



Non Hormonal Induction of Oestrus in Nellore Ewes

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ABSTRACT

A non hormonal induction of synchronization of estrus in ewes of Nellore breed, in two seasons June-July and September – October, covering 39980 and 42370 ewes respectively, spread over 2015 to 2019, with micro minerals (Bioplex High Seven), after onset of monsoon and deworming the sheep, appropriate to the season and type of prevailing parasitic infection, were studied. All the supplemented ewes came to estrus within a week, and were bred with stud rams. After the completion of gestation period all the ewes were lambed within a week uniformly. This may be due to elimination of stress due to environment, nutrition, parasites, replenishment of minerals and stimulation of folliculogenesis with Bioplex. The current extension method induction of estrus is safe, economical, easy to adopt and eco-friendly.

Keywords: Non hormonal induction of estrus-Nellore ewes- Bioplex High Seven

Sheep is a seasonal breeder and shows their cyclicity, at three mating seasons viz. March to April or summer, June to July or autumn, September to October or post monsoon. Fertility is found to be high during autumn season in the plains whereas in the hilly region, it is summer season (Verma, 1999). After every 16 days on an average (Actual range 14-20 days) the ewe shows heat. The average length of heat period is 30 hours. Conception is best when breeding occurs late in heat period.

Synchronization of heat is the practice of bringing all the ewes of the flock together to heat within 2-3 days. Estrus synchronization is a valuable management tool for increasing pregnancy rate of ewes. Successful estrus synchronization programs have a key role on lambing rate efficiency and profitability of sheep holders under semi-intensive production systems (Knights *et al.* 2001). Ovarian response of sheep to estrus synchronization varies according to the type of intravaginal device,

kind of progestagen, nutritional status, stress, environmental aspects, male effect (Kleemann and Walker, 2005) and breed (Boscos *et al.* 2002).

Practical advantages of this method are as follows (Khanvilkar *et al.* 2009).

Shepherd may plan the lambing time in such a way, when the climate is most suitable for raising the healthy lambs with least effort.

1. It saves labour charges as servicing and lambing takes place within the same short period.
2. Breeding by natural process or by A.I. becomes easier and economical.
3. Flock management is effective as all ewes are in the same stage of pregnancy.

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4. Shepherd may plan breeding as per future market demands.

The major practice in vogue for synchronization of oestrus, is either using controlled intra-vaginal drug releasing devices (CIDR) or progesterone sponge alone or accompanied by gonadotropin (Rhodes and Nathaniels, 1998). Equine chorionic gonadotropin with a long half-life and no need for several injections is the mainly used gonadotropin for superovulation (Leyva *et al.* 1998; Ali, 2007; Wheaton *et al.* 1993). The use of exogenous hormones generally resulted in a high incidence of both behavioural oestrus and ovulation, but the conception rates for the induced oestrus during mid-anoestrus ranged from 21% (Gordon, 1963) to 50% (Brunner *et al.* 1964).

Another novel approach using non-hormonal agents i.e., kisspeptin peptide and sulpiride, a dopamine antagonist, has been successfully used for induction of oestrus in sheep at ICAR-CSWRI. Ovine kisspeptin was synthesized and administered @ 20 ug/ewe (single bolus Intravenous) which resulted in exhibition of oestrus and an 8-10 times increase in LH levels (Naqvi *et al.* 2017). Induction of estrus with proteins is in the experimental stage and may be expensive.

Good old practices namely ram effect and photo-period is promising in inducing the oestrus in non-breeding season. Ram effect induces secretion of LH and estrogen, which result in ovulation within 1 to 3 days (in some ewes, response may be slower, 4 to 7 days), but without the expression of oestrus. If the CL has a normal life span (12 to 14 days) oestrus and ovulation occur around 16 to 17 days after introduction of rams. Because such effects have been most obvious when the ewes were in states of physiological transition: either from non-breeding to breeding season or were coming into estrus for the first time (Dyrmundsson & Lees, 1972), it was hypothesized that once cyclic reproductive activity had been established, the occurrence and pattern of oestrus was no longer

influenced by ram stimulation (Dyrmundsson & Lees, 1972).

Free range system of sheep rearing often encounters various types of stress like:

1. Environmental stress including Temperature, Cold, Heat, Wind, Humidity,
2. Manage mental stress, Herd density, Social status, Transportation, alteration of routine, Psychological distress, Physical traumatic,
3. Parasitic, and
4. Nutritional consisting Poor or deficient forage.

1. The impact of stress on reproductive endocrinology

For efficient reproduction, follicles should grow at an appropriate rate in the ovaries, ovulation must occur and hormones need to be produced, not only to control pheromone release (to attract the ram at a time synchronous with ovum release into the female reproductive tract), but also to prepare the uterus to supporting the conceptus. This disruption in adult animals is usually temporary, so that, when prevailing conditions improve, normal fertility would resume.

2. The impact of stress on oestrus behaviour

Oestrus is delayed when ewes are below or above critical temperatures (thermal stress) (Doney *et al.* 1973), or when they are transported (Enhert and Moberg, 1991).

3. The impact of Nutritional Stress

Nutrition plays a key role in regulating the reproductive performance in farm animals (Maurya *et al.* 2010). This nutrition deficiency along with heat stress imposes severe effects on livestock production and reproduction. Zarazaga *et al.* (2004) reported that nutrition is an important factor affecting reproductive



function and the onset of postpartum ovarian cyclicity in farm animals.

The phenomenon of feed ‘flushing’ has been incorporated into sheep management for many years to hasten seasonal breeding periods (Clark, 1934). There are several regimens for increasing ewe fertility by increasing energy availability as day-length decreases (with or without pre exposure to ‘teaser’ rams (Walkden-Brown *et al.* 1999).

There has been special interest in effects of dietary trace element deficiencies on physiological function and particularly on reproduction. Severe dietary deficiencies of copper, selenium (and zinc are commonly seen in ruminants (Monem and El-Shahat, 2011). Underwood (1981) stated that minerals have the functions of the body’s metabolic processes, among the productive, and reproductive processes (Chan *et al.* 1998), are: structure, physiological, catalysts and regulator.

The dietary and tissue balance of antioxidant nutrients is important in protecting tissues against free radical damage. Free radicals and reactive oxygen species play a number of significant and diverse roles in reproductive biology (Agarwal *et al.* 2006). Deficiency of free radicals may also arise due to different kinds of stress (McDowell *et al.* 2007).

Minerals such as Phosphorus, Calcium, Magnesium, Iodine, Manganese, Copper, Selenium, and Zinc are all involved in governing successful reproductive processes (Wilde, 2006).

Adequate micro minerals supplementation is required as most of the roughages, greens, concentrates and even most of commercial feeds available to Indian market are deficient in trace mineral elements. Superoxide radicals are reduced to hydrogen peroxide by superoxide dismutases in the presence of Copper and Zinc cofactors. Hydrogen peroxide is then reduced to water by the Se-glutathione peroxidase couple (Chan *et al.* 1998). Efficient removal of these superoxide free radicals maintains the integrity of membranes.

In India, more than 80% of sheep are being reared under the Free Range System of Sheep Rearing. Nellore sheep is the tallest mutton breed of sheep in India which is widely distributed in Nellore district and neighboring areas of Prakasam and Kadapa districts of Andhra Pradesh. Three Strains are distinguished primarily on the basis of their coat colour. Nellore Jodipi is the most predominant population with white colour on the dorsal surface of the body with black colour under the belly. Nellore Palla is completely white in colour. Nellore Brown is completely brown in colour with little hair except at brisket, withers and breech regions on the body. The sheep numbering 82,350 brought to Sreepathi veterinary services, Kadapa during 2015 to 2019 were subjected to estrus synchronization with organic micro-minerals (Table 1).

MATERIALS AND METHODS

The shepherds dewormed 82350 ewes with either Anorox (A brand product of curevet

Table 1: Number of ewes selected for the study

Sl. No.	Year	Number of ewes supplemented		Number of days the ewes exhibited and bred (93%)	Lambing pattern (90 to 93%)
		June- July	September-October		
1	2015	6025	7045	3-7	140-147
2	2016	8010	8024	3-7	140-147
3	2017	7456	9424	3-7	140-147
4	2018	8241	8012	3-7	140-147
5	2019	10248	9865	3-7	140-147
Total		39980	42370	3-7	140-147

formulation, Hyderabad containing Rafoxanide with levamisole) or Neozide Plus (A brand product of Intas Ahmedabad containing Oxcyclozanide with levamisole) or Alzonc (A brand product of Intas, Ahmedabad comprising Niclosamide with Albendazole) depending on the parasitic infection. Yeast based micro mineral Bioplex high seven (A brand product of Alltech, Bangalore) boli, were procured. The shepherds were advised to dissolve 10 boli in one liter of drinking water over night and were requested to drench 10 ml per anoestrus ewes on the second day after deworming, with help of 10 ml disposable syringe, in both the seasons, as a solitary drench (Table 1). Eighty two thousand, three hundred and fifty ewes were supplemented, in two seasons, June- July and September-October, during 2015 to 2019. Each Bioplex High Seven bolus contains Zinc 360 mg, Manganese 143 mg, Copper 60 mg, Iodine 4.5 mg, Cobalt 6.25 mg, Selenium 1.5 mg and Chromium 1.68 mg.

RESULTS AND DISCUSSION

After medication, 93% of the ewes were in estrus for 3 to 7 days irrespective of the presence or absence of stud rams and were bred duly. After completion of gestation, all the ewes were lambled within a week uniformly. There were no repeaters.

Prior to the breeding season all ewes were prone to oxidative stress due to nutrition, parasitic load, adverse climate like hot and cold, Stress due to parasitic load was removed with selected dewormers. The program was planned two weeks after the onset of monsoon. Owing to grazing, lush green pastures, the poor body condition sheep was improved and were fit for breeding. Supplementation of micro minerals would have replenished the mineral deficiencies, reduced the oxidative stress and primed the reproductive system and synchronized the estrus effectively. The outstanding results strongly support the fact that synchronization of estrus in sheep, unlike in cows, is more nutritional than physiological.

Minerals act as catalysts in both enzyme and hormone systems (Ceylan *et al.* 2008). Metallo-enzymes, of which essential minerals are important constituents in the synthesis of many steroid minerals, hormones, (Yamaguchi *et al.* 2009; Yokus *et al.* 2010) and thyroid hormones Hess and Zimmermann, 2004; Gottsch *et al.* (2000) suggested the role of zinc in the reorganization of follicle, source of progesterone through the involvement of metalloproteinase-2 (MMP-2), member of zinc endopeptidase family.

Some evidence suggests that Manganese plays a role in the activity of certain endocrine organs. It is involved as a co-factor in cholesterol synthesis which is necessary for the synthesis of steroids like progesterone, estrogen and testosterone (Keen and Zidenburg-Cherr, 1990). Manganese supplementation has proven to be effective in shortening the postpartum anoestrus and increasing conception rates in dairy cows (Krolak, 1968). Chromium plays an important role in the secretion of pregnancy specific proteins from the uterine endometrium which is helpful in preventing early embryonic death. Chromium exerts a significant influence on follicular maturation and LH release. Signs of cobalt deficiency include delayed uterine involution, irregular estrous cycle and decreased conception rate (Satish Kumar, 2003). El Marsy and Nasr (1996) reported an increase in plasma progesterone and oestradiol-17 beta level after supplementation with Cobalt.

Improvement in conception rate at first service following selenium supplementation has been reported (McClure *et al.* 1986). The effect of iodine on secretion of thyrotropin-releasing factor, which in turn stimulates Prolactin secretion, can also have effect on length of estrus cycle (Khillare, 2007). Progesterone secretion was impaired due to a copper deficiency during the oestrus cycle and especially in late pregnancy in ewes (Van Niekerk, and Van Niekerk, 1989). Kandrzez *et al.* (1997) reported negative correlation between plasma progesterone and zinc, during dry period in goats. Zinc deficiency results in alteration of steroidogenesis (Yamaguchi, *et al.* 2009).



The induction of estrus with hormones is costly, laborious and requires technical assistance. In advertent injection of PG alpha to pregnant animals may induce abortion. Since insemination facility is not available and practicable, in the free range system, the only recourse is employing ram in hormonal induction of estrus. As a consequence more numbers of rams are required to cover all the ewes in the flock within 3 days of induction in hormonal induction. Non hormonal induction is simple, safe, effective and economical. The total cost of deworming and one dose of Bioplex will be 10+2 in Indian rupees.

CONCLUSION

It is concluded that programmed synchronization of estrus and lambing is possible in Nellore ewes with yeast based micro-minerals, supplemented as Bioplex High seven, in fall and winter seasons with economy.

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