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Scientific Management Practices of Mithun

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Abstract

Mithun (*Bos frontalis*), the unique bovine species of the northeastern hilly region of India. It is an integral part of the tribal people and is considered a unique micro-enterprise with potential benefits. Mithun is presently reared under a free-range forest ecosystem; however, with the decreasing forest coverage in this region, it is imperative to adopt a semi-intensive rearing system. Scientific management practices such as the construction of sheds, selection, feeding roughages and concentrate, deworming, vaccination, artificial insemination and record-keeping are beneficial to maximize the profit. Some of the strategies that are required for the scientific management of mithun are discussed.

Introduction

Recently, there is an increasing scope of change in approach from traditional mithun rearing to the semi-intensive system. At a slow pace, mithun farmers are shifting from a traditional free-range system of rearing to semi-intensive mithun farming. A semi-intensive system of mithun rearing has several advantages such as control breeding, recording keeping, proper management of pregnant cows and calf, protection from wild predators, *etc*. (Joshi *et al.,* 2021). Traditionally, mithun has been reared for only meat; however, its value in terms of milk, hide, and draught power is recently explored. Herd management is crucial for better performance of mithun reared scientifically under the free-range or semi-intensive system. The factors such as improper nutrition, endocrine imbalance, heredity, infectious diseases and reproductive abnormalities decrease the performance of the herd.

Genetic Improvement of Mithun

Breeding and genetic improvement of any livestock species are continuous processes. The selection between breeds and within breeds, and nominated mating practices are two major tools in the hands of a breeder which are widely used in farm livestock practice coupled with systematic record-keeping and has led to the dramatic improvement in the performance of dairy and beef cattle over the last 50 years. Initially, the emphasis was given to milk yield and body weight traits; however, at present selection for the traits including health, longevity, and reproduction is considered important for improved animal performance. Concerning mithun, "*the indiscriminative slaughtering of the elite mithun bulls has led to the loss of potential germplasm*". At present, the best mithun bull in terms of its physical traits, health and body weight is selected for slaughtering at ceremonies and marriages. Keeping in view the overall genetic improvement of mithun herd, the superior bulls with high genetic merit should not be slaughtered, rather these bulls

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need to be selected and maintained for further propagation. A proper breeding plan for genetic improvement of mithun population in the form of ONBS (Open nucleus breeding system) under participatory mode needs to be strengthened and should be established in the community herd or institute herd (Figure 1). At the same time, conservation and propagation of elite mithun germplasm are important to continue genetic improvement of mithun population.

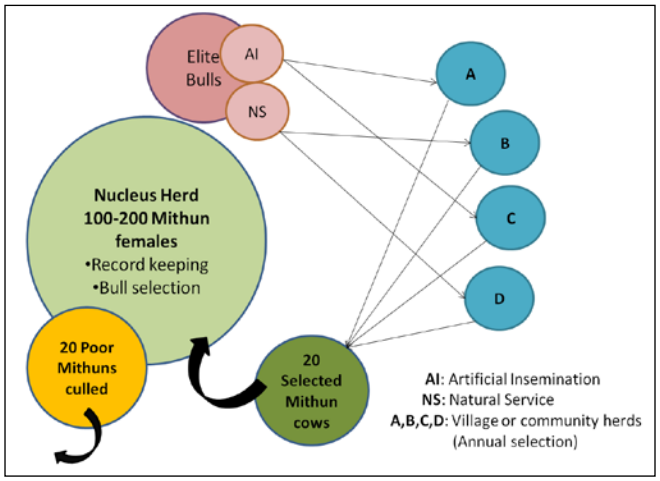

Figure 1: Schematic representation of ONBS (Open Nucleus Breeding System) for mithun under participatory mode with the local community

Nutritional Management of Mithun

Mithun being reared in the free-range system, moves and browses around the forest and thrives on the forest forages, shrubs, herbs, and other natural vegetation. The mithun is not fed with the additional feed except the salt which is offered from time to time by the farmers. Improper nutrition directly affects health and reproductive performance by lower expression of estrus, increased incidence of embryonic or fetal death, and increased inter calving period. All the animals require a specific diet during the transition period to counteract negative energy balance. Forest grasses and mixed forages do not fully meet the nutrient requirements of mithun reared under captivity by the scientific method; however; in the free-range system mithun meet their requirements by consumption of the nutrient-rich vegetation available in the forest. Besides, in the hilly regions of northeast India, the leaching of minerals by excess rainfall is a common phenomenon, so the soil and vegetation are deficient in micro and macro minerals. To achieve maximum productivity in a free-range or semi-intensive system, during the flush season, tree fodders, shrubs, herbs, salt and mineral mixture may be fed to fulfill the nutrient requirement and avoid mineral deficiency. During the lean season when forest grasses or foliage are scarce, concentrate mixture (14-16% CP and 70% TDN) fortified with salt and mineral mixture may be supplemented at the rate of 1-2 kg to mithun <2 years and 2-4 kg >2 years or recently calved mithun (per animal on daily basis). Supplementation of minerals is very essential as they play an important role in health and reproduction. The free-range mithun may be fed with minerals or concentrates in a particular location in the forests, while under a semi-intensive system, minerals may be provided in the sheds during the late evening or early morning.

Health Management of Mithun

In the present scenario, foot-and-mouth disease (FMD) is the most important and very common viral disease of mithun mainly caused by serotype 'O' of FMD virus (Joshi *et al.,* 2020). It is a fatal disease with a high mortality rate and post-convalescence complications such as lameness, reduced reproductive efficiency, *etc*. FMD is a highly contagious disease of mithun which can only be prevented by practicing routine vaccination. The primary vaccination is done at the age of 4 months and above followed by a booster after 2-4 weeks and then, twice yearly. Other common health problems of mithun include tick and leech infestation which if not routinely controlled, may lead to anemia and loss of body condition. The routine application of ectoparasiticides (dip or spray) like amitraz, deltamethrin, etc. is important for their control. The other less frequently recorded diseases of mithun which may directly or indirectly affect health and reproduction include infectious bovine rhinotracheitis (IBR), malignant catarrhal fever (MCF), brucellosis, black quarter, anthrax, tuberculosis, and paratuberculosis. Likewise, mithun herd should be regularly dewormed to check various gastrointestinal nematodes, and coccidian parasites, so that the health and in turn reproductive performance of mithun herd does not deteriorate. The involvement of infectious agents and parasites in mithun health indicates that strict prevention and control measures are important in reducing their impact on health.

Reproductive Management of Mithun

Many reproductive technologies are used to aid in mithun reproductive management. Traditional approaches to reproductive management and the use of artificial insemination have included either visual observation of estrus behaviour, or the use of fixed time insemination protocols.

Estrus Detection and Artificial Insemination (AI)

It is extremely difficult for estrus detection in the free-range system as mithun cannot be continuously monitored; however, in semi-intensive rearing, estrus detection and inseminating with the best male semen is important for genetic improvement. Generally, mithun cows exhibit silent estrus/ heat. The intensity of expression of behavioral signs of estrus is markedly low. In addition, other behavioral signs

of estrus such as mounting fellow animals, standing to be mounted, and restlessness are usually expressed in much-diminished intensity. The cardinal signs of heat in mithun cows are standing to be mounted by bull or teaser, congested and swollen vulva, and occasionally transparent mucus discharge from genitalia (Figure 2). The vaginal mucus during heat exhibits characteristics fern-like pattern in its dried smear when observed under the magnifying lens (using crystoscope) or it may also be observed with naked eyes by seeing the slide against the black background.

The major advantages of AI over natural mating are: permits mithun farmers to use proven bull semen for genetic improvement of the herd, helps in the control of venereal diseases and improves overall growth rate and productivity of the herd. Some animals which fail to get pregnant after repeated AI should be checked for genital infections, hormonal imbalance, nutrient deficiency, semen quality, and timing of AI.

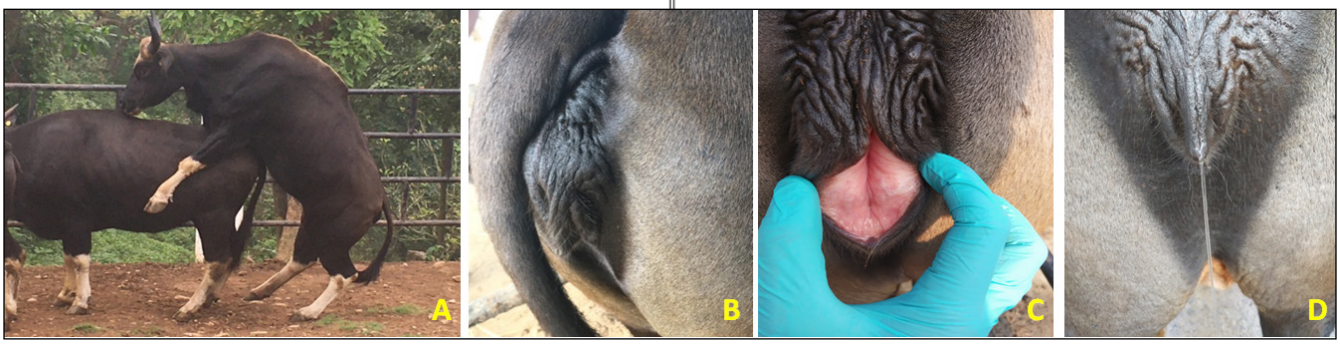

Figure 2: Cardinal signs of estrus (heat) in mithun cows (A) - Mounting by bull or teaser, (B) - Swollen vulva, (C) - Congested vulval mucosa, (D) - Transparent stringy mucus discharge

Estrus Synchronization and Fixed Time Artificial Insemination (FTAI)

Estrus synchronization programmes are designed to use FTAI (Fixed time artificial insemination) in mithun herds to eliminate the investment of time and labor for estrus detection. Ovsynch (GnRH-PGF2α-GnRH) is one of the widely known protocols and consists of two injections of a GnRH analogue separated by a single administration of PGF2α. The timed insemination 12-24 h after 2nd GnRH results in a high probability of successful conception. The synchronization protocol with prostaglandins includes administration of a single injection or two injections of PGF2α - 11 days apart in cyclic mithun cows. The animal comes into heat after 48 to 72 h of PGF2α injection in single-shot or after repeating injection on the 11th day in the two-shot protocol. For this protocol, mithun should be cyclic with the presence of mature corpus luteum. CIDR (Controlled Internal Drug Release) is also used for the synchronization of estrus in cyclic and postpartum anestrus mithun cows. It results in prominent signs of estrus in cyclic or anestrus mithun cows compared to non-treated cows in heat.

Pregnancy Diagnosis (PD)

Accurate pregnancy diagnosis is an important part of reproductive management. The early pregnancy diagnosis is a key to shortening the calving interval so that the non-pregnant animals can be identified early and rebred in the next estrus. Various methods are available for pregnancy diagnosis in mithun. The non-return to estrus, rectal palpation of the reproductive tract and ultrasound scanning are the commonly used methods of PD in mithun.

Male Fertility

The role of the male should not be forgotten, as "*Bull supplies half of the genetics to all the cows he sire*". The well-built mithun bull with larger testes produces more volume of high-quality semen. In a free-range system, as natural service is followed, the male should be of high genetic merit and any male mithun which fails to impregnate females should be culled immediately (Khan *et al.,* 2019). In scientific mithun rearing where the AI is followed, success depends on the deposition of the appropriate number of sperm with good fertilizing capacity at the appropriate site in the reproductive tract at the appropriate time of ovulation. The fertility potential of an AI dose is a function of the quantity, quality, and health status of the semen present therein. In a nutshell, the use of semen from mithun males with proven fertility is the most important thing to be considered.

Record Keeping

One of the key components of any scientific management is proper record-keeping and analysis. Accurate record-keeping can guide the mithun farmers, veterinarians, and consultants to make better decisions regarding herd management. The records should be regularly analyzed to know the herd performance in the past and what is needed in the future by using the method of selection and culling animals. Furthermore, it helps to know the health, deworming and vaccination status, inter-calving intervals, non-pregnant animals, reproductive problems, and male fertility. Helps in overall better supervision and management of the herd.

Conclusion

In their native hilly terrains, mithun roams freely in small groups; while individual bulls mostly remain solitary. However, in recent years several factors like deforestation, urbanization, and cross-breeding with cattle are limiting factors towards mithun population growth. The age-old tradition of sacrificing the best bull of the herd is another major hurdle for genetic improvement of mithun population, breeding naturally in their remote locations. Further, various human activities like shifting cultivation, construction works, commercialized cropping are also largely responsible for the shrinking habitat of mithun. The small and scattered population of mithun herd is having the risk of an increased rate of inbreeding within the populations leading to reproductive problems. The new developments in the form of semi-intensive mithun rearing should be adopted which will promote improved breeding, feeding and reproductive performance of the mithun herd in the future.

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