



Efficacy of different estrus synchronization protocols in repeat breeder cows

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One of the most imperative factors determining the profitability of cattle herds is reproductive performance which has declined over the last several years (Sharma *et al.* 2018). Delayed ovulation, anovulation and luteal insufficiency can lead to functional infertility in dairy cows which are characterized by abnormal follicular development and abnormal estrous cycle (Parmar 2015). These conditions result in mismatching of the time of ovulation and artificial insemination (AI) followed by lower conception rate, early embryonic mortality, and repeat breeder syndrome (Kashyap *et al.* 2018). Size of the dominant follicle also has an important role in maintaining luteal function and subsequent embryonic survival (Vasconcelos *et al.* 2013). Estrus synchronization protocols manipulate follicular development, corpus luteum (CL) regression and ovulation and result in improved reproductive performance as all the cows are inseminated timely irrespective of manifestation of estrus signs (Kapse *et al.* 2017). So the present study is solely focused on finding the comparative efficacy of different estrus synchronization protocols in repeat breeder cows followed by evaluation of relationship between follicular size and conception rate.

The study was conducted in cows present at Teaching Veterinary Clinical Complex (TVCC), Instructional Livestock Farm Complex (ILFC) of CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur and nearby field institutions around Palampur (32.6°N, 76.3°E, altitude 1290.8 m). Cows (272) showing clear discharge at the estrus were selected for the study. The protocols for synchronization of estrus and ovulation were applied on day 6 of estrous cycle. These cows were divided into four treatment and one control groups. Ovsynch (n=73) and Ov-cosynch (n=23) synchronization protocols were applied according to Kashyap *et al.* (2018) whereas Doublesynch (n=36) and Heatsynch (n=47) were applied as per Kapse *et*

al. (2017). A control group consisted of 93 cows which were not given any treatment and AI was done on the day of observed estrus after the examination of clear cervico-vaginal discharge. Pregnancy diagnosis was done at 45 days post AI by rectal examination/ultrasonography method, using linear transducer of frequency 7.5 MHz (Mindray, Model Z5 Vet) in cows that did not return to estrus within this duration. After compilation of the data, conception rates were calculated. Also, the impact of treatment on follicular dynamics was evaluated by measuring the size of the dominant follicle prior to AI. The obtained data were statistically analyzed using chi-square test for conception rate and one way ANOVA for dominant follicle size as described with SAS (Statistical Analysis Software), SAS® 9.2 TS Level 2M2 for windows.

The conception rate for cows treated with Ovsynch protocol was significantly higher (P<0.05) than control group, 52.05 vs 34.41%, respectively (Table 1). The conception rate in present study following Ovsynch protocol was very much comparable to the findings of Prajapati *et al.* (2015). Similarly, Jayaganthan *et al.* (2016) and Karki *et al.* (2018) reported 58.82% and 55% conception rate,

Table 1. Conception rate and mean (±SE) diameter of dominant follicle on day 9 following application of different synchronization protocols

Synchronization protocol	Cows inseminated	Pregnant	Conception rate (%)	Mean diameter of dominant follicle prior to AI
Ovsynch	73	38	52.05 ^a	12.87±0.58 ^{ax} (n=30)
Ov-cosynch	23	11	47.82 ^{ab}	11.02±0.44 ^{ab} (n=20)
Doublesynch	36	15	41.66 ^{ab}	10.50±0.48 ^b (n=20)
Heatsynch	47	17	36.17 ^{ab}	10.58±0.66 ^b (n=20)
Control	93	32	34.41 ^b	10.42±0.32 ^y (n=30)

Values with different superscripts within the same column differ significantly (^{a,b}P<0.05, ^{x,y}P<0.01).

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respectively; with Ovsynch protocol in repeat breeder Jersey crossbred cows. In other study, Arunmozhi *et al.* (2014) stated that cyclicality and conception can be improved by controlling the follicular wave pattern by the use of Ovsynch protocol to stimulate follicular development and ensure ovulation. Conception rate recorded in our study following Ov-cosynch protocol (47.82%) was higher than the findings of Biradar *et al.* (2014), i.e. 37.50%. Contrarily, Akbarabadi *et al.* (2014) reported higher conception rate in cows treated with Ov-cosynch protocol (52.00%). However, the difference in conception rate between Ovsynch and Ov-cosynch was non-significant in our study ($P>0.05$). Barolia *et al.* (2016) also reported a reduction in conception rate when Ov-cosynch is compared with Ovsynch which is in agreement to our study.

In present study, conception rate (41.66%) following Doublesynch treatment protocol was in concurrence with Mirmahmoudi *et al.* (2014) who stated that synchronisation of ovulation with a PGF2 α two days before GnRH instead of GnRH alone has been reported to yield better fertility. However, Harichandan *et al.* (2018) reported 65% conception rate following Doublesynch protocol in repeat breeder cows. In Heatsynch protocol, lowest conception rate among all treatment groups (36.17%) was recorded in our study. This might be due to low ovulation rate as confirmed by Stevenson *et al.* (2004). Contrarily, Rabiee *et al.* (2005) recorded conception rates similar to Ovsynch protocol.

The mean diameter of dominant follicle in the cows treated with Ovsynch protocol was significantly higher ($P<0.05$) as compared to Doublesynch and Heatsynch protocol. However, mean diameter of dominant follicle in cows treated with Ovsynch protocol was not significantly higher ($P>0.05$) than cows treated with Ov-cosynch protocol. Also, dominant follicle size in cows under control group was significantly lower ($P<0.01$) than Ovsynch protocol cows.

Dominant follicle size appears to be a strong indicator of follicle maturity and perhaps a better indicator of fertility than serum estradiol at the time of AI or expression of estrus as the behavioral estrus is not dependent upon the follicle size (Perry *et al.* 2005; Kapse *et al.* 2017). Also, the competence of bovine oocytes increases with size of follicular diameter (Arlotto *et al.* 1996). Vernunft *et al.* (2013) also reported that follicle size and estradiol concentration in the follicular fluid seems to be very important for the further development of a pre-ovulatory follicle into a healthy, actively secreting corpus luteum (CL). Smaller size of dominant follicle can be correlated with low number of LH receptors on the follicle which may contribute towards anovulation, delayed ovulation or formation of dysfunctional CL (Vasconcelos *et al.* 2001). Small, incompetent follicles can result in decreased conception rates and increased embryonic mortality due to luteal inadequacy and short estrous cycles (Santos *et al.* 2004). Moreira *et al.* (2000) also stated that decrease in conception rate owing to lower progesterone concentration

is observed in cows having dominant follicle size <12 mm which is in agreement to our study.

In conclusion, Ovsynch protocol resulted in better conception rate in repeat breeder cows. Also, efficient synchronization following Ovsynch protocol led to better dominant follicle size which can be important for achieving timely LH surge and hence, ovulation.

SUMMARY

The work was conducted in 272 repeat breeder cows diagnosed with functional form of infertility, i.e. luteal insufficiency and ovulatory defects. The objective of present study was to evaluate the efficacy of synchronization protocols in functionally infertile repeat breeder cows. These cows were divided into 4 treatment, viz. Ovsynch, Ov-cosynch, Doublesynch, Heatsynch and one control group. The overall conception rate of Ovsynch treatment protocol was significantly higher than control cows. Similarly, the mean diameter of dominant follicle in cows treated with Ovsynch protocol was significantly higher than cows treated with Doublesynch and Heatsynch protocols. Also, the mean diameter of dominant follicle prior to artificial insemination in the cows treated with Ovsynch protocol was significantly higher in comparison to control cows. In conclusion, Ovsynch protocol fared better in terms of conception in repeat breeder cows.

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