Effect of breed and initial body weight on daily weight gain of Simmental Ongole Crossbred Cattle and Ongole Grade Cattle

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Abstract. The research was aimed to observe the influence of the breed and the initial body weight on the daily gain of Simmental Ongole crossbred (SimPO) and Ongole grade (PO) cattle in a feedlot system. The research was conducted for three months, used 12 SimPO and 12 PO (age ranged at 1.5-2.5 y), fed by concentrates and King grass. Cattle were grouped as: (I) SimPO <300 kg; (II) SimPO >300 kg; (III) PO < 300 kg; and (IV) PO >300 kg. Feed consumption, average daily gain (ADG), feed conversion ratio (FCR), and feed cost per gain were observed and analyzed using ANOVA. The results showed that ADG, FCR, and feed cost per gain were significantly (P<0.05) influenced by different breeds and initial body weight, while feed consumption was significantly (P<0.05) influenced by initial body weight. There were interactions between breed and initial body weight on feed consumption, FCR, and feed cost per gain. The highest FCR and feed cost per gain showed in group IV. SimPO had higher ADG than PO. Cattle < 300 kg had higher ADG than > 300 kg. Ongole grade > 300 kg were less efficient to be used as feeder cattle in feedlot system.

1. Introduction

Ongole grade (PO) cattle was local cattle formed as result of grading up between Javanese and Sumba Ongole (SO) cattle in about 1930 [1]. Ongole grade cattle was the result of crossbreeding between local cattle with India cattle [2]. The Ongole cattle are large, long-bodied with short necks and long limbs. The natural coat color is white, but the male has dark grey markings on the head, neck, and hump and sometimes black points on the knees. The skin has a medium thickness; the head is long, ears are moderately long and slightly drooping. The horns are short and stumpy, growing outwards and backward. The hump in the males is well developed and erected. The dewlap is large, fleshy, and hangs in folds that extend to the navel flap [3]. Meanwhile, Simmental Ongole crossbred (SimPO) cattle were a result of crossbreeding between Simmental bull and PO cows by artificial insemination (AI) which had the purpose of increasing the cattle production performance. Characteristics of SimPO cattle resembles PO, Simmental and a combination of both the cattle, among others: the color of feather body varies from white to reddish-brown; the color of the tail feather, the tip of the nose, the circumference of the eye and the horn are black and redish-brown; flat, long and wide head profile, white forehead; do not have the hump; there is a small dewlap; long and large body posture [4].
Feedlot or fattening was an exertion of cattle rearing on the final growth stadium, which aims to produce meat production through optimally gain weight by high-quality feeding in a brief time [5,6]. By the feedlot system, cattle productivity, such as gain weight, feed efficiency, carcass, and meat production, could be improved [7]. Genetic and environmental factors, including growth, slaughter age, body weight, sex, and breed, could influence meat production. Feed composition and nutrition also influenced the growth rate, and proportion of the carcass component, especially meat and fat, also nutrition value of meat, including protein, water, and fat [8].

Some factors are influencing the fattening system, such as breed, age, initial body weight, slaughter weight, cattle type, sex, and nutrition [7]. In addition to breed factors, the initial body weight would also affect daily weight gain. The cattle with the bony condition but healthy, which was high average daily gain. Low initial body weight will result in compensatory growth, which was a rapid growth rate in the fattening period [9]. The research was aimed to determine the influence of the breed and the initial body weight on the daily weight gain of Simmental Ongole crossbred (SimPO) and Ongole grade (PO) cattle grown on a feedlot system.

2. Material and methods
The research was conducted at a feedlot company (CV. Indonesia Multi Indah Pati, Central Java) for three months, starting from February to April 2017. Twenty-four cattle consisting of 12 head of SimPO and 12 head of PO cattle. The age of cattle were ranged at 1.5-2.5 years. The initial body weight divided into two groups: the bodyweight less than 300 kg (< 300kg) and body weight more than 300 kg (> 300kg). The cattle fed with concentrates and forage (King grass and corn straw) with a ratio of 70:30. The cattle were grouped by breed and the initial body weight: (I) SimPO cattle with bodyweight < 300kg; (II) SimPO cattle with body weight > 300kg; (III) PO cattle with bodyweight < 300 kg; and (IV) PO cattle with body weight > 300 kg.

The variables observed in this study were feed consumption, average daily gain, feed conversion ratio, and feed cost per gain. The data were analyzed using analysis of variance. When there was a real interaction between breeds and initial body weight, followed by Duncan’s New Multiple-range test (DMRT) using the SPSS 16 for windows program [10].

3. Results and discussion
The results showed that the differences in initial body weight had a significant effect (P<0.05) on the feed consumption of dry matter (DM), crude protein (CP) and total digestible nutrients (TDN), while breed cattle differences had no significant effect. There was an interaction between breed cattle differences and initial body weight on feed consumption (Table 1). The DM, CP and TDN consumption of PO cattle with an initial body weight < 300 kg were the highest than PO and SimPO cattle with initial body weight > 300 kg, there were 115.00; 11.83 and 71.04 g/kg BW0.75, respectively. The other study [11] reported that DM, CP and TDN consumption of Brahman cross (BX) was higher than PO cattle, but was not significant differences between SimPO and BX, as well as between SimPO and PO cattle.

The results showed that the difference between the breed and initial body weight was a significant effect (P<0.05) on the ADG, FCR, and feed cost per gain. There were interactions between breed and initial body weight differences on FCR and feed cost per gain (Table 2).

The ADG of SimPO cattle was higher than PO cattle; there were 0.72±0.80 and 0.63±0.07 kg/head/day, respectively. The initial body weight < 300 kg had higher ADG (0.72±0.08 kg/head/day) than initial body weight > 300 kg (0.64±0.07 kg/head/day). The high ADG of cattle caused by high feed consumption (DM, CP, and TDN).
Table 1. Feed consumption (Dry Matter, Crude Protein and Total Digestible Nutrient) of Simental Ongole Crossbred (SimPO) and Brahman Cross (BX) with different initial body weight

| Feed consumption / Breed of Cattle | Initial body weight | Mean\(\text{ns}\) |
|-----------------------------------|---------------------|------------------|
|                                   | < 300kg             | >300kg           |                     |
| DM (dry matter), kg/head/day      | SimPO: 8.06         | 8.11             | 8.09               |
|                                   | PO: 8.09            | 8.10             | 8.10               |
|                                   | Mean\(\text{ns}\): 8.07 | 8.10             |                     |
| DM (dry matter), % BW            | SimPO: 2.63\(^k\)   | 2.30\(^j\)       | 2.46               |
|                                   | PO: 2.79\(^l\)      | 2.26\(^j\)       | 2.53               |
|                                   | Mean: 2.71\(^b\)    | 2.28\(^a\)       |                     |
| DM (dry matter), g/kg MBW        | SimPO: 109.94\(^k\) | 99.61\(^l\)      | 104.78             |
|                                   | PO: 115.00\(^l\)    | 98.42\(^j\)      | 106.71             |
|                                   | Mean: 112.47\(^b\)  | 99.01\(^a\)      |                     |
| CP (crude protein), g/kg MBW     | SimPO: 11.33\(^{kl}\)| 10.24\(^{jk}\)   | 10.79              |
|                                   | PO: 11.83\(^l\)     | 10.08\(^j\)     | 10.95              |
|                                   | Mean: 11.58\(^b\)   | 10.16\(^a\)     |                     |
| TDN (total digestible nutrients), g/kg MBW | SimPO: 67.93\(^k\) | 61.55\(^j\) | 64.74          |
|                                   | PO: 71.04\(^l\)     | 60.82\(^j\)      | 65.93               |
|                                   | Mean: 69.49\(^b\)   | 61.19\(^a\)      |                     |

\(\text{\(a,b\) Different superscripts at the same row indicated significant differences (P<0.05).}\)
\(\text{\(j,k,l\) Different superscripts at the same row and column indicated significant differences (P<0.05).}\)
\(\text{\(\text{ns}\) non significant.}\)

Table 2. Average daily gain, feed conversion ratio and feed cost per gain of Simental Ongole Crossbred (SimPO) and Brahman Cross (BX) with different initial body weight

| Variable / Breed of Cattle | Initial Body Weight | Mean |
|----------------------------|---------------------|------|
|                            | < 300kg             | >300kg |              |
| ADG (average daily gain); kg/head/day | SimPO: 0.75±0.10 | 0.70±0.42 | 0.72±0.80\(^p\) |
|                            | PO: 0.69±0.03       | 0.57±0.03 | 0.63±0.07\(^p\) |
|                            | Mean: 0.72±0.08\(^b\)| 0.64±0.07\(^a\) |                     |
| FCR (feed conversion ratio); kg/kg gain | SimPO: 10.93±1.34\(^j\)| 11.69±0.72\(^j\) | 11.31±1.10\(^p\) |
|                            | PO: 11.75±0.40\(^j\)| 14.16±0.90\(^k\) | 12.95±1.42\(^a\) |
|                            | Mean: 11.34±1.04\(^a\) | 12.92±1.51\(^b\) |                     |
| Feed cost per gain (IDR/kg gain) | SimPO: 21,814.88\(^j\) | 23,335.58\(^k\) | 22,575.73\(^p\) |
|                            | PO: 23,440.72\(^j\) | 28,270.82\(^k\) | 25,856.77\(^q\) |
|                            | Mean: 22,628.80\(^b\) | 25,803.70\(^p\) |                     |

\(\text{\(a,b\) Different superscripts at the same row indicated significant differences (P<0.05).}\)
\(\text{\(p,q\) Different superscripts at the same column indicated significant differences (P<0.05).}\)
\(\text{\(a,b\) Different superscripts at the same row and column indicated significant differences (P<0.05).}\)

The highest FCR and feed cost per gain showed in PO cattle with initial body weight above 300 kg. The growth influencing factors includes genotype, sex, hormone, and castration. Moreover, types of feed, consumption, and chemical composition of feed are a significant effect on growth. The high
protein and energy consumption will result in a faster growth rate [8]. The other study [11] reported that FCR of SimPO and BX cattle were lower than PO cattle, but was not significantly different between SimPO and BX cattle. FCR influenced by feed consumption, quality, and quantity of feed, ADG, and breed of cattle. Ideal FCR for cattle with a weight of 300 kg is 9 kg/kg gain [5]. PO cattle with an initial body weight > 300 kg had the highest FCR and feed cost per gain (14.16 kg/kg gain and 28,270.82 IDR/kg gain), making it less efficient as feeder cattle in fattening. Feed cost per gain influenced by feed efficiency and was the main thing to consider in the feedlot system [12].

4. Conclusions
It could be concluded that SimPO cattle had higher average daily gain (ADG) than PO cattle, and cattle with initial body weight below 300 kg had higher ADG than initial body weight above 300 kg. Feed conversion ratio and feed cost per gain of PO cattle with an initial body weight above 300 kg were the highest. Ongole grade cattle with an initial body weight above 300 kg were less efficient to be used as feeder cattle in feedlot system.

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References
[1] Ngadiyono N 2012 Beternak Sapi Potong Ramah Lingkungan (Yogyakarta: PT. Citra Aji Parama)
[2] Baliarti E 1985 Performance Pra Sapih Anak Sapi Hasil Inseminasi Buatan di Kabupaten Gunungkidul (Universitas Gadjah Mada)
[3] Williamson G dan Payne W 1978 An Introduction to Animal Husbandry in the Tropics (London: Longman Group)
[4] Triyono 2003 Studi perbandingan ciri eksterior, ukuran tubuh dan status fisiologis antara sapi Peranakan Ongole dengan sapi silangan Simmental Peranakan Ongole di Kabupaten Sleman, DIY (Universitas Gadjah Mada)
[5] Tillman A, Hartadi H, Reksohadiprodjo S, Prawirokusumo S dan Lebosuekojo S 1998 Ilmu Makanan Ternak Dasar (Yogyakarta: Gadjah Mada University Press)
[6] Ngadiyono N 1995 Pertumbuh serta sifat-sifat karkas dan daging sapi Sumba Ongole, Brahman cross dan Australian Commercial Cross yang dipelihara secara intensif pada herbagi bobot potong (IPB University)
[7] Dyer I dan O’Mary C 1977 The Feedlot (Philadelphia: Lea and Febiger)
[8] Soeparno 2005 Ilmu dan Teknologi Daging (Yogyakarta: Gadjah Mada University Press)
[9] Firdausi A, Susilawati T, Nasich M dan Kuswati 2012 J. Ternak Trop. 13 48–62
[10] Steel R dan Torrie J 1984 Principles and Procedures of Statistics (Singapore: McGraw-Hill International Book Company)
[11] Ngadiyono N, Soeparno, Panjono, Setiyono dan Akhmadi I 2015 Growth, carcass production and meat quality of Ongole grade cattle, Simmental Ongole crossbred cattle and Brahman cross The 6th International Seminar on Tropical Animal Production (Yogyakarta: Faculty of Animal Science Universitas Gadjah Mada) hal 343–7
[12] Taylor R 1984 Beef Production and the Beef Industry: A Beef Production Prespective (NewYork: Macmillan Publishing)