
Sexed Semen: A Boon to Animal Breeding

N. D. Singh

*Division of Animal Nutrition,
ICAR- IVRI, Izatnagar, Barielly (U.P.) India*

ABSTRACT

The current sexed semen product produced by Sexing Technologies and Cogent is marketed under the tradename Sexed ULTRA 4M. This product was evaluated in field trials conducted in Ireland in 2018 (AI after detected heat) and 2019 (fixed-time AI). In both trials, using bulls that were resident in a stud at the sex-sorting laboratory. The mean conception rate for sexed semen was poorer than conventional semen (2018: 50.2% vs. 60.3%; 2019: 50.1 vs. 61.1% for sexed and conventional, respectively). The conception rates achieved with sexed semen, on average, were 82% to 84% of those achieved with conventional semen. Maximising conception rate with sexed semen requires careful animal selection, appropriate timing of AI, and attention to detail regarding straw handling. Read more on the research and get further advice [here](#) and at the links below.

Keywords: *Sexed-semen, Animal Breeding, Sexing Technologies.*

INTRODUCTION

As we know, semen contains two types of sperm: Y chromosome holder sperm and X chromosome bearing sperm. When the male's Y chromosome carrying sperm meets the female's egg, a male animal is born. Conversely, when the sperm carrying the X chromosome of the male meets the egg of the female, the female animal is born. The size of the X chromosome and the DN present in it. a. The amount of X and Y chromosomes present in the semen can be separated through flowcytometry technique as compared to Y chromosome [1]. Sexed semen can be successfully used to increase numbers of dairy female replacements born and to reduce the number of dairy bull calves born. Teagasc recommends that early calving younger cows or maiden heifers are most successfully bred to sexed semen. In addition, sexed semen can be used to compact the birth of replacement heifers closer to the start of the calving season than when conventional semen is used. The challenge is the sperm is more fragile after the sorting process and sexed semen straws contain fewer sperm than conventional semen [2].

It is important to pay particular careful attention to straw handling and AI procedures. In the video below Jim White, Dairy Farmer outlines the reasons why he chose to use sexed semen. He has good fertility in his herd to begin with and as he has also sells surplus stock it gave him greater choice for his own herd and for growing his own herd. The video outlines the benefits and challenges of using sexed semen [3]. Sexed semen provides many potential advantages to dairy farmers. The most obvious and compelling reason to use sexed semen is because of the sex bias induced in the calf crop. Stephen Butler, Teagasc, Moorepark has some advice as part of Teagasc / ICBF Breeding Week [4].

Sexed semen provides many potential advantages to dairy farmers. The most obvious and compelling reason to use sexed semen is because of the sex bias induced in the calf crop, with 90% of the pregnancies resulting in a heifer birth, and only 10% male dairy calves. This in turn means that more beef semen can be used, using bulls with high Dairy Beef Index [5].

This will provide long term sustainability for the Irish Dairy Industry. Some of the key factors that affect the likelihood of pregnancy establishment when using sexed semen have been identified. These are summarized in the text below and discussed in the following clip [6].

X and Y Chromosomes

The use of semen with X chromosome produces female animals and the use of semen with Y chromosome produces male animals. The sexing of semen has made it possible to breed animals of any sex (male or female) of their choice. The accuracy of this method is about 90% [7]. All livestock owners wish for the birth of only female animals for milk production because male animals do not contribute to their business. In such a situation, farmers can produce female animals (cows) by using sexed semen. Sexed semen is now widely available and imported sexed semen is being used in India to get better heifers. The use of sexed semen as masculine semen is almost non-existent [8].

Benefits of Sexed Semen

- 1) With its use only calves are born, so the production of milk increases and the farmer does not have to spend unnecessarily on the rearing of the calves. In our situation, the use of sexed semen will be more beneficial.
- 2) With the birth of more calves, a greater number of milk giving cows will be available with the farmer.
- 3) The farmer will not have to buy cows from outside, which will help in the prevention of diseases.
- 4) Sexed semen does not cause difficulty during delivery in pregnant calves. Therefore, its use is more useful in calves.
- 5) Apart from this, cows also get relief from difficult delivery [9].

Precautions

The sperm count (about 2 million per dose) is very low in sexed semen as compared to conventional semen, so the chances of conception with its use are lower by about 10-15% than conventional semen. Its use is more beneficial in those areas where the work of artificial insemination (KG) is going well.

- 1) Its use in healthy and normally hot young calves gives expected results.
- 2) The cost of sexed semen is many times higher than that of conventional semen, so skilled and experienced Kr. It is good if the technician uses it only after seeing the symptoms of heat at the right time [10].

Disadvantages of Sexed Semen Technology

- 1) High cost of maintenance of sexed sorting machine like flow cytometry and lower sorting speed and efficiency
- 2) Higher cost of sexed semen than conventional semen
- 3) Delayed sexual maturity in heifers under Indian condition
- 4) The conception rate with sex sorted semen is 10–15% less than conventional semen, which is more detrimental condition in our country where total coverage of AI is less than 25% of breedable population (Abdalla *et al.*, 2014).
- 5) Sexed semen contains only 2–4 million sperms/dose as compared to conventional semen which contains 20 million sperms/dose which will be challenge under Indian field condition [11].

- 6) Sperm from some bulls had higher tolerances for sorting, freezing and thawing than from other bulls also every bull's semen cannot be sexed due to inherent abnormalities in the sperm cells [12].
- 7) Lack of skilled manpower.
- 8) Lack of awareness about sex semen to farmers. The major problem is that it needs highly specialized, non-portable equipment which is quite costly for routine use [13].

CONCLUSION

Indian Dairy farmers have started using the sexed semen technology to deal with upcoming challenges in the future Dairy Industry. However, reduction in sperm concentration in sexed semen straw to 2 million viable motile sperm leads to pregnancy depression by 15-20% as compared to conventional system, but fetal female sex ratio is close to 90% with sexed sperm. Optimum fertility from low dose sexed sperm may only be achieved with bulls of high fertility and good managemental practices. Indian farmer needs to be educated and supported financially to adopt sexed semen nationwide. Dairymen could produce more female calves and by this lessen the chance of dystocia at calving, reduce biosecurity risks and genetic improvement at a faster rate. Sexed sperm will cost more and will require greater cattle management and AI breeding skills. More research is needed for sperm sorting efficiency and on large-scale field trials to improve pregnancy rates of low dose, sexed sperm. The Indian government announced, dairy farmers will be provided with sexed semen for Rs 100 per vial by 2020 so that buffaloes and cows produce female calves only. It is reported that use of sexed semen gives 80-90% accuracy as compared to conventional semen straws where male: female ratio is about 50:50. However, as sperm concentration in sexed semen straw is far less than the conventional semen straw and the sorting procedure itself damages the sexed sperm, conception rate is 10 to 20 % less with sexed semen as compared to normal semen. Currently no agency is producing sexed semen in India so it has to be imported. Sexed semen is not available with all AITs. Sexed semen is not available for all breeds of cattle and buffalo in India, presently it is available for only HF and Jersey breeds. As sexed semen is imported, approval from state AH department is required to use it and keeping complete records of progeny born out of imported semen is mandatory. Sexed semen is available at the rate of Rs.1,500 to 2,000 per dose. However, some states are making it available at a subsidized rate.

REFERENCES

- 1) Moore, K., Thatcher, W.W. 2006. Major Advances Associated with Reproduction in Dairy Cattle. *J. Dairy Sci.*, 89: 1254-1266.
- 2) Johnson L.A. 2000. Sperm for Production of Offspring: The State-of-the-Art. *Animal Reproduction Science*, 60-61: 93-107.
- 3) DeJarnette, J.M., Nebel, R.L., Marshall, C.E. 2009. Evaluating the success of sex-sorted semen in US dairy herds from on farm records. *Theriogenology*, 71:49-58.
- 4) Garner, D.L., Gledhill, B.L., Pinkel, D., Lake, S., Stephenson, D., Van Dilla, M.A., Johnson, L.A. 1983. Quantification of the X- and Y-chromosome-bearing spermatozoa of domestic animals by flow cytometry. *Biol. Reprod.*, 28:312-321.
- 5) Frijters, A.C.J., Mullaart, E., Roelofs, R.M.G., van Hoorne, R.P., Moreno, J.F., Moreno, O., Merton, J.S. 2009. What affects fertility of sexed bull semen more, low sperm dosage or the sorting process? *Theriogenology*. 71: 64-67.
- 6) Hohenboken, W.D. 1999. Applications of Sexed Semen in Cattle Production. *Theriogenology*, 52: 1421-1433.
- 7) Johnson L.A., Welch G.R. 1999. Sex Preselection: High-Speed Flow Cytometric Sorting of X and Y Sperm For Maximum Efficiency. *Theriogenology*, 52: 1323-1341.

- 8) Garner D.L., Gledhill B.L., Johnson L.A., Lake S., Pinkel D., Stephenson D., Van Dilla M.A. 1983. Quantification of the X- and Y-Chromosome-Bearing Spermatozoa of Domestic Animals by Flow Cytometry. *Biology of Reproduction*, 28: 312-321.
- 9) Schenk, J.L., Cran, D.G., Everett, R.W., Seidel, G.E. Jr. 2009. Pregnancy rates in heifers and cows with cryopreserved sexed sperm: Effects of sperm numbers per inseminate, sorting pressure and sperm storage before sorting. *Theriogenology*. 71:717–728.
- 10) Seidel, G.E. Jr. 2007. Overview of sexing sperm. *Theriogenology*, 68:443–446.
- 11) Seidel, G.E. Jr., Schenk, J.L., Herickhoff, L.A., Doyle, S.P., Brink, Z., Green, R.D., Cran, D.G. 1999. Insemination of heifers with sexed sperm. *Theriogenology*, 52:1407–1420.
- 12) Weigel, K.A. 2004. Exploring the Role of Sexed Semen in Dairy Production Systems. *J. Dairy Sci.*, 87: (E. Suppl.): E120-E130.
- 13) <http://cattletoday.com/archive/2008/February/CT1428.shtml>