The Pharma Innovation Journal 2021; SP-10(11): 2587-2588

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(11): 2587-2588

www.thepharmajournal.com
Received: 28-09-2021
Accepted: 30-10-2021

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Different types of external OS, ease of penetration at artificial insemination and conception rate in native sheep breeds of Karnataka

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Abstract
The present study was carried in native sheep breeds Karnataka, in villages located in and around Bangalore. The purpose of the current study was to identify different types of external os of the cervix during the process of artificial insemination. During this study 180 non pregnant ewes were selected for the insemination process using short term progesterone treatment protocol. In the selected ewes different shapes of external cervical os was identified such as Rose of 55 (30.00%), Flap of 80 (44.00%), Slit 33 (18.00%) and Duckbill 12 (7.00%) and recorded pregnancy in 14 ewes with Rose, 9 in flap type, 9 with slit shape and 3 with duckbill shape. The ease of penetration of AI gun was better in Rose, Flap followed by slit and Duckbill types of external os. The pregnancy rate was mainly influenced by the depth of penetration and variation in the type of the external cervical os was influenced by the age of the animal and also the parity.

Keywords: sheep, external cervical os, TCAI, pregnancy rate

Introduction
Trans-cervical artificial insemination (TCAI) contributes significantly to increase the rate of genetic improvement in sheep (Erlich, 2015) [3]. It is a tool with low operationg cost and less stress to animal (Cruz *et al*., 2014) [1], however reports indicates poor fertility with frozen thawed semen using TCAI. Morphological complexity of cervix is most important factor that limits the advancement of insemination catheter through the body of the uterus (Kershaw *et al*., 2005) [7].
Ovine cervix is a fibrous tube with the lumen containing annular folds or rings in numbers of 3–7. The annular folds are obstructed by prominences and depressions (Kershaw *et al*., 2005) [7]. The tortuous and narrow structure of the cervical canal does not permit the catheter to reach the uterus or site of deposition of semen (Halbert *et al*., 1990) [5]. The external os of the cervix varies between animals and is classified as Rosette/Rose, flap, slit and duckbill shapes basing on the appearance (Kershaw *et al*., 2005) [7].
Kaabi *et al*. (2006) [6] observed external os type in ewe lambs indicates the depth of penetration which mainly affected by the cervical lumen. This study aims to record the variation in external os in native sheep breeds of Karnataka and also to note the ease of penetration at estrus.

Material and Methods
Selection of the animals
The multiparous native breeds of ewes aged around 2-5 years were selected for the study from the villages in and around Bangalore. At the point of insemination using frozen thawed semen an observation into the type of cervical os was attempted. The ewes were restrained by elevating the hind quarter and the cervical os was identified using vaginal speculum along the sides or lateral wall of the vaginal lumen and pulled to the center with using light source and different types of external os was recorded.
The 250 animals were selected for the short term progesterone protocol using progesterone sponge kept *in situ* for seven days and on the day of sponge removal PGF2 given at the dose rate of 125 mcg as total dose and after 48-55 hrs fixed time transcervical insemination was done. On the day of insemination the ewes were observed for the signs of estrus if any. During insemination the ease of cervical penetration was recorded in all animals irrespective of expression of heat. The conception rates were recorded after 30 days of insemination.

Results

In the present study total 250 animals were examined of which 180 animals were selected and subjected to artificial insemination technique, during which time examination of external of the cervical os was done. Out of 180 animals in 55 (30.00%), 80 (44.00 %), 33 (18.00 %) and 12 (7.00 %) Rose, flap, slit and Duckbill types of external os were observed. The total number of animals exhibited estrus signs were 100, The penetration of the cervix with AI gun was easier in Rose pattern followed by the flap, Duckbill and Slit type of external cervical os. The conception rate recorded was higher in rose type of external os of 14%, followed by Flap and Slit with equal conception rate of 9% and least was 7% recorded in the ewes having Duckbill type of the cervical os (Table 1).

Table 1: Types of external os, ease of penetration at artificial insemination and conception rates in native sheep breed

Types of external cervical os	Number of animals with different types	Number of ewes exhibited estrus	Ease of penetration	Conception rate (Percentage)
Rose	55	45	45	14
Flap	80	40	40	09
Slit	33	08	08	09
Duckbill	12	07	07	03

Discussion

The anatomy of external os of cervix in sheep varies greatly between animals and breeds. The success of transcervical or cervical AI in ewes is highly dependent on anatomy of the cervical lumen on the stage of the estrous cycle.

In local breeds of Karnataka in multiparous ewes rose type of external os were more common and duckbill was less frequently found. El-Shahat and Alsafy. (2009) [4] and Kershaw *et al*. (2005) [7] found distribution of os type differed with age, with rose type being more common in adults and papilla type common in ewe lambs. El-Shahat and Alsafy. (2009) [4] opined that rose type was more common in multiparous ewes as the incidence of cervical prolapse is greater in parous ewes. The type of external os may change depending on parturition, increases in size and complexity of the reproductive tract (Dun, 1955) [2].

In this study since multiparous ewes were selected rose type was more common and penetration was much easier. Where as in a study the cervical penetration was neither affected by age of the ewe, nor the number of cervical rings and type of the cervical external os (Kershaw *et al*., 2005 and Kaabi *et al*., 2006) [7, 6]. In the ewes with estrus the penetration was easier in the study which corroborates with the findings of Kershaw *et al*. (2005) [7]. Although the type of external os does not change with the stage of the cycle, penetration of cervix during estrus was easier since estradiol stimulates PGE_2 synthesis. PGE_2 acts on extracellular matrix of cervix separating the collagen fibers and bundles resulting in cervical relaxation (Kaabi *et al*., 2006) [6]. The success of cervical penetration cannot be predicted by shape of cervical os, difference in length and number of rings.

In the present study the higher conception rate was recorded in ewes with rose type of external os, which had higher ease of cervical penetration. Salamon and Maxwell. (1995) [8] recorded 10 percent increase in lambing rate by increase in penetration by 10mm and increased pregnancy rate (Halbert *et al*., 1990) [5]. In conclusion, in native sheep breeds of Karnataka during fixed time artificial insemination, penetration of cervix is better in animals that are in estrus and in rose type of external cervical os.

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