International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

Semen Production of Simmental Bulls based on Different Body Weight at National Artificial Insemination Center (NAIC), Singosari Indonesia

Rafika Febriani Putri[1], Woro Busono[2], Suyadi[2]
[1]Master Student of Animal Science University of Brawijaya
[2]Lecturer of Animal Science University of Brawijaya, Veteran Street, Malang 65145, Indonesia
Corresponding author: suyadi@ub.ac.id
Email adress: rafikafebi13@gmail.com

***Abstract*—** *Body weight is a factor that affect semen production and quality in bull. This factor is also counted in bull's selection. The aim of this research was to evaluate the effect of body weight on the semen production of Simmental bull at National Artificial Insemination Centre, Singosari, Indonesia. A total of 323 ejaculate data of semen collected from 17 Simmental bulls aged 4 to 8 years old were used in this study. Body weight ranged 700 kg to 1100 kg, and was divided into four groups of 700 to <800 kg as Group one, 800 to <900 kg as Group two, 900 to <1000 kg as Group three, and >1000kg as Group four. The observed parameters were semen production and qualities, which consisted sperm motility and sperm concentration. The results showed that the body weight affect the semen volume and sperm motility, but had no effect on the sperm concentration. The research concluded that the body weight of Simmental bulls affect its total semen production and qualities.*

***Keywords*—** *Simmental bulls, Body weight, Semen production, Semen quality.*

I. INTRODUCTION

Simmental is a subtropical cattle breed which served as dual-purposes cattle with well muscle and large body frame. The crossbreeding of Simmental cattle with local breed is become more popular to obtain cattle with high productivity and good adaptation to the tropical environment as well. Sutarno and Setyawan [1] stated that Indonesian farmers are much prefer to crossbreed local cattle with Simmental cattle because of the produced outspring are bigger and grow faster compared to the common local breeds. This crossbreeding of Simmental cattle with local cattle are commonly done through artificial insemination (AI).

The success of AI implementation was influenced by several factors, which include the cows, farmers, technicians, and bulls. The bulls that are used to produce semen should have a good semen quality. The macroscopic or microscopic examinations are then become essential to evaluate semen quality and characteristics of the fresh semen [2]. Another factors such as body weight, age, genetic traits, frequency of ejaculation, feed, the environmental temperature, and seasonal factors would have a significant affect on the semen production and qualities of bulls [3]. Furthermore, body weight is significantly correlated with scrotal circumference, whereas scrotal circumference is an indicator for semen production and qualities. Perumal [4] reported that testicular size and weight showed the physical and physiological maturity of bulls, semen production, and birth weight of their off springs.

Based on the mentioned description, the information about body weight and its relationship with semen production and qualities of Simmental bull is important for managing the breeding program, especially on Simmental bull selection. The aims of this study is then to observe the semen production and qualities of Simmental bulls on different body weight.

II. MATERIALS AND METHODS

A. Materials

The research was conducted at National Artificial Insemination Center, Singosari, Indonesia. The material used was 323 ejaculate records from 17 Simmental bulls aged from 4 – 8 years old. The animals were fed 15 kg forage, 3 kg silage, 4 kg concentrate, 4 kg hay and 0.05 mineral. Water was provided *ad libitum*. All of the bulls were reared under similar management based on standard procedure in NAIC, Singosari.

B. Methods

The body weight of bulls was measured once a month by digital measurement. A total of 323 body weight data was included in this study. When semen was not collected, the body weight also was not recorded. The body weight were divided to four groups, group 1 was 700 to <800 kg (n = 28), group 2 was 800 to <900 kg (n= 94), group 3 was 900 to <1000kg (n= 172) and group 4 was >1000kg (n= 29).

The semen collection was done twice a day with two times a week interval, one at early in the morning before feeding and the other in the afternoon by using a strerilized artificial bovine vagina. The semen volume and qualities were observed immediately after collection. The observed parameters were semen production and qualities, which consisted sperm motility and sperm concentration.

C. Data analysis

The obtained data of semen colletion were classified to four different body weight group, then analyzed by using computer statistical package (SPSS) with one-way ANOVA and followed by Duncan's test to determine any significant differences. Correlation coefficient was estimated among the sperm motility, volume, concentration and body weight by Pearson correlation.

Rafika Febriani Putri, Woro Busono, and Suyadi, "Semen Production of Simmental Bulls based on Different Body Weight at National Artificial Insemination Center (NAIC), Singosari Indonesia," *International Research Journal of Advanced Engineering and Science*, Volume 4, Issue 3, pp. 247-249, 2019.

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

III. Results and Discussions

A. Semen Poduction and Qualities of Simmental Bulls on Different Body Weight

The results of different sperm motility, concentration and volume at different body weight groups were presented in Table I, which indicated that sperm motility and volume were significantly ($p<0.05$) different between the body weight groups, meanwhile the concentration were not significant ($p>0.05$) in different body weight groups. The highest volume was found in group 1, and decreased in group 2, 3 and 4. Group 1 had the lowest motility, followed by group 4, 2 and 3 (Table I). The concentration of sperm in group 1, 3 and 3 were better than those in the group 2. The highest concentration was produced in group 4, but there was no significant different ($p>0.05$) sperm concentration on whole groups.

TABLE I. Sperm motility, concentration and semen production of Simmental bulls at different body weight groups

Body Weight Groups	N	Semen Production (ml)	Sperm Motility (%)	Sperm Concentration (mil/ml)
I	28	6.40 ± 1.95^{b}	57.94 ± 10.68^{a}	1498.21±506.53
II	94	5.82 ± 1.40^{a}	63.31 ± 7.48^{b}	1484.21±369.39
III	172	6.12 ± 1.18^{ab}	64.54 ± 7.23^{b}	1492.27±326.77
IV	29	6.01 ± 0.72^{ab}	57.94 ± 13.95^{a}	1505.32±420.93

Different superscripts within rows indicate significant differences ($p<0.05$)

Factors that affected semen volume and concentration were frequency of ejaculation, nutritional status, geographic location, season, method of storing semen and handling bulls during shelter [5]. The low body weight thought caused low sperm motility. Nutrition was sufficiently needed in the reproductive process. Cattle bull that had low body weight due to nutritional deficiencies caused reproductive disorders. An important factor that affected puberty was nutrition. Delay in puberty also occured because of the inadequate supply of food and the provision of important nutrients during the initial growth period [6]. Increased sperm concentration was caused by the effect that GH increased testicular mass, which in turn increased sperm production [7].

B. Correlation between Body Weight and Semen Production on Simmental Bulls

The results of different sperm motility, concentration and volume at different body weight groups were presented in Table I, which indicated that sperm motility and volume were significantly ($p<0.05$) different between the body weight groups, meanwhile the concentration were not significant ($p>0.05$) in different body weight groups. The highest volume

Regression analysis results to find out the relationship between body weight and semen volume in Simmental bull obtained regression equation $Y = 6.036 + 1.624$ X, where X is the body weight (Table II). The statistical test results showed the regression coefficient (0.25) had no significant effect ($p>0.05$). This results means that the regression equation can not be used to predict the volume of Simmental male semen. Based on the Table II R2 = 0.00, that showed below 1% of the variation in the body weight can explain the semen volume. The relationship between body weight and sperm concentration in Simmental bull obtained regression equation $Y = 1475.424 + 3.381$ X. The statistical test results showed the regression coefficient (0.01) had no significant effect ($p>0.05$). Based on the Table II $R^2 = 0.00$, that showed below 1% of the variation in the body weight can explain the sperm concentration.

TABLE II. Correlation between Body Weight and Semen Production on Simmental Bulls

Independent variable	Dependent variable	r	R^2 (%)	Coefficient of regression
Body weight	Semen volume	0,00	0,0	Y = 6,036 + 1,624 X
	Sperm concentration	0,01	0,0	Y = 1475,424 + 3,381 X
	Sperm motility	0,05	0,3	Y = 58,054 + 0,006 X

In this study, the regression equation can not be used to predict the volume of Simmental male semen. Kumar and Srivastava [8] stated that the relationship between body weight and scrotal circumference in the Murrah bull is positive with a correlation coefficient of 0.98, testicular volume of 0.97, sperm concentration of 0.94, concentration per ejaculation 0.64, individual motility 0.90. The regression equation of body weight also can not be used to predict volume of semen and sperm concentration. The results of the Torrentera et al. [9] study found that the correlation between ADG and IGF-I concentrations was consistently positive. The correlation between plasma GH and ADG is negative, and tends to decreased over time. Muthiapriani et al. [10] showed that body weight had no significant correlation with sperm motility. 42.3% of the variation in body weight can explain the sperm motility, while 57.7% is influenced by other factors.

IV. Conclusion

The research concluded that the body weight affect its semen production and sperm motillity, but was not affect the sperm concentration. Body weight can not be used to predict semen production, sperm motility and sperm concentration of Simmental bulls.

Acknowledgment

This paper is supported by USAID through Sustainable Higher Education Research Alliances (SHERA) Program – Center for Collaborative Research Animal Biotechnology and Coral Reef Fisheries (CCR ANBIOCORE). The authors thank to Prof. Dr. Bambang Purwanta, DVM as Leader of ANBIOCORE (Animal Biotechnology and Coral Reef Fisheries) under coordination of SHERA (Sustainable Higher Education Research Alliances) USAID for supporting collabpration and publication funding, Prof. Dr. Erdogan Memmili, DVM, PhD, University of Mis-sisippi, USA for some valuable suggestion during preparing and conducting the study. We thank also very much the Director and Team of National Artificial Insemination Center at Singosari, Malang-Indonesia for providing data of semen production for PO bull and direct data collecting during semen collection.

Rafika Febriani Putri, Woro Busono, and Suyadi, "Semen Production of Simmental Bulls based on Different Body Weight at National Artificial Insemination Center (NAIC), Singosari Indonesia," *International Research Journal of Advanced Engineering and Science*, Volume 4, Issue 3, pp. 247-249, 2019.

REFERENCES

[1] Sutarno and A.D. Setyawan "The diversity of local cattle in indonesia and the efforts to develop superior indigenous cattle breeds" *Biodiversity* vol. 17, issue 1, pp. 275-295, 2016.
[2] Suyadi, S. 2012. Sexual behaviour and semen characteristics of young male boer goats in tropical condition: a case in Indonesia. International Journal of Animal and Veterinary Sciences 6(6): 388-391.
[3] T. Susilawati, Suyadi, Nuryadi, N Isnaini and S Wahyuningsih. 1993. Semen qualities of FH and Bali cattle in different ages and body weights. Research Report. Faculty of Animal Science University of Brawijaya. Malang.
[4] Perumal, P. 2014. Research article: scrotal circumference and its relationship with testicular growth, age, and body weight in Tho Tho (Bos indicus) Bulls. Hindawi Publishing Corporation.
[5] Lemma, A and T Shemsu. 2015. Effect of age and breed on semen quality and breeding soundness evaluation of pre-service young bulls. Journal of Reproduction and Infertility 6(2): 35-40.
[6] Gupta, S K, P Singh, K P Shinde, S A Lone, N Kumar and A Kumar. 2016. Strategies for attaining early puberty in cattle and buffalo: a review. Agricultural Research Communication Centre Journals 37(2): 160-167.
[7] Masood, A, I Ahmad, N Ahmad, Z I Qureshi and M Zubair. 2016. Effect of growth hormone on semen parameters, partial hemogram, and testosteron level in Nilli Ravi buffalo bulls. Revista Veterineria 27(2): 98-102.
[8] Kumar, S and S Srivastava. 2017. Testicular biometry and its correlation with body weight and semen output in Murrah Bull. Buffalo Bulletin 36(1): 106-113.
[9] Torrentera, N, R Cerda, M Cervantes, P Garces and W Sauer. 2009. Relationship between blood plasma IGF-1 and GH concentrations and growth of Holstein steers. Archivos Latinoamericanos de Producción Animal 17(1): 37-41.
[10] Muthiapriani, L, E Herwijanti, I Novianti, A Furqon, W A Septian and Suyadi. 2019. The estimation of semen production based on body weight and scrotal cir-cumference on PO Bull at Singosari National Artificial Insemination Center. Indonesian Journal of Animal Sciences 29(1): 75-82.

Rafika Febriani Putri, Woro Busono, and Suyadi, "Semen Production of Simmental Bulls based on Different Body Weight at National Artificial Insemination Center (NAIC), Singosari Indonesia," *International Research Journal of Advanced Engineering and Science*, Volume 4, Issue 3, pp. 247-249, 2019.