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Estrus Induction and Fixed Time Artificial Insemination of Crossbred Anestrus Cattle Under Semi Intensive Rearing in Tropical Island Ecosystem

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Abstract

A study was conducted in cross bred anestrus cattle at ICAR-CIARI, Port Blair, Andaman and Nicobar Islands with aim to observe efficacy of controlled intra vaginal drug release (CIDR) device and Ovsynch protocol as combination for estrus induction besides conception rate at fixed time artificial insemination (FTAI) in induced estrus thereafter. The cattle were maintained under semi intensive rearing which is a prevalent practice of cattle rearing in these islands. A total of eight dairy cows and heifers were selected based on history of anestrus and reproductive examination of ovary at 10 days interval to confirm inactive ovaries including non pregnancy status. All experimental animals were first given oral dose of dewormer (day0) and supplement of mineral mixture for a month from day3 onward. On day19 (8:00 AM), CIDR device was inserted followed by first GnRH injection at same time. CIDR implants were removed on day26 (8:00 AM) followed by prostaglandin injection at same time. The second injection of GnRH was injected on day28 (4:00 PM) followed by two frozen semen inseminations at fixed time, first on day29 (afternoon) and second 12 hours later (day30). Pregnancy diagnosis was performed using ultrasonography and by per rectal examination. Present study has shown that all the animals (100%) responded to estrus induction using combination of CIDR device and Ovsynch protocol. Out of eight cattle, five becomes pregnant (62.5%) using FTAI. It may be concluded that estrus can be induced in anestrus cattle using combination of CIDR device and Ovsynch protocol and fertility of anestrus cattle can be enhanced with use of fixed time AI during induced estrus.

Keywords: Andaman, Anoestrus cattle, CIDR, Conception, Estrus Induction, Fixe Time AI

Introduction

Andaman and Nicobar Islands (ANI) have a tropical hot and humid climate where the experimental station is located (11.68°N 92.77°E). Cattle populations in these islands account 53488 as per 19th Livestock census (2012) and thereafter 45617 in number (Sunder, 2014). Semi intensive rearing is prevalent practice of cattle rearing in ANI. The majorities of the cattle in these islands are affected with anoestrus and repeat breeding problem where some pockets of these South Andaman district have almost 52.63% of cattle with cases of infertility (Sunder, 2014). In a survey of Andaman districts (Kundu *et al.,* 2010), a total of 31.62% of cattle suffered infertility out of which 48.6% have encountered anestrus problem followed by 33.8% cases of repeat breeding, infectious cause of reproductive problem such as Brucellosis and IBR (6%) and other causes viz. underdeveloped genitalia, failure of insemination (2%) etc. Anoestrus and repeat breeding are major reproductive diseases of economic importance which account for loss of production, cost of treatment, and feed, fodder labour charges during unproductive period. Anoestrus may arise from various reasons including negative energy balance after parturition, underfeeding, environmental stress, uterine pathology and improper management practices. True anoestrus is characterized by quiescent ovaries without signs of cyclicity (Zulu *et al.,* 2002). Use of Ovsynch protocol, controlled internal drug release (CIDR) device and Norgestomet ear implant were suggested for estrus induction and estrus synchronization to improve conception rate in anestrus dairy bovines (Kutty and Ramchandran, 2003; Nak *et al.,* 2011; Chaudhari *et al.,* 2012). Estrus synchronization and fixed time artificial insemination (FTAI) become one of the popular reproductive management tools to enhance pregnancy rate in cyclic cattle. Estrus synchronization

technique allows manipulating the estrous cycle or inducing estrus within a short and predetermined time in a group of females (Odde, 1990). The advantage of estrus synchronization protocols is that estrus detection is not mandatory especially in large herds. FTAI can be performed at prescheduled time which improves the fertility of animals. Thus, these tools minimize the human error and reduce the cost on detection of heat in animals. Parturition of animals can also be scheduled at the favorable season and during availability of food for better survival.

Short term exposure to progestogens along with a luteolytic agent in (pre pubertal or post partum anoestrus cattle benefitted them to begin estrous cycle (Islam, 2011). Thus, some of the anestrous females are induced to show signs of estrus and ovulate using estrus synchronization treatment. CIDR insert along with prostaglandin F2α (PG2α) treatment increased the synchronization rate by approximately 30% and pregnancy rate by 20%, in both the anestrous and cyclic females (Lucy *et al.,* 2001). Cyclicity in postpartum anestrous cows can also be induced with combination of GnRH and PG2α (Pursley *et al.,*1995). The Ovsynch protocol can be applied at any stage of the estrous cycle in the cow. It include administration of first dose of GnRH, followed by PGF2α on day7, and a second dose of GnRH 2 days after PGF2α, and subsequent FTAI done 12 to 24 hour later. Other modifications of this protocol include an intra vaginal insert containing progesterone which is placed for 7 days between the first dose of GnRH and the administration of PGF2α in the Ovsynch protocol (El-Zarkouny et al., 2004; Ambrose et al., 2005; Stevenson et al., 2006). The effectiveness of such protocol is yet to be used in anoestrus cattle for estrus induction under the tropical Island ecosystem of ANI. Therefore, present study was conducted to induce estrus in anoestrus cross bred cattle and to study conception rate in them during induced estrus using combination of Ovsynch and CIDR insert.

Methodology

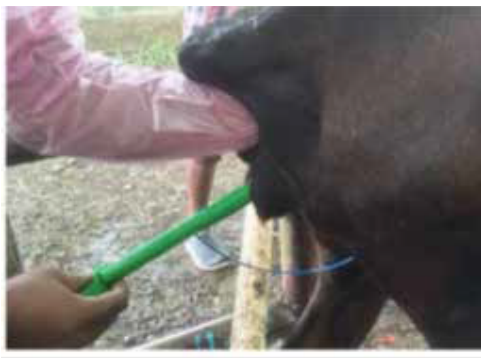
Present study was conducted at Cattle Farm, ICAR-Central Island Agricultural Research Institute, Port Blair during August to September of year 2019. For this study, a total of eight anoestrus cross bred cattle aged 3 to 9 years (Parity 0 to 5) and weighing more than 250 kg were included based on animal's history of not showing signs of estrus. Reproductive tract examination was conducted using ultrasonography to confirm lack of uterine pathology and non pregnancy status of animal. Anoestrus cattle were confirmed by presence of small and smooth ovary palpated at 10 days interval. A month long schedule was initiated first with deworming (Day0) of all the experimental animals cows with Albendazole Oral Suspension (ALbomar, Virbac India) @60 ml per animal total dose. From Day 3 onwards, mineral mixture (Agrimin Forte, Virbac India) @40 gm daily per animal was given with concentrate feed to animals and continued for one month. First injection of synthetic GnRH, (Receptal, Intervet India Pvt. Ltd., Thane) @0.021 mg Buserelin-Acetate, IM along with insertion of CIDR ((1.38 g of progesterone in the silastic coil, Pfizer Animal Health, Mumbai) device was placed intra vaginally on Day19 (7:00 AM). On Day26 (7:00 AM), CIDR devices were removed and all experimental cows were injected intramuscularly with synthetic Prostaglandin, Cloprotenol (Pregova, Virbac Animal Health India Pvt. Ltd, Mumbai) @250mcg IM, total dose per animal. Second injection of GnRH@@0.021 mg Buserelin-Acetate, IM was given on Day28 (3:00 AM). On Day29 forenoon, all cows were inseminated with frozen semen and repeated after 12 hours of first insemination. To note number of conceived animals, pregnancy diagnosis was performed 35 days post insemination using ultrasonography and reconfirmed by rectal examination at 60 days post insemination. Data analysis was done as per standard procedure.

Results and Discussion

This study presents the results of using controlled internal drug release (CIDR) in cows (Fig. 1). We found that CIDR insert was retained in all the experimental cows (100%) for 7 days. Again, signs of estrus were exhibited by all the experimental cows (100%) within 48-72 hrs of PGF2α treatment with no difference as in the normal cyclic cow. Findings of present study is supported by study of Dhami *et al.* (2015) where all the anestrus cows (n=10) under three groups treated with either CIDR insert, Ovsynch protocol or Norgestomet ear implant exhibited

induced estrus within 42-72 hrs of PGF2α treatment in all three protocols where estrus signs were similar to normal cyclic cows. In our study, a total of 5 out of 8 (62.5%) cows conceived following estrus induction treatment and timed artificial insemination with frozen semen. Pregnancy was confirmed at day 35 with ultrasonography post insemination and reconfirmed by rectal examination. Dhami *et al.* (2015), conducted study in crossbred anestrus cows using CIDR, Ovsynch and Norgestomet ear implant were conception rate of 60, 50 and 50%, respectively were obtained during induced estrus which supports findings of this study. In similar study, anoestrus cows treated with combination of Ovsynch and CIDR have shown 64% conception compared to 27% with Ovsynch alone (El-Zarkouny *et al.,* 2004). They reported however, that cycling cows receiving Ovsynch plus CIDR had a pregnancy rate similar to that of cycling cows receiving Ovsynch alone. Stevenson *et al.* (2003) reported that pregnancy outcomes showed larger increases when cows were treated with Ovsynch plus CIDR than with Ovsynch alone because more anestrus cows conceived. In another study, cows that did not show signs of estrus following treatment with two PGF injections at 14 days intervals started on 47 days postpartum stage were given Ovsynch treatment with or without progesterone insert (containing 1.9 g of progesterone) are compared for pregnancy rate. It was observed that group of cows given Ovsynch treatment with progesterone insert had a greater pregnancy rate (31.2% compared to control (22.7%) group (Melendez *et al.,* 2006). Following removal of implant or vaginal insert allow resumption of follicular development and their maturation due to the flux of the gonadotropin from the pituitary gland. Behavioral estrus is direct effect of the high endogenous estradiol on the hypothalamus (Cavalieri and Fitzpatrickm 1995). Use of hormonal protocols like Ovsynch, controlled internal drug release (CIDR) insert and Norgestomet ear implant can be helpful to induce and synchronize the estrus which can achieve better conception rate in anoestrus dairy cattle with lesser number of services per conception and making acyclic cow to cycle normally, thereby achieving ideal inter-calving interval of 12-13 months (Nak *et al.,* 2011; Chaudhari *et al.,* 2012).

Materials used for estrus induction



Intra vaginal insertion of CIDR device

Cow with induced estrus

Fig. 1 Use of controlled internal drug release

Conclusions

It may be concluded that estrus induction using Ovsynch and CIDR protocol together is effective in anestrus cows to bring them into estrus and fixed time insemination thereafter during induced estrus enhance conception rate of anestrus cows which can be implemented successfully to improve fertility in anestrus cows.

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