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Review Article

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Review on Major Factors Affecting Synchronization effectiveness in Dairy cows

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Abstract

Synchronization is one of reproductive biotechnology which can quickly boost the genetics of local cattle breeds, shorten generational cycles, and spread genetic material within populations of breeding animals. However, the success of the synchronization is limited by numerous management and cow level factors like proper levels of heat detection technique, semen quality, proper time of insemination, nutrition, body condition, health, efficiency of AI technicians and age. However, inadequacy in any of these areas can spell disaster for an estrus synchronization program. The choice of a protocol which fits the specific situation under consideration is the base for the success of any prostaglandin-based estrus synchronization in dairy cows. As a conclusion, the choice of technically right and practically feasible protocol is essential for successful estrus synchronization.

Keywords: Synchronization, Dairy cattle, Factors, Estrus

1. Introduction

Ethiopia is ranked first in Africa, with an estimated 53.99 million heads of cattle. Of these breeds, local breeds are 98.95 percent of the total cattle in the country, and the rest are mixed and exotic breeds, comprising between 0.94 percent and 0.11 percent, respectively. The population involves the majority of local breeds and some exotic crossbreeds of cattle on specified farms (CSA, 2017. In Ethiopia, dairy production is still substantial and indigenous cows have an estimated daily milk production of 1.37 liters per day (CSA, 2014). Among the reproductive biotechnologies, estrus synchronization is a part of a successful AI program to improve the genetics of local cattle to increase milk production, which typically involves administering a series of hormones to induce a group of cows or heifers to be fertile at a chosen time period, which makes it easier to determine when the cows are in heat (Soren et al., 2018).

Synchronization of ovulation is the process by which the reproductive cycle of animals is manipulated by the use of hormones or their analogues to induce ovulation at a precise point in time (Tegegne *et al*., 2016). Estrus synchronization works either by controlling follicular development, promoting ovulation in

anestrus cattle, regressing the corpus luteum in cyclic animals or synchronizing estrus and (or) ovulation (Lucy *et al*., 2004). The fundamental method is to control the timing of estrus initiation by regulating the estrous cycle duration. The various approaches to control cycle length are prostaglandin administration to regress the corpus luteum (CL) of the animal prior to natural luteolysis and the use of gonadotropin-releasing hormones (GnRH) and an analog to temporarily suppress ovarian activity or new ways to create estrous synchrony (Ozill *et al*., 2011).

Synchronization improves reproduction efficiency by reducing the calving interval, schedule calving season and milk availability, production of uniform calf crops, increasing calf weaning weights, and efficient use of artificial insemination technique (Girmay *et al*., 2015). According to (Tegegne *et al*., 2012) report awareness creation, proper training, careful animal selection (good body condition score, cows free from diseases and with functional ovaries), good animal handling facility at a convenient location, a well-trained, organized and motivated multi-disciplinary team (livestock science, feeds and nutrition experts, veterinarians, AI technicians, etc.) actively participant community and proper leadership and coordination are key elements for the success of synchronization.

In order to improve the low genetic potential of local cattle in particular, selection of the most promising breeds and cross breeding of these indigenous breeds with highly productive exotic cattle has been considered as a practical solution (Tadesse, 2008). In Ethiopia, artificial insemination had been going on for nearly fifty years. However, it is widely believed that the artificial insemination (AI) service in the country has not been successful to improve reproductive performance of dairy industry (Ozill *et al.*, 2011). Therefore, the objective of this review paper was to identify the factors that affect the effectiveness of synchronization in dairy cows.

2. Literature Review

2.1. Synchronization protocol

Single injection protocol: this system uses minimum number of doses of PG Animals was observed for estrus three times daily for 5-6 days and those detected in estrus during the period were inseminated. The remaining animals are injected with PG on 6th or 7th day depending on whether a 5 or 6 day breeding period had been used prior to treatment. The estrus detection continues for another 5 to 6 days and animal inseminated on the basis of estrus. With this system most of the cyclic female in a group is inseminated once in 10-12 day period of time. If fixed time insemination is to follow, it is best to give two inseminations, the first at 72 hr and second at 96 hr after treatment (Sanjay, 2021).

Double injection protocol: this system can be used in two ways. First Injecting PG in all animals of the group on the first day and are than detected for estrus during the next 5 days. Those detected in estrus during this 5 days period are bred on the basis of estrus. Animals not detected in estrus during the first 5 days are injected again on day 11 or 12. These animals are observed for estrus for 5 days and inseminated in the basis of estrus or are given fixed time inseminations at 72 and 96 hours. Second giving two injections of PG in all animals at 11 or 12 days apart and animals were observed for estrus only after 2nd PG injection for 5 days. Those found in estrus were bred at estrus or given fixed time insemination at 80 hr (single insemination) or at 72 and 96 hr (double insemination). The advantage of this system over single injection system is that a fairly high degree of synchrony is maintained which even last for three-estrus cycle and secondly, less time is consumed on estrus detection (Sanjay, 2021).

2.2. Factors affecting the effectiveness of synchronization

The success of the dairy operation is influenced by biological, environmental, and management factors. Due to these factors, it is difficult to

achieve one calves per one one-year principle while it is considered as an economically feasible and optimal success for dairy operation (Murugavel *et al*., 2010).

2.3. Body condition and nutrition

Body condition score (BCS) of an animal is a means to assess physiological states, energy reserves, and rebreeding potential of animals. Poor nutrition is the main cause of infertility in cattle reared in tropical (Maqhashu *et al*., 2016) and state synchronization implemented with a poor body conditioned animals results in a low level of heat response and pregnancy rates.

2.4. Heat detection and insemination time

Heat detection is a major limiting factor and the base for success. Failure of estrus detection results in infertility in cattle. Generally strict follow up, the use of heat-detector devices and technologies helps to increase detection ability to have successful breeding (Jemal *et al*., 2016). Detecting estrus many times a day as much as possible is better than detecting estrus once a day. For the last seven decades, the standard for the time of insemination recognized as 12h after onset of estrus (Dorseya *et al*., 2011) stating the higher degree of conception achieved at 10-15h of insemination after the onset of estrus.

2.5. Parity

The results of different studies clearly indicate the effect of parity in different protocols of the synchronization program. However, the effect should depend on the health status and management of dairy animals (Girmay *et al*., 2015).

2.6. Insemination service and insemination technicians

Insemination service is delivered as a daily round of inseminators, static point insemination and cell phone-based systems. The major problems of insemination in-tropics include technical limitation, lack of transport facility, poor quality of semen, timely unavailability of semen, poor heat detection, lack of incentives, unavailability of the service off- working hours, high cost of service, and low efficiency and shortage of AI technicians (Tegegne *et al*., 2012). There is great variation in terms of the skill of technicians in detecting the presence of functional corpus luteum for hormone administration and effective AI service (Gizaw *et al*., 2016). In general, the use of experienced technicians can help to ensure conception in females that respond to treatment (Gizaw *et al*., 2016).

2.7. Semen quality

According to the recommendation of IAEA (International Atomic Energy) and FAO (food and agricultural organization) (IAEA [International Atomic Energy Agency] and FAO [Food and Agriculture Organization of the United Nations], 2005), acceptable semen should have 40% or more actively forward-moving spermatozoa after freezing and thawing while semen motility and viability is influenced by AI centers (collection up to packaging), storage conditions, level of contamination, thawing procedure and temperature, reproductive health of bulls, and genetic and morphological differences among semen products (Bainesagn, 2015).

3. Conclusion and Recommend

The most common failure of estrus synchronization and AI programs is poor attention to detail. Neglecting major management practices, such as nutrition, record keeping, AI technician proficiency, good heat detection, and proper timing of estrus synchronization protocols, generates poor results. Therefore, attention to management practices is the key to having a effective estrus synchronization and AI program and the following recommendations are forwarded.

- Good management practices in terms of reproductive health management, heat detection, semen quality, feeding and housing should be considered before implementing effective estrous synchronization and mass artificial insemination program.

J The skill and knowledge based training for enhancement estrus synchronization must be given for both the farmers and implementers to enhance perception and adoption of the technology.

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