



Fertility following frozen semen Artificial Insemination in Jamunapari goats

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Commercial use of frozen-thawed semen is relatively limited in caprine reproduction (Batisa *et al.* 2009) and is still to be explored extensively for wider use in India. Fresh, refrigerated and frozen methods of semen preservation and 3 techniques of insemination (vaginal, cervical and intrauterine) are used worldwide in goats (Chemineau and Cognie 1991, Leboeuf *et al.* 2000). Freezing of caprine semen is technically challenging as it contains the bulbourethral secretion capable of interacting with the cryoprotectants used and the freezing and thawing processes results in reduced viability, motility and velocity of sperm movement. This in turn decreases conception rate as it varies from 30 to 70% when frozen-thawed semen is used for AI (Ritar and Salamon 1991, Salvador *et al.* 2005, Dorado *et al.* 2007). Anatomical arrangement of cervix in goats and the difficulty in traversing it demands a higher number of sperm cells to obtain reasonable pregnancy rate via transcervical insemination. Thus a reliable means of insemination of goats with frozen semen would be most advantageous not only for commercial breeders interested for genetic improvement of their stock, but also for small producers who cannot afford a breeding stock of their own (Sohrney and Holtz 2005). The information on the fertility of goats using frozen semen AI is meagre. Therefore, the present study was undertaken to observe the fertility following the frozen semen AI in Jamunapari goats.

Management of bucks: Jamunapari, a descript goat breed of semi-arid zone of the country, is potentially known for milk production. The semi-intensively managed Jamunapari bucks (2–5 years) were allowed to 4 to 6 h daily grazing in the institute grazing area and supplemented with concentrate pellets @ 500 g/head/day.

Semen collection, cryopreservation and Thawing: Semen samples were collected from 6 Jamunapari bucks twice a week during winter (Nov to Feb) and evaluated for seminal parameters, viz. volume, mass activity, initial progressive

motility, sperm concentration, live sperm and abnormal sperms. Ejaculates were selected if the following criteria were met: semen volume ≥ 0.5 ml, mass activity $\geq$ grade 4 and initial progressive sperm motility $\geq 80\%$. The selected semen samples were processed as per the conventional freezing protocol standardised in our laboratory. Thawing of the frozen semen straws was performed individually at 40°C for 15 sec in water bath and post thaw seminal parameters were evaluated. The samples showing individual motility of $\geq 40\%$ were stored and used for AI.

Oestrus detection and artificial insemination: Oestrus was detected twice daily using an aproned buck at a time interval of about 12 h and 32 estrus goats were inseminated between 10 to 12 h after detection of standing heat, and a second AI was performed 12 h later. For AI, estrus goats were randomly divided into group 1 (n=18): Estrus does were restrained in such a way that the rear quarters was kept elevated as both the hind legs were lifted and held by the helper at the time of A.I., group 2 (n=14): Estrus does were restrained in a dorsal recumbence position in a especially designed crate (Fig. 1) for AI. A lubricated glass speculum was inserted into the vagina after sterilizing the vulval region of the goat. A flash-light/sun light was used to illuminate the cervix and the external os was located. The insemination gun was inserted through the vaginal speculum, fixed into the external os and then manoeuvred deeply into the cervix as far as possible and the semen was released slowly. The females were held in the same position for 2–3 min and the vulva was massaged gently. Insemination was carried out twice (morning/evening) for each goat during May-July 2012.

Statistical analysis: The pregnancy rate of Jamunapari goats were calculated in percentage. The Chi square test was utilized to compare the pregnancy rate. The level of significance was observed at the 5% level (Snedecor and Cochran 1989).

The seminal traits of Jamunapari bucks used in the present study have been shown in Table 1. The mean semen volume (ml), mass activity (0–5 scale), initial progressive motility (%), sperm density ($10^6/\text{ml}$), live sperm (%) and total

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Table 1. Seminal traits of Jamunapari bucks

Seminal parameters	
Volume (ml)	0.54±0.04
Mass Activity (0–5 scale)	3.58±0.14
Initial progressive motility (%)	63.29±0.02
Sperm Concentration (10 ⁶ /ml)	3573.04±1.05
Live sperms (%)	72.07±0.04
Head abnormal sperms (%)	0.60±0.004
Mid piece abnormal sperms (%)	0.03±0.002
Tail abnormal sperms (%)	0.28±0.004
Total abnormal sperms (%)	1.27±0.004

Table 2. Pregnancy rate following AI in Jamunapari does

	No of does inseminated	No of does Kidded	Overall (%)
Group 1	18	8	44.44
Group 2	14	9	64.28
Cycle wise pregnancy rate			
	1st cycle (%)	2 nd cycle (%)	Overall (%)
Non-return basis	46.88	28.12	75.00
Actual kidding basis	34.38	18.75	53.13

abnormal sperms (%) corroborated the reported values for the seminal traits of different breeds of bucks (Hassan *et al.* 2010, Bispo *et al.* 2011, Naing *et al.* 2011). The post thaw motility of the stored frozen semen used in the study ranged from 35 to 40%. Dorado *et al.* (2010) reported that the post-thaw progressive motility was observed to be 33.00±1.02% while mean post-thaw motility was 56.07±1.32% in Florida bucks. The higher (Bispo *et al.* 2011) and lower (Kulaksiz and Daskin 2010, Daskin *et al.* 2011) post thaw motility were also reported and the variation could mainly due to variation in initial semen quality and processing methods.

The pregnancy rate following AI in Jamunapari does are presented in Table 2. The pregnancy rate based on actual kidding was recorded to be 44.44% in goats restrained manually for insemination (group 1) whereas it was nonsignificantly higher (64.28%) in goats restrained using specially designed AI crate (group 2). This may be due to the fact that goats were immobilised/restrained comfortably in crate for few minutes after insemination which favours the sperm travel in the female genital tract. The use of crate also provides comfort for the restrainers during insemination. In France, where AI is an established technique in goat breeding management, the average conception rate of 60–65% has been reported (Leboeuf 1992, Leboeuf *et al.* 1998). A conception rate of 44.4% was obtained in does inseminated with skimmed milk extended semen as compared to 12.5% for Tris-citric acid extended semen (Mehmood *et al.* 2011). Batisa *et al.* (2009) has reported 43.6% of conception rate in Majorera goat breed using frozen thawed semen. In India, Bhattacharyya *et al.* (2012) reported higher pregnancy rate



Figs 1–2. 1. A.I. Crate for goats, 2. Jamunapari kids produced through frozen semen AI.

(71.43%) in Kashmir local goats which could be due to the use of Boer pellet semen with more volume and higher post thaw motility during breeding season. Unsatisfactory pregnancy rates are a common complaint when goats are inseminated with cryopreserved semen. Variation in fertility between breeds and farms (Leboeuf 1998, Salvador *et al.* 2005, Nordstoga *et al.* 2010, Priyadharsini *et al.* 2012), between individual males used for insemination (Ritar *et al.* 1990), initial semen quality and freezability (Corteel *et al.* 1987), method of AI and skill of inseminator (Sohnrey and Holtz 2005, Nordstoga *et al.* 2010), time/stage and season of insemination (Bhattacharyya *et al.* 2002) have also been reported after artificial insemination in goats.

Our data demonstrated that out of 32 Jamunapari goats inseminated, 17 became pregnant with an overall pregnancy rate of 53.13%. It was also observed that the pregnancy rate was nonsignificantly higher in does inseminated in first cycle than that of second cycle both on non-return and actual kidding basis (Table 2). Seven does produced singles (41.17%), nine does delivered twins (52.94%) and one doe gave triplets (5.88%). Thus 17 does delivered 28 kids (Fig. 1) that resulted in to 1.64 kids per goat which is higher than the kidding rate reported in Kashmir local goats (1.27; Bhattacharyya *et al.* 2012).

The results indicated that Artificial Insemination using frozen semen could successfully be used in goats with satisfactory conception rate for preservation, conservation and propagation especially Jamunapari goats. The use of crate enhanced the pregnancy rate following AI.

SUMMARY

The present study was undertaken at Central Institute for research on Goats, Makhdoom to study the fertility following AI using frozen semen of Jamunapari bucks. The semen samples initially qualified for freezing was frozen as per the protocol standardised in our laboratory, stored in LN₂ having the post thaw motility of 35 to 40% and were later used for AI. Out of 32 Jamunapari goats 17 become pregnant with a pregnancy rate of 53.12%. The pregnancy rate based on actual kidding was recorded to be 44.44% in goats restrained manually for insemination (group 1) whereas it was nonsignificantly higher (64.28%) in goats restrained using specially designed AI crate. One doe gave triplets, nine does

delivered twins and seven does produced singles. Thus 17 does delivered 28 kids that resulted in to 1.64 kids/goat. The results indicated frozen semen AI could successfully be used for preservation, conservation and propagation in goats. The use of crate enhanced the pregnancy rate following AI.

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