

Oestrus synchronization and artificial insemination in sheep

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Oestrus synchronization and artificial insemination is an important reproductive technology for controlled breeding in sheep. Indigenous medicated sponge is a simple, low cost, safe and field applicable technique over the prostaglandin approach. The technology has the merit to accelerate lamb production and meet the mutton demand during festive season thereby providing additional income to farmers.

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INDIA country ranks third in world sheep population, accounting 65.06 million in 2012, but the population has declined by about 9.07% over census 2007 (19th Livestock census, 2012). This has been reflected by an increase in the number of sheep slaughtered over the period from 33.13% in 2007-08 to 47.05% in 2011-12. Moreover, export of meat from sheep/goat has also increased from 15.67 million kg in 2012-13 to 21.99 million kg in 2013-14. However, estimates of meat production have increased by 25.5% (294 to 369 million kg) from 2007 to 2012. From the above figures, it is clear that there is a wide gap between demand and supply which is expected to widen further in future with increasing demands. The demand of sheep meat varies widely and usually due to ethnic holidays, which change from year to year to coincide with traditions and festivals as listed on different calendars. Thus, there is an urgent need to boost the productivity of sheep to meet the demand of ever increasing Indian population. The oestrus synchronization technology developed by ICAR-CSWRI is low cost and field applicable. Targeting peak demand dates, oestrus synchronization and fixed time AI will enhance opportunities of

increased revenue for small farmers in India by producing more sheep per sheep.

Basics of Sheep Reproductive Physiology

Sheep cycles regularly after every 16–17 days during the breeding season (seasonally polyestrous). The major environmental factor controlling the estrous cycle is the day length. However, nutrition, social interaction and stress (temperature) are the modulating factors. Decreasing day length after the summer solstice (in June) causes secretion of melatonin, which triggers the hypothalamus to produce gonadotropin-releasing hormone thereby inducing the reproductive cycle. In tropical and subtropical countries the effect is not

predominant as there is not much difference in the length of day light throughout the year. However, in India the major ovulatory season tends to be in the autumn and early winter; the anovulatory season in the late winter, spring, and early summer; and the transition season is the late summer. In general, higher fertility is observed in autumn in the plains and in summer in the hilly areas in India. It is important to know the basics of sheep reproduction and is mentioned in the below Table 1.

Oestrus synchronization

Oestrus synchronization is management tool for controlled breeding to shorten and manage the breeding and lambing season. Sponge and Prostaglandin methods are the two popular methods used in small

Table 1. Sheep reproductive cycle

Age of maturity	9-12 months
Estrous cycle length	14-19 days (average 17 days)
Duration of heat	26 to 30 hours
Time of ovulation	12 hours before the end of heat period
Optimal time to breed (naturally or artificially)	12–18 hr after the onset of estrus
Ram to ewe ratio season	One ram for 30 ewes for complete breeding
Gestation period	142 to 152 days (average 147 days)
Time to expel the fetus and placenta	Within 2-3 hours after the appearance of clear-whitish discharge at the vulva



Fig. 1. Avikesil-S kit. It includes 25 sponges, 1 speculum and 1 plunger and costs ₹ 684 exclusive of GST as applicable. The cost of additional items Sponge: ₹ 24/piece; Speculum: ₹ 36 each; Plunger: ₹ 48 each; DVD on oestrus synchronization procedures: ₹ 200 each. For details contact: cswriavikanagar@yahoo.com; naqvismk@gmail.com; ragnvendar.kumar@icar.gov.in

ruminants (Fig. 1). While artificial insemination is a tool that will potentiate the other reproductive technology by rapid dissemination of pedigreed germplasm.

Benefits of Oestrus synchronization

- Concentrated lambing at a predetermined time as per the market demand.
- Uniform lamb crop at weaning to fetch maximum market price.
- Better health care and management of pregnant ewes and lambs.
- Effective use of labour
- Maximizing the use of AI on large scale programme.
- Out-of season breeding
- Breeding infertile anoestrus sheep
- No need to detect estrus

Steps involved in Oestrus synchronization and artificial insemination

Sponge method/ AVIKESIL-S Method

AVIKESIL-S has been developed indigenously for oestrus induction and synchronization in sheep and goats (Fig. 1&2). These sponges are low cost, efficient and are utilize for fertility management and artificial insemination programme. The procedure with sponge method of oestrus synchronization is as follow (Plate 1).

- Select the breedable sheep (Ewes that have completed 2 months of lambing, delayed pubertal ewe

lambs or anoestrus sheep).

- Load the medicated sponge into open end of the glass speculum.
- Apply the paraffin on outer surface of the loaded end of the speculum as a lubricant.
- Restrain the sheep properly and gently insert the loaded speculum into the anterior vagina.
- Retain the plunger and withdraw the speculum 2-3 cm to dislodge the sponge out of speculum.
- After dislodging the sponge take out the plunger first followed by speculum.
- Cut the excess thread with scissor.
- Allow the sheep for routine grazing for 12 days under special supervision.
- Withdraw the sponge on 12th day by pulling the thread and inject 200 IU of Folligon or PMSG intramuscularly.
- After removal, either burn or bury the used sponges.
- Inseminate the ewes with chilled semen at fixed time at 48 and 56 h of sponge withdrawal or breed naturally to the detected estrus.
- Estrus response of 90 to 100% is expected but it depend on the flock health and would yield about 50-60% lambing with fixed time artificial insemination with chilled semen. While the lambing would be as high as 86% with natural mating of synchronized flock.

Prostaglandin method/ Double injection method

The two commonly used prostaglandin (PG) injections to synchronize are lutalyse and estrumate. However, their use in sheep is off-label. The method involves injecting two doses of PGF intramuscularly at 7-9 days apart in sheep (Fig. 3). The recommended dose is 7.5 mg (Lutalyse) or 125 mcg (Estrumate) by deep intramuscular route. Estrus is exhibited within 36-40 h after second dose of PG injection. An estrus response of 80-100% is expected. Unlike sponge method this method is used only in breeding season when ewes are cycling and method is not recommended to the pregnant ewe.

Artificial insemination

Artificial insemination (AI) is the deliberate introduction of sperm into a female's uterus or cervix for the purpose of achieving a pregnancy by means other than natural (Fig. 4). It is a common practice in animal breeding, including dairy cattle, buffalo, goat, sheep and pigs as one of the important reproductive technology in animal husbandry.

Benefits of Artificial insemination

- Effective use of pedigreed germplasm (one ram can produce > 3,000 liquid semen doses in a year)

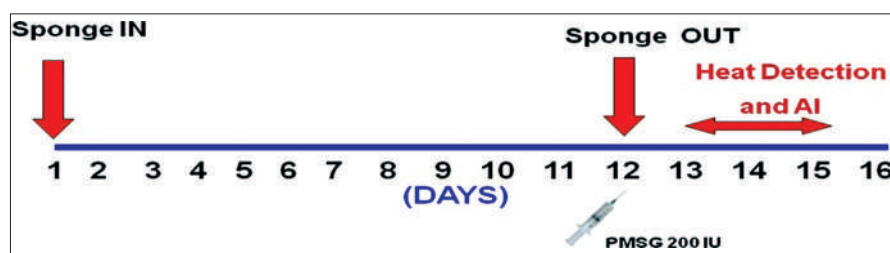


Fig. 2. Sponge method/ AVIKESIL-S method of Oestrus synchronization. Note: Accidental insertion of sponge to pregnant ewe will not result abortion in sheep

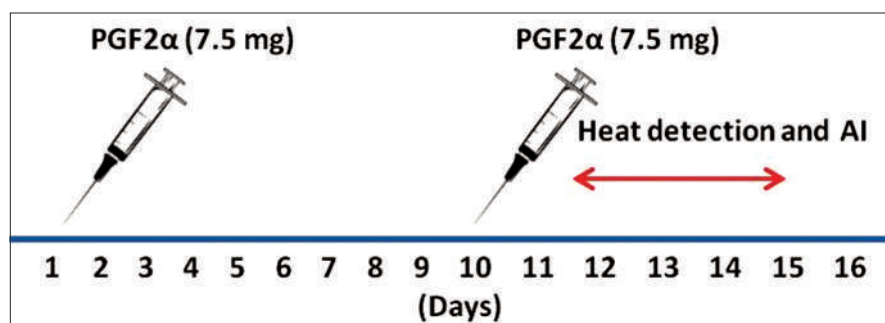


Fig. 3. Prostaglandin method of Oestrus synchronization



- Rapid dissemination of pedigreed germplasm.
- Cost of maintaining the breeding rams can be reduced.
- Rapid genetic progress.

- Those disease can be controlled which are associated with natural mating.
- Curtailing the progeny of infertile rams through semen evaluation.



- Simple technique to adopt.
- To achieve accelerated lambing when combined with oestrus synchronization thereby resulting in consistent and uniform lamb crop.

Steps involved in AI with liquid chilled semen

Following are the steps (Fig. 5) followed for insemination with the chilled semen (Plate 2).

- Selection of breedable rams 2 months before the expected date of breeding
- Preparation of semen extender-Egg-Yolk-Citrate-Glucose (EYCG) and checking the pH.
- Preparation of artificial vagina (AV)
- Semen collection- AV method
- Semen evaluation- Mass motility, concentration and total motility
- Semen dilution with EYCG to 1,000 million sperm per ml or approximately 1:2.
- Preservation at 5°C
- Transportation over ice cubes in shipper.
- Fixed time AI 0.2 ml (200 million) at 48 h and 56 h of sponge withdrawal in synchronized flock.

SUMMARY

Oestrus synchronization and Artificial insemination can be a useful tool in reproductive management of a sheep flock for the accelerated lamb production, and to meet high demand of meat during festivals. Sponge method has an added advantage over the prostaglandin method for field applicability where former can be used to synchronize both cyclic and anoestrus ewes irrespective of stage of reproductive cycle. However, for successful programme it is necessary to ensure proper levels of nutrition, body condition, health and record keeping. Improvements in facilities and management may be necessary before implementing an oestrus synchronization program on a large scale. Therefore, attention to detail is the key to have a successful oestrus synchronization and AI program.

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