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Research Article

Changes in milk yield in relation to reproductive performance in suckled and non-suckled buffaloes

A. K. SINGH[1] AND P. S. BRAR[2]

Department of Animal Reproduction, Gynaecology & Obstetrics,
College of Veterinary Sciences, GADVASU Ludhiana - 141 004

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ABSTRACT

High milk yield, a common aim in commercial dairy farming system in the developing countries, delays the onset of ovarian activity in dairy buffaloes. The present study was, therefore, conducted on six suckled and nine non-suckled buffaloes at organized dairy farms to determine alterations in milk yield during estrus and its effect on reproduction in buffaloes. Colustrum on the day of calving was 10.23 ± 0.52 kg in suckled and 9.96 ± 0.32 kg in non-suckled buffaloes. Peak milk yield (kg) was significantly higher ($P < 0.05$) in suckled than in their non-suckled counterparts (13.75 ± 0.39 vs 12.53 ± 0.25). However, duration of peak yield was significantly ($P < 0.05$) longer in non-suckled buffaloes (41.22 ± 4.46 vs 31.5 ± 4.28 days). Milk yield on the day of first post-partum estrus, two days pre- and post-estrus was 9.57 ± 0.63, 10.42 ± 0.75 and 10.54 ± 0.72 kg in suckled and 9.21 ± 0.65, 10.68 ± 0.5 and 10.84 ± 0.87 kg in non-suckled buffaloes. Milk yield was least in buffaloes while they were in estrus. Buffaloes which did not conceive had significantly ($P < 0.05$) higher peak yield (14.5 ± 0.0 kg/day in suckled and 14.2 ± 0.96 kg/day in non-suckled) as compared to their conceived counterparts (12.76 ± 0.9 kg/day in suckled and 12.3 ± 0.93 kg/day in non-suckled). These results suggest that high milk yield appears to suppress ovarian activity during the early post partum period in dairy buffaloes.

Key words: Buffaloes, conception, estrus, LH, milk yield, non-suckled, suckled

Homeorhesis, defined as the orchestrated or coordinated changes in metabolism of body tissues necessary to support a physiological state may be applied to the inter-relationship of milk yield and ovarian activity of the early post-partum animals (Staples and Thatcher, 1990). Cows with higher genetic potential for milk yield effect conception (Snijders *et al.*, 2001). Since high producing animals cannot maintain a positive energy balance during early lactation and must mobilize their body reserves (Butler *et al.*, 1981), so it is not surprising that post-partum ovarian activity was closely associated with milk production. While considering the relationship of lactation to reproduction in dairy buffaloes, the most important period is early and peak lactation. The nature of this relationship has not been clearly established in buffaloes and is the subject of the present study.

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[1]Corresponding author & Assistant Professor, [2]Associate Professor, COVS, GADVASU, Ludhiana.

MATERIALS AND METHODS

Selection of animals: Nine non-suckled and six suckled healthy, pleuriparous buffaloes with high genetic potential, in their 3rd to 5th parity were selected for this study at organized dairy farms (PAU and Mattewara Dairy Farms, Ludhiana) during the year 2004. All the buffaloes had parturated 25-35 (29.2 ± 0.91) days before the start of the experiment. On the basis of progesterone concentration on the first day of sampling (25 - 35 days post-partum), the buffaloes were divided into cyclic (plasma progesterone concentration > 1.0 ng/ml; n = 9) and non-cyclic (plasma progesterone concentration < 1.0 ng/ml; n = 6). The buffaloes were subjected to GnRH treatment at 29.2 ± 0.91 days post-partum. Suckling was allowed for 2-3 min. before and after each milking, twice daily. The non-suckled buffaloes had their calves weaned at birth and letdown of milk was through teat stimulation by milkers. All the buffaloes were maintained on standard feeding schedule, managemental and

hygienic conditions.

Data on milk yield: Information pertaining to milk yield was recorded after the day of calving up to 120 days post-partum on daily basis.

Collection of blood samples: Blood samples were collected through jugular venipuncture in heparinised tubes at weekly intervals for next seven weeks of GnRH (Buserelin acetate 20 µg; Receptal, Intervet) administration. Plasma was harvested immediately after blood collection by centrifuging the samples at 3000 rpm for 20 min. at 4°C and was stored at -20°C till further analysis.

Hormonal estimations in plasma: Plasma progesterone was estimated using RIA kit supplied by Animal Production Unit, FAO/IAEA Agriculture and Biotechnology Laboratory, Seibersdorf, Austria. The intra-assay coefficient of variation for low and high control samples in replicates at the beginning and end of each assay were 6.88 and 9.55% respectively. Corresponding inter-assay coefficient of variation in replicates was 8.06 and 12.1%, respectively. The analytical detection limit of the assay was 0.032 ng/ml.

Plasma LH was determined in all the samples by EIA using biotin-streptavidin amplification system and second antibody coating technique (Prakash *et al.*, 2002). The intra and inter-assay coefficient of variations determined using pooled plasma containing 0.62 and 5.0 ng/ml in 11 assays were 7.73 and 16.0% and 3.21 and 9.89%, respectively. The lowest LH detection limit was 0.31 ng/ml.

Detection of estrus: The estrus activity of the buffaloes was detected by parading the teaser bull and visual observations, twice daily. The ovarian activity, if any, was recorded weekly through per-rectal examinations. These visual and weekly per-rectal observations were correlated with progesterone concentration of the animal. The results so obtained were subjected to statistical analysis as per Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Observations on 15 buffaloes (nine non-suckled and six suckled), kept at organized dairy farms revealed that colustrum on the day of calving was 10.23 ± 0.52 kg in suckled and 9.96 ± 0.32 kg in non-suckled buffaloes. Time taken to reach peak milk yield was 29.5 ± 1.12 days in suckled buffaloes as compared to 29.67 ± 1.17 days in their non-suckled counterparts. Further, in suckled buffaloes peak milk yield was significantly ($P < 0.05$) higher (13.75 ± 0.39 kg/day vs 12.53 ± 0.25 kg/day) than in non-suckled buffaloes (table 1). Smith *et al.*, (1982) found high milk yield in suckled than in weaned cattle during the early post-partum period due to the presence of calf. Maternal offspring bond relationship including roles for maternal vision, olfaction and calf identity plays an important for instant release of more milk (Williams *et al.*, 1996). Similarly, in non-cyclic buffaloes peak milk yield was 13.37 ± 0.46 kg which was significantly ($P < 0.05$) higher than 11.2 ± 0.38 kg in cyclic buffaloes on the first day of sampling (25 – 35 days post-partum). High concentration of progesterone decreases milk yield (Hafez and Hafez, 2000). However, duration of peak yield was found to be significantly ($P < 0.05$) longer in non-suckled buffaloes (41.22 ± 4.46 days) than in suckled ones (31.5 ± 4.28 days; table 1 and fig. 1). A longer duration of peak yield in non-suckled buffaloes could be attributed to the fact that milking stimulus releases more milk for longer time than suckling (Arya and Madan, 2001b). It is known that buffaloes as compared to cattle are difficult milkers and take more time for milk letdown (Roy, 1982) and the release stimulation at milking needs to be more sustained than among cattle and this could be the reason for more production of milk in weaned buffaloes for longer duration because in suckled animals there is an instant and potent stimulus for letdown of milk by the suckling calf but for letdown of milk in weaned buffaloes milker has to stimulate/massage the teats for a longer duration and this increased duration of teat massage has been reported to increase prolactin release for longer time which in turn increases the milk yield for longer duration (Reinhardt and Schams, 1975).

Milk yield and estrus: Suckled buffaloes took significantly ($P < 0.05$) longer period (86.67 ± 2.32 days) to experience their first post-partum estrus than non-suckled buffaloes (34.67 ± 2.48 days). Milk yield on the

Table 1. Comparison of milk yield during early lactation in suckled and non-suckled buffaloes (Mean ± SEM)

Parameters	Unit	Suckled buffaloes (n = 6)	Non-suckled buffaloes (n = 9)
Colustrum on the day of calving	kg	10.23 ± 0.52	9.96 ± 0.32
Time to reach peak yield	days	29.5 ± 1.12	29.67 ± 1.17
Peak milk yield	kg/day	13.75 ± 0.39a	12.53 ± 0.25b
Duration of peak yield	days	31.5 ± 4.28c	41.22 ± 4.46d
Milk yield on the day of first estrus	kg	9.57 ± 0.63	9.21 ± 0.65*
Milk yield two days pre-estrus	kg	10.42 ± 0.75	10.68 ± 0.55**
Milk yield two days post-estrus	kg	10.54 ± 0.72	10.84 ± 0.87**
Peak milk yield in conceived buffaloes	kg/day	12.76 ± 0.9*	12.3 ± 0.93*
Peak milk yield in non-conceived buffaloes	kg/day	14.5 ± 0.0**	14.2 ± 0.96**
Peak LH concentration	ng/ml	14.3 ± 2.7a	26.2 ± 4.3b

Values with different superscripts differ significantly (P < 0.05)

day of first post-partum estrus was found to be 9.57 ± 0.63 kg in suckled buffaloes. Two days pre-and post-estrus, the milk yield was 10.42 ± 0.75 kg and 10.54 ± 0.72 kg respectively (table 1). In non-suckled buffaloes, milk yield at first estrus was 9.21 ± 0.65 kg/day. Percent fall in milk yield two days pre- and post-estrus was 8.16 and 9.2% in suckled and 13.76 and 15.04% in non-suckled buffaloes, respectively. Hafez and Hafez, (2000) reported that high concentration of estrogen at time of estrus suppresses milk yield.

Milk yield and conception: For optimum reproduction a buffalo is expected to conceive by 125 days. In the present study, five out of six suckled and six out of nine non-suckled buffaloes got conceived (108.2 ± 2.59 vs 61.17 ± 3.85 days). Rest one suckled and three non-suckled buffaloes did not conceive. Peak milk yield in suckled and non-suckled buffaloes which did not conceive was 14.5 ± 0.0 kg/day and 14.2 ± 0.96 kg/day respectively, which was significantly (P < 0.05) higher than in their conceived counterparts (12.76 ± 0.9 kg/day in suckled vs 12.3 ± 0.93 kg/day in non-suckled buffaloes; table 1). High production of milk affects conception through increased serum concentrations of prolactin which is antagonistic in release of GnRH that plays an important role in normal follicular development and ovulation (Nebel and McGilliard, 1993).

Milk yield and response to GnRH-induced

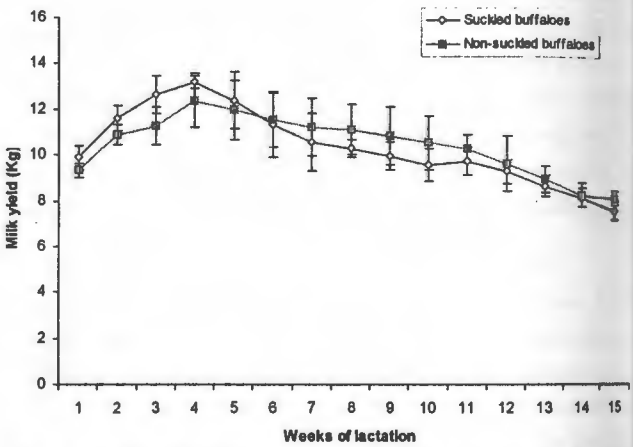

Fig 1: Weekly per day milk yield during early lactation in suckled and non-suckled buffaloes

LH release: GnRH was administered (29.2 ± 0.91 days) during the period of peak lactation in suckled (29.5 ± 1.12 days) and non-suckled buffaloes (29.67 ± 1.17 days). However, peak LH concentration after GnRH administration was significantly (P < 0.05) higher in non-suckled buffaloes (26.2 ± 4.3 ng/ml) as compared to their suckled counterparts (14.3 ± 2.7 ng/ml; table 1). High milk yield during the period of GnRH administration (13.75 ± 0.39 kg/day) in suckled than in non-suckled buffaloes (12.53 ± 0.25 kg/day) along with the effects of suckling could have resulted in lower LH profiles in the suckled buffaloes. High practice of suckling has also

en reported to deepen the effect of milk yield on RH-induced LH release in buffaloes (Arya and adan, 2001a). Similar observations were reported by oss *et al.*, (1980) that high production of milk results in increased serum prolactin concentrations which ppresses the circulating levels of LH and FSH.

It can thus be summarized that milk yield was east in buffaloes at estrus and while they were in luteal hase of estrus cycle, high milk yield appears to synergize the effects of suckling on LH release and interferes with the reproductive performance in dairy buffaloes during the early post-partum period.

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