Growth and carcass production of Ongole grade cattle and Simmental Ongole crossbred cattle growing in a feedlot system

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ABSTRACT: The purpose of this research was to determine the growth and carcass production of Ongole grade cattle (PO) and Simmental Ongole (SimPO) crossbred cattle growing in a feedlot system. Six ongole grade cattle and six Simmental Ongole crossbred cattle with the respective initial body weight of PO 315,6 ± 39,46 and SimPO 368,3 ± 17,81,were grown for 3 months and were fed with concentrates, elephant grass, soybean and cassava. At the end of the experiment all cattle were slaughtered. The observed variables included feed consumption and digestibility, daily body weight gain, feed conversion, feed cost per gain, and blood urea and glucose levels, carcass cuts weight, carcass yield, carcass percentage, carcass component and meat-bone ratio. The collected data were analyzed using T-test. The treatments significantly affect the carcass weight and carcass percentage ($P< 0,05$), but the treatment had no significant effect ($P> 0.05$) on feed consumption, feed digestibility, daily body weight gain, feed conversion, feed cost per gain, carcass component and meat-bone ratio. In conclusion, the Simmental ongole crossbred had higher carcass weight and carcass percentage and feed cost per gain more efficient when compared with Ongole grade cattle.

Key words: growth, carcass, Ongole grade cattle, Simmental Ongole crossbred cattle , feedlot

INTRODUCTION

Indonesia is a potential country to develop beef cattle farming. This development should be supported by several factors includes calves, feeds availability, social condition and market opportunities.

Until now, the experts still not sure about when and where was the cattle first domesticated. Many experts think that cattle was originated from Middle Asia, and then spread out to Europe, throughout Asia and Africa. Whereas in America, Australia, and New Zealand, which now becoming source for superior type of beef and dairy cattle, there are no original breed cattle, but imported from Europe. We should note, however, that cattle are a domesticated animal and its domestications are different in each region or country.

If we want to trace the history of cattle that spreading throughout the globe, those cattle was originated from domesticated primitive cattle.

In general, cattle are classified into three groups as follows (Sudarmono and Sugeng, 2008):

1.Bos Indicus

Bos Indicus (zebu: hump cattle) is now developed in India, a finally spread out to several countries, especially to tropical country in Southeast Asia includes Indonesia.

2.Bos Taurus

Bos taurus is cattle which breed beef and dairy cattle in Europe. These groups ultimately spread out throughout the globe, particularly America, Australia, and New Zealand. Recently, many of the descent of Bos Taurus is maintained and developed in Indonesia, such as Aberden Angus, Hereford, Shorthorn, Charolais, Simmental and Limosin.

3. Bos Sondaicus

This class is Indonesia original cattle. The ancestor is bull (Bos bibos), which then develop toward cattle's that we can see today as Bali cattle, Madura cattle, Sumatera cattle, and other local cattle.

Various efforts have been undertaken by the government to increase the productivity of cattle, one of which is through cross-breeding program (Hardjosubroto, 2004). Cross-bred cattle's have shown better performance than local cattle so it has been preferred by breeders. It needs to know, however, that each cattle have excellences and weaknesses that sometimes carry with a risk of lack profitable.

To prove the risk sides that less advantage and more advantage, each of cattle's are needed to be tested in field. In this research, it will be compared between Ongole grade cattle (PO) and Simmental Ongole crossbred (SimPO) especially their growth and carcass production produced during fattening period.

MATERIALS AND METHODS

This research was conducted in Ranch House of Fattening of Beef Cattle which is located at Jl. Kaliurang Km 9.7 Sleman Yogyakarta for 14 week from December 4, 2009 until March 21, 2010. Laboratory analyzes were conducted in laboratory of Feed Science Faculty, Gadjah Mada University, for feces analysis, laboratory of Food and Technology and Agricultural Products Faculty, Gadjah Mada University, for feed analysis, and Integrated Research and Testing laboratory of Gadjah Mada University for blood sample analysis.

Materials used in this experiments were large ruminants cattle, that were, 6 male Ongole grade cattle (PO) and Simmental Ongole crossbred (SimPO) of about 18-24 old-month. Tools used in this research are 12 plot of individual cage (each plot is 80 x 140 cm), a set cage and laboratory equipments, "FHK" weigher with capacity of 800 kg and degree of sensitivity of 1 kg, "Fagani Scales" weigher with scale of 10 kg and degree of sensitivity of 0.01 kg, and Salter of 20 kg with degree of sensitivity of 100 g for weighing feed and its rest (which is not consumed by cattle's) during the treatment.

Feeds for cattle's were 13% roughages, 55% concentrate, 25% soybean leather, and 5% cassava.

This research was lasted for 14 weeks: the first two weeks was for feed adaptation; 10 weeks later was for fattening process; the last two weeks was for data collection in the abattoir. The concentrate, leather soybean, and cassava were given two times a day: the first was at 08.00 a.m. and the last was at 16.00 p.m. While roughage was given in the midday between 12.00 p.m. and 13.00 p.m. Water was given by way ad libitum during the research.

After the adaptation period, especially by roughage and concentrate, the amount of feed that was consumed and the rest was recorded to evaluate the amount of feed consumption. Cattle's was weighed twice a week to record daily gain. After fattening period (both PO and SimPO), these cattle's were slaughtered in the abattoir to know the carcass production.

Observed Variables

Variables which were observed included:

Feed consumption. This variable was accounted by subtracting total feed weight before given to cattle's and feed weight which was not consumed by cattle's.

Digestible feed. This variable was accounted by subtracting feed nutrient (BK, BO, PK, and SK) and feces nutrient (BK, BO, PK and SK).

Daily Gain. Cattle's was weighed every two week in the morning just before cattle's is fed. It was aimed to know the daily gain. Initial weight is then subtracted by final weight before the result was divided by the amount of research days or the duration of treatment.

Feed conversion ratio. This variable was accounted based on the ratio between dry feed and daily gain per day.

Feed cost per gain. This was account ted based on average feed cost per kg cattle gain.

Slaughter weight. This was obtained from the results of weighing cattle's gain before slaughtered.

Carcass weight. This was obtained from the result of weighing the carcass after separated from non-carcass material.

Carcass percentage. This is obtained by way dividing fresh carcass weight by slaughter weight then multiplied by 100%.

Carcass component weight (meat and bone). This was obtained by weighing each component taken or separated from carcass.

Meat-bone ratio. This was obtained by comparing meat weight and bone weight.

Data analysis

The obtained data analyzed using analysis of variance with SPSS for windows version 16, procedure T-test (Sugiyono, 2000)

RESULTS AND DISCUSSION

Dry Feed Consumption. Statistical analysis showed that there was no significant different on level of feed consumption (kg/cattle/day), metabolic gain (g/kg/$G^{0.75}$), and percentage of gain (% kg G) which was given in the two treatments. Average dry feed consumptions are 10.97 ± 2.22 kg/cattle/day (PO) versus 11.80 ± 2.58 kg/cattle/day (SimPO), 135.75 g/kg$G^{0.75}$ (PO) versus 146.36 g/kg$G^{0.75}$ (SimPO), and 3.13% kg G (PO) versus 3.38% kg G (SimPO), respectively. These results were probably caused by the similarity of feeds which was given in the two treatments.

Gross Protein Consumption (PC). Statistical analysis showed that there was no significant different on consumption (kg/cattle/day) and protein metabolic gain (g/kg $G^{0.75}$) in the two breeds. Average protein consumptions are 0.91 ± 0.22 kg/cattle/day (PO) versus 1.03 ± 0.17 kg/cattle/day (SimPO), and 11,26 g/kg/$G^{0.75}$ (PO) versus 12.77 g/kg/$G^{0.75}$ (SimPO), respectively. These results were probably caused by the similarity of feeds which was given to the two breeds during the treatment. According to Pond et al (1995), protein is an important organic material for organism. Protein is needed in high quantity for growing period of cattle and then will be decreased gradually along with the age.

Organic Material (OM) Consumption. Statistical analysis showed that there was no significant different on consumption (kg/cattle/day) and organic material metabolic gain (g/kg $G^{0.75}$) in the two breeds. Average organic material consumptions are 17.58 ± 2.12 kg/cattle/day (PO) versus 18.93 ± 2.45 kg/cattle/day (SimPO), and 17.58 g/kg $G^{0.75}$ (PO) versus 18.93 g/kg $G^{0.75}$ (SimPO), respectively. These results were probably caused by the similarity of quality of feed which is given in the two treatments. Organic material consumption of feeds was determined much by protein content and rough fiber of feed used in this research.

Total Digestible Nutrients (TDN) Consumption. Statistical analysis showed that there was no significant different on total digestible nutrient consumption (kg/cattle/day and g/kg $^{G0.}$75) in two breeds. Average TDN of feeds are 9.94 ± 1.53 kg/cattle/day versus 10.5 ± 1.62 kg/cattle/day (SimPO) and 123.00 g/kg $G^{0.75}$ (PO) versus 130.48 g/kg $G^{0.75}$ (SimPO). These results were probably caused by the similarity of feeds quality used in this research. TDN consumption of feed in SimPO breed was higher than PO breed. Results of statistical analysis, however, showed that there was no significant different. Parakkasi (1999) suggested that the amount of feed consumption on Ruminants cattle is determined by environment, cattle condition and feed factors.

Digestible Feed.Digestible feed is a series of feed process began from the feeds are in alimentary canal until the absorption. Digestible feed is interrelated very much by chemical composition of the feed, especially its rough fiber, because of roughage (especially the older) commonly contain high rough fiber (Tillman et al, 1998). The higher digestible level of a feed the higher nutrient will be absorbed (Crowder and Cheda, 1982). According to Anggorodi (1979), digestible feed measurement is an effort to account nutrient value absorbed by alimentary canal. Tillman et al (1998) stated that nutrient value of a feed is determined by the lost part of nutrient after digestive process, this absorption and part is easy to be accounted. Furthermore, it was stated that digestible is related with the nutrient which is not contained in feces or which is digested and absorbed completely. In the other words, digestible is a nutrient part of a feed which is excreted along with feces.

Average digestible feeds in this research include dry feed, organic material, rough fiber and protein These are showed in Table 2.

Statistical analysis showed that there was no significant different on digestible dry feed, organic material, rough fiber and protein between PO and SimPO breeds. This result is probably caused by the similarity of feeds quality which was given to the two breeds during the treatment. Digestible dry feed, organic material and rough protein was determined very much by rough fiber and protein contents of feeds given during treatments. The degree of digestible feed by cattle is determined by materials contained by feed, feed nutrients, and cattle condition. Average digestible feed for PO and

Table 2. Average digestibility nutrients

	Cattle breed	
Digestibility	PO	SimPO
Dry matter[ns]	67,37 ± 2,22	68,57 ± 2,58
Crude protein[ns]	51,74 ± 0,15	50,02 ± 0,17
Crude fiber[ns]	58,82 ± 0,83	57,06 ± 0,89
Organic matter[ns]	75,27 ± 2,12	71,78 ± 2,45

[ns] non significance

SimPO breed is 67.37 ± 2.22 and 68.57 ± 2.58 for dry feed, 51.74 ± 0.15 and 50.02 ± 0.17 for rough protein, 58.82 ± 0.83 and 57.06 ± 0.89 for rough fiber, and 75.27 ± 2.12 and 71.78 ± 2.45 for organic material, respectively. From this research, the nutrient of dry feed, rough protein and fiber, and organic material which is digested by the two breeds was highly varied. Level of digestible food was determined by feed composition, feed treatment, the amount of feed given, and physiological condition of cattle (Tillman et al, 1998).

Initial Body Weight, Final Body Weight, and Average Daily Gain

The average of initial body weight, final body weight, and daily weight gain of Ongole grade cattle (PO) and Simmental Ongole crossbred (SimPO) during fattening period are shown at Table 3.

Table 3. Average of Initial body weight, final body weight, average daily gain

	Cattle breed	
Variable	PO	SimPO
Initial body weight	315,6 ± 39,46	368,3 ± 13,23
Final body weight	383,3 ± 50,83	437,0 ± 11,62
Average daily gain[ns]	0,86 ± 0,18	0,99 ± 0,20

[ns] non significance

The results of analysis show that no significant differences between two cattle breeds used in this research on daily weight gain. The average of daily gain of ongole breed Cattle is 0.86 ± 0.18 kg/head/day vs. Simmental Ongole Crossbred of 0.99 ± 0.20 kg/head/day. This insignificant result supposed to be caused by feed similarities at both treatments. This result is different from Yudhanto's research (2008) on Ongole and Simmental Ongole Crossbred cattle that obtained daily weight gain for Ongole of 0.58 ± 0.13 and Ongole-Simmental of 1.05 ± 0.24. And much differ from Hasbullah (2003) which obtained results for daily weight gain of Ongole grade cattle as much as 0.36 ± 0.25 and Simmental Ongole Crossbredas much as 0.71 ± 0.51.

Types, consumption, and chemical composition of feed have a large effect on growth, protein consumption, and higher energy will results faster growth rate (Soeparno, 2005). In general, influencing factors on animal growth and development are feed, gender, hormone, age, environment, and climate. Chemical composition, consumption, and types of feed have effect on growth. Based on Table 3, we can see that daily weight gain of Ongole grade cattle are 0.86 ± 0.18 kg/head/day and Simmental Ongole Crossbred are 0.99 ± 0.20 kg/head/day. From this results, although Ongole-Simmental cattle shows a higher daily weight gain than Ongole grade cattle, but Simmental Ongole crossbred has not show a better daily weight gain performance yet. This differences is supposed to be caused by initial breeding age of Simmental Ongole Crossbred which are younger than Ongole grade cattle, beside that, Ongole grade cattle has better ability to utilize the feed efficiently at quality food application (Guntoro, 2002). Suparno (2005) suggests that growth influencing factors includes genotype, gender, hormone, and castration. Moreover, types of feed, chemical composition and feed consumption have a large effect on growth too. High protein and energy consumption will results faster growth rate.

Feed Conversion

Feed plays an important role in production improvement, both for growth or other processes. The value of feed conversion reflects the number of feed that consumed to increase daily gain as much as 1.0 kg/head/day, that is, the comparison between consumed feed and resulted daily gain. Average feed conversion is shown in Table 4.

Table 4. Average of feed conversion, and feed cost per gain

	Cattle breed	
Variable	PO	SimPO
Feed conversion[ns]	22,55 ± 6,02	18,47 ± 2,36
Feed cost per gain (Rp)	19.816	16.947

[ns] non significance

The result of statistical analysis in Table 4 shows that no significant differences between both feed treatments on feed conversion ($P > 0.05$). This insignificant difference supposed to be resulted by similarities quality of feed used in both treatments. The average result of feed conversion for Ongole Grade cattle is higher than Simmental Ongole crossbred, but based on statistical results no differences there are no differences. Average feed conversion for Ongole grade cattle 22.57 ± 6.02 vs. Simmental Ongole crossbred 18.47 ± 2.36. This feed conversion differences supposed to be resulted by the types of feed ratio, animal's breed, and barn management. The results of this research is much higher than Suwignyo (2003) on ACC cattle with hay fermentation and concentrate as the feed which result feed conversion as much as 9.6 – 11.4 kg/head/day and Ngadiyono (1995) on Frishian Holstein cattle with concentrate and elephant grass (70 : 30) which results conversion of 10.8 kg/head/day. Ideal feed conversion for cattle with weight of 300 kg is 9 kg/head/day (Tilman et al., 1998). One of influencing factor on feed conversion value is the quality of feed.

Feed Cost per Grain

Feed cost per grain between Ongole grade cattle and Simmental Ongole crossbred cattle at Table 4 shows that Ongole-Simmental cattle are more efficient than Ongole cattle. The average of feed cost per grain for Ongole grade cattle are Rp.19.817 and Simmental Ongole crossbred are Rp.16.948. This result is higher than Supriyana (2005) on Ongole cattle which used concentrate. According to Jesse *et al*. (1976) cited in Basuki *et al*. (2000), the application of high quality feed in order to fattening beef cattle could increase feed consumption, growth rate, feed efficiency, carcass percentage, fat percentage, and decrease the feed cost allocation for each weight gain unit. The increase of feed cost in fattening attempt is more likely caused by feed consumption by animal that not in line with expectation, thus influence on resulted daily weight and increasing the cost.

Slaughter Weight, Carcass Weight, Carcass Percentage, Carcass Component, and Meat Bone Ratio

The average of slaughter weight, carcass weight, carcass percentage, carcass component, and meat bone ratio are shown in Table 6.

Slaughter Weight

The results of statistical analysis show no significant differences on slaughter weight between two cattle breeds. The average of slaughter weight for Ongole is 395.67 ± 58.45 kg/head/day and 442.83 ± 11.40 kg/head/day for Simmental Ongole crossbred, for details these results are shown in Appendix 19. This insignificant differences caused by similar quality of given feed and results same daily weight gain. Types of feed, consumption, and chemical composition of feed are have large effects on growth. A higher protein and energy consumption will results faster growth rate (Soeparno, 2005).

Table 6. Average of slaughter weight, carcass weight, carcass percentage carcass component and Meat-bone ratio

Variable	Cattle breed	
	PO	SimPO
Slaughter weight (kg)[ns]	395,66 ± 58,45	442,83 ±11,40
Carcass weight (kg)	195,00 ± 25,69[a]	224,17 ± 9,70[b]
Carcass percentage)(%)	49,40 ± 1,27[a]	51,18 ± 0,70[b]
Carcass componen(%)		
Meat[ns]	81,31 ± 1,74	81,80 ± 2,37
bone[ns]	18,69 ± 1,74	18,19 ± 2,37
Meat-bone ratio (%)[ns]	4,39 ± 0,50	4,57 ± 0,67

[ns] non significance
[ab] Within a row, means without a common superscript differ (P<0,05)

Carcass Weight

The results of statistical analysis shows a significant difference (P<0.05) in carcass weight among cattle breeds used in this research. The average of carcass weight for Ongole is 195.00 ± 25.69 kg and for Simmental Ongole crossbred is 224.17 ± 9.70 kg. These results are higher than Budiarto (2010) which has 186.15 ± 45.10 kg for Ongole cattle and 219.10 ± 56.08 kg for Simmental Ongole crossbred, and a little bit different than Zonia (2007) which has 193.00 kg for Ongole and 224.57 kg for Simmental Ongole crossbred cattle. Carcass weight is highly affected by animal condition before slaughtered and its empty body weight. Slaughter weight is closely related to growth. Growth is highly determined by feed factors given to animal which could result a maximum slaughter weight. This condition directly affects carcass weight and carcass percentage. According to Soeparno (2005), live weight is correlated to carcass fat weight and it said that carcass percentage was ranged between 50 to 60%.

Carcass Percentage

The results of statistical analysis shows that there is a significant differences (P<0.05) in carcass percentage between two cattle breeds used in this research. The average of carcass percentage for Ongole cattle is 49.40 ± 1.27[a] % and for Simmental Ongole crossbred cattle is 51.18 ± 0.70[b] %. This significant differences are supposed to be caused by slaughter treatment and weighing factor after slaughtering. Carcass weight, carcass percentage, carcass components (bone and meat) and meat-bone ratio are highly affected by quality, consumption, and composition of feed compiler used in the research. Types of feed, chemical composition and feed consumption have a great influence on growth. A higher protein and energy consumption will result faster growth rate (Soeparno, 2005). Moreover, Soeparno (2005) suggests that live weight is correlated to carcass percentage. The results of this research are much higher than Budiarto (2010) which has results of 48.40 ± 3.03% for Ongole cattle and 49.06 ± 2.56% for Simmental Ongole crossbred and very different from Zonia (2007) which has higher Ongole (49.88%) and lower Simmental Ongole crossbred 49.94%.

Carcass Components

From Table 6 we could see that the averages of carcass components from two treatments are: meat percentage of Ongole is 81.31 ± 1.74% and for Simmental Ongole crossbred is 81.80 ± 2.37%, and bone percentage of Ongole is 18.69 ± 1.74% and for Simmental Ongole crossbred is 18.19 ± 2.37%. Meat percentage of Simmental Ongole crossbred is greater than Ongole; meanwhile, bone percentage of Ongole is greater than Simmental Ongole crossbred. Based on statistical results on both treatments, however, the difference is insignificant (P>0.05). This difference between meat and bone percentage are caused by high carcass fat variation. The results for meat percentage are higher than Supriyana (2005) with meat percentage of Ongole breeds of 67.9 ± 1.9 and Simmental Ongole

crossbred of 65.5 ± 4.2, whereas bone percentage is much lower, 24.2 ± 1.1 and 22.4 ± 1.4 for Ongole and Ongole-Simmental, respectively. Fat percentage has negative correlation with bone and meat percentage, but positively correlated to meat-bone ratio (Tillman *et al*. 1998 in Rusman. 1997). According to Berg and Butterfield (1978) which cited in Soeparno (2005), environmental and genetic factors are highly affecting animal carcass composition. Moreover, different nutrient treatment caused great differences in relationship among body components. Main components of carcass are bone, muscle, and fat (Tulloh, 1978). In general, it said that growth production efficiency could be improved if feed consumption could suffice the needs and does not cause any health disorders to the animals. This condition needs feed with good quality (Pond *et al*., 2005).

Meat-bone Ratio

Table 6 shows that there is no significant difference on meat-bone ratio among treatments. This insignificant supposed to be caused by similar quality of feed in both treatments. The average of meat-bone ratio for Ongole is 4.39 ± 0.50% and for Simmental Ongole crossbred is 4.57 ± 0.67%. Based on statistic analysis, however, there is no significant difference between two treatments. These results are higher than Budiarto (2010) which had results 3.98 ± 0.51 for Ongole and 4.07 ± 0.54 for Simmental Ongole crossbred. Fat percentage has negative correlation with bone and meat percentage, but positively correlated to meat-bone ratio (Tillman *et al.,* 1998 in Rusman. 1997). The increase of body weight has effect on the decrease of meat and bone proportion in carcass, whereas, fat proportion is increased. At 2-3 years fattening age, in which growth rate of bone starting to decrease, the next process is the increase of meat and fat weight. The increase of meat weight is dominated by the increase of intramuscular fat. In general, production efficiency on growth could be improved if feed consumption could meet the needs and does not cause any health disorders for the animals. This condition needs feed with good quality (Pond *et al.,* 2005)

CONCLUSIONS

From the results of the experiment which used two different male cattle breeds (Ongole grade cattle and Simmental Ongole crossbred cattle) that maintained with feedlot and same feed treatments, we conclude that there are significant differences on carcass percentage and carcass weight variables among the two breeds. Simmental Ongole crossbred cattle has higher carcass percentage than Ongole cattle, but there are insignificant difference on feed consumption and feed digestibility, daily weight gain, slaughter weight, carcass component, urea and blood glucose levels, and meat-bone ratio. Simmental Ongole crossbred cattle are more efficient than Ongole grade cattle since they had lower feed cost per gain.

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