Der Tropenlandwirt, Zeitschrift für die Tropen und Subtropen
87. Jahrgang, 1986, S. 109 - 120

Studies on some reproductive and productive traits of buffaloes in Egypt

Untersuchungen über einige reproduktive und produktive Merkmale von Büffeln in Ägypten

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1. Introduction

The Egyptian buffaloes are the most reputed dairy animals in Egypt.
Many dedicated works have been carried out on the reproductive and productive performance of Egyptian buffalo and most of these researches were done on animals at experimental stations (Governmental and/or University farms), which cannot represent the animal population in the country as a whole. There are little available information on the productive and reproductive performance of Egyptian buffaloes owned by peasants and in small number under particular economic and environmental conditions. Such information is of vital importance in planning schemes for improving buffalo on a national scale, since at least 80% of the Egyptian buffaloes are kept under such rural conditions.
The present study is a close survey and information recording on the reproductive and productive activities of buffaloes raised under such conditions in three villages in Moufia and one in Gharbia Province in the middle of the delta.

2. Materials and Methods

The data used in this study were collected from three villages in Monoufia Province; Namely Kafr Shobra Zangy, Garawan and Sers Ellayan during the period from October 1979 to November 1981. The data comprised 93 lactation records of 77 Egyptian buffalo cows kept under the regular systems of feeding and management by the Egyptian farmers. Each farmer has a farm of an average size of 2 feddan and keeps in most cases one buffalo cow.

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On the other hand, one of the commercial dairy herds in Gharbia Province has been studied to determine the differences between the individually kept animal and small size herds concerning the studied traits.

The animals were kept under the regular systems of feeding and management adopted by the Egyptian farmers. Feeding was mainly on Egyptian clover (*Trifolium alexandrinum*) in winter months from November to May with extra rations of concentrates. During summer months feeding depended on concentrates available (cotton seed–cake, maize, corn cob and corn meal). Milking was done twice a day by hand. Regardless of the method of feeding, the calf remains with the dam for three to four days to receive the colostrum, then it joins the dam until weaning of disposal. As the daily milk production increases suckling is reduced proportionately. This was done by allowing the calf to suck from three quarters only, then two and finally one.

The study of the commercial herd comprised 24 lactating buffalo cows. Feeding was mainly on Egyptian clover in winter months and Napier grass in summer months with extra rations of concentrates available (7 kg/buffalo/day). The calf was kept with the dam for three days only to receive the colostrum then was artificially suckled on milk replacer. In this unit the careful selection of stock from reliable milk records and other data has been in progress for a number of years.

The animals were used essentially for milk production and not for work.

Statistical Analysis of data:
The least squares analysis of variance model (HARVEY, 1960) used to determine the different characters studied was:

$$Y_{igkl} = \mu + V_i + S_g + L_k + E_{igkl}$$

where:

Y_{igks} is the characters studied for the 1^{th} cow in the igk^{th} subclass,
μ is the overall mean,
V_i is the effect due to the i^{th} village,
i= 1,2,3,4, where:

1 = Zingy
2 = Garawan
3 = Serse Ellayan
4 = El Namla (commercial farm)

S_g is the effect due to the g^{th} season of calving
g = 1,2 where:

1 = summer (Apr.,May, Jun., Jul.,Aug., Sep.)
2 = winter (Oct., Nov., Dec., Jan., Feb., Mar.)

L_k is the effect due to the k^{th} sequence of lactation No. (Parity), k = 1, 2, 3, 4, 5 where:

1 = first lactation
2 = second lactation
3 = third lactation
4 = fourth lactation
5 = fifth lactation and more

E_{igkl} is the random error particular to each observation.

Significant differences among means were detected using Ducan's Multiple Range Test as described by HARVEY (1960). Correlations and regressions were estimated according to SNEDECOR (1974).

3. Results and Discussion

3.1 Reproductive characters

Service period: The last squares means and standard errors of service period are shown in Table 1. The overall mean was 109.3 ± 8.6/day which is shorter than several estimates reported by many other investigators for experimental buffalo herds in Egypt; between 135.5 and 283.0/days (KIRRELLA, 1977; ABDEL AZIZ and ABDEL GHAN, 1978; MoURAD, 1978; MOSTAGEER et al., 1981) Moreover the average is also shorter than that estimated for Indian buffaloes, by VEDARGEN, 1955; VENKAYYA AND ANANTAKRISHNAN, 1957; KOHLI and MALIK, 1960; KANAUIA et al., 1974 (ranged between 163.7 and 238.2 days). The present value, however, approaches those reported by OLOUFA (1968) for Egyptian buffaloes; GOSWAMI and KUMAN (1968) for Indian buffaloes; POLIHRONOV (1965) for Bulgarien buffaloes; ROYCHOUDHURY (1970) for Italian buffaloes (averages ranged between 96.9 and 117.0 days).

Tab. 1: Least Squares Means ± SE of service period

Classification	No.	x ± SE (day)	DT*
Overall mean:	117	109.3 ± 8.6	
Season of calving:*			
Summer	44	88.0 ± 10.6	a
Winter	73	130.6 ± 10.6	a
Village **			
ZINGY	56	124.8 ± 11.2	a
GARAWAN	16	150.2 ± 17.2	b
SERSE	21	120.7 ± 14.7	c
EL NAMLA	24	41.4 ± 17.5	d

* = P < 0.05
** = P < 0.01
DT* = Duncan's Multiple Range Test. within each classification means having the same letter differ non-significantly from each other otherwise they differ significantly at P < 0.05

The effect of season: Least squares analysis of variance showed a significant effect of season on service period (Table 1). Winter calvings were followed by longer service periods (130.6 ± 10.6/days) than summer ones (88.0 ± 10.6days). This conclusion is in agreement with that reached by MOHAMED (1974), KIRRELLA (1977) and is in a full agreement with that reached by ABDEL–AZIZ and ABDEL GHANI (1978). this mostly due to the ovarian activity being higher during the winter than the rest of the year (KIRRELLA, 1977) and BARKAWI, 1981). It appears that the mild weather and/or green fodder available in winter season favours high functional activity of the reproductive system than in other seasons.

The effect of village: As shown in Table 1, village exerted a highly significant effect on service period. The least squares means of service period for different villages differ highly significantly from each other. These means were 150.2, 124.8, 120.7 and 41.4 days for Garawan, Zingy, Serse and commercial farm (El Namla) respectively. It is noteworthy to point out that the farmer looks after his animals better and watch them closer than in Governmental herds.

Calving interval: The least squares means and standard errors of calving interval are presented in Table 2. The overall mean of the character was 426.1 ± 8.6 days. This length is shorter than severals found by different authors SHARIN et al., 1966 (516.0 days); ALIM, 1978 (507.9 days); MOURAD, 1978 (518.9 days), nevertheless it is considerably closer to that found by many other investigators OLOUFA, 1968 (415.6 days); KIRRELLA, 1977 (452.8 days); MOSTAGEER et al., 1981 (452.0 days). It is well known that the Egyptian farmer is very keen to keep buffaloes of good reproductive performance.

Tab. 2: Least Squares Means ± SE of calving period

Classification	No.	x ± SE (day)	DT*
Overall mean:	117	426.1 ± 8.6	
Season of calving:*			
Summer	44	404.3 ± 10.7	a
Winter	73	447.9 ± 10.7	b
Village **			
ZINGY	56	442.4 ± 11.3	a
GARAWAN	16	466.8 ± 17.4	b
SERSE	21	436.1 ± 14.8	c
EL NAMLA	24	359.4 ± 17.7	d

Footnotes see Tab. 1:

As it is apparent form Table 3 that 95% of the calving intervals occupied not more than 403.7 days (13.5 months). This result denotes signs of traditional selection to improve fertility irrespective of the other environmental conditions.

Tab. 3: Means, Standard Deviation and Range of productive traits studies

	Nr.	x	sx	Minimum	Maximum	95% under
No. of Buffalo per farm	93	2.1	0.1	1.0	5.0	1.9
Suckling period (day)	117	33.9	2.4	1.0	95.0	29.2
Service period (day)	117	101.4	7.4	20.0	445.0	87.0
Calving interval (day)	117	117.9	3.9	44.0	302.0	110.2
Lactation period (day)	117	418.2	7.4	335.0	763.0	403.7
Milk yield (kg)	117	300.3	6.8	173.0	553.0	186.9
	117	2112.1	51.7	634.0	4141.0	2010.8

The effect of season: As shown in Table 2, season of calving affected calving interval significantly. Summer calvings were followed by the shortest calving intervals (404.3 ± 10.7 days) while winter calvings were associated with the longest ones (447.9 ± 10.7 days). The significant influence of season of calving on calving interval length reported here is in agreement with the results reached by MOHAMED (1965), KIRRELLA (1977) and BASU and GHAI (1980), nevertheless, desagrees with those of MOURAD (1978) and MOSTAGEER et al. (1981).

It is apparent that buffaloes calved all the year round, nevertheless, calving was more frequent in winter (62%). This could be attributed primarily to the system of management which allows buffaloes to calve at onset of the clover season in Egypt.

The rank of the length of calving intervals per season is exactly similar to that of service period per season.

The effect of village : As shown in Table 2, village exerted a highly significant effect on calving interval. The least squares means of calving interval for different villages differ highly significant from each other. These means were 466.8, 442.4, 436.1 and 359.4 days for Garawan, Zingy, Serse and commercial farm respectively.

3.2. Productive characters

Total milk yield: The least squares means and standard errors of total milk yield are presented in Table 4. The overall mean was 2153.3 ± 63.8 kg. This mean is higher than those reported by SIDKY (1951), BEDEIR (1965), ALI (1972), FAHMY et al. (1975), ALIM (1978), MOURAD (1978) and MOSTAGEER et al (1981) in Egyptian buffaloes, all of them collecting data from Governmental farms.

It is obvious that farmers owned buffaloes having average milk yield well above the known for the national herd.

The range of milk yield (Table 3) was between 634.0 kg (during lactation period of 173.0 days) and 4141.0 kg (during lactation period of 553 days). 52.8% of the animals gave between 2000.0 and 3000.0 kg. At the commercial farm in Gharbia Province, for example, yields of 3073 kg and occassionally 3500 kg of even 4000 kg have been regularly recorded in individual lactations.

Tab. 4: Least Squares Means ± SE of milk yield

Classification	No.	x ± SE (day)	DT*
Overall mean:	117	2153.3 ± 63.8	
Season of calving:			
Summer	44	2143.0 ± 79.0	a
Winter	73	2163.6 ± 79.0	a
Village			
ZINGY	56	2105.6 ± 83.7	a
GARAWAN	16	2342.8 ± 128.4	b
SERSE	21	2067.2 ± 109.3	c
EL NAMLA	24	2097.6 ± 130.9	c

For explanation see Tab. 1

With the existing range of individual variation, it is obvious that the genetic material is available and awaits the attention of the skilful animal breeder. This shows that great attention should be given to the sires produced by the Ministry of Agriculture for improving the farmers buffaloes. These must be well above the average if improvement is seeked. The least squares analysis of variance (Table 4) indicated that village and season had no significant effect on milk yield.

Lactation period: The overall least squares mean of lactation period was 309.3 ± 8.1 days (Table 5). This mean is longer than those reported by SHALASH et al. (1969), MOURAD (1978) and MOSTAGEER et al. (1981), but close to the values reported by BEDEIR (1965), ASKER (1968) and ALIM (1978), in Egyptian buffaloes. The present estimate is shorter thatn the values reported by ASKER and EL ITRIBY (1957) and EL KIMARY (1966).

Tab. 5: Least Squares Means ± SE of lactation period

Classification	No.	x ± SE (day)	DT*
Overall mean:	117	309.2 ± 8.1	
Season of calving:			
Summer	44	301.2 ± 10.0	a
Winter	73	317.2 ± 10.0	a
Village*			
ZINGY	56	308.1 ± 10.6	a
GARAWAN	16	362.5 ± 16.3	b
SERSE	21	298.8 ± 13.9	c
EL NAMLA	24	267.4 ± 16.6	d

For explanation see Tab. 1

The effect of village: The least squares analysis of variance indicated that village had a significant effect on lactation period. Ducan's Multiple Range Test (tabel 5) indicated that least squares means of lactation periods for different villages differ significantly from each other. Buffaloes from commercial farm (El Namla village) had the shortest

lactation period (267.4 ± 16.6 days), while those form Garawan had the longest ones (362.5 ± 16.3 days). Differences among lactation periods due to season of calving were statistically not significant (tabel 5)

Dry period: Results of dry period are presented in Table 6. The overall mean of the character was 116.9 ± 4.3 days. These estimate is comparatively shorter than values reported by RAGAB et al. (1954), KHISHIN et al. (1963), ALIM (1978) and MOURAD (1978) in Egyptian buffaloes, but close to the value reported by ASKER and EL ITRIBY (1957) in Egyptian buffaloes. The range of dry period was between 44 and 302 days (Table 3). 95% of the animals did not exceed 110.2 days.

Tab. 6: Least Squares Means ± SE of dry period

Classification	No.	x ± SE (day)	DT*
Overall mean:	117	116.9 ± 4.3	
Season of calving:*			
Summer	44	103.2 ± 5.3	a
Winter	73	130.6 ± 5.3	b
Village**			
ZINGY	56	134.1 ± 5.6	a
GARAWAN	16	104.2 ± 8.6	b
SERSE	21	137.3 ± 7.4	c
EL NAMLA	24	92.0 ± 8.8	d

For explanation see Tab. 1

The effect of season: As shown in Table 6, the effect of season of calving on dry period was significant. Summer calvers had the shortest dry period (103.2 ± 5.3 days), while winter calvers had the longest ones (130.6 ± 5.3). Significant effect of season on dry period was reported by ALMI (1978) and MOURAD (1978) for Egyptian buffaloes.

The effect of village: The effect of village on dry period was highly significant. Duncan's Multiple Range Test revealed that dry periods of buffaloes on different villages differ significantly from each other. Buffaloes from El Namla (commercial farm) and Garawan had the shortest dry period (92.0 ± 8.8 and 104.2 ± 8.6 days respectively), while those from Zingy and Serse had the longest ones (134.1 ± 5.6 and 137.3 ± 7.4 days respectively).

3.3 Relationships between suckling period and some productive and reproductive characters

Table 7 shows the relationships between suckling period, service period, calving interval, lactation period, dry period and milk yield.

Tab. 7: Relationship between suckling period (y) and some productive and reproductive characters

	DF	R	BYX	SBYX
Service period (day)	113	0.35**	1.3	0.34
Calving interval (day)	113	0.36**	1.4	0.34
Milk yield (kg)	113	0.18	4.9	2.54
Lactation period (day)	113	0.30**	1.0	0.32
Dry period (day)	113	0.17	0.3	0.18

** = P < 0.01

It is obvious from the Table that the correlation coefficient between suckling period and service period was highly significant (r=0.35). The regression coefficient was 1.30 ±.34 days, which indicates that an increase of one day in suckling period resulted in an increase of 1.30 days in length of service period. These results are in agreement with those reported by EL SOBMY (1975) in Egyptian buffaloes, WILTBANK and COOK (1958) and SAIDUDDIN et al. (1967) in milking Shorthorns and Holstein dams, respectively.

It appears that suckling is a powerful stimulus, probably activates the pituitary to produce more prolactin and other tropic hormones known to be involved in the initiation and maintenance of lactation, but inhibits gonadotrophin production. On the other hand one of WEBB et al. (1977) investigations revealed that two injections LR–RH, first given at 20 to 30 days after calving and the second approximately 10 days later, will reduce the anestrous period in suckling cows. Research should be initiated to study the effect of hormone injection on shortening the anestrous period in suckling buffaloes.

Correlation coefficient between suckling period and calving interval was highly significant (r=0.36). The regression coefficient was 1.4 ± 0.34 days, which indicates that an increase of 1.4 days in length of calving interval.

The two components of calving interval, i.e. service period and gestation length, the latter is less variable and thus the principal factor contributing to variation in the calving interval is service period.

It is obvious from Table 7 that the correlation coefficient between suckling period and lactation period was highly significant (r=0.30). The regression coefficient was 1.0 ± 0.32 days which indicates that an increase of one day in suckling period resulted in an increase of one day in length of lactation period.

Dry period and total milk yield correlated non significantly with suckling period. The regression coefficients between suckling period on one hand and dry period and milk yield on the other were 0.30 and 4.9 days respectively.

3.4. Reason for disposal of buffalo calves

The general belief is that male calves are kept suckling for 40 days, then killed for meat production.
In the present study only 17.0% are kept till weaning, few of them to be selected as bulls and the rest are kept for fattening (Table 8). 76.6% of the male calves are disposed of before 40 days for veal production. It seems that farmer sells his calf at such early age to save the expensive milk and/or to get the tempting price of the calf nowadays.

Tab. 8: Reasons for disposal of buffalo calves

	Suck-ling period	Male calves		Female calves		Σ	
		No.	%	No.	%	No.	%
Sold for veal production	< 40	36	76.6	22	47.8	58	62.4
Died	< 40	3	6.4	1	2.2	4	4.3
Kept till weaning	> 50	8	17.0	23	50.0	31	33.3
Σ		47	50.5	46	49.5	93	100.0

What happens with the female calves is striking. Female calves are usually kept for herd replacement. The picture noticed is one, which is somewhat different. 47.8% of the females is disposed of before 28 days of age. This means that they are slaughtered illegally outside the slaughterhouses. This has its deleterious effect on buffalo improvement by limiting selectivity.

It can be recognized that good results could be achieved in larger herds if these receive the proper management. This is practiced in the commercial herd studied where personal interest of the owner was obvious. Service period, calving interval and milk yield are in good standard.

The number of animals used in this study was relatively small. Accordingly none of the results presented can be considered final or complete. Nevertheless, it reveals that undoubtedly there is a great need for field investigations concerning performance and potentialities of buffaloes owned by the farmers and in commercial herds if improvement projects are to be planned.

4. Summary

Records of 77 Egyptian buffaloes with 93 lactations collected during the period from October 1979 to November 1981 from three villages of Monoufia Province were used to evaluate the reproductive performance of this species by the Egyptian farmers (small farm). On the other hand one of the commercial dairy herds in Gharbia Province have been studied (24 records) to determine the differences between both farm conditions. The means and standard deviations of service period, calving interval,

lactation period, dry period and total milk yield were 110.1 ± 85.0 days, 426.8 ± 85.8 days, 304.9 ± 78.7 days, 121.9 ± 43.7 days and 2125.8 ± 505.3 kg resp.. The effects of season of calving, lactation number and farm were also studied.

Zusammenfassung

In der Zeit vom Oktober 1979 bis November 1981 wurden die Leistungen von 77 ägyptischen Büffeln mit 93 Laktationen aus drei Dörfern der Monoufia Provinz aufgenommen, um die reproduktive und produktive Leistung dieser Rassen, gehalten in kleinbäuerlichen Betrieben, zu untersuchen. Dem gegenüber wurde eine kommerzielle Milchherde einer Farm in der Gharbia Provinz mit 24 Leistungskontrollen untersucht, um Unterschiede zwischen beiden Haltungsbedingungen festzustellen.

Durchschnittswerte und Standardabweichungen von Service Periode, Zwischenkalbezeit, Laktationsperiode, Trockenzeit und Gesamtmilchmenge waren 110,1 ± 85,0 Tage, 426,8 ± 85,8 Tage, 304,9 ± 78,7 Tage, 121,9 ± 43,7 Tage und 2125,8 ± 505,3 kg. Die Auswirkungen von Kalbezeit, Anzahl der Laktationen und Betriebsbedingungen wurden ebenfalls untersucht.

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