

LACTATION INDUCTION PROTOCOLS AND COST BENEFIT ANALYSIS IN REPEAT BREEDING COWS

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ABSTRACT

The present study was designed with an objective to induce lactation by various lactation induction protocols and to compare the cost benefit analysis of the protocols employed. Forty crossbred, non-lactating cattle with a history of repeat breeding for 15 to 20 months were selected for the present study. They were randomly divided into four equal groups with 10 animals in each group. Four different treatment protocols were used to induce lactation in these animals. Group 1 animals received twice daily 17 β -estradiol (0.1 mg/kg) and progesterone (0.25 mg/kg) from day 1 to 7 daily by subcutaneous route. Reserpine (5 mg/animal) and dexamethasone (20 mg/animal) were administered for 4 days (day 14 to 17) by intramuscular route. Group 2 animals received 17 β -estradiol (0.1 mg/kg) and progesterone (0.25 mg/kg) from day 1 to 7 twice daily 12 h apart by subcutaneous route. Metoclopramide (0.1 mg/kg) and dexamethasone (20 mg/animal) were administered for 4 days (d 14 to 17) by intramuscular route. Animals in Group 3 and 4 initially received 2 doses of PGF_{2a} at 10 days apart followed by hormonal therapy similar to Group 1 and 2 respectively. Significant increase (P<0.05) in the 90 day milk yield and higher conception rate (%) was observed for those animals that were synchronized with 2 doses of PGF_{2a} (Group 3 and 4). Though the cost of treatment for the induction protocols used for group 3 and 4 were high, the margin of profit earned was higher for group III and IV compared to other groups.

Key words: Lactation induction, Protocol, Cost benefit, Repeat breeding, Drugs

INTRODUCTION

Hormones play a pivotal role in the development and function of the mammary gland. Researchers in the past had tried several hormones and drugs alone or in combinations for the successful induction of lactation in infertile cattle. The development and function of the mammary gland is regulated by the hormone. Estrogen stimulates growth of mammary duct. Estrogen and progesterone in combination stimulate lobule-alveolar development of the mammary gland (Tucker, 2000). Milk yields from the induced lactations can be enhanced with the addition of other hormones (prolactin and glucocorticoids) which work synergistically along with estrogen and progesterone for the onset of galactogenesis (Tucker, 2000; Akers, 2002; Mohan *et al.*, 2009). Though protocols for induction of lactation are available in considerable number, the information regarding cost benefit

analysis of such protocols is rarely documented. Development of reliable and cost efficient protocol for induction of lactation in infertile cattle is need of the hour. Thus, the present study was designed to induce lactation in repeat breeding cattle and to compare the cost benefit analysis of various protocols employed for induction of lactation.

MATERIAL AND METHODS

The study was conducted in 40 healthy crossbred and non-lactating repeat breeding cattle with an average weight of 340 \pm 10 kg were selected from various villages of Shimoga and Uttar Kannada districts of Karnataka, India. These animals were randomly grouped into four equal groups with 10 animals in each. Subcutaneous twice daily administration of mixture of 17 β -estradiol and progesterone (1:2.5 in ethyl alcohol) for seven days was common to all groups. The treatment variation for hormones and drugs of respective protocols is

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depicted in Table 1. The milking was initiated on day 19. Milk yield of each animal was recorded for the period of 90 days. Cows exhibiting estrus during the induction period and milking period were inseminated and followed up to 3 months for their possible conception. The pooled milk yield was analyzed by one way analysis of variance with Bonferroni's Multiple Comparisons Test using GraphPad Prism Software, Trial version 5.00, GraphPad Software, San Diego, California, USA.

The cost benefit analysis for each protocol was performed by considering the following variables:

1. Sale of milk: Selling price of milk was Rs 11.00/l as per the existing Karnataka Milk Federation (KMF) price.

2. Cost of hormones/drugs: The cost varied between protocols. The hormones/drugs and their price for each protocol are mentioned in Table 2.

3. Cost of concentrate feed: The cost of commercially available formulated cattle feed (Formulated according to BIS specification) was Rs: 9/kg. For the animals weighing 340 ± 10 kg, the

maintenance ration of the concentrate was 1 kg/cow/day for the period of 109 days (19 days experimental period + 90 days milking period). In addition, the animals induced to milk were fed with the concentrate at the rate of 0.5 kg /l of milk/day.

4. Sale of manure: The cost of the manure (period for 90 days) was considered as Rs 900 / ton.

RESULTS AND DISCUSSION

The 90 days average milk yield for all treatment groups is given in Table 2. The average milk production varied between the groups. The animals which were synchronized with 2 doses of PGF_{2a} (group 3 and 4) responded to the treatment two days earlier and the daily milk yield increased more rapidly. Consequently, 90 days milk yield and peak milk yield were higher for these groups. The average 90 days milk yield for group 3 and 4 was significantly higher ($P < 0.05$) over the group 1 and 2. The increased milk yield might be attributed to the synchronization of the estrous along with the metoclopramide therapy (Tracy, 2002; Shridhar and Narayana, 2006). The animals treated with metoclopramide had a relatively better milk yield than

Table 1: Experimental protocols and 90 days mean milk yield for various groups

| Group | Day -10 | Day 0 | Day 1-7 | Day 14-17 | Day 19 | 90 days mean milk yield (l) |
|---------|---|---|--|--|----------------|------------------------------------|
| Group 1 | - | - | 17 β -Estradiol (0.1 mg/kg) s.c Progesterone (0.25 mg/kg) s.c | Dexamethasone (20 mg/d) i.m Reserpine (5 mg/d) i.m | | 260 \pm 19 ^a |
| Group 2 | - | - | 17 β -Estradiol (0.1 mg/kg) s.c Progesterone (0.25 mg/kg) s.c | Dexamethasone (20 mg/d) i.m Metoclopramide (0.1mg/kg /d)i.m | Day of milking | 220 \pm 27 ^a (n=7) |
| Group 3 | PGF _{2α} 0.25 mg i.m | PGF _{2α} 0.25 mg i.m | 17 β -Estradiol (0.1 mg/kg) s.c Progesterone (0.25 mg/kg) s.c | Dexamethasone (20 mg/d) i.m Reserpine (5 mg/d) i.m | | 427 \pm 38 ^b |
| Group 4 | PGF _{2α} 0.25 mg i.m | PGF _{2α} 0.25 mg i.m | 17 β -Estradiol (0.1 mg/kg) s.c Progesterone (0.25 mg/kg) s.c | Dexamethasone (20 mg/d) i.m Metoclopramide (0.1mg/kg/d) i.m | | 417 \pm 48 ^b |

n=10 unless otherwise mentioned

The means with different superscript are significantly different from each other.

Table 2: Cost (in rupees) of hormones or drugs for an animal weighing 340 ± 10 kg

| Drug | Firm | Presentation | Quantity of drug used | Cost in rupees |
|-----------------------------------|---------------------------|--------------|-----------------------|----------------|
| 17β-estradiol | Sigma Chemicals, USA | 25 g | 238 mg | 215.00 |
| Progesterone | Sigma Chemicals, USA | 25 g | 595 mg | 165.00 |
| Reserpine | Sigma Chemicals, USA | 1 g | 20 mg | 110.00 |
| Dexamethasone | KAPL, Bangalore | 5 ml vial | 4 mg/ml, 4 × 20 | 80.00 |
| Metoclopramide | Ipca Laboratories, Mumbai | 10 ml vial | 5 mg/ml, 3 × 13 | 39.00 |
| Cloprostenol (PGF _{2a}) | Vetcare Ltd, Bangalore | 2 ml vial | 250 µg/ml, 2 × 160 | 320.00 |

Table 3: Cost benefit analysis

| Group | Variables | | | | (A-B) Profit earned in Rupees |
|---------|---------------------|------------------|-------------------------|--------------|-------------------------------|
| | A Revenue in rupees | | B Expenditure in Rupees | | |
| | Milk | Manure (Per ton) | Hormones/Drugs | Concentrates | |
| Group 1 | 2860.00 | 900.00 | 570.00 | 2151.00 | 1039 |
| Group 2 | 2420.00 | 900.00 | 499.00 | 1971.00 | 850 |
| Group 3 | 4697.00 | 900.00 | 890.00 | 2903.00 | 1804 |
| Group 4 | 4587.00 | 900.00 | 819.00 | 2858.00 | 1810 |

the reserpine treated groups. This is due to the release of higher concentration of plasma prolactin by metoclopramide as suggested by Gupta and Gupta (1985) and Shridhar and Narayana (2006). In the present study, the margin of profit was relatively higher for group 3 and 4.

The cost benefit analysis for various groups is depicted in Table 3. It was observed that the cost of treatment for induction of lactation was higher for group 3 and 4 compared to other group 1 and 2 which may possible due to addition of 2 doses of PGF_{2a} to the lactation induction protocols. Magliaro *et al.* (1999) and Kensinger *et al.* (2000) also compared the profitability of inducing lactation in order to salvage non-pregnant cows versus purchasing replacement heifers. They found it more profitable to induce lactation in non-breeder cows compared to purchasing replacement heifers.

The higher conception rate which is an additional benefit in the group 3 and 4 could possible be attributed to the use of PGF_{2a} which might have caused luteolysis and might have helped in uniform follicular development. The percentage of conception obtained was 30, 20, 50 and 40 were recorded for

the treatment groups 1, 2, 3 and 4 respectively, which was lower than 56 per cent and 90 per cent those reported by Collier *et al.* (1976) and Peel *et al.* (1978) respectively. The difference in the conception rates observed might be due to the variation in feeding regimens of the animals, detection of estrus and timely inseminations performed. In addition, obtaining a calf out of infertile animals is also considered as an extra benefit to the farmer.

CONCLUSION

Among the four protocols followed in the present study, protocol for group 3 and 4 worked to be better in terms of milk yield, percentage conception and profit earned. Use of PGF_{2a} along with other hormones and drugs to induce lactation in repeat breeding animals helped in receiving higher profit.

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