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ORIGINAL ARTICLE

Monthly and Seasonal Variations in Calving Pattern of Nili Ravi Buffaloes at Large Herd Sized Farm of ICAR-CIRB, Sub Campus, Bir Dosanjh, Nabha (Punjab)

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Abstract

The present study was undertaken to study the monthly and seasonal variations in calving pattern, calf sex and birth weight of calf during the year 2016-17 at Nili Ravi farm of CIRB, Sub Campus, Nabha (Punjab). The results showed that the 154 calvings occurred during the year 2016-17, out of which 82 males and 70 females were born. The maximum number of calvings occurred in the month of September (31), followed by August (23), January (19), November (14), April (13), October (12), December (12), February (10), July (6), March (5), May (5) and June (4). The overall average birth weight of male calves was 36.63 Kg and those of female calves was 36.46, with an overall average birth weight of male and females calves of 36.59 Kg. In the present study, the overall average birth weight of male calves was slightly higher than those of female calves despite the very low birth weight of two male calves in the month of September (11.4Kg) and November (16.0 Kg). The average birth weight of male calves was the highest in the season of winter (38.6 Kg), followed by spring (37.47), autumn (35.83) and summer (34.61). The average birth weight of female calves was the highest in the season of spring (38.55 Kg), followed by winter (37.33), summer (35.72) and autumn (34.3 Kg). The overall average birth weight of male and female calves was the highest in the season of spring (37.92 Kg), followed by winter (37.81), summer (35.33) and autumn (35.29 Kg). With regard to seasonal variations in calving pattern of Nili Ravi buffaloes, the highest number of calvings (66; 42.85%) occurred in the season of autumn (in the months of August, September and October); followed by winter (45; 29.22%) in the months of November, December and January; spring (28; 18.88%) in the months of February, March and April; and summer (15; 9.74%) in the months of May, June and July. It was concluded that the highest number of calvings occurred in autumn followed by winter, spring and summer. The average birth weight of calves was highest in the month of February and lowest in the month of June. The study further concluded that overall average birth weight of male calves was slightly higher than those of female calves.

Keywords: Calving pattern, Calf sex, Calf birth weight, Nili Ravi, Buffaloes.

1. Introduction

Accurate record keeping begin with the birth of every calf. Effective measuring and monitoring of herd's reproductive performance with the best measures and at the best times enables to confidently compare herd's reproductive performance to previous years. Then, respond more quickly when measures indicate that herd reproductive performance is not as good as desired and establish which aspects of the system are most likely to be limiting performance, allowing you to target efforts to improve in the right places. The buffalo is considered as sluggish breeder as the reproductive efficiency of buffalo is adversely affected by certain constraints such as late maturity, poor expression of the estrous signs particularly during summer, irregular estrous cycle, silent heat, seasonality in breeding, poor conception rate/early embryonic mortality and prolonged inter-calving interval (Pugashetti *et al*., 2009). Although buffaloes are polyestrous, they exhibit a distinct seasonal variation in display of estrus, conception rate, and calving rate in Indian buffaloes having better reproductive efficiency during winter compared to summer months attributed to environmental factors (Choudhary and Singh, 2004; Monget and Monniaux, 2019). Season of calving has a profound effect on service period (Choudhary and Singh, 2004; Stevenson *et al.*, 1984). As reported in India, buffaloes calving in late winter and early summer

have lower reproductive efficiency compared to those calving during other periods (Thomas and Dobson, 1989; Kunkel *et al*., 1977) and calving during rainy or monsoon season had shorter anoestrus period than other season calvers (Nautiyal *et al*., 1998). The resumption of ovarian activity after calving was significantly delayed in buffaloes that calved from February to May (116-148 days) compared to the rest of the year (38-64 days) (Kunkel *et al*., 1977). The mean service period of buffaloes calving from December to June was more than 140 days which was significantly higher than calving between July to November (< 110 days), the high service period during former group was associated with more silent estruses (Singh *et al*., 2001). Furthermore, conception rates were lower between February and August (Choudhary and Singh, 2004) and number of services per conception was higher in summer calvers than those calving in other seasons. Summer-calving cows have also been found to have lower lactation yields than those calving in spring, autumn or winter Brouek *et al*. (2004) and in a study of the reproductive performance of British Friesian cows, Darwash *et al.* (1997) reported that the number of days from calving to conception was higher in summer-calving animals compared with those calving in either the spring or autumn periods. In an evaluation of autumn and spring-calving herds O'Brien *et al*. (1999) reported superior processing characteristics (higher fat, total protein and casein concentrations) from the former herds due to a higher plane of nutrition, with a minimum of 70% milk from autumn calvers being added to the milk from spring calvers to ensure the milk was suitable for processing into cheese. Autumn-calving cows were found to have lower peak yields than those calving in the spring but higher milk persistency during lactation (Garcia and Holmes, 1999). Key advantages for herds calving in the autumn are the benefit of higher lactation yields, a more favourable milk price and a spring flush in yield during late lactation (ADAS, 1987). The decision to change the calving pattern can be achieved in three ways: move the calving date of the heifers, manipulate the calving date of the current cows and purchase new animals. Two major advantages for producers with a year-round calving pattern are the ability to provide a relative stable supply of milk throughout the year and also the more consistent month to month milk fat and protein values. The seasonal variations observed in calving pattern of Nili Ravi buffaloes at aminal farm of ICAR-CIRB, Sub campus, Bir Dosanjh, Nabha (Punjab) have been communicated in this communication.

2. Materials and Methods

2.1 Buffalo Farm and Feeding

The Nili-Ravi is one of the important buffalo breeds of India with its home tract in Gurdaspur, Amritsar and Ferozepur districts of Punjab i. e. along with the international border of Pakistan. Due to the non-availability of pure and superior breeding bulls in the tract, farmers face constraint in breeding their Buffaloes. To preserve the important germplasm of Nili-Ravi buffalo in India, Sub-campus of Central Institute for Research on Buffaloes was established on 1st December, 1987 at Bir Dosanjh, Nabha in Punjab by acquiring land and other facilities from the Government of Punjab for research on improvement of Nili-Ravi buffalo. The CIRB, sub campus, Nabha was identified as one of the centers for research work under the Network Programme on buffaloes for Nili-Ravi breed. As the only organized farm of Nili-Ravi breed in India, Central Institute for Research on Buffaloes, sub-Campus, Nabha is contributing to conservation and improvement of this fine breed of buffalo. The farm has a herd of about 500 heads of Nili Ravi breed of buffaloes. During the year 2016-17 (1st April 2016 to 31st March 2017), the calving as and when occurred was reported. The month of calving, the number of calving in a particular month, sex of the calf, the range of birth weight of male and female calves, the overall range of birth weight, average birth weight of male and female calves and overall average birth weight was calculated. The above mentioned traits were also calculated as per season and the seasonal variations in the above mentioned traits were reported. The sick animals were treated by an experienced veterinarian employed at ICAR-CIRB, Sub campus, Nabha. Standard concentrate mixture containing 20% crude protein and 70% TDN was prepared from locally available feed ingredients and was used during the study period as the concentrate supplement for the buffalo herd across the Institute. The experimental animals were fed as per the nutrient requirements of buffaloes (Paul and Lal, 2010). To speed up the development of rumen and early initiation of microbial fermentation, the calves were offered calf starter and green grass from second week of life itself. The whole milk was provided to the calf @ 2.5, 2.5, 3.0, 3.50, 3.50, 3.00, 3.00, 2.00, 1.50, 1.50, 1.00, 0.50, 0.00 kg during 1st to 13th week of age; and the calf starter was given to the calf @ 0.00, 0.05, 0.10, 0.20, 0.40, 0.60, 0.70, 0.80, 1.00, 1.20, 1.30, 1.40 and 1.70 kg during 1st to 13th week of age, respectively. The calf starter contained 22% Crude Protein and 70-75% Total Digestible Nutrients and was formulated based on the locally available feed resources. All animals were fed in groups throughout the experimental period. Fresh water was made available to every animal round the clock. Troughs were cleaned and maintained regularly. The quality of water was monitored regularly as water needs, if not adequately fulfilled, can lead to rapid deterioration of animal health and welfare. With regard to temperature of drinking water, the temperature of drinking water has only a slight effect on drinking behavior and animal performance. All possible efforts were made to provide fresh drinking water to the animals. As far as a choice of water temperature is concerned, the dairy animals prefer to drink water with

moderate temperatures (17-28°C) rather than cold or hot water (Andersson, 1987; Lanham *et al*., 1986; Wilks *et al*., 1990). The calving pattern during the year was divided into four seasons namely, winter (November to January), spring (February to April), summer (May to July) and autumn (August to October).

2.2 Signs of Calving

Several signs of calving were reported in Nili Ravi breed of buffaloes at CIRB, sub campus, Nabha. Early signs of imminent parturition can be observed as early as four weeks before parturition. The calving animal avoid aggressive interactions with other animals in herd which continues for about a month, where the calving animal is increasingly reluctant to engage in social encounters. One week before parturition the calving animal is increasingly restless, which includes regular looking and turning around, vocalising, licking and pawing the bedding material, tail-waving, frequent alternation of lying and standing and interrupted eating patterns. There is swelling of the udder and vulva, and relaxation of the pelvic ligaments. These morphological signs are used as signs of imminent parturition, and leads to decision making about the time to move the animal to a calving pen. Milk dripping from the teats in calving animals has also been observed rarely just before the calving. After calving the dam stands up and starts licking her calf. Licking is most intense just after calving and declines with time after calving.

2.3 Periparturient Stress

The calving animals were observed for their periparturient stress. Fear, presence of humans or other animals (e.g. dogs) may delay parturition. Incomplete dilatation of the vulva or cervix in primiparae is associated with periparturient environmental stress (Duffy, 1981; Sutherland, 1990). Incomplete dilatation of the vulva and cervix in pluriparae is associated with confinement and environmental disturbance at calving (Bendixen, 1986; Mee, 2004) and preterm calvings (Mee, 2004). Stress of parturition can be compounded to unacceptable levels by adverse environmental conditions (Kersting, 1997). The result of excessive stress is impaired immunity of dam and calf.

2.4 Monitoring Calving

The calving buffaloes were monitored from first stage of calving to 2-3 days after calving. Monitoring calving is essential, particularly at stage 2, and intervening when necessary, but excessive direct supervision should be avoided (Drew, 1988). Observation of cows and heifers during calving is critical for reducing calf losses (Youngquist, 1997). Peri-partal monitoring of cows reduces neo-natal mortality and cow genital lesions, but may delay parturition. Continuous presence of an observer during second-stage was associated with an increase in both calving problems and assisted parturitions among penned animal but the stillbirth rate was reduced in those animals undergoing dystocia (Duffy, 1981). Monitoring should continue after parturition for quick detection of uterus prolapse and hypocalcemia that can result in Downer cow Syndrome if not treated immediately (Cox, 1998; Cox and Onapito, 1986). Calving area management, delivery management and newborn management should be extremely important areas of dairy management focus. Events that occur here can affect calf morbidity and mortality, treatment costs, transmission of herd diseases, dam health and reproductive performance and ultimately the cost/benefit of replacement heifer rearing (Garry, 2004).

3. Results and Discussion

The monthly calving pattern, sex of calf and birth weight of calf pertaining to the year 2016-17 as recorded at the farm is presented in Table 1.

3.1 Monthly Calving Pattern, Calf Sex and Birth Weight of Calf During the Year 2016-17

The results showed that the 154 calvings occurred during the year 2016-17, out of which 82 males and 70 females were born. The maximum number of calvings occurred in the month of September (31), followed by August (23), January (19), November (14), April (13), October (12), December (12), February (10), July (6), March (5), May (5) and June (4). With regard to sex of the calf, the maximum number of male calves were born in the month of September (18), followed by August (12), January (9), October (8), November (8), April (6), December (5), February (4), July (4), March (3), June (3) and May (2). Similarly, the maximum number of female calves were born in the month of September (13), followed by August (11), January (10), April (8), December (7), February (5), October (4), November (4), May (3), March (2), July (2) and June (1). The overall range of birth weight of male calves varied from 11.4-49.7 kg and that of female calves varied from 27.0-47.0 kg with overall range of birth weight of male and female calves varied from 11.4-49.7 kg. The average birth weight of male calves was the highest in the month of January (41.03), followed by December (40.18) followed by, February (38.67), July (38.0), October (37.87), April (37.8), March (35.96), August (35.47), November (34.61), September (34.17), June (33.66) and May (32.25). The average birth weight of female calves was the highest in the month of February (43.02), December (38.01), March (37.75), January (37.65), May (36.66), November (36.35), July (35.5), June (35.0), April (34.7), September (34.7), August (34.5) and October (33.7 Kg). The average birth weight of male and female calves was the highest in the month of February (41.08), followed by January (39.34), December (38.91), July (37.16), March (36.68), October (36.48), April (36.02), November (35.19), August (35.01), May (34.9), September (34.39) and June (34.0 Kg). The -

Table 1: Month-wise calving pattern, calf sex and birth weight of calf during the year 2016-17

Sr. No.	Month	No. of calvings	Calf sex		Range of birth weight (Kg)	Range of birth weight (Kg)	Overall range of birth weight (Kg)	Average birth weight (Kg)	Average birth weight (Kg)	Average birth weight (Kg)
			Male	Female	Male	Female	M+F	Male	Female	M+F
1	January, 2017	19	9	10	33.5-49.7	30-46	30-49.7	41.03	37.65	39.34
2	February, 2017	10	4	5	34-38.5	41.2-44	34-44	38.67	43.02	41.08
3	March, 2017	5	3	2	35.4-36.6	36-39.5	35.4-39.5	35.96	37.75	36.68
4	April, 2016	13	6	8	33.70- 45.8	27-42.6	27-45.8	37.8	34.7	36.02
5	May, 2016	5	2	3	31-33.5	35-39	31-39	32.25	36.66	34.90
6	June, 2016	4	3	1	32-36	-	32-36	33.66	35.0	34.00
7	July, 2016	6	4	2	33-42	32-39	32-42	38.0	35.5	37.16
8	August, 2016	23	12	11	26-48	30.3-39	26-48	35.47	34.50	35.01
9	September, 2016	31	18	13	11.4-41.4	28-42	11.4-42	34.17	34.70	34.39
10	October, 2016	12	8	4	27.5-46.6	30.3-40	27.5-46.6	37.87	33.70	36.48
11	November, 2016	14	8	4	16-43.5	31.6-41	16-43.5	34.61	36.35	35.19
12	December, 2016	12	5	7	30.4-45	29-47	29-47	40.18	38.01	38.91
13	Overall	154	82	70	11.4-49.7	27-47	11.4-49.7	36.63	36.46	36.59

overall average birth weight of male calves was 36.63 Kg and those of female calves were 36.46, with an overall average birth weight of male and females calves of 36.59 Kg. In the present study, the overall average birth weight of male calves was slightly higher than those of female calves despite the very low birth weight of two male calves in the month of September (11.4 Kg) and November (16.0 Kg). This result was in agreement with that of earlier studies (Reynolds *et al*., 1980; Uğurlu *et al*., 2016). In the present study, two twins birth cases were reported, one in the month of April and another in the month of November, 2016. Calving animals giving birth to twins are at a higher risk of being culled (Thomsen *et al*., 2007) and the probability of having twins increases with infertility treatments. Because of the reduced body condition at calving, susceptibility to metabolic and infectious disease may increase in animals that deliver twins. Reduced milk yield and reduced fertility (more fertility-related treatments, increased number of days open and increased number of inseminations per conception) are to be expected after twinning (Nielen *et al*., 1989). More dystocia, stillbirths, placenta retention, metabolic diseases, abortions and culling are to be expected with twinning (Talebkan Garoussi, 2002). Another effect of excess twinning may be less replacement heifers left on the farm because of increase calf mortality and- 'free-martinism' (Nielen *et al*., 1989).

3.2 Dystocia

Several cases of dystocia were reported during the study period. It has been observed that calf birth weight and dam pelvic area were the two of the most important factors that contributed to the incidences of dystocia. Similar observation was also reported by Youngquist (1997). First-parity animals have a 4.7 times higher risk of dystocia than animals in later parities (Johanson and Berger, 2003; Bendixen, 1986). Primiparae dystocia is most influenced by sire (Meijering, 1984) weight at insemination (Drew, 1988) and age, weight and body condition at calving (Drew, 1988; Meijering, 1984). Over conditioned heifers have excessive deposits of fat in the pelvic canal which reduces its calibre and increases the difficulty of delivery, but calving difficulty is not diminished in underfed heifers (Youngquist, 1997). First calving and male calves have more probability of assisted calving (Lombard *et al*., 2007). Twins, sex of calf (male) and breed of sire and dam have an important influence on the incidence of dystocia (Heins *et al*., 2003; Bendixen, 1986). Dystocia affects adversely milk, protein and fat yield, reproduction indexes, disease incidence, culling and animal deaths (Tenhagen *et al*., 2007; Garry, 2004; Lombard, 2003; Rajala and Grohn, 1998; Dematawena and Beger, 1997; Phillipsson, 1976).

3.3 Seasonal Variations in Calving Pattern Calf Sex and Birth Weight of Calf of Nili Ravi Buffalo During the Year 2016-2017

The seasonal variations in calving pattern, sex of calf and birth weight of calf pertaining to the year 2016-17 as recorded at the farm is presented in Table 2. With regard to seasonal variations in calving pattern of

Table 2: Seasonal variations in calving pattern of Nili Ravi buffalo during the year 2016-2017

Sr. No.	Season	Month	No. of calvings	Calf sex		Range of birth weight	Range of birth weight	Overall range of birth weight	Average birth weight	Average birth weight	Overall average birth weight
				Male	Female	Male	Female	M+F	Male	Female	M+F
1.	Winter	November	14	8	4	16-43.5	31.6-41	16-43.5	34.61	36.35	35.19
		December	12	5	7	30.4-45	29-47	29-47	40.18	38.01	38.91
		January	19	9	10	33.5-49.7	30-46	30-49.7	41.01	37.65	39.34
		Overall	45 (29.22%)	22	21	16-49.7	29-47	16-49.7	38.6	37.33	37.81
2.	Spring	February	10	4	5	34-38.5	42.3-44	34-44	38.67	43.22	41.08
		March	5	3	2	35.4-36.6	36-39.5	35.4-39.5	35.96	37.75	36.68
		April	13	6	8	33.7-45.8	27-42.6	27-45.8	37.8	34.7	36.02
		Overall	28 (18.88%)	13	15	33.7-45.8	27-44	27-45.8	37.47	38.55	37.92
3.	Summer	May	5	2	3	31-33.5	35-39	31-39	32.25	36.66	34.90
		June	4	3	1	32-36	-	32-36	33.6	35	34.0
		July	6	4	2	33-42	32-39	32-42	38.0	35.5	37.1
		Overall	15 (9.74%)	9	6	31-42	32-39	31-42	34.61	35.72	35.33
4	Autumn	August	23	12	11	26-48	30.3-39	26-48	35.47	34.5	35.01
		September	31	18	13	11.4-41.4	28.0-42	11.4-42	34.17	34.7	34.39
		October	12	8	4	27.5-46.6	30.3-40.0	27.5-46.6	37.87	33.7	36.48
		Overall	66 (42.85)	38	28	11.4-48	28-42	11.4-48	35.83	34.3	35.29
5.	April, 2016 to March, 2017		154	82	70	11.4-49.7	27-47	11.4-49.7	36.62	36.47	36.58

Nili Ravi buffaloes, the highest number of calvings (66; 42.85%) occurred in the season of autumn (in the months of August, September and October); followed by winter (45; 29.22%) in the months of November, December and January; spring (28; 18.88%) in the months of February, March and April; and summer (15; 9.74%) in the months of May, June and July. Out of the 82 male calves, born during the year, 22 were born during winter, 13 during spring, 9 during summer and 38 were born during autumn season. Similarly, out of the 70 female calves, born during the year, 21 were born during winter, 15 during spring, 6 during summer and 28 were born during autumn season. In the present study, the minimum calvings occurred in the season of summer. However, for many farmers a summer-calving pattern is focused on producing milk in the period when the maximum benefit can be obtained from seasonality payments. The manipulation of the estrous cycle or induction of estrus brings a large percentage of a group of females into estrus at a short, predetermined time (Odde, 1990). One of the advanced management processes through which the human errors and management costs could be minimized is synchronization of estrus. It helps in fixing the breeding time within a short predefined period and thereby scheduling the parturition time at the most favourable season in which newborns can be reared in suitable environment with ample food for augmenting their survivability. As timely breeding of the animals is possible with this technique, fertility in farm animals may be expected toward the upper side. By improving the production efficiency of animals, estrus synchronization provides more economic returns to the owner. In the present study, during winter, the overall range of birth weight of male calves varied from 16-49.7 kg and that of female calves varied from 29.0-47.0 kg with overall range of birth weight of male and female calves varied from 16.0-49.7 kg. During spring, the overall range of birth weight of male calves varied from 37.7-45.8 kg and that of female calves varied from 27.0-44.0 kg with overall range of birth weight of male and female calves varied from 27.0-45.8 kg. During summer, the overall range of birth weight of male calves varied from 31.0-42.0 kg and that of female calves varied from 32.0-39.0 kg with overall range of birth weight of male and female calves varied from 31.0-42.0 kg. During autumn, the overall range of birth weight of male calves varied from 11.4-48.0 kg and that of female calves varied from 28.0-42.0 kg with overall range of birth weight of male and female calves varied from 11.4.0-48.0 kg. The average birth weight of male calves was the highest in the season of winter (38.6 Kg), followed by spring (37.47), autumn (35.83) and summer (34.61). The average birth weight of female calves was the highest in the season of spring (38.55 Kg), followed by winter (37.33), summer (35.72) and autumn (34.3 Kg). The overall average birth weight of male and female calves was the highest

in the season of spring (37.92 Kg), followed by winter (37.81), summer (35.33) and autumn (35.29 Kg). In the present study, five cases of still birth and eight mortality upto 2 months of age were reported during the year. Significant basic risk factors associated with PM (Peri-natal mortality) following all calvings include genetic variables such as calf sire, sire breed, dam breed, inbreeding and gestation length (Mee, 2004; Johanson and Berger, 2003, Heins *et al.*, 2003, Kindahl *et al*., 2002; Meyer, 2001; McNeil *et al*., 1989). The primary determinant of whether a herd had high or low PM is not management factors before calving, but rather calving management (Drew, 1988). Simple nursing techniques such as warming, drying, provision of extra colostrums, shelter, stimulation, and extra mothering attention increase calf survival rate (Garry, 2004; Mee, 2004). The present study further revealed that there are considerable monthly and seasonal variations in calving pattern of buffaloes. The calving distribution can be controlled by estrous synchronization technique, however, inducing calving may cause retained placenta, lower milk production and other problems (Mansell *et al*., 2006; Peters and Poole, 1992). Induction was also associated with low pregnancy rates in the next breeding (Peters and Poole, 1992).

4. Conclusion

It was concluded that there are considerable monthly and seasonal variations in calving patters of buffaloes as the highest number of calvings occurred in autumn followed by winter, spring and summer. The average birth weight of calves was highest in the month of February and lowest in the month of June. The study further concluded that overall average birth weight of male calves was slightly higher than those of female calves. Close and rigorous examination of buffalo i.e. rectal temperature and performing rectal palpation of the genital tract during the first ten days post-partum to detect uterine or other infections is recommended.

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