

Effect of Parity on Productive Performance and Calving Interval in Water Buffaloes

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Abstract: The aim of this study was to determine the effect of the parity on productive performance (lactation length, total milk yield and milk yield by day of calving interval) and calving interval in water buffaloes. For this purpose, records of 663 lactations from 248 buffaloes were evaluated. Total milk yield was 1344.91 liters, lactation length was 291.20 days, calving interval was 453.55 days and milk by day of calving was 2.77 liters. Parity did not significantly affect total milk yield, but had a significant effect on lactation length, calving interval and milk by day of calving interval. First calving buffaloes had a longer lactation, a longer calving interval and in consequence lower productivity than buffaloes with two and three or more calving. Second calving buffaloes had intermediate and significantly different values than buffaloes with three or more calving. Calving interval was positively correlated with total milk yield ($r = 0.34983$, $p < 0.0001$) and length of lactation ($r = 0.67408$, $p = < 0.0001$); and negatively with milk by day of calving ($r = -0.41263$, $p < 0.0001$). In conclusion, parity affected the productive performance and calving interval, with buffaloes of one and two calving being less productive due to a longer calving interval. An increase of milk yield is related with a longer calving interval, therefore, buffaloes of one and two calving, must be provided with optimal management conditions, which allow them to support milk yield and not to compromise the reproductive performance.

Keywords: Buffalo, milk yield, calving interval, lactation length.

INTRODUCTION

Buffalo (*Bubalus bubalis*) is a triple purpose animal that contributes enormously to food production worldwide. Buffalo, is adapted to tropical conditions with productivity levels comparable to cows and taking into account this adaptive capacity, the buffalo herd have increased progressively in the last years in Venezuela, occupying the second place in the number of heads in South America, after Brazil [1]. A high number of buffalo herds are destined to milk production motivated in the high content of butterfat, which is a very important issue for the cheese industry; and selection of buffaloes by high milk yield and the use of imported cryopreserved semen from Brazil, Italy and India, are tools used by farmers to attain a genetic improvement and increase milk yield. In one herd, an increases of 750 kg and 860 kg of milk at 244 and 305 days, respectively, has been observed between 1991 and 2008 [2].

It has been reported that the reproductive efficiency in buffalos may be affected by several factors, including milk yield and parity [3], and an interrelationship

between parity, milk yield and calving interval has been observed. Parity has been reported by affect the milk yield [2, 4-8] and calving interval [6, 8-11]. Additionally, milk yield is correlated positively with calving interval [12-14] and buffaloes with high milk yield have a longer calving interval, reducing the production of milk by day of calving, as reported in dual-purpose cows [15]. In cows, the increase of milk yield affects the reproductive efficiency [16-17] and recently, this has been also observed in buffaloes [18-19].

In Venezuela, there is few information about the interrelationship between parity, productive performance and reproductive efficiency in buffaloes available in the scientific literature. Therefore, to evaluate this relationship is very important because a low reproductive performance and a low milk yield are the two main reasons to cull buffaloes [20] and to implement improvement in the management conditions to achieve an increase in the productivity. The aim of this study was to determine the effect of parity on productive performance (total milk yield and milk yield by day of calving interval) and calving interval in buffaloes of one herd in the tropical conditions of Venezuela.

MATERIALS AND METHODS

This work was a retrospective study to analyses the milk and reproductive records of 248 buffaloes (663

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lactations between 2002 to 2008) belonging to one commercial farm. This commercial farm was particularly chosen since they possess a system with improved management, characterized by technology application such as computerized reproductive and health records, and preventive medicine standard operating procedures. This farm also has 24 hours on-location veterinarians year-round. The farm is located in the Catatumbo County, Zulia State, Venezuela, with a mean daily temperature of 28.3 °C and a mean of relative humidity of 80% (measured in the farm). The animals grazed in pasture consisting of German grass (*Echinochloa polystachya*), and Braquiaria grass (*Brachiaria humidicola*) in half day paddock rotation, with access to a commercial mineral block *ad libitum*, as a dietary supplement. In summer chopped sugar cane was provided in the evenings after the milking. Mechanical milking was performed twice a day after a short sucking by the buffalo's own calf to stimulate milk release. During the milking, the calf remained bound to a buffalo's forelimb and after milking, the buffaloes were suckled again by their own calves to remove residual milk from the udder. Buffaloes were mated through natural mating and to this, one entry buffalo bull for each 25 cows was present continuously during the year. The farm maintained computerized and paper records of each cow, including day of calving, number of calving, sex and weight of the calf, milk yield (measured in the two milkings of the day, every two weeks), and day of dry off.

Data were analyzed using a statistical software program [21]. The effect of parity (one, two and three or more calvings) on lactation length, total milk yield, calving interval, milk by day of calving interval was evaluated using two-way ANOVA with interaction term (adjusted for month of calving) and differences in least square means were assessed using pairwise t tests adjusting for multiple comparisons using Tukey's HSD method, according to this model: $Y_{ijm} = \mu + P_i + S_j + e_{ijm}$; where Y_{ijm} is the observation taken of the animal; P_i is the effect of parity; S_j is the effect of month of calving; and e_{ijm} is the random error associated with each

observation. The Pearson correlation between calving interval, lactation length, total milk yield and milk yield by day of calving interval were calculated. Differences were considered significant at $P < 0.05$.

RESULTS

In this study, the effect of parity on total milk yield, lactation length, calving interval and milk by day of calving interval, as well as the relationship between these parameters were analyzed. Total milk yield was 1344.91 liters, lactation length was 291.20 days, calving interval was 453.55 days and milk by day of calving was 2.77 liters.

Parity did not affect significantly total milk yield, but had a significant effect on lactation length, calving interval and milk by day of calving interval (Table 1). First calving buffaloes had a longer lactation, a longer calving interval and in consequence lower milk by day of calving interval than second and third or more calving buffaloes. Second calving buffaloes had intermediate and significantly different values than first and third or more calving buffaloes.

Calving interval was positively correlated with total milk yield ($r = 0.34983$, $p < 0.0001$) and length of lactation ($r = 0.67408$, $p = < 0.0001$) and negatively with milk by day of calving ($r = -0.41263$, $p < 0.0001$). Total milk yield was correlated with lactation length ($r = 0.57928$, $p < 0.0001$) and with milk by day of calving ($r = 0.66531$, $p < 0.0001$).

DISCUSSION

No effect of parity on total milk yield was observed, and this is similar to previous results [9, 22, 29] but contrast with results of Chaudhry [5] and Thiruvankadan *et al.* [8], who observed that milk yield was ascending from first to sixth and from first and fourth lactation, respectively. Recently, Verma *et al.* [30], observed a significant effect of parity on milk yield, with first calving buffaloes having a lower milk yield than multiparous buffaloes. Mourad and Rashwan [7]

Table 1: Effect of Parity on Productive Performance and Calving Interval in Buffaloes

Parity	Lactation length (days)	Total lactation yield (lts)	Calving Interval (days)	Milk yield by calving day (lts/day)
First	310.05±3.60 ^a	1327.88±20.29 ^a	497.45±5.35 ^a	2.42±0.04 ^c
Second	291.26±3.60 ^b	1362.55±20.30 ^a	454.47±5.35 ^b	2.81±0.4 ^b
≥Third	268.05±3.54 ^c	1345.60±19.93 ^a	418.39±5.26 ^c	3.13±0.04 ^a

Values (lsm±SE) with different letters in the same column, differ, $p < 0.05$.

and Afzal *et al.* [4], observed that first calving buffaloes produced lower milk than multiparous.

Parity had a significant effect on lactation length, calving interval and milk yield by day of calving, with primiparous buffaloes having a longer lactation, longer calving interval and lower milk yield by day of calving interval, and these parameters were improving with the increase of parity (Table 1). Chaudhry [5], observed that lactation length was longer in primiparous and it decreased until the sixth lactation and Thiruvankadan *et al.* [8] reported a reduction of lactation length with the increase of calvings, from 310.4 ± 2.9 in first calving to 284.3 ± 4.6 ($p < 0.05$) to buffaloes with six or more calving. Mourad and Rashwan [7] and Afzal *et al.* [4] did not observe an effect of parity on lactation length. More recently, Poudel *et al.* [28] and Jamuna *et al.* [31] observed that parity was a factor affecting lactation length in Murrah buffaloes.

Several factors are affecting the calving interval in buffaloes, including parity [10, 23, 32]. In this study, first calving buffaloes had a longer calving interval and this has been reported previously [8-11]. This could be a consequence of the longer service period, days open and higher services per conception reported in primiparous buffaloes [31, 32] and cows [10, 24]; and although it was not studied in the present study, one and two calving buffaloes could be more sensitive than buffaloes with three or more calving, to calf presence and suckling, even though the cows were milked mechanically. Mechanical milking has been observed to decrease the calving interval in comparison with manual milking [25], while suckling has been reported to delay the resumption of postpartum ovarian activity anestrus alone or in combination with inadequate nutrition [3]. In primiparous cows, this has been observed that longer postpartum period could be due to certain characteristics that first calving cows possess, such as: lesser energy balance, poor dry matter intake, greatest loss in body condition, lesser concentrations of glucose, and insulin as well as Insulin-like Growth Factor-I [26-27]. In primiparous buffaloes, a similar situation could occur, given that the offer of a diet with high energy density did improve the reproductive performance, probably by reducing the negative energy balance [34].

Parity influenced milk yield by day of calving interval, being lower in primiparous buffaloes than two and three or more calving buffaloes, and lower in two than three or more calving buffaloes. Similarly, a progressive increase of milk by day of calving interval

from first to fifth parity have been reported in Murrah buffaloes [33]. A negative correlation between calving interval and milk yield by day of calving interval was observed. In cows, a negative correlation between milk by day of calving interval with days to conception, was observed [15], and this suggests that cows with long interval to conception (and in consequence long calving interval) have lower productivity.

Phenotypic correlation analysis showed a positive relationship between calving interval with milk yield and lactation length; and similar correlations have been reported [12-14]. These results show that milk yield could have a negative impact on the reproductive efficiency in buffaloes. Long calving interval is a consequence of the long anestrus period, low fertility or long interval to conception, and several factors affect these reproductive parameters, including milk yield and parity [3]. Recently, a negative relation was observed between milk yield and pregnancy rate, with the decrease of pregnancy rate like a consequence of selection by milk yield, (-0.9% of pregnancy rate per each increase of 100 kg of milk in 305 days) [18-19].

CONCLUSIONS

Parity has an important effect on calving interval of buffaloes and in consequence on productive performance of water buffaloes, with those of one and two calving having a longer calving interval and being less productive. Correlation analysis shows that milk yield is related with calving interval, therefore, the buffaloes, especially those of one and two calving, must be provided with better management conditions, which allow them to support the milk yield and not to compromise the reproductive performance.

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