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ADVANCES IN CAPRINE BREEDING MANAGEMENT

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Goats have always been the species of choice for in-house rearing for innumerable small, marginal and landless farmers because of their hardiness, versatility, feeding habits and prolificacy. Meat and milk of this species are accepted universally and there is ready liquidity cash value. Reproductive management of goat for increasing the profit is of utmost requirement therefore, advances in reproductive technology to accelerate goat production have been started since 1980s. Extensive investigation of the reproductive physiology of goats such as hypothalamic and pituitary control of the ovary related to estrus behavior and cyclicity have been conducted. Hormonal treatments for synchronization of estrus and ovulation in combination with artificial insemination (AI) or natural mating, embryo transfer (ET), multiple ovulation and ET (MOET) programme in goats combined with estrus synchronization (ES) and AI are evolving technologies being used in goat production.

Contribution of goat has an immense impact when it comes to the rural India, usually being associated with the poorest of the poor and goat has been the only source of income for some family. That is why; it has rightly been called "Poor Man's Cow" by Mahatma Gandhi, because of its contribution to the poor man's economy. They not only supply nutritious and easily digestible milk to their children but also regular source of additional income for poor and landless or marginal farmers. Being small-sized animals, goats can easily be managed by women and children as their feeding, milking and care does not require much capital investment, equipment and hard work. Four goats can be maintained as cheaply as one indigenous cow. Goats are the most prolific domesticated ruminant contributing. Farmers and pastoralists are increasingly relying on goat as means of survival and a way of boosting their income (Peacock, 2005). Returns on capital of up to 50% and recovery of 70% of retail price

are possible in goat farming. India contributes 16.1% to the world's goat population (FAO Statistics, 2013), making it among the highest livestock holding countries in the world. Based on the latest GOI statistics (19th Livestock Census, 2012), the number of goats in the country is 135.17 million. The state with the highest number of goats is Rajasthan (21.6 million), followed by Uttar Pradesh (15.6 million) and Bihar (12.1 million).

Breeding Management of Goat at a Glance

The male and female ratio for breeding goats should be 1:20. To avoid inbreeding, males should be replaced or exchanged once in two years. Indigenous breeds of goat can be put to breeding from 18to 24 months depending upon their body condition as too young animals result in more weaklings and higher kid loss. The body weight of the animal should be less than the adult body weight of that breed. Timely oestrous detection of all female goats above 1 year should be conducted using only approved or vasectomized bucks. September to October, February to March and May to June are considered as the normal breeding season. If any goat in a farm has no kidding for complete one year they should be removed from the flock. Day length (photoperiod) plays an important role in behavior of breeding goats. The nerve impulses received by eye signal the pituitary gland to secrete melatonin which promotes cyclical induction of reproductive processes in goats (Bearden and Furquay, 1984). Short days stimulate sexual activity, but prolonged exposure results in refractoriness and subsequent cessation of reproductive activity (Chemineau *et al*., 1992). Cyclic activity is observed in doe managed in tropical and subtropical climate as a result of exposure to equal or nearly equal lengths of day light and night.

Selection of Breeding Goat

For breeding, goats with 2 dental ages with a long, preferably low set body, roomy hind quarter, well-formed pliable udder, active foraging habit and good mothering instincts are the desirable breeding traits. The females having poor milking capacity, over shot or undershot jaw, broken mouth, blind teat and meaty udder should be disqualified. Females should be mated only when they reach 70% of the adult body weight. Male animals should be in good body condition, masculine, legs should be stronger and free from defects. The animal should have both testicles intact in the scrotum with good libido.

Preparation of Buck and Doe for Breeding

The breeding animals should be provided sufficient period of rest prior to initiation of the breeding season and examine6 to 8 weeks prior to the breeding seasonto determine the breeding soundness. Deworming and vaccination with tetanus toxoid before two to three weeks of breeding is important. Hairs from preputial sheath and around the eye of the buck, and from the perenial region and base of the tail of doe should be trimmed. Optimum BCS (body condition score) of the buck should be 5-6. Flushing (additional feed) is advised two months prior to the breeding season to improve body condition and ovulation rate. If required, the doe should be injected with vitamin E/Se to aid in ovulation.

Signs of Heat/Estrous

A female goat in heat exhibits reddening of the vulva and vulvar discharge, wagging of tail, mounting on other goat, seeking male, frequent bleating, push her back, and standing to be mounted (standing reflex).

Heat/Estrus Detection

Estrus detection can be done either by:

a) Using an intact male: Here, the male is allowed in the flock to identify the doe in estrus. Upon attraction by smell, sight and sound of the estrus doe the buck sniffs the vulva, extendsneck with curling of upper lip, and bites the side of the doe with wool pulling.
b) Use of intact male fitted with aprons: In this method, an apron made of a soft piece of cloth measuring 60x45 cm with strings on four sides is tied on the abdomen of the male tocover the penis to prevent mating. The apronized buck are allowed in the morning and evening for about 15 to 20 minutes for identification of estrous doe.
c) Vasectomized buck: vasectomized buck can be prepared by surgical intervention and allowed into the flock which follows the doe in estrous.

Artificial insemination (AI): AI is probably the most important biotechnology for significant genetic improvement used in the dairy goats. It entails semen collection, processing, and evaluation, with an emphasis on bucks. Nowadays, AI is extensively used in intensive dairy goat production systems. In the last decades, the sex-sorted sperm

technique has opened a new window to improve the reproductive efficiency of dairy goat to produce kids of the same sex (Jun Luo *et al*., 2019).

Embryo transfer (ET): The first ET in goat was reported by Warwick *et al*., in 1934(Warwick *et al*., 1934). Nineteen 2–16 cell embryos were transferred to 18 recipient ewes, and eight lambs were born (Hunter *et al*., 1955). Experiments have demonstrated the critical importance of the state of the uterine environment to embryo viability and the embryo must be present in the uterus in post-estrus does to prevent corpus luteum regression. The ET between breeds of differing gestational length has indicated conclusively that the genotype determines the duration of pregnancy (Jun Luo*et al*., 2019). The sequence of events leading to the ET usually starts with superovulation. Dairy goats of all breeds could ovulate 1 to 3 eggs per estrus cycle, but 10 to 20 available oocytes can be obtained from these goats after superovulation treatment with appropriate doses of FSHs (Melican*et al.,* 2008). The principle of superovulation is to artificially add exogenous gonadotropin so that more follicles have the opportunity to continue development. Finally these follicles will be able to complete the conversion from FSH-dependent to LH-dependent, and will establish the status of dominant follicle (Chang *et al*., 2006). PMSG and FSH are widely used for superovulation in the dairy goat industry.

Oestrous Synchronization

Large numbers of doe can be made to come in heat at one time through synchronization of oestrous. This reduces the cost of AI or natural breeding and subsequent care of kidding and also uniform flocks of kids are produced.

For synchronization of the female goats improved hormonal technology may be used or buck may be in a partitioned corral of woven-wire net so that the does and the buck may have full view of each other. This may be done a week or two before or during the breeding season. A 90% conception rate is ensured if one buck with one doe or more does (not exceeding 2 to 3) in heat are allowed to remain together for a whole day or whole night provided it is followed over period of 3 cycles. If two services are provided at an interval of 8 to 12 hours, improvement in conception is achieved. Goats which do not return to oestrus after 2 cycles are considered as pregnant and be kept in a group of not more than 15 to 20 does to avoid infighting.

Estrous Synchronization Protocol

During the mating season oestrus can be synchronized by intra-vaginal progestagen pessaries, progesterone implants or prostaglandin.

- Administration of progesterone hormones or their analogues through feed, as implant or as impregnated vaginal sponges which are removed after 14 days. The animal comes to heat within 3 days.
- Administration of two intra muscular injections of Prostaglandin F2 alpha or its synthetic analogues (10 mg each) at an interval of 10 days is effective to bring all the animals in heat within 72 to 96 hrs.
- Buck effect: Sudden introduction of buck in the does flock after prolonged separation leading to more number of does into oestrous is known as buck effect. Estrus can be induced with the strategic exposure of anestrus does to intact males, which is dependent on the depth of seasonal anestrus and associated with a first ovulation in two to three days. The first ovulation is usually silent and of low fertility. The second ovulation occurs after five days which is usually a fertile estrus.
- Light control: Goats are short-day breeders because they breed in the fall and when they are exposed to short periods of day light they are more receptive to breeding. This unique breeding behavior is used to program the cycle if they are kept in a building where the amount of day light exposure is controlled. Light exposure to the females can be reduced gradually over 8 to 12 week period and for the males the same lighting regiment improves sperm production, libido, semen quality and fertility (Gimenez, 2007).

Conclusion

The high nutritional quality and health benefits from consumption of goat milk in particular and also meat has become more widely acknowledged, with gradual realization of goat milk being higher in nutritional value than cow milk. However, the dairy goat industry has not yet become well developed in many developing countries, and there is great potential to produce more milk and meat and develop many high valued products. With the deepening understanding of the value of goat milk and meat, the market will gradually grow and expand, and goat industry will receive increasing attention and investment with more emphasis on dairy goat. The dairy goat industry also faces several challenges, such as lesser

number of large-scale intensive dairy farms, limited consumer market of milk products, and fewer high producing breeds of dairy goats etc. Therefore, it is necessary to formulate relevant breeding regulations to form a supporting breeding technique, and to accelerate the development of key technologies of reproduction, breeding, and feeding management in the goat industry. These measures could improve the production performance of goats to provide more excellent goat products for human consumption.

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