Title of thesis : Studies on the effect of gonadotrophin releasing hormone administration on conception rate following artificial insemination in cattle

Thesis by : Dr. Amit Kumar Sharma (V-2001-30-05)
Major Advisor : Dr. Madhumeet Singh

SUMMARY

The study was conducted at the livestock farm of CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur. A total of 448 Jersey and Jersey X Red Sindhi crossbred cows were inseminated during this study that included 346 normal and 102 repeat breeder cows.

Buserelin acetate (Receptal, Intervet India Ltd.) at the dose rate of 0.0105 mg (2.5 ml) equivalent to 0.01 mg Buserelin and Gonadorelin (Fertagyl, Intervet India Ltd.) at the dose rate of 0.25 mg (2.5 ml) were used for the treatment as GnRH analogues. These hormones were injected simultaneously with first insemination, either through intra muscular (I/M) or intra venous (I/V) routes, depending upon the groups of the animals.

The animals were divided breed wise into two groups viz. Jersey (n= 216) and Jersey X Red Sindhi crossbreds (n=232). Jersey cows were subdivided to normal (n=167) and repeat breeder animals (n=49). Normal animals were further sub-divided to treatment (n=127) and control groups (n=40). Treatment group comprised of Buserelin acetate (n=61) treated and Gonadorelin (n=66) treated animals. The Buserelin acetate treated animals were sub-divided to I/M (n=40) and I/V (n=21) injected cows which were sub-divided to single (n=20 and n=9) and double insemination (n=20 and n=12) groups, respectively.

Similarly, the cows in Gonadorelin treated group were subdivided to I/M (n=40) and I/V (n=26) injected animals and which were further subdivided to single (n=20 and n=13) and double insemination (n=20 and n=13) groups, respectively. Repeat breeder Jersey cows were inseminated as single (n=11) or double (n=17) insemination regimens following the injection of GnRH analogues injected through I/M route. The animals in control group were also divided to single and double insemination groups (n=11 and 10, respectively).

Crossbred animals (n=232) were subdivided to normal (n=179) and repeat breeder animals (n=53). Normal animals were again subdivided to treatment (n=139) and control groups (n=40). Treatment group was constituted by Buserelin acetate (n=65) and Gonadorelin (n=74) treated animals. The Buserelin acetate treated cows were subdivided to I/M (n=40) or I/V (n=25) injected groups which were further subdivided to single (n=20 and
n=13) and double insemination (n=20 and n=12) groups, respectively. The animals in Gonadorelin group were subdivided to I/M (n=40) and I/V (n=34) injected cows and which were further subdivided to single (n=20 and n=14) and double insemination (n=20 each) groups, respectively. As in Jersey animals, repeat breeder crossbred cows were inseminated as single (n=10) or double (n=14) insemination regimens following the injection of GnRH analogues injected through I/M route only and the animals in control group were divided to single and double insemination groups (n=14 and 15, respectively).

Pregnancy diagnosis was carried out 60 days post AI by rectal palpation method in cows not returning to estrus within this duration.

The blood was collected from 21 Jersey (Buserelin acetate treated n=9, Gonadorelin treated, n=6 and Control n=6) and 30 crossbred (Buserelin acetate treated n=12, Gonadorelin treated, n=12 and Control n=6) cows for progesterone estimation. The blood samples were collected twice from each animal. First sample was collected on day 0 and second on day 5.

Conception rate (CR) in treatment group following Buserelin acetate injection through I/M or I/V routes in Jersey animals was 60.0% and 61.9%, respectively. Similarly, CR in treatment group when Gonadorelin was injected through I/M and I/V routes in Jersey animals was 55.0% and 50%, respectively. On pooling the data, the CR were 57.5% and 55.3% in I/M and I/V injected groups, respectively. CR in control group was 42.5%. CR in treatment group following Buserelin acetate injection through I/M or I/V routes in crossbred animals was 62.5% and 48.0%, respectively. Similarly, CR in treatment group when Gonadorelin was injected through I/M or I/V routes in crossbred animals was 60.0% and 52.9%, respectively. On pooling the data, the CR was 61.2%, 50.8% and 52.5% in I/M, I/Vand control groups, respectively. CR was better when GnRH analogues were injected by I/M route as compared to I/V administration or control groups. In Jersey cows, GnRH increased conception following AI when given by either of the routes (I/M or I/V) but there was no effect of route of administration of hormone on conception. However, in crossbred cows I/M administration of GnRH gave much better results as compared to I/V route or control animals. There was no difference in conception between the animals administered GnRH by I/V route or control in crossbred animals. After inseminating Jersey cows in two Buserelin acetate treated groups CR of 65.5% and 56.2% was achieved following single or double insemination, respectively. Similarly, following the insemination of two Gonadorelin treated groups, CR was 54.5% and 51.5% following single and double insemination, respectively. In control group, 40% and 45% cows conceived, respectively. After pooling the data CR was 59.6% and 53.8% following single and double insemination, respectively. Similarly, following the insemination of
crossbred cows in two Buserelin acetate treated groups CR was 57.5% and 56.2% and with two Gonadorelin treated groups CR was 58.8% and 55.0% with single or double insemination, respectively. In control group, 45% and 60% cows conceived, respectively. After pooling the data 58.2% and 55.5% CR was achieved following single or double insemination, respectively. Single insemination was found to be better in both the breeds, when performed along with GnRH. Double insemination did not give any additional advantage and rather decreased the CR when GnRH was injected. However, in normal crossbred cows, simple double insemination gave better results even without GnRH.

In repeat breeder Jersey cows, CR was 54.5 and 47.0% in treatment group and 36.3 and 40% in control group, respectively, following single or double insemination. In crossbred repeat breeder animals, CR was 50.0 and 42.8% following the use of GnRH analogues and 42.8 and 53.3% in control cows following single or double insemination, respectively. Single insemination was found to be better in repeat breeder cows when performed along with GnRH as in normal animals of both the breeds. Double insemination did not have any additional advantage when GnRH was injected. However, in repeat breeder crossbred cows, simple double insemination gave better results even without GnRH. After inseminating normal Jersey animals the CR was 59.6% and 53.8% whereas, in repeat breeder animals 54.5% and 47.01% cows conceived following single and double insemination, respectively. On pooling data in normal and repeat breeder animals the CR was 56.5% and 50.0%, respectively. Following insemination of crossbred animals subsequent to single or double insemination 58.2% and 55.5% cows conceived while in repeat breeder animals 50.0% and 42.8% conceived, respectively. On pooling data in normal and repeat breeder animals the CR was 56.8 and 45.8% respectively. Following GnRH treatment, improvement in CR was more in normal than in repeat breeder cows. The mean plasma progesterone concentration on day 0 and 5 in Buserelin acetate treated Jersey animals was 0.327±0.155 and 1.710±0.181 ng/ml. There was significant rise in progesterone level from 0 to 5th day post insemination (p< 0.01). Similarly the mean on day 0 and 5th day in Gonadorelin treated Jersey animals was 0.113±0.037 and 1.220±0.157 ng/ml, respectively. There was significant rise in progesterone level from 0 to 5th day post insemination (p< 0.05). There was no difference in progesterone concentration in two treatment groups, so the data were pooled and the mean progesterone concentration were 0.245±0.098 and 1.470±0.131 ng/ml on 0 and 5 day post insemination, respectively. Rise in progesterone values between 0 and 5 day post insemination were highly significant (p< 0.01). In control Jersey animals in which no treatment was given the mean progesterone was 0.285±0.112 and 0.738±0.201 ng/ml on 0 and 5 day post insemination, respectively. The rise in progesterone was statistically non
significant. There was no difference in day O progesterone concentration (0.245±0.098 and 0.285±0.112) between treatment and control groups; however, on day 5 the difference was statistically significant (1.470±0.131 and 0.738±0.201, p< 0.05). The mean plasma progesterone concentration on day 0 and 5 in Buserelin acetate treated crossbred animals was 0.114±0.039 and 1.459±0.260 ng/ml, respectively. There was significant rise in progesterone level from 0 to 5\textsuperscript{th} day post insemination (p< 0.01). Similarly, the mean on day 0 and 5\textsuperscript{th} day in Gonadorelin treated crossbred animals was 0.169±0.046 and 1.440±0.175 ng/ml, respectively and the rise in progesterone level from 0 to 5\textsuperscript{th} day post insemination was highly significant (p< 0.01).

There was no difference in progesterone concentration in the two treatment groups, so the data were pooled and the final mean values of progesterone were 0.162±0.033 and 1.447±0.169 ng/ml on 0 and 5 day post insemination, respectively. There was significant rise in progesterone values between 0 and 5 day post insemination (p< 0.01). In control crossbred animals in where treatment was given the mean progesterone concentration was 0.146±0.031 and 0.505±0.153 ng/ml on 0 and 5 day post insemination, respectively but the rise in progesterone was statistically non significant. There was no difference in day O progesterone concentration (0.162±0.033 and 0.146±0.031) between treatment and control groups; however, on day 5 the difference was statistically significant (1.447±0.169 and 0.505±0.153) in crossbred animals (p< 0.01). As the GnRH causes ovulation to occur earlier, CL is formed earlier in such cows and thus progesterone level is higher on day 5 as compared to untreated controls and probably responsible for higher conception rate.

**Conclusions drawn from this study are;**

1. Both preparations are almost equally effective with Busereline acetate (Receptal) having little edge over Gonadorelin (Fertagyl) in Jersey cows.
2. In Jersey cows either of the two routes (I/M or I/V) of administration of hormone can be adopted but in crossbred cows only I/M route should be preferred.
3. If GnRH is to be injected along with AI in normal animals, single insemination is sufficient. In case no hormone is to be injected, double insemination at 24 hr. interval is advantageous.
4. In prolonged estrus repeat breeder animals single insemination along with GnRH is sufficient. In the absence of hormonal treatment in such animals, double insemination at 24 hr. interval gives better results, particularly in crossbred cows. Although single insemination along with GnRH or double insemination without any hormone improves conception in repeat breeder cows, improvement can not be expected as in normal animals probably because of unseen secondary etiologies.