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Studies on estrus response and fertility in estrus synchronized Nari Suvarna EWES with different systems of feeding

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Abstract

The purpose of this experiment was to study the estrus response and fertility in synchronized NARI Suvarna ewes maintained under two systems of feeding. Fifty adult NARI Suvarna ewes of similar age were divided randomly into two groups. Group I (n=25) were fed with balanced sheep feed and group II (n=25) and were allowed for grazing only in the fields. They were not fed any balanced feed throughout the experiment. Ewes in both the groups were subjected for estrus synchronization protocol for 12 days by using intravaginal progesterone sponges with PGF 2α and PMSG. They were inseminated with freshly collected & diluted semen and pregnancy. The pregnancy was diagnosed with the aid of ultrasonography 30 days after AI. It was observed that the estrus response was 96 and 80% in ewes fed with balanced feed and pasture grazing respectively. Similarly, time taken for onset of estrus was 32.09 \pm 1.25 hrs & 33.12 \pm 1.45 hrs and mean duration of estrus recorded was 36.7 \pm 1.11 hrs & 34.77 \pm 1.25 hrs in ewes fed with balanced feeding and pasture grazing respectively. The conception rate recorded in ewes fed with balanced feed (83.3%) was significantly higher than the conception rate recorded in ewes maintained under pasture grazing (55%).

Keywords: Estrus synchronization, NARI Suvarna, progesterone, nutrition, reproduction, sheep

Introduction

Feeding of sheep is one of the most important factors that influence fertility in terms of good estrus response and ovulation rate (Branca *et al.*, 2000) [5]. Generally sheep will be at grass for half of the year, however during winter or at lambing they may be housed and given extra feed. It is important to get the nutrition right to prevent loss of body condition or problems at calving. Poor nutrition may cause irregular cycles and poor fertility (Forcada and Abecia, 2006) [11]. The most economically important trait in sheep production is reproduction and it can be effectively manipulated by using nutritional and hormonal treatments (Gunn, 1983) [16]. There are several methods for improving reproduction in ewes, often aim to increase the proportion of ewes having multiple ovulations, and thereby increase lambing rate (Koycegiz *et al.*, 2009) [21]. Several techniques have been developed to induce out-of-season estrus in sheep, allowing farmers to raise and provide the market lambs year round.

Intravaginal devices containing different types of progestogens, maintained in situ during 12–14 days, associated with gonadotrophin administration is the most widely were used (Madani *et al.*, 2009) [23]. Sponges impregnated with progesterone provide estrus synchronization by extending the luteal phase during the treatment period in ewes (Getahun, 2008) [13]. Intravaginal sponges containing progesterone are one of the most commonly applied treatments for estrus synchronization in small ruminants during the breeding and non-breeding seasons. Sponges are used together with PMSG, particularly out of season, at the time of sponge withdrawal or 48 h prior to sponge removal.

Undernutrition results in the loss of body weight and body condition, delays the onset of puberty, increases the postpartum onset of estrus, interferes with normal ovarian cyclicity by decreasing gonadotropin secretion, and increases infertility (Getahun, 2008 [13], Boland *et al.*, 2001 [3] and Capuco, *et al.*, 1990 [6]). Nutrition during gestation not only affects maternal body weight gain, body condition, and reproductive performance [Hess *et al.*, 2005 [17]; Wettemann, *et al.*, 2003 [33]], but also affects prenatal and postnatal offspring growth and development [Godfrey and Barker, 2000.] [19], [Wu *et al.*, 2006] [35]. The interaction between nutrition and reproduction has long been known to have important implications for reproductive

performance [Smith and Chase, 2010] ^[31]. Therefore, the present study was conducted to investigate the estrus response and fertility in estrus synchronized NARI Suvarna ewes maintained under different systems of feeding.

Materials and Methods

Fifty adult Nari Suvarna ewes of similar age (1.5 to 2 Years) were equally and randomly divided into 2 groups, T1 and T2. Group T1 consisted of 25 ewes impregnated with progesterone sponge for estrus synchronization and fed according to ICAR standards and group T2 composed of 25 ewes impregnated with progesterone sponge for estrus synchronization and maintained under grazing only as observed in a few rural farmers. All the ewes were vaccinated against Foot and Mouth, Enterotoxemia, Peste des petits ruminants and Black Quarter diseases and also dewormed once in 3 months using broad-spectrum anthelmintics. Ewes in group I (n=25) were given approximately 250g of balanced sheep feed, comprising of yellow maize (45%), soybean meal (15%), wheat bran (35.5%), salt (2%) and mineral mixture (2%) daily as per the recommendations described by Dwyer *et al.* (1996) ^[10]. In addition to the concentrate feed, ewes were fed *adlib* ragi straw and water. Ewes in group II (n=25) did not receive any concentrate feed or mineral mixture and were allowed to graze in the field for a period of 10 hrs daily and these ewes were maintained under pasture grazing throughout the period of study. Ewes in both groups were subjected to estrus synchronization protocol using progesterone-impregnated intravaginal sponges for 12 days. Forty-eight hrs prior to sponge removal, each animal received an intramuscular injection of 125 µg of synthetic prostaglandin (Cloprostenol) and an intramuscular injection of 500 IU of Pregnant Mare Serum Gonadotrophin (PMSG). Estrus was identified using vasectomized ram and estrus response, time taken for onset of estrus, mean duration of estrus, and conception rate has been recorded for both the groups. Chi-square test was used to study the significant difference in the estrus response, onset of estrus, duration of estrus, and conception rate between ewes maintained under two different systems of feeding strategies.

Results and Discussion

The estrus response was defined as the percentage of animals identified in estrus by the vasectomized ram following sponge removal. 96% of the ewes maintained on a balanced feed were identified to be in estrus by the vasectomized ram after the sponge removal. In contrast, only 80% of the ewes were identified by the vasectomized ram in groups of animals maintained on pasture grazing only and subjected to estrus synchronization protocol. Although, chi-square test revealed no significant difference in estrus response between two types of feeding management, the chi-square value was higher in the group fed with balanced diet suggesting of greater estrus response.

The type of feeding did not appear to influence the time taken for the animals to exhibit estrus after the sponge removal. The onset of estrus after sponge removal was recorded as 32.09±1.25 hours in T1 ewes and compared favorably with 33.12±1.45 hours recorded in T2 group. The mean duration of estrus in ewes in T1 and T2 groups were 36.7±1.11 hours and 34.77±1.25 hours which was statistically indifferent. The mean conception rates were 83.3 and 55% respectively in T1 and T2 groups respectively which indicates that rate of

conception was significantly increased by good plane of nutrition (up to 28% higher) resulting in higher fecundity and lambing rates.

In the present study, 96% estrus response was observed following sponge removal in T1 group against 80% in T2. Four animals in T2 group did not exhibit any signs of estrus up to 6 days following sponge removal and the treatment was considered as failure. The serum progesterone concentration in the serum of these animals still above the basal levels after the sponge removal, suggesting that the exogenously administered PGF₂α had fail to bring about luteolysis in these animals. The luteolytic effect of PGF₂α is dependent on the stage of the cycle. It is also possible that, the progesterone released by the sponge continued to be maintained for long time after the sponge removal in these animals preventing follicular growth. The estrus response with progesterone and PMSG has been reported by several other workers. While Ucar *et al.* (2002) ^[32] in chio and other breeds, Yilmaz *et al.* (2003) ^[35] in Akkaraman ewes and Todini *et al.* (2007) ^[31] in lactating sarda ewes reported 100% estrus response after sponge removal. In studies of Boscos *et al.* (2002) ^[4] and Zeleke *et al.*, (2005) ^[36], the estrus response after sponge removal was also encouraging and ranged between 84.2 to 96%. On the other hand, Abdullah *et al.* (2002) ^[11], reported that the estrus response in Awassi ewes following progesterone impregnated intravaginal sponge removal ranged between 64-84.6% Moeini *et al.* (2007) ^[26], similarly obtained estrus response ranging from 64.4- 82.2% in Sanjabi and Lora breeds.

As observed in the present study, the variability in the estrus response following sponge removal is perhaps related to the plane of nutrition. Unfortunately, many of the reports on estrus response to intravaginal progesterone sponges don't mention the type of feeding on which the ewes were maintained. It is also possible that the type and dose of progesterone (Ataman *et al.*, 2006), potency of progesterone used (Kridli *et al.*, 2006) ^[22], breed of the animal (Zeleke *et al.*, 2005) ^[36], physiological status of the animal and the season of the year (Keisler and Buckrell, 1997) ^[20] have some role to play. The progesterone intravaginal sponges used in the present study contained 350 mg of natural progesterone appears to be sufficient in elucidating the estrus response in all the ewes provided the ewes are maintained on a balanced feed. Further, a 12 days treatment with intravaginal device appears to induce maximum estrus response.

In the present study, the onset of estrus was determined using a vasectomized ram which was paraded into the flock 3 times a day to identify ewes in estrus. It has been reported that it is difficult to identify the estrus in ewes without the aid of a teaser ram (Gordon, 1997) ^[15]. It was also observed in the present study that the visual identification of estrus was difficult and that the vasectomized ram was highly successful in identifying ewes in estrus. The main estrus symptoms exhibited by the female when the teaser ram was left into the flock was standing to be mounted and other symptoms of estrus exhibited included, restlessness, twitching of tail which was not exhibited by every ewe in estrus. Very few ewes exhibited mild mucoid vaginal discharge. The average time taken for onset of estrus following sponge removal was 32.09±1.25 h in T1 group and was only marginally longer (33.12±1.45 h) in T2 ewes (Table 1). The results of the present study with regard to time of onset of estrus following sponge removal is in agreement with the reports of Das *et al.*,

(2004) [9]; Moein *et al.*, (2007) [26] and Martemucci and D'Alessandro, (2010) [24].

In other studies, the onset of estrus following sponge removal was slightly later than in the present study. Husein and Kridli (2002) [18] reported that, the interval of onset of estrus was 42.9±0.44, 48.2±4.4 and 41.8±4.7 hrs with intravaginal sponge containing 60 mg of MPA, 30mg of FPA and 40mg of FGA. Further, the interval to onset of estrus was as short as 28.2±5.0 hours with intravaginal sponge containing 600mg of progesterone. Abdullah *et al.*, (2002) [1] also observed that, the onset of estrus after sponge removal depended upon the progesterone concentration of the sponge. Therefore, it appears that onset of estrus following sponge removal is unrelated to the plane of nutrition and more depended on the type and dose of progesterone used in the device (Sirjan *et al.*, 2011 [29]; Moakhar *et al.*, 2012 [25]).

Further, the physiological status of the animal (Simonetti *et al.*, 2000) [28], breed (Godfrey *et al.*, 1997) [14] and the season (Fuentes *et al.*, 2001) [12] may also have some influence on the time taken for onset of estrus following sponge removal.

In the present study, the mean duration of estrus following the onset of estrus in ewes maintained with a balanced feed was recorded as 36.7±1.11 h. This was slightly lower than 34.77±1.25 h recorded in ewes maintained under pasture grazing. Almost all the reports indicate the duration of estrus following sponge removal to be around 30h. Quirk *et al.* (1979) [27] reported the mean duration of estrus as 37.2±2.4h. In studies of Das *et al.* (1998) [7], the mean duration of estrus was reported as 28.0±2.11h. In other reports (Das *et al.*, 1999; Das *et al.*, 2004) [8, 9] the duration of estrus following sponge removal was reported as 22.8±2.33 h and 26.8±1.7 h respectively.

Table 1: Estrus response (%), Onset of estrus (hrs) Duration of estrus (hrs) and conception rate (%) following withdrawal of progesterone impregnated vaginal sponges in NARI Suvarna ewes maintained under two different systems of feeding strategies.

Particulars (n=25)	Scientific feeding	Pasture grazing
Estrus response (%)	24 (96%)	20 (80%)
Time taken for onset of estrus.(hrs)	32.09±1.25 (24)	33.12±1.45 (20)
Mean duration of estrus (hrs)	36.70±1.11 (24)	34.77±1.25 (20)
Pregnancy (%)	20 (83.3%) ^a	11 (55%) ^b

*The values in rows with different superscript differ significantly ($p \leq 0.05$).

Conclusion

The higher plane of nutrition in NARI Suvarna ewes followed by estrus synchronization and Artificial Insemination showed that conception rate, lambing %, number of animals showing symptoms of estrus were significantly higher in animals fed with scientific plane of nutrition when compared to those animals maintained under grazing only. However, other parameters *viz.*, time for onset of heat, mean duration of estrus though numerically higher, were statistically insignificant. Therefore it is highly recommended that ewes should be fed with good place of nutrition for normal physiological development and reproductive activities for profitable sheep farming.

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