

ROLE AND IMPROVING QUALITY OF SEX SEMEN IN CATTLE FARMING

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ABSTRACT

Numerous advantages are offered to farms and the industry as a whole by the use of sexed semen in the development of dairy and beef cattle. Global demand for dairy and beef products is rising, thus there will need to be more attention paid to improve production efficiency. Unwanted male calves that are excess are produced in dairy farming. In comparison to heifer calves, male dairy calves have a higher risk of dystocia, and as an undesirable by product of mating with traditional semen, they are of little economic use. Sexed semen is defined as desired sex, whether it be female or male, that is produced from sperm carrying the X or Y gene. By increasing the number of outstanding heifers and good male germplasm from exceptional bulls utilised for future breeding programmes, sexed semen helps a herd make genetic advancement. In order to effectively divide bovine sperm into fractions having larger quantities of X or Y chromosome-bearing sperm, a number of techniques have been developed, including density gradient centrifugation or swim-up, sex-specific antibodies, free flow electrophoresis, and flow cytometry. The only semen sexing technique that has been shown to yield calves with desired sex with greater than 90% accuracy and is economically feasible is flow cytometry. Other techniques for sperm sex sorting have also been developed, but they still need to be refined for commercial viability. These techniques include centrifugal counter current distribution, free flow electrophoresis, identification of the H-Y antigen, genetic approaches, and others. The purpose of this study was to evaluate the sexed semen technique, the usefulness of sexed semen, and the advantages and drawbacks of sexed semen.

KEYWORDS: Sexed Semen, Cattle, Fertility, Economics.

INTRODUCTION

Sexed semen technology has transformed the landscape of cattle farming, offering farmers the ability to selectively choose the sex of offspring. This innovative technique allows for targeted breeding, genetic improvement, and enhanced herd quality. In this article, we will explore the role of sexed semen in cattle farming and the methods employed to improve its quality.

The sperm-sexing device now in use is an amazing accomplishment of engineering. X-sperm, Y-sperm, unsexable plus dead sperm, and over 30000 successive assessments of individual sperm may be performed by these flow cytometer/cell sorters per second for each nozzle. Even at these rates, traditional sperm packaging per insemination is not financially viable.

Table 1: Difference between X and Y spermatozoa

Parameter	Difference
Size of X sperm	Larger
DNA content	Less in Y sperm
Presence of cell surface antigen H-Y antigen	Y sperm
Surface charge of X sperm	Negative
Motility of Y sperm	Faster

Understanding the role of sexed semen

- A. Genetic Selection and Improvement:** Sexed semen provides farmers with a powerful tool for genetic selection. By choosing the sex of the offspring, breeders can focus their breeding programs on desired traits, enhancing the genetic potential of their herds. This targeted selection can lead to improvements in milk production, growth rates, disease resistance, and other economically valuable traits.
- B. Herd Expansion and Replacement:** Sexed semen plays a critical role in herd expansion and replacement. Farmers can use sexed semen to produce a higher proportion of female calves, ensuring an adequate supply of replacement animals for future breeding. This controlled approach helps maintain or increase the herd size while optimizing genetics and reducing the need for external purchases.
- C. Market considerations:** Sexed semen allows farmers to cater to specific markets and meet consumer demands. For example, dairy farmers can produce a surplus of female calves for sale as dairy replacements, while beef producers can focus on producing high-quality female calves for breeding or niche markets. This flexibility opens up additional revenue streams and improves profitability.

Sex semen in the creation of meat

When opposed to dairy production, beef production uses and adopts AI significantly less frequently. As a result, there is little use of sexed semen in the production of beef. However, a high fertility sexed semen product might change the cattle industry. Accurate heat detection is crucial for the efficient application of AI, especially with sexed semen. In cattle herds, particularly in sizable beef herds maintained under wide rangeland systems, this can be challenging. Even if they are difficult to put into practice, high fertility timed AI methods enable synchronisation and whole-herd insemination at the beginning of the mating season. Sexed semen might be used to preselect the offspring sex in traditional beef production systems, which now rely on conventional semen for AI. This would enable the development of male progeny with strong terminal qualities and female offspring with strong maternal features.

Methods to improve sexed semen quality

- A. Advanced sorting techniques:** Continuous advancements in sorting technologies have greatly improved the quality of sexed semen. Techniques such as flow cytometry and high-speed sorting have increased the accuracy of separating X and Y chromosome-bearing sperm. These methods enhance the reliability and efficiency of sexed semen production.
- B. Semen Processing and Storage:** Strict protocols during semen processing and storage are crucial for maintaining high-quality sexed semen. Proper laboratory conditions, controlled temperatures, and

appropriate packaging ensure the longevity and viability of sperm. By following these procedures meticulously, breeders can preserve the genetic potential of sexed semen.

- C. Quality control measures:** Regular quality control measures are essential to ensure the quality of sexed semen batches. Post-thaw sperm motility assessment, sperm concentration determination, and semen viability testing are common practices used to assess the quality of sexed semen. These measures help identify any potential issues and allow for prompt corrective action.
- D. Bull selection:** Selecting superior sires is crucial for improving the quality of sexed semen. Bulls with high fertility rates, excellent semen quality, and desirable genetic traits should be chosen for sexed semen production. This careful selection increases the chances of successful conception and the production of superior offspring.

Factors to take into account for successful implementation

- A. Timed Artificial Insemination (AI):** In order to maximise conception rates with sexed semen, artificial insemination (AI) must be timed correctly. Breeding programmes are more precise and effective when they use timed AI protocols based on precise estrus detection or synchronisation techniques. This guarantees the use of sexed semen at the best window of fertility for the greatest likelihood of a successful pregnancy.
- B. Breeding management:** Adequate management practices are key to successful conception rates with sexed semen. Proper nutrition, herd health management, and stress reduction are essential factors to consider. Maintaining optimal body condition, providing balanced diets, and minimizing environmental stressors contribute to improved reproductive performance of animals inseminated with sexed semen.
- C. Monitoring and Evaluation:** Regular monitoring of breeding outcomes, conception rates, and calving intervals is vital to assess the effectiveness of sexed semen in achieving breeding goals. Analyzing this data allows farmers to make informed decisions for future breeding strategies and continuous improvement.

Advantage of using sexed semen in dairy cattle

- This permits quick herd growth without running the danger of introducing illnesses that might happen with purchased animals.
- It guarantees a 90:10 or vice versa female to male ratio.
- By halting the generation of male calves, dystocia was reduced.
- The generation of elite bulls.
- Progeny testing programmes are more affordable and increase the utility of genetic markers used in embryo transfer.

- Strict culling.
- By selecting genetically better dams for replacements, selection intensity may be boosted by utilising sexed semen, speeding up the pace of genetic gain in dairy herds.
- The main advantage of utilising sexed semen is the birth of calves with the chosen sex.
- By expanding the size of the herd while keeping a closed herd, it is feasible to lower the frequency of difficulties in first calves (heifer calves are lighter than male calves). Additional replacement heifers for herd expansion may also give benefits in terms of increased biosecurity.

Techniques for increasing conception rates using sexed semen

1. The use of sexed semen in animals with highly fertile females (having AI pregnancy rates with conventional semen 60%) and healthy cycling females with good body condition scores would be helpful.
2. Sexed semen will be more useful when used by trained AI technicians. When handling, storing, and thawing the straws, exercise utmost caution. While using fixed time AI, make sure that a high percentage of animals were in heat before doing AI.
3. Excellent and cautious animal management (nutrition, illness control, estrus detection, semen handling, and insemination method) is essential for the best possible application of sexing technology.

CONCLUSION

Sexed semen technology has revolutionized cattle farming by allowing farmers to selectively breed for desired traits, expand their herds, and access value-added markets. By implementing advanced sorting techniques, maintaining strict quality control measures, and considering various management factors, the quality of sexed semen can be enhanced. Cattle farmers can harness the power of sexed semen to improve herd genetics, optimize breeding programs, and ultimately achieve superior quality offspring, leading to increased profitability and long-term sustainability in the industry.

The most popular and effective method for sperm sexing is flow cytometry. The government is currently primarily focused on this technology, and several studies are being conducted to advance this method in cooperation with other laboratories so that it is practical in India. Additionally, its widespread use across the nation is constrained by its high cost and poor fertility-related issues. The highly fertile herd and the healthy cycling females with good body condition scores must use the sexed semen. This method will be acknowledged as one of the most widely used procedures in many parts of India after the cost of sex sorted semen is reduced with sufficient fertility rates.

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