

Influence of Different Estrus Induction Protocols on Fertility Improvement in Dangi Cows

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Abstract

The aim of the study was to evaluate the different estrus and ovulation induction protocols for improving fertility in Dangi cow. Total 48 postpartum anoestrus Dangi cows were selected from an organized farm in Nashik. They were divided into four groups and treated with Ovsynch (G-I), PRID plus PGF2 α (G-II), and PRID + Ovsynch (G-III) protocols (n=12 each), and one group was kept as untreated control (G=IV) (n=12). Before starting the hormonal treatment, all the 48 animals were treated with dewormer, Inj. AD3E, Inj. Phosphorus and Mineral mixture as premedication. The induction of behavioral estrus in group I to III was 91.66% (11/12), 83.33% (10/12) and 91.66% (11/12), respectively. Mean duration of induced estrus in three treatment protocols I to III was 18.5 ± 0.47 , 18.25 ± 0.56 and 20.02 ± 0.39 hrs, respectively. The pregnancy rates observed at induced estrus with fixed time artificial insemination were 41.66, 33.33 and 50.00%, while the overall conception rate observed in animals of groups I to III were 66.67%, 50.00% and 75.00%, respectively. The corresponding values for spontaneous estrus and conception in untreated control group IV were 16.66% and 8.33%, respectively. PRID plus Ovsynch protocol was beneficial than Ovsynch alone and PRID plus PGF2 α . Hence, it was concluded that all three-estrus induction and ovulation synchronization protocols established regular estrus cyclicity and majority of them conceived at induced as well as subsequent estrous cycles, proving influence of estrus induction protocols on postpartum fertility in anoestrus Dangi cows.

Keywords: Dangi Cows, Estrus Induction, Synchronization, Ovsynch, PRID, Postpartum Anoestrus

Introduction

Dangi is a draught breed found in Nashik and Ahmednagar districts in Maharashtra state including an area in the Western Ghats known as Dangs from which the breed takes its name. They are well known for their excellent working qualities in heavy rainfall areas, rice fields and hilly tracts. Among the various causes of infertility, anoestrus is most common single cause of infertility in Dangi cows. Estrus induction and synchronizations of ovulation protocols to improve the fertility of the cows involve programmed follicular development, regression of corpus luteum and sequentially timed artificial insemination. Initially, the Ovsynch protocol was developed as a breeding strategy to eliminate the need for estrus detection (Pursley *et al.*, 1995). Later, the Progesterone Releasing Intra vaginal Device (PRID) protocol by inclusion of an exogenous progestogen was developed. Another protocol developed by administering PGF₂ α along with PRID. All these protocols produce varying success rates. This scenario clearly shows the need for an in-depth study of different ovulation synchronization strategies for increasing the reproductive efficiency in indigenous cows, the research in Dangi cattle is very limited. With this fact, the present study was designed to evaluate the comparative efficacy of different estrus induction and ovulation synchronization protocols, *viz.*, Ovsynch, PRID plus PGF₂ α , and PRID plus Ovsynch for fertility improvement in postpartum anoestrus Dangi cows.

Material and Methods

The study was conducted on 48 postpartum anoestrus (>100 days) Dangi cows at Cattle Breeding Farm and Dangi Cow Research Station, Igatpuri, Nashik (Maharashtra). All these experimental cows were treated with standard dose using oral Albomar, Inj. AD₃E, Inj. Phosphorus and oral chelated minerals and vitamins (Agrimin Forte®, Virbac Animal Health) as premedication treatment fifteen days before start of induction protocol. All 48 selected Dangi cows were randomly divided in to 4 equal groups (n=12 each), out of which 36 cows were subjected to standard estrus induction and ovulation synchronization protocols with fixed time artificial insemination (FTAI), *i.e.*, Group I (Ovsynch group), Group II (PRID/ Triu-B plus PGF₂ α) and Group III (PRID plus Ovsynch), while Group IV was kept as untreated control (n=12).

Experimental animals of Group I (Ovsynch) were administered Buserelin acetate (a GnRH analogue) 20 μ g intramuscular (i/m) on day '0' (Inj. Pregulate®, Virbac Animal Health, 5 ml) followed by Inj. Cloprostenol (PGF₂ α analogue) 500 μ g i/m on day 7 (Pregova® 2 ml, Virbac Animal Health) and a second dose of Inj. Buserelin acetate 20 μ g i/m on day 9. Fixed time AI was done 16 to 18 hrs after the second GnRH injection. Cows of Group II (PRID plus PGF₂ α) were inserted with intra-vaginal device (Triu-B®, Virbac Animal Health) on Day '0', Inj. PGF₂ α was given on 7th day, removal of PRID on 8th day and fixed time AI 56 hrs after removal of PRID. Cows of Group III (PRID plus Ovsynch) were inserted with intra-vaginal device (Triu-B®, Virbac Animal Health) followed by administration of GnRH inj. on day '0'. Inj. PGF₂ α was administered on 7th day, PRID was removed on 8th day and a second dose of Inj. GnRH on 9th day at the same dose schedule and route mentioned in Group I. All the cows were inseminated with frozen-thawed semen of Dangi bull on induced estrus and two more subsequent spontaneous estrous cycles in non-conceived animals. In cows of group IV (untreated control Group), no hormonal treatment but only premedication was given and those cows showed natural estrus were inseminated by using good quality frozen semen at detected estrus.

Pregnancy was confirmed in all the groups 60 days post AI by rectal examination. Conception rates with respect to first service and overall conception rates of three cycles were determined. The overall conception rate was calculated as percentage of animals pregnant in three consecutive AI out of the number of animals treated in each group. The estrus induction response and conception rate of cows of different hormonal protocol groups were compared by using Chi square test (Snedecor and Cochran, 1989)

Results and Discussion

The findings on the effect of various estrus synchronization protocols on estrus induction response, duration of estrus and conception rate in anoestrus Dangi cows are summarized in Table 1. Out of 48 Dangi cows each group of 12 subjected to Ovsynch, PRID plus PGF₂ α , and PRID plus Ovsynch protocols and a control group 91.66% (11/12), 83.33 % (10/12), 100% (12/12) and 16.66 % (02/12) exhibited estrus response, respectively. It was found that out of 36 cows treated with different hormones (Group I to III), thirty-three cows responded with signs of estrus and palpable follicles on ovary at the time of estrus. While in control group, 2 cows out of 12 showed the signs of

estrus. The overall percentage of cows exhibiting estrus among three treated groups was 91.66%, which was far better than in control group (18.66%). Mean durations of estrus in three treatment protocols (Group I, II, III) and control group were 18.5 ± 0.47 , 18.25 ± 0.56 , 20.02 ± 0.39 and 17.50 ± 0.64 hrs, respectively (Table 1).

Table 1: Effect of various estrus synchronization protocols on estrus induction response, duration of estrus and conception rate in anoestrus Dangi cows

Group	Treatment protocol	No. of cows	Estrus induction response (%)	Duration of estrus (hrs)	Conception rate (%)			
					Induced estrus	Second cycle	Third cycle	Overall
I	Ovsynch	12	91.66 (11/12)	18.50 ± 0.47	41.66 (5/12)	28.57 (2/7)	20 (1/5)	66.67% (8/12)
II	PRID + PGF ₂ α	12	83.33 (10/12)	18.25 ± 0.56	33.33 (4/12)	25 (2/8)	0 (0/6)	50% (6/12)
III	PRID + Ovsynch	12	100.00 (12/12)	20.02 ± 0.39	50 (6/12)	33.33 (2/6)	25 (1/4)	75% (9/12)
IV	Control	12	16.66 (02/12)	17.50 ± 0.64	--	8.33 (1/12)	--	8.33 (1/12)

In Ovsynch protocol (Group I), the percentage of estrus response was 91.66 % which was in agreement with the findings of Pawshe *et al.* (2011) and Ammu *et al.* (2012) who reported 95.66 % and 83.33 % of estrus response, while Virmani *et al.* (2013) and Buhecha *et al.* (2015) reported 100% estrus response. On the contrary to present findings, Ahmed *et al.* (2016) and Sathiamoorthy *et al.* (2010) reported very low (48.75 and 54.5 %) estrus response with Ovsynch protocol as compared to the findings of the present study.

In PRID plus PGF₂ α protocol (Group II), the percentage of estrus response was 83.33% which was in close agreement with the finding of Lucy *et al.* (2001). However, Buhecha *et al.* (2015) reported 100 % estrus response which was higher than present study. Whereas, Tauck *et al.* (2007) found lower estrus response of 60%. In PRID plus Ovsynch (Group III), the estrus response was observed to be 100% which concurred well with the report of Khade *et al.* (2011). However, Echternkamp and Thallman (2011) observed lower estrus response (66.7%) with this protocol. The variation in estrus response in different studies could be due to the reproductive status of estrous cycle in the beginning of the protocol, in addition to variations in nutrition, management, lactation, drug, season, age, and breed. The conception rate obtained at induced estrus with FTAI in treatment with Ovsynch, PRID plus PGF₂ α and PRID plus Ovsynch protocols were 41.66, 33.33 and 50.0%, respectively, while the corresponding overall three cycles conception rates observed in animals of groups I to III were 66.67, 50.00 and 75.00%. Overall, 91.66 (33/36) % estrus response and 63.88 (23/36) % conception rate were recorded in hormone treated animals. Amongst untreated anoestrus control group (IV) of 12 cows, only 2 (16.66%) cows exhibited spontaneous estrus within 60 days of follow up and 1 (8.33%) cow conceived at second estrus, thus proving the worth of hormonal protocols (Table 1).

In Group I (Ovsynch protocol), the conception rate for induced estrus was 41.66 % (5/12) which was in close agreement (41.6-50.0%) with Hadiya *et al.* (2015), Sathaimoorthy *et al.* (2010) and Ahmed *et al.* (2016). However lower conception rates of 16.66 and 20.00 % were found by Khade *et al.* (2011) and Virmani *et al.* (2013), respectively. The overall conception rate for Ovsynch group was 66.67% (8/12). Similar observation (71 %) was reported by Naikoo *et al.* (2016), while Ammu *et al.* (2012) reported relatively higher overall conception rates of 83.33%. The efficacy of Ovsynch protocol in these studies suggests that GnRH given on day 0 causes better follicular development and increases luteal function. So, it can be used for estrus induction and synchronization in Dangi cows.

In Group II (PRID +PGF₂ α), the conception rate for induced estrus was 33.33 % (4/12), whereas overall conception rate for three cycles was 50.00 % (6/12) which concurred with Buhecha *et al.* (2015) and Lucy *et al.* (2001) who reported 33.33, 36.00% conception rates for induced estrus and 50.00, 58.00 % overall conception rates for three cycles, respectively. However, Ghuman *et al.* (2011) and Tauck *et al.* (2007) reported higher overall conception rates of 61 and 80%, respectively. The efficacy of PRID in these studies suggests that it will be a reliable option for estrus synchronization in Dangi cows when used in conjunction with an injection of PGF₂ α .

In Group III (PRID + Ovsynch), the conception rate for induced estrus was 50.00% (6/12), whereas overall

conception rate was 75.00% (9/12), which was in close agreement with findings of Khade *et al.* (2011) and Bhoraniya *et al.* (2012) for induced estrus. However, Steckler *et al.* (2002) reported similar overall conception rate of 72.0%. On the contrary to present findings, lower conception rate of 38.00 was reported by Stevenson *et al.* (2006). The improved and higher conception rate observed in the present study of Group III when compared with previous studies might be due to the synchrony between luteolysis, ovulation and FTAI and the supplementation of progesterone through PRID. The combination of GnRH and progesterone in the PRID regimes seems to be sufficient to facilitate follicular growth and maturation before ovulation after removing the progesterone devices, which leads to improved ovulation and pregnancy.

Conclusion

In the present study, supplementation of exogenous progestagens like PRID to Ovsynch protocol had helped the cows to exhibit better estrus due to progesterone priming. Further, it was opined that PRID+ Ovsynch (Group III) protocol yielded apparently higher conception rates compared to PRID+ PGF₂α (Group II) and Ovsynch (Group I) protocols. It is concluded that, while treating postpartum anoestrus in Dangi cow's estrus response has little significance when compared to achieving optimum conception rate with a cost-effective protocol like PRID+ PGF₂α (Group II). It required one reduced dose of GnRH hormone which is economical to the farmers. However, higher conception seen in protocol PRID+ Ovsynch (Group III) is more beneficial in terms of fertility improvement in Dangi cows.

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Conflict of Interests

There is no conflict of interest.

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