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Oestrus Detection Methods: From Farm Observations to Advanced Technologies

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Abstract

Efficient reproductive performance is the foundation of profitable dairy farming, and accurate oestrus detection plays a decisive role in determining conception success in cattle and buffaloes. Failure to detect oestrus at the appropriate time leads to mistimed insemination, prolonged calving intervals, and significant economic losses (Kumaresan et al., 2001). The challenge is more pronounced in buffaloes due to weak expression of behavioural signs and a high incidence of silent oestrus This article discusses the biological basis of oestrus, commonly observed signs, conventional and modern detection methods, and practical farm-level strategies for improving heat detection efficiency in dairy herds.

Keywords: Heat detection; Dairy animals; Buffaloes; Activity monitoring; Fertility management

Introduction

Why Oestrus Detection Is Important The principle "No reproduction, no production" clearly highlights the importance of reproductive efficiency in dairy animals (Short et al., 1994). Each missed oestrus results in the loss of one complete oestrous cycle of approximately 21 days, increasing days open and reducing lifetime milk yield (Boyd et al., 1992). Poor heat detection has been identified as one of the major causes of low conception rates in both cattle and buffaloes (Kumaresan et al., 2001; Madkar et al., 2022).

Biological Basis of Oestrus

Oestrus is the period of sexual receptivity caused by rising oestrogen levels from the dominant follicle and occurs shortly before ovulation (Senger et al., 2005). Increased oestrogen stimulates the central nervous system, leading to behavioural excitement and physical changes that can be observed externally (Peters et al., 1995). Ovulation generally occurs 24–32 hours after the onset of oestrus, making timely detection essential for successful artificial insemination (Senger et al., 2005).

Buffaloes often show subdued oestrus expression, and behavioural signs are frequently confined to night hours, contributing to a high incidence of silent oestrus (Layek et al., 2011; Warriach et al., 2015).

Behavioural and Physical Signs of Oestrus

The most reliable behavioural sign of oestrus is standing to be mounted, which closely corresponds to the fertile period (Senger et al., 2005). Other behavioural signs include mounting other animals, restlessness, increased walking activity, bellowing, sniffing of herd mates, tail raising, and frequent urination (Lyimo et al., 2000; Roelofs et al., 2005).

Physical signs commonly observed during oestrus include swelling and reddening of the vulva, clear and stringy vaginal mucus discharge, and a slight reduction in feed intake or milk yield in some animals (Gunasekaran et al., 2007). In buffaloes, these signs are often weak or absent, necessitating the use of detection aids (Layek et al., 2011).

Conventional Oestrus Detection Methods

Visual observation of animals for behavioural and physical signs remains the most widely practiced method of oestrus detection, particularly in smallholder dairy systems (Senger et al., 2005). Observations conducted during early morning and late evening hours improve detection efficiency, as oestrus activity is more pronounced during cooler periods (Roelofs et al., 2005).

Simple detection aids such as tail paint, tail chalk, and heat mount patches are commonly used to supplement visual observation. These aids provide indirect evidence of mounting activity and are inexpensive and easy to use (Nebel et al., 2004). However, their effectiveness depends on proper application and regular monitoring, and they may fail to detect silent heats (Madkar et al., 2022).

Activity Monitoring Systems

Animals in oestrus exhibit a marked increase in physical activity due to elevated oestrogen concentration, which forms the basis for activity monitoring systems (Roelofs et al., 2005). Pedometers and accelerometer-based collars continuously record locomotor activity and compare it with individual baseline values to identify oestrus-related changes (Mottram et al., 2015).

Activity monitoring systems are particularly useful for detecting silent and night-time oestrus, which are commonly missed by visual observation alone (Layek et al., 2011). These systems reduce dependence on skilled labour and enable continuous monitoring of large herds (Firk et al., 2002). However, false-positive alerts may occur due to stress, lameness, or environmental disturbances, indicating the need for confirmation using visual signs or additional aids (Mottram et al., 2015).

Progesterone-Based Oestrus Detection

Progesterone concentration in milk or blood provides a reliable indicator of ovarian activity, as progesterone levels are low during oestrus and increase rapidly after ovulation (Nebel et al., 1988). Monitoring progesterone allows accurate confirmation of oestrus and identification of non-pregnant animals, particularly in cases of silent heat (Esslemont et al., 1993).

On-farm progesterone assays and biosensor-based systems integrated into milking parlours have improved reproductive decision-making and insemination timing in organized dairy herds (Mottram et al., 2015; Samsonova et al., 2015). However, high cost and infrastructure requirements limit their widespread adoption in smallholder systems (Madkar et al., 2022).

Improving Oestrus Detection at Farm Level Effective heat detection requires a combination of good management and appropriate detection tools. Key strategies include:

- ✓ Regular observation during cooler hours of the day
- ✓ Maintenance of optimal nutrition and body condition
- ✓ Reduction of heat stress through shade and cooling
- ✓ Use of teaser bulls, especially in buffalo herds
- ✓ Combining visual observation with detection aids or sensor-based systemsMaintaining accurate breeding and health records

These integrated approaches significantly enhance oestrus detection efficiency and conception rates (Layek et al., 2011; Mottram et al., 2015).

Conclusion

Accurate oestrus detection remains the cornerstone of reproductive efficiency in dairy cattle and buffaloes. While conventional methods continue to play an important role, their limitations necessitate the use of modern detection aids, particularly in large and high-producing herds (Madkar et al., 2022). A combined approach integrating farmer observation with scientific tools offers the most practical and effective strategy for improving fertility, reducing reproductive losses, and enhancing overall dairy farm profitability.

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