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Effect of Pregnancy on Lactation Milk Value in Dairy Buffaloes

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ABSTRACT : Buffalo are a major source of milk production, contributing 12.1% in the World and 38.0% in Asia. The buffaloes are kept under peri-urban farming systems to produce milk for urban populations. Breeding is delayed in these herds to get more economic benefit because farmers believe that the pregnancy decreases milk production. The lactation milk value has been studied in this paper as an economic indicator. Complete milk yield records of 3,304 buffaloes was collected from a group of state farms. Economic traits including lactation yield, lactation length, calving interval (CI), dry period and milk yield per day of calving interval (MYPDCI) were derived from the data. The animals were grouped according to parity number (1-3), service period (G1 to G4, conceiving during <150, 150-200, 200-300 and >300 days post calving) and yield levels (HMY>2,500; MMY 2,001-2,500; and LMY 1,500-2,000 liters/ lactation). To study the effect of pregnancy on milk composition a research trial was conducted at a medium size private dairy farm, using forty lactating buffaloes of three yield levels and four service period groups, as described already. Milk was sampled on alternate weeks and analyzed for fat and protein contents (%). For quantifying the value of milk produced during a lactation period, the value corrected milk (VCM) was determined and converted to lactation milk value (LMV). Group means were compared for various parameters. Highest milk yield (2,836.50±15.68 liters/lactation) was recorded in the HMY animals of G4 group while lowest milk yield of 1,657.04±18.34 liters/lactation was found in LMY of G1. Lactation was significantly increased with the extending of service period. The shortest dry period was recorded in HMY, parity 1, G1 animals and the longest in parity 2, MMY, G4.The CI was shortest in HMY, parity 1, and G1 animals and longest in LMY, parity 3, G4 buffaloes. The HMY, parity 2, G1 buffaloes showed the highest MYPDCI and the lowest value was recorded (6.53±0.17 vs. 2.76±0.04 liter/day) for LMY, parity 1, G4 buffaloes. The VCM decreased with the delayed conception. This decreasing trend was higher in respect of the total yield but decrease in the VCM was smaller due to the increasing levels of fat and protein in the milk. The gap between the various production classes was reduced based on the VCM as compared with the yield per day of CI. LMV showed a consistent decline with extending service period in all three production groups. The study suggests that CI increased with delayed conception, showing a consistent trend in the low, moderate and high yielding buffaloes. There was a coherent declining pattern of milk yield with delaying conception, associated with prolonged CI. An animal conceiving at a later stage of lactation showed a decline in financial returns of 24 to 27% compared with those conceiving earlier. (**Key Words :** Pregnancy, Lactation Milk Value, Dairy Buffaloes, Reproduction)

INTRODUCTION

Buffalo is the major source of milk production contributing 12.1% in World, 38.0% in Asia, 55.0% in India, 66.6% in Pakistan, 16.4% in China, 50.8% in Egypt and 65.2% in Nepal's total milk production. In addition to the milk, the buffalo contributes 1.3, 2.8, 24.4, 26.9, 0.6, 21.2 and 51.8% of the total meat, which is a by-product of buffalo farming, in the aforementioned regions (FAOSTAT, 2007). The Indo-Pak Subcontinent possesses the best dairy buffalo breeds, named as Nili-Ravi of Pakistan and Murrah of India. Average milk yield of buffaloes in the two countries is 1,909 and 1,407 kg per lactation. It has been anticipated that the buffaloes will be increasingly used for milk and meat production in Asia, especially in the densely populated countries of Indian Subcontinent and China (Ranjhan and Qureshi, 2006).The animals are kept under peri-urban and rural farming systems with the primary aim to produce milk for utilization by the urban and rural populations. China has introduced dairy characteristics in their swamp buffaloes through cross breeding with dairy buffaloes form India and Pakistan (Burghese, 2006). The

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Table 1. Distribution of animals according to parity, yield class and service period

Parity and production class*	Service period (days)				
	<150	150-200	200-300	>300	Total
Parity 1					
HMY	46	76	91	91	304
MMY	81	93	100	100	374
LMY	65	63	94	133	355
Total	192	232	285	324	1,033
Parity 2					
HMY	53	76	91	89	309
MMY	95	102	112	110	419
LMY	63	61	237	148	509
Total	211	238	440	347	1,236
Parity 3					
HMY	51	73	89	89	302
MMY	94	99	111	112	416
LMY	65	62	114	76	317
Total	210	234	314	277	1,035
G. Total	613	704	1,039	948	3,304

* HMY ≥2,500, MMY = 2,001-2,500, LMY = 1,500-2,000 liters per lactation.

milk yield per lactation was 1,423 and 2,326 kg for the two breeds, respectively from F_2 generation. Average milk yield per lactation of Pakistani Dairy Buffalo ranged from 1671 to 3,988 liters (Syed et al., 1996). A higher milk yield of 3,700 kg per lactation period of 300 days has also been reported in nearly 14 percent of the registered buffaloes under progeny testing program in Pakistan (Asghar et al., 1992). Buffaloes, because of their higher milk fat content than cattle, are extensively reared in Pakistan on small scale for family consumption of milk, with the surplus milk being sold to compensate the family budget. However, during recent years, rearing of buffalo as a commercial dairy animal on larger scale has been popularized in Pakistan and the number of commercial dairy farms has shown a tremendous increase. Syed et al. (2003) concluded that commercial dairy farmers in and around Peshawar did not take interest in rebreeding their buffaloes due to fear of drastic decline in yield after conception. They usually miss heat deliberately and thus several valuable animals loose their reproducing capabilities, as they are not provided a chance to conceive and propagate well in time. Total losses due to under-managed health, nutrition and reproduction coupled with the hostile marketing system causes an annual loss of US$ 10 billion to the Pakistan's economy (Qureshi, 2002).

Milk quality is indicated by somatic cells count (SCC). Dang et al. (2007) reported that, as in cows, the change in buffalo milk SCC and immunity of the mammary gland is disturbed during both involution and postpartum. Prolactin is needed for lactogenesis. Modal et al. (2007) found that during summer, prolactin levels were higher in nonlactating buffaloes.

Pregnancy has been shown to cause a drain of nutrients from the main pool of the body, sparing little for the other functions of the body. The growing fetus on one hand, procures more nutrients for its development (Bell et al., 1995). And on the other, its presence in the body of a lactating animal puts further stress in form of hormonal changes (Bachman et al., 1988; Aker, 20002), expanding space requirements. In addition, the fetus acts as a foreign body, having antigenic property, interacting with the maternal immune system (Hunter and Einer-Jensen, 2003). Resultantly, the lactation synthesis and reproductive physiology are likely to be affected adversely. These two parameters carry significant economic importance and lead to depression of the associated economic traits in dairy animals.

In above studies the effects of pregnancy on milk production have been investigated on the basis of data from dairy cows. This information can not be applied exactly to dairy buffaloes due to the difference in species, climate and socio-economic conditions of the farmers. In addition, other economic traits indicating the productivity of dairy animals, as affected by pregnancy, need to be documented in buffaloes. This paper reports the adverse effects of pregnancy on lactation milk value of dairy buffaloes.

MATERIALS AND METHODS

Data collection and management

Data on milk yield by using the records of 3,304 buffaloes maintained at a large state farm during the years 1995-2005. The management system for health, nutrition and reproduction was similar at all farms. Complete milk yield records of 3,304 buffaloes was collected .Economic traits derived from the data were lactation yield, lactation length, calving interval, dry period and yield per day of calving interval.

Table 2. Mean (±SE) lactation yield of dairy buffalo having various service periods*

Parity	Prod class	Service period (days)			
		<150	151-200	201-300	>301
1	HMY	2,576.98^{c}±28.23	2,618.23^{b}±21.43	2,692.64^{a}±26.47	2,616.52^{b}±33.78
	MMY	2,182.64^{d}±26.06	2,233.67^{c}±29.03	2,301.80^{b}±30.93	2,332.87^{a}±42.56
	LMY	1,588.02^{c} ±18.88	1,641.94^{b}±27.75	1,699.16^{b}±32.26	1,797.05^{a}±24.90
2	HMY	2,634.67^{c}±54.73	2,695.08^{c}±26.77	2,772.45^{b}±27.65	2,851.70^{a}±21.24
	MMY	2,196.10^{d}±29.85	2,260.25^{c}±29.66	2,322.79^{b}±30.75	2,409.63^{a}±11.43
	LMY	1,675.38^{c}±34.38	1,736.00^{b}±37.34	1,797.34^{b}±29.12	1,857.54^{a}±17.19
3	HMY	2,668.73^{d}±59.03	2,732.15^{c}±29.78	2,811.69^{b}±25.21	2,896.74^{a}±18.86
	MMY	2,239.63^{d}±33.15	2,301.63^{c}±29.01	2,374.8^{b}±24.41	2,453.96 ^{a}±9.17
	LMY	1,709.14^{c}±33.74	1,771.65^{c}±37.10	1,842.17^{b}±29.60	1,921.55^{a}±14.40
Overall	HMY	2,630.07^{d}±19.10	2,682.42^{c}±16.15	2,760.11^{b}±16.09	2,836.50^{a}±15.68
	MMY	2,210.79^{d}±16.26	2,266.45^{c}±17.02	2,340.77^{b}±16.22	2,417.08^{a}±8.44
	LMY	1,657.04^{d}±18.34	1,716.43^{c}±21.00	1,789.28^{b}±18.25	1,848.68 ^{a}±12.91

* Means fallowed by different letters in same row are significantly different from one another (p<0.05).

** HMY≥2,500, MMY 2,001-2,500, LMY = 1,500 to 2,000 liters per lactation.

The animals were grouped according to parity number (1-3), conceiving during various stages of lactation (G1 = service period of <150; G2, 150-200; G3, 200-300; and G4 ≥300 days). The data were further grouped on the basis of yield levels (LMY 1,500 to 2,000; MMY 2,001-2,500; HMY, >2,500 liters/lactation) as shown in (Table 1).

Milk sampling, analysis and corrected values

The second part of this study was regarding the determination of milk composition with the advancement of lactation and pregnancy during different stages of conception. For this purpose, an experiment was conducted during the year 2005, at a medium-sized private buffalo farm, located in peri-urban areas of Peshawar, Pakistan. Total number of forty lactating buffaloes divided into three production classes: HMY, >2,500; MMY 2,001-2,500; LMY, 1,500 to 2,000 liters/lactation and four conception groups (G1 = service period of <150; G2, 150-200; G3, 200-300; and G4≥300 days) were used in this investigation. Twice a day milking was practiced at 4 am and 4 pm. Milk yield was recorded on alternate weeks and sampled for determination of milk composition through ultrasonic milk analyzer (model Ekomilk Total Ultrasonic Milk Analyser, Bullteh 2000, Stara Zaqora, Bulgharia), using manufacturer's instruction. Mean milk fat and protein (%) were used for tabulating the output, reporting distribution of the data among various yield groups and service periods.

In order to quantify the value of milk produced during a lactation period by the buffaloes conceiving during various stages of lactation, the MYPDCI was converted to VCM using the fallowing formula as reported by Arbel et al. (2001):

$$\text{VCM (kg)} = -0.05\times\text{milk (kg)} + 8.66\times\text{fat (kg)} + 25.98\times\text{protein (kg)} \qquad (1)$$

$$\text{LMV (US\$)} = \text{VCM}\times 400\times 20/60 \qquad (2)$$

Where LMV is the lactation milk value, VCM is value corrected milk, 400 is the length of ideal calving interval in buffaloes (days), 20 is the current wholesale price of milk in Pakistani rupees and 60 is the approximate conversion factor (US$ 1 = Pak-Rs.60).

Statistical analysis

Lactation records from 3,304 buffaloes belonging to three parities, three yield classes and four service periods, were analyzed using the procedures described by Steel and Torie, (1980). Means, variances, standard errors of all the combinations of parities, production classes and groups were calculated. Group means within parities-production-classes combinations were compared using t-test. As heterogeneity of variances was suspected and the number of records varied for the different combinations of groups, classes and parities; F-test was used to find out if variances are equal or not. When the variances were equal, pooled variance (S_p^2) was used to calculate t using the following formula:

$$t = \frac{\overline{Y}_1 - \overline{Y}_2}{\sqrt{S_P^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \qquad (3)$$

When variances were not equal, variances from the two groups were used to calculate t using the following formula:

$$t = \frac{\overline{Y}_1 - \overline{Y}_2}{\sqrt{\left(\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}\right)}} \qquad (4)$$

Table 3. Mean lactation length of dairy buffalo conceived at various stages of lactation*

Parity	Prod class**	Service period (days)			
		<150	151-200	201-300	<301
1	HMY	291.59[c]±2.76	292.77[c]±2.59	299.10[b]±1.60	329.12[a]±3.03
	MMY	288.96[c]±2.40	287.83 [c]±2.27	299.60[b]±1.53	331.87 [a]±5.90
	LMY	293.08[d]±2.22	285.00[c]±3.06	297.97[b]±1.34	334.63[a]±4.19
2	HMY	291.53[c]±2.70	292.77[c]±2.59	299.10[b]±1.60	365.52[a]±62.18
	MMY	287.35[c]±1.84	289.04[c]±2.15	298.92 [b]±1.48	328.21[a]±3.29
	LMY	288.32[c]±2.38	291.39[c]±2.88	294.05 [b]±1.03	335.21[a]±3.80
3	HMY	292.59[c]±2.64	292.84[c]±2.63	299.36 [b]±1.58	334.08[a]±3.42
	MMY	292.40[c]±1.91	289.44[c]±2.20	300.96 [b]±1.59	328.39 [a]±3.25
	LMY	294.29[c]±2.08	291.33[c]±2.83	299.60 [b]±1.74	333.30[a]±5.34
Overall	HMY	291.94[c]±1.53	292.81[c]±1.49	299.33[b]±0.91	333.18[a]±2.12
	MMY	289.60[c]±1.13	288.79[c]±1.26	299.69 [b]±0.90	328.47[a]±1.90
	LMY	291.92[c]±1.31	289.23[c]±1.71	296.95[b]±0.81	334.59[a]±2.47

* Means fallowed by different letters in same row are significantly different from one another (p<0.05).

** HMY≥2,500, MMY = 2,001-2,500, LMY = 1,500-2,000 liters per lactation.

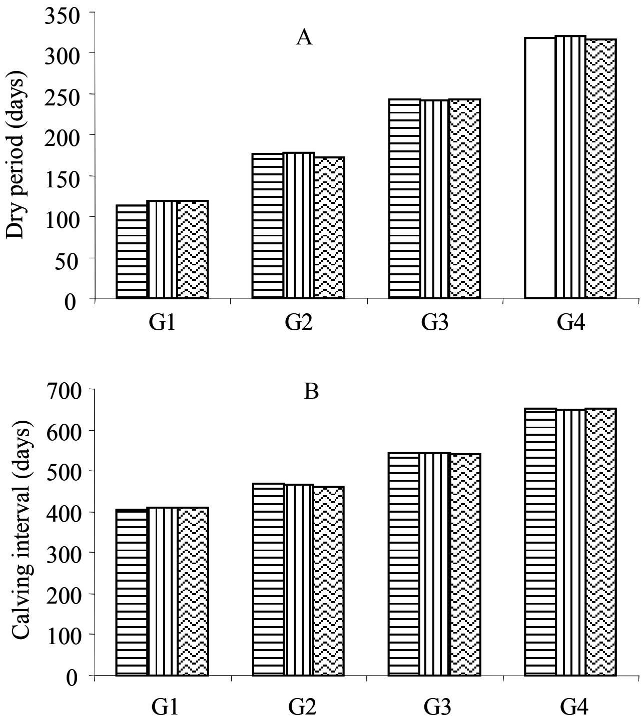

Figure 1. Dry period (A) and calving interval (B) for animals conceiving at various stages of lactation (G1 = conceiving during 90-150 days postpartum, G2 = conceiving during 151-200 days postpartum; G3 = conceiving during 201-300 days postpartum; G4 = conceiving after 300 days postpartum; in three yield classes {high: light horizontal; moderate: light vertical low yielders: zig zag}. Means for all the three yield classes were different (p<0.05) at various stages of conception, with the ranking order of D, C, B and A.

RESULTS

Lactation yield and length

Mean lactation yield was categorized into various parities, yield classes and service groups as given in Table 2. In overall parities, the highest milk yield of 2,836.50±15.68 liters per lactation was recorded in the HMY of G4 group while lowest milk yield of 1,657.04±18.34 liters/lactation was reported in the LMY buffaloes of G1 group. In MMY and LMY buffaloes and in the data pooled for overall parities a decreasing milk yield was observed in G1 through G4 animals with a consistent trend. However, HMY animals in parity 1 showed a decreasing milk yield pattern in G3 followed by G2, G4 and G1. These results indicate that lactation yield increased with the increasing service period in a linear pattern.

Results regarding lactation length in buffaloes conceived during various stages of lactation for the three parities and production classes are given in Table 3. Lactation was significantly longer in G4 buffaloes followed by G3, G2 and G1, respectively. This pattern was observed in all the production classes suggesting an increase in lactation length with the increasing service period.

Dry period and calving interval

Parity-wise mean dry period of high, moderate and low yielding buffaloes conceived during different stages of lactation is given in Figure 1(A). The shortest dry period (111.18±6.40 days) was recorded in HMY, parity 1, G1 animals and the longest period (320.41±3.54 days) was recorded during parity 2 in MMY, G4 animals. Buffaloes in G4 group had a significantly longer dry period as compared with the other three groups.

Parity-wise mean CI of high moderate and low yielding buffaloes conceived during different stages of lactation is given in Figure 1(B). CI ranged from 402.77±5.25 days in HMY, parity 1, G1 animals and the longest CI was found in the LMY, parity 3, and G4 buffaloes (652.46±5.67 days). The calving interval increased with delayed conception, showing a consistent trend, in the low, moderate and high yielding buffaloes.

Table 4. Mean yield per day of calving interval in dairy buffalo conceived at various stages of lactation*

Parity	Prod class**	Service period (days)			
		<150	151-200	201-300	>301
1	HMY	6.41^{a}±0.10	5.63^{b}±0.06	4.98^{c}±0.07	4.04^{d}±0.06
	MMY	5.36^{a}±0.08	4.76^{b}±0.07	4.27^{c}±0.07	3.59^{d}±0.08
	LMY	3.85^{a}±0.06	3.57^{b}±0.06	3.13^{c}±0.07	2.76^{d}±0.04
2	HMY	6.53^{a}±0.17	5.79^{b}±0.08	5.11^{c}±0.08	4.38^{d}±0.05
	MMY	5.41^{a}±0.09	4.92^{b}±0.07	4.30^{c}±0.07	3.72^{d}±0.03
	LMY	4.12^{a}±0.09	3.77^{b}±0.09	3.32^{c}±0.06	2.86^{d}±0.03
3	HMY	6.53^{a}±0.17	5.76^{b}±0.07	5.20^{c}±0.07	4.45^{d}±0.04
	MMY	5.45^{a}±0.09	4.89 ^{b}±0.07	4.40^{c}±0.06	3.79^{d}±0.03
	LMY	4.15^{a}±0.08	3.83^{b}±0.09	3.44^{c}±0.07	2.95^{d}±0.03

* Means with different letters in same row are different from one are other (p<0.05).
** HMY≥2,500, MMY = 2,001-2,500, LMY = 1,500-2,000 liters per lactation.

Table 5. Mean values for milk fat and protein contents (%) of buffalo conceived during various stages of lactation*

Milk contents	Production levels**	Service period (days)			
		<150	150-200	200-300	>300
Fats	HMY	6.22^{c}±0.21	6.51^{b}±0.06	6.87^{a}±0.25	6.90^{a}±0.03
	MMY	6.34^{c}±0.27	6.63^{b}±0.03	6.90^{a}±0.23	7.10^{a}±0.39
	LMY	6.36^{c}±0.36	6.66^{b}±0.07	6.93^{a}±0.18	7.10^{a}±0.33
Protein	HMY	3.41^{c}±0.02	3.52^{b}±0.03	3.60^{a}±0.02	3.60^{a}±0.02
	MMY	3.40^{c}±0.03	3.53^{b}±0.02	3.61^{a}±0.02	3.64^{a}±0.03
	LMY	3.40^{c}±0.02	3.55^{b}±0.03	3.62^{a}±0.03	3.65^{a}±0.02

* Means with different letters in same row are different from one are other (p<0.05).
** HMY ≥2,500, MMY = 2,001-2,500, LMY = 1,500-2,000 liters per lactation.

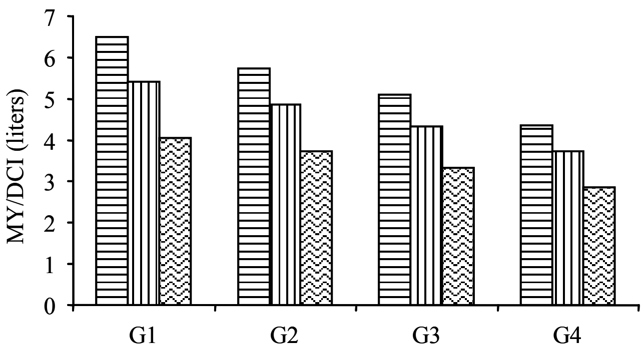

Figure 2. Overall milk yield per day of calving interval (MY/DCI) for animals conceiving at various stages of lactation (G1 = conceiving during 90-150 days postpartum, G2 = conceiving during 151-200 days postpartum; G3 = conceiving during 201-300 days postpartum; G4 = conceiving after 300 days postpartum; in three yield classes (high: light horizontal,; moderate: light vertical low yielders: zig zag). Means for all the three yield classes were different (p<0.05) at various stages of conception, with the ranking order of D, C, B and A.

Milk yield per day of calving interval

Parity wise mean milk yield per day of calving interval (MYPDCI) of high moderate and low yielding buffaloes conceived during different stages of lactation is given in Table 4. The HMY, parity 2, G1 buffaloes showed the highest yield per day of calving interval and the lowest value was recorded (6.53±0.17 vs. 2.76±0.04 liters per day) for LMY, parity 1, G4 buffaloes. Across all the parities and yield classes, the mean MYPDCI was significantly higher in buffaloes conceived in G1 buffaloes followed by G2, G3 and G4 buffaloes. It showed a consistent declining pattern of MYPDCI with the delaying conception, associated with prolonged calving interval (Figure 2).

Table 6. Mean value corrected milk (kg/day) in dairy buffalo conceived at various stages of lactation

Prod classes*	Service period (days)			
	>150	150-200	200-300	<300
HMY	8.92	8.18	7.54	6.46
MMY	7.48	6.93	6.42	5.63
LMY	5.59	5.38	4.97	4.29

* HMY≥2,500, MMY = 2,001-2,500, LMY = 1,500-2,000 liters per lactation.

Milk fats and protein contents

Table 5 reports values of milk fat and protein contents in three production classes for the four service period groups of buffaloes. Milk fat and protein contents decreased across all production classes from longest to the shortest service period. Fat and protein values for longer service periods (G4 and G3) animals were highest and statistically similar followed by buffaloes having shorter service periods (G2 and G1). It may be concluded that fat and protein contents increase with the extending services periods.

Milk corrected values

Table 6 reports the mean value corrected milk

Table 7. Lactation milk value (Rs) of buffaloes conceived during various stages of lactation

Production classes*	Service period (days)			
	<150	150-200	200-300	>300
HMY	71,360	65,440	60,320	51,680
MMY	59,840	55,440	51,360	45,040
LMY	44,720	43,040	39,760	34,320

** HMY ≥2,500, MMY = 2,001-2,500, LMY = 1,500-2,000 liters per lactation.

production (VCM, kg/day) across various production levels and service periods. VCM decreased with the increasing service period, i.e. the delayed conception. This decreasing trend was higher in respect of the total milk yield but decrease in the VCM was smaller due to the increasing levels of fat and protein contents in the milk. The gap between various production classes was reduced while looking at the VCM as compared with the yield per day of calving interval. Table 4 and 5 indicate that in all production classes there was a decrease in the milk yield but and an increase in the fat and protein contents with the increasing service period.

LMV milk values are given in Table 7, showing a consistent decline with the extending service period from <150th day of lactation up to >300th day. This trend was seen in all the three production groups. The decrease in LMV was 27.6, 24.7 and 23.3% respectively, in the high, moderate and low yielding buffaloes. These results indicate that an animal conceiving at an earlier stage of lactation returns better in monetary terms than those conceiving later.

DISCUSSION

Lactation yield and length

The present study showed a consistent and significant increase in lactation yield in animals conceiving in early lactation, than those conceiving at the end of lactation in all production classes and parities. The low yield in early bred animals may be due to the effect of pregnancy on lactation. Pregnancy has been reported to have a negative effect on milk yield of dairy cows due to hormonal changes, causing regression of the mammary gland (Akers, 2002), and nutrient requirements of the fetus reduce the available nutrients for milk production (Bell et al., 1995). The effect of pregnancy is small at the beginning of gestation and becomes greater at later stages of gestation when growth and nutrient requirements of the conceptus are increased. Significant effect of pregnancy on milk yield is usually observed from the 5th month of gestation onwards (Olori et al., 1997; Bormann et al., 2002; Roche, 2003).

The present results showed that the impact of pregnancy on milk yield varies with conception at various stages of lactation. The effect was higher in early lactation followed by mid late and after lactation. Olori et al. (1997) reported that the effect was higher in mid lactation than in late lactation in cattle. Buffaloes that conceived after lactation had significantly higher yield and longer lactation length. Lactation in these animals was not under the influence of pregnancy and therefore performed at maximum of their potentials due to prolonged lactation.

The present study shows a significant increase in lactation length with delayed conception. In dairy cattle possibility of extending lactations has received attention as an alternative to maximizing peak yield and minimizing calving interval (Knight, 1997, 1998). Extending lactations can be accomplished by planned increase in calving interval (Bertilsson et al., 1997), for example, and by use of bovine somatotropin to increase daily yield (van Amburgh et al., 1997). Expected benefits of extended lactations, defined as calving every 18 months or more, might include reduction in number of excess progeny, insemination costs, and in number of days dry within the cow's lifetime (FAWC, 1997).

Nevertheless, one approach to extend the lactation is to alter the shape of the lactation curve to produce flatter, more persistent, prolonged lactations (FAWC, 1997). In dairy buffalo the delay in postpartum is mainly associated to anoestrus, poor heat detection, poor quality of semen or premedictated for more milk in current lactation (Syed et al., 2003). The problems may be broadly categorized into management, physiology and environment. Buffaloes belong to farmers with poor socio-economic conditions, so management inputs are not appropriate, putting the animals under stress. Physiological disorders of the animal are its species characteristic and may be overcome through improved practices. Environmental stress on the animal contributes to summer infertility reflected by lower progesterone levels (Qureshi and Ahmad, 2007) and this type of stress may be overcome through cooling and feed supplementation.

Geeta et al. (2006) concluded that 240 days was ptimum first lactation length required for genetic evaluation of Indian Murrah buffaloes for genetic persistency of first lactation milk yield.

The present study suggests that delayed breeding favors higher milk production during a prolonged lactation. It gives an economic edge to the late conceiving buffaloes under the peri-urban dairying where the land and operational inputs are expensive. Under such a system the rearing of pregnant and low yielding animals is not feasible, and these animals need to be shifted to remote areas with less expensive operational inputs.

Dry period and calving interval

The present study concluded that delayed conception prolonged dry period and vice versa. The shorter service period favored birth of another calf followed by lactation. While the traditional farming system with the taboo of intentional delayed breeding for the fear of milk decline with the onset of pregnancy, leads to a prolonged service period and dry period. The peri-urban dairy farmers can not sustain by keeping animals in dry period and the lack of any organized system for breeding of these buffaloes, leads them to the slaughter house.

Present findings were supported by the results of Tiwana et al. (1994), Usmani et al. (1997) and Sujit et al. (2000). A short dry period will not provide adequate rest and time for mammary gland regeneration, while long dry periods will result in greater feed costs with no income from milk production. Long dry periods can also result in fat animals that are more prone to problems with health and reproductive performance.

Same is the status of calving interval which increased with delayed conception, showing a similar trend, in the low, moderate and high yielding buffaloes. Calving interval is one of the major traits affecting the economic efficiency of the herd. Deliberate or natural delay in breeding of dairy animals directly effect calving interval and in turn the net profit from an animal (Syed et al., 2003). Tiwana et al. (1994), Nasir et al. (1994), Usmani et al. (1997) and Sujit et al. (2000) reported that first calving interval was significantly affected by the service period in dairy buffalo. Shiv et al. (2001) reported that the affect of service period on first calving interval was less significant in Murrah buffalo.

Panda et al. (2006) found that vitamin E supplementation in Murrah buffaloes might improve the total antioxidant status at parturition which may reduce calving interval.

Prolonged calving interval in buffaloes is definitely a management problem resulting from delayed breeding. The rearing cost of a dry buffaloes under the peri-urban dairying is high and not affordable by the resource-constrained farmer. Breeding may be delayed by prevalence of silent estrus, summer infertility, low progesterone levels (Qureshi and Ahmad, 2007), lower LH levels (Batra and Pandey, 1983) and suckling (Perera et al., 1992). Seasonality of breeding and nutritional status are the additional contributing factors. (Qureshi et al., 1999 a, b) The prolonged calving interval is not desirable in buffalo due to its lower milk yield level, as it will lead the animal to slaughter house instead of rebreeding.

Milk yield per day of calving interval

The present study showed a stable declining pattern of MYPDCI with the delayed conception, associated with prolonged CI. It indicates that delayed breeding reduces the economic weightage of buffalo in terms of milk productivity because the total yield is distributed evenly throughout a prolonged calving interval in a delayed breeder. Buffalo farmers deliberately delaying post partum breeding of their animals receive a high lactation yield but face a heavy loss due to significant reduction in MYPDCI. This economic loss was greater in HMY followed by MMY and LMY, respectively.

The optimal calving interval for dairy buffaloes in Pakistan was found to be 12-13 months (Shah et al., 1991). Losses caused by suboptimal calving intervals were Pakistani Rs. 9-14 per extra day per calving interval. Losses for forced replacement was Rs. 133 per buffalo and the lactation persistency curve had a stronger influence on the losses caused by longer calving intervals than change in milk prices. Syed et al. (2003) reported that yield per day of calving interval was positively correlated with lactation yield and negatively correlated with CI. In dairy cows, Arbel et al. (2001) examined the effect of extended CI on production and profitability of high-yielding cows (n = 937) and reported that primiparous and multiparous cows with extended lactations were more profitable. A delay of 60 days, with respect to the usual VWP has economic advantages and allows the farmer an option for decisions regarding individual cows.

Weller and Folman (1990) stated that late conception reduced profitability and showed early breeding to be advantageous, especially if the value of a calf is high. Bar-Anan and Soller (1990) reported that in high-yielding herds the highest productivity in the current and subsequent lactations was achieved by primiparous cows that were inseminated not earlier than 70 days post partum and by multifarious cows at 41 to 90 days open. Heimann (1984) advocated prolonged CI, particularly for high-yielding cows with good persistency. As buffalo is not a good producer, its prolonged calving interval will not benefit the farmer in real sense as it will lead to a decreased MYPDCI and decreased re-placement heifer cost.

Milk corrected values

This study indicates a decrease in the milk yield but and an increase in the fat and protein contents with the increasing service period. However, LMV showed a declining trend. It suggests that an animal conceiving at an earlier stage of lactation returns better in monetary terms than those conceiving later, which contradicts the prevailing opinion among the conventional farmers, who desire to delay breeding for the loss of milk with the onset of pregnancy. Although in shorter term there is an immediate saving in milk but prolonged lactation and calving interval the financial returns are reduced in late conceivers.

CONCLUSIONS

The calving interval increased with delayed conception, showing a consistent trend, in the low, moderate and high yielding buffaloes. There was a consistent decline in milk yield per day of calving interval with delayed conception, associated with prolonged calving interval. An animal conceiving at a later stage of lactation showed a decline in financial returns by 24 to 27% than those conceiving early.

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