Journal of Science-FAS-SEUSL (2023) 04(01) 16-20
ISSN:2738-2184

Comparative evaluation of performance of calves born through Sex-sorted semen and conventional semen in Sri Lanka

P. G. I. D. Amarasiri 1[a] and P. A. B. D. Alexander 2[b]

[a]Veterinary Research Institute, Gannoruwa, Peradeniya, Sri Lanka
[b]Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Sri Lanka
idamarasiri@gmail.com

Abstract
The aim of this study was to compare the performance of sex sorted semen born calves with that of the conventional semen born calves in four veterinary ranges in Sri Lanka. A total of ten Jersey female calves born through sex sorted semen and ten Jersey female calves born through conventional semen were selected. The mean birth weight of calves born through sex sorted semen technology was 35.3 ± 3.6 kg and the conventional calves born was 31.6 ± 2.4 kg respectively. The mean weight gain per day of a sex semen born calf and a conventional semen born calf were 0.47 ± 0.1 kg/day and 0.45 ± 0.08 kg/day respectively. The mean birth weight of sex semen born calves was significantly higher ($p < 0.05$) compared to the mean birth weight of conventional semen born claves. No significant difference ($p > 0.05$) observed between mean weight gain per day of two groups of calves. Comparatively high mean birth weight of sex semen born claves may be due to high genetic merit of proven bull used in sex semen processing. Exposing to same management practices may be the cause of same weight gain per day in two groups of calves.

Keywords: Sex sorted semen, mean birth weight, mean weight gain

1. Introduction

In this research project, we compared the performance of sex sorted semen born calves with the performance of conventional semen born calves managed in same farm environment to assess the suitability of the sex sorted semen technology for long term use under field conditions in Sri Lanka.

2. Literature Review

The dairy industry plays an important role in economy of Sri Lanka. It is one of the traditional industries that has been practicing by rural communities for several decades while uplifting the nutritional status of Sri Lankans. Moreover, it is an important source of employment [1].
Artificial Insemination was the first biotechnology applied in cattle with the purpose of genetic improvement in the world [2]. The technology was introduced to Sri Lanka in 1938 and reached the field within 13 years [3]. The number of inseminations performed annually increased continuously witnessing the success of the technology in the field. The artificial insemination technique has played a vital role in Sri Lankan dairy industry through continuous genetic upgrading of local animals [4].

Corresponding Author: idamarasiri@gmail.com

Sex sorted semen technology is one of the advancements of modern reproductive biotechnology. In this technology, semen obtained from a proven male animal is separated into two different fractions based on the weight difference of the sex chromosomes [5]. Use of sex sorted semen technology in Cattle was initiated in late 1990 in the world [6]. The use of sexed semen is becoming more popular and has secured a permanent place in the dairy industry as a fertility compromised product, thus resulting 90% accuracy in pre-determined sexed of the calves [7]. Whereas, the when conventional semen is used in inseminations, it results in calving with a sex ratio of male: female be 50:50.

The technology is applied to produce offspring of a desired sex and thereby to maximize the productivity and economic return of cattle farmers. The use of technology in Sri Lanka has also been initiated and the first sex sorted semen heifer calf named 'Tania' was born in 2010 at Bopaththalawa farm that belongs to National Livestock Development Board.

The use of sex sorted semen is becoming more popular among Sri Lankan large scale private dairy farmers as the technology facilitates the expansion of their herds with more female animals. However, the cost associated with sex sorted semen is comparatively higher than that of conventional semen [8]. As a pilot project, heifer cows of selected small holder dairy farmers of four veterinary ranges were inseminated with sex sorted semen.

3. Methodology

3.1 Study Area and Selected Animals

The study was conducted in Nuwara Eliya, Theldeniya, Kurunegala and Polpithigama Veterinary Ranges. Smallholder dairy farmers who managed up to 10 dairy animals intensively were selected for the study. Four farmers were selected from Nuwara Eliya veterinary range while two farmers were selected from other three ranges based on confirmation of pregnancy. All the selected animals were Jersey heifers inseminated with sex sorted Jersey semen and conventional Jersey semen managed in same environment. All the animals were approximately at same age. The animals in both groups were fed with a mixture of commercially available concentrate and good quality grass (CO -3) according to the body weight of the animal.

All the sex sorted born calves were female, thus, care was taken to select only female calves to be included in conventional semen calves group. The two study groups were managed in same farm environment in each veterinary range.

To evaluate the performance of claves the birth weight and the weight gain per day were used. The birth weight of each calf was measured using a mechanical weighing machine and to the nearest kilogram. Each calf was weekly visited and the weighed using the mechanical weighing machine to calculate the daily weight gain. The daily weight gain was monitored up to the time of weaning. Finally, the results were analyzed using two sample t test at $\alpha = 0.05$ to compare the statistical significance of the results and to thereby to compare the performance of sex sorted semen born calves with conventional semen born calves.

4. Results and Discussion

The results of the study revealed that the mean birth weight of calves born through sex sorted semen technology was 35.3 ± 3.6 kg and the conventional calves born was 31.6 ± 2.4 kg, respectively. The minimum and the maximum birth weight of the calves born in sex sorted and conventional semen were 30 – 41 kg and 30 – 38 kg, respectively. Table 1, illustrates the range of birth weight of calves born through sex sorted semen and conventional semen.

Table1: Birth weight of calves born through sex sorted semen and conventional semen

Birth weight of sex sorted semen born calves (kg)	Birth weight of conventional Semen born calves (kg)
30	30
37	31
41	30
38	31
30	33
37	31
36	32
32	30
38	38
34 Mean birth weight 35.3 ± 3.6 kg	30 Mean birth weight 31.6 ± 2.4 kg

The mean weight gain per day of a sex sorted semen born calf was 0.47 ± 0.1 kg/day and the mean weight gain of a conventional semen born calf was 0.45 ± 0.00 kg/day. Table 2 illustrates the range of daily weight gain of calves born through sex sorted semen and conventional semen.

Table 2: Daily weight gain of calves born through sex sorted semen and conventional semen

Weight gain of sex sorted semen born calves (kg/day)	Weight gain of sex conventional semen born calves (kg/day)
0.428	0.560
0.480	0.562
0.656	0.469
0.406	0.501
0.504	0.342
0.603	0.304
0.464	0.433
0.325	0.435
0.349	0.502
0.529 Mean weight gain 0.47 ± 0.1 kg/day	0.388 weight gain 0.45 ± 0.08 kg/day

The mean birth weight of sex sorted semen born calves was significantly higher ($p < 0.05$) compared to the mean birth weight of conventional semen born claves. There was no a significant difference ($p > 0.05$) between the mean weight gain per day of sex sorted semen born calves and the mean weight gain per day of conventional semen born calves.

The mean birth weight of the calves born through sexed sorted semen technology was higher than the mean birth weight of the calves born through conventional semen, may be due to the high genetic merit of the donor bull from which the semen was processed for sexed semen

compared to the conventional donors. In contrast, many of the previously conducted studies have shown that female calves through sex sorted semen have less body weight when compared to calves born through conventional semen [9].

The weight gain of a calf prior to weaning is affected by a number of factors. Birth weight, breed, sex of the calf, level of nutrition, diseases and other farm management practices such as housing, farm hygiene, diseases and management of climatic stress have a great influence on daily weight gain [10]. Nutrition is the most important factor that has a greatest contribution on weight gain of calves. In commercial dairy industry, farmers always take necessary action to provide female calves with adequate nutrition while ensuring their income and profit through milk. Thus, usually, female calves in both groups might have received an approximately equal amount of milk in their pre-weaning period, leading to no significant difference in daily weight gain.

The breed of the animal is another contributing factor that can result in difference in weight gain per day. But in this study, both semen types and the dams are of Jersey breed resulting no significant difference in weight gain per day in their offspring. When the sex of the calves is considered, although it is also another influencing factor of daily weight gain, as all the studied animals of this study were females, the sex of the animals has no contribution in difference in daily weight gain.

In addition to above major factors equal exposure to some other factors including diseases, farm hygiene, housing, climate and other stress conditions and other management practices may be a cause of no significant difference in daily weight gain between two groups of calves.

5. Conclusion

The mean birth weight of sex sorted semen born calves is comparatively higher than that of conventional semen born calves while no significant difference was seen in weight gain per day in the two groups of calves. However, more calves are needed to be used in the comparison experiments in order to minimize the errors.

References

1. Damunupola, D.A.P.R., Munasinghe, M.A.L.S.S., Rasika, D.M.D. and Weerathilake, W.A.D.V. (2022). Sri Lanka's Dairy Sector: Where to Move and What to Do – Prediction and a Trend Analysis. *Sri Lankan Journal of Agriculture and Ecosystems*, **4(1)**, p.81. doi: https://doi.org/10.4038/sljae.v4i1.74.
2. Foot, R. H. (2008). The history of artificial insemination: Selected notes and notables. *Journal of Animal Science*, Department of Animal Science, Cornell University, Ithaca, NY 14853-4801.
3. Alexander, P. A. B. D., Abeygunawardena, H., Perera, B. M. A. O. and Abeygunawardena, I. S. (1998). Reproductive Performance and Factors Affecting the Success Rate of Artificial Insemination of Cattle in Up-country Multiplier Farms of Sri Lanka. *Tropical Agricultural Research* Vol. **10** 1998, 356-371.

4. Abeygunawardana, W. M., Pushpakumara, P. G. A., Wasana, H. M. S., Rathnakumara, W. M. T, D. and Alexander, B. (2021). An Evaluation of Semen Quality of Donor Bulls in the Central Artificial Insemination Station (CAIS), Kundasale, Sri Lanka. *Tropical Agricultural Research* (2021) **32**(4): 426-433.
5. Alexander, B., Mastromonaco, G. and King, W. A. (2010). Recent Advances in Reproductive Biotechnologies in Sheep and Goat. *Journal of Veterinary Science and Technology* Vol **1**:101. doi:10.4172/2157-7579.1000101
6. Moore, S. G. and Hasler, J. F. (2017). *A 100 - Year review*: Reproductive technologies in dairy science. *Journal of Dairy Science* Vol. **100** No. 12 :10314–10331.
7. Garner, D. L. and Seidel, G. E. Jr (2003). Past, present and future perspectives on sexing sperm. Can J Anim Sci. **83**: 375-384.
8. Cottle, D. J., Wallaace, M., Lonergan, P. and Fahay, A. G. (2017). Bioeconomics of sexed semen utilization in a high-producing Holstein-Friesian dairy herd. *Journal of Dairy Science*, Vol.**101**, Issue 05, Pages 4498-4512
9. Djedović, R., Bogdanović, V., Stanojević, D., Nemes, Z., Gáspárdy, A. and CSEH, S. (2016). Involuntary reduction in vigour of calves born from sexed semen. *Acta Veterinaria Hungarica* **64** (2), pp. 229–2386.
10. Hyde, R. M., Green, M. J., Hudson, C. and Down, P. M. (2021). Factors associated with daily weight gain in pre-weaned calves on dairy farms. *Preventive Veterinary Medicine*. Vol. **190**, 105320.