Post-Weaning Growth Performance of Belgian Blue Crossed with Brahman Cross

M Sidik[1], I Gemilang[1], A Fathoni[1], T Hartatik[1], S Bintara[1], Ismaya[1], B P Widyobroto[1], I G S Budisatria[1], P Leroy[2], N Antoine-Moussiaux[2], and P Panjono[1]*

[1]Faculty of Animal Science, Universitas Gadjah Mada, Jln Fauna No.3, Bulaksumur, Yogyakarta 55281, Indonesia
[2]Faculty of Veterinary Medicine, University of Liège, B-4000 Liège, Belgium

*Email: panjono@mail.ugm.ac.id

Abstract. This study was conducted to observe the post-weaning growth performance of Belgian Blue-Crossed (BB-crossed) and Brahman Cross (BX) calves. This study used a total of eighteen calves (BB-crossed = 6 heads and BX = 12 heads) aged 6 months. Calves were reared for six months under the same conditions and management. Calves were observed and measured their growth performance (body weight, body length, heart girth, and withers height). Data were analyzed using One-Way Anova, and for body weight gain and body size gain were analyzed by Ancova with initial body weight and initial body size as covariates. BB-crossed calves in this study had a body weight and body size greater than BX calves ($P<0.05$). BB-crossed calves also had increasing in body weight (BB-crossed 0.87±0.06 vs BX 0.63±0.04 kg/day) and body length (BB-crossed 0.23±0.01 vs BX 0.12± 0.01 cm/day) was greater ($P<0.05$) than BX calves, while the increasing in body height (BB-crossed 0.09±0.01 vs BX 0.07±0.01 cm/day) and heart girth (BB-crossed 0.16±0.02 vs BX 0.18±0.01 cm/day) did not differ. In conclusion, BB-crossed calve had post-weaning growth performances greather than BX calves, except increasing in withers height and heart girth. Thus, crosses with Belgian Blue cattle can improve post-weaning growth performance of BX calves.

1. Introduction

As a product with high economic value, beef is important animal protein sources for humans. Based on data from the Central Statistics Agency in 2021, the national beef and buffalo production is 425.98 tons (61%) of the national need, which is 696.96 tons [1]. Since 2005, the government has declared a desire to be self-sufficient in meat. Various attempts have been made to achieve this goal but have not obtained satisfactory results. The main problem in realizing food security is that the demand for food products is faster than the supply, and domestic beef production can not suffice.

So far, to meet the shortage of beef, feeder cattle are imported from Australia. Hamdani et al. [2] state that the cattle imported to Indonesia were Brahman Cross (BX) cattle. The BX cattle from Australia are the result of crossing Brahman cattle with Hereford-Shorthorn cattle. Solehudin and Hasibuan [3] add that BX cattle have better performance than local cattle, so they are suitable for fattening. BX cattle

can adapt well to the Indonesian environment and have good growth. However, BX cattle still need to increase their productivity through crossbreeding. Based on the genetic impact assessment (GIA) analysis, it indicates that crossing with the introduction of exotic breeds in Indonesia can contributed to increase the beef cattle production [4].

Crossing a superior male bull with a less superior female cow will produce offspring that have better performance than the parent. The purpose of crossbreeding is to combine two, three, or four different breeds to obtain the desired trait of each breeds [5;6]. As a result, the heterosis effect of each breeds can appear. The breed of cattle that is now starting to be widely used as superior bulls is Belgian Blue (BB). Agung et al. [7] add that BB cattle have the advantage of high meat p r o d u c t i o n with double muscle properties to be crossed with BX cattle. Post-weaning growth of crossbred cattle is the determining period for cattle to have good abilities at the next stage. The growthof livestock can be seen from changes in body size and weight [8;9]. Crossing BB cattle with BX cattlehas been carried out, but there were fewer reports on the post-weaning growth of the offspring from their crosses. Therefore, this study was aimed to observe the post-weaning growth Belgian Blue-Crossed(BB-crossed) and Brahman Cross (BX) calves.

2. Materials and methods

2.1. Ethical Clearance

This research has been approved by the Research Ethics Commission, Faculty of Veterinary Science, Universitas Gadjah Mada, Yogyakarta (No:0065/EC-FKH/EKs/2020).

2.2. Research Materials

Six heads calves from crossing BB with BX (BB-crossed) and 12 heads of BX calves aged six months were observed for growth and development up to 12 months. Cattle were grouped into two groups, BB-crossed (BB x BX) and BX (purebred), and were reared with the same management and feed. Cattle were fed with commercial concentrate and forage. The concentrate contained 87.09% dry matter, 11.38% crude protein, 1.93% crude fat, 14.39% crude fiber, and 8.97% ash. The forage used were elephant grass and straw. Concentrated feed was given in the morning and forage in the afternoon. The amount of feeding was 4 kg concentrate, 4 kg elephant grass, and 2 kg straw at the age of 6-9 months. Meanwhile, at 9-12 months, the feeding amount was increased to 8 kg concentrate, 6 kg elephant grass, and 1 kg straw. Drinking water was provided ad-libitum.

2.3. Data Collection and analysis

The data observed included body measurement and body weight. Body measurements included body length and withers height measured with a ruler, while heart girth was measured with a measuring tape. The ruler and measuring tape used were the Agrilab brands with an accuracy of 1 cm. Body weight was weighed in a chute that has been integrated with Kenko KK-300 brand scales with a max capacity of 2,500 kg and an accuracy of 0.5 kg. Body measurements and body weight were measured every 60 days until the age of 12 months. Data were analyzed using One-Way Anova, and for body weight gain and body measurement gain were analyzed by Ancova with initial body weight and initial body size as covariates.

3. Results and discussion

The body measurements observed included withers height, body length, and body weight of BB-crossed and BX cattle at the age of 6, 8, 10, and 12 months which presented in Table 1. The daily gain in body measurement and body weight of BB-crossed and BX cattle at the age of 6 to 12 months which presented in Table 2.

Table 1. Body measurements and body weight of BB-Crossed and BX cattle aged 6 to 12 months

Variable	Age (months)	BB-Crossed (n=6)	Brahman Cross (n=12)	Significance
Withers height (cm)	6	99.81±4.50	91.64±4.36	**
	8	104.42±6.20	96.25±5.77	*
	10	112.22±6.72	100.49±5.55	**
	12	118.02±7.02	104.69±5.62	**
Heart girth (cm)	6	130.22±8.28	102.85±6.23	**
	8	136.76±9.79	113.52±6.23	**
	10	152.52±10.30	125.39±8.43	**
	12	160.58±10.80	134.42±7.63	**
Body length (cm)	6	90.32±4.08	78.82±7.55	**
	8	103.21±6.05	90.07±7.93	**
	10	117.78±7.64	95.66±7.24	**
	12	129.07±5.00	101.95±6.84	**
Body weight (kg)	6	168.96±25.18	97.45±21.50	**
	8	220.69±29.20	132.54±26.53	**
	10	280.19±38.35	167.38±30.34	**
	12	339.86±43.48	204.63±28.67	**

* = P<0.05. ** = P<0.01

Table 2. The daily gain in body measurement and body weight of BB-crossed and BX cattle aged 6 to 12 months

Variable	BB-crossed (n=6)	Brahman Cross (n=12)	Significance
Withers height (cm/day)	0.09±0.01	0.07±0.01	ns
Heart girth (cm/day)	0.16±0.02	0.18±0.01	ns
Body length (cm/day)	0.23±0.01	0.12±0.01	**
Body weight (kg/day)	0.87±0.06	0.63±0.04	*

* = P<0.05. ** = P<0.01. ns = non-significant

The daily gain in withers height and daily heart girth of BB-Crossed and BX cattle were not significantly different at the age of 6 to 12 months. The daily gain in withers height of BB-Crossed cattle was lower than [10] study. BB-crossed cattle had an average withers height growth rate of 0.11 cm/day. The heart girth of BB Crossed cattle was lower than [11] who reported that the heart girth of BB cattle aged 14 months had an average of 203 cm. While [12] reported that the heart girth of a cross between BB and Ongole Grade cattle was 156.1 cm. [13] weaning and yearling weights of Belgian Blue crosses with Ongole Grade are 165 and 240 kg. It indicates that the daily gain in body height and heart girth of BB cattle has not been expressed optimally because the proportion of BB cow's blood is only 50%. To approach the nature of the parents. it required a blood composition of 75% [14]. The different growth rates and body compositions can be influenced by different breeds. The growth rate isclosely related to the environment. so it will affect the nature of its growth [6;15].

The body length of BB-Crossed was larger (P<0.01) compared to BX cattle. Significant differences were also found in body weight. where the BB-Crossed cattle were bigger (P<0.05) than the BX cattle. The body length of BB-Crossed and BX cattle is longer than the results of research by Bramastya et al [16]. who reported that the body length of Brahman cattle aged 7 to 12 months ranged from 95 to 105 cm. While body weight and daily gain in body weight of BB-Crossed cattle are following Coopman [17] that body weight of BB cattle at the age of 7 to 12 months ranges from 148 kg to 370 kg and daily gain ranging from 0.7 to 1.05 kg/day. The diversity of body measurement and body weight in cattle is influenced by genetics and the environment [14]. The crossing is one of the steps to obtaining cows with desired characteristics in terms of adaptation. maternal nature. and productivity. Mating different cattle

races can improve growth performance. reproductive performance. and carcass [18]. BB cattle are one of the most widely developed breeds to increase the productivity of local cattle. The BB cattle are large breeds with a good growth rates. have fast muscle mass gain. and are efficient in converting feed into muscle [19].

4. Conclusion

In conclusion. crossing BB bulls with BX cows can improve the post-weaning growth performance of BX cows.

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