

ESTRUS INDUCTION, FOLLICULAR DYNAMICS AND FERTILITY RESPONSE TO MID-CYCLE PGF_{2 α} , CIDR AND OVSYNCH PROTOCOLS IN SUBFERTILE GIR AND CROSSBRED COWS

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ABSTRACT

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This study was carried out on 36 infertile (subestrus and repeat breeders) Gir and HF x K crossbred cattle of University farm using three estrus synchronization protocols, viz., Mid-cycle PGF_{2 α} , Ovsynch and CIDR, to evaluate estrus response and conception rates clinically and through transrectal ultrasound scanning, and the findings were compared with those of 24 untreated cyclic cows. Six subestrus/repeat breeding cows each of Gir & crossbreds (6x2 = 12) having mid cycle mature CL were treated with single i/m injection of 500 \pm g cloprostenol, and fix timed AI (FTAI) was performed at 72 and 96 hrs post-treatment. Similarly, six infertile cyclic Gir and crossbred cows each (6x2 =12) were treated with standard CIDR protocol and equal numbers (6x2 =12) with Ovsynch protocol using FTAI on day 9 and 10. Ovarian and uterine changes were monitored using transrectal ultrasound scanning (USG) on alternate days till induced estrus/FTAI, and then at weekly interval till day 42 post-AI. Estrus induction response was 100 % with all three synchronization protocols as seen clinically and through USG. The conception rates of 12 subfertile cows, each subjected to CIDR, Ovsynch and Mid-cycle PGF_{2 α} treatment protocols were 41.66, 41.66 and 33.33 %, respectively, at induced estrus. The corresponding conception rates at second cycle post-treatment were 28.57, 42.85 and 25.00 %; and at third cycle 40.00, 50.00 and 33.33 %, with the overall conception rates of 3 cycles as 75.00, 83.33 and 66.66 %. In untreated cyclic control cows, the conception rates at first, second and third service and overall of 3 services were 20.83, 21.05, 26.66 and 54.16 %, respectively. The mean CL size on the day of mid-cycle PG injection was largest (14.02 \pm 0.46 mm) and that of follicle smallest (4.22 \pm 0.42 mm), which changed drastically (P<0.01) within 48-72 hrs and the values at induced estrus by 72 hrs post-PG treatment were almost inversed (7.70 \pm 1.16 and 12.94 \pm 0.74 mm). Similar were the observations for cows of CIDR and Ovsynch groups also between PG injection and induced estrus/AI. Moreover the changes noted in CL/Follicle size around day 21-23 post-AI were in accordance with the maintenance of pregnancy or repeat cycle. One pregnant cow each in Mid-cycle PGF_{2 α} and Ovsynch treated groups showed early embryonic mortality between day 28 and 42 post-AI. The fertility results obtained using all 3 treatment protocols were much better than that of untreated cyclic animals. Gir cattle in fact responded better with CIDR, while Crossbreds showed better results with Ovsynch, and the response with Mid-cycle PGF_{2 α} treatment was relatively poor and almost same in both the classes of animals. There were positive correlations between USG data sheet and rectal palpation findings on ovarian and uterine changes following treatment/AI.

Key words: Cows, Estrus induction, Fertility, Follicular dynamics, Ovsynch, CIDR, Mid-cycle PG protocol.

INTRODUCTION

High reproductive performance in dairy animals is an essential requisite to ensure maximum production and satisfactory economic return (Baruselli *et al.*, 2012). Cattle productivity depends largely on reproductive efficiency and is often measured by offspring per breeding animal per unit of time. There are apparently several reasons for the anestrus, subestrus and repeat breeding and no single treatment is likely to alleviate these conditions in every herd or animal. Infertility in dairy cattle is associated with malnutrition, estrus detection errors, endocrine dysfunctions, ovulatory defects, uterine infection, gamete quality etc. Hormonal therapies have good therapeutic value to enhance reproductive efficacy in infertile animals with good nutritional status (Ghuman *et al.*, 2009; Bhoraniya *et al.*, 2012; Savalia *et al.*, 2014). Goley and Kadu (1995) reported that prostaglandin increased the conception rate in repeat breeders. Further, the timed AI (TAI) program independent of oestrus detection is now considered as an important tool for reproductive management to enhance the reproductive performance of cattle and is currently applied routinely in the reproductive management programs on farms (Bartolome *et al.*, 2004; Baruselli *et al.*, 2012). The transrectal USG helps to confirm the presence or absence of CL/ Follicle and its functional competency which is directly related with ovarian function and fertility of the female. Hence, this study was planned to evaluate the comparative efficacy of CIDR, Ovsynch and Mid-cycle PG protocols in infertile cows of an organized farm to enhance their ovarian function and fertility added with ultrasound monitoring of treatment response and post-AI pregnancy/embryonic mortality in them.

MATERIALS AND METHODS

A total of 60 Gir and crossbred (HF x K) cows of the University farm (LRS) in healthy state were utilized for the present study. All the animals were cycling and had normal calving and subsequent normal genital health as assessed by Gynaeco-clinical examination. They were subjected to transrectal ultra-sonographic

scanning to study the follicular dynamics, ovulation and pregnancy. The subestrus condition was confirmed through periodical rectal examination for presence of palpable corpus luteum on one of the ovaries. The animals found in spontaneous or induced estrus were inseminated with good quality frozen-thawed semen. Pregnancy was confirmed in non-return cases on day 23, 28, 35 and 42 post-AI using transrectal ultrasonography and per rectal palpation 60 days post-AI.

The animals so selected were distributed in the following subgroups according to their physiological and reproductive status for various treatments. Thirty six infertile animals (subestrus and repeat breeding) were included in estrus synchronization protocols, viz., Mid-cycle PGF_{2α}, Ovsynch and CIDR (12 each; 6 Gir & 6 CB), and subsequent ovarian follicular/luteal dynamics and fertility evaluation as under.

In group A, 6 subestrus/repeat breeding postpartum cows each of Gir & crossbreds (6 x 2 = 12) were treated with single i/m injection of 500 µg cloprostenol (Estrumate, 2 ml, Intervet) at mid cycle after thorough confirmation of mature CL on the ovary with rectal palpation as well as ultrasonographic examination. Ultrasound scanning of the animals was performed at 24-hourly intervals from start of treatment till 72-hrs or expression of induced estrus and/or ovulation (AI) and then on day 7, 14, 21 post-AI and then on day 23, 28, 35 and 42 post-AI in non-return cases.

In group B, six infertile cyclic animals each of Gir and crossbred category (6 x 2 = 12) were treated with Ovsynch protocol consisting of injection 20 µg Buserelin acetate (5 ml Receptal, Intervet) on day 0 (day of start of experiment), 500 µg cloprostenol (2 ml Estrumate, Intervet) on day 7 and second injection of 10 µg Buserelin acetate on day 9, followed by fix timed AI (FTAI) twice at 24 and 36 hrs later. Ovarian follicular changes were monitored on alternate days up to ovulation/AI, i.e. on day 0, 2, 4, 6, 8 and 10 (AI) of treatment, and then on day 7, 14, 21 post-AI and then on day 23, 28, 35 and 42 post-AI in non-return cases.

In group C, six infertile cyclic animals each of Gir and crossbred category were treated with intravaginal insertion of CIDR (1.38 g hydroxyprogesterone in silastic coil, Pfizer) on day 0 (day of start of experiment), its removal on day 7 with 500 µg i/m injection of cloprostenol (2 ml Estrumate, Intervet), Injection Buserelin acetate 10 µg i/m on day 9 and FTAI on day 10. Monitoring of ovarian follicular dynamics was done as described in Ovsynch protocol.

In group D, the cows (n=24) exhibiting spontaneous estrus ≥ 90 days postpartum were scanned through USG and were bred with quality frozen-thawed semen without any treatment served as cyclic controls. These cows were scanned post AI as in above groups.

The data on estrus induction response, conception rates to first 3 AIs, overall pregnancy rates as well as follicular / luteal status in different groups were analyzed statistically (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

All the Cows subjected to three different treatment protocols responded well with cent per cent estrus induction/synchronization response. The conception rates of 12 subfertile cows, each subjected to CIDR, Ovsynch and Mid-cycle PGF_{2α} treatment protocols were 41.66, 41.66 and 33.33 per cent, respectively, at induced estrus. The corresponding conception rates at second cycle post-treatment were 28.57, 42.85 and 25.00 per cent; and at third cycle 40.00, 50.00 and 33.33 per cent, with the overall conception rates of 3 cycles as 75.00, 83.33 and 66.66 per cent. In untreated cyclic control group, out of 24 animals inseminated, the conception rates at first, second and third service and overall of 3 services were 20.83, 21.05, 26.66 and 54.16 per cent, respectively. The fertility results obtained using all 3 treatment protocols were much better than that of untreated cyclic control animals. Gir cattle in fact responded better with CIDR, while crossbreds showed better results with Ovsynch protocol, and the response with Mid-cycle PGF_{2α} treatment was almost same and relatively poor as

compared to other two protocols in both the classes of animals. Interestingly, all the treated animals became regular cyclic and expressed subsequent estruses, if not settled at induced or next estrus/AI.

The first service conception rate in CIDR treated cows corroborated well with the previous report of Sathiamoorthy and Kathirchelvan (2010) as 37.20 and 42.74 per cent, respectively, in crossbred and zebu cows and heifers. Similarly, Cevik *et al.* (2010) reported conception rates of 50.00 and 53.30 per cent at induced estrus following CIDR treatment in anoestrus crossbred and HF cows, respectively.

The present overall 3 cycles CR in CIDR group also compared favourably with Ammu *et al.* (2012) as 80.00 and 83.33 per cent, respectively, while Khade *et al.* (2011) observed overall conception rate of 66.66 per cent in Gir heifers, and Bhoraniya *et al.* (2012) reported 100 per cent overall conception rate of three cycles in anoestrus Kankrej cows. The possible explanation for better estrus response and conception rate in this group could be establishment of proper endocrine harmony, progesterone priming, favourable season and better management of animals.

The present first service CR at induced estrus (41%) with Ovsynch protocol is better than 30.00 and 33.33 per cent reported by Bhoraniya *et al.* (2012). While Ammu *et al.* (2012) reported comparable 83.33 per cent overall conception rate in anoestrus crossbred and/or zebu cows with the same protocol. However, slightly lower overall 3 cycles conception rates of 56 to 61 % following Ovsynch treatment have been reported in cows by Sathiamoorthy and Karthirchelvan, 2010. The possible reasons for variation could be the reproductive status or stage of estrous cycle at the beginning of the protocol, apart from nutritional, managerial, lactational status, drug source, age and such other factors. The first GnRH injection in Ovsynch protocol is expected to induce ovulation and/or partial lutenization of dominant follicle if present, which is then lysed by PGF_{2α} injection leading to folliculogenesis and ovulation of second wave follicle after second GnRH injection.

Further, prostaglandin F_{2α} (25 to 30 mg) and its analogues induce luteolysis and were found to induce ovulatory estrus and improve reproductive efficiency in subfertile dairy animals (Dhami et al., 2014). The luteolytic action is most potent between day 5 and 17 of the bovine cycle and most of the animals show ovulatory estrus within 3-4 days of treatment (Patel et al., 2014). Moreover, Kadarbhai et al. (2012) obtained first service conception rate of 30.00 per cent with mid-cycle PGF_{2α} in crossbred cows, which is in line with the present result. Although, Kumar et al. (2010) reported higher first service conception rate of 52.38 per cent in subestrus cows with similar treatment. Further, the overall conception rate of three cycles (66.66 %) obtained with mid-cycle PG treatment in subfertile cows under study compared favourably with the reports of Mane et al. (1992) as 66.40 per cent in crossbred heifers and cows.

The present results, however, suggest that the application of Ovsynch and/or CIDR protocol can serve as a good tool for induction of estrus and ovulation as well as enhancement of conception rate in subfertile Gir and crossbred cows as was confirmed by USG and per rectal palpation. The similar or better conception rates obtained at second cycle following induced estrus could be due to better estrus synchrony and endocrine harmony in these treatment groups.

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