

Full Length Research Paper

Effects of buserelin acetate Treatment 12 days Post Inseminations in improvement of Conception Rate in Repeat Breeding Dairy Cattle in Mekelle, Tigray, Ethiopia

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Accepted 23rd March, 2015

The aim of the present study was to evaluate the effect buserelin acetate given 12 days post AI and double inseminations during estrous period of dairy cattle and improvement of conception rate. Field trial was carried out on repeat breeding cross breed dairy cows which are lactating and apparently healthy that exhibits estrus regularly. A total of forty four repeat-breeding cows from twenty herds were selected and assigned randomly in to two equal groups, A and B: one treated and one control group. Group A (n=22) cattle were treated intramuscularly with 10 µg buserelin acetate 12 days post AI. Group B (n=22) cattle were inseminated once during estrus exhibition with single service and considered as control. Dairy cows were examined for pregnancy after three months through rectal palpation. Pregnancy rates recorded were 55%, and 32% in A and B respectively. The conception rates of treated group exceed control group by 23% respectively. Treated group showed a significant statistical variation ($P<0.05$) as compared to control groups. From this experiment it is recommended that the use of GnRH injection 12 days post AI and can improve pregnancy rate in repeat breeding cross breed dairy cows.

Keywords: Crossbred cattle, Estrus, buserelin acetate, Pregnancy rates, treated group

INTRODUCTION

Reproduction problems in dairy cattle are most frustrating to farmers and caused by several factors. It is most costly problems that faces the dairy industry and occurs frequently in lactating dairy cows. Repeat breeding is among the most frustrating problems which are defined as cows' failure to conceive from three or more services (Royal et al., 2000; Lucy, 2001 and McDougall, 2006). These are cows that cycle normally and have no clinical abnormalities after a minimum of 3 inseminations (Levine, 1999). The economic losses associated with this problem are highly considerable resulted from increased veterinary expenses, insemination costs, reduced productivity, and losses due to involuntary culling. Reproductive problems have been the primary cause of culling in animal husbandry for many years (Coleman, 1985 and Opsomer et al., 2000).

Several investigations were carried out to find out possible solutions to reduce number of repeat breeder dairy cows. Some of the possible suggestions that were tried to reduce the incidence of repeat breeding were; strengthening estrus detection, embryo transfer, administration of gonadotropin releasing hormone (GnRH) at insemination and post insemination, continued AI, resynchronization of non-pregnant cows. Gonadotropin-releasing hormone analogue treatment twelve days post AI of repeat-breeding dairy cattle were also among the most suggested solutions for this problem by Stevenson et al., 2000. Repeated inseminations increases chances of pregnancy rate due to hidden or error of estrus detection of the dairy men.

Physiologically it is known that (GnRH) is produced by hypothalamus which controls synthesis and release of

lutinizing hormone (LH) and follicle stimulating hormone (FSH). These two hormones have combined effects on follicular development, ovulation and corpus luteum functions (Douglas, 1998). The efficacy of synthetic gonadotropin releasing hormone GnRH analogue mimics the function of this natural hormone in modifying reproductive efficiency of normal as well as repeat breeder dairy cows. This hormone has improved half life in blood circulation, greater stability to enzymatic degradation, increased receptor affinity, prolonged biological potency and less antigenic than other molecules for repeated use (Cline, 2002). The exogenous administration of these hormones at different period of estrus to the cow may lead to treat the disease condition or cysts in the ovary or may rectify hormonal problem or insufficiency to these cows. In addition to this, this analogue could also rectify defected corpus luteum (Morgan, et al., 1993 and Bearden and Fuquay, 1997).

Synthetic GnRH has generally been used as a therapeutic agent in reproductive management. It had been used as treatment on rates of fertilization, embryonic mortality and as a therapeutic treatment for cystic ovaries (Gustafsson et al., 1986). It had also been used as treatment along with or 12 days post insemination (AI) to increase rates of fertilization, reduce embryonic mortality and as a therapeutic treatment for the cystic ovaries, ovarian follicular cysts and for triggering LH surge to stimulate ovulation (Gustafsson et al., 1986; Thatcher, 1991).

Only few understanding was available about treatment and use of synthetic hormones for management of repeat breeding dairy cows in Ethiopia in general and in Tigray region in particular. Nothing was done to investigate problems of repeat breeding using GnRH analogue on day 12 post AI for enhancement of conception rate of cross breed repeat breeding dairy cattle. Therefore, the present study was conducted with the aim of enhancing conception rates in cross breed cattle with specific objectives of: evaluating effects of GnRH analogue (buserelin) 12 days post AI on enhancement of conception rate as compared to control groups. In addition to this, the study will estimate financial benefits of the farmers from using buserelin acetate.

MATERIALS AND METHODS

Areas description

This experiment was conducted in Mekelle, capital of Tigray regional state. It is among the seven Administrative Zones located at 783 km north of Addis, geographically located 39° 29'E and 13° 3'N longitude. It has an average temperature of 20°C and experiences an average annual rain fall of 600 mm. Livelihoods of the people in the city depends on trade, civil servants and agricultural products. Dairy farming is one of the most

farming systems practiced in the city and small holder farmers around the city supply moderate amount of milk to urban dwellers. Some of the farmers in the nearby area practice a mixed crop livestock production system. The area is moderately covered with savanna, bushy and low weed vegetations. Both the small holder farmers and commercial dairy farms owners were included the study.

Study animals

Experiment was conducted in cross breed dairy herds which were repeat breeding, owned by small holder farmers and private commercial dairy farms in the city. Study animals were kept in stall facility and feed grass hay, concentrate composed of wheat by products, locally available crop residues, forages and other locally prepared fermented alcohol by products. The cows have good body condition and apparently healthy. They are with history of more than two services and milked twice per day. They were vaccinated regularly against common infectious diseases. Generally, these dairy cows were managed and kept in similar agro ecological and climatic conditions. AI was exercised based on visual observation of standing heat and mucosal discharges from vulva by herd keepers.

Experimental design

Randomized controlled trial was used to study effects of GnRH analogue (buserelin acetate) given 12 days post insemination for enhancement of pregnancy rates as compared to dairy herds which receive single service. The study period was from November 2009 to February 2010 Mekelle. A total of 44 dairy cows were selected from twenty farms. Cows with normal cycling, no clinical abnormalities, failed to conceive after two successive inseminations, not previously assigned for any study and aged from three to ten years were included in the study. Cows that were treated at the first AI and returned to estrus couldn't be reassigned for the study. A total of 44 cross breed dairy cows were selected based on this and equally divided in to two groups each consisting of twenty two dairy cows. These repeat breeders were randomly assigned into two protocols of treatment groups.

Experimental procedure

This experimental study consists of three main parts: In the first part, training was provided for twenty herd owners for awareness creation about symptom of estrus cycle or behavioral changes observed during estrus cycle. Some of the signs to be observed by herd owners were mucosal discharges from their vulva, restlessness,

Table 1: Treatment schedule of the experiment

Treatment	Group A	Group B
Number of animals	22	22
Buserelin Acetate (10µg) 12 days post insemination	Treatment given intramuscular	No treatment given

frequent urination; allow to be mounted by other animals, raised tails and others. Herd owners were informed that as soon as these symptoms were observed, they would phone to inseminator immediately and these cows were included in the study. The second phase was random assignment of these dairy herds in to two groups; control and treatment groups. The first group G_A (n=22) was inseminated and 10 µg (2.5ml) buserelin acetate was given intramuscularly 12 days post AI. The second group G_B (n=22) was inseminated with single service and considered as control group estrus exhibitions. The last part of the study was pregnancy diagnosis and was done after 60 days post AI using a rectal palpation in these herds which failed to return to estrus. The cows were considered as pregnant if the researchers were able to palpate or sense fetal membrane, amniotic vesicles, cotyledons and fetus otherwise the cows were classified as negative. The treatment schedule of the experiment was indicated in the following table.

Financial losses and benefits obtained after treatment

Estimation of financial losses of single cow because of failure to conceive was computed by considering certain variables. These variables were mean conception rate as result of treatment, average of milk yield of cross breed cows per head of cow, average duration of cycle and current market price for liter of milk. The following financial equation was developed on excel spread sheet where FL represent Financial Loss, CR=conception rate, MY=Milk Yield, DC= Duration of Cycle.

FL=Average CR*average MY *average DC
*current price of milk per liter

During the full financial losses calculation, costs of calf loss, management and feed costs should be considered. Benefit cost ratio would be computed using BCR=

$$\frac{\sum_{t=1}^n \frac{B_t}{(1+i)^t}}{\sum_{t=1}^n \frac{C_t}{(1+i)^t}} \text{ which is equivalent to } \frac{B_t}{C_t} \text{ B=benefit,}$$

C=cost, R=ratio, t=individual year, n= number of years being considered.

Data collections and statistical analysis

Data was recorded concerning owners name and

inseminations date. Dairy herd owners were asked about breed type, insemination and service history, parity, management condition and milk yield, time and day of estrus exhibition and previous condition of the dairy herds. During study period, pregnancy diagnosis was made through rectal palpation and positive and negative results were recorded. Secondary data was collected from farm records about animals' previous milk yield, clinical cases, origin of animal service type and market price and seasonal fluctuation of milk price. Collected data was fed to Microsoft Excel spread sheet and process of data cleaning, handling, validating and coding was done on this spread sheet. Difference in pregnancy proportion, age and parity among different treated groups against control one was compared using descriptive statistics and paired t-test is used to compare these two population means from the two samples in which observations in one sample can be paired with observations in the other sample using a statistical packages of SPSS 20.0; 2005). The significance level of difference was observed at P value of less than 5%.

RESULTS

From the 44 dairy cows included in the study, 19 cows were found to be conceived. A total of 12 cows from group A were pregnant with conception rate of 55%. In the group B, 7 cows out of 22 (32%) were conceived. The results were indicated in Table 2. Those animals treated with buserelin acetate 12 days post inseminations exceeds in conception rate control group by 23% that was given no treatment. In general treated groups recorded higher pregnancy rate as compared to controlled group.

Conception rate of group A (treated) exceeds conception rate of group B (control) by 23% with statistical significant variation ($P < 0.05$). Comparison of conception rate between treated and control groups: Group A injected with buserelin acetate 12 days post AI scores more conception rate with statistical significant difference as compared to group B ($P < 0.05$). The overall comparison of treated and controlled group was shown in table 3. Management condition, season and parity variation doesn't show any significant variation in the treated groups as compared to controlled group.

Table-2: Descriptive statistics of the experimental protocol

Protocol results	Group A	Group B	Total Animals
Number of Animals	22	22	44
Number of Animals Pregnant	12	7	19
Number of Animals not Pregnant	10	15	25
Conception Rate	55%	32%	87%
Mean	0.55	0.32	0.87
Std.Deviation	0.510	0.477	
Std. Error Mean	0.109	0.102	

Table 3: Statistical variation of experimental procedures with confidence interval

Groups	T-value	Degree of Freedom	Level of Significance (P<0.05)	Mean Difference	95% Confidence Interval of the Difference
A	5.020	21	.000	.545	0.32-0.77
B	3.130	21	.005	.318	0.11-0.53

DISCUSSION

Repeat breeding cross breed dairy cows are sources of high economic damage to the dairy producers and the present study was carried out to observe the effects of treatment of GnRH analogue 12 days post AI as compared to control groups. Buserelin acetate treated group scores more conception rate (55%) as compared to control group (32%) respectively and vary with statistical significance ($p < 0.05$) than control groups. This indicates that incidence of repeat breeding can be reduced through synthetic GnRH treatment. This may be due to insufficient or defective corpus luteum development (Pursley et al., 1997) and treatment might have produced a healthy CL. This could maintain high progesterone concentration in the serum which reduces embryonic mortality in the early stages.

This result was in agreement with the study by Blowey (1992) that administration of GnRH analogue 12 posts AI improves fertility of cows by 9 % to 12 % and by Drew and Peter (1994) which was already reported. Other study by Beckelr et al., (2006) observed that there was no significant difference between treated and controlled groups which were given 12 days post AI on reproductive performance of dairy cows which is opposite to the present study. Reduction in incidence of repeat breeding following these treatments results in financial return to the farmers as compared to animals with single service. Intramuscular injection of GnRH analogue 12 days post AI exceeds pregnancy rate by 23% from controlled group. So, all these variations indicated that hormonal treatment will result in a great financial benefit to the farmers.

Intramuscular injection of GnRH analogue 12 days post insemination enhances pregnancy rate that prevents owners from economic losses as a result of prolonged calving interval since cows back to heat repeatedly. This protocol is fair in cost and has fewer tendencies for the pharmacological intervention in the

reproductive tract of the cow as compared to other complicated and expensive protocols. Financial losses of cows per cycle were computing and estimated based on the above equation. The given variables are average conception rate= 23%, average milk yield = 14 liters per day of per head of cow, total cows get conceived over the control=5 cows, average number of days per cycle=21days). So, the total financial loss would be computed as: 14 liters of milk per day* 21 days per cycle *5 cows *10 birr is equal to 14700 Birr or (\$735) at which the owners going to loss in addition to the loss of calf, management and feed costs. From this we can understand that as the cow takes more time, the loss will be more severe. A farmer could loss birr 2940 / \$147 per cycle from single cow may highly affect its livelihood. In calculation of benefit cost ratios, it is indicated that farmers would be benefitted if they bought GnRH analogue (buserelin acetate) for treatments of repeat breeding dairy cows rather than living with problem. The cost is effective and affordable to the farmers to pay 25 to 50 birr (2.20-4.40 \$) to the 10 / 20 µg of the hormone rather than losing 140 USD.

CONCLUSION AND RECOMMENDATIONS

The finding our study indicated that intramuscular injection of buserelin acetate can be used as treatment options for repeat breeding dairy cows. GnRH analogue treated 12 days post AI and scores 55% as compared to 32% of the control one. There is statistical significance variation between treated and control groups. This experiment provides evidence for continued recommendation of GnRH analogue treatment to improve conception rates of repeat breeders and farmers could be benefitted financial from these alternative treatment options. Based on these results, the following points are recommended.

- ✓ Administration of buserelin acetate 12 days post AI could improve the reproductive performance of repeat breeding dairy cows
- ✓ Farmers should be aware of treatment options to be benefitted from their dairy cows
- ✓ Given the cost of GnRH analogue, we continue to recommend the use of this hormone to rectify the problem of repeat breeding crossbred dairy cows to prevent financial losses

Conflicts of interest statements

None of the authors has any financial or personal relationships that could inappropriately influence the contents of the paper.

ACKNOWLEDGEMENTS

The authors acknowledge to Ethiopia Ministry of Science and Technology for financial support and Mekelle University for the provision of necessary facilities and administrative work which had remarkable role for the success of research work.

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