Studies of Some Factors Influencing Milk Production of Egyptian Buffaloes in Upper Egypt

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ABSTRACT

The aim of this study was to evaluate the effect of some factors on milk yield and lactation length in Egyptian buffaloes. A number of 439 milk records of 138 Egyptian buffaloes maintained at the Experimental Farm of the Animal Production Department, Faculty of Agriculture, South Valley University, Qena Governorate were used during the years of 2002 to 2012. The effects of parity, calving season, sex of calf and days open on milk yield and lactation length of these buffaloes were examined. The overall means of milk yield and lactation length were 1840.4 ± 90.9 kg and 260.8 ± 21.7 days, respectively. Significant effect ($P<0.05$) of parity was found on milk yield. Results illustrated that milk yield was lower in the first lactation compared to those in 2 nd, 3 rd and 4 th lactations. Total milk yield increased ($P<0.05$) with increasing lactation length. Also, calving season had significant ($P<0.05$) effect on milk yield. Spring and winter calvings showed longer lactation length and higher milk yield than summer or autumn calvings. Milk yields of buffaloes conceived within 31–100, 101–200 and 201–300 days after calving were not significantly different. However, milk yield per lactation of the animals conceived >300 days after calving was significantly ($P<0.05$) higher (2066.6± 88.5 kg) than that of the animals conceived within31-100 days after calving (1846.1±77.5 kg). The lactation length (260.8±21.7days) was not affected by parity, calving season, days open and calf sex. The present results indicated that synchronization calving of buffaloes during spring and winter in Upper Egypt led to increased lactation length and milk production, which can reflect positively on net profit of farmers.

Keywords: Egyptian buffalo, milk yield, lactation length, parity, calving season, days open, sex of calf.

INTRODUCTION

The Egyptian buffaloes are integral part of livestock agriculture in Egypt over the years (Bhat, 1992) producing milk, meat and draft power for agriculture operations. In Egypt, buffaloes are considered as the main dairy animals, contributing more than 50% of the annual milk production (FAO, 2007). However, buffalo productive and reproductive performance suffer from a number of genetic and non-genetic problems that include feed, silent ovulation, delayed maturity, breeding seasonality, prolonged generation interval, low conception rate and inactivated ovaries. These problems cause low efficiency of productive and reproductive performance. These limitations emerge during the hot summer season and when food availability and quality are reduced and fertility significantly decreased (De Rensis et al.,2008). Generally, buffaloes are considered as low milk producers compared to foreign dairy cows under various Egyptian environmental conditions. In spite of this fact, buffaloes are more adapted to the Egyptian conditions.

Milk yield and lactation length as main traits depende on both genetic and non-genetic factors for improving dairy animals. Several non-genetic factors as feed, season of calving, lactation period, dry period, calving interval, and days open affect milk production. Most of these traits have lower heritability estimates, indicating its association with a large degree of variation due to numerous of environmental factors (Tonhati *et al.*,2000).

In addition, milk productive traits in buffaloes showed normal variations according to the region of the country. Therefore, the aim of the present study was to evaluate the effects of parity, season of calving, days open and sex of calf on milk yield and lactation length of Egyptian buffaloes under Southern Egypt conditions.

MATERIALS AND METHODS

The Egyptian buffaloes maintained at the experimental farm of Animal Production Department, Faculty of Agriculture, South Valley University, Qena Governorate, Upper Egypt, represent the experimental herd of this study. Animals were fed according to their milk production on Egyptian clover from December to May, and were concentrate feed mixture with wheat or rice straw from June to November. Concentrates were offered individually twice daily at 6.0 a.m. and 6.0 p.m during milking times. Animals were machine - milked and milk yield was recorded individually for each milking and each animal. Fresh water was available to animals at all time in addition to block minerals. Animals were vaccinated against foot and mouth disease, hemorrhagic septicemia and black quarter disease every year. Monthly bath against ecto-parasites were also applied. The buffaloes were housed in open sheds . Natural mating was used, and breeding dates, calving dates and sex of calf

born were recorded. Calves were weaned at 4 months of age . Heifers were bred for the first time at 22 months of age. Buffaloes were usually mated two months after calving by sires chosen at random Data were classified according to parity, season of calving, lactation length, days open and sex of the calf. Year was divided into four seasons, *viz.* Winter, (December to February), Spring (March to May), Summer (June to August) and Autumn (September to November).

Records of buffaloes which calved normally during 2002 to 2012 were used in this study. A total of 439 normal lactation records were used for analysis from 138 buffalo cows. Information on date of birth, calving dates and calf sex, lactation number, milk yield per lactation and lactation length for each animal were used for statistical analyses.

The lactation length of buffaloes was classified into 7 groups as follows : 181 – 210 days (group 1), 211–240 days (group 2), 241 – 270 days (group 3), 271 – 300 days (group 4), 301 – 330 days (group 5), 331 – 360 days (group 6) and 361– 450 days (group 7).The days open of buffaloes was splited into four categories viz. 30–100 days (group1), 101– 200 days (group 2), 201– 300 days (group3), and >300 days (group 4).

The data were analyzed using General linear method of statistical analysis system, SAS [2001], Duncan multiple range test [1955] was carried out for comparison among means. Correlation coefficient was calculated between lactation length and milk yield.

Data were analyzed using the following model:

$Yij = \mu + Ti + eij$

Where :-

Yij = the individual observation;

μ = the overall mean;

Ti = the fixed effect of the i factor (parity, calving season, sex of calf , days open);

eij = Random error associated with individual observation and assumed to be independently and randomly distributed (o, δ).

RESULTS

The present results indicated that the age at first conception was 892.3 ± 66.8 days and the days open was 153.1± 47.1 days. Table 1 shows the overall means and standard errors of maximum and minimum air temperatures and relative humidity in the south valley region of Egypt during the study.

Results of Table 2. illustrated that the overall mean of milk yield was 1840.4 ± 90.9 kg per lactation and that of the lactation length was 260.8±21.7 days. Milk yield was lower in the first lactation and increased ($P<0.05$) progressively in the 2nd, 3rd and 4th lactations. Thereafter, the milk yield declined in the 5th, 6th and 7th lactations. Parity had an effect ($P \leq 0.05$) on milk yield.

Regarding the lactation length, Table 3 showed that the milk production increased with increasing lactation length. The lowest yield occurred at the lactation length less than 210 days, while the highest one occurred at lactation lengths >361 days. The differences were significant ($P<0.05$). In general, significant ($P<0.05$) positive correlation noted between lactation length and milk yield (r= 0.623).

Table1: Means (± SE) of air temperature, relative humidity and THI in the area of farm in south valley during the study period.

SEASON	AIR TEMPERATURE, °C			RELATIVE HUMIDITY, %			THI
	Max.	Min.	Mean	Max.	Min	Mean	
Winter	19.8±1.1	7.6±0.4	13.7±0.4	68.7±1.4	18.1±1.3	42.4±1.4	56.97±0.89
Spring	34.7±1.4	22.8±0.4	26.8±0.4	26.4±2.4	8.4±2.5	17.4±2.4	70.11±1.1
Summer	43.2±5.9	23.8±0.8	33.6±0.8	35.3±0.8	13.3±0.8	24.3±0.8	89.87±0.67
Autumn	32.2±4.1	17.4±3.0	25.1±0.3	58.8±5.0	24.5±0.4	41.7±1.1	73.78±0.73

THI = [(TDBx1.8)+32] – [0.55 x (RH/ 100) x(TDB X I.8) +32] - 58

Where THI =Temperature Humidity Index

TDB =Dry blub Temperature in °C

RH = Relatve Humidity in %

Table 2: Means of milk yield(± SE) and lactation length(±SE) of Egyptian buffaloes at different lactations.

Lactation number (parity)	Number	Lactation length, day	Milk yield, kg
1	118	257.2 ± 21.2 [a]	1629.0 ± 71.0 [b]
2	107	261.5± 21.8 [a]	1896.7 ± 67.0 [a]
3	84	264.3 ± 16.4 [a]	1926.5 ±83.9 [a]
4	54	265.5± 17.4 [a]	2003.8 ± 85.6 [a]
5	37	255.4± 11.2 [a]	1873.3 ± 74.0 [a b]
6	23	264.7 ± 12.5 [a]	1894.9 ±54.5 [a b]
7	16	256.9 ± 11.3 [a]	1659.0 ±95.0 [ab]
Overall mean	439	260.8 ± 21.7	1840.4 ±90.9

Means in the same column followed by different letters are significantly different ($p<0.05$).

Table 3: Means of milk yield (± SE) of Egyptian buffaloes as affected by lactation length.

Lactation length, days	Number	Milk yield, kg
181 – 210	48	1132.9 ±51.2e
211 – 240	78	1478.6 ±76.2d
241 – 270	108	1685.0 ±93.2cd
271 –300	84	1870.3 ±64.6c
301 –330	62	2122.0 ±73.1ab
331 –360	31	2053.3 ±66.3b
361 – 450	28	2541.0 ±86.0 a

Means with different superscripts in the same column differ significantly (P<0.05).

Season of calving had a significant (P<0.05) effect on milk yield of buffaloes (Table 4). The highest milk yield noted in Spring (2125.0 ± 60 kg) followed by winter (1844.6±72.1 kg), autumn (1763.6±58.6) and summer (1628.5± 86.9 kg). However, the milk yield did not differ significantly among autumn, winter and summer calvings.

Results in Table 5 indicate that milk yield and lactation length of animals related to days open. Milk yield of animals conceived >300 days after calving was significantly (P<0.05) higher than that of the animals conceived within 31–100 days after calving. Results in Table 5 also show that the lactation lengths according to the four service period categories were nearly similar.

Sex of calf (Table6) was in nearly normal ratio, where 49 % buffaloes gave female births and 51% gave male births. The buffaloes of male births produced 1852.6 ± 73.5kg milk per lactation and those of female births produced 1821.7± 66.7 kg milk per lactation.

As for lactation length; the overall mean of lactation length of 439 records of buffaloes was 260.8 ± 21.7 days (Table2). The lactation length was not affected by parity (Table 2), calving season (Table4), days open (Table5) and calf sex (Table6).

DISCUSSION

It can be noted that higher value of mean air temperature (33.6± 0.8^{O}C) was recorded in summer, while higher value of mean relative humidity (42.4±1.4 %) was recorded in winter. (Table 1). Temperature Humidity Index (THI) was calculated from ambient temperature and relative humidity according to Hahn *et al.* (2003).

The obtained average milk yield in the present study seem to be lower in most cases than that of north regions of Egypt (El Kirabi, 1995 and Borghese, 2005). The average milk yield per lactation in Egyptian buffaloes during the period from 2002 to 2012 was recorded as 1840.4 ±90.9 kg per lactation for an average lactation length of 260.8 ±21.7 days (Table 2). These results could be explained in general to role and degree of adaptation. Thus, these values can be explained in light of short lactation period, as a normal effect of climate which directly affected decline in feed intake with, subsequent decline in milk production. The same trend was noted in findings of Nigm (1996) and Mourad *et al.* (2005) using the Egyptian buffaloes as well as of Cady *et al.* (1983) and Khan and Chaudhry (2000) for lactating buffaloes.

Parity showed normal effect on milk yield to be lower in the first lactation and increased gradually in the 2nd, 3rd and 4th lactations, theirafter decreased in the 5th to 7 th lactation to form normal curve of lactation (Cady *et al.*,1983). Also, Afzal et al (2007) found that milk yield of Nili Ravi buffaloes was lower in the first lactation than yield in 2nd, 3 rd and 4 th lactations. Similar results were reported by Ahmad *et al.* (2009) .The average age at first conception in buffaloes of the present study was 892.3 ±66.9 days and this explained the incomplete body and udder growth at the time of first lactation, thus the full production potential was not reached till the 4th lactation. The decline in milk yield has been reported after 4th lactation in buffaloes (Ahmad and Shafiq 2002). No doubt the role of development of the body, udder and the adaptation of animals on subtropical climatic area explained these results (Tahir *et al.*, 1989 ; Bajwa *et al.* 2004 and Anwar *et al.* 2009).The lactation length was similar in the different parities in the present study. However, significant effect of parity on lactation length was recorded by Anwar *et al.* (2009). The difference may be due to a different level of production and different managerial conditions.

The positive and strong correlation between lactation length and milk yield was demonstrated in the present study (Table 4). Similar results were found between lactation length and milk yield in buffalo and cattle (Khan, 1997). Khan and Chaudhry (2000) observed that the overall relationship between lactation length and milk yield was quite linear in lactating buffaloes except for animals with shorter lactation length. Ahmad and Shafiq (2002) also noted that the regression coefficient of lactation length on milk yield was highly significant. However, the lactation length seemed to be shorter than the normal (305 day) or ideal one . Generally, improving management and feeding beside selection can play important role in

achieving this goal. In the case of the present study, more attention must be given to improve management and reduce the effect of temperature and humidity in this region .The present study showed no effect of season of calving on lactation length (Table 4) which supports the observations of Ghaffar *et al.* (1991), Chaudhry (1992) and Khan and Chaudhry (2000).

The animals that calved in spring showed the highest milk yield and those calved in summer showed the lowest . Similar results were reported by Khalil *et al* (1992). They found that buffaloes calved in spring recorded the longest lactation period and the highest total milk yield. These findings are in quite agreement with those of other studies in Egypt (Rahad, 1989) .The interaction effect between temperature and humidity during the four seasons explained the variation in milk yields related to each season, as well as the available green feed, to the animals. These results agree with those observed by Ahmed and Shafiq (2002) who reported that the highest milk yield in Egyptian buffaloes occurred during spring and winter (by calving during the mild period) and the lowest one occurred in summer (by calving during the hot period). Generally, the explanation of the effect of season of calving on milk yield is confounded by breed, the stage of lactation, climatic condition, and interaction between day light and ambient temperature (Thomas, 2004). Mohamed (2000) and Marai *et al.* (2009) reported that seasonal differences have less significant effect on milk yield by better feeding and management.

Sex calf at birth showed no effect on milk yield in the present study (Table 6). These results are in agreement with other studies. On the other hand , Chaudhry (1992) found that the male calvers buffaloes yielded higher milk per lactation than female calvers (2078 vs 1985 kg) due to a longer post partum estrous interval in buffaloes giving male calves at birth.

In spite of the lower milk yield related to short days open (31-100 days) than those related to the long days open (301-600 days), the milk yields were increased with small amounts (Table 5). It is important to note that the buffalo farmer believes that the milk yield decreases if they let their buffaloes to conceive during the first six months of lactation. However, longer days open is not considered economical from different directions (Din and Ahmad, 1987).

From the present results, it can be concluded that the calving of buffaloes should be synchronized, specially in upper Egypt during spring or winter to reduce the advanced effect of heat stress during summer on lactation length as well as on milk production, which can be positivly reflected on calves and net profit of farmers.

Table 4: Means of lactation length (±SE) and milk yield (± SE) of Egyptian buffaloes as affected by calving season.

Calving season	Number of calving	Lactation length, day	Milk yield , kg
Winter	133	267.8 ± 17.7 [a]	1844.6 ± 72.1 [a b]
Spring	88	267.0 ± 15.7 [a]	2125.0 ±60.0 [a]
Summer	32	248.7 ± 13.2 [a]	1628.5 ± 86.9 [b]
Autumn	186	259.4 ± 13.6 [a]	1763.6 ± 58.6 [b]

Means in the same column followed by different letters are significantly different ($p<0.05$).

Table 5: Means of lactation length (±SE) and milk yield (±SE) of Egyptian buffaloes as affected by days open.

Days open, day	Number	Lactation length, day	Milk yield, kg
31 – 100	156	256.3 ± 18.0 [a]	1846.1 ± 77.5 [b]
101 – 200	119	259.2 ± 15.0 [a]	1878.7 ± 85.0 [a b]
201 – 300	59	264.1 ± 15.4 [a]	2047.5± 66.6 [a]
Over 300	38	263.4 ± 17.3 [a]	2066.6 ±88.5 [a]

Means in the same column followed by different letters are significantly different ($p<0.05$).

Table 6: Means of lactation length (± SE) and milk yield (± SE) of Egyptian buffaloes as affected by calf sex.

Calf sex	Number of calving	Lactation length, day	Milk yield, kg
Female	220	258.6 ± 17.6 [a]	1821.7 ± 66.7 [a]
Male	219	262.0 ± 25.7 [a]	1852.6 ± 73.5 [a]

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الملخص العربى

دراسة بعض العوامل المؤثرة على إنتاج اللبن فى الجاموس المصري فى مصر العليا

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شمل البحث ٤٣٩ سجل إنتاج لبن ناتج من ١٣٨ جاموسة حلابة مصرية من مزرعة قسم الإنتاج الحيوانى بكلية الزراعة- جامعة جنوب الوادي بمحافظة قنا خلال مدة عشرة سنوات من ٢٠٠٢/١/١- ٢٠١٢/١/١ بهدف دراسة موسم الإنتاج وموسم الولادة وفترة التلقيح وجنس المولود على أنتاج الحليب الكلي وطول موسم الحليب في الجاموس المصري. تم تسجيل كل من حجم القطيع الكلى والعمر عند الولادة إضافة إلى الإنتاج اليومي والموسمي للحليب خلال فصول السنة. خلصت الدراسة الى تأثر إنتاج اللبن الكلي بصورة معنوية بكل من موسم الولادة وفترة التلقيح، بينما لم يكن لجنس المولود تأثير معنوي على إنتاج اللبن الكلي وطول موسم الحليب. و بلغ متوسط إنتاج اللبن الكلي 1840.4 ± 90.9 كجم، بينما بلغ طول موسم الحليب 260.8 ± 21.7 يوم.