CARCASS PRODUCTION AND MEAT QUALITY OF MALE SUMBA ONGOLE, BRAHMAN CROSS AND AUSTRALIAN COMMERCIAL CROSS IN A FEEDLOT SYSTEM

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ABSTRACT

The research was conducted to study the carcass production and meat quality of Sumba Ongole (SO), Brahman Cross (BX) and Australian Commercial Cross (ACC) cattle grown intensively and slaughtered at different weight. Ninety-six (96) heads of male SO, BX, and ACC beef cattle of approximately slaughtered at the live-weight of I (350-375 kg), II (376-400 kg), III (401-425 kg) and IV (426-450 kg), respectively. All animal were grown in a feedlot system with similar diet, namely 85% concentrated and 15% King Grass. The ration and water were given in *ad libitum*. The data obtained were analyzed by using a covariance analysis and profile analysis. The results indicated that the carcass percentage of BX was higher than SO and ACC cattle. There were significant differences between cattle breeds on percentage of bone, meat and fat of carcass. The percentage of bone tended to decrease by increasing of slaughtered weight. The physical quality and chemical composition of meat were affected significantly by breed. The meat of BX and ACC were tendered, and the water-holding capacity (WHC) value was higher than SO cattle. The meat water content of SO cattle was higher than BX and ACC; on the contrary, the protein content of SO cattle was lower. The meat chemical composition did not differ significantly between slaughtered weight, excepted for the water content was tended to decrease by increasing of slaughtered weight. The hydroxyproline content of SO was higher than BX and ACC, nevertheless no differ significantly between slaughtered weight were observed.

Key words : SO, BX and ACC Cattle, Feedlot, Carcass, Meat quality

INTRODUCTION

The meat demand will increase continuously according to the people increases, their incomes and their consciousness of food and nutrition. So the increasing of animal production and productivity, those involving carcass and meat quality resulted from beef have to be improved consequently.

Feedlot of beef cattle is one alternative to improve the meat production, because this work could to be expected had optimal gain-weight and good efficiency, and finally it was obtained the meat with good in quantity and quality (Dyer and O'Mary, 1977). He stated, some factors must to be interested in feedlot system, namely factors of breed, sex, slaughtered weight, animal ages, types and feeding.

The quality of meat was affected by *ante* and post slaughtered. The *ante* slaughtered were species, breed, types, sex, ages, feeding and stress; while the post slaughtered were aging or chilling, cooking, intramuscular fat or marbling, pH, additive ingredient, storage, preservation, kind of muscles, and collagen content (Soeparno, 1992). The meat quality was determined by testing of tenderness (shear force), taste, texture, aroma, colour, juiciness, pH, water-holding capacity, cooking loss, marbling, and feeding nutrition (Lawrie, 1985). Meat containing of approximately 75% water, 18.5% protein, 1.5 - 13% fat, 1.5% NPN substances, 1% carbohydrates and non

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nitrogenous substances and 1% inorganic constituents (Judge *et al.*, 1989). This chemical variation due to different growth factor, feeding, breed, animal age, muscle proportion, storage and preservation.

Collagen is a major structural protein in the tissue (Forrest *et al.*, 1975). Collagen could affected the tenderness, because it property in great number of muscle relatively, and it changes molecularly since the animal obtained maturity (Crouse *et al.*, 1985). Collagen was determined by hydroxyproline content, which the higher hydroxyproline containing in meat is the high collagen content (Kanagy, 1977).

The fattening (feedlot system) of beef in Indonesia could to be conducted by local and or Australian imported beef. The information from carcass production or meat quality resulted by beef cattle above are very important, especially in determining of production system and efficiency programs in the best meat production.

This research was conducted to study the carcass production and meat quality of Sumba Ongole (SO), Brahman Cross (BX) and Australian Commercial Ongole (ACC) kept intensively in feedlot system with various slaughtered weight. The results of this study was expected as considerable in fattening, and especially in most efficient breed and slaughtered weight determination to obtain carcass production and meat quality

MATERIALS AND METHODS

The study of fattening was conducted at Beef Holding unit PT Kariyana Gita Utama, Sukabumi, lasted in four methods; followed the animal slaughtering was done at PT Sampico Adhi Abattoir, Bekasi.

Ninety-six (96) male cattle consisting of 32 heads of Sumba Ongole (SO), 32 heads of Brahman Cross (ACC) with an initial of live-weight 314.61 ± 21.25 kg with ages of approximately 2 years were used in this study. The rations formulated according to NRC (1976) from local materials, namely concentrate (wheat pollard, rice bran, cacao bean skin, kapok seeds meal, *onggok*, limestone, salt and buffer) 85% and King grass 15%.

All cattle were slaughtered at the slaughtered weight of I (359-375 kg), II (376-400 kg), III (401-425 kg) and IV (426-450 kg). The groups I and II was 6 heads, and groups III and IV was 10 heads, respectively for each cattle breed. The feed and water were given in *ad libitum*. The animal weighing was done monthly, while the slaughtering was done by 24 hours fasting. The meat sampling was taken from *Longissimus dorsi* (LD) of cube roll muscles.

The slaughtered data were : Carcass weight, carcass percentage, loin fat thickness, loin eyes area (LEA), kidney, pelvic and heart (KPH) fats percentage, and carcass component. The meat quality were tenderness (shear force), water-holding capacity (WHC), cooking loss, pH, water content, protein, fat, ash, and hydroxyproline content, respectively.

The collected data were analyzed by using a covariance analysis with the initial live-weight as a covariate (Steel and Torrie, 1984). The profile analysis also done to see the tendency of cattle breed and slaughtered weight (SAS, 1987).

RESULTS AND DISCUSSION

Carcass and carcass composition

Carcass percentage of BX cattle was higher than the SO and ACC cattle. Those value was : 54.18,52.69 and 53.07%. On the contrary, the carcass shrinkage or drip percentage of BX cattle was lower than SO and ACC cattle, namely 2.07, 2.42 and 2.43% (Table 1). The drip percentage was still in tolerant. Romans and Ziegler (1974) stated that carcass shrinkage of approximately 2-3% losses of carcass weight resulted from drip.

The loin thickness, KPH fat of BX and ACC cattle was higher than SO cattle. Also the yield grade for BX and ACC were higher than SO cattle. Those the higher yield grade similar to the lower meat percentage and fattening increasing (Minish and Fox, 1979). The carcass containing the high of

Table 1. Carcass and carcass composition

Parameters	Breed			Slaughtered weight			
	SO	BX	ACC	I	II	III	IV
Slaughtered weight (kg)	412.50	404.75	405.06	365.22	385.67	410.27	443.00
Carcass (%)	52.69^{a}	54.18^{b}	3.07^{a}	53.08	52.95	53.66	53.67
Drip percentage (%)	2.42^{b}	2.07^{a}	2.43^{b}	2.22	2.23	2.34	2.43
Bone (%)	17.38^{b}	16.22^{a}	7.73^{b}	7.73^{r}	7.10^{qr}	16.52^{pq}	16.29^{p}
Meat (%)	77.31^{c}	75.49^{b}	3.60^{a}	74.71	5.41	75.38	76.37
Fat (%)	4.85^{a}	7.21^{b}	8.07^{c}	6.81	6.50	7.20	6.34
Loin fat thickness (inci)	0.09^{a}	0.17^{b}	0.19^{b}	0.14	0.16	0.16	0.15
Kidney, pelvic and heart (KPH) fats (%)	1.23^{a}	2.66^{c}	0.04^{b}	1. 98	0.78	2.10	2.04
Loin eye area (inch^{2})	10.26	10.53	0.09	9.63^{p}	10.25^{q}	10.24^{q}	11.06^{r}
Yield grade	1.53^{a}	1.96^{b}	.99^{b}	1.86	1.75	1.94	1.77

^{a,b,c} different superscripts differed significantly (P<.05)
^{p,q,r} different superscripts differed significantly (P<.05)

muscle proportion and optimal fattening was preferred by consumer. The loin eye area (LEA) for SO, BX and ACC tended similarly, and more LEA score resulted the increasing slaughtered weight of animal.

The highest meat percentage was obtained from SO cattle, followed by BX and ACC cattle. On the contrary, the carcass fat of SO was lower than BX and ACC cattle. Berg and Butterfield (1976) stated, the increase carcass fat affected the decrease percentage of meat and bone. Percentage of meat and fat did not differ significantly between slaughtered weight, and bone percentage tended to decrease by increasing of slaughtered weight. This reason, that the bone as a body skeleton and grown early, followed by muscle and fat tissue (Forrest *at el.*, 1975; Berg and Butterfield, 1976).

The physical property and chemical composition

The physical property and chemical composition of SO, BX and ACC cattle (Table 2 and 3). The shear force of SO meat was higher than BX and ACC. Thus, the BX and ACC meat more tender than SO meat (Table 2). Crouse *et al.* (1989) reported that Bos Indicus offspring had the more tough than

Table 2. The physical property of meat

Physical property	Breed			Slaughtered weight			
	SO	BX	ACC	I	II	III	IV
Tenderness (shear force), kg/cm^{2}	2.80^{b}	2.14^{a}	2.17^{a}	2.40	2.39	2.33	2.37
Water-holding capacity WHC, %	16.92^{a}	18.84^{b}	19.74^{b}	18.28	18.57	18.56	18.54
Cooking loss, %	32.90^{b}	29.85^{a}	30.03^{a}	31.40	30.57	30.73	31.01
pH	5.73^{a}	5.74^{a}	5.88^{b}	5.75^{p}	5.73^{p}	5.82^{q}	5.83^{q}

^{a,b,} different superscripts differed significantly (P<.05)
^{p,q,} different superscripts differed significantly (P<.05)

Table 3. The chemical composition of meat

Chemical composition	Breed			Slaughtered weight			
	SO	BX	ACC	I	II	III	IV
	..... %			..... %			
Water	73.13^{b}	71.25^{a}	71.34^{a}	$73.^{11q}$	72.24^{p}	71.74^{p}	71.88^{p}
Protein	22.18^{a}	23.68^{b}	24.36^{b}	22.76	23.37	23.70	23.80
Intramuscular fat	4.22	5.30	5.49	3.94	4.84	5.13	6.10
Ash	4.15	3.90	3.86	3.94	4.01	3.97	3.96
Hydroxyproline	0.10^{b}	0.07^{a}	0.07^{a}	0.09	0.09	0.07	0.08
Collagen *)	0.70^{b}	0.48^{a}	0.52^{a}	0.63	0.61	0.46	0.55

^{a,b,} different superscripts differed significantly (P<.05)
^{p,q,} different superscripts differed significantly (P<.05)
*) Calculation by multiple factor with 7.14 from hydroxyproline content

Bos Taurus offspring. The older cattle resulted the tissue structure changes, and the meat to be hardness and increase the shear force (Forrest *et al.*, 1975). The higher collagen (hydroxyproline) content from SO cattle resulted the tough meat than BX and ACC meat (the higher shear force obtained by SO cattle).

Water-holding capacity (WHC) of from BX and ACC cattle were higher than the SO cattle, while between different slaughtered weight were no differed significantly. The differences of WHC between cattle breed were caused by meat pH, which ultimate pH of ACC cattle was higher significantly than BX and SO cattle. There was correlation between ultimate pH and WHC. In the lower ultimate pH due to a number of lactic acid, caused the protein reactive groups decrease, released drip and the water-holding capacity decreased (Forrest *et al.*, 1975). The either factor affected WHC value was animal ages, activity of proteolytic enzyme degraded muscle protein.

There were correlation between WHC and cooking loss. The cooking loss of SO was higher than BX and ACC meat, but no differed significantly in different slaughtered weight. The different ultimate pH between cattle breed and slaughtered weight may be caused by animal condition before slaughtering and muscle glycogen stock. The limited glycogen stock at slaughtered caused uncompleted processing of postmortem glycolysis and restricted lactic acid formation and resulted the high ultimate pH relatively.

The water content of SO meat higher than the BX and ACC meat (Table 3), and differed was observed for BX and ACC meat. The differences of water content between breed and slaughtered weight could to be indicated that cattle breed and slaughters weight had different potency on intramuscular fat (marbling) deposit. There were negative correlation on fat content and water content, which it was indicated that more higher fat content resulted the lower water content (Minish and Fox, 1979). The protein content was constant relatively. The differences of protein content between cattle breed was caused by meat structure, especially it was caused by myofibrillar protein and connective tissues. The ash and fat content did not differ between breed and slaughtered weight. But the result indicated that fat content from SO cattle was the lowest than BX and ACC cattle. Based on the profile analyses showed that water content tended to decrease by increasing of slaughtered weight; while the intramuscular fat tended to increase by increasing of slaughtered weight.

CONCLUSIONS

Brahman cross cattle had the higher carcass percentage than SO and ACC cattle. The carcass quality of BX and ACC were

better than SO cattle. But, in quantity aspect, the SO cattle had the higher meat production with the lower carcass fat.

According to the physical property and chemical composition of meat, showed that the BX and ACC cattle had the better meat quality than the SO cattle.

Percentage of bone and water content were tended to decrease by increasing of slaughtered weight, while the fat content was tended to increase by increasing of slaughtered weight.

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Appendix 1. The composition of concentrate diet

Ingredients matter	Asfed (kg)	%	Dry matter (kg)
Wheat pollard	61.85	55.00	55.29
Rice bran	18.70	16.63	17.14
Skin of cacao bean	11.85	10.53	9.75
Kapok seeds meal	4.50	4.00	3.98
Onggok (by product of tapioca)	11.47	10.20	9.81
Limestone ($CaCo_3$)	3.00	2.67	2.95
Salt (NaCl)	0.53	0.47	0.52
Buffer (CaO and MgO)	0.56	0.50	0.56
Total	112.46	100.00	100.00

Appendix 2. The chemical composition of concentrate and King grass

Chemical composition	Concentrate	King grass
Dry matter (%)	88.70	13.83
Metabolizable energy (ME), kcal/kg	2,511.41	2,422.20
Crude protein (%)	12.76	15.60
Fat (%)	5.47	3.08
Crude fiber (%)	12.48	35.47
Calcium (Ca), %	0.84	0.26
Phosphor (P), %	0.66	0.28
Ash (%)	5.56	13.50
Total digestible nutrient (TDN), %	71.31	45.00