



Fertility Response of the Sex Sorted and Conventional Semen in Cattle

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ABSTRACT

The present research work was carried out to observe fertility response of the sex sorted semen in crossbred pubertal heifers and cattle. A total 20 crossbred heifers and 20 pluriparous cows were selected for the present study. Animals were divided into four equal groups. The GPG + G protocol was used in all four groups. Inj. GnRH @ 20 mcg on day 0, inj. PGF_{2α} @ 2 ml on day 7, inj. GnRH @ 10 mcg administered on day 9 and inj. GnRH @ 10 mcg at the time of A.I. on day 10, FTAI was performed 24 h after the second GnRH injection. Group I (n=10) was included pubertal heifers and inseminated with sex sorted semen. Group II (n=10) was carried out pubertal heifers and inseminated with conventional semen, Group III (n=10) was inseminated sex sorted semen in pluriparous cows and Group IV (n=10) used conventional semen in pluriparous cows. Duration of estrus was observed as 25.2±4.54, 24.60±2.27, 20.2±1.87, 30.00±2.68 hrs in Group I, II, III and IV, respectively. The overall conceptions achieved in present research by use of sex sorted semen and conventional semen was 50.00, 70.00, 70.00 and 80.00 per cent in pubertal heifers and pluriparous cows, respectively.

HIGHLIGHTS

- GPG+G protocol can be effectively used for estrus induction in anoestrus pubertal heifers and pluriparous cows.
- Sex sorted semen resulted in lower conception rate than conventional semen in pubertal heifers and pluriparous cows.

Keywords: Conception rate, Sex sorted semen, GPG+G protocol, Cattle

Since long ago, the animals have been an integral part of human life. Presently, huge dairy cattle numbers throughout the world is contributing in compensating the global food security. But, the rapid explosion of human population has increased the demand for animal products. So, researches are being targeted towards getting maximum production from the animals. It is need of time to produce desired sex calf has been a long cherished dream of dairy cattle producers and scientists. Pre-conception selection of gender in bovines has lot of economic importance to justify its use as in most situations; one gender is more valuable (commercially) than other. Marketing, disposal or economic use of male calves continues to be a problem for the dairy farmers and planners. It leaves us in a peculiar

situation where 50% population of the total progeny born is of unwanted sex (male) and remains more or less a liability rather than an actively performing asset. The sexed semen methodology used to minimize the numbers of the progeny belonging to the desirable and undesirable sex of calf. The biotechnology for pre-selection of sex of the embryo is based on basic biological principles. It is non-invasive and doesn't involve any foeticide. X and Y chromosomes is determined sex either female or male which is integral part of the genetic material.

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In present study, the research is dealing with use of sex sorted semen for artificial insemination after synchronization of estrus in cows. Desired sex either female or male which is produced from semen having X or Y bearing sperm is known as sex sorted semen.

The advancement of commercial sexed semen and its role in animal husbandry was summarized by (Garner and Seidel 2008; Kumar *et al.*, 2017). Advantages of using sex sorted semen in dairy cattle as female to male ratio with 90:10 or vice-versa is ensured and the cost of progeny testing programs is lowers and enhances the value of genetic markers of embryo transfer (De Vries *et al.*, 2008). Sex-sorted semen can increase the profitability of dairy farms by increasing the number of genetically superior heifers born after AI (Hohenboken, 1999).

The manipulation of the estrous cycle or induction of estrus brings a large percentage of a group of females into estrus at a short, predetermined time. Use of advanced managerial processes by which the managerial errors and its costs could be reduced is synchronization of estrus. To control the timing of the onset of estrus by controlling the length of the estrous cycle is the basic principle for the estrus synchronization.

MATERIALS AND METHODS

The present research work was carried out on 40 crossbred anoestrus heifers and cows at Department of Animal Reproduction, Gynaecology and Obstetrics, College of Veterinary and Animal Sciences, Udgir, Dist Latur, Maharashtra. A total 20 crossbred heifers and 20 pluriparous cows were selected for the present study. Animals were divided into four equal groups. The GPG+G protocol was used in all four groups. Inj. GnRH @ 20 mcg on day 0, inj. PGF₂α @ 2 ml on day 7, inj. GnRH @ 10mcg administered on day 9 and inj. GnRH @10 mcg at the time of A.I. on day 10, FTAI was performed 24 h after the second GnRH injection. Group I (n=10) was included pubertal heifers and inseminated with sex sorted semen. Group II (n=10) was carried out pubertal heifers and inseminated with conventional semen, Group III (n=10) was inseminated sex sorted semen in pluriparous cows and Group IV (n=10) used conventional semen in pluriparous cows. The animals were selected on the basis of reproductive history and gynaeco-clinical examinations. All the experimental

animals were screened gynaeco-clinically by performing rectal examination on the day of treatment/selection of animals and at the time of insemination. Selected animals were dewormed with routine drug followed by mineral supplementations @ 50 gm daily per head, inj. Urimin @ 10 ml and inj. Intavita-H @ 5ml intramuscularly for 3 alternate days.

Cervical mucus with primary, secondary and tertiary branches of fern pattern were classified as typical; fern pattern with primary and secondary branches was classified as atypical. The data was statistically analyzed by use of technique described by Snecdor and Cochran (1994).

RESULTS AND DISCUSSION

In the present study, crossbred pubertal anoestrus heifers were induced estrus with GPG + G in all groups of animals. 100.00 % heifers and pluriparous cows were responded within 24 hours of treatment. Duration of oestrus was noted 25.2 ± 4.54 , 24.60 ± 2.27 , 20.2 ± 1.87 and 30.00 ± 2.68 hours in Group I, II, III and IV respectively. Similar estrus induction protocol (GPG + G) was used by Lingaswamy (2017) reported 100.00% in crossbred cows estrus response, mean onset of estrus was in 50.90 ± 1.20 hrs mean duration of estrus in crossbred cows was 22.30 ± 0.79 hrs. The overall conception rate was mentioned as 50.00 in Ovsynch + GnRH protocol. Sathiamoorthy and Subramanian (2003) observed that the duration of estrus was found to be 20.5 ± 2.5 hours in 60 days postpartum crossbred cows treated with Ovsynch protocol and the induced estrus was recorded as 90 per cent which is very close to present study. Dhama *et al.* (2015) who noted 100.00 per cent response in cows after receiving Ovsynch protocol and also recorded intensity of induced estrus which is similar to normal cyclic control group within 42-72 h from the time of PGF₂α injection. The author also recorded 64.13 ± 1.33 h the mean estrus induction interval with conception rates at induced estrus of 50% the overall of three cycles as 80% in cows. Difference in duration of estrus was found to be greater than the present finding; it might be due to the species specific relation, productive traits and environmental factors which alter the duration of estrous. The observations of the parameters has been depicted in table 1 and 2.

Table 1: Effect of estrus induction protocol in pubertal heifers and Pluriparous cows

Sl. No.	Parameter	Observations			
		Group I	Group II	Group III	Group IV
1	No. of animals under research	10	10	10	10
2	No. of animals responded after treatment (%)	10 (100)	8 (80)	10 (100)	10 (100)
3	Onset of oestrus after treatment (hrs)	24	24	24	24
4	Type of semen used	SSS	CS	SSS	CS
5	Duration of oestrus (hrs)	25.2 ± 4.54	24.60±2.27	20.2± 1.87	30.00±2.68
6	Conceptions (%) 1 st estrous	3/10 (30)	5/10 (50)	4/10 (40)	2/10 (20)
	2 nd estrous	2/4 (50)	2/6 (33.33)	00	6/7 (85.71)
	3 rd estrous	00	00	3/4(75)	00
7	Overall Conception rate (%)	5 (50)	7 (70)	7 (70)	8 (80)
8	Services per conception	2.8	1.8	2.57	2.25
9	Intensity of estrus (%)				
	Intense	40	40	60	70
	Intermediate	50	50	40	30
	Weak	10	10	00	00
10	Fern Pattern (%)				
	Typical	50	70	70	80
	Atypical	50	30	30	20
11	Non cyclic animals	03	02	02	01
12	No. of animals continued cyclicity	02	01	01	01

Note: All the above results calculated based on descriptive statistical analysis.

Table 2: Overall estrual symptoms in experimental animals

Sl. No.	Estrual symptoms	Observations (%)			
		Group I	Group II	Group III	Group IV
1	Tummification of vulva	90	90	80	90
2	Swollen and edematous vulva	100	80	90	90
3	Cervico-vaginal mucus discharge	100	100	100	100
4	Vulvar mucus membrane moist and congested	80	80	90	80
5	Uterine tone	100	100	100	100
6	Cervix opened	100	100	100	100

Note: All the above results calculated based on descriptive statistical analysis.

Statistically, it was observed that the duration of estrous across different groups was found to be non-significant ($p=0.171$). However, the duration of estrous in Group IV (Pluriparous cows) was longer (30.00 ± 2.68 hrs) and shortest (20.2 ± 1.87 hrs) in Group III. However, duration

of estrous in heifers and cows was found to be non-significant ($p=0.949$) difference.

Intensity of estrous was recorded as intense, intermediate and weak as 40, 50, 10; 40, 50, 10; 60, 40, 00 and 70, 30, 00 per cent in Group I, II, III and IV, respectively.

Ahmed *et al.* (2016) treated cows with Ovsynch protocol and reported the onset of estrus and duration of estrus was 48.750 ± 0.713 and 21.83 ± 0.787 h and the intensity of estrus was intense, intermediate and weak as 16.67, 66.67 and 16.67%, respectively.

Fern pattern were found to be typical and atypical as 50, 50; 70, 30; 70, 30 and 80, 20 per cent in Group I, II, III and IV, respectively. Percentage of typical and atypical fern patterns of estrual discharge were 87.50% and 12.50% in conceived cows reported by Bennur *et al.* (2004). Dodamani *et al.* (2010) who reported the Deoni cows subsequently becoming pregnant exhibited considerably higher percentage of typical fern pattern (80.95%) as compared to atypical fern pattern (19.05%). Those cows failed to conceive had 56.6% typical and 44.44% atypical fern pattern. Ningwal *et al.* (2018) recorded the per cent incidence of typical fern pattern of cervicovaginal mucus in conceived crossbred cows as 86.67% whereas in heifers as 83.33%. Whereas, the frequency of atypical fern pattern of cervicovaginal mucus in conceived cows was 13.33 per cent and in heifers 16.66 per cent.

Pregnancy diagnosis was performed after 60 days of artificial insemination in all animals. In Group I, overall conception rate by use sex sorted semen was found in 5 (50%) with 2.8 services per conception. In 1st and 2nd estrous, 3 and 2 heifers were found to be pregnant. In group II, overall conception rate by use of conventional semen were observed 7 (70 %) with 1.8 services per conception. In 1st and 2nd estrous, 5 and 2 heifers were found confirmed pregnant. Pubertal heifers inseminated with conventional semen had greater conception rate than those inseminated with sex sorted semen following induced estrus. In Group III, overall conception rate by use sex sorted semen was found in 7 (70%) cows with 2.57 services per conception. In 1st and 3rd estrous, 4 and 3 cows were found confirmed pregnant. In group IV, overall conception rate by use of conventional semen were observed 8 (80%) with 2.25 services per conception. In 1st and 2nd estrous, 2 and 6 cows were confirmed pregnant. Pluriparous cows inseminated with conventional semen had greater conception rate than those inseminated with sex sorted semen following induced estrus. Out of 10 pluriparous cows from Group III, 2 non cyclic and one pluriparous cows were observed cyclic repeat breeder whereas in Group IV, one each pluriparous cow was found as non cyclic and cyclic repeat breeder. Bodmer *et al.* (2005)

observed fertility in 132 heifers and cows after low dose insemination with sex-sorted and non-sorted sperm under field conditions. Heifers and cows were inseminated with 2×10^6 x-bearing, frozen-thawed sperm. The pregnancy rates after PE1 were 33.3% (9/27) and 59.3% (16/27) in heifers ($P = 0.05$) and 27.6% (29/105) and 28.1% (18/64) in cows. Cerchiaro *et al.* (2007) assessed the fertility and purity of sexed semen used for inseminating Holstein-Friesian heifers in commercial dairy herds. The overall pregnancy rate for sexed semen was 51%.

Twagiramungu *et al.* (1992) observed postpartum beef cows and heifers. Overall synchronization rate (85.2 vs. 92.6%), pregnancy rate (57.4 vs. 68.5%) and conception rate (67.4 vs. 74.0%) were similar for both treatment groups. Roy and Twagiramungu (1997) observed 61% conception rates during induced estrus in cows treated with GnRH-PGF2 α -GnRH protocol.

CONCLUSION

It was concluded that use of GPG + G protocol has achieved 100.00 per cent estrus induction response in anoestrus pubertal heifers and pluriparous cows. Pluriparous cows exhibited higher percentage of intense estrous as compared to pubertal heifers. Higher conception rate can be achieved by insemination in correlation with typical fern pattern than atypical or nil pattern. Sex sorted semen resulted in lower conception rate than conventional semen in pubertal heifers and pluriparous cows.

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