

REPRODUCTIVE PERFORMANCE OF BRAHMAN CROSS COWS ON DIFFERENCE TIME INTERVALS OF ARTIFICIAL INSEMINATION

MOHAMAD ERVANDI^{1,2}, M. NUR IHSAN³, SRI WAHJUNINGSIH³, AULIA PUSPITA ANUGRA YEKTI³ AND TRINIL SUSILAWATI³

¹Faculty of Animal Husbandry, University of Brawijaya, Malang, Indonesia

²Faculty of Agricultural Sciences, Muhammadiyah University of Gorontalo, Indonesia

³Faculty of Animal Husbandry, University of Brawijaya, Malang, Indonesia

(Received 1 January, 2019; accepted 23 April, 2019)

Key words : Reproductive Performance, Artificial Insemination (AI), Time Intervals of Artificial Insemination, Brahman Cross (BX)

Abstract – The success of the Artificial Insemination (AI) is determined by the precise time of the artificial insemination influencing on the successful pregnancy of cow. This study aims to find out the reproductive performance on differences time intervals between the estrus signs and the artificial insemination of Brahman Cross Cows. The materials used were 40 heads cow. The samples were chosen through purposive sampling employing criteria: 2-3 years of age, 300-500 kg of weight, normal circle of estrous, and BCS ranges from 4 to 7 (in scale 1-9). The treatments of artificial insemination consist of 20 head with time interval 0-2 hours and 20 head others with time interval 8-10 hours as a control. The estrus synchronization was performed by using PGF2 α hormone (labeled as *Lutelayse*), and as for the artificial insemination using Ongole Crossbred liquid semen was used with motility more than 40%. The observed parameters were the pregnancy rate using NRR method, service per conception and conception rate. The data was analyzed with descriptive-analytic approach. The result of the study showed that the success of the artificial insemination of the Brahman Cross with time interval 0-2 hours (NRR1 85%, NRR2 85%, NRR3 85%) was higher than that of with time interval 8-10 hours (NRR1 75%, NRR2 65%, NRR3 65%), but did not indicate a significant result in conception rate of the artificial insemination with time interval 0-2 hours (25%) which was higher than that of 8-10 hours (20%). The time interval difference of the artificial insemination of the Brahman Cross has the effect on the service per conception.

INTRODUCTION

The fulfillment of the beef consumption needs that continues to increase has not sufficiently been settled by the local beef availability. To cope with this problem, imports of cattle and frozen meat have become the solutions. The Brahman Cross (BX) is introduced to be the alternative for the fulfillment of domestic needs of the local beef. Kuswati *et al.* (2014) stated that the Brahman Cross (BX) has a percentage of carcass quality at 56.6% and its meat content is at 75.0%. For this reason, the effort to support the livestock population is through the technology of artificial insemination on Brahman Cross (BX). The artificial insemination is proven to be an effective technology to develop the livestock population and to improve the genetic

quality in Indonesia (Yekti *et al.*, 2017^a). The success of the artificial insemination is affected by some factors include physiology, cows condition, estrous detection, semen handling, semen quality, inseminator skill, and time accuracy of the artificial insemination (Susilawati, 2013). Jemal and Lemma (2015) said that the breeder skill in detecting the heat and time accuracy of the artificial insemination influences on the success or failure of the insemination.

The accuracy of artificial insemination time become important so that fertilization can occur between spermatozoa and egg cells then following with pregnancy. The estrous length of cows is 12-24 hours and the estrous occurs within 12-18 hours (Yekti *et al.*, 2017^b). The appearance of cervical mucus can be used as a sign of detecting estrous to

determine the exact time of insemination for an increased percentage of pregnancy (Bernardi *et al.*, 2015). Perry *et al.* (2007) stated that the opportunity of the artificial insemination success is extremely affected by the insemination time determination. However, standing heat is a dominant factor influencing on the success or failure of the insemination and at once as an indication of cattle ovulation that occur. The time interval of the artificial insemination has a big effect on the pregnancy success for the Brahman Cross. However, the estrous time cannot be firmly determined by standard time of the artificial insemination. Hopkin and Evans (2003) said that if the cows showing an estrous in the morning, then the AI can be performed in the afternoon and if it is found in the afternoon, the AI can be applied in the coming morning. However, in the field, it is difficult to practically determine the estrous length and the ovulation time. Therefore, it requires a right solution for the determination of the time interval of the artificial insemination of the Brahman Cross so that the pregnancy success rate can be increased.

MATERIALS AND METHODS

Research Material

The materials used were 40 heads of Brahman Cross (BX). The samples was selected by purposive sampling with criterias: cows aged at 2-3 years, 300-500 kg of weight, previously ever reproduced, normal cycle of estrous, and BCS ranges from 4 to 7 (in scale 1-9). The treatments used were 20 heads of Brahman Cross cows inseminated with time interval 0-2 hours and the other 20 cows with time interval 8-10 hours. The hormone used to synchronize the estrus was PGF2 α (labeled as *Lutelayse*). Liquid semen of Ongole Crossbred bull was used for For artificial insemination with the motility was above 40% based on Indonesia National Standard.

Research Method

The methods used was an experimental method, with two treatments in T1= 20 heads of cow inseminated with time interval 0-2 hours, and T2= 20 heads of cow inseminated with time interval 8-10 hours. The feed cows were consisting of concentrates, grass, and rice straw produced by Feedmil at PT. Pasir Tengah, in Cianjur Regency, West Java. The observed parameters were Non Return Rate (NRR), Service per Conception (S/C), and Conception Rate (CR) (Susilawati, 2013;

Jainudeen and Hafez, 2008; and Royal *et al.*, 2000). The details of NRR, S/C and C/R are formulated as follows.

$$\text{NRR} = \frac{\text{Number of Cows of AI} - \text{Number of Cows of repeat AI}}{\text{Number of Cows of AI}} \times 100\%$$

$$\text{S/C} = \frac{\text{Number of service AI}}{\text{Number of Pregnant Cows}}$$

$$\text{CR} = \frac{\text{Number of Pregnant Cows in the First AI}}{\text{Number of Acceptor}} \times 100\%$$

The data obtained was then tabulated for analysis using descriptive analytic approach.

RESULTS AND DISCUSSION

The comparison of NRR and CR value with Time Interval of Artificial Insemination 0-2 hours and 8-10 hours

Comparison of the results of pregnancy detection based on the NRR method with differences in treatment AI time interval 0-2 hours and AI time interval 8-10 hours in this study are shown in Figure 1.

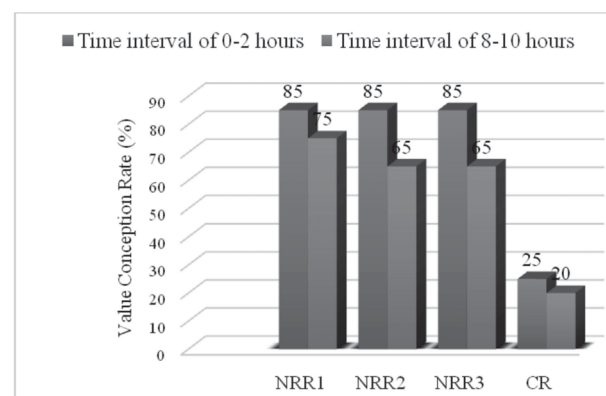


Fig. 1. The comparison of NRR and CR value of Brahman Cross Cows with Different Time Interval of Artificial Insemination

The results showed that the success of AI in Brahman Cross Cows with the treatment time interval of AI 0-2 hours was (NRR1 85%, NRR2 85%, NRR3 85%), higher than the AI interval 8-10 hours (NRR1 75%, NRR2 65%, NRR3 65%). However, it did not show a significant value of CR with time interval 0-2 hours of artificial insemination (25%) which was higher than interval 8-10 hours (20%) as presented in Figure 1. This results was not quite different from the study done by Annashru *et al.* (2017). Brahman Cross cattle in AI at 0-4 hour

intervals have a CR based on NRR1 which is 70% compared to those in AI at 8-12 hour IB intervals having CR 37.14 %. This indicates that the imbalance between the percentage value of NRR and also CR in each treatment is due to the occurrence of Silent heat and also Repeat Breeder which causes an early embryo death and also due to reproductive disorders in Brahman Cross cattle.

The silent heat occurs when there is no indication of the estrous signs performed by the Brahman Cross Cows. This silent heat is a condition of the cattle in which the female does not show signs of estrous clearly, because of the low estrogen hormone (Yekti *et al.*, 2017^b).

During one estrous cycle, reproductive hormones interact each others to to perform the physiology and behavior changes of the female (Hafez and Hafez, 2008). Tsiliganni *et al.* (2011) said that the cervix mucus is produced by the secretion cells in the endocervix in which its quality and quantity are greatly affected by the hormones condition being secreted during the estrous. Son *et al.* (2011) stated that the cow given a feed intake with enough energy and protein has an effect on the fast growing of the cow and normal estrous.

The repeat breeder causing the early embryo death of the Brahman Cross Cows (BX) in the field of this research cannot directly observe without medical equipment and assistance. Yekti *et al.* (2017^b) exposed that the embryo death is commonly influenced by two factors, namely virus and management (malnutrition is very common in which the lack of feed or obesity may lead to the embryo death). The inaccuracy of the estrous detection, insemination time accuracy, lack of nutrition and environment may have the effect on the pregnancy failure indicated by repeat breeding phenomenon (Windiq *et al.* 2005). The early embryo death is closely related to the implantation process in the endometrium where zygotes take longer time to reach uterus, and has its variety depended on the species of the cow (Hafez and Hafez, 2008). The embryo death is possibly caused by non-infection factor, for instance, nutrition (Vanroose, *et al.*, 2000). A fast or slow movement sometimes effects on the embryo death (Pineda, 2003).

Service per Conception (S/C) of Time Interval 0-2 hours and 8-10 hours of Artificial Insemination

The S/C value can be obtained by comparing between the number of service and the number of successfully pregnant cow. The S/C value was

described in Figure 2.

The best S/C value in this study was 3,42 on T1

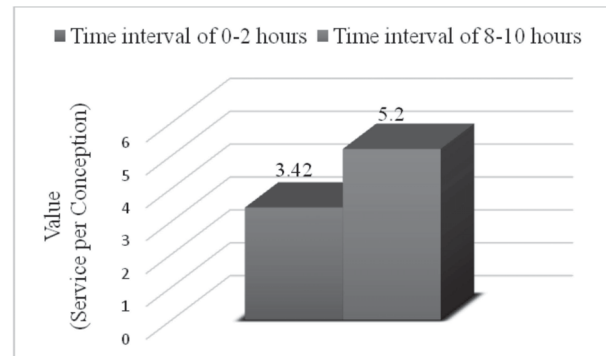


Fig. 2. The S/C average of Brahman Cross with Time Interval Differences of Artificial Insemination

with time interval of artificial insemination of 0-2 hours, while the S/C value on T2 with time interval of artificial insemination of 8-10 hours was 5.2. The S/C values in this research were categorized poor since they were under the Indonesia National Standard at 1.6-2. Jainudeen and Hafez (2008) stated that the normal value of S/C ranges from 1,6 through 2. The time accuracy of the artificial insemination of the Brahman Cross is one of the factors influencing on the success or failure of the artificial insemination as reflected in the S/C value. Perry *et al.* (2007) said that the opportunity of the artificial insemination success is considerably affected by the accuracy time of the artificial insemination. The S/C value is influenced by the nutrition and weight of the cow (Hoque *et al.*, 2003). The nutrition has also an effect on the conception rate (CR) of the artificial insemination success (Roche, 2006). The lack of nutrition and the poor BCS condition can negatively impact on the cow fertility. The cow reproduction fertility is influenced by the nutrition fed in which it plays a vital role in the reproduction cycle (Pradhan, 2008). The hyper-nutrition in which feed is given out of normal measure may lead to the obesity of the cow, forming excessive fat tissue so that the reproduction organ does not function optimally (Jainudeen and Hafez, 2008). The hypo-nutrition condition in which the low feed ration composition, the insufficiency for needs, and the lack of mineral, vitamin, or protein causes the abnormal reproduction system of the cow (Yekti *et al.*, 2017^b).

The Calculation Result of the Feed Quality based on the Need and Feed Consumption of the Brahman Cross

The comparison between the feed nutrition

consumption and the need for feeding in this research can be observed in Figure 3.

The result showed that the feed ration

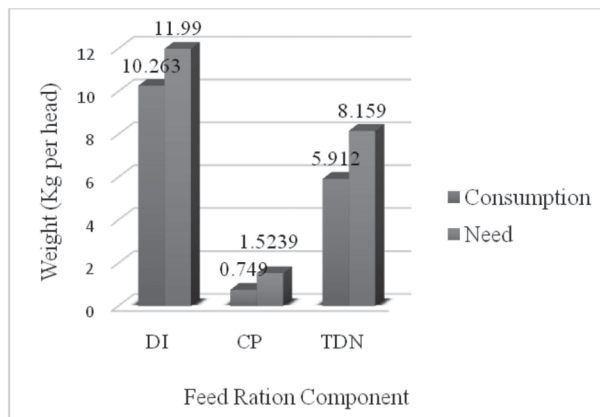


Fig. 3. Diagram of Comparison between Nutrition Need and Feed Nutrition Consumption of Brahman Cross

consumption given to the Brahman Cross was not sufficient, as presented in Figure 3. It was found that the Brahman Cross cows experience the lack of feed nutrition given in which Dry Ingredients (DI) – 1.727 kg per head, Crude Protein (CP) – 0.774 kg per head, and Total Digestible Nutrient (TDN) – 2, 247 kg per head. The lack of the nutrition need for the Brahman Cross cow may cause unclear estrous condition or late estrous, and lead to the reproduction disorder. The hypo-nutrition condition in which the low feed ration composition, the insufficiency of need, and the lack of mineral, vitamin, or protein can impact on the abnormal reproduction system of the cattle (Yekti *et al.*, 2017^b). The cattle with sufficient energy and protein feed intake has an effect on the fast growing of the cattle and normal heat performance (Romano *et al.*, 2005). Ibtisham *et al.*, (2018) mentioned that the lack of nutrition may cause the imbalance of the reproduction hormones, which leads to the ovulation inhibition and effect on the success of the artificial insemination. This results indicates that the consumption of feed rations given to Brahman Cross cow was not appropriate with the feed requirements given.

CONCLUSION

Based on the research result, it can be concluded that the success of the artificial insemination of Brahman Cross cow show that the pregnancy rate using methods of NRR1, NRR2, and NRR3 with time

interval of artificial insemination 0-2 hours is higher than time interval 8-10 hours. However it does not have impact on the CR value. Meanwhile the difference of the time interval of the artificial insemination of the Brahman Cross possibly influences on the S/C value.

ACKNOWLEDGMENT

The researcher would like to say a great gratitude to the management of BUDI-DN Scholarship in cooperation with LPDP (Educational Fund Management Institute), Ministry of Finance of Republic of Indonesia for the funding support given to this research. A special thank is also addressed to the director and staffs of PT. Pasir Tengah (PT. Widodo Makmur Perkasa) which has facilitated this research.

REFERENCES

- Annashru, F.A., Ihsan, M.N., Yekti, A.P.A. and Susilawati, T. 2017. Pengaruh Perbedaan Waktu Inseminasi Buatan Terhadap Keberhasilan Kebuntingan Sapi Brahman Cross. *Jurnal Ilmu – Ilmu Peternakan*. 27 (3): 17-23
- Bernardi, S., Rinaudo, A. and Marini, P. 2015. Cervical Mucus Characteristics and Hormonal Status at Insemination of Holstein Cows. *Iranian Journal of Veterinary Reserach*. 17 (1) : 45-49.
- Hafez, E.S.E. and Hafez, B. 2008. *Reproductive Cycle. Reproduction in Farm Animals*. Edited by B. Hafez, and E.S.E. Hafez 7th Edition. Blackweell Publishing. USA : 59-60.
- Hopkins, S.M. and Evans, L.E. 2003. Artificial Inseminations. In: Leslie E. McDonald *Veterinary Endocrinology and Reproduction*. 5th Edition. Edited by Pineda, M.H. With the editorial of Dooley M.P. Blackwell Publishing. USA : 391393.
- Hoque, M.A., Salim, H.M., Debnath, G.K., Rahman, M.A. and Sayifudin, A.K.M. 2003. A Study to Avaluate de Artifisial Insemination (AI) Success Rate in Cattle Population Based on Three Years Record Among Different Subcenters of Chittagong and Cox's Bazar District of Banglades. *Pakistan Journal of Biological Science*. 6 (2) : 105-111.
- Ibtisham, F., Nawab, A., Li, G., Xiao, M., An, L. and Naseer, G. 2018. Effect of Nutrition on Reproductive Efficiency of Dairy Animals. *Journal Med. Weter*. 74 (6) : 356-361.
- Jainudeen, M.R. and Hafez, E.S.E. 2008. *Reproductive Failure in Females*. Edited by B. Hafez, and E.S.E. Hafez 7th Edition. Blackweell Publishing. USA : 395-403.
- Jemal, H. and Lemma, A. 2015. Review on Major Factors Affecting the Sucessful Conception Rates on

- Biotechnological Application (IA) in Cattle. *Global Journal Inc.* 15 (3) : 19-27.
- Kuswati, Kusmartono, Susilawati, T., Rosyidi, D. and Agus, A. 2014. Carcas Characteristics of Brahman Cross Breed Cattle in Indonesia Feedlot. *Journal of Agricultural and Veterinary Sciences.* (7) : 19-24.
- Perry, G.A., Smith, M.F., Robert, A.J., Macneil, M.D. and Geary, T.W. 2007. Relationship Between Size of Ovulatory Follicle and Pregnancy Success in Beef Heifers. *Journal Animal Sci.* 85 : 684-689
- Pineda, M.H. 2003. Female Reproductive System. In: *Veterinary Endocrinology and Reproduction.* Ed. by M.H. Pineda, and M.P. Dooley. 5th Edition. Blacwell Publishing : 283-340.
- Pradhan, R. 2008. Reproductive Disorders in Cattle due to Nutritional Status. *Journal of International Development and Cooperation.* 14 (1) : 45-66.
- Roche, J.F. 2006. The effect of nutritional management of the dairy cow on reproductive efficiency. *Journal Animal Reproduction Science.* 96 : 282-296.
- Romano, M.A., Barnabe, W.H., Silva, A.E.D.F. and Freitas, 2005. The Effect of Nutritional Level on Advancing Age at Puberty in Nelore Heifers. *Ambienciã Guarapuãva PR.* 1 : 157-167.
- Royal, M.D., Darwash, A.O., Flint, A.P.F., Webb, R., Woolliams, J.A. and Lamming, G.E. 2000. Declining Fertility in Dairy Cattle: Changes in Traditional and Endocrine Parameters of Fertility. *Journal Animal Science.* 92 (8) : 236-240.
- Son, C.H., Kang, H.G. and Kim, S.H. 2001. Application of Progesterone Measurement for age and body Weight at Puberty and *Postpartum anestrus* in Korean Native Cattle. *Journal Veterinary Medical Sci.* 63 (12): 1287-1291.
- Susilawati, T. 2013. *Pedoman Inseminasi Buatan Pada Ternak,* Universitas Brawijaya (UB Press). Malang. ISBN : 978-602-203-458-2.
- Tsiliganni, T., Amiridis, G.S., Dovolou, E., Menegatos, L., Chadio, S., Rizos, D. and Adan, A.G. 2011. Association Between Physical Properties of Cervical Mucus and Ovulation Rate in Superovulated Cows. *Canadian Journal of Veterinary Research.* 75 : 248 – 253.
- Vanroose, G., deKruif, A. and Soom, A.V. 2000. Embryonic Mortality And Emryo-Pathogen Interactions. *Journal Animal Reproduction Sci.* 60 : 131-143.
- Windig, J.J., Calus, M.P. and Veerkamp, R.F. 2005. Influence of Herd Environment on Health and Fertility and Their Relationship With Milk Production. *Journal Dairy Sci.* 88 : 335-347.
- Yekti, A.P.A., Kusumawati, E.D., Kuswati, A. Ridhowi, Sudarwati, H., Isnaeni, N. and Susilawati, T. 2017^a. Succesfull of Artificial Insemination by Using Chilled Semen on Brahman Cross Cows. International Conference in One Health (ICOH 2017). *Advances in Health Sciences Research (AHSR).* (5) : 221-226.
- Yekti, A.P.A., Susilawati, T., Ihsan, M.N. and Wahjuningsih, S. 2017^b. *Fisiologi Reproduksi Ternak (Dasar Manajemen Reproduksi).* Universitas Brawijaya (UB Press). Malang. ISBN : 978-602-432-245-8.
-