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Heat Detection Techniques in Cattle and Buffalo

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Abstract

Proper heat detection for achieve appropriate timing of insemination is the major limitation in achieving high conception rate in dairy herd. Failure to detect estrus leads to delayed insemination, longer calving intervals, higher culling rates, considerable economic losses and overall reduces in the fertility status of herd. Among all behavioural signs, standing to be mounted is considered the most reliable indicator for estrus and the timing of ovulation can be accurately predicted based on the period of standing heat. Feeding practices and overall management conditions play a particularly important role in estrus behaviour of animals. for enhance the efficiency of heat detection in animals, visual observation is one of the most effective methods and three times daily for a minimum duration of 30 minutes during each observation period. Timing of ovulation is a critical factor in dairy reproduction management for success of artificial insemination depends on inseminating the animal at the right time. Research has shown that accurately detecting estrus plays a major role in maintaining the herd's reproductive performance. Therefore, careful and routine observation of the dairy herd is essential to minimize unobserved estrus.

Key word: Buffalo, cow, estrus, heat detection, ovulation

Introduction

The success of artificial insemination (A.I.) relies on careful observation of animals to detect heat at the right time, as inseminating too late often results in failure of conception. Accurate heat detection is help in effective breeding program. This can be achieved through close monitoring of animals, timely A.I., and proper record-keeping. The reproductive performance of both the herd and individual females depends on how effectively estrus is identified and when insemination is performed. Missing a single heat period result in a

production loss of approximately minimum 21 days. Any gaps in the detection process due to missed observations or management errors can lead to significant production and economic losses. This issue is more challenging in buffaloes because which, often show weak or silent estrus signs, delayed sexual maturity, and slower postpartum recovery, making accurate detection difficult. The ultimate goal of heat detection is to predict actual time of ovulation and make successful insemination.

Protocol for Successful Heat Detection

1. Tracking of individual animal from their life using permanent numbering system.
2. An effective record-keeping system should be regularly updated with current information.
3. A clear standard operating procedure (SOP) should be developed for heat detection. Punctual and responsible staff should be assigned to monitor animals for record essential information such as animal ID, timing of estrus signs and estimate the optimal time for ovulation.
4. During heat detection, activities like feeding or milking should be minimized to avoid disturbing the animals.
5. The duration and intensity of estrus behaviour can vary depending on the type of flooring. animals tend to be 3-15 times more active on soil compared to concrete while slippery surfaces cause a sudden decrease in mounting activity.
6. Heat detection aids are most effective when used to support visual monitoring rather than replace.
7. Hormones can be used to synchronize the herd for easier to heat detection at the right time.
8. A well-planned schedule is needed to catch heat animal and keeping in mind that estrus usually returns every 18–24 days.
9. Lame animal should be treated quickly because prevents pain from showing or allowing mounting and easy heat detection.
10. A standard protocol should be followed consistently and all activities should be properly recorded.

Techniques of Heat Detection

1) **Vaginal pH:** Vaginal pH is a useful indicator for identifying estrus in animals. During estrus period the vaginal pH gradually decreases. It typically drops from about 7.0 to 6.72 one day before estrus and then falls further to around 6.45

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immediately before ovulation. This progressive decline in pH reflects the hormonal changes linked with the reproductive cycle.

2) **Fern pattern of cervical mucus discharge:** Cervical mucus can be used to detect estrus animals. Mucus is collected from animal suspected to be in heat and make smeared on a glass slide then allowed to air-dry. When examined under a microscope the presence of a characteristic fern pattern that indicates the animal is in estrus. This fern pattern can appear as early as 84 hours before estrus and begins to decline before ovulation. A more distinct and highly branched fern pattern suggests the optimal time for insemination.

3) **Uterine tone:** The uterine horns show maximum tone on the day of estrus. Conception rates are directly related to the degree of uterine tonicity, with higher tone indicating a more favourable time for breeding. Accuracy requires an experienced and skilled examiner.

4) **Milk yield fluctuation:** A sudden drop in milk production up to about 75% of the female animal usual yield during estrus. This temporary decline in milk yield is associated with increased levels of oestradiol in the blood.

5) **Tail painting:** Tail painting or chalking is a simple method for heat detection. Fluorescent paint can be used for night-time heat detection with the help of artificial lighting. However, this method is less effective False positive results may also occur in buffaloes because wallowing behavior can remove the paint.

6) **Use of Androgenized cow:** An androgenized cow can be used instead of a male to detect estrus. When a chin-ball marker is attached, the cow leaves a mark on animals it mounts that making it easier to identify cows in heat. This method is low-cost and reduces the risk of spreading venereal diseases within the herd.

7) **Chin ball device:** The chin-ball device is attached under the chin of a male. When the male mounts on a female, the pressure causes paint to be rubbed onto the female back. The device works like a ball-point pen when the chin presses against the rump and release paint. A buffalo bull fitted with a chin-ball marker can detect estrus effectively when used at least twice a day. If used only once daily then estrus detection accuracy is about 50%.

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8) **Bio-stimulation:** The presence of a male near females helps stimulate and enhance the visible signs of estrus. This method is commonly used in buffaloes especially silent heat because estrus signs are often less noticeable.

9) **Pressure sensitive KaMaR or BeaCon heat detector:** This device is attached to the sacrum of a female animal and is effective for detecting estrus in cattle. In buffaloes its performance is less reliable because wallowing habit. These detectors are generally more efficient than chin-ball markers on steers. Correct attachment is also important to prevent the device from falling off. 80% to 90% Detection efficiency with this method.

10) **Pedometer and activity meters:** Animal is in estrus that are more active and walking two to four times more than non-estrous animal. Activity meters can be attached to the neck or leg and the data can be sent to a receiver or computer for monitoring. Some pedometers even signal increased activity with a light. Careful monitoring is needed to avoid false positives. Activity data from pedometers correlates well with estrus. The ALT system (Activity, Lying time, and Temperature) is a real-time device that tracks the rise in activity. These devices are highly effective with heat detection rates of 90–96%.

11) **Video camera and recording using CCTV:** CCTV allows 24-hour monitoring of Animal activity and night-time activity can be reviewed quickly using time-lapse. It works best in close housing but is less useful in open or grazing systems because female animal may move out of camera view.

12) **Electronic odour detector:** This device detects pheromones the natural chemical signals released by female daring estrus. Trained dogs can also identify estrus odour from urine, milk, or vaginal fluid with about 80% accuracy. The BOVINOSE system works on the same principle that detecting sex pheromones released in animal dung during estrus. These pheromones are mainly volatile fatty acids like acetic acid and propionic acid. The system can be up to 90% efficient and is still under development for future improvements.

13) **Milk progesterone Detection:** Cattle and buffalo can be breed on the day when milk progesterone (P_4) is at its lowest to achieve good fertility. Progesterone in milk comes from the corpus luteum present on the ovary which releases P_4 directly into the blood and milk. Milk levels of P_4 are 4–5 times higher than in plasma. While manual testing is not possible for large herds. Automatic kit-based systems or biosensors using

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ELISA routine progesterone monitoring at each milking. Although currently expensive such systems provide valuable information for estrus detection and progesterone profile.

14) **Heat detection by 17 β-estradiol and P_4 in milk:** Measuring pre-ovulatory oestradiol (17β-oestradiol) in raw milk using an enzyme immunoassay (EIA) along with progesterone (P_4) quantification is a reliable method for detecting estrus animals. This approach is rapid, precise, and cost-effective.

15) **Use of ultra-sonography for monitoring of ovarian status**: Ultrasound helps monitor ovarian activity in female animal improving understanding of follicle development and dynamics. It can detect ovulation timing, signs of estrus and predict the ovulation time. Measuring endometrial thickness before and during estrus can indicate fertility and conception potential. Ultrasonography is accurate for estrus and ovulation detection with an efficiency of 85-95 % but it requires a skill full person and careful handling of the equipment.

Conclusion

One of the biggest challenges affecting reproductive success in herds is poor heat detection. Improving this can bring significant benefits to farm productivity and also increase profit. Cattle and buffalo come into estrus at any times of the day, moreover she may not be very active in hot weather and remain in heat for only a short period of time (roughly 12-18 hours) making it difficult to observe. Allowing animal to interact in small group with two to three visual observations per day will increase the chances of observation of cycling animals. The use of heat detection aids can decrease time spent in heat detection but not benefit a non-cycling animal. The management interventions are required to maintain the herd cyclic. For this good quality nutrition should be provided and also need exceptional animals comfort including hoof health, body condition and non-slippery surface.

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