The variables observed were percentage of carcass and non carcass, fleshing index, dorsal fat thickness, rib eye area (REA), beef marbling and meat cholesterol content. The data were analysed using analysis of variance with SAS software and continued with Duncan's Multiple Range Test at 95% of convidence level.

3. Result And Discussion

3.1 Carcass and non-carcass

Result on carcass and non carcass quality of Bali cattle fed with cocoa pod husk based feed were presented in Table 1.

Table 1. Quality of carcass and non carcass of male Bali cattle fed with Bioplus fermented cocoa pod husk concentrate based feed (CPHCFBio).

Variables	Treatment			P
	CPHCFBio (30%)	CPHCFBio (40%)	CPHCFBio (50%)	
Slaughtered weight(Kg)	186,500±11,533a	189,500±9,657a	186,667±13,042a	NS
Carcass weight (Kg)	97,117±7,261b	100,060±5,620a	97,603±9,484b	*
Carcass (%)	52,045±0,732	52,795±0,753	52,225±1,669	NS
Dorsal fat thickness (mm)	2,600±0,078	2,633±0,0567	2,617±0,548	NS
Rib eye area (cm^2)	57,100±1,430	58,103±1,345	57,602±0,548	NS
Fleshing Indeks (%)	0,843±0,064	0,837±0,046	0,840±0,548	NS
Hide (%)	10,472±0,414	9,411±0,241	9,930±0,423	NS
Head (%)	5,634±0,126	5,806±0,061	5,631±0,138	NS
Viscera (%)	4,828±0,092	4,749±0,049	4,730±0,173	NS
Feet (%)	4,301±0,274	4,229±0,219	4,200±0,294	NS
Liver (%)	0,979±0,100	0,9640,111	0,961±0,149	NS
Limpa (%)	0,392±0,040	0,404±0,013	0,374±0,029	NS
Lungs (%)	0,635±0,201	0,720±0,045	0,639±0,094	NS
Heart (%)	0,355±0,061	0,350±0,064	0,355±0,061	NS
Digestive tract (%)	10,558±0,363	10,828±0,303	10,551±0,320	NS
Reproduction organ (%)	0,605±0,076	0,527±0,027	0,586±0,112	NS

Note: NS = Not significant, * = Significant (P<0,05)

The results of the variance analysis showed that the treatment of feed based on the percentage of CPHCFBio had a significant effect (P<0.05) on carcass weight, but had no significant effect (P<0.05) on slaughter weight, carcass and non carcass percentage as well as on meat quality indicators such as back fat thickness, rib eye area, and fleshing index of male Bali cattle. Table 1 indicates that on average the percentage of carcass of male Bali cattle

based on treatment ranged from 52.045 ± 0.732% - 52.795 ± 0.753%. This percentage of carcass reflects that the provision of CPHCFBio as Bali cattle feed can produce a high carcass, which is above 50%. Treatment II (CPHCFBio 40%) resulted in a higher percentage of carcass, which was 52.795 ± 0.753%, followed by the treatment of CPHCFBio 50% (52.225 ± 1.669 %) and the lowest was in the CPHCFBio 30% treatment (52.045 ± 0.732 %). The percentage of Bali cattle carcass obtained in this study was lower than the percentage of carcasses of Bali cattle which were slaughtered at the age of 2.5–3.0 years, that were 54% (Wiyatna, 2007, Ngadiyono and Baliarti.2001). Additionally, it was also lower that of the carcass percentage of Bali cattle as reported by Hapid and Rugayah (2009) and Kuswati (2011), namely Bali cattle which were slaughtered at live-weight of 200 - 220 kg obtained carcasses of 53.73%. The results of this study indicate that if Bali cattle are cut with a cut weight below 200 kg it will produce a carcass percentage of 50-52%.

Table 1 showed that the dorsal fat thickness of Balinese cattle fed with CPHCFBio up to 50% produced fat thickness in a ranged of 2,600 ± 0.078 mm - 2.633 ± 0.0567 mm. This result indicates that the use of CPHCFBio as Bali cattle feed does not have a negative impact on carcass quality because the percentage of dorsal fat produced is still relatively low. The results are in accordance with Kuswati (2011) who said that carcasses that have a lot of dorsal fat are not good and can be detrimental to meat products because they are considered fatty which will be disposed. According to the guideline for carcass fatty score proposed by McIntyre and Ryan (1980) cited by Saka et al. (2011), the thickness of dorsal fat with a score of 5 to 7 mm considered as medium class carcass.

Rib eye area is one of general indicators used in meat marketing. Instead of used as a single indicator, rib eye area is likely to be a complementary predictor of meat production (Ransaleleh, 1998). Table 1 showed that REA of Balinese cattle fed with CPHCFBio up to 50% produced REA in a ranged of 57,100±1,430 - 58,103±1,345, cm^2. This result is in line with Ransaleleh (1998) who cited Field dan Schonover (1967), that rib eye area is influenced by life weight and positively correlated with carcass weight. This research proved that treatment of CPHCFBio up to 40% resulted in high carcass weight (100,060±5,620kg) with high rib eye area as well (58,103±1,345cm^2).

Fleshing index is one of carcass characteristics or objective measurement of carcass quality which is an option to substitute a subjective visual judgement of carcass conformation (Saka et al., 2011). According to Wiyatna (2007) fleshing index is a ratio of carcass weight

and carcass length. Therefore high performance in carcass percentage not always reflects a high performance in fleshing index since it is determined by other factor such as carcass length. Table 1 showed that fleshing index of Balinese cattle fed with CPHCFBio up to 50% produced fleshing index in a ranged of 0,837±0,046–0,843±0,064%. This result is parallel with a study by Wiyatna (2007) which showed that male Bali cattle slaughtered under 3 years of age resulted in fleshing index below 1 %, while if it is slaughtered after 3 years of age with carcass percentage above 50% resulted in fleshing index above 1% that is 1,232% for Bali cattle, 0,948% for Madura cattle, 1,210% for Ongole Cross Breed and 1,415% of Australian Commersial Cross (ACC) cattle.

The results in this study showed that other than carcass, male Bali cattle also produce high amount of non carcass products that were 38,759 %, 37,988 %, and 37,957% by treatment of CPHCFBio at the level of 30%, 40% and 50% respectively. These results agree with Soeparno (1994) and Yurleni (2013) who said that non carcass percentage of Bali cattle in range of 45-47 %.

3.2 Marbling and Meat Cholesterol of Bali Beef

Result of marbling quality and meat cholesterol level in beef of male Bali cattle fed with CPHCFBio based feed are presented in Table 2.

Table 2. Marbling quality and meat cholesterol level in beef of male Bali cattle fed with CPHCFBio based feed.

Variables	Treatment			P
	CPHCFBio (30%)	CPHCFBio (40%)	CPHCFBio (50%)	
Marbling (%) Cholesterol (mg/100gr)	3,337±0,208 17,250±0,250	3,717±0,047 16,375±0,375	3,527±0,548 16,500±0,500	NS NS

Note: NS = Not significant

Result of variance analysis showed that feed treatment using CPHCFBio did not significantly affect (P>0.05) on marbling and cholesterol of Bali beef. Table 2 displayed average of marbling degree ranged from 3,337±0,208% to 3,717±0,047%. It indicates that CPHCFBio treatments in feed give marbling degree which categorized as low. This result

agreed to Swatland (1984) who stated that if marbling degree of beef in a ranged between 2,5 - 7,5%, so the marbling is considered as low.

The low marbling degree in this study may also be influenced by the age of the cattle. In this study we slaughtered the cattle at the age of 2-2.5 years which is considered as young. Soeparno (1994) said that percentage of intramuscular fat which is marbling, tend to increase along with the increament of fat percentage of the body tissue and dorsal fat thickness. Marbling is also influenced by feed (nutrition status) during rearing. Cattle fed with grain will have higher marbling and intramuscular fat compared with those fed with grass or other greeny plants. This study showed that dorsal fat thickness and nutrition status have influence on marbling degree of meat. The evidence can be seen in treatment CPHCFBio 40% which have higher dorsal fat thicknes (2,633±0,0567%) compared to the other treatments, are also have higher marbling. Priyanto et al (1993) reported that Hereford cattle which fed with concentrated grains as the main feed have higher proportion of fat and lower lean meat compared to that of fed with forage as the main feed. Study by Ransaleleh (1998) and Irmania (2010), reported that cattle weight at slaughter has significant effect on marbling score, cooking loss, water holding capacity and colour of the beef. Comparison of meat marbling of male Bali cattle after treated with CPHCFBio 30%, CPHCFBio 40% and CPHCFBio 50% are presented in Figure 1.

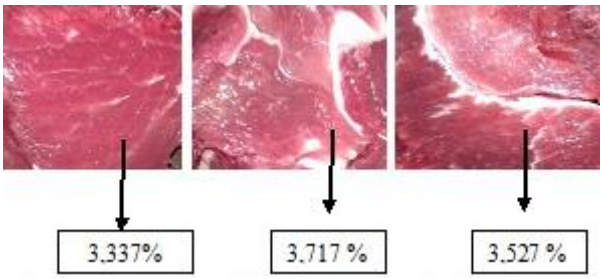

Figure 1. Marbling quality of Bali beef based on the feed.

Cholesterol content in male Bali cattle based on the feed treatment was ranged from 16,375±0,375 to 17,250±0,250 mg/100 g. This result showed that Bali cattle fed with CPHCFBio up to 50% have lower meat cholesterol content compared to the study by Saidin (2000) and Husaini (1973) which reported cholesterol content of cattle beef in different body condition i.e. thin and fat showed meat cholesterol content as high as 65 mg/100g and 68 mg/100g respectively.

4. Conclusion And Recommendation

4.1 Conclusion

1. The use of CPHCFBio up to 50% incorporated with corn straw as feed of male Bali cattle give carcass percentage of 52 % and non-carcass percentage of 37-38 %.
2. The utilization of CPHCFBio up to 50% incorporated with corn straw as feed of male Bali cattle give high fleshing index (0,843±0,064%), high rib eye area (58,103±1,345 cm^2), marbling score (3,337-3,717%) and meat cholesterol content (3,337-3,717%) which are in accordance with Indonesian National Standard (SNI).

4.2 Recommendation

CPHCFBio can be used up to 50% of total feed for male Bali cattle fattening.

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