

EFFECT OF GnRH AND PGF_{2α} ADMINISTRATION IN EARLY POST PARTUM PERIOD ON FERTILITY POTENTIAL OF BUFFALOES

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ABSTRACT

The present research was carried out to study the effect of GnRH and PGF_{2α} administration on uterine involution and post-partum fertility in buffaloes. A total of 36 normally calved Murrah buffaloes were divided into three groups. The buffaloes of Group 1 were treated with GnRH (buserelin acetate) 0.020 mg while buffaloes of Group 2 with PGF_{2α} (cloprostenol sodium) 1.30 mg on day 14 post-calving intramuscularly while the buffaloes of Group 3 were kept as control. The average days required for involution of the uterus were 25.08±1.04, 22.75±0.91 and 30.33±1.31 while the average days required for exhibition of first post-partum oestrus were 37.5±5.16, 26.91±1.36 and 45.08±3.77 days in Groups 1, 2 and 3, respectively. The first service conception rate was highest 41.66% in Group 2 while the rates were 33.33 and 16% in Groups 1 and III, respectively.

Keywords: buffaloes, *Bubalus bubalis*, post-partum, fertility, GnRH, PGF_{2α}

INTRODUCTION

The buffalo occupies an important place in the livestock economy of Asia and India. Buffaloes are valued for milk, meat and draught power. Low

reproductive efficiency in livestock in general and in buffaloes in particular remains a major economic problem globally, and its incidence is higher in India. The post-partum period is regarded as an important period in the reproductive life of bovines (Fonesca *et al.*, 1983). Uterine involution begins and ovarian follicular waves resume soon after parturition due rising in FSH concentration (Schallenberger, 1985). However, the dominant follicle of these waves fails to ovulate due to failure to undergo final terminal maturation. Failure of post-partum dominant follicles to undergo final maturation is due to inadequate LH pulse frequency, which results in low androgen production in the follicle (Fortune, 1986) and inadequate oestrodial positive feedback to induce an LH surge (Peters *et al.*, 1985), which is prerequisite for follicular terminal maturation prior to ovulation. Absence of LH pulses between days 15 to 30 post-partum is due to continued sensitivity of the hypothalamic GnRH pulse generator to the negative feedback effect of estradiol-17β, which results in an absence of GnRH pulses. The administration of GnRH will overcome the inadequate secretion of pituitary LH in the early post-partum period (Shah *et al.*, 1990) and restore ovarian function earlier within the post-partum period and assists in cleansing the uterus, bringing faster uterine involution and terminal maturation and ovulation of the dominant follicle (Takkar *et al.*, 1999).

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The reproductive cyclicity and its rhythm in terms of its reawakening during the early post-partum period has been linked to temporal changes of hormones, mainly prostaglandin (Perera *et al.*, 1981). Leindell *et al.* (1980) reported that PG metabolites increased at the time of parturition and remained high for 8 to 16 days post-partum. So delay in involution of uterus was due to the short period of high prostaglandin $F_{2\alpha}$ metabolite release. It has also positive effect on the uterine musculature tone (Lindell and Kindahl, 1983). $PGF_{2\alpha}$ injection in the early post-partum period enhances the uterine involution and reproductive efficiency in normal calved buffaloes (Nazir *et al.*, 1994). Considering these facts, the present research was carried out to evaluate the effect of GnRH and $PGF_{2\alpha}$ administration on day 14 post-calving on uterine involution and post-partum fertility in buffaloes.

MATERIALS AND METHODS

A total of 36 Murrah buffaloes in their second to seventh lactation which had normally calved were selected. The buffaloes were housed in a loose housing barn and fed chopped roughages like sugercane, alfalfa, napier grass, green maize and jowar straw three times a day. A pre-calculated

quantity of concentrate mixture was fed through an automatic concentrate feeding station (AFS) to each buffalo based on milk yield, body weight and pregnancy status. The selected buffaloes were divided into three groups and buffaloes of Group 1 were treated with GnRH (buserelin acetate) 0.020 mg intramuscularly while those of Group 2 with $PGF_{2\alpha}$ (cloprostenol sodium) 1.30 mg on day 14 post calving intramuscularly while the buffaloes of Group 3 were kept as control. The uterine involutions were monitored at weekly intervals on day 14, 21 and 28 post-partum. The finger width of left palm was pre-measured with a measuring tape and this was used as a scale for measuring internal biometry. The data pertaining to uterine involution, post-partum exhibition of oestrus, first service conception rate were analyzed by randomized block design described by Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

Uterine involution

The average days required for involution of the uterus in these buffaloes were 25.08 ± 1.04 , 22.75 ± 0.91 and 30.33 ± 1.31 for Groups 1, 2 and 3, respectively. In Group 2, the least time was required for whereas Group 3 required more time

Table 1. Average days required for involution of uterus in experimental buffaloes.

Sr. No.	Particulars	Mean
1	Group 1	25.08 ± 1.04^a
2	Group 2	22.75 ± 0.91^b
3	Group 3	30.33 ± 1.31^c

Column wise superscript (a, b and c) denoted the significant difference at $P < 0.05$ and $P < 0.01$ levels.

for involution of the uterus. The results were statistically significant at the $P < 0.05$ and $P < 0.01$ levels (Table 1).

The present findings regarding the effect of GnRH administration on the uterine involution is in close accordance with Barkawi *et al.* (1995) who reported 27.90 ± 0.9 days while Takkar *et al.* (1999) recorded 31 days for uterine involution in GnRH treated buffaloes, which was slightly more than present findings. The results of the present study for the number of days required to complete uterine involution after $PGF_{2\alpha}$ treatment were slightly less than those reported by Nazir *et al.* (1994) who observed 24.88 ± 0.97 days required for uterine involution in Nili-Ravi buffaloes. Nasr *et al.* (1994) observed 29.9 days and Iqbal *et al.* (2003) observed 28.90 ± 1.79 days for uterine involution in after $PGF_{2\alpha}$ treatment. In the present study, the effect of $PGF_{2\alpha}$ treatment on uterine involution was in close agreement with those of Malvi *et al.* (2004) who observed 22.7 ± 1.75 days and Tiwari *et al.* (2004) who observed 18.20 ± 1.47 days required for uterine involution in buffaloes.

The finding of days required for uterine involution in the control group was in accordance Nazir *et al.* (1994) who observed 29.75 ± 0.75 days in Nili Ravi buffaloes, Khasatiya *et al.* (2005) observed 30.00 ± 1.36 and 33.75 ± 1.65 days in post-partum fertile and infertile Surti buffaloes.

The variation between values obtained by the above mentioned researcher and the present

findings may be due to factors like difference in age, parity, nutrition of dams during late gestation, season of calving, sex and birth weight of the calf and the post-partum husbandry practices and hygiene of buffaloes.

Days required for exhibition of first post-partum oestrus

The average days required for exhibition of first post-partum oestrus were 37.5 ± 5.16 , 26.91 ± 1.36 and 45.08 ± 3.77 days in Groups 1, 2 and 3, respectively. The results are significant at $P < 0.05$ and $P < 0.01$ (Table 2).

The average days required for first post-partum estrus exhibition after GnRH treatment in Group 1 were 37.5 ± 5.16 days. The results are in concurrence with Barkawi *et al.* (1995) who reported 33.6 ± 3.1 days in GnRH treated buffaloes. Fewer days required for PPE after GnRH treatment than present findings are reported by Takkar *et al.* (1999) who reported 24.0 ± 2 and 27.3 ± 4 days when GnRH was administered at doses of $8 \mu\text{g}$ and $12 \mu\text{g}$, respectively in buffaloes.

The average days required for exhibition of first post-partum oestrus in Group 2 were 26.91 ± 1.36 . However, the days required for first post-partum exhibition after $PGF_{2\alpha}$ treatment in the present study were less than those reported Nasr *et al.* (1994) 43.00 days and Tiwari *et al.* (2004) 54.00 ± 3.19 days in buffaloes. In Group 3 (control group), the average days required for first

Table 2. Average days required for exhibiting first PPE in experimental buffaloes.

Sr. No.	Particulars	Mean
1	Group 1	37.5 ± 5.16^a
2	Group 2	26.91 ± 1.36^b
3	Group 3	45.08 ± 3.77^c

Column wise superscript (a, b and c) denote a significant difference at the $P < 0.05$ and $P < 0.01$ levels.

post-partum exhibition of estrus were 45.08 ± 3.77 . However, the days required for first post-partum exhibition of estrus in untreated buffaloes are less than reported by Suthar and Kavani (1992) 56.72 ± 3.58 days in Meshana buffaloes and Tiwari and Pathak (1995) 57.7 ± 5.61 days in suckled buffaloes. The variation between values obtained by the above mentioned research scientists and the present findings may be due to factors like difference in nutrition of dam during late gestation and the post-partum husbandry practices and hygiene, and estrus detection aids.

First service conception rate

The first service conception rate was highest 41.66% in Group 2 which is indicative of the fact that $\text{PGF}_{2\alpha}$ treatment was most beneficial. That the first service conception rate was 33.33% in Group 1 buffaloes indicates that GnRH treatment also yielded good results. Group 3 yielded the lowest results i.e. a 16.16% first service conception rate. The present results are low in comparison with Takkar *et al.* (1999) who reported a 50% conception rate in GnRH treated and a 38% rate in control buffaloes.

CONCLUSION

The buffaloes treated with $\text{PGF}_{2\alpha}$ showed the least time i.e. 22.75 ± 0.91 days required for uterine involution and their first service conception rate was highest: 41.66%, which is indicative of the fact that $\text{PGF}_{2\alpha}$ treatment is beneficial for improving postpartum fertility in buffaloes.

REFERENCES

- Barkawi, A. H., N.M. Farghely and A.M. El-Borady. 1995. Effect of treatment with GnRH analogue on post-partum reproductive performance of suckling Egyptian buffalo cows. *Buffalo Journal*, **1**: 117-123.
- Fonesca, F.A., J.H. Britt, B.T. McDainel, A.H. Rakes and J.C. Wilk. 1983. Reproduction traits in Holland and Jersey. Effect of age, milk yield and clinical abnormalities on involution of cervix and uterus, ovulation, estrus cycle, detection of estrus, CR and days open. *J. Dairy Sci.*, **66**: 1128-1147.
- Fortune, J. E. 1986. Bovine theca and granulosa cells interact to promote androgen production. *Biol. Reprod.*, **35**: 292-299.
- Iqbal, S., M. Aleem and M.A. Sayeed. 2003. Role of single injection of prostaglandin $\text{F}_{2\alpha}$ on breeding efficiency of post-partum buffaloes. *Pak. Vet. J.*, **23**(4): 197-201.
- Khasatiya, C.T., A.J. Dhami and F.S. Kavani. 2005. Productive traits and metabolic profile in post-partum fertile and infertile Surti buffaloes. *Indian Vet. J.*, **82**: 637-641.
- Leindell, W., P. Hegner and P. Rockel. 1980. Investigations on the prostaglandin $\text{F}_{2\alpha}$ concentrations in maternal and fetal cotyledons of cows with and without retained fetal membranes. *Zabl. Vet. Med. A.*, **27**: 691-696.
- Lindell, J.O. and H. Kindahl. 1983. Exogenous prostaglandin $\text{F}_{2\alpha}$ promotes uterine involution in the cows. *Acta Vet. Scand.*, **24**(3): 269-274.
- Malvi, G.R., R.K. Pangaonkar, R.K. Sharma and V.K. Gandotra. 2004. Effect of certain hormones on reproductive performance of post-partureint buffaloes. *Buffalo Journal*,

- 2: 193-201.
- Nasr, M.T., M.A. Agag and G.A. Sosa. 1994. The effect of PGF_{2α} and/or L-tyrosine on the puerperium of buffaloes. *Annals of Agricultural Science Moshtohor*, **32**(4): 2213-2225.
- Nazir, F., R.A. Chaudhry, T. Rahil and K.R. Chohan. 1994. Effect of prostaglandin F_{2α} at early postpartum on uterine involution and subsequent reproductive performance in suckled Nili-Ravi buffaloes. *Buffalo Journal*, **10**(3): 269-271.
- Perera, B.M.A.O., H. Abeygumawardona, A. Thamotharm, H. Kindahl and L.E. Edquist. 1981. Peripheral changes of oestrogen, progesterone and prostaglandin in water buffaloes. *Theriogenology*, **15**: 463-467.
- Peters, A.R., M.G. Pimental and G.E. Lamming. 1985. Hormone response to exogenous GnRH pulses in post-partum dairy cows. *J. Reprod. Fertil.*, **75**: 557-565.
- Schallenberger, E. 1985. Gonadotropin and ovarian steroids in cattle. III Pulsatile changes of gonadotropin concentration in jugular vein post-partum. *Acta Endocrinol-Cop.*, **109**: 37-43.
- Shah, S.N.H., A.H. Willemase and D.F.M. Van-de-wiel. 1990. Reproductive performance of Nili-Ravi buffaloes after single injection of GnRH early post-partum. *Trop. Anim. Health Pro.*, **22**(4): 239-246.
- Snedecor, G.W. and W.G. Cochran. 1989. *Statistical Methods*, 8th ed. Iowa State University Press, Ames, Iowa, USA.
- Suthar, B.N. and F.S. Kavani. 1992. Occurrence and nature of first post-partum estrus in Meshani buffaloes. *Indian Journal of Animal Reproduction*, **13**(2): 161-164.
- Takkar, O.P., N. Singh, J. Kaur and K.C. Chaudhary. 1999. Augmentation of post partum reproductive efficiency by use of GnRH in buffaloes. *Indian Journal of Animal Reproduction*, **20**(1): 9-11.
- Tiwari, R.P., S. Jogi and S.K. Sahu. 2004. Effect of prostaglandin administration after calving in buffaloes on post-partum reproductive performances. *Buffalo Bull.*, **23**(3): 53-57.
- Tiwari, S.R. and N.M. Pathak. 1995. Influence of suckling on postpartum reproduction performance of Surti buffaloes. *Buffalo Journal*, **11**(2): 213-217.