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Puberty and Post Pubertal Changes in Semen Characteristics of Buffalo and Friesian Bulls as Affected by Weaning Systems

F.M.R. El - Feel, A.K.I. Abd Elmoty and A. A. Abd Elhakeam

Animal Production Department, Faculty of Agriculture, Minia University, Elminia, Egypt.

FIFTY - two male calves (26 buffalo and 26 Friesian) were raised under two weaning systems to study their effect on puberty and post-pubertal changes in semen characteristics. The early weaned (EW) group received a restricted amount of whole milk and weaned at 45 and 31 days of age for buffalo and Friesian male calves; respectively. The second group of both species was raised on milk replacer (MR) and weaned at 63 days of age. Puberty age was found to be 442 and 315 days for buffalo and Friesian bull calves, respectively. The corresponding values of body weight at puberty were 274 and 240 kg in the same order. Weaning system showed no significant effect on both age and body weight at puberty in both species.

Two successive ejaculates were collected weekly from each bull (10 buffalo and 10 Friesian representing the two weaning systems) from puberty till six months post-puberty. Weaning system showed no significant effect on all semen characteristics of both species. However, EW in both species tended to be higher in values than MR ones. All semen characteristics increased significantly, while pH value decreased significantly by advancing of age toward sexual maturity. Friesian bulls had higher values of semen volume, sperm output/ejaculate, total motile sperm/ejaculate and initial percentage of motility and had lower values of both sperm concentration/ml and pH of the semen than buffalo bulls. Buffalo and Frie-

sian bulls reached sexual maturity (one billion sperm/ml) at about 18 and 15-16 months of age, respectively. The differences due to weaning systems on both age and body weight at sexual maturity were not significant in both species.

Keywords: Buffaloes, Friesian, puberty, semen characteristics, weaning system.

The reproductive efficiency of males in livestock is associated with the quantity and quality of nutrition during the weaning period (Kirchgessner, 1975). Maximum reproductive efficiency of bulls can be achived by using the male as early as possible (Yassen *et al.*, 1975; Hafez, 1987). Little information is known about the effect of weaning systems on puberty and subsequent semen production of buffalo and Friesian bulls under the Egyptian conditions. Therefore, this study was conducted to evaluate the effect of two different weaning systems on age and body weight at puberty, sexual maturity and post-pubertal changes in semen characteristics of buffalo and Friesian bulls.

Materials and Methods

This study was conducted at the farm of the Animal Production Department, Faculty of Agriculture, El - minia University, Egypt.

Twenty-six male buffalo and twenty-six male Friesian calves were used throughout this study. Calves were housed individually in crates. The following two weaning systems were used for raising calves:

1 - Early weaning on whole milk (EW)

Buffalo male calves were weaned at 45 days of age during which each calf received 105 kg whole buffalo milk; while Friesian male calves were weaned at 31 days of age during which each calf consumed 67 kg whole cow milk (Table 1). This system used for both buffalo and Friesian calves was reported by Ahmed and El - Shazly (1960).

2 - Milk replacer (MR):

The milk replacer was prepared as follows: 125 g. of milk replacer powder (commercial milk replacer imported from Holland supplemented with vitamins, minerals and antibiotics) was added to 875 ml of warm water (t 38°C). Buffalo and Friesian calves received 270 liter/calf of milk replacer solution from birth till wean-

ing at 63 days of age (Table 1). One litre of this solution contained 3.2% crude protein and 17.5% TDN (Mahdy, 1983). Buffalo and Friesian calves received about 26 kg whole milk during the first two weeks of age after a colostrum period of 3 days. Calves were fed whole milk or milk replacer in buckets twice daily at 7.00 a.m and 3.00 p.m. The systems of nursing and the amounts of whole milk and milk replacer consumed are shown in Table (1).

TABLE 1. Systems of raising buffalo and Friesian male calves on early weaning and milk replacer.

Early weaning (EW)				Milk replacer (MR) for buffalo and Briesian		
Buffalo		Friesian		whole milk		milk replacer
Age day	Milk kg/day	Age day	Milk kg/day	Age day	kg/ day	litre/ day
0 - 3	colostrum	0 - 3	colostrum	0 - 3	colostrum	1
4 - 24	3.0	4 - 18	3.0	4 - 7	3	2
25 - 31	2.5	19 - 24	2.5	8 - 14	2	3
32 - 38	2.0	25 - 31	1.0	15 - 28	-	5
39 - 45	1.5			29 - 42	-	6
				43 - 56	-	5
				57 - 63	-	2
Total	105		67		26	270
T. D. N	26%		17%		26or 17%	17.5%

Starter mixture (consisted of: 35 maize grains, 15 lineseed oil meal, 10 barly grains, 30 horse beens *(Vicia Vaba)*, 7 molasses, 2 calcium carbonate and 1 part mineral mixture, with 71.5% TDN and 13.0% DP) was freely offered in buckets to calves of EW and MR groups on the fifth day of birth till 90 days of age. The residuales left after feeding were collected on the next day, weighted and recorded daily. The calculated amounts of starter consumed during this period were 75 and 65 kg/calf for Friesian and buffalo raised on EW system, while it was 45 kg/ calf for both species raised on MR system. Starter was offered cooked during the first two months and it was offered dry during the third month of age.

Berseem *(Trifolium alexandrinum)* was also offered to all calves in winter or darawa (green maize) during summer in quantities increased by the increase of the calves body weight and age. After the third month of age, rice straw was used as a roughage representing 30% of the requirements, while commercial mixture (55% TND and 14% crude protein) represented 70% of the requirements for feeding all calves. Calves were fed individually according to their body weight (Tommi, 1963).

The sexual behaviour of male calves was recorded every week starting from the beginning of the seventh month of age till they reached puberty. Male calves were placed for an hour on the assigned day between female calves, which were housed freely inside yards. Males were closely watched and their sexual behaviour was recorded. Age at puberty was considered the age at which first sperm was collected according to Asdell (1955) and Hussam (1979). Body weight at puberty was also recorded.

Semen collection and evaluation

Twenty male calves (10 buffalo and 10 Friesian) representing the two weaning systems were used, starting from puberty and continued for six months post-puberty, to evaluate their semen production. Semen was collected between 8.00 and 10.00 a.m using artificial vagina. Each male was sexually stimulated by allowing two false mounts and 2-3 min. restraint before collection. Two successive ejaculates were collected weekly from each male in an interval of one hour. Semen volume was recorded using graduated collecting tube. Sperm motility and the pH of the freshly collected semen were immediately recorded after collection using a microscope stage warmer and Whatman pH comparative indicator paper. Number of spermatozoa/ml of semen was determined using a haemocytometer. Total and motile sperm output/ejaculate were calculated.

Bulls were considered sexually mature when produced two successive ejaculates of one billion sperm/ml (Hussam, 1979; Hafez, 1987). Body weight at sexual maturity was, also recorded.

Data of semen characteristics were analysed by the least squares means method (S. A. S, 1988). The following statistical model was assumed and used:

$Yij_n = U + S_i + X_j + eij_n$ where:

Yij_n = the observation on the n th animal in the i th weaning system of the j th month order post - puberty.

U = the overall mean,

Si = fixed effect of i th weaning system (1 = EW, 2 = MR).

Xj = fixed effect of j th month order post-puberty (j = 1-6),

eij_n = the random error.

Differences due to effect of weaning system on age and body weight at puberty and sexual maturity were tested by T-test (Snedecor and Cochran, 1967). Models were run separately for buffalo and Friesian calves.

Results and Discussion

I - *Effect of weaning systems on age and body weight at puberty:*

The effect of weaning systems on age and body weight at puberty are shown in Table (2). There was no significant effect due to weaning systems, early weaning (EW) and milk replacer (MR) systems, on age and body weight at puberty in both buffalo and Friesian male calves. However, it was observed that early weaned males of both species tended to be slightly heavier than those of MR.

TABLE 2. Mean values ±SE of age and body weight at puberty and sexual maturity of buffalo and friesian bull calves raised under two different weaning systems.

Variable		Weaning systems EW	MR	Sig.	Overall mean
		BUFFALO CALVES			
Puberty:					
age	(day)	440±13.6	443±13.0	NS	442±15.5
body weight	(kg)	278±15.0	270±25.1	NS	274±21.9
Sexual maturity:					
age	(day)	535±16.5	547±17.0	NS	541±18.0
body weight	(kg)	375±12.0	370±14.6	NS	373±13.7
		FRIESIAN CALVES			
Puberty:					
age	(day)	316±16.0	314±17.6	NS	315±13.2
body weight	(kg)	245±04.5	235±06.6	NS	240±5.5
Sexual maturity:					
age	(day)	446±18.6	454±19.2	NS	450±17.0
body weight	(kg)	366 ± 5.5	354 ± 6.6	NS	360±6.2

EW = early weaning MR = milk replacer NS = not significant

Despite that EW calves of both species received less amount of liquid feed and weaned earlier than those raised on MR, they tended to be equal or slightly better in growth rate. Mean values of daily gain for buffalo raised on EW and MR were 0.63 and 0.60 kg/day, while they were 0.78 and 0.75 kg/day for Friesian male calves from birth till puberty. El - Feel (1984) found that early weaned group had higher values of body weight at 24 and 72 weeks of age than milk replacer group. Khalil and Pirchner (1986) stated that, the early weaned Friesian calves grew fastest in the early phase of the growing period and this probably reflected their superior appetite for dry feeding. The present results confirm this finding, where friesian and buffalo male calves of EW group received higher amount of starter (75 and 65 kg/calf) than those of MR group, which received about 45 kg/claf of both species, during the first three months of age. It could be stated that raising buffalo and Friesian male calves on restricted amount of whole milk (EW) and offering high quality starter with good management is more economical than using imported milk replacers. Kirchgessner (1975) and Hafez (1987) reported that reproductive efficiency of bulls in livestock is associated with the quantity and quality of nutrition during weaning period and thereafter. Bratton *et al.* (1961) reported that all factors that might affect the growth rate of the calf are expected to affect age of puberty.

Generally, it was observed from Table (2) that Friesian bulls reached age of puberty and sexual maturity 127 days and 91 days, respectively, earlier than buffalo bulls. Early sexual development in Friesian bulls could be explained on basis of species differences, good care and/or intensive selection in Friesian breed while little or no selection has been practised with buffaloes. Bhattacharya (1974) and Hussam (1979) reported that buffalo bulls attain puberty rather later than the cattle bulls, even under good nutritional and management conditions. It has been reported that body weight at puberty seems to be a genetic character (Almquist and Amann, 1976).

II - Post - pubertal semen characteristics

Least squares means and significance of factors affecting semen characteristics of both buffalo and Friesian bulls during six months post-puberty are presented in Table (3).

II - 1 - Effect of weaning system

Generally, there was no significant effect due to weaning system on all semen characteristics in both species. However, post-pubertal semen characteristics of both

species tended to be in favor of EW system than MR (Table 3), which could be related to the difference in age and body weight at puberty. Jaskowski, *et al.* (1977) found that, there was no difference in semen quality between bulls raised on different amounts of whole and skimmed milk.

II - 2 - Effect of age

Data in Table (3) showed that, with advancing of age from the first month to the sixth month post-puberty, there was a gradual increase in ejaculate volume, sperm concentration/ml, sperm output/ejaculate, total motile sperm/ejaculate and initial percentage of motile cells and a decrease in the pH of semen for both buffalo and Friesian bulls. Differences due to age post - puberty were significant for all semen characteristics. This may be due to the continous increase in body weight and the development of the primary and secondary sex organs which had not yet reached its optimal weight and function. Yassen and Mahmoud (1972) found a positive and significant relationship between body weight and testicular size and their production of semen. The present results agree with those reported by Cunningham *et al.* (1967), El - Alamy (1973), Yassen *et al.* (1975), Hussam (1979), Batosamma *et al.* (1987) and Darwish (1990). They reported that after puberty most semen characteristics of both buffalo and cattle bull calves increased and improved with advancing of age. Similar results were found by El. Sheikh and Mahmoud (1967), and Darwish (1990).

It could be noticed from the present study that Friesian bulls produced semen with higher seminal values than buffalo bulls (expressed as overall mean of all ejaculates). The respective values for seminal volume 2.14 vs. 1.40 ml, sperm output/ejaculate 2.87 vs. 2.47 x 10^9 sperm, total motile sperm/ejaculate 2.42 vs. 1.93 x 10^9 sperm and initial sperm motility 79.30 vs. 73.15% for Friesian and buffalo bulls.respectively, However, lower values of sperm concentration/ml 1.04 vs 1.27 x 10^9 sperm and semen pH 6.95 vs. 6.99 in Friesian semen than that of buffalo bulls. Differences were due to species. It is worth to note that Friesian bulls had higher values of testicular circumference, size and weight than those of buffalo bulls of similar body weight. The average values of post-puberty semen traits in the present study are in agreement with those reported by Hussam (1979) on Egyptian buffalo and Friesian bulls. Average seminal volume of Egyptian buffalo bulls was 3.5 ml (Fayez *et al.*, 1985) and 2.9 ml (Tawfik, 1988). Mean initial percentage of motile

sperm in Egyptian buffalo bull semen was 63.2% (Fayez *et al.*, 1985).

III - Sexual maturity

A concentration of one billion sperm/ml of semen was assumed as a normal mean of a standard ejaculate for sexually mature cattle or buffalo bulls (Hussam, 1979). The same value is routinelly accepted by international A. I organization (Hafez, 1987). Applying this hypothesis on the present study, it was found that buffalo bulls reached sexual maturity at the third month post-puberty (18 months old). However, the Friesian bulls reached their sexual maturity at about the 4th -5th month post-puberty (15-16 months old) as it has been shown in Tables (2 & 3). Hussam (1979) found that buffalo and Friesian male calves reached sexual maturity at 18 and 16 months of age, respectively.

IV - First and second ejaculates characteristics

It has been found (Table 3) that overall means of seminal volume (ml), sperm concentration/ml, sperm output/ejaculate and total motile sperm/ejaculate were higher in first than second ejaculates in both buffalo and Friesian bulls. Semen pH of first ejaculates was higher than that of second ones in buffalo but the reverse was observed in Friesian bulls. Initial sperm motility of second ejaculates was higher than first ones in both species. Difference could be due to the efficiency of sexual stimulation for collecting the first eijaculates of those bulls. The decrease in semen volume, sperm concentration and sperm output/ejaculate of the second ejaculate is beleived to be due to limited storage capacity of the bulls epididymis (Yassen *et al.*, 1975). The present results are in agreement with those reported by Badawy (1971), El - Alamy (1973), El-Hariri (1973), Ibrahim (1973), El-Azab *et al.* (1977), fayez *et al.* (1985), tawfik (1988) and Darwish (1990). They reported that semen volume, sperm concentration/ml and sperm output/ejaculate were higher in the first ejaculates than in the second ones.

It could be concluded from the present study that using either early weaning or milk replacer systems in raising buffalo and Friesian male calves in addition to a high quality starter diet and good management during the first three months of age had no adverse effect on the development of sexual behavior and post-pubertal seminal characteristics. However, from a practical and economical point of view, early weaning system could be used in raising buffalo and Friesien male calves under the Egyptian conditions is pereferable to milk replacers.

TABLE 3. Least squares means ± S.E and significance of factors affecting semen characteristics in Buffalo and Friesian calves.

Item	Weaning systems							
	Buffaloes calves				Friesian calves			
	Overall mean	E.W	M.R	Sig.	Overall mean	E. W	M.R	Sig.
eminal volume (ml):								
1 St ejac.	1.65	1.70±0.09	1.60±0.09	NS	2.24	2.24±0.13	2.24±0.12	NS
2 nd ejac.	1.15	1.18±0.07	1.13±0.07	NS	2.04	2.11±0.14	1.98±0.12	NS
can 2 ejac.	1.40	1.49±0.07	1.37±0.07	NS	2.14	2.15±0.11	2.13±0.10	NS
Perm concentration/ml (x 10 sperm):								
1 St ejac.	1.30	1.42±0.07	1.31±0.07	NS	1.14	1.14±0.07	1.14±0.08	NS
2 nd ejac.	1.21	1.25±0.07	1.07±0.09	NS	0.93	0.98±0.06	0.87±0.06	NS
can 2 ejac.	1.27	1.34±0.07	1.20±0.08	NS	1.04	1.06±0.06	1.03±0.05	NS
Perm output/ejac. (x 10 sperm):								
1 St ejac.	3.03	3.25±0.18	2.81±0.19	NS	3.16	3.15±0.26	3.18±0.24	NS
2 nd ejac.	1.91	2.03±0.15	1.79±0.15	NS	2.57	2.64±0.21	2.49±0.19	NS
can 2 ejac.	2.47	2.63±0.18	2.30±0.14	NS	2.87	2.90±0.21	2.90±0.19	NS
Otal motile sperm/ejac. (X 10 sperm):								
1 St ejac.	2.36	2.54±0.18	2.18±0.16	NS	2.67	2.69±0.22	2.65±0.21	NS
2 nd ejac.	1.52	1.64±0.13	1.40±0.14	NS	2.17	2.23±0.18	2.12±0.17	NS
can 2 ejac.	1.93	2.09±0.12	1.76±0.12	NS	2.42	2.46±0.21	2.38±0.21	NS
Otility %:								
1 St ejac.	72.53	71.56±1.85	73.51±2.26	NS	78.80	79.01±2.50	78.58±2.51	NS
2 nd ejac.	73.71	74.07±1.88	73.35±2.33	NS	79.89	82.26±2.48	77.52±2.29	NS
can 2 ejac.	73.15	72.88±1.76	73.43±2.24	NS	79.33	80.63±2.36	78.02±2.18	NS
emen pH:								
1 St ejac.	7.00	7.01±0.03	6.98±0.04	NS	6.93	6.88±0.05	6.97±0.04	NS
2 nd ejac.	6.98	7.02±0.03	6.93±0.04	NS	6.96	6.91±0.05	7.01±0.04	NS
can 2 ejac.	6.96	7.01±0.03	6.96±0.03	NS	6.95	6.90±0.05	7.00±0.04	NS

W = early weaning M.R = Milk replacer

TABLE 3. (Cont.)

Item	Age (post - puberal month)						
	Buffalo calves						
	1 St	2 nd	3 rd	4 th	5 th	6 th	Sig
eminal volume (ml):							
1 St ejac.	1.29±0.17	1.44±0.14	1.72±0.12	1.80±0.14	1.85±0.12	1.90±0.15	*
2 nd ejac.	1.12±0.12	1.34±0.10	1.41±0.09	1.50±0.10	1.52±0.08	1.54±0.11	*
ean 2 ejac.	1.21±0.13	1.38±0.10	1.57±0.09	1.64±0.10	1.69±0.09	1.72±0.11	*
Perm concentration/ml (x 10 sperm):							
1 St ejac.	0.46±0.13	0.90±0.10	1.04±0.09	1.50±0.10	1.58±0.09	1.68±0.11	**
2 nd ejac.	0.55±0.13	0.90±0.10	1.04±0.10	1.25±0.10	1.40±0.10	1.42±0.12	**
ean 2 ejac.	0.50±0.11	0.90±0.10	1.04±0.08	1.38±0.09	1.49±0.08	1.55±0.10	**
Perm output/ejac. (x 10 sperm):							
1 St ejac.	1.03±0.36	1.69±0.30	2.43±0.27	3.43±0.30	3.69±0.26	3.84±0.34	**
2 nd ejac.	1.11±0.30	1.63±0.25	2.02±0.22	2.40±0.24	2.45±0.22	2.61±0.27	**
ean 2 ejac.	1.07±0.28	1.66±0.22	2.23±0.21	2.90+0.22	3.05±0.20	3.23±0.26	**
Otan motile sperm/ejac. (X 10 sperm):							
1 St ejac.	0.72±0.31	1.22±0.26	1.92±0.22	2.89±0.25	2.88±0.22	3.02±0.29	**
2 nd ejac.	0.84±0.26	1.25±0.21	1.65±0.19	1.84±0.21	1.94±0.18	2.06±0.24	*
ean 2 ejac.	0.79±0.23	1.24±0.19	1.78±0.17	2.33±0.18	2.38±0.17	2.54±0.22	**
Otility %:							
1 St ejac.	52.63±3.71	67.13±3.02	76.35±2.68	77.48±2.98	75.20±2.67	78.74±3.37	**
2 nd ejac.	56.23±3.77	68.48±3.06	76.04±0.72	75.63±3.02	74.23±2.71	79.21±3.42	**
ean 2 ejac.	54.42±3.52	67.77±2.87	76.20+2.54	76.54±2.82	74.70±2.52	78.98±3.19	**
emen pH:							
1 St ejac.	7.22±0.06	7.93±0.05	6.91+0.05	6.88±0.05	6.88±0.04	6.89±0.06	**
2 nd ejac.	7.14±0.05	6.84±0.05	6.82±0.04	6.98±0.05	6.89±0.04	6.96±0.05	**
ean 2 ejac.	7.14±0.05	6.89±0.04	6.87±0.04	6.93±0.04	6.88±0.04	6.92±0.05	**

* : Significant (P <0.05) **: Significant (P <0.01)

TABLE 3. (Cont.)

Item	Age (post - puberal month) Friesian calves						
	1 St	2 nd	3 rd	4 th	5 th	6 th	Sig.
eminal volume (ml):							
1 St ejac.	1.62±0.14	1.69±0.14	1.92±0.14	2.05±0.15	2.42±0.14	2.81±0.15	**
2 nd ejac.	1.64±0.14	1.56±0.14	1.97±0.14	2.05±0.15	2.44±0.14	2.40±0.15	**
ean 2 ejac.	1.63±0.12	1.62±0.12	1.94±0.13	2.05±0.15	2.43±0.12	2.62±0.13	**
Perm concentration/ml (x 10 sperm):							
1 St ejac.	0.46±0.07	0.67±0.07	0.84±0.07	1.06±0.08	1.18±0.08	1.42±0.08	**
2 nd ejac.	0.43±0.06	0.63±0.06	0.70±0.06	0.98±0.06	0.89±0.06	1.12±0.06	**
ean 2 ejac.	0.44±0.06	0.66±0.05	0.77±0.06	1.02±0.06	1.04±0.06	1.28±0.06	**
Perm output/ejac. (x 10 sperm):							
1 St ejac.	1.15±0.27	1.52±0.27	2.14±0.29	2.86±0.30	3.80±0.29	4.54±0.30	**
2 nd ejac.	1.08±0.22	1.47±0.25	1.78±0.22	2.50±0.24	2.90±0.22	3.35±0.25	**
ean 2 ejac.	1.11±0.22	1.50±0.22	1.94±0.22	2.73±0.24	3.38±0.22	3.97±0.24	**
Otan motile sperm/ejac. (X 10 sperm):							
1 St ejac.	0.73±0.24	1.06±0.24	1.78±0.25	2.41±0.26	3.37±0.25	4.17±0.26	**
2 nd ejac.	0.73±0.20	1.14±0.20	1.46±0.21	2.21±0.22	2.46±0.21	2.93±0.22	**
ean 2 ejac.	0.73±0.22	1.08±0.22	1.62±0.22	2.31±0.24	2.92±0.23	3.46±0.24	**
Otility %:							
1 St ejac.	42.69±2.66	63.42±2.68	81.45±2.79	82.78±2.88	80.95±2.76	80.52±2.93	**
2 nd ejac.	44.87±2.64	65.20±2.65	81.07±2.76	84.98±2.85	82.26±2.73	81.74±2.90	**
ean 2 ejac.	43.77±2.52	64.29±2.53	81.23±2.63	83.86±2.72	81.50±2.60	82.18±2.76	**
Semen pH:							
1 St ejac.	7.04±0.05	6.88±0.05	6.92±0.05	6.89±0.05	6.83±0.05	6.81±0.05	*
2 nd ejac.	7.07±0.05	7.00±0.05	7.00±0.05	6.91±0.05	6.91±0.05	6.84±0.05	*
ean 2 ejac.	7.06±0.05	6.94±0.04	6.96±0.05	6.89±0.05	6.87±0.05	6.83±0.05	*

* : Significant (P <0.05) **: Significant (P <0.01)

References

Ahmed, I. A. and El - Shazly, K. (1960) Early weaning in cow and buffalo calves. *Alex. J. Agric. Res.* **8:** 217.

Almquist J. O. and Amann, R. P. (1976) Reproductive capacity of dairy bulls. XI. puberal characteristics and postpuberal changes in production of semen and sexual activity of Holstein bulls ejaculated frequently. *J. Dairy Sci.* **59:** 986.

Asdell, S. A. (1955) *Cattle Fertility and Sterility.* London, Churchill.

Badawy, A. B. A. (1971) Some reproductive patterns of Egyptian buffalo bull with special reference to sexual behavior and semen characteristics. *M. V. Sc. Thesis,* Fac. Vet. Med., Cairo Univ., Egypt.

Batosamma, J. T.; Toelihere, M. R. and Sukra, Y. (1987) The application of artificial insemination in preserving the spotted swamp buffalo. *Buffalo Bulletin,* **6:** 52.

Bhattacharya, P. (1974) Reproduction. In: *The Husbandry and Health of the Domestic Buffalo.* ed. by W. R. Cockrill, FAO, Rome, 105 P.

Bratton, R. W.; Musgraue, S. D.; Dunn, H. O. and Foote, R. H. (1961) Causes and prevention of reproductive failures in dairy cattle. III. Influence of under feeding and over feeding from birth to 80 weeks of age on growth, sexual development, semen production and fertility of Holstein bulls. *Cornell Univ., Agric. Exp. Sta. Bul. No.* **964**.

Cunningham, D. C.; Almquist, J.O. and Pearson, R. E. (1967) Reproductive capacity of beef bulls. II -postpuberal relations among ejaculation frequency, sperm freezability and breeding potential. *J. Anim. Sci.;* **26:** 182.

Darwish, S. A. (1990) Physiological studies on buffaloes. *M. Sc. Thesis.* Fac. Agric., Kafr El - Sheikh, Tanta Univ., Egypt.

EL - Alamy, M. A. (1973) Studies on some physiological aspects in semen of buffalo, Jersey and Friesian cattle. *Ph. D. Thesis,* Fac. of Agric., Assiut Univ., Egypt.

EL - Azab, A. I.; Rakha, A. M.; Zaki, K. and EL - Chahidi, A. A. (1977) Studies on some factors affecting semen production in buffalo bulls. *Egyptian J. Vet. Sci.*; 14: 115.

EL - Feel, F. M. R. (1984) Special studies on the Egyptian cattle under Minia environmental conditions. *Ph. D., Thesis. Fac. Agric.*, Minia Univ., Egypt.

EL - Hariri, M. H. (1973) Evaluation and dilution of buffalo bulls semen in relation to fertility. *M. V. sci. Thesis, Fac. Vet. med.*, Cairo Univ., Egypt.

EL - Sheikh, A. S. and Mahmoud, S. A. (1967) Some physical and chemical properties of buffalo semen. *J. Anim. Prod.*, U. A. R., No. 1-2: 57.

Fayez, M. Maria; Daader, A. H. and Nasr, A. E. (1985) Some physical and biochemical atributes of buffalo semen. *Egyptian J. Anim. Prod.* **25**: 99.

Hafez, E. S. E. (1987) *Reproduction in Farm Animals*. Lea and Febiger, Phladelphia, U. S. A.

Hussam, H. A. (1979) Sexual development and sperm output in Friesian and buffalo bulls. *M. Sc. Thesis, Fac.* of Agric., Alex. Univ., Egypt.

Jaskowski, L.; Rozankiewicz, E.; Skyrzynski, J.; Szulc, L. (1977) and Observation on the sexual development and semen quality of bulls reared on small quantities of milk. *Polskie Archiwum Weterynaryjne*. **16**: 621. (English abstrct).

Ibrahim, M. A. R. (1973) Semen production from Egyptian buffalo bulls and cross bred cattle bulls. *M. Sc. Agric. Sci., Fac. of Agric.*, Alex. Univ., Egypt.

Kirchgessner, M. (1975) Tierernahrung. DLG - Verlag, Frankfurt (Main), 3. Auflage.

Khalil, H. and Pirchner, F. (1986) Growth and carcass traits of bulls and veal calves of continental cattle breeds. *J. Anim. Prod.*, **43**: 225.

Mahdy, A. E. (1983) Studies on cows and buffaloes in Egypt : Effect of system of weaning on the performance of cow and buffalo calves. *Ph. D. Thesis*, Alex. Univ., Fac. of Agric., Egypt.

S. A. S. (1988) *Statistical Analysis System User' Guide: Basis*. SAS Inst. Inc. Cary. NC.

Snedecor, G. W. and Cochran, G. (1967) *Statistical Methods* (6th Ed.). Iowa State University Press. Ames, U. S. A.

Tawfik, K. M. C. (1988) Seasonal variations in semen characteristics of Egyptian buffalo bulls. *M. Sc. Thesis. Agric.* Sci., Fac. of Agric., Ain Shams Univ., Egypt.

Tommi, Y. (1963) *Allowances and* Rations For farm Animals. pp. 71. sel - Khosidat, Moscow.

Yassen, A. M.; Ibrahim, M. A. and El - Kamash, M. A. (1975) Effect of frequency of ejaculation on the seminal characteristics and sperm output of young buffalo bulls. *Alex. J. Agric.* res. 23: 67.

Yassen, A. M.; Mahmoud, M. N. (1972) Relationship between body weight and testicular size in buffalo bulls. *J. Agric. Sci.*, Camb 78: 367.

تأثير نظم الفطام على البلوغ الجنسى والتغيرات فى صفات السائل المنوى للذكور الجاموس والفريزيان

فوزى محمود الفيل ، عبد المعطى خيرى ، عبد الهادى عبد الحكيم

قسم الانتاج الحيوانى ـ كلية الزراعة ـ جامعة المنيا ـ مصر .

اشتملت الدراسة على ٥٢ عجل ذكرى (٢٦ جاموسي + ٢٦ فريزيان) تم تنشئتها تحت نظامين للرضاعة : فطام مبكر وبديل اللبن لدراسة تأثيرها علي البلوغ الجنسى والتغيرات فى صفات السائل المنوى فى نظام الفطام المبكر تم أعطاء العجول كميات محددة من اللبن الكامل وفطمت العجول البقرى عند عمر ٣١ يوما والجاموسى عند عمر ٤٥ يوما. بينما في نظام بديل اللبن تم فطام العجول البقرى والجاموسى عند عمر ٦١ يوما. وكان عمر البلوغ ٤٤٢ ، ٣١٥ يوما لكلاً من العجول الجاموسى والبقرى على التوالى وكانت القيم المقابلة لوزن الجسم عند البلوغ هى ٢٧٤ ، ٢٤٠ كجم علي التوالى وقد أظهرت النتائج أن نظام الفطام ليس له تأثيرا معنوي على كلاً من العمر والوزن عند البلوغ فى كلا النوعين .

ثم جمع قذفتين متتاليتين من السائل المنوى أسبوعياً من كل ذكر (١٠ جاموس + ١٠ فريزيان) ممثلة لنظامى الفطام لمدة ستة شهور ابتداء من البلوغ . وقد أظهرت النتائج أن نظام الفطام ليس له تأثيرا معنويا على كل صفات السائل المنوى على الرغم من أن نظام الفطام المبكر أعطى قيما أفضل من نظام بديل اللبن فى كلا النوعين ، تزايدت معنويا جميع صفات السائل المنوى بينما انخفضت معنويا قيمة رقم الحموضة بتقدم العمر . أعطت طلائق الفريزيان قيم أعلى لكل من حجم السائل المنوى وعدد الحيوانات المنوية المخرجة / قذفة وإجمالى المخرج الحى من الاسبرمات / قذفة وكذلك النسبة المئوية لحيوية الاسبرمات وقيما أقل لكل من تركيز الاسبرمات / مل ورقم الحموضة عن نظيرتها فى العجول الجاموسي.

وصلت طلائق العجول الفريزيان للنضج الجنسى (١ بليون حيوان منوى/ مل) عند عمر ١٨ شهرا بينما كانت فى العجول الجاموسى عند عمر ١٥ – ١٦ شهرا وكانت الفروق الراجعة لتأثير نظام الفطام على كل من العمر والوزن عند النضج الجنسى غير معنوية فى كل من النوعين .