Utilization of complete feed based on fermented rice straw for Australian commercial cross steer on carcass and meat quality

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ABSTRACT: The objectives of this research was to study the utilization of complete feed (CF) based on fermented rice straw (FRS) for Australian Commercial Cross (ACC) steer on the carcass percentage and physical-chemical quality of meat. Thirty six steer of 1.5-2 year of age (310-330 kg) were divided into two groups (treatment vs control) 3 flocks consisting of 6 head/flock were used. In treatment group to the experimental animals were offered as much as 3% BW of CF (consisting concentrate 75% and FRS 25%), while in control group animal received 2% BW of concentrate and FRS ad libitum**.** Complete feed was formulated to cover the nutrient requirement of beef cattle as recommended by NRC (1984). The drinking water was given ad libitum. Prior to feeding treatment (3 month) the animals were adapted on the experimental during for 10 days. Feed was given twice a day (08.00 a.m. and 15.00 p.m.). Data of carcass and meat quality (colour, WHC, cooking loss and tenderness, pH, protein, ashes, and cholesterol) were taken from 3 head per flock, slaughtered at the end of the treatment. Meat samples (500 g) were taken from Longisimus dorsi (LD) muscle. All collected data, were analyzed by T-test. The effect of CF on carcass percentage was better than KF. For all of the variables, the physical-chemical quality of meat showed that there is no significant difference between groups in longisimus dorsi muscles (LD) except for WHC (50.82 vs 38.28; $P<0.05$). It could be concluded that CF based on FRS indicated good result than KF on ACC steer performance raised for 3 month.

Key words: complete feed, fermented rice straw, steer, Australian Commercial cross, carcass quality.

INTRODUCTION

Cattle are important commodity that contributes to meat demand for people. Beef contribute 23.9% from total national meat consumption in 1998 (Pambudy, 2000). Every year, Indonesia imports at least 380,000 cows and 25 million frozen meats to satisfy high demand of meat (Harmadji, 1999). Mostly, breed of cattle imported are Brahman Cross (BX) which are well known as with *Australian Commercial Cross* (ACC).

Nutrition and feed was important factor which affected carcass composition and quality, especially fat content (Soeparno, 1994). Recently, animal nutritionist develops a complete feed (CF) for beef cattle. Utilization of agricultural by products i.e. rice straw as basal feed (complete feed in this research) is one strategy to increase business efficiency through reduces cost from feed.

Business sector that can utilize rice straw is feedlot either conventional or commercial. Further research need to be conducted to study more intensive about CF. the objectives of this research is to study effect of complete feed (CF) based on fermented rice straw for Australian Commercial Cross (ACC) on the carcass beef and meat quality.

MATERIALS AND METHODS

Research was conducted at Widodo Makmur Farm Company, Bayat, Klaten, Central Java, with duration of 3 months (12 weeks), including slaughtering processes. Animal adaptation was conducted for 10 days until animals on stable condition. Feed and refusal analysis was done in Animal Feed Laboratory, Department of Nutrition and Feed Science, Faculty of Animals Science, Gadjah Mada University (UGM) Yogyakarta and Food Biochemistry and Nutrition Laboratory, Faculty of Agriculture Technology, UGM. Meat quality analysis was done in Meat Processing Laboratory, Department of Animal Products and Technology, Faculty of Animal Science, UGM, Yogyakarta.

There were 36 ACC *Steers* having 310 - 330 kg body weight, 1.5 – 2 years of age. The animal were divided into 6 flock of 6 animals each. Feed being offered to animals were *complete feed* (CF) and conventional *feed* (KF) as control. Feed offered was given into two equal parts at 800 and 1500 hrs. Feed sample was taken before feeding period to determine dry matter (DM), crude protein (CP), and crude fiber. Nutrient content of concentrate type in KF and CF were not the same. KF diet formulated consists of commercial concentrate 2% body weight (dry matter basis) and *ad libitum* fermented rice straw. Commercial concentrate was manufactured in Sarono Makmur Feedmill, Cangkringan in every100 kg consisted of rice brand (15), onggok (cassava pomace) (30), gaplek (6), coconut meal (8), peel nut (15), bread (8), pollard (9), mollases (5), salt (2), and calsid (2). CF diet formulated consisted of concentrate: fermented rice straw (75: 25), given to the animal as much as 3% body weight (dry matter basis).

Concentrate in CF in every 100 kg consisted of rice brand (12), onggok (24), gaplek (4.8), copra meal (6.4), peel nut (12), bread (6.4), pollard (7.2), grounded yellow corn (19.5), mollases (4), Biofad® (0.5), salf (1.6), and calsid (1.6). Water was offered *ad libitum.* Rice straw was fermented using stater Biofad® (Agus *et al.*, 1999).

Materials being used in this study were animal housing, feed container, water container, digital weighing for animal merk *Rougweight* with sersitivity 0.1 kg, feed and sample weighing merk *Salter* with sensitivity 1 kg and merk *Lion Star* with sensitivity 0.025 kg, one unit proximat analysis, slaughterer equipments and one unit meat analysis.

After 3 month feeding, 3 from 6 ACC in every flock were slaughtered as sample, to make total sample of 18 ACC. All part of carcass was weighed to determine carcass composition. Meat sample from *Longisimus dorsi* (LD) muscle was taken on cube roll cut, amount $\pm$ 500 g. Meat sample were analysis to determine physical quality i.e. pH, tenderness, colour, water holding capacity and cooking loss in Laboratory of Food Science of Animal Products, Department of Animal Products Technology, Faculty of Animal Science, UGM, Yogyakarta. Chemical quality analysis to determine protein, fat, ashes and cholesterol were done in Food Biochemisry and Nutrition, Faculty of Agriculture Technology, UGM, Yogyakarta.

Variables being observed were carcass persentage, physical meat quality and chemical i.e. tenderness, colour, water holding capacity and cooking loss, pH, water content, protein, ashes and cholesterol. Carcass percentage was determined by carcass weigh over with total live weight. Data collected from control and treatment groups were analyzed with T-test using Microsoft Excel software.

RESULTS AND DISCUSSION

Cascass and Meat

Carcass percentage is important factor to determine income/ benefit of farmer. Farmer income will be higher as the carcass percentage bigger. Carcasss in cow, buffalo, sheep, and goat is part of body after diducted with blood, head, legs, skin, tractus digestifus include intestine, urine sac, heart, trachea, pulmo, spleen, liver, and existing fat that stick in that component. Kidney usually accounted as carcass. Meat is defined as all animal tissue and its tissue proceses product that available to be eaten and save for comsumers health (hygienis) (Soeparno, 1994).

In this study, ACC receiving CF diet produced average slaughtered weight of 390.1 kg, carcass percentage 49.7 – 52.6% (average of 50.85%). ACC receiving KF diet produced average slaughtered weight of 379.6 kg, carcass percentage 47.1 – 52.1% (average of 49.19%). Carcass fat in ACC with CF was 1.37 – 6.58% (average of 3.7%), while with KF 1.3 – 8.66% (average of 5.0%). Average slaughtered weight in animal with CF was higher compared with KF. This condition may affect to carcass percentage. Soeparno (1994) stated that body live weight had correlation with carcass percentage. The average of beef carcass percentage was around 50 – 55%.

Result in this study was higher than research on Onggole halfbreed (PO) done by Satoto (2000) with king grass (49.86%) and rice straw (47.82%), while research of Isnainiyati (2001) with fermented rice straw resulted carcass percentage 48.7%. However, carcass percentage in this study was lower than research done with diet king grass and concentrate (15 : 85) on BX (54.18%) and

ACC (53.07%) (Ngadiyono, 1995); 52.79% on ACC with diet king grass and concentrate (20:80) (Tuswati, 1998); 53.59% on BX with diet elephant gras and concentrate (20: 80) (Suparman, 1997).

Component of the diet (concentrate and forage) may affect the carcass percentage. In this study, ratio of concentrate consumption in CF diet was found higher than KF (75.1% vs 67.8%), and carcass percentage resulted was higher. This statement supported by Coleman et al. (1995) who stated that carcass percentage, and carcass quality of Angus (*steer*) on silage diet was lower than Angus receiving grains (concentrate) 56.7% vs 59.2%.

Meat Physical-Chemical Quality

Carcass has close correlation with meat production. Good carcass will produce good meat quality since meat is main component of carcass which consist of muscle, connective tissue, fat, water, bone, skin (in pig), nervous and blood vessels (Masykuri, 1997). Result of physical-chemical meat quality of ACC (LD part) was affected by type of diet CF and KF can be seen in Table 1.

Table 1. Physical-chemical meat quality (LD part).

Variables	Average		RSD[1]	Significance
	CF	KF		
colour-LD	6,7	6,6	2,61	Ns
pH-LD	6,0	5,2	1,08	Ns
Water holding capacity -LD	50,8	38,3	10,11	*
Cooking loss –LD	36,1	33,5	4,18	Ns
Tenderness -LD	2,7	3,2	0,94	Ns
Ash-LD	1,04	1,25	0,22	Ns
Water content-LD	80,1	79,0	4,46	Ns
Protein –LD	18,5	17,6	1,23	Ns
Cholesterol-LD	150,7	162,6	14,56	Ns

[ns] Not significant.
* $P < 0,05$.
[1]RSD residual standard deviation.

Colour . Colour is first meat quality parameter that can be seen by consumers (Masykuri 1997). Result of this research showed that colour score of ACC (LD) with CF and KF diet was 6.69 vs 6.56. There was not significant differences caused by CF and KF diet, both produced meat colour red or red cherry. Red cherry colour in indicated good quality meat and consumers preference (Masykuri, 1997).

Consumption of concentrate that reach 75.1% in CF diet did not affect meat colour becaming pale, as well as fermented rice straw consumption in KF that reach 32.2% did not affect meat colour becaming dark or yellow.

pH Meat . Average of pH value at LD meat receiving CF and KF were 6.02 and 5.15. This result was lower than another research, pH 6.99 (Suparman, 1997); 5.72 (Soeparno, 1994), while normal fresh meat is 5.3 –5.8.

pH value affected to odor, textur, and temperature (Masykuri, 1997). pH value may be affected by diet and others factor i.e. temperature, stress, species temperature, breed, sex, animal itself, type of meat muscle, muscle activities, enzim glikolysis activities (Lawrie, 1979 dan Judge *et al.*, 1989 cyted by Soeparno, 1994; Masykuri, 1997). Soeparno (1994) stated that meat having high pH value usually has high WHC, and pH value has close correlation with water holding capacity value (WHC). Data Table 3 shows that there is similar pattern between pH value and WHC in term of increasing and decreasing value.

Water Holding Capacity (WHC). Meat resulted from CF diet significantly had higher WHC ($P<0.05$) compared to those resulted from KF diet. Water holding capacity (WHC) affected by pH, age, type and muscle location, fat marbling, nutrition, muscle function , stress, processing, temperature and moisture, species, animal healthy, and sex (Soeparno, 1990). There was positip correlation between pH and WHC. Acumulation of lactic acid during glycolysis postmortem process caused low pH and finally reduce WHC.

Cooking loss. Cooking loss was the amount of water which was lost when meat being cooked, Bouton *et al.* (1971). Result in this study was lower than previous research: which were 43.02% (Satoto, 2000), 43.23% (Puspitasari, 1999), 47.06 (Isnainiyati, 2001) on PO with basal diet rice straw; 42.76% (Suparman, 1997) on BX with diet Elephant Grass and consentrate (20: 80). Value of cooking loss on ACC was lower than PO which means that ACC meat quality is better than PO. Soeparno (1990) stated that high value of cooking loss indicated low quality of meat, because the lost water content was related to meat juiciness (Soeparno, 1994).

Tendernes . Tenderness was one of important factor in determining consumers preference to meat, aside from odor, juiciness and colour (Masykuri, 1997). Tenderness was measured with S*hearpress*. Result of this study was different with previous research which were 5.02 – 5.35 kg/cm^2 (Satoto, 2000) and 5.36 – 6.87 kg/cm^2 (Puspitasari, 1999) on PO with basal diet rice straw, and 2.045 (Suparman, 1997) on BX with diet Elephant Grass and concentrat (20: 80).

Result of this study indicated that ACC meat was more tender and juicy. Masykuri (1997) stated that tenderness was depending on comparison of ration, muscle tissue, connective tissue and fat, and size of muscle on its rigormortis.

Ashes. Ashes determination based on AOAC (1975). Meat LD resulted from CF diet was significantly had lower ashes than those resulted from KF (Table 3). Result of this study was found lower than previous research done by Ngadiyono (1995) on diet concentrate and grass respectively 4.15% (Sumba Ongole), 3.90% (BX), 3.86% (ACC). However, this results almost similar to research done by Isnainiyati (2000) on PO receiving diet concentrate and fermented rice straw 1.18%. Soeparno (1994) stated that ashes content usually constant around 1%, and not affected by type of muscle. Ash content related with water content, protein and fat.

Water. There was not significant difference on water content value of meat LD result from CF diet compared with those result from KF (Table 3), means type of diet did not affect water content. Furthermore, type of diet (CF or KF) did not affect meat quality such as palatability, juiciness and tenderness. Soeparno (1994) stated that water content was important factor that would affect meat quality and palatability. Biggest contribution to juiciness was water that stay in the material when it was being cooked, and juiciness determined all palatability impression (Masykuri, 1997).

Protein Content (CP). CP value was determined by AOAC (1975). There was not significant difference between meats LD resulted from CF diet vs those resulted from KF. Soeparno (1994) stated that muscle with high CP usually had low fat, and finally more mineral (Forrest *et al.*, 1975). CP content in meat had the most influence to nutritional value and price (Soeparno, 1994).

Cholesterol. Cholesterol was determined according to procedure Liebermann – Burchard (1979). Aharoni *et al.* (1995) stated that menu with cholesterol and fat became interesting issue in community and animal industry. However, in this study there was no significant difference on cholesterol between meats LD resulted from CF diet compared with those result from KF.

CONCLUSION

In general, physical-chemical quality of meat from animal receiving CF and KF diets are similar except water holding capacity. Utilization of complete feed with fermented rice straw as basal diet in the *fattening* ACC *steer* did not affect physical-chemical quality of meat including cholesterol level.

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