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Enhancing off-season fertility in dairy buffaloes through monensin supplementation

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ABSTRACT

Ninety suboestrus, pluriparous, Murrah buffaloes (60–180 days post-partum) reared under semi-intensive system formed the subject of this study. These buffaloes failed to exhibit overt oestrus and remained un-bred. The buffaloes were subjected to synchronized breeding using modified ovsynch protocol which included 5 ml receptal (20 µg buserelin) on day 0, 2 ml vetmate (500µg cloprostenol) on day 7 and 2.5 ml receptal (60 h after cloprostenol) on day 9, injected intramuscularly. Fixed time AI was done at 16 and 40 h after the last injection. Some of the buffaloes which returned to oestrus about 15–21 days later were served naturally. The pregnancy was diagnosed 90 days later through rectal palpation of genitalia. In the first phase, buffaloes were synchronized and bred either in the favourable breeding season (October through March; n= 40) or in the unfavorable season (April through July; n=40). The first service and the overall conception rates were 30 and 37.5% (during unfavourable season) and 55 and 65% (during favourable season; $P<0.05$), respectively. Assuming that poor quality and low quantity of the fodder availability in the unfavorable period, the second phase of the study incorporated oral supplementation of 200 mg monensin (an ionophore) per animal per day (n=10) for 30 days before and during the application of synchronized breeding. The first service and the overall conception rates increased substantially to 50 and 80%, respectively. Average follicular diameter 36 h after the cloprostenol injection in the buffaloes that conceived (5) or remained un-conceived (5) were similar (9.99±0.33 vs 8.45±0.56 mm). Supplementation of monensin did not affect the quality of the milk. It is concluded that supplementary feeding of monensin substantially improved fertility in suboestrus buffaloes following their management through ovsynch synchronization and fixed time insemination during off-season.

Key words: Buffalo, Monensin, Ovsynch, Suboestrus

In tropical countries, productivity of buffalo farming has not reached the desirable level due to impaired reproductive efficiency. Poor oestrus expression or sub oestrus forms one of the major reproductive disorders in dairy buffaloes, causing huge economic losses to the dairy industry (Brar and Nanda 2004). Sub oestrus is frequently encountered in the early postpartum period, during the humid and hot season, in malnutritioned and suckled buffaloes (El-Wishy 2007). Due to the high (20–80%) incidence of sub oestrus, large numbers of buffaloes are left unbred and substantially contribute to days open (Honparkhe *et al.* 2008). The mean days open of buffaloes calving from December till June were >140 days and was higher than the mean of buffaloes calving in July to November (110 days; Prakash 2002).Therefore, optimal reproductive management of buffalo would require implementation of oestrus and ovulation synchronization protocols (Brar *et al.* 2005). The extreme variations are observed in onset of oestrus, ovulation and conception rates following these interventions during breeding and nonbreeding season using hormonal protocols (Neglia *et al.* 2003). The supplementation of monensin would increase ruminal propionate thereby increasing glucose production (Beckett *et al.* 1998) and ultimately would improve hormone-induced fertility in summer. Therefore, the present study aimed at improving fertility of sub oestrus dairy buffaloes through a composite application of synchronized breeding and modulation of rumen microbial environment through monensin feeding.

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MATERIALS AND METHODS

Selection of animals

Ninety sub oestrus, pluriparous, otherwise healthy lactating Murrah buffaloes (60–180 days post-partum) reared under semi-intensive system formed the subject of this study. They were fed with *ad lib.* seasonal green fodder, supplemented with about 5 kg home made concentrate ration and 1 to 2 kg of wheat straw during August through March and about 15 to 20 kg of green fodder supplemented with about 6 kg concentrate ration and 2–3 kg wheat straw in April through July. Oestrus was detected visually by the farmers. These buffaloes failed to exhibit overt oestrus and remained un-bred. However, clinical evaluation thruogh ultrasonography confirmed them as cycling for having functional corpus luteum, and hence were designated as suffering from 'suboestrus'.

Experiment 1

In the first phase, buffaloes were synchronized and bred either in the favorable breeding season (October through March; n= 40,) or in the unfavorable season (April through July; n=40).These buffaloes were subjected to 'modified ovsynch protocol' which included intramuscular (IM) inections of 5 ml receptal (20 µg Buserelin) on day 0, 2 ml vetmate (500µg cloprostenol) on day 7 and 2.5 ml receptal (60 h after cloprostenol) on day 9. In this modified ovsynch the dose of second GnRH was reduced to half. Fixed time artificial insemination was done 16 and 40 h after the last injection. Some of the buffaloes which returning to oestrus about 15–21 days later were served naturally. The pregnancy was diagnosed 90 days later through rectal palpation of genitalia.

Experiment 2

Assuming that poor quality and low quantity of the fodder availability could be a major limiting factor to optimal fertility in the unfavorable period, the second phase of the study incorporated oral supplementation of 200 mg monensin (an ionophore)/head/day (n=10) for 30 days before and during the application of synchronized breeding (with modified ovsynch protocol as used in experiment 1). Fixed time artificial insemination was done 16 and 40 h after the last injection. The pregnancy was diagnosed 90 days later through rectal palpation of genitalia. The quality of milk produced by supplemented buffaloes was also assessed by measuring the density, conetrations of milk urea nitrogen, fat, solid not fat protein, and lactose.

Statistical analysis

Numerical data are represented as mean±SEM and differences were considered significant at $P<0.05$. Chi-square (χ^2) test (Dytham 1999) was used for the number of buffaloes that conceived subsequently in different season during experiment 1 and 2. Two sample Student's t-test (Dytham 1999) was employed to compare follicular diameter and various milk parameters before and after monensin supplementation.

RESULTS AND DISCUSSION

In experiment 1, the first service and the overall conception rates were 30 and 37.5% in unfavorable season (summer) than 55 and 65%, respectively, in winter ($P<0.05$). Following monensin supplementation during unfavorable season (experiment 2), the first service and the overall conception rates increased ($P<0.05$) substantially to 50 and 80%, respectively. Average follicular diameter 36 h after the cloprostenol injection in the buffaloes that conceived (n=5) or remained un-conceived (n=5) were similar (9.99±0.33 vs 8.45±0.56 mm; $P>0.05$). Supplementation of monensin did not affect ($P>0.05$) the quality of the milk produced in terms of concentration of milk urea nitrogen (10.67±0.49 vs 12.16±0.61 mg/dl), fat (8.84±0.46 vs 7.83±0.58%), solid not fat (9.83±0.18 vs 10.02±0.20%), density (31.14±0.69 vs 32.79±0.74%), protein (4.67±0.08 vs 4.76±0.09%) and lactose (4.42±0.08 vs 4.51±0.09%).

The administration of GnRH leads to a luteinizing hormone surge during any stage of the estrous cycle, which will promote the ovulation of a dominant follicle or induce luteinization and/or atresia of pre-dominant follicles in cattle and buffaloes (Ghuman *et al.* 2009). It has been reported that GnRH administration in buffaloes induces ovulation in 60–86% of treated animals (De Araujo Berber *et al.* 2002). However, conception rates following the ovsynch protocol reduced during transition from the breeding to non-breeding season (Neglia *et al*. 2003). Similarly, in the present study, poor conception rates were observed during non-breeding season which may be attributed to heat stress and or unavailability of good quality fodder.

Incorporation of progesterone treatment between first GnRH and prostaglandin may improve the response of ovsynch in cattle and buffaloes (De Rensis *et al.* 2005, Ghuman *et al*. 2011, and Honparkhe *et al*. 2011) but considering scarcity of green fodder and cost-effectiveness, monensin was supplemented to enhance conception rates in the present study.

The net impact of feeding monensin is an increase in plasma glucose concentrations (Duffield *et al.* 1998), and hence the energy status of the ruminants. Bushmich *et al.* (1980) investigated the effects of dietary monensin on ovarian response and demonstrated that beef heifers fed monensin (200 mg/d) had greater ovarian weight, more corpora lutea, and more follicles following GnRH treatment than controls.

The present experiment revealed increased conception rates following ovsynch plus monensin supplementation during non-breeding season. Monensin can modulate pituitary and ovarian functions through increase LH surge (Randel and Rhodes 1980) and thus might have improved conception rates in buffalo during summer. Monensin supplementation did not cause any significant change in milk composition. The consistency in milk composition following monensin feeding was also observed by Tallam *et al.* (2003) in dairy cows.

It is concluded that supplementary feeding of monensin substantially improved fertility in suboestrus buffaloes following their management through ovsynch and fixed time insemination during the unfavourable breeding months without compromising milk quality.

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