Evaluated of Egyptian buffaloes crossing with Italian buffaloes for reproductive traits

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Abstract: In 2003, MoA (Ministry of Agriculture) approved the commercial importation and utilization of Italian buffaloes (IT) semen, which is being uncontrollably spread around the country; a practice needs prior performance and genetic assessment for both milk production and reproduction traits. In a previous publication (Fooda *et. al.*, 2011) the milk productivity was studied, and the current one handles the reproductive traits. Two of the private dairy buffalo farms that utilize Italian semen for obtaining the crossbred along with the native buffalo were selected from two different ecological zones to be included in this study being "Ganat Elreda" farm in Ismaeleia governorate (Newly reclaimed desert area) and "United Group" farm in Qaliobeia governorate (old delta). This study aims to evaluate the Egyptian Italian buffalo crosses (1/2EG.1/2IT) for some reproductive traits, in comparison to their Egyptian contemporaries (EG), to assess the crossing trial. The traits included age at first calving (AFC), number of service per conception (NS), gestation period (GP), calving interval (CI), days open (DO) and service period (SP). A total 177 records, 102 record from Ganat Elreda farm (57 record EG and 46 record 1/2EG 1/2IT; and 74 records from United Group farm (26 record EG and 48 record 1/2EG 1/2IT) was utilized, covering the period from 2007 to 2009. Results obtained indicate that the Egyptian buffaloes performed better than the crossbreed for (NS), (CI), (DO) and (SP) traits. Since the results for NS, CI, DO and SP were 1.2, 395, 71 and 38 days, respectively for EG, while for crossbred, the results were 1.87, 429, 118 and 76 days, respectively in farm1. And in farm 2, the results were 1.82, 418, 104 and 77 days for EG, but, the results were 2, 433, 119 and 85 days, respectively for crossbred.
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1. Introduction

The buffalo occupies an important place among the domestic animals as a provider of dairy produce, beef and draught power. They are playing important role in Egypt's agriculture. The Egyptian buffaloes are nearly to 4 million (FAOSTAT, 2009). Their ability to convert coarse feeds to milk and meat outstanding. Which contribute 44 % (2640638 Ton) of total milk production (5960102 Ton) and 18 % (270000 Ton) of total meat production (1528789 Ton) (FAOSTAT, 2008). Reproduction efficiency is one of the most important factors for productivity and profitably of dairy animals and it's the primary factor affecting productivity in female buffalo, but is greatly hampered by late attainment of puberty, seasonality of calving, long postpartum anoestrus and subsequent calving interval.

Late or delayed oestrus in buffalo heifers is one of the major factors limiting its overall productive and reproductive performance. Feeding and general management have been reported to improve reproduction efficiency of buffaloes (Jabalkandi, 2010).

According to Bagnato and Oltenacu (1993) milk yield and fertility are the main factors that affect the profitability of milk herds. As the milk yield is related to the variations in the reproductive activity, then the shorter calving intervals can be associated to bigger milk production during the animal's productive life, besides the possible increase in the number of calves per year.

Thus, the genetic importance of the fertility in these herds must be evaluated according to the reproductive performance of the buffalo and its relations to the milk yield. However, there is an antagonism between the milk production and the fertility of an animal. Pryce et al (2002) showed that there is a genetic correlation between milk yield and calving intervals that vary from 0.22 and 0.67. It indicates that cows with high milk yield merit have a bad reproductive performance.

However, a good management may improve the reproduction. Pasture of high quality can give the same performance as in intensive systems (Maria Larsson, 2009).

Ramos et al (2006) studied the traits of milk yield and interval between calving in buffaloes. The heritability estimates were 0.21 and 0.22 to the milk yield and interval between calving, respectively. The genetic, phenotypic and environmental correlations between the traits were -0.22, 0.01 and 0.03, respectively.

The age at first calving and interval between first and second calving traits showed low estimates of

heritability, indicating that those traits should not have a good response for selection (Ramos et al (2006), long calving intervals and a large number of days open are characteristics typical of buffalo cows. These traits have low heritability, and means are associated with a large degree of variation due to numerous environmental factors (Mourad, *et al*., 1989; Khalil, *et al*., 1991; Afifi, *et al*., 1992; Ibrahim, 1998 and Mourad *et al.*, 2005).

Puberty can appear at the age of 16–40 months, but average for buffaloes in Italy is 20–21 months (Maria Larsson, 2009).

Therefore, this study was under-taken to investigate and evaluate the reproductive traits for the Egyptian buffalo crosses with Italian buffaloes.

2. Material and Methods

In 2003, MoA allowed the commercial importation of Italian buffaloes (IT) semen, which spread in large scale buffalo farms. Two of these dairy buffalo farms were selected to be included in this study being "Ganat Elreda" farm in Ismaeleia governorate and "United Group" farm in Qaliobeia governorate. They keep the new purchased lactating animals under assessment, for production and health conditions, for two weeks, and then they decide to keep or cull them. It seems successful practical selection rules under the conditions of absence of pedigree and production recording system in the majority of small and medium scale buffalo holdings. For crossbreeding, they use imported Italian buffalo semen with known breeding values for various production and type traits. A total 177 records, 103 record from Ganat Al-Rada farm (57 record Egyptian buffaloes (EG) and 46 record ½ EG & ½ IT) and 74 records from United Group farm (26 record EG and 48 record ½ EG & ½ IT) through period from 2007 to 2009.

The traits were study, age at first calving (AFC), number of service (NS), gestation period (GP), calving interval (CI), days open (DO) and service period (SP).

The data were analyzed by SAS (2002) according to the following model for total milk yield:

$$\mathbf{Y_{ijklm} = \mu + B_i + P_j + C_k + S_l + b_1(L)_{ijklm} + b_2(A)_{ijklm} + (LA)_{ijklm} + E_{ijklm}}$$

Where: Y_{ijklm}: observation on the m^{th} animals of the i^{th} population in the j^{th} parity in the k^{th} year of calving in the l^{th} season of calving, μ : Overall mean, B_i : fixed effect due to the population, (i: 1= EG and 2= 1/2 EG & 1/2 IT), P_j : fixed effect due to lactation parity, (j: 1 and 2), C_k : fixed effect due to the year of calving, (k: 1=2007, 2=2008 and 3=2009), S_l : fixed effect due to the season of calving (l: 1= Winter and 2= Summer), b_1 : regression coefficient of Y on L (lactation period), b_2 : regression coefficient of Y on A (Age at first calving), (LA) : the interaction between lactation period and Age at first calving and E_{ijklm} : random error assumed N.I.D. (0, $б^2e$).

3. Results

Unadjusted means, standard deviations and number of records for reproductive traits are presented in Table (1).

For the crossing buffaloes in both farms, all reproductive trait values were higher than these traits for EG except age at first calving. In farm 1, the age at first calving for EG was higher than the crossbred population, while in farm 2, the age at first calving the same value for two populations.

The results for all trait values in farm 1 were lower than those values in farm 2 for two populations. The averages for CI and DO in EG were lower than those reported by Mostageer *et al.* (1981), Kotby *et al.* (1989), Mourad *et al.* (1989), Ashmawy (|1991), Khalil *et al.* (1991), Afifi *et al.* (1992) and Mourad *et al.* (2005) in Egyptian buffaloes Many factors affect days open in buffaloes and cows. Herd has been a significant source of variation in most studies. Cady *et al.* (1983) observed that the days open were significantly ($P \leq 0.01$) affected by herd in Nili-Ravi buffaloes. Marai *et al.* (2009) reported that the values of AFC, DO and CI were 25 month, 92 days and 403 days respectively for buffaloes were reared at Khattara Provincial Buffalo Farm. Maria Larsson (2009) reported that AFC and CI values were 36 month and 400-500 days, respectively, in Italian buffaloes.

Table (2) shows the mean squares for reproductive traits in two farms. In farm 1 the effect of breed on all traits, except gestation period, was highly significant ($P \leq 0.01$). While the effect of lactation parity, year and season of calving on all traits were insignificant.

In farm 2 the effect of population on all traits considered was no significant. The effect of year of calving on NS and GP were highly significant ($P \leq 0.01$). And the effect of season on NS was significant ($P \leq 0.05$).

The effect of covariables (L and A) and interactions (L*A) on all traits were insignificant in two farms, except on gestation period in farm 2. Mourad *et al*. (1989); Afifi *et al*. (1992); El-Menshawy (1994) and Aziz *et al.* (2001) reported that the effect of party, year and season for calving were significant on days open in Egyptian buffaloes. Mourad *et al.* (2005) reported that the effect of parity and year of calving were significant on days open. Marai *et al.* (2009) showed that the effect of parity, year and season of calving were highly significant on DO. While the effect of parity and season of calving were highly significant on CI.

Table (1). Unadjusted means, standard deviations (SD) for reproductive traits in Egyptian (EG) and their crossing with Italian (IT) buffaloes.

Traits	Egyptian buffaloes (EG)			1/2 EG & 1/2 IT		
	Mean	SD	N	Mean	SD	N
Farm 1+						
Age at first calving (AFC, month)	29	5.38	57	27	2.42	45
Number of service (NS, no.)	1.2	0.59	51	1.87	0.93	46
Gestation period (GP, day)	317	6.25	51	314	5.43	46
Calving interval (CI, day)	395	59.67	35	429	75.21	26
Days open (DO, day)	71	48.83	27	118	75.87	26
Service period (SP, day)	38	22.07	10	76.08	38.87	24
Farm 2+						
Age at first calving (AFC, month)	31	2.63	26	31	2.64	48
Number of service (NS, no.)	1.82	1.13	17	2	1.09	40
Gestation period (GP, day)	315	5.66	17	313	5.21	40
Calving interval (CI, day)	418	39.98	9	433	53.73	9
Days open (DO, day)	104	36.16	9	119	61.86	8
Service period (SP, day)	77	54.09	7	85	38.49	24

+ Farm 1: Ganat Elreda Farm 2: United Group

Table (2) Mean squares (MS) for reproductive traits.

Source of variation	NS		GP		CI		DO		SP	
	d.f	MS	d.f	MS	d.f	MS	d.f	MS	d.f	MS
Farm 1+										
Population (B)	1	4.046***	1	37.067	1	33324**	1	36082**	-	-
Lactation parity (P)	1	0.331	1	27.753	1	2677	1	1337	-	-
Year of calving (C)	2	0.013	2	51.701	2	5883	2	6831	-	-
Season of calving (S)	1	0.063	1	7.601	1	191.53	1	292.39	-	-
Covariable										
Lactation period (L)	1	0.084	1	27.574	1	18.411	1	96.992	-	-
Age at first calving (A)	1	0.202	1	37.818	1	410.38	1	1321	-	-
Interactions:										
L*A	1	0.120	1	32.370	1	189.51	1	806.63	-	-
Farm 2+										
Population (B)	1	1.113	1	3.647	1	57.251	1	69.663	1	1104.671
Lactation parity (P)	0	-	0	-	0	-	0	-	0	-
Year of calving (C)	1	6.932**	1	176.190**	1	573.547	1	266.558	1	25.519
Season of calving (S)	1	4.018*	1	23.788	1	59.908	1	367.9322	1	764.110
Covariable										
Lactation period (L)	1	0.693	1	112.448*	1	2219.30	1	1741.04	1	54.691
Age at first calving (A)	1	0.233	1	14.026	1	1675.63	1	1168.79	1	711.751
Interactions:										
L*A	1	0.589	1	119.704*	1	1922.39	1	1445.21	1	36.109

+ Farm 1: Ganat Elreda Farm 2: United Group * : P ≤ 0.05 ** : P ≤ 0.01 *** : P ≤ 0.001

Table (3) Least square means (LSM) and their standard errors (SE) for reproductive traits.

Effect	NS			GP			CI			DO			SP		
	LSM	SE	N	LSM	SE	N	LSM	SE	N	LSM	SE	N	LSM	SE	N
Farm 1+															
B															
1	1.03	0.16	30	316	1.51	30	366	16.79	25	47	18.96	24	-	-	-
2	1.79	0.14	25	314	1.25	25	444	18.65	18	137	20.04	18	-	-	-
P															
1	1.32	0.13	31	316	1.16	31	415	12.29	32	99	13.05	31	-	-	-
2	1.51	0.16	24	314	1.44	24	395	20.62	11	84	21.50	11	-	-	-
Y															
2007	1.37	0.26	7	315	2.39	7	370	24.55	8	49	27.94	7	-	-	-
2008	1.44	0.12	28	313	1.11	28	415	13.32	26	107	13.91	26	-	-	-
2009	1.43	0.15	20	317	1.40	20	430	23.67	9	119	25.41	9	-	-	-
SE															
1	1.45	0.13	28	315	1.22	28	407	16.33	22	95	17.05	22	-	-	-
2	1.37	0.14	27	314	1.32	27	403	16.00	21	86	17.17	20	-	-	-
Farm 2+															
B															
1	1.74	0.28	15	314	1.48	15	416	27.61	9	104	28.73	9	67.77	25.89	5
2	2.21	0.19	31	315	1.05	30	411	35.64	8	99	38.44	7	91.13	15.19	18
P															
1	1.98	0.14	46	314	0.78	45	414	27.31	17	102	29.21	16	79.45	16.19	23
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y					1.56										
2008	2.69	0.28	19	318	1.34	18	428	15.28	15	112	16.78	14	82.17	34.55	5
2009	1.27	0.26	27	311		27	400	56.48	2	92	59.82	2	76.74	14.50	18
SE															
1	1.62	0.18	23	314	0.99	23	416	29.85	11	107	30.85	11	71.78	17.21	10
2	2.33	0.23	23	315	1.28	22	412	32.51	6	96	35.62	5	87.12	21.51	13

+ Farm 1: Ganat Elreda Farm 2: United Group

This effect could be attributed to the managerial practices, climatic elements, especially air temperature and relative humidity, photoperiodicity, and nutritional factors, particularly availability of green fodder.

Least square means and their standard errors for reproductive traits are presented in Table (3). In farm 1 the LSM for all traits in EG were lower than in crossbred. The same trend was shown in farm 2, except for CI and DO.

It can be concluded that the Egyptian buffalo reproductively better perform than its crossbreed with the Italian buffalo.

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