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EFFECT OF ENROLLMENT IN MILK RECORDING SYSTEMS ON IMPROVING MILK PRODUCTION OF EGYPTIAN BUFFALO

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ABSTRACT

A total of 4257 lactation records of 1031 buffaloes in 5 herds were recorded by the Cattle Information System/Egypt (CISE) of the Faculty of Agriculture, Cairo University during the period from 2005 to 2011.

The overall averages of of lactation period (LP, day) ,total milk yield (TMY, kg), and daily milk yield (DMY ,kg) of buffaloes were 269 days, 1854 kg and 6.9 kg , respectively . All effect of farm , season , parity , enrollment interval and interaction between farm and enrollment interval were significant (P<0.0001) on all traits studied. Continuation of enrollment increased improvement in TMY and DMY. The highest TMY and DMY was recorded for the longest enrollment period from 2005 to 2011 (1943 and 7.23 kg , respectively). The results indicated that enrollment in the CISE program for milk recording would increase TMY and DMY of Egyptian buffalo, the longer the enrollment interval the higher the increase of both TMY and DMY.

Keywords: Total milk yield, Egyptian buffalo, fixed effects, Milk Recording systems

INTRODUCTION

Milk recording systems played an important role in developing dairy industry in many countries. Due to their valuable services: milk recording, genetic evaluation, early selection, and extension services, they have been spread in developed countries. In Egypt, the first real milk recording activities were started by Cairo University in 1989 through the research project financed by IDRC to establish "The Cattle Information System/Egypt". In 1996, the research project was developed an independed special type unit "Cattle Information System /Egypt" (CISE) to serve development of the national dairy industry in Egypt. Many reports indicated the advantage of enrollment in milk recording systems for improving milk yield. The Pennsylvania State Holstein Association (2006) reported that the average 305-d milk yield was improved by an increase of 1.2% from 2004 to 2005 for registered Holstein in Pennsylvania State.

The third edition of "The Egyptian Buffalo Herdbook, 2011" issued by CISE revealed marked variability in milk production, some buffaloes scored about 3500 liters in one single lactation. However, no single publication has dealt with the effect of enrollment in the CISE program for mil recording on MY.

The objective of this study is to investigate the effect of enrollment in milk recording system on milk production represented by total milk yield (TMY) and daily milk yield (DMY) of Egyptian buffaloes enrolled in the CISE.

MATERIALS AND METHODS

Data

This study was carried out on 4257 milk production records collected on 1031 buffaloes in five herds. The data was collected by the Cattle Information System/Egypt (CISE) of Faculty of Agriculture, Cairo University during the period from 2005 to 2011. The current study was conducted to shed light on the improvement of milk production of Egyptian buffalo through enrolment in the recording system of CISE.The CISE has a computer network capable of processing data on 50 thousand cows/year. The CISE also store the data in archive files to be used in genetic evaluation and ultimately to build a dairy database for research and breeding purposes. The CISE applies the international standards approved by the International Committee for Animal Recording (ICAR). The CISE milk recording scheme depends on once-a-month visit (official 24-hour milk recording system). An official supervisor collects the data on farm at a specific day "centering date" identified by CISE. The data processing system is working with the Input-Sheet number as the animal identification key. Data are recorded on a single Input-Sheet specific for every animal. The following information is recorded: milk yield, animal status, insemination information, pregnancy diagnosis and calving information. The input sheets are transported by the supervisor to the data processing lab (CISE).The CISE provides a package of services for farmers include:

Monthly technical report, Milk analysis, which helps the farmers in a correct estimate for the price of milk and increasing income, Early diagnosis of pregnancy using ultrasound, Early detection of Mastitis and Issuing Buffalo-Herdbook in Egypt.

Data were drawn from the same farm on three stages of recording intervals. The first recording interval contains animals registered from 2005 to the year 2007 and the second from 2005 to the year 2009 and the third from 2005 to the year 2011 to study the impact enrollment period on milk production traits.

Statistical Analysis

The following fixed model was used to estimate the least squares means of lactation period (LP, day) ,total milk yield (TMY, kg), and daily milk yield (DMY ,kg) of buffaloes in different farms, seasons , parities and recording intervals; using the General Linear Model (GLM) procedure (SAS, 2004).

$$Y_{ijklm} = \mu + F_i + S_j + P_k + R_l + (FR)_{il} + e_{ijklm}$$

Where:

Y_{ijklm} = observation of lactation period, total milk yield and daily milk yield

μ = the overall mean;

F_i = the fixed effect of i^{th} farm, (i=5);

S_j= the fixed effect of j^{th} season of calving (j=4); where 1= winter (December- February), 2= spring (March-May), 3= summer (June- August) and 4= autumn (September –November)

P_k = the fixed effect of k^{th} parity, (k=7);

R_l= the fixed effect of l^{th} recording intervals l, (l=3), which 1=2005 to 2007, 2=2005 to 2009 and 3=2005 to 2011
$(FR)_{il}$= the effect of interaction between farm and recording intervals ,and
e_{ijklm}= random residual effect.

RESULTS AND DISCUSSION

The least squares analysis of variance (Table 1) shows the effects of farm, season, parity , recording interval and interaction between farm and recording interval on lactation period (LP), total milk yield (TMY) and daily milk yield (DMY). The table indicates significant variation for all traits.

Table-(1): Least squares analysis of variance (Pr>F) for factors affecting LP, TMY and DMY of buffaloes.

Source of variation	D.F.	LP	TMY	DMY
F	4	< 0.0001	< 0.0001	< 0.0001
S	3	< 0.0001	< 0.009	< 0.0001
P	6	< 0.0001	< 0.0001	< 0.0001
R	2	< 0.0001	< 0.0001	< 0.0001
F*R	8	< 0.0001	< 0.0001	< 0.0001

Table 2 shows the least squares means of lactation period (LP), total milk yield (TMY) and daily milk yield (DMY), in 5 buffalo farms recorded by CISE. Farm 5 recorded the largest average daily milk yield (7.75 kg) , total milk yield (2274 kg) and lactation period (294 day). The least squares means of total milk yield of recorded buffalo ranged from 1479 kg milk in farm4 to 2274 kg milk in farm5. The difference in total milk yield between farms is due mainly to the difference in environment and management systems. Estimate obtained in the present study lie within the range of estimates mentioned by Soliman *et al*. (1985) , Badran *et al*. (1991) (2159 and 2241 kg, respectively) , Ashmawy (1991) 1564 kg, Abd El-Raoof (1995) 1505 kg and Mourad *et al*. (2005) 1581 kg, on Egyptian buffaloes.

Table (2): Least squares means(X) of lactation period (day) ,total milk yield (kg), and daily milk yield and their standard error (SE) of buffaloes in 5 farms

Farm	No. of records	LP		±SE	TMY		±SE	DMY		±SE
1	342	266	a	3.48	1936	a	34	7.30	a	0.09
2	214	283	c	3.90	1558	b	39	5.56	c	0.11
3	947	267	a	2.07	2021	c	20	7.69	d	0.06
4	1290	236	b	1.62	1479	b	16	6.26	b	0.04
5	1464	294	d	1.64	2274	d	16	7.75	d	0.04
overall	4257	269		0.84	1854		8.3	6.91		0.02

Means followed by different letters within the same column are significantly different at (P<0.05)

Table 3 shows the least squares means of LP, TMY and DMY of buffalo in different seasons. The LP was significantly lower in autumn than the other seasons. Cows calving in season summer and autumn had

significantly higher milk yield and daily milk yield than cows calving in season winter and spring.

Table (3): Least squares means (X) of lactation period (day) ,total milk yield (kg), and daily milk yield(kg) and their standard errors (SE) of buffaloes under different seasons.

Season	No. of records	LP		±SE	TMY		±SE	DMY		±SE
winter	1294	271	a	1.73	1831	a	17	6.79	a	0.05
spring	986	270	a	1.96	1832	a	19	6.78	a	0.05
summer	709	273	a	2.32	1912	b	23	7.02	b	0.06
autumn	1268	263	b	1.79	1839	b	18	7.06	b	0.05

Means followed by different letters within the same column are significantly different at (P<0.05)

Table 4 shows the least squares means of LP TMY AND DMY of buffalo in different parities. The total milk yield increases gradually from the first to the seventh parity. The milk production was significantly lower in the first lactation than the yield in the 2^{nd}, 3^{rd}, 4^{th}, 5^{th}, 6^{th} and 7^{th} lactation (P<0.05). However, the yield of 2^{nd} lactation was not different from that of , 3rd, 4th,5th, and 6th lactation. Milk yield. These results are in agreement with Soliman (1976); Badran *et al*. (2002) , Abdel-Salam *et al*. (2008) and Fooda *et al*.(2011). Such results reflect the buffalo ability to develop milk production and its biological processes for longer production life span (longevity)than the cattle. The daily milk yield did not differ among fourth to seventh lactations.

Table (4): Least squares means (X) of lactation period(day) ,total milk yield (kg), and daily milk yield (kg) and their standard errors (SE) of buffaloes at different parities.

Parity	No. of records	LP		±SE	TMY		±SE	DMY		±SE
1	646	278	a	2.4	1719	a	24	6.17	a	0.07
2	472	273	b	2.7	1865	bc	27	6.87	b	0.07
3	677	268	b	2.2	1815	b	22	6.79	b	0.06
4	704	258	c	2.2	1822	b	22	7.06	c	0.06
5	725	267	b	2.3	1892	c	23	7.14	c	0.06
6	467	270	b	2.8	1921	c	27	7.13	c	0.08
7	566	270	b	2.6	1942	d	26	7.23	c	0.07

Means followed by different letters within the same column are significantly different at (P<0.05)

Table 5 shows the least squares means of LP, TMY and DMY of buffalo in different recording intervals. The highest TMY was 1943 kg milk for longest recording interval which contains the animals registered from 2005 to the year 2011. Also, the DMY was the highest (7.23 kg) in the same recording interval. The results indicate that recording interval had a significant effect on LP, TMY and DMY.

It could be observed that the continuation of farms to participate in the milk recording systems lead to an improvement in the milk production as a result of the guidances & advices provided by CISE.

Table (5): Least squares means (X) of lactation period(day) ,total milk yield (kg), and daily milk yield(kg) and their standard errors (SE) of buffaloes under different recording intervals

recording intervals	No. of records	LP	±SE	TMY	±SE	DMY	±SE
1(2005-2007)	918	276 a	2.5	1776 a	24	6.48 a	0.07
2(2005-2009)	1473	263 b	1.7	1842 b	17	7.02 b	0.05
3(2005-2011)	1866	269 c	1.9	1943 c	19	7.23 c	0.05

Means followed by different letters within the same column are significantly different at (P<0.05)

Figure 1 shows that increasing enrollment period increases daily milk yield and total milk yield according to the regression line.
The regression equation of TMY on length of enrollment interval shows that TMY would increase by about 41 kg milk/year. A corresponding increase of 0.18 kg milk was annually calculated in DMY

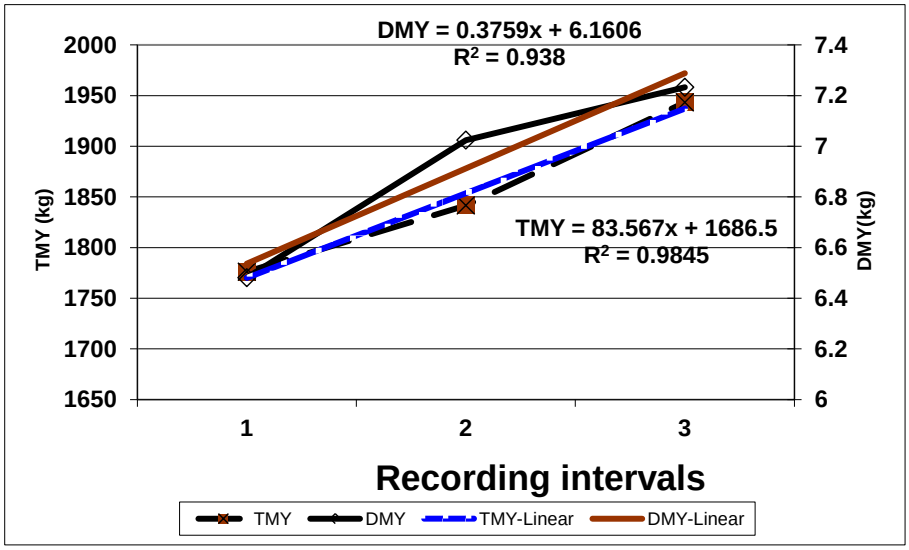

Fig. (1): Linear trend line of TMY and DMY

Table 6, fig. 2 and fig. 3 Shows the interaction between recording intervals and the farms. It has been observed from table 6, fig 2 and fig 3 that there has been significantly improvement in TMY and DMY especially in the final stage of registration in each of the farm 1, 3 and farm5. While the improvement is not significant in each of the farms 2 and farm4.

Table 6. Least squares means (X) of lactation period (day) ,total milk yield (kg), and daily milk yield and their standard errors (SE) of buffaloes under interaction between farm and recording intervals.

Farm	Recording intervals	LP		±SE	TMY		±SE	DMY		±SE
1	1	277	de	7.31	1863	bc	72	6.8	de	0.2
	2	253	bc	3.89	1827	b	38	7.16	e	0.11
	3	267	cde	6.13	2118	de	61	7.95	f	0.17
2	1	289	ef	7.64	1544	a	76	5.35	a	0.21
	2	277	e	6.1	1542	a	60	5.62	ab	0.17
	3	282	e	6.18	1589	a	61	5.7	ab	0.17
3	1	282	e	4.34	1938	bc	43	6.99	e	0.12
	2	255	bc	3.04	2001	cd	30	7.98	f	0.08
	3	263	cde	2.72	2123	e	27	8.1	f	0.07
4	1	247	bc	3.1	1468	a	31	6	b	0.08
	2	230	a	2.6	1478	a	26	6.36	c	0.07
	3	232	a	2.46	1491	a	24	6.41	cd	0.07
5	1	284	e	3.14	2068	de	31	7.26	e	0.09
	2	296	f	2.88	2360	f	28	8	f	0.08
	3	301	f	2.05	2395	f	20	8	f	0.06

Means followed by different letters within the same column are significantly different at (P<0.05)

As shown in Table 6, we find that farm 2 and 4 were significantly less affected in TMY than the rest of farms. Farms with higher TMY in early recording intervals were marked by the highest improvement in TMY at the later recording intervals. The variable response of individual farms way be due to varied genotypes and managerial standards.

It could be concluded that joining a milk recording system would improve TMY and DMY of Egyptian buffaloes. The magnitude of improvement is positively correlated with the duration of enrollment interval.

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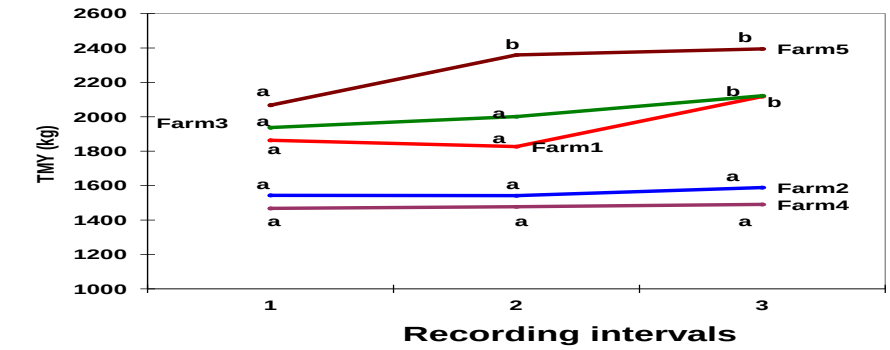

Fig.(2): The effect of interaction between farm and recording intervals on TMY

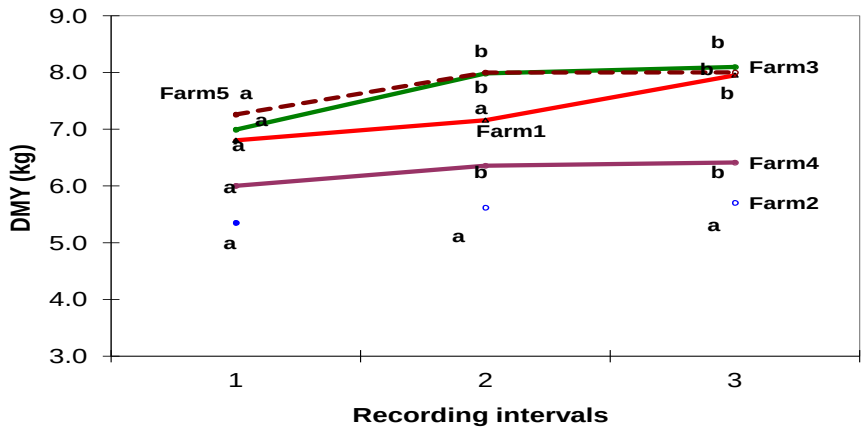

Fig. (3): The effect of interaction between farm and recording intervals on DMY

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تأثير الإشتراك فى نُظم تسجيل إنتاج اللبن على تحسين إنتاج اللبن فى الجاموس المصرى

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أستخدم فى هذه الدراسة 4257 سجلاً لعدد 1031 جاموسة من خمس مزارع مُسجلة فى مركز دراسات نُظم معلومات الماشية- كلية الزراعة- جامعة القاهرة، خلال الفترة بين 2005 – 2011. كانت متوسطات طول موسم الحليب، وإنتاج اللبن الكلى، وإنتاج اللبن اليومى 269 يوماً، 1854 كيلو جرام لبن، و6.9 كجم لبن (على التوالى).

تمت دراسة تأثيرات المزرعة، فصل السنة، موسم الحلب، وفترة المُشاركة فى التسجيل، وكذلك التداخل بين المزرعة × فترة المُشاركة. وكانت جميع هذه العوامل تؤثر معنوياً ($P<0.0001$) على جميع الصفات المدروسة.

كان لطول فترة المُشاركة فى التسجيل تأثير معنوى على تحسين إنتاج اللبن اليومى (DMY) وإنتاج اللبن الكلى (TMY) وظهر ذلك بوضوح فى فترات المُشاركة الطويلة (2005-2011) حيث بلغت المتوسطات فى هذه الفترة 7.23 كيلوجرام لبن/يوم لصفة DMY و1943 كيلوجرام لبن/ موسم لصفة TMY. وكان مُعدل التحسين يتناسب طردياً مع طول فترة المُشاركة فى نظام التسجيل التابع لمركز دراسات نُظم معلومات الماشية بكلية الزراعة جامعة القاهرة.

قام بتحكيم البحث

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