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CALF CROP IN EGYPTIAN BUFFALOES

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ABSTRACT

Records on University of Alexandria buffalo herd were collected during the period started in 1960 to study the effects of age and weight at first calving, first calving interval, first lactation milk yield, inbreeding, breeding efficiency, productive life, longevity and sire on calf crop per buffalo cow.

The results obtained were as follow:

1- Averages of calf crop per buffalo cow were 1.6, 1.5 and 2.0 for female, male and both sexes total calves born during her lifespan.
2- Calf crop tended to decline significantly ($P<0.01$) as age at first calving increased and in contrast, it showed a tendency to increase significantly ($P<0.05$) with the progress of weight at first calving.
3- Both first calving interval and first lactation milk yield had non significant effect on calf crop.
4- Calf crop was lower (1.5) for inbred buffaloes than that for non-inbred ones (2.1) and the difference was significant ($P<0.05$) in this respect.
5- Calf crop was affected significantly ($P<0.01$) by each of breeding efficiency, productive life and longevity and it showed increasing trend.
6- Regression and correlation coefficients between calf crop and the mentioned factors came to the same results. Also, sex ratio and averages of birth weight of calves born were undertaken in the present study.
7- Differences in calf crop due to service sire effect were non significant.

INTRODUCTION

The low productivity and poor fertility resulted from various causes are of the main problems which face the breeder of buffaloes in Egypt. More investigations must be done to study these problems to overcome it. Calf crop per cow during her lifespan is considered an important economic character of dairy cattle because it is one of the criteria measuring productive and reproductive efficiencies for cow. It means more number of lactations and thus giving much amounts of total milk yield, a longer productive life and higher breeding efficiency. Besides, it would allow to produce more offspring for selection and reduce the cost of replacement in the herd.

Moreover, huge economic losses were due to a substantial reduction of the calf crop on the farm (Stipkovits *et al.*, 1993) and declines in profit from calf morbidity can be minimized by focusing on pounds of beef from calf crop instead of maintaining cow numbers (Ott and Miller, 1993).

The objectives of the present work were to study the effects of some environmental and genetic factors which influence calf crop of Egyptian buffaloes such as age and weight at first calving, first calving interval, first lactation milk yield, inbreeding, breeding efficiency, productive life, longevity and sire.

MATERIALS AND METHODS

Data on 574 productive and reproductive records of 282 Egyptian buffalo cows, belonging to Faculty of Agriculture, University of Alexandria, Egypt, were collected during the period started in 1960.

The present work was designed to study the effects of age and weight at first calving, first calving interval, first lactation milk yield, inbreeding, breeding efficiency, length of productive life (first calving to disposal), longevity (birth to disposal) and sire on calf crop per buffalo cow. Calf crop per cow was the total number of calves born during her lifespan. Breeding efficiency (BE) was calculated as described by Wilcox et al, (1957):

$$BE\ (\%) = \frac{365\ (n-1) \times 100}{D}$$

Where, n: is number of parturitions and

D: is the period in days from first to last parturition.

In order to study the effect of each factor on calf crop, buffalo cows were classified into groups within each factor. Analysis of variance was carried out according to Snedecor and Cochran (1967). Also, sex ratio (males: females) and birth weight of calves born were studied. Regression of calf crop on each factor as well as correlation coefficients between them were calculated.

RESULTS AND DISCUSSION

Frequency distribution of calf crop per cow in Egyptian buffaloes presented in table 1. From this table, it is evident that the averages of calf crop per buffalo cow were 1.6, 1.5 and 2.0 for female, male and both sexes total calves born during her lifespan, respectively. Also, 45% of buffalo cows were giving birth to one calf only and such higher percentage of early culling indicate more studies must be done to examine its reasons. Only 6% of them gave more than four calves during their lifespan.

Table (1): Frequency distribution of calf crop in Egyptian buffaloes.

Calf crop[1] per cow	Buffalo cows		?Calf crop[2] per cow	Buffalo cows		?Calf crop[3] per cow	Buffalo cows	
	No.	%		No.	%		No.	%
1	127	45.0	1	116	64.1	1	138	68.3
2	87	30.9	2	41	22.7	2	45	22.3
3	26	9.2	3	14	7.7	3	14	6.9
4	25	8.9	4	9	5.0	4	3	1.5
5	10	3.5	5	1	0.5	5	1	0.5
6	4	1.4	6	-	-	6	1	0.5
7	3	1.1	7	-	-	7	-	-
Total	282	100.0	Total	181	100.0	Total	202	100.0
Total calves:		574		281			293	
Average calf crop per cow:		2.0		1.6			1.5	
Average calf crop per 100 cows:		200		160			150	

1-Total number of calves born per cow during its lifespan.
2-Total number of female calves born per cow during its lifespan.
3-Total number of male calves born per cow during its lifespan.

These results were lower than that estimated by Tomar and Ram (1992), who found that in Murrah buffaloes, the lifetime calf production averaged 3.59 of which 3.40 were born alive and 1.61 were females. Also, Rawal and Tomar (1994) studies on Sahiwal cattle reported that a cow during its lifetime in the herd produced a total of 3.73 calves, 3.61 calves born alive, 1.80 female calves and 1.26 female calves that reached the milking stage. Nasr *et al.* (1997) showed that the average total number of pure Friesian calves born was 2.7 and ranged from 2.60 to 3.87 for crossbred ones.

Coefficients of regression and correlation between different factors and calf crop are given in table 2.

Factors affecting calf crop:

1-Age at first calving (AFC):

Calf crop tended to decline significantly ($P<0.01$) as AFC increased, being 2.6 and 1.8 calves when AFC was less than 30 months and over 42 months, respectively (Table 3). Such decrease in calf crop seemed to result from decreasing length of productive life of buffalo cows. Regression and correlation coefficients between calf crop per cow and AFC emphasize this significant ($P<0.01$) and negative relationship resulting as –0.030 and –0.17, respectively (Table 2). Such results were in accordance with the findings of Gregory *et al.* (1992) who showed that calf crop born percentage were the greatest in 2 years old dams and the smallest in dams greater than or equal to 5 years old. Gnyp and Litwinczuk (1997) found that the highest number of Friesian crossbred calves were noted in cows having AFC as 24-27 months. On the other hand, Mac Laren and Berg (1983) indicated that young dairy crossbred cows had low calf crop and the lowest weaning weight per cow.

Table (2): Regression and correlation coefficients between calf crop and the different factors studied in Egyptian buffaloes.

Factors	Regression coefficient (±S.D)	Correlation coefficient (±S.D)
1-Age at 1st calving (mo.)	-0.030**±0.010	-0.17**±0.05
2-Weight at 1st calving (kg.)	0.003*±0.001	0.15*±0.07
3-1st calving interval (mo.)	-0.026±0.022	-0.10±0.08
4-1st lactation milk yield (kg.)	0.00003±0.00009	0.03±0.06
5-Inbreeding (Fx%).	-0.029±0.032	-0.17±0.11
6-Breeding efficiency (wilcox, %)	0.026**±0.001	0.73**±0.04
7-Productive life (mo.)	0.054**±0.002	0.87**±0.03
8-Longevity (mo.)	0.048**±0.002	0.79**±0.04

*(P<0.05) ** (p<0.01)

Also, results given in table (3) showed that sex ratio was in favour of females (0.8) as AFC was less than 30 months and tended to males (1.3) when AFC being (30-36) months. Averages of birth weight of calves born were heavier for AFC groups up to 36 months.

2-Weight at first calving (WFC):

The effect of WFC on calf crop was significant (P<0.05) and that calf crop showed a tendency to increase with the progress of WFC. It was maximum (2.6) when WFC was over 500kg. (Table 3). Significant (P<0.05) and positive regression and correlation coefficients in this respect were observed (Table 2). Similar results were reported by Sims (1993) who found an increase in calf crop as average cow weights increased from 484 kg to peak weight at 568 kg. in Hereford crossbreds. Also, Godfrey *et al.* (1988) showed significant influence of cow weight at calving on calf performance i.e., calf crop in Brahman crossbreds.

Moreover, sex ratio seemed to be almost the same for different groups of WFC and the averages of birth weight of buffalo calves showed an increasing trend as WFC increased (Table 3).

Table (3): Effect of age at first calving (AFC), weight at first calving (WFC), first calving interval (FCI) and first lactation milk yield (FMY) on calf crop in Egyptian buffaloes.

1st record performance		No. of buffalo cows	Calf Crop					
Item	groups		Male	Female	Total calves	Sex ratio	Birth weight (±S.D) kg.	Calf crop per cow+ (±S.D)
AFC (mo.)	Less than 30	28	31	43	74	0.8	35.8±7.2	2.6^{a}±1.7
	30-36	91	113	90	203	1.3	36.5±6.4	2.2^{ab}±1.4
	-42	104	96	97	193	1.0	33.4±5.4	1.9^{b}±1.2
	Over 42	59	53	51	104	1.0	35.4±6.7	1.8^{b}±1.1
	Total	282	293	281	574	1.0	35.1±6.2	2.0±1.3
	Sig.							(4.3**)
	L. S.D 0.05							(0.51)
WFC (kg.)	Less than 400	48	46	42	88	1.1	33.2±5.8	1.8^{a}±1.2
	400-450	63	68	68	136	1.0	34.4±5.8	2.2^{ab}±1.4
	451-500	57	60	62	122	1.0	35.5±5.7	2.1^{a}±1.3
	Over 500	42	56	57	113	1.0	36.0±7.4	2.6^{b}±1.6
	Total	210	230	229	459	1.0	34.7±6.1	2.2±1.4
	Sig.							(3.0*)
	L.S. D 0.05							(0.54)
FCI (mo.)	Less than 15	33	46	54	100	0.9	36.1±7.0	3.0^{a}±1.3
	15-18	50	73	68	141	1.1	35.3±6.6	2.8^{a}±1.1
	-21	32	45	52	97	0.9	36.4±6.4	3.0^{a}±1.4
	Over 21	40	56	53	109	1.1	36.0±6.4	2.7^{a}±1.2
	Total	155	220	227	447	1.0	35.9±6.6	2.9±1.2
	Sig.							$(0.6)^{n.s.}$
	L.S. D 0.05							(0.56)
FMY (kg.)	Less than 1000	126	133	113	246	1.2	34.8±6.3	1.9^{a}±1.4
	1000-1500	45	46	50	96	0.9	35.0±6.0	2.1^{a}±1.2
	1501-2000	38	41	39	80	1.1	36.3±5.9	2.1^{a}±1.3
	Over 2000	16	24	20	44	1.2	35.1±7.2	2.8^{b}±1.7
	Total	225	244	222	466	1.1	35.1±6.2	2.1±1.4
	Sig.							$(1.7)^{n.s}$
	L.S. D 0.05							(0.56)

*(P<0.05) **(P<0.01)

+ Means within each classification having the same letter were not significant.

3-First calving interval (FCI):

There was a slight decrease in calf crop accompanied by an increase in FCI but it did not reach the significant level (Table 3). A weak, negative association between them was observed (Table 2). Such effect reflects that a longer FCI would lead to shorter length of productive life of a buffalo cow and thus decreasing her crop of calves indicating that level of management and reproductive practices must be good enough to result in shorter service period of these buffalo cows for lowering its calving interval in order to obtain the optimum calf crop. Godfrey *et al.* (1988) working on (Brahman X Hereford) cows showed that calf crop decreased from 91.1 to 73.3% as calving interval increased from 363.2 to 394.3 days.

It is also shown in table 3 that sex ratio was around one and the averages birth weight of calves ranged from 35.3 to 36.4 kg.

4- First lactation milk yield (FMY):

From table (3), it was noticed that calf crop per buffalo cow tended to increase as FMY increased up to over 2000 kg. and being 2.8 but this effect lacked significance. Small and positive regression and correlation coefficients between calf crop and FMY (Table 2) were calculated as 0.00003 and 0.03, respectively. Montano and Nielsen (1990) found a significant age x milk yield interaction for calf crop and that it was the lowest (73.6%) for low milk yield cows and the highest (92.5%) for medium yield cows during the first lactation. Regardless the second group (1000-1500 kg.), sex ratio was in favour of males in most groups. The averages of birth weight of calves born slightly increased with increasing FMY as shown in table 3.

The present results suggest that the highest percentage of buffalo cows (126 of 225) is giving the lowest calf crop (1.9) for the first group of FMY (less than 1000 kg.) and this could be explained early culling for them owing to lower milk yield. Moreover, such results may be lead to the conclusion that good care, feeding and management for buffalo heifers in early stage of age will produce heifers calving for the first time at optimum younger age, heavier weight, shorter first calving interval and giving a higher amount of milk yield and thus they remaine in the herd for a longer time producing more calves during their lifespan.

5-Inbreeding:

Table (4) revealed that calf crop per buffalo cow was lower (1.5) for inbred buffaloes than that for non-inbred ones (2.1) and the differences due to inbreeding effect were significant ($P<0.05$). Negative and non significant regression and correlation coefficients in this concern were observed (Table 2). These results indicate that the breeder to realize higher calf crop per cow must be careful to avoid high levels of inbreeding inside his herd.

Sex ratio seemed to be constant and being 1.0 for the two groups whereas the averages birth weight of calves were in favour of non-inbred group (Table 4). Gregory *et al.* (1992) stated that when loss of heterosis was greater, calf crop born percentage reduced and this was a result of increased fetal loss between pregnancy diagnosis and parturition. Ayyat *et al.* (1997)

found that inbreeding had significant effect (P<0.001) on birth weight of Egyptian buffalo calves and being 34.0 and 31.3 kg. for non-inbred and inbred calves, respectively.

Table (4): Effect of inbreeding, breeding efficiency (B.E), Productive life (Prod. life) and longevity on calf crop in Egyptian buffaloes.

Lifetime performance		No. of buffalo cows	Calf Crop					
Item	groups		Male	Female	Total	Sex ratio	Birth weight (±S.D) kg.	Calf crop per cow+ (±S.D)
Inbreeding	Inbred (Fx≤28.5%)	35	27	27	54	1.0	34.5±5.8	1.5^{a}±1.2
	Non-inbred	247	266	254	520	1.0	35.2±6.4	2.1^{b}±1.3
	Total	282	293	281	574	1.0	35.1±6.2	2.0±1.3
	Sig.							(5.7)*
	L.S. $D_{0.05}$							(0.47)
B.E (Wilcox, %)	Less than 40%	130	78	57	135	1.4	32.5±4.6	1.0^{a}±0.1
	(40-)	33	38	40	78	1.0	34.1±5.5	2.4^{b}±0.8
	(60-)	75	112	113	225	1.0	36.7±6.6	3.0^{c}±1.2
	80% and over	44	65	71	136	0.9	36.1±6.8	3.1^{cd}±1.4
	Total	282	293	281	574	1.0	35.1±6.2	2.0±1.3
	Sig.							(100.9)**
	L.S. $D_{0.05}$							(0.32)
Prod. Life (mo.)	Less than 12	61	36	25	61	1.4	32.2±5.0	1.0^{a}±0.0
	12-24	90	68	66	134	1.0	34.1±5.2	1.5^{b}±0.5
	-36	43	43	39	82	1.1	34.3±6.9	1.9^{c}±0.6
	-48	35	54	45	99	1.2	36.6±6.5	2.8^{d}±0.9
	Over 48	46	87	105	192	0.8	36.4±6.7	4.2^{e}±1.4
	Total	275	288	280	568	1.0	34.4±5.8	2.1±1.3
	Sig.							(147.8)**
	L.S. $D_{0.05}$							(0.29)
Longevity (mo.)	Less than 48	64	42	37	79	1.1	34.4±5.7	1.2^{a}±0.4
	48-60	78	62	48	110	1.3	33.0±5.4	1.4^{a}±0.5
	-72	47	38	50	88	0.8	35.9±6.9	1.9^{b}±1.1
	-84	40	60	44	104	1.4	35.4±7.0	2.6^{c}±1.0
	Over 84	48	89	99	188	0.9	36.4±6.4	3.9^{d}±1.4
Total		277	291	278	569	1.0	34.8±6.1	2.1±1.3
Sig.								(79.8)**
L.S. $D_{0.05}$								(0.34)

***(P<0.05) ** (P<0.01)**

+ Means within each classification having the same letter were not significant.

6-Breeding efficiency (BE):

It is obvious that there is a tendency for calf crop per buffalo cow to increase significantly (P<0.01) from 1.0 to 3.1 as BE increased (Table 4). Results given in table (2) came to the same results and showed significant ((P<0.01) and positive regression and correlation coefficients between them and being 0.026 and 0.73, respectively. Such an increase in calf crop may be attributed to the increase in productive life length resulting from good management and reproductive practices such as success in detecting heat, timing of service as reported by Wiltbank *et al.* (1994) who put steps for improving calf crop of which to develop a plan for improvement of reproduction. Also, PCARRD (1989) showed that low reproductive efficiency of buffaloes in Philippine leads to low calf crop and hence a great economic loss to farmers.

Sex ratio tended towards males (1.4) in the first group as BE was less than 40% and the averages birth weight of buffalo calves showed increasing trend resulting from advancing age and weight of their dams (Table 4).

7- Productive life and longevity:

Both productive life and longevity had significant (P<0.01) effect on calf crop per buffalo cow and that calf crop showed an increasing trend as each of them increased and ranged from 1.0 to 4.2 and from 1.2 to 3.9 for productive life and longevity groups, respectively (Table 4).

Similarly, significant (P<0.01) and positive associations between calf crop and both of productive life and longevity were observed (Table 2). It is also evident from table 4 that sex ratio was in favour of males in most groups and the averages of birth weight tended to increase with the progress of age. The present results were in agreement with Gnyp and Litwinczuk (1997) working on Holstein Friesian cows and Afifi *et al.* (2001) studies on upgrads of Domiati cattle with dairy breeds in Egypt who indicated that the highest crops of calves were associated with the longest life, i.e herd life and productive life.

8-Sire effect:

There were variations among sires in calf crop, but these variations did not reach the significant level and its ranged from 1.0 to 3.2. Such fluctuations may greatly due to higher percentage of sires having few offspring in this respect (Table 5).

Table (5): Effect of sire on calf crop in Egyptian buffaloes.

Sire[1] Code	No. of daughters	Calf Crop					
		Male	Female	Total	Sex ratio	Birth weight (±S.D) kg.	Calf crop per cow[2] (±S.D)
1	29	23	26	49	0.9	33.7±4.2	1.7^{abc}±0.8
2	10	9	6	15	1.5	31.5±6.9	1.5^{abc}±0.7
3	10	10	12	22	0.8	39.3±5.5	2.2^{ad}±2.0
4	9	13	10	23	1.3	37.2±7.5	2.6^{cd}±2.1
5	6	8	6	14	1.3	40.9±7.2	2.3^{bcd}±0.8
6	5	3	2	5	1.5	32.8±5.3	1.0^{a}±0.0
7	5	5	2	7	2.5	34.6±4.6	1.4^{abc}±0.5
8	5	3	6	9	0.5	32.4±4.2	1.8^{abc}±0.8
9	5	3	6	9	0.5	32.3±5.5	1.8^{abc}±1.0
10	5	6	10	16	0.6	38.5±6.5	3.2^{d}±2.9
11	5	4	4	8	1.0	25.0±5.3	1.6^{abc}±1.0
12	5	6	10	16	0.6	42.2±1.0	3.2^{d}±1.7
13	5	3	3	6	1.0	30.7±1.2	1.2^{ab}±0.5
Sig. L.S.D $_{0.05}$							$(1.81)^{n.s}$ (1.29)

n.s= not significant at (P<0.05).

[1]Sires having less than five daughters were excluded.

[2]Means having the same letter were not significant (P<0.05).

Mcreover, both sex ratio and the averages birth weight of buffalo calves born showed non specific trend over different sires (Table 5). Sire effects within generation on lifetime calf production, i.e. total calves, calves born alive, female calves and female calves that reached the milking stage were not significant (Rawal and Tomar, 1994).

In general, the present results indicate that improving the level of nutrition, management and breeding efficiency of buffalo cows besides all means which make buffalo cows to stay for longer time inside the herd economically or to longitude the length of productive life and longevity of them, lead to desirable increase in their calf crop.

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محصول العجول فى الجاموس المصرى

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قسم الإنتاج الحيوانى ـ كلية الزراعة (الشاطبى) جامعة الإسكندرية

تم تحليل البيانات المأخوذة من ٥٧٤ سجل إنتاجى وتناسلى لعدد ٢٨٢ جاموسة تتبع قطيع الجاموس الحلاب التابع لقسم الإنتاج الحيوانى بكلية الزراعة جامعة الإسكندرية فى الفترة من (١٩٦٠ – ١٩٨٠) لدراسة تأثير بعض العوامل البيئية على محصول العجول للجاموسة الواحدة خلال حياتها ويمكن تلخيص نتائج الدراسة فيما يلى:

١- بلغ متوسط محصول العجول /للجاموسة الواحدة خلال حياتها ١,٦، ١,٥، ٢,٠ وذلك بالنسبة لمحصول الإناث ومحصول الذكور ومحصول العجول الكلى على الترتيب.

٢- اظهر محصول العجول ميلا الى النقصان معنوياً مع زيادة العمر عند أول ولادة وعلى العكس من ذلك حيث يميل للزيادة معنوياً مع زيادة الوزن عند أول ولادة.

٣- ليس لكل من الفترة بين أول ولادتين وإنتاج اللبن خلال الموسم الأول وكذلك تأثير الطلوقة تأثيرات معنوية على محصول العجول.

٤- سجل محصول العجول انخفاضا (١,٣) فى حالة إناث الجاموس المرباة تربية داخلية مقارنة بمحصول العجول لإناث الجاموس الغير مرباة تربية داخلية (٢,١) وكان الفرق بين هاتين المجموعتين معنوياً.

٥- أثرت كل من الكفاءة التناسلية، طول الحياة الإنتاجية وطول العمر تأثيرا عالى المعنوية على محصول العجول وأظهرت علاقة طردية بينهم حيث وجد اتجاه متزايد فى محصول العجول مع زيادة كل منها.

٦- أعطت معاملات الانحدار والارتباط المحسوبة بين محصول العجول والعوامل تحت الدراسة نفس النتائج السابقة. وكذلك تم دراسة النسبة الجنسية واوزان الميلاد للعجول الجاموسى المولودة فى هذا القطيع.