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CARCASS AND WHOLESALECUT PRODUCTION OF BRAHMAN CROSS (BX) HEIFER

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ABSTRACT

This research aims to determine the quantitative characteristics of Brahman cross heifer cattle's carcass and wholesale cut at different age levels. The number of heifer cattle taken as samples was 104 heifer. The research method used is a case study with the selection of locations by purpose sampling. Direct observation is used to obtain information on age, slaughter weight, carcass weight, wholesale cut weight, and parts thereof (primary, secondary, and manufacturing cut). The data obtained were then analyzed by analysis of variance (ANOVA). If there was a significant difference, it is followed by a further test of the Least Significant Difference (LSD). The results showed that the age levels in slaughter had a significant effect ($P<0.05$) on the slaughter weight, fresh carcass weight and wilted carcass weight, but had no effect on the percentage of carcass and wholesale cut. The older the age of cattle and the longer the cattle are raised, the higher their body weight will affect the slaughter weight produced, and the higher the slaughter weight, the higher the carcass weight made. Average slaughter weight at different age by Permanent Incisor (PI): PI_0 (<18 months), PI_2 (18-24 months) and PI_4 (24-36 months). While the average percentage of heifer carcass at different age levels was relatively the same (52,71% : 53,04% : 53.10%). The weight and rate of wholesale cut and its parts are also somewhat the same. The research results show that the slaughter age affects the slaughter weight and carcass weight but not dressing percentage and wholesale cut weight. Brahman cross heifer cattle at PI_4 produced optimal carcass weight and wholesale cut.

Keywords: Brahman cross; heifer; carcass; wholesale cut

INTRODUCTION

Brahman cross (BX) cattle are cattle from Australia which are widely imported and fattened in various feedlots in Indonesia. This type of cattle was chosen since it has a higher carcass production than local Indonesian cattle (Kuswati et al, 2014). Brahman Cross carcasses varied between 45%-55% depending on the cattle's condition when weighed alive and the performance of each individual (Iqbal Zajulie et al., 2015). The carcass is the main product produced from livestock slaughter because it has a high economic value. Since the formation of two different market segments, namely the local market and the specialty market, carcass classification is carried out.

Carcass classification is the development of methods to describe carcass products in the meat industry. Specialty markets serve the upper class, restaurants, hotels and franchises, and specialty markets tend to pay attention to meat quality based on commercial carcass cuts. Opportunity for private companies, in this case, PT. Cianjur Arta Makmur as one of the carcass producers to increase the economic value of carcass by classifying carcass which is commonly known as commercial cut (wholesale cut).

Commercial cuts of carcass produced have different economic values, and some commercial pieces have high, medium, and low selling prices. The difference in selling prices between commercial cuts causes the carcass to be grouped (wholesale cut). According to Aus-meat (2005), wholesale cut cuts are divided into prime cut loin, a second cut divided into forequarter and hindquarter and manufacturing cuts or leftover meat from main and second-class cuts. According to SNI:3932 (2008), commercial cuts of the carcass are still applied to imported cattle at international slaughterhouses only. If it can be applied to local cattle in traditional slaughterhouses, it will increase the economic value of beef because each piece of the carcass will have a different price depending on the meat class.

High wholesale cut production is obtained from high carcass production, meaning that the livestock to be slaughtered must produce a high percentage of carcass. the larger the carcass produced, the larger the commercial cut of the carcass. The percentage of carcass produced by an animal is influenced by age, slaughter weight, breed, sex, percentage of non-carcass and maintenance management. The older the age, the higher the body weight, so the carcass weight produced will also be higher. The ideal body weight can result in a high slaughter weight (Maulid et al, 2021). If the cut weight is high, then the carcass weight produced is also high, so the wholesale cut weight will also be higher, and the profits obtained by the company will also be high. Heifer at a young age has a higher slaughter weight than a steer, so it can produce a higher carcass than a steer. Heifer cattle also have a faster growth rate than steers because they can reach sexual maturity more quickly. Therefore, heifer is also widely fattened in Indonesian feedlots.

MATERIALS AND METHODS

This research was conducted at PT. Cianjur Artha Makmur, Cianjur Regency, West Java. The method used is a case study, selecting locations by purpose sampling. Data collection body measurements, carcass weight, and wholesale cut were done by

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random sampling. The data were analyzed by using analysis of variance (ANOVA), if the results were significantly different, proceed with the LSD test (Least Significant Difference). The research material used 104 Brahman cross heifer cattle which were divided into 3 age groups Permanent Incisor (PI): PI_0 (<15 months), PI_2 (15-18 months), and PI_4 (18-24 months). Questionnaire sheet specially designed to make it easier to collect research data. The data obtained were then analyzed by analysis of variance (ANOVA), if there was a significant difference followed by the Least Significant Difference (LSD) further test was conducted. The linear model of the ANOVA experiment according to Sudarwati et al, (2011).

RESULTS AND DISSCUSION

Effect of Age on Cutting Weight

The slaughter weights at the age level PI_0 and PI_4 showed significant differences between group age level. Table 1 shows that the slaughter weights at the age level PI_0, PI_2 and PI_4 were significantly different ($P<0.05$). The older the age of beef cattle and the longer the beef cattle is raised, the higher the livestock's slaughter weight will be. The effect of age is closely related to the growth of beef cattle, with growth it will cause an increase in the weight of the components that make up the body of beef cattle such as bones, meat, and fat, increasing body weight of livestock. The growth of the body has an essential meaning in a production process since high production can be achieved with rapid growth (Martín et al., 2021).

Effect of Age on Fresh Carcass Weight and Withered Carcass

Carcass is a part of the body of the that is obtained after the slaughter process is carried out and separated from the non-carcass part, which is then weighed to determine the weight of the carcass produced by each animal that has been slaughtered.

Table 1. Quantitative average of Brahman cross heifer cattle carcass by age level

No.	Variable	Age Level	N	Average ±
1	Cutting Weight (kg)	PI_0	21	$476,19 \pm 21,45^a$
		PI_2	33	$478,76 \pm 24,52^a$
		PI_4	50	$490,10 \pm 26,76^b$
		Average		$483,69 \pm 25,62$
2	Carcass Weight (kg)	PI_0	21	$250,95 \pm 12,75^a$
		PI_2	33	$253,84 \pm 14,72^a$
		PI_4	50	$259,91 \pm 15,62^b$
		Average		$256,18 \pm 15,12$
3	Withered Carcass Weight (Kg)	PI_0	21	$246,29 \pm 12,44^a$
		PI_2	33	$249,13 \pm 14,34^a$
		PI_4	50	$254,95 \pm 15,13^b$
		Average		$251,40 \pm 14,70$
4	Carcass Percentage (%)	PI_0	21	$51,74 \pm 1,75$
		PI_2	33	$52,05 \pm 1,93$
		PI_4	50	$52,05 \pm 1,93$
		Average		$51,99 \pm 1,93$

Note: superscript (a-b) in the same column shows a significant difference ($P<0.05$).

The results of the data analysis in Table 1 showed that the fresh carcass weight and wilted carcass weight at age levels PI_0, PI_2, and PI_4 were significantly different ($P<0.05$). The highest fresh carcass weight and wilted carcass weight were obtained at the age level of PI_4 and the lowest weight was obtained at the age level of PI_0. At the age level, PI_4 has the highest cutting weight and the lowest cutting weight is obtained at the age level PI_0. The higher the slaughter weight of the cattle, the higher the carcass

weight produced (at the age level of PI_4). Carcass weight is strongly influenced by slaughter weight, the higher the slaughter weight number, the more carcass weight will also increase. Carcass weight are mostly influenced by muscle or meat weight). the factors that affect the production of carcasses and non-carcasses include slaughter weight, nation, age and feed. With increasing age and body weight, the carcass weight will undergo a greater increase than the non-carcass weight (Choi et al., 2010; Martín et al., 2021)

Effect of Age on Carcass Percentage

Carcass percentage is the ratio between carcass weight and live weight multiplied by one hundred percent (Mckiernan & Gaden, 2007). The percentage of carcasses at the age PI_0, PI_2 and PI_4 showed no significant difference between group age. The percentage of carcass increased with increasing age of livestock. A high carcass weight does not necessarily produce a high carcass percentage. This is due to the percentage of carcass produced is also affected by non-carcass weight. In addition, the variation in the contents of the digestive tract from the feed consumed by livestock can also affect the percentage of carcasses that will be produced. It is also possible to produce high non-carcass weight at high slaughter weights because the contents in the digestive tract and in the end will reduce the percentage of carcass. High carcass weight is not always followed by a high carcass percentage, since it is influenced by non-carcass weight. The percentage of carcass beef cattle that were rested and fasted for 3 hours was higher than that of cattle that were rested for 18 hours without fasting. Cattle that have not fasted had more digestive tract contents than those that were fasted, so the carcass percentage was lower. Carcass percentage is strongly influenced by slaughter, carcass, and non-carcass weight. A high percentage of carcass does not always follow high carcass weight due to differences in the contents of the digestive tract.

Effect of Age on Carcass Composition Components

Carcass is composed of several components, namely meat, bone and fat. The proportion of each component that makes up the carcass greatly determines how good the quality of the carcass produced (Field, 2007).

Table 2. Average production of Brahman cross heifer beef, bone and fat by age level

No.	Variable	Age Level	N	Average ± (Kg)	Percentage (%)
1	Meat	PI_0	21	156,96 ± 9,42	63.78
		PI_2	33	157,12 ± 9,28	63.16
		PI_4	50	160,36 ± 10,89	62.16
		Average		158,65 ± 10,16	63.18
2	Bone	PI_0	21	56,27 ± 4,11	22.86
		PI_2	33	56,23 ± 4,50	22.56
		PI_4	50	58,27 ± 4,10	22.83
		Average		57,20 ± 4,31	22.75
3	Fat	PI_0	21	26,52 ± 8,14	10.71
		PI_2	33	28,82 ± 8,97	11.48
		PI_4	50	29,42 ± 7,54	11.51
		Average		28,64 ± 8,13	11.34

Table 2 shows that the average weight and percentage of meat, bone and fat at the age level PI_0, PI_2 and PI_4 are not significantly different. The meat, bone and fat distribution is the same at different age levels. Postnatal growth is hypertrophic muscle growth. Hypertrophic growth of skeletal muscle in mammals is the addition of a new nucleus to a multinucleated muscle fiber (Smith & Johnson, 2020). The

livestock body's growth and development level is the same because of genetic similarities and race, body size, management, and environment. The frame size category of beef cattle can affect growth and carcass formation. Differences in fat, muscle, and bone composition for small, livestock size category can affect growth and carcass formation.having a genetic factor of relatively fast body weight growth compared to small to medium-sized beef cattle, this must be supported by good environmental factors (feed and maintenance systems) (Beline et al., 2021; Murray et al., 2021).

Wholesale cut

Effect of Age on Production of Prime Cut Parts

Commercial carcass cuts were carried out according to Standard Australian Meat (2005). The data analysis results in Table 3 show that the prime cut weights consisting of: tenderloin, striploin and cube roll at age levels PI_0, PI_2 and PI_4 are not significantly different. Although the fresh carcass weight and withered carcass weight obtained were significantly different, the resulting meat weight was not significantly different, so that the prime cut weight produced was also not significantly different. The size of the same body frame may be one of the factors that causes no significant difference in the resulting prime cut weights. This causes the growth rate and spread of meat in the same section. Beef cattle size category can affect growth and carcass formation. Differences in fat, muscle and bone composition for small, medium and large cattle at the same live weight. This difference is caused by large-sized beef cattle having a relatively fast body weight growth genetic factor compared to small to medium-sized beef cattle (Murray et al., 2021).

Table 3. Average production of Prime cut class: Tenderloin, Striploin, Cuber roll Brahman cross heifer based on age level

No.	Variable	Age Level	N	Average ± (Kg)	Percentage (%)
1	*Tenderloin*	PI_0	21	3,38 ± 0,27	1.37
		PI_2	33	3,34 ± 0,41	1.34
		PI_4	50	3,46 ± 0,35	1.36
		Average		3,40 ± 0,37	1.36
2	*Striploin*	PI_0	21	9,76 ± 0,93	3.96
		PI_2	33	10,01 ± 0,87	4.01
		PI_4	50	10,14 ± 0,87	3.97
		Average		10,02 ± 0,89	3.98
3	*Cube roll*	PI_0	21	5,16 ± 0,26	2.10
		PI_2	33	5,30 ± 0,41	2.13
		PI_4	50	5,34 ± 0,42	2.10
		Average		5,29 ± 0,39	2.11

The highest prime cut weight was obtained from the PI_4 age level, and the lowest weight at the tenderloin section was obtained at the PI_2 age level. While the lowest weight of the striploin and cube roll parts is obtained from the PI_0 age level. The high prime cut weight at the age level of PI_4 was due to the higher cut weight and carcass weight than PI_0 and PI_2. The high retail meat weight is not necessarily a high percentage, because other factors influence the wilted carcass weight as a comparison. The highest percentage of tenderloin was obtained at the age level of PI_0 which was 1.37% and the percentage of striploin and cube roll was obtained at the age level of PI_2 which was 4.01% and 2.13%. Soeparno (2009), that the weight of the carcass and the component of the carcass is influenced by the body weight of the cattle to be slaughtered. In addition to cutting weight, Carcass composition is also influenced by several factors, namely sex, hormones, castration, physiology, and age. Variations in body weight mostly dominate

variations in body composition or carcass; a small part is influenced by age.

The weight of the meat in the prime cut section is the lowest when compared to the forequarter, hindquarter and manufacturing sections. The proportion of meat in the prime cut section is only 11.80%, while in the forequarter, hindquarter and manufacturing sections, respectively, 36.01%, 35.71% and 16.48%. This is because in this section it grows last, so it experiences the slowest growth. Hafid and Priyanto (2006), explained that the growth pattern starts from the neck and back (chuck) to the back (cuberroll) and stops at the waist (loin).

This indicates that the body part that grows the slowest is the loin. However, the prime cut section is the section of meat with the highest economic value, because the meat in this section has the best tenderness value due to the presence of marbling. According to Bonny, O'Reilly, Pethick, Gardner, Hocquette and Pannier (2018), marbling or intramuscular fat is known to have a positive relationship with beef quality. Marbling and fat rib scores positively correlate with the meat's level of delicacy and are one of the determinants of the selling price of meat.

Effect of Age on Production of Secondary cut (Forequarter) Parts

The data analysis results in table 4 show that the average weight of the forequarter secondary cut class consists of chuck, chuck tender, blade, shin/shank and brisket at age level PI_0, PI_2 and PI_4 differ not significantly. Although the slaughter weight and carcass weight at the age level PI_0, PI_2 and PI_4 were significantly different, they did not cause a significant difference to the weight of the meat in the forequarters produced.

Table 4. Average production of forequarter parts: Chuck, Chuck Tender, Blade, Shin/Shank, Brahman cross heifer brisket by age

No.	Variable	Age Level	N	Average ± (Kg)	Percentage (%)
1	*Chuck*	PI_0	21	19,20 ± 1,96	7.80
		PI_2	33	19,49 ± 2,45	7.84
		PI_4	50	19,59 ± 2,23	7.68
		Average		19,48 ± 2,24	7.76
2	*Chuck Tender*	PI_0	21	2,27 ± 0,32	0.92
		PI_2	33	2,37 ± 0,36	0.95
		PI_4	50	2,36 ± 0,28	0.93
		Average		2,34 ± 0,31	0.93
3	*Blade*	PI_0	21	15,41 ± 1,17	6.25
		PI_2	33	15.71±1.60	6.31
		PI_4	50	16,29 ± 1,95	6.38
		Average		15,93 ± 1,82	6.33
4	*Shin/Shank*	PI_0	21	6,20 ± 0,71	2.52
		PI_2	33	6,31 ± 0,70	2.54
		PI_4	50	6,59 ± 0,77	2.59
		Average		6,42 ± 0,75	2.56
5	*Brisket*	PI_0	21	12,69 ± 1,08	5.16
		PI_2	33	12,99 ± 1,28	5.23
		PI_4	50	13,02 ± 1,30	5.11
		Average		12,94 ± 1,25	5.16

High carcass weight does not guarantee that it will produce high meat weight, because other factors such as bone weight and fat weight are also components of carcass composition. In addition, the growth of meat at the high PI_0 age level and the decline in growth at the PI_2 and PI_4 age levels caused the weight of the meat

produced to be not significantly different. Genetics, breed, environment, maintenance management, and handling before slaughtering the same are factors that cause no significant difference. Soeparno (2009) explained that the factors that influence the carcass component are genetic, gender, hormonal, castration, physiology, age, body weight, nutrition and addictive substances. The results of data analysis showed that chuck meat had the highest weight of all meat in the forequarter, followed by blade, brisket, shank/shin and the lowest weight was chuck tender meat.

This is different from the results of research by Priyanto, Johnson and Taylor (2009), that the blade is the largest piece of carcass and has the largest muscle (meat) content. The high weight of the meat in the chuck section in this study was due to the fat attached to that section which was thicker than that of the blade. The position of the chuck which is in the dorsal part and the lower level of movement of the muscles cause the fat growth in the morning to be higher when compared to the blade which is positioned close to the leg so that it experiences more movement.

Effect of Age on Production of Secondary (Hindquarter) Parts

Based on the results of data analysis in Table 5, it shows that the weight of meat on the hindquarters such as topside, shank, outside, eye round, knuckle and rump at the age level PI_0, PI_2 and PI_4 were not significantly different. The different weights of meat did not significantly affect the weight of the wholesale cuts which were not significant either.

Table 5. Average Hindquarter production: Topside, Shank, Outside, Eye round, Knuckle, Rump Brahman cross heifer based on age level

No.	Variable	Age Level	N	Average ± (Kg)	Percentage (%)
1	*Topside*	PI_0	21	14,81 ± 1,25	6.01
		PI_2	33	14,89 ± 1,00	5.99
		PI_4	50	14,87 ± 1,03	5.86
		Average		14,86 ± 1,06	5.93
2	*Shank*	PI_0	21	7,21 ± 0,57	2.93
		PI_2	33	7,18 ± 0,74	2.89
		PI_4	50	7,25 ± 0,73	2.85
		Average		7,22 ± 0,70	2.88
3	*Outside*	PI_0	21	8,45 ± 0,68	3.43
		PI_2	33	8,33 ± 0,72	3.35
		PI_4	50	8,51 ± 0,82	3.34
		Average		8,44 ± 0,76	3.36
4	*Eye round*	PI_0	21	4,05 ± 0,27	1.65
		PI_2	33	4,02 ± 0,33	1.62
		PI_4	50	4,03 ± 0,37	1.58
		Average		4,03 ± 0,33	1.61
5	*Knuckle*	PI_0	21	8,63 ± 0,82	3.51
		PI_2	33	8,62 ± 0,69	3.47
		PI_4	50	8,81 ± 0,75	3.46
		Average		8,72 ± 0,74	3.47
6	*Rump*	PI_0	21	13,27 ± 0,99	5.40
		PI_2	33	13,11 ± 1,17	5.28
		PI_4	50	13,60 ± 1,36	5.34
		Average		13,37 ± 1,24	5.33

The existence of rules in the production process and the same size and weight of each wholesale cut meat that refers to the Australian Meat Standard causes the parts of the wholesale cut meat obtained to have almost the same weight and size. Supported by Aus-meat (2005) 's explanation, each part of the wholesale cut is cut according to a predetermined standard. This is useful to assist in cutting meat further (retail cut). Besides that, With the stipulation of wholesale and retail cut standards, it increases consumer confidence in buying meat, because the information on the packaging label is in accordance with the products offered. Wholesale cut meats on the market have almost uniform sizes and weights in the same parts.

The highest meat weight in the hindquarters was obtained from the topside meat weight, then followed by rump, knuckle, outside, shank and eye round. The difference in the weight of each piece of meat was due to the influence of the growth pattern of meat, fat and bone as components of the carcass. The high weight of the topside is caused because the topside is one part of the meat that is attached to the leg bone along with the thick flank, shank, outside and silverside which are the parts that experience muscle growth earlier (meat). While the high weight of rump meat is caused by the influence of fat that is still attached to the meat which is dominated by intermuscular and subcutaneous fat. This is because the rump is one part that experiences high fat growth, resulting in fat accumulation in that part.

This is in accordance with the explanation of Priyanto et al, (2009), that the largest subcutaneous fat deposition in the hindquarters was found in the topside, silverside, thick flank and rump sections. This was caused by the growth of subcutaneous fat starting from the ventral area to the dorsal carcass area with the highest level of subcutaneous fat deposition in the lumbar and sacral areas (rib set, loin and rump).

CONCLUSION

Based on the research results, it can be concluded that different age levels in Brahman cross heifer cattle affect carcass production and wholesale cut, the older the age of the cattle, the higher the slaughter weight, fresh and withered carcass weight obtained, but not on the percentage of carcass.

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