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Artificial Insemination in Cattles

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Abstract

Artificial Insemination technology is one of the greatest technology developed in the field of Animal Husbandry which solves a lot of problems associated with the sexual mating of the Cattles. Artificial Insemination is the technique of fertilizing the female Cow artificially i.e., without physical mating of the Cow and bull. It is performed by injecting the semen of a bull directly into the Ractovagina of the Cow. This technique not only prevents Sexually transmitted diseases but also at the same time provides maximum chances of fertilization with superior offspring. Although, the success rate of this technique is low in our Country due to lack of skilled personals and improper handling. Therefore, in this paper we have briefed about the need of Artificial Insemination in our Country along with its adequate procedure, equipments used and methods.

Keywords: Animal Husbandry, Artificial Insemination

Introduction

The fertilization process in Cattles has always been a most difficult part in Animal husbandry or can say in dairy industry. The natural process of sexual mating had low conception rate as well as the chances of getting Sexually transmitted diseases were also higher. Therefore, this technique of Artificial Insemination was developed by a Russian researcher, Llya Lvanovich Lvanov in 1922 (Ombelet & Robays., 2015) ^[1]. Artificial Insemination is a method in which the Ova of a Cow are fertilized artificially by inserting the semen of bull using a syringe. In this method, the cattles are not allowed for sexual mating and thus it prevents sexually transmitted diseases and as the semen are directly injected into the cervix part of ractovagina of Cow thus, it increases the rate of conception along with genetically superior offspring in them (Patel *et al.*, 2017) ^[2].

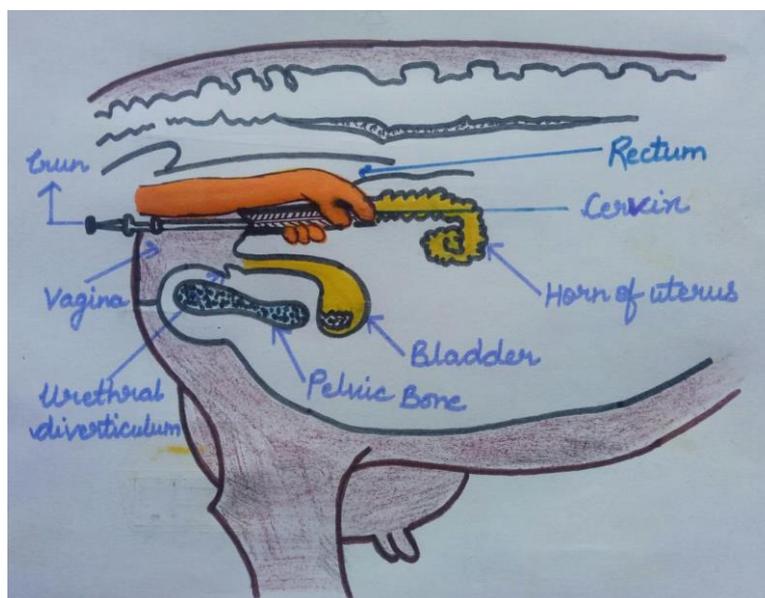


Fig 1: Artificial Insemination of Cow

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Procedure of Artificial Insemination

➤ **Equipments needed for Artificial Insemination:-**

a. **Artificial Vagina:** Artificial vagina is the most important part of Artificial Insemination as this is used to collect the semen of bull artificially. It is made up of a rubber barrel both externally and internally in which hot water of upto 60°C temperature are poured in a way that the temperature of inner lining of the rubber remains 40°C to 45°C (FAO joint., 2005) [3]. For smooth insertion of Penis and better penile erection, the inner lining of the AV are lubricated properly and are placed firmly around the male genitalia of Bull (Brinsko *et al.*, 2011) [4]. The artificial vagina are attached properly with the semen collection vial through rubber bands and are covered by a jacket like material to avoid leakage of semen ejaculated by Bull.

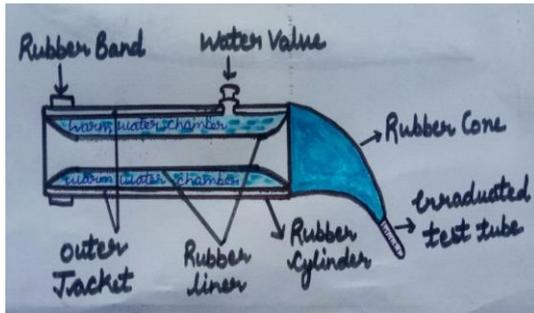


Fig 2: Artificial Vagina

b. **Extender:** Extenders are the nutritive materials like Milk, Egg yolk, Glycerin and some antibiotics etc. which not only dilutes the semen but also provides nourishment to the stored sperms and maintains their viability (Rehman *et al.*, 2013) [5].

c. **Straws:** The collected and processed semen are transferred in straws in an amount sufficiently needed to fertilize a female Cow (Diskin, 2018) [6].



Fig 3: Semen Containing Straw

d. **AI Rods/ Catheter:-** This is basically a syringe like equipment which draws the semen out from the semen containing straws and once it reaches the site of insemination i.e., into the cervix of the ractovagina of Cow, it deposits the semen into the cervix for fertilization process (Mike O'Connor., 2012) [7].



Fig 4: AI Rod

e. **Straw Cutter:** These are used to cut the ends of the straws containing semen without harming the sperms so that the straw could easily gets attached to the AI Rod.

f. **Collection Vial:** A semen collection vial is a glass tube with pre-marked scale for determining the quantity of collected semen and is attached to the artificial vagina via rubber band at the time of semen collection (Knoop & Pounden., 1943) [8].

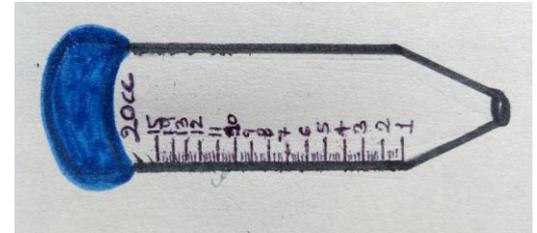


Fig 5: Collection Vial.

g. **Thaw bath:** As the Semen are stored at freezing temperature to protect it from getting denatured, it is very important to defrost the semen before injecting it into the vagina of Cow and thus a Thaw bath of about 40 seconds in warm water at 35° to 38° C are given to the Straw containing semen without harming the sperms (Patel *et al.*, 2017) [2].

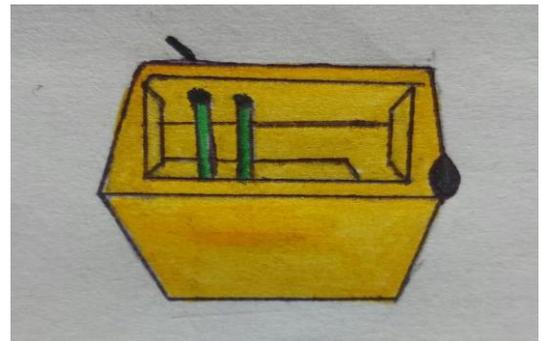


Fig 6: Thaw Bath

h. **Paper Towels:** As we know that the sperm in the semen denatures at high temperature, thus in order to avoid the denaturing of sperm in the semen and to avoid contaminations, the ends of AI Rods are wrapped in paper towel before inserting it into the Vagina of the Cow. The paper towel also absorbs the excess moisture of vulva.

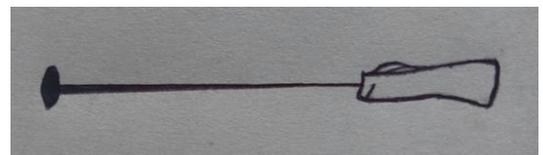


Fig 7: AI Rod wrapped in a paper towel

i. **Lubricants:** These are the aqueous substances like Vaseline etc., used to lubricate the inner lining of artificial vagina while semen collection for smooth insertion of the Male genitalia of the Bull (FAO Joint. 2005) [3].

j. **Plastic Sheath:** A protective sheath is kept over the AI rod once it gets attached with the Semen containing straws and are locked with the help of a plunger during insemination.

➤ **Methods of Semen Collection:** For performing the artificial insemination of Cattles, collection of viable

semen from healthy bull is mandatory. The semen can be collected via any of the three methods given below:-

- a. **Rectal Massage:** This method is the most common method of collecting semen from bull in which the semen collecting personal uses his finger tips to massage the ampullae near the prostate gland of rectum softly along with rhythmic strokes, in order to excite the Penis for semen ejaculation into the semen collecting vial (Perry *et al.*, 2021) ^[9].
 - b. **Electro-ejaculation:** Palmer *et al.*, 2005 ^[10] studied that Electro-ejaculators equipped with a rectal probe having three electrodes can be used for semen collection mechanically.
 - c. **Artificial Vagina:** Artificial vagina is a device used for semen collection. These are fitted with outer rubber jackets in which warm water are filled in a way to maintain the internal temperature upto 44°C to 48° C and are then fixed around the penis of bull after lubrication, in order to provide favorable condition for Penile erection and semen ejaculation by bull (Brinsko *et al.*, 2011) ^[4].
- **Semen Evaluation:** Tanga *et al.*, 2021 ^[11] in his paper described that, once the semen from healthy and viable bull are collected, it went through a evaluation procedure in which the semen are evaluated to analyse whether it can fertilize the ova of Cow or not along with their viability, motility and their tolerance to freezing and thawing procedures.
 - **Processing of Semen:** Cseh *et al.*, 2012 ^[12] studied that the semen after collection should be stored carefully as the sperm can get destroyed at higher temperatures and thus just after collection of semen they are processed by adding extenders such as Milk, Glycerine, Egg Yolks etc. to dilute the semen as well as to provide nourishment to the sperms during storage.
 - **Storage of Semen:** As sperms are highly temperature sensitive and cannot tolerate high temperature, thus it becomes important to store it carefully. Therefore, the straw containing the semen are stored in liquid Nitrogen tanks and are frosted at a constant rate of temperature till the temperature reaches 320° F.
 - **Symptoms of Heat in Cow:** The procedure of Artificial Insemination is carried out only when the Cow is on heat (estrous) i.e., when the ova matures and is about to get released into the genitalia for fertilization which lasts for about 36 to 72 hours but the period of conception ranges only between 12 to 18 hours (Khan *et al.*, 2020) ^[13]. Therefore, it becomes crucial to identify the heat duration in the Cow for better breeding procedures and thus following are the symptoms of heat in Cow:-
 - The Vulva of Cow swells up during heat and the vulva lips upon opening can be seen red in colour with mucous layering.
 - Recurrent urination is also observed at the onset of estrous cycle.
 - During estrous, Cow can be seen raising their tail again and again.
 - Generally, during standing heat duration the Cow allows mounting of other animals on her.
 - The onset of heat is marked with the thin & transparent mucous discharge which becomes thick and rubbery after the completion of the estrous cycle (O'Conner. 2016) ^[14].
 - **Steps of Artificial Insemination:** When the Cow is on heat i.e., when her ova matures for

fertilization process, the procedure of Artificial Insemination should carried out (Mike O' Connor. 2012) ^[7]. First of all, the straw containing the semen are given thaw bath for 40 seconds to stabilize the temperature of the semen as they are stored at freezing temperature (Patel *et al.*, 2017) ^[2]. The semen containing straw is then attached with the AI rod and is fixed carefully with protective sheath and plunger and the part of AI rod having semen are then wrapped with paper towel to maintain the temperature of semen (Selk., 2017) ^[15]. The AI rod loaded with semen are then carried to the cervix of the Racto vagina of Cow and once it crosses three layered rings of cervix, the sperms are injected to fertilize the Ova in the uterus of Cow. After the incorporation of the semen into the cervix, the AI rod is removed out carefully and the reproductive tract of Cow is given a slight massage to distribute the semen into the uterus as an assurance of fertilization whether the ova is released from left or right ovary.

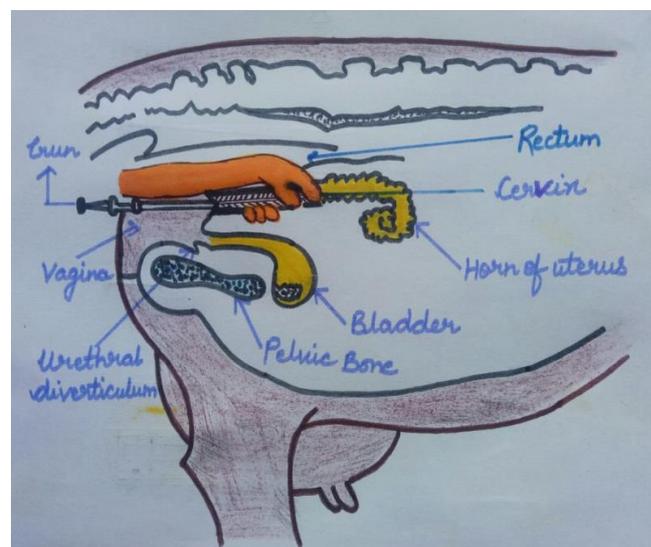


Fig 8: Artificial Insemination of Cow

Conclusion

Artificial insemination is an artificial process of fertilizing female cattle by depositing the semen of viable bull directly into the cervix of ractovagina of Cow to increase the conception rate in females Cattle. This technology is not only helping the dairy industry to emerge with higher production but is also helping dairy farmers to have high Milk yielding Cow to uplift their earnings from them.

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