Milk Production of Buffaloes and Causes of Calf Mortality under a Semi-Intensive Production System in Egypt

M. Mourad[1] S. Rashwan[1]

Key words

Bovinae - Buffalo milk - Yield factor - Calf - Mortality - Egypt.

Summary

Records of 71 buffaloes, raised under a semi-intensive production system in a university herd, collected from 1993 to 1999, were used to study the effect of some nongenetic factors on milk performance and causes of calf mortality. The averages of the milk yield, lactation length, calving interval, daily milk yield and proportion of lactation length on the calving interval were 1626 kg, 305 days, 431 days, 7.4 kg and 0.714, respectively. The calving season ($P < 0.05$) and parity significantly ($P < 0.001$) affected the milk yield. The calving interval as the only reproductive trait was significantly ($P < 0.001$) affected by the calving season. The year of calving had no significant ($P > 0.05$) effect on the traits studied. The daily milk yield and proportion of lactation length in the calving interval were not significantly ($P > 0.05$) affected by the calving year, calving season and parity. The average persistency of the milk yield was 73%. Yearly calf mortality rates were 19, 33, 25.5, 25 and 12%, whereas those of buffaloes were 2.3, 2.3, 2.2, 6.6 and 2.1% during the five years of the veterinary study. Seasonal raw mortality rates of calves were high during the winter (53.6%), followed by spring and summer (17.3 and 12%). The complex "light body weight at birth-pneumonia-bad management" caused 71.4% of total calf mortality during the period of the study. The year of calving had a significant ($P < 0.01$) effect on the number of calves that died and that died by particular from pneumonia, and a highly significant ($P < 0.001$) effect on the light body weight at birth.

■ INTRODUCTION

In Egypt, buffaloes are an economically important source of milk and meat: there are about 3.49 million head (1) and they are considered as the main dairy animals. Most of them are mainly in the hands of smallholders (1-5 head). Khalil *et al.* (12) reported that buffalo's milk accounts for 70% of the total milk produced in Egypt and is characterized by a high butterfat content compared to cow's milk. FAO (8) noted that Egyptian buffaloes contribute to about 5 and 14% of the world buffalo's milk and meat, respectively.

Buffaloes are reared in Egypt in different production systems, which are determined by regions, breeders, living conditions, and strategies of holders. Recently, new attempts have been made to raise buffaloes either under an intensive or a semi-intensive production system in large herds of new projects to facilitate milk industry and to obtain heavy calves at slaughtering (above 350 kg body weight) instead of the traditional veal calves (about 100 kg body weight), which are not satisfied by the local meat market in Egypt. Many studies have been carried out to describe the Egyptian buffalo's performance, but none mentions the buffalo's performance in these two production systems.

High calf mortality is a serious concern in both dairy and beef herds because it decreases the numerical productivity of the herd and consequently the annual net profits. It also affects the replacement rate and thereby genetic improvement. The main objectives of this investigation were to determine some nongenetic factors affecting the productive performance of the Egyptian buffalo as a milk-type animal under the semi-intensive production system, and to detect causes of calf mortality within the system.

■ MATERIALS AND METHODS

The experiment was carried out from 1993 to 1999, using a herd of 71 buffaloes and three sires in a university herd at Shalakan, Kaliobia governorate (about 30 km north of Cairo). The animals were identified at the beginning of the experiment, as well as the

1. Department of Animal Production, Faculty of Agriculture, University of Ain-Shams, PO Box 11241, Hadayek Shoubra, Cairo, Egypt

Fax: +202 444 44 60; E-mail: mosaadmourad@hotmail.com

newborn calves at birth. A semi-intensive system was set in place, whereby animals grazed *ad libitum* for about five hours daily in a pasture, which contained Berseem (Egyptian clover, i.e. *Trifolium alexandrinum*) in winter and green maize in summer. Seasonally, the herd made full use of grass and some plants and grains after the harvest (especially wheat and maize). In the afternoon, every buffalo was complemented with about eight kilograms of a concentrate mixture containing 11% proteins and about five kilograms of rice straw according to its weight and level of milk yield. To avoid the problem of silent heat in buffaloes, random mating was practiced, whereby one of the three sires stayed permanently with the herd, in rotation with the other sires to avoid inbreeding. The breeding season and, consequently, the calving season occurred throughout the year. Calves suckled their dams until three months of age. A system of milk control was applied by enclosing the calves during the day of control, weighing them before and after suckling their dams twice a day at milking. The difference in body weight was the suckled milk added to the milking portion to express the milk performance of the buffalo. A starter was used to feed calves at one month of age to help weaning at three months. The persistency of milk yield was calculated by dividing the average lactation length for every parity by the equivalent average of calving interval for the same parity.

All dead animals were divided into two age groups: from birth to weaning and after weaning (90 days). The numbers of dead animals per age group was recorded. Dead animals were autopsied within 24 hours after death, and their tongue, lungs, liver, heart, stomach, small and large intestines were examined. The four seasons of the year were taken into account in the study: winter (from 21 December to 20 March), spring (from 21 March to 20 June), summer (from 21 June to 22 September), fall (from 23 September to 20 December). Average seasonal temperatures and rainfalls in Kaliobia, Egypt, between 1993 and 1999 are shown in Table I.

Table I

Average seasonal temperatures and rainfalls in Kaliobia, Egypt between 1993-1999

Season	Mean temperature (°C)		Relative humidity	Mean rainfall (mm)
	Day	Night		
Spring	25	18	53	3
Summer	35	24	56	0
Fall	27	20	66	4
Winter	13	8	72	16

The yearly mortality rate (YMR) before weaning was calculated as follows:

$$(1)\ YMR = DA/T \times 100$$

where DA is the number of dead calves between birth and weaning and T is the total number of born calves.

The yearly mortality rate after weaning (YMR') was calculated as follows:

$$(2)\ YMR' = DA/M \times 100$$

where DA is the number of dead animals after weaning and M is the average herd size [M = (M1 + M2 + M3) / 3); M1 = herd size at the beginning of the year, M2 = herd size in the middle of the year, and M3 = herd size of the end of the year].

The seasonal raw mortality rate before weaning was calculated by using equation (1) during a season. All actions with deadly consequences from buffalo breeders (carelessness with the calves, high doses of veterinary products, accidents, absence or insufficient husbandry of calves, etc.) were referred to as "bad management".

Milk production data were analyzed by SAS (25) using the following model:

$$Y_{ijkl} = \mu + a_i + P_j + S_k + e_{ijkl}$$

where μ is the overall mean, Y_{ijkl} is the milk yield of the buffalo number l for the season number k, the parity number j and the year of calving number i, while a_i is the fixed effect of i year of calving (i = 1...7; 1 = 1993, 2 = 1994, 3 = 1995, 4 = 1996, 5 = 1997, 6 = 1998, and 7 = 1999); P_j is the fixed effect of j parity (j = 1...12); S_k is the fixed effect of the season number (k = 1...4; 1 = spring, 2 = summer, 3 = fall, 4 = winter); e_{ijkl} is a random element assumed to be independent and normally distributed IND~(0, σ_e^2).

However, it was not possible to calculate interactions between the main effects because of the limited numbers of their records or their absence in some subclasses. Duncan's multiple range test (6) was used to identify significant differences. The chi-square test was used according to Snedecor and Cochran (27) to detect significant differences between the five years of study.

■ RESULTS

Milk Performance

Results of the analysis of variance are shown in Table II. Significant effects were found for the calving season ($P < 0.05$) and parity ($P < 0.001$) on the milk yield (MY). Daily milk yield (DMY) and the proportion of lactation length on the calving interval (LLCI) were not significantly affected by the nongenetic

Table II

Results of analysis of variance on the milk yield, lactation length, calving interval, average daily milk yield and proportion of lactation length on the calving interval according to the calving year, calving season and parity

Source of variation	Degree of freedom	Means squares (MY)	Means squares (LL)	Means squares (CI)	Means squares (ADMY)	Means squares (LLCI)
Year	6	43,785	6959	31,819	0.6807	0.00238
Calving season	3	234,145*	8162**	10,100***	1.9395	0.01012
Parity	11	479,779***	2873	7875	1.9809	0.00799
Error	216	87,099	2885	5540	1.4456	0.01111

MY = milk yield, LL = lactation length, CI = calving interval, ADMY = average daily milk yield, LLCI = lactation length on calving interval
* Significant at $P < 0.05$; ** Significant at $P < 0.01$; *** Significant at $P < 0.001$

factors studied. Averages of milk yield, lactation length, calving interval, daily milk yield and lactation length on the calving interval were 1626 kg, 305 days, 431 days, 7.4 kg and 0.714 days, respectively. Table III shows the least squares means and standard errors of the milk traits and the calving interval according to the calving year, calving season and parity. Milk yield ranged from 1578 in 1996 to 1702 kg in 1998 (Figure 1), while DMY was approximately 5.6 kg and LLCI near 0.71. Calving in the fall significantly ($P < 0.05$) increased MY, but it had no significant effect on DMY and LLCI. Parity affected significantly ($P < 0.001$) MY. Older buffaloes (over 7 years old) produced much more milk than younger ones (3-6 years old). Calving in the spring increased significantly ($P < 0.05$) the lactation length. However, there was no significant ($P > 0.05$) parity effect on the lactation length.

Persistency ratios of the milk yield were 67, 68, 66, 67, 72, 71, 70, 77, 76, 81, 79 and 83% for buffaloes in the first lactation number up to those in the twelfth number. Average persistency was 73%.

The calving interval as a reproductive trait was significantly ($P < 0.001$) affected by the calving season. Buffaloes that calved in the spring had longer calving intervals than those that calved in other seasons.

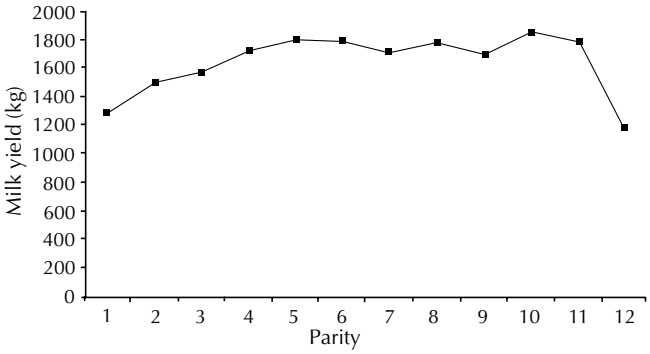

Figure 1: *Milk yield of Egyptian buffaloes under a semi-intensive production system.*

Table III

Least squares means and standard errors of milk yield, daily milk yield, lactation length and proportion of lactation length to calving interval according to the calving year, calving season and parity

Traits	MY LSM ± SE	DMY LSM ± SE	LL LSM ± SE	LLCI LSM ± SE	CI LSM ± SE
Calving year					
1993	1621 ± 62	5.69 ± 0.25	302 ± 10	0.71 ± 0.02	424 ± 21
1994	1648 ± 66	5.88 ± 0.27	308 ± 11	0.70 ± 0.02	429 ± 24
1995	1602 ± 64	5.79 ± 0.26	303 ± 13	0.69 ± 0.02	432 ± 25
1996	1578 ± 71	5.52 ± 0.29	307 ± 12	0.71 ± 0.03	430 ± 18
1997	1647 ± 59	5.74 ± 0.24	304 ± 11	0.70 ± 0.02	429 ± 17
1998	1702 ± 54	5.45 ± 0.22	306 ± 13	0.72 ± 0.02	435 ± 16
1999	1673 ± 82	5.62 ± 0.34	306 ± 10	0.71 ± 0.02	429 ± 17
Calving season					
Spring	1609 ± 35^{a}	5.82 ± 0.20	323 ± 12^{b}	0.70 ± 0.02	468 ± 19^{f}
Summer	1610 ± 71^{a}	5.60 ± 0.27	300 ± 10^{a}	0.72 ± 0.02	409 ± 13^{e}
Fall	1749 ± 80^{b}	5.41 ± 0.24	289 ± 8^{a}	0.72 ± 0.02	420 ± 17^{e}
Winter	1587 ± 22^{a}	5.85 ± 0.17	310 ± 8^{a}	0.68 ± 0.02	421 ± 18^{e}
Parity					
1	1289 ± 63^{e}	4.83 ± 0.26	317 ± 11	0.67 ± 0.02	473 ± 15
2	1494 ± 58^{f}	5.08 ± 0.24	309 ± 10	0.68 ± 0.02	452 ± 13
3	1562 ± 62^{f}	5.35 ± 0.23	295 ± 10	0.72 ± 0.02	444 ± 18
4	1722 ± 57^{g}	5.60 ± 0.23	312 ± 10	0.71 ± 0.02	466 ± 19
5	1801 ± 60^{g}	5.44 ± 0.24	316 ± 11	0.69 ± 0.02	438 ± 18
6	1781 ± 56^{g}	5.48 ± 0.23	293 ± 10	0.72 ± 0.02	414 ± 19
7	1708 ± 62^{g}	5.72 ± 0.25	291 ± 11	0.73 ± 0.02	415 ± 17
8	1784 ± 92^{g}	5.72 ± 0.37	317 ± 16	0.71 ± 0.03	413 ± 15
9	1696 ± 109^{g}	5.61 ± 0.45	272 ± 20	0.71 ± 0.04	447 ± 15
10	1847 ± 140^{g}	5.52 ± 0.57	283 ± 25	0.68 ± 0.05	351 ± 17
11	1796 ± 154^{g}	6.46 ± 0.63	289 ± 27	0.73 ± 0.06	396 ± 18
12	1189 ± 301^{e}	7.23 ± 1.23	372 ± 55	0.72 ± 0.11	446 ± 19

MY = milk yield, DMY = daily milk yield, LL = lactation length, LLCI = lactation length on calving interval, CI = calving interval
^{a,b,c} Means with different superscripts are significantly different ($P < 0.05$)
^{e,f,g} Means with different superscripts are significantly different ($P < 0.001$)

Causes of Mortality

During the five years of the veterinary study, the yearly calf mortality rates were 19, 33, 25.5, 25 and 12%, whereas those of buffaloes were 2.3, 2.3, 2.2, 6.6 and 2.1%. Table IV shows that 49 calves died between birth and weaning (three months of age), equivalent to a yearly average of 29.3% calf mortality, whereas that of buffaloes during this period was only 2.5%. The seasonal raw mortality rates of calves (Figure 2) were high during the winter (53.6%), lower in the spring (17.3%) and in the summer (12%). Light body weight at birth caused 36.7% calf mortality, while pneumonia was responsible for 24.5% of total mortality during the five years of study. Bad management caused 10.2% calf mortality. These three major causes of mortality combined were responsible for 71.4% of total calf mortality. However, Table V shows that the numbers of dead calves and of animals that died of pneumonia changed significantly ($P < 0.05$) from year to year. Calves that died because of a light body weight at birth, and which were mainly produced by young buffaloes, were highly significantly ($P < 0.01$) affected by the year.

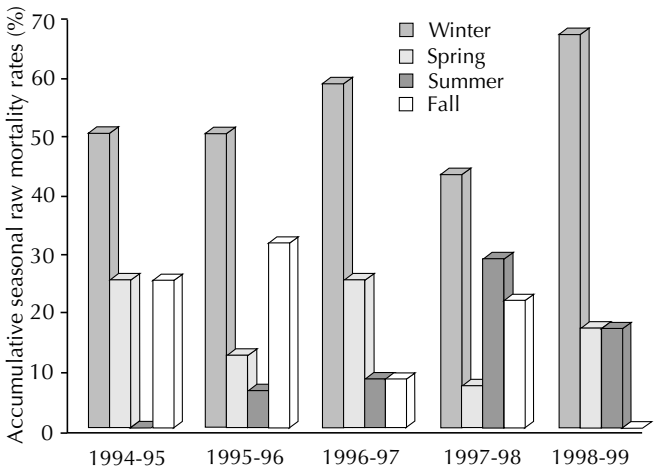

Figure 2: *Seasonal raw mortality rates of calves that died between birth and weaning.*

Table IV

Causes of buffalo mortality between birth and weaning and postweaning from 1993 to 1999 in Shalakan, Egypt

Causes	From birth to weaning			Postweaning		
	Num. of mortality	% of total	Age (days) Means ± SE	Num. of mortality	% of total	Age (years)
1994-1995						
Bad management	3	37.5	108 ± 25	1	100.0	4
Pneumonia	4	50	100 ± 22	-	-	-
Light body weight at birth	1	12.5	10 ± 3	-	-	-
Total	8	100.0	-	1	100.0	-
1995-1996						
Gastritis	5	35.7	67 ± 12	-	-	-
Light body weight at birth	6	42.9	6 ± 1	-	-	-
Heart disease	-	-	-	1	100.0	7
Pneumonia	3	21.4	50 ± 8	-	-	7
Total	14	100.0	-	1	100.0	7
1996-1997						
Pneumonia	4	36.4	104 ± 35	-	-	-
Gastritis	2	18.2	112 ± 8	-	-	-
Diarrhea	2	18.2	105 ± 15	-	-	-
Bad management	2	18.2	15 ± 5	1	100.0	4.5
Light body weight at birth	1	9.1	11	-	-	-
Total	11	100.0	-	1	100.0	-
1997-1998						
Light body weight at birth	7	63.6	6 ± 3	-	-	-
Gastritis	3	27.3	95 ± 18	-	-	-
Bad management	-	-	-	3	100.0	1.5
Pneumonia	1	9.1	22	-	-	-
Total	11	100.0	-	3	100.0	-
1998-1999						
Light body weight	3	60.0	18 ± 8	-	-	-
Gastritis	2	40.0	75 ± 15	-	-	-
Bad management	-	-	-	1	100.0	2
Total	5	100.0	-	1	100.0	-

Table V

Chi-square test results for dead calves from birth to weaning in five years of study

	Degree of freedom	Chi-square values
Number of dead calves	4	13.50**
Light body weight at birth	4	27.30***
Pneumonia	4	11.89**
Gastritis	4	3.32^{NS}

** Significant at $P < 0.01$
*** Significant at $P < 0.001$
^{NS} Not significant at $P > 0.05$

■ DISCUSSION

Milk Performance

The year of calving did not significantly ($P > 0.05$) affect the buffalo milk yield. However, Kawthar Mourad *et al.* (10) using 4608 records of 1444 Egyptian buffaloes under an intensive production system reported that the year of calving affected significantly ($P < 0.01$) a 305-day milk yield. This may be due to different methods of selection and management between the herds. In India, Dhar and Deshpandi (5) with data on 466 Murrah buffaloes covering a period of 15 years reported that the period had a significant effect ($P < 0.05$) on the milk yield.

The milk yield increased with the increase in the lactation number, reaching a peak at the eleventh lactation and decreasing thereafter. Similar results were obtained by Kawthar Mourad *et al.* (10), who reported that a 305-day buffalo milk yield increased ($P < 0.01$) with parity (from the first to the tenth parity). However, in another study using 2780 records of Egyptian buffaloes Kawthar Mourad *et al.* (11) reported that a 305-day milk yield increased from the first parity to the fifth and decreased ($P < 0.01$) thereafter. El Barbary and Badran (7) arrived at the same results with another herd of Egyptian buffaloes. Many Egyptian authors reported the increase of the milk yield with the advance of parity (3, 12, 13, 15, 16, 22, 28). Similar results were also reported by many Indian authors (4, 5, 14, 23, 26). But the milk yield peak was reached at various lactations in the herds within the same country or in different countries. This might be attributed to genetic properties, nutritional treatment, age at first calving, lactation length or management system. Differences in the data size and statistical analysis could be added in this respect. The main reasons for the increase in the milk yield in relation with the increase in the lactation number are the buffalo's weight gain and maturing of its milk secretion system. Kawthar Mourad *et al.* (10) added that the increase in the lactation number results in the development of the udder physiological functions and in the increase of the udder capacity until the animal reaches its mature weight. Conversely, the decrease in milk production with the advance in parity after reaching its peak was reported to be caused by the decrease in the physiological activity of all body functions and the partial degeneration of the udder secretory tissue, which usually starts after the female reaches its mature body weight and size (3).

In this study, the calving season significantly affected the milk yield. Calving in the fall induced a milk yield in buffaloes much higher than in other seasons. However, Kawther Mourad *et al.* (10, 11) reported that calving in May compared to other months significantly ($P < 0.01$) increased the 305-milk yield. The difference in the milk yield between seasons may be attributed to the production system (semi-intensive *vs* intensive). Many authors reported a significant effect of the calving season on the milk yield: in Egyptian buffaloes (2, 9, 13), in Pakistani buffaloes (29), and in Indian buffaloes (18). Climate conditions, good pasture and available feeds in the various months of the year are important factors influencing the calving season and consequently the buffalo milk yield.

Calving in the spring was the only factor that increased significantly ($P < 0.05$) the lactation length. This finding agrees with that of Kawthar Mourad *et al.* (10), who noted that spring and winter calving increased the lactation length of Egyptian buffaloes. However, a significant ($P < 0.01$) effect of the calving year on the lactation length was also observed. It may be due to differences between the two periods of the study. The average persistency of Egyptian buffaloes was 73%, lower than the 87.7% observed by Syed *et al.* (29) in buffaloes in Peshawar, Pakistan. The difference in the persistency may be attributed to the genetic pattern of Egyptian buffaloes compared to those from Pakistan, the management system and the calculation method .

Calving in the spring caused the longest calving interval. It may be due to the effect of a long period of heat stress during the last month of spring and in the summer months.

Causes of Mortality

Mortality rates in this study were higher than the annual mortality rates of 12.8, 13.7, 22.1, 3.1 and 4.5% reported in Indian buffaloes in a five-year study (1981-1985) by Parmatma Singh *et al.* (19). The results of this study on the cause of mortality agree with those of Roy *et al.* (24), who reported that a light birth weight had a significant ($P < 0.05$) effect on calf mortality. It was responsible for approximately 35% of calf mortality during the study. However, in an institute farm, Pkinjavdekar *et al.* (21) reported that the main causes of calf buffalo mortality were gastroenteritis (45.6%), enteritis (20.6%) and pneumonia (5.9%). They added that the highest mortality during the neonatal stage was due to inadequate care in management of newborn calves. From 31 to 60 days of age mortality was mainly caused by an inadequate diet and milk withdrawal.

To eliminate mortality caused by a light body weight, restrictive measures at mating should be applied to the heifers. Light heifers or heifers with poor performances should not be allowed to mate. To eradicate mortality caused by pneumonia, hygienic practices and good calf management should be implemented. To eliminate bad management, modern methods of husbandry and calf care should be practiced. Mourad and Magassouba (17) reported that in N'Dama cattle in Guinea the complex diarrhea-pneumonia-bad management caused 71.4% of calf mortality between birth and six months of age.

The finding that the year affected the mortality agrees with that of Roy *et al.* (24), who used data on 228 Jersey x Tharparkar calves over a period of nine years and reported that the period of birth had a highly significant ($P < 0.01$) effect on calf mortality.

The highest seasonal mortality rate was in the winter, agreeing with Roy *et al.* (24), who found that calving in the winter (November-February) caused ($P < 0.05$) the highest mortality. These results also agree with those of Mourad and Magassouba (17), who found that in cattle the highest calf mortality rate was in the humid season. Similar results were obtained in India by Patil *et al.* (20), who reported that the overall mortality rate of 4035 buffalo calves from birth up to 12 months of age was 9.84%.

The highest mortality (38.29%) was observed during winter (November-January), followed by the monsoon season (32.5% in June-October), and summer (29.2% in February-May). As in the present study, Roy *et al.* (24) found that the main mortal diseases were enteritis (22.58%), pneumoenteritis (20.97%), debility (16.13%) and pneumonia (9.68%).

■ CONCLUSION

To increase milk yield in Egyptian buffaloes, it is better to arrange for the calving season to occur in the fall than in other seasons. Older buffaloes have better persistency and produce much more milk than younger ones. It is important that farm procedures and management be organized so as to obtain the calving season also in the fall. To minimize the high calf mortality rate (22.8%), the complex "light body weight at birth-pneumonia-bad management", which caused more than 70% of total calf mortality, had to be eliminated. It was suggested that without paying money the best heifers be selected before mating, new born calves be better taken care of, modern methods of husbandry and veterinary care be applied.

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Résumé

Mourad M., Rashwan S. Production laitière des buffles et cause de mortalité des veaux dans un système de production semi-intensif en Egypte

Les données d'un troupeau de 71 buffles, élevés dans un système de production semi-intensif dans une université, ont été recueillies entre 1993 et 1999 afin d'étudier l'effet de facteurs non génétiques sur la performance laitière des buffles et la cause de mortalité des veaux. Les moyennes de la production laitière, de la durée de lactation, de l'intervalle entre mises bas, de la production laitière journalière et de la proportion de la durée de lactation dans la période entre deux mises bas ont été respectivement de 1 626 kg, 305 jours, 431 jours, 7,4 kg et 0,714 jour. La saison de vêlage ($P < 0,05$) et le rang de lactation ($P < 0,001$) ont affecté significativement la production laitière. L'intervalle entre mises bas, le seul paramètre sur la reproduction, a été significativement ($P < 0,001$) affecté par la saison de vêlage. L'année de vêlage n'a pas eu d'effet significatif ($P > 0,05$) sur les paramètres étudiés. La production laitière journalière et la proportion de la durée de lactation dans la période entre deux mises bas n'ont pas été significativement ($P > 0,05$) affectées par l'année de vêlage, la saison de vêlage et le rang de lactation. La moyenne de la persistance de la production laitière a été de 73 p. 100. Les taux de mortalité annuels des veaux ont été de 19, 33, 25,5, 25 et 12 p. 100, alors que ceux des buffles ont été de 2,3, 2,3, 2,2, 6,6 et 2,1 p. 100 pendant les cinq années de l'étude vétérinaire. Les taux de mortalité bruts saisonniers ont été élevés pendant l'hiver (53,6 p. 100), et plus faibles au printemps (17,3 p. 100) et en été (12 p. 100). Le complexe « poids vif léger à la naissance-pneumonie-mauvaise conduite d'élevage » a causé 71,4 p. 100 des cas de mortalité des veaux pendant la période de l'étude. L'année de vêlage a eu un effet significatif ($P < 0,01$) sur le nombre de veaux morts et en particulier de veaux morts de pneumonie, et un effet très significatif ($P < 0,001$) sur le poids léger à la naissance.

Mots-clés : Bovinae - Lait de bufflesse - Facteur de rendement - Veau - Mortalité - Egypte.

Resumen

Mourad M., Rashwan S. Producción de leche en búfalos y causas de mortalidad en terneros en un sistema de producción semi intensivo en Egipto

Se colectaron los registros de 71 búfalos, criados en un sistema de producción semi intensivo en un hato universitario, entre 1993 y 1999, con el fin de estudiar el efecto de algunos factores no genéticos en el rendimiento de leche así como causas de mortalidad en terneros. Los promedios de producción láctea, duración de la lactación, intervalo entre partos, producción láctea diaria y proporción en la duración de la lactación durante el intervalo entre partos fueron de 1626 kg, 305 días, 431 días, 7,4 kg y 0,714, respectivamente. El periodo de parto ($P < 0,05$) y el número de parto ($P < 0,001$) afectaron significativamente la producción de leche. El intervalo entre partos, en tanto que único trazo reproductivo, fue afectado en forma significativa ($P < 0,001$) por la estación de parto. El año de parto no presentó efecto significativo ($P > 0,05$) sobre los caracteres estudiados. La producción de leche diaria y la proporción de la duración de la lactación durante el intervalo entre partos no fueron afectadas en forma significativa ($P > 0,05$) por el año de parto, la época de parto y el número de parto. La persistencia promedio de la producción láctea fue 73%. Las tasas de mortalidad en terneros fueron de 19, 33, 25,5, 25 y 12%, mientras que en adultos fueron de 2,3, 2,3, 2,2, 6,6 y 2,1% durante los cinco años del estudio veterinario. Las tasas de mortalidad brutas en terneros fueron mayores durante el invierno (53,6%) y menores durante la primavera y el verano (17,3 y 12%). El complejo «bajo peso al nacimiento-neumonía-mal manejo» provocó 71,4% del total de las muertes en terneros durante el periodo del estudio. El año de parto tubo un efecto significativo ($P < 0,01$) sobre el número de terneros que murieron y que murieron en particular de neumonía y un efecto altamente significativo ($P < 0,001$) sobre el bajo peso al nacimiento.

Palabras clave: Bovinae - Leche de bufala - Factor de rendimiento - Ternero - Mortalidad - Egipto.