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The Effect of Region, Season and Year of Calving on Complete Milk Records of Egyptian Buffaloes

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A total number of 4903 complete lactation milk records produced by 1755 Egyptian buffaloes were analyzed using the least squares techniques according to a mathematical model which included the effects of region, season and year of calving, and the interaction of region by season.

The overall mean total milk yield was 1968 kg. Region 2, which included the herds located south to Cairo had significantly higher milk yield (2075 kg, $P<0.05$) than region 1. Spring-calving buffaloes had the highest mean milk yield (1996 kg) though not statistically different from the winter and summer means. A generally negative trend was observed in the mean milk yield over a period of 42 years from 1931 to 1972. All effects studied contributed 13.68% of the total variation in milk yield, with year of calving alone accounting for 7.75 % of the variation.

Non-genetic sources of variation in total milk yield are numereous and have variable effects on dairy records. Statistical evidence of the effect of season, farm, year, and other major factors on milk yield in Egyptian buffaloes was reported in many studies (Ragab *et al.*, 1970 and 1973) but in very few the effects were quantitatively evaluated.

The purpose of this paper was to estimate the contribution of region, season and year of calving to the total variation complete milk yield records of Egyptian buffaloes.

Material and Methods

Data

The data used in this study included sets of total milk yield records of Egyptian buffaloes 150 day lactation period or more. The total number of

records was 4903 made by 1755 buffaloses over a period 42 years (1931-1972), and representing all available records in six farms from which age at calving could be computed. The farms belonged to the Ministry of Agriculture, University of Cairo, University of Ain-Shams, and the Military farms. Three of these farms were located north to Cairo (Region 1),while the otheres were south to Cairo (region 2). The first region have relatively mild weather all over the year, and more forage are usually available for animal feeding that region than in region 2.

Data were classified into six year classes. The first comprised the records which started before 1950. Records begun during the period from 1951 to 1970 were grouped in four classes each of four years. The last class included all records begun after 1970. Four seasons of calving were distinguished : autumn (September 1 to November 30), winter (December 1 to February 28), spring (March 1 to May 31), and summer (June 1 to August 31). Better climatic and pasture conditions usually prevail during winter and spring.

Statistical procedures

Part records were extended to 365-day basis using the extention factors developed by Abdel-Aziz *et al.* (1973).Least squares techniques (Harvey, 1960) were used to analyze the data according to a fixed effects model including region season and year of calving, and interaction between region and season. The following linear model was assumed to underly each milk record.

$$Y_{ijkl} = u + R_i + S_j + T_k + (RS)_{ij} + e_{ijkl} \ldots (1)$$

where :

Y_{ijkl} = the total milk record made by the l^{th} buffaloe calving at the i^{th} region in the j^{th} season of the k^{th} year,

u = the overall mean of he total milk records,

R_i = an effect due to the i^{th} region, and $i = 1, 2$,

S_j = an effect due to the j^{th} season of calving , and $j = 1,2 \ldots\ldots, 4$,

T_k = an effect due to the k^{th} year group, and $k = 1, 2, \ldots\ldots, 6$.

$(RS)_{ij}$ = an effect due to the interaction between the i^{th} region and the j^{th} season of calving, and,

e_{ijkl} = a random effect associated with theijklth individual observation and assumed to be random,independent and normally distributed with mean zero and variance O_e^2.

Duncan's multiple Range test as described by Harvey (1960) was used in comparisons among subclass means.

Results and Discussion

Several studies indicated the important effect of some environmental factors on total milk yield Egyptian buffaloes (Abdel-Aziz *et al.*, 1973, Asker and Bedeir, 1961, Ragab *et al.*, 1954, 1956, 1956, 1970 and 1973). To assess quantitatively the effect of each source of variation, the analysis of the data was performed in this study in such a way provide estimates of each of the effects considered in the linear modle underlying each record. The model included the effects of region, season and year of calving, and the interaction between region and season. These effects were supposed to be major factors that could influence total milk yield.

The least squares analysis of variance of the total milk yield is presented in Table 1. All sources of variance showed evidence of statistically significant effects on total milk yield.

TABLE 1. Least squares analysis of variance of total milk yield.

Source of variation	D.F.	M.S.	V%
Region	1	46,288,371,149**	5.60
Season of calving.	3	1,253,561,253*	0.20
Year of calving	5	23,484,042,565**	7.75
Region x season	3	957,867,119*	0.14
Residual	4290	345,838,918	86.32

* $P < 0.05$ ** $P < 0.01$

All factors studied contributed 13.68% of the total variation in total milk yield. Among all non-genetic factors studied, year of calving contributed 7.75%. Differences between regions accounted for 5.60% of the total variation,while 0.20% and 0.13% of the total variation were due to season of calving and region × season interaction respectively.

The least squares means and standard errors of the total milk yield are presented in Table 2. The overall mean of the total milk yield was 1968 kg. Comparing the region means, region 2 which comprised the three herds located south of Cairo was found to have significanly higher yield (2075 kg, $P<0.05$).

TABLE 2.Least squares means($\bar{\times}$) standard errors (S.E.) and results of Duncan's Multiple Range Test(1) of total milk yield.

Classification	No.	$\bar{\times}$(kg)	S.E.
Overall mean :	4903	1968	9.894
Region :			
Region 1	2987	1862a	12.489
Region 2	1916	2075b	14.448
Season of calving :			
Autumn	1626	1933a	17.612
Winter.	1412	1994b	17.948
Spring	945	1996b	18.911
Summer	920	1950ab	20.448
Year of calving :			
Group 1	703	2026a	23.238
Group 2	479	2151b	25.792
Group 3	508	2127b	25.814
Group 4	1021	1756c	20.477
Group 5	1771	1770c	18.380
Group 6.	421	1980a	28.874

(1) Within each classification means not followed by the same letter differ significantly from each other ($P < 0.05$).

Considering season of calving, the lowest total milk yield was that of autumn-calving buffaloes (1933 kg $P< 0.05$), which was significantly different from winter and spring calvers. No significant differences were found among the mean milk yield of the winter, spring and summer calvers.

A generally negative trend was observed in the mean milk yield of the year groups. However, the buffaloes calving before 1960 had significantly higher means ($P<0.05$) than those calving thereafter, with the exception of the mean milk yield of the last group which was not significantly different from the yield of the first group.

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تاثير المنطقة وموسم وسنة الوضع على سجلات اللبن الكاملة للجاموس المصرى

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أجرى تحليل التباين بطريقة الحد الأدنى للمربعات على ٤٩٠٣ سجلا كاملا للحليب أنتجتها ١٧٥٥ جاموسة خلال الفترة من ١٩٣١ الى ١٩٧٢ فى ست محطات موزعة على منطقتين الأولى شمال القاهرة والثانية جنوبها .

وكانت السجلات موزعة من حيث تاريخ بدئها ـ على فصول السنة الأربعة وقد شمل النمط الرياضى الذى أجرى التحليل على أساسة : المنطقة فصل وسنة الوضع والتداخل بين المنطقة وفصل الوضع وهو التداخل الوحيد الذى يحمل معنى من وجهة النظر العملية .

وقد كان المتوسط العام لناتج اللبن الكلى ١٩٦٨ كجم . وقد كان متوسط ناتج اللبن فى المنطقة الثانية أعلى معنويا (٢٠٧٥ كجم) من المنطقة الأولى .

كما كان متوسط ناتج اللبن فى الربيع أعلى من باقى فصول السنة (١٩٦٦ كجم) الا أن الاختلاف بينه وبين متوسط كل من الصيف والشتاء لم يكن معنويا .

قد ظهر وجود اتجاه سلبى بصفة عامة لناتج اللبن مع السنين .

وقد ساهمت كل العوامل التى شملتها الدراسة بما قيمتة ١٣٫٦٨٪ من التباين الكلى لناتج اللبن وكان أكثر العوامل تاثيرا هو سنة الوضع التى ساهمت وحدها بحوالى ٧٫٧٥٪ .