THE ROLE OF ARTIFICIAL INSEMINATION COMPARED TO NATURAL BREEDING IN LIVESTOCK

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ABSTRACT

Artificial Insemination (AI) is one of the most significant reproductive technologies used for genetic improvement and disease control in cattle. This article outlines the AI process including insemination techniques and discusses its advantages and limitations compared to natural breeding.

KEYWORDS: Artificial insemination, Natural breeding, Genetic improvement.

INTRODUCTION

Breeding is one of the challenging tasks in dairy farms. The choice between artificial insemination (AI) and natural breeding is still a question of debate due to both methods' varying highs and lows. Artificial insemination (AI) plays a crucial role in modern livestock breeding and has clear advantages over traditional natural breeding. While natural service has long been the conventional method, today's farmers and breeders increasingly rely on AI to meet the growing demand for better productivity, improved genetics, and safer herd management. Genetic improvement is one of the biggest strengths of AI. With artificial insemination, farmers can use semen from genetically superior bulls anywhere in the world. This allows them to rapidly improve the genetic quality of their herds producing animals with higher milk yield, better meat quality, and greater resistance to diseases. In contrast, natural breeding limits farmers to the bulls available locally, which can slow genetic progress.

PROCESS OF ARTIFICIAL INSEMINATION

Insemination Techniques-Timing is crucial cows should be inseminated during standing oestrus, about 12 hours before ovulation. The recto-vaginal method is widely used, placing semen directly into the uterus for higher conception rates.

Preparation

Check the identity of the animal obtain the cows previous history; inseminations, calving, fertility, and disease. Once the semen dose has left the container it should be thawed. Straw should be thawed in a 30 ºC to 37 ºC water bath for 10-60 seconds is commonly recommended. Try to dry the straw and maintain the temperature at 37 ºC while the insemination gun in cold weather to lift the straw from the water and wipe it dry with a paper towel. Put a straw in the insemination gun sealed end first. Cover the gun with a plastic sock to prevent contamination of the instrument. Push the plunger of the insemination gun slowly until the semen is visible at the open end of straw.

Techniques

The technique of inseminating a cow is a skill requiring adequate knowledge, experience and patience. Improper AI techniques can negate all other efforts to obtain conception. Semen must be deposited within the tract of the cow at the best location and at the best time to obtain acceptable conception rates. Early method of AI involved deposition of the semen in the vagina, as would occur in natural mating. Those methods are not satisfactory. Fertility is low and greater numbers of sperm are required. Another method which gained popularity was the "speculum" method. This method is easily learned, but proper cleaning and sterilizing of the equipment is necessary, making it more impractical to inseminate than with the rectovaginal. The safe and best method of insemination is "Recto vaginal method of insemination". In the recto-vaginal technique a sterile, disposable catheter containing the thawed semen is inserted into the vagina and then guided into the cervix by means of a gloved hand in the rectum. The inseminating catheter is passed through the spiral folds of the cow's cervix into the uterus. Part of the semen is deposited just inside the uterus and the remainder in the cervix as the

catheter is withdrawn. Expulsion of the semen should be accomplished slowly and deliberately to avoid excessive sperm losses in the catheter. The body of the uterus is short; therefore, care should be taken not to penetrate too deeply which might cause physical injury. In animals previously inseminated, the catheter should not be forced through the cervix since pregnancy is a possibility.

ADVANTAGES OF AI

AI is used as:- means of genetic improvement, ensuring routine semen evaluation and monitor, removal of geographical restriction, permitting the storage for posterity, reduction in risk of injury, reinforcement of natural service, encouragement of routine examination of female reproductive tract, improvement in the reproductive potential of sub-fertile male, permitting the use of fixed time AI, allows for control of venereal disease with in a herd, frozen semen can be stored and used long after the donor or sire is dead.

Increased efficiency of bull usage

During natural breeding, a male will deposit much more semen than is theoretically needed to produce a pregnancy. In addition, natural breeding is physically stressful. Both of these factors limit the number of natural mating a male can make. However, collected semen can be diluted and extended to create hundreds of doses from a single ejaculate. Also, semen can be easily transported; allowing multiple females in different geographical locations to be inseminated simultaneously, and semen can be stored for long periods of time, meaning that males can produce offspring long after their natural reproductive lives end.

Increased potential for genetic selection

Because artificial insemination allows males to produce more offspring, fewer males are needed. Therefore, one can choose only the few best males for use as parents, increasing the selection intensity. Furthermore, because males can have more offspring, their offspring can be used in a progeny test program to more accurately evaluate the genetic value of the male. Finally, individual farmers can use artificial insemination to increase the genetic pool with which his or her animals can be mated, potentially decreasing effects of inbreeding.

Decreased costs

Male animals often grow to be larger than females and can consume relatively larger amounts of feed. Also, male animals are often more strong, powerful, and potentially ill-mannered and thus require special housing and handling equipment.

Increased safety for animals and farmers

Male animals can become large and aggressive. These factors mean that maintaining a bull on a farm may be dangerous. Also, because of the relatively larger size of adult males than females, natural mating is more likely to result accidents and injury to either the cow or the bull than is artificial insemination.

Reduced disease transmission

Natural mating allows for the transfer of venereal diseases between males and females. Some pathogens can be transmitted in semen through artificial insemination, but the collection process allows for the screening of disease agents. Collected semen is also routinely checked for quality, which can help avoid problems associated with male infertility.

Permitting the use of fixed- time insemination

AI should ideally allow the use of fixed time insemination; such system aims to manipulate the female oestrus ovulation and insemination.

DISADVANTAGES OF ARTIFICIAL INSEMINATION

Labour Intensive: Requires skilled personnel for heat detection and insemination.

Needs Proper Infrastructure: Storage tanks, sterile equipment, and record-keeping.

Risk of Poor Genetic Diversity: Overuse of a few sires may reduce variability if not managed.

Potential for Disease Spread: Improper screening may transmit undetected infections.

Technical Errors: Mistakes in semen handling and insemination can reduce conception rates.

CONCLUSION

Artificial Insemination remains the most effective tool for genetic improvement, herd health management, and sustainable dairy development. However, success depends on trained personnel, reliable infrastructure, effective disease control, and proper sire selection. Expansion and improvement of AI services can significantly benefit cattle producers, especially in developing countries.

Therefore, having the above conclusion in mind, the following points are forwarded as recommendation: AI must be applied widely in Ethiopia to increase their genetic improvement and prevention of disease transmitted through semen as compared to the other assisted

reproductive technology because it is less costly. A successful heat detection program and subsequent proper timing of insemination will increase reproductive efficiency.

This widely use AI must be with recording the identity of sire to avoid in breeding, long insemination dates and some form of positive pregnancy diagnosis

Table: 1 Comparison Artificial Insemination and Natural Breeding

Aspect	Artificial Insemination (AI)	Natural Breeding
Genetic Improvement	Allows rapid genetic progress by using semen from proven superior bulls worldwide.	Limited to the genetics of bulls available locally.
Disease Control	Reduces risk of sexually transmitted diseases.	Higher risk of spreading venereal diseases.
Cost and Management	No need to maintain costly breeding bulls; safer for handlers.	Requires keeping bulls, which are expensive and can be dangerous.
Breeding Efficiency	Breeding Efficiency	Breeding Efficiency
Record Keeping	Enables better record keeping and planned breeding programs.	Records are harder to maintain accurately in natural service.
Timing and Control	Fertilization can be timed precisely for better conception rates.	Less control over timing; success depends on bull's condition and behavior.
Genetic Diversity	Access to semen from bulls across countries increases genetic pool.	Restricted gene pool, especially in isolated herds.
Physical Risks	No risk of injury from bull mounting	Risk of injury to cows and handlers during natural mating.
Limitations	Requires skilled technician and good heat detection.	Does not require technical skills but needs good bull management.