MOST PORBABLE PRODUCING ABILITY (MPPA) OF DAIlY MILK PRODUCTION FOR LOCAL COWS

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ABSTRACT

This research was carried out on 51 local raised in three local cow herds in Erbil plain, for the period from 2016 to 2017. To estimate the most probable producing ability (MPPA) of cows and to study the effect of non-genetic factors affecting on daily milk production (DMP) and to estimate the repeatability for (DMP). The most probable producing ability (MPPA) of local cows was calculated by using the test day records and then the animals were ranked based on their MPPA values. Cow number 1237 inquired the highest value of MPPA (16.91 kg) for DMP among all tested cows in the three flocks. The overall mean for the (DMP) was 11.85 kg. The results of current study revealed that the effect of flock, parity, season of calving, services per conception and dry period length (days) had a significant effect ($p<0.05$) on (DMP).Repeatability estimates was (0.40).Knowledge of the (MPPA) values of cows helps in the conduct of selection programs through the application of the method of culling and replacement of cows.

Keywords: ***local cows, daily milk production, repeatability, MPPA.***

القابلية الإنتاجية الممثلة لإنتاج الحليب اليومي للأبقار المحلية

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المستخلص

أجري هذا البحث على 51بقرة محلية مرباة في ثلاثة قطعان من الأبقار المحلية في سهل أربيل خلال المدة من2016 لغاية 2017. لمعرفة تسلسل القابلية الإنتاجية الممثلة للأبقار ولدراسة تأثير العوامل اللاوراثية (القطيع، عمر البقرة ، الموسم ، عدد التلقيحات اللازمة للأخصاب وفترة الجفاف) في إنتاج الحليب اليومي، فضلاً عن تقدير المعامل التكراري لأنتاج الحليب اليومي. قدرت القابلية الأنتاجية الممثلة للأبقار لصفة إنتاج الحليب اليومي اعتمادا على الفحص اليومي لسجلات انتاج الحليب اليومي بلغ المتوسط العام لأنتاج الحليب اليومي11.85كغم. أوضحت النتائج ان البقرة ذات الرقم1237 حققت أقصى قابلية انتاجية محتملة لقيمة انتاج الحليب اليومي (16.97كغم) من بين أبقار القطعان الثلاثة ، و بينت نتائج الدراسة الحالية ان تأثيرالقطيع، عمر البقرة ، الموسم،عدد التلقيحات اللازمة للأخصاب و فترة الجفاف كان معنويا ($P<0.05$) في انتاج الحليب اليومي . بلغت قيمة المعامل التكراري (0.40) وان معرفة أقصى قابلية انتاجية محتملة للأبقار يساعد في اجراء عمليات برامج الانتخاب من خلال تطبيق طريقة الاستبعاد والاستبدال للأبقار.

كلمات المفتاحية: أبقار محلية، انتاج الحليب اليومي، المعامل التكراري، أقصى قابلية إنتاجية محتملة

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INTRODUCTION

The most probable producing ability (MPPA) is also known as expected producing ability (EPA), of dairy animal indicates to the inherent milk producing ability. Milk production is one of the most important economic traits in cows. Dairy sector is economically and socially very important due to the multi-functionality of dairy animals performing output (23). Cross breeding has been in practice for several years as a tool to improve production performance of our native cows. The Friesian and local cows are the two breeds of choice for crossbreeding. An estimation of MPP as value based on the cow's performance (milk production) is very important for cow selection. Repeatability indicates the proportion of phenotypic variation for repeatable trait, which is caused by genetic and permanent environmental factors (breeding value and the maternal effects). (19), used MPPA values to study the cow's transmitting ability half an individual estimated breeding value (EBV). Breeders aim at selecting cows, which will have the optimum future records of performance using their MPPA values. The measurement MPPA values take into consideration the idea of repeatability, and show how the number of records a cow has should influence the estimate of her producing ability. According to (Falconer) repeatability is an expression of the proportion of variance of single records that are attributed to the additive genetic and permanent environmental differences between individuals. Different methods of evaluation are used by various workers (13, 18).Previous studies reported that to maximize milk yield in the next lactation in dairy cows, at 50 to 60 day dry period is necessary (14). The purpose of the present study was to investigate am component of local cow's maternal abilities as measured by MPPA. Repeatability estimate of daily milk production, and the effects of some factors on daily milk production including flock, parity, season of calving, services per conception and dry period length (days) in local cows in Erbil.

MATERIALS AND METHODS

A study was conducted on51 local cows on commercial farms in Erbil- Iraq, from 2016-2017 to evaluate the efficacy of different local cows. Animals were housed free in shaded open yards, grouped according to their average daily milk production. The cows were machine milked two times per day and each year was further delineated into 4 seasons each with duration of 3 months. Mixed native and alfalfa hay was supplied during the breeding and calving seasons. All the animals are vaccinated according to the schedule against various bacterial and viral diseases. The mathematical formulas used for computing MPPA of the production trait (8) is as follows:

MPPA=μ +nr / 1+ (n-1) r * (individual average –μ)

Where: μ = Herd average; n = Number of lactations for each cows r = Repeatability of the traits

The animal, which produces less than average MPPA or below a certain level of MPPA, is culled. Repeatability estimate was obtained as follows

$R= \delta^2d / \delta^2d+ \delta^2e$ where

R=Repeatability was estimated for daily milk production.

δ^2d = Variance among cows

δ^2e = Variance within cows

A general linear model (GLM) used for the statistical analysis of the data .Duncan multiple range test (3) was performed for the mean differences comparisons. Procedure of the statistical analysis (15) was used according to the following linear additive model:

$Yijklmn=\mu+D_i+F_j+P_k+S_l+N_m+DP_n+Eijkman$

Where: Yijklmn= the individual observation

μ= overall mean of trait ,D_i=Effect of i^{th} Dam or cow i=1…51,F_i= Effect of j^{th} Flock j=1…3

P_k= Effect of k^{th} parity k=2…≥5

S_l= Effect of l^{th} Season of calving l=1…4

N_m= Effect of m^{th} Number of services per conception m=1…3

DP_n= Effect of n^{th} Dry period length (days)n=1…3 Eijkman=Error term NID (o, σ^2e).

RESULTS AND DISCUSSION

Some non-genetic factors affecting daily milk production: Milk production is influenced by several genetic and environmental factors the mean and standard error for daily milk production (DMP) studied of local cows have been given in Table 1. The overall mean of DMP was 11.85 kg. The estimated value of the present work were

found to be lower than those obtained by Raoof (11) , for the Friesian cows bred in Erbil plain (19.96kg), and Usman (21) , for that of the crossbred cows (16.68kg), but higher than. (Wassie), on Friesian x Boran in Ethiopia (7.02kg).The differences in DMY may be due to the differences in genetic makeup of native cattle and management systems. The effect of flock on DMP was significant (p<0.05). DMP in the first, second and third flock cows were 12.29, 11.50 and11.76kg respectively (Table 2). The differences in milk production attributed to flock effects are interpreted to be due to climatic, feeding and nutrition and managerial conditions, which changed from flock to another. The parity effect on DMP in local cows was significant (P<0.05) (Table 1).Milk production increased with the advanced of parity and mostly reached its maximum value in the 4th parity being 13.47kg per day, this could be due to an increase of body weight, which results in a larger digestive system and a larger mammary gland for the secretion of milk. Milk production increased with fourth or fifth parity this could be attributed to udder size and development and to increase body size along with advanced age. Our findings were in agreement with the results of many researcher (4) for Holstein cattle in Egypt and Friesian cows in Erbil (11).Likewise, Usman (21) working with Holstein cattle in Egypt reported that the parity has a significant (P<0.05) effect on milk production and similar results were obtained by some studies (20,23) .The present results showed that milk production increased with the increasing of lactation orders (Table 1).It is evident that such increase might be due to the increased body weight and to a concomitant advancement of age and to the full development of the secretary tissue of the udder. The present results disagree with those obtained by (Laxman), in HF×GIR Half-bred cattle. Results presented in Table 1 revealed that the season of calving has a significant (p<0.05) effect on DMP. Cows calved in autumn had a highest milk production than that calved in other seasons .The results showed that the winter, summer and autumn seasons showed the highest milk production, daily milk productions were 10.33, 11.67, 12.50 and 12.85kg for the winter, spring, summer and autumn, respectively. The lower daily milk production during spring season (10.33kg) per day (Table1) , this could be related to the fluctuation of climate and the availability of feeds and fodders as compared with other seasons. These results are in accordance with those reported by several researchers (1, 16, 21, 23) However, the results disagreed with other researchers **(**6, 10) who reported

Table.1.Non-genetic factors affecting milk production traits in local cows

Factors	No.	Daily milk production (kg)
Overall mean	**51**	**11.85±0.05**
Flock		*
First	**19**	**12.29±0.15a**
Second	**15**	**11.50±0.15b**
Third	**17**	**11.76±0.12ab**
Parity		*
1	**07**	**8.95±0.13c**
2	**10**	**9.62±0.14c**
3	**12**	**11.90±0.24b**
4	**10**	**13.47±0.16a**
5≤	**12**	**12.14±0.10b**
Season of calving		*
Winter	**15**	**11.67±0.14b**
Spring	**10**	**10.33±0.23c**
Summer	**12**	**12.50±0.21ab**
Autumn	**14**	**12.85±0.16a**
Services per conception		*
First	**25**	**12.85±0.09a**
Second	**14**	**11.75±0.14b**
Third	**12**	**10.07±0.17c**
Dry period length (days)		*
Until 60	**12**	**11.92±0.20b**
61- 75	**24**	**12.68±0.09a**
75more	**15**	**10.78±0.14c**

Means within column classification followed by different superscript are different significantly (P<0.05).

That season of calving had no significant influence on total milk production. Spring calves had the highest milk production, higher yields in autumn and summer could be attributed to better climatic conditions enhancing the increase in feed intake. The results of the study showed the significant ($p<0.05$) effect of number of services per conception on DMP12.85, 11.75 and10.07 for first, second and third respectively (Table1). The Daily milk production was highest 12.85kg for cows conceived from the first service while was lowest 10.07kg in cows conceived during the third services (Table1),Number of services per conception, which is defined, as the number of natural services or artificial required for a successful conception, depends largely on the breeding system used, the reproductive health status of the animal, the management and feeding practices in a farm and the semen quality of artificial insemination or natural service bulls (7,17).The findings of this study were in agreement with those reported by Raoof (11) for the Friesian cows bred in Erbil. The term of dry period length refers to the period of off milking, the dry period length was found to have a significant effect ($p<0.05$) on daily milk production in local cows. Daily milk production was 11.92, 12.68 and10.78 kg for cows having dry periods of until 60, 61- 75 and 75 more days, respectively (Table 1). These results were in accordance with those reported by Raoof (11) for Friesian cows bred in Erbil. However (Sawant) that the dry period of 40-60 days would be the most favorable in terms of the highest production of milk in cattle

Repeatability

Repeatability estimate is considered as the upper limit of heritability because it contains the permanent environment effects in addition to genetic and phenotypic variances (8).The results obtained from this study, showed that the repeatability estimate for DMY (0.40), was higher than that obtained by (12)for daily milk production 0.24 in Friesian cows bred in Erbil, but lower than that obtained by(2)for milk production was 0.46 in Sahiwal cattle, it means that selection of dam and culling could best on their first record.

Most Probable Producing Ability (MPPA): Estimated MPPA for DMP of each individual are given in the Table 2 . The cow having ID no. 1237 had the highest calculated MPPA value (16.97 kg) for DMP among the considered 51 individuals and ranked first (1^{st}).Among the experimental animals, cows with numbers, 1256, 772, 773,332, 112, 120, BB and113 possessed the top ranking MPPA values (Table 2) among the cows. It is evident from the results shown in Table 2 that DMP of the cows (FF.771, 1255, 1257, 230 and 223) possessed the same rank of the calculating MPPA values. On the contrary, the cow bearing no. 108 occupied the last position (48^{st}) for MPPA with a value of 8.25kg.The estimates of (MPPA) are useful for efficient selection programmed, which helps in predicting correlated response to selection. This ultimately helps in choosing breeding system to be followed for future improvement and for increasing the genetic gain. Much of the gain from using it comes with the second records, but if is small the gain from waiting for a third or even a fourth record may be considerable. he significant effect of non-genetic factors on daily milk production indicated the response of cows to better environmental conditions, including the improve feeding, management and MPPA introduce the possibility of making the change in population dynamics due to selection pressure and culling.

Table 2. Details of number of cows obtained evaluation

Cow cods	Actual values of DMP	MPPA	Rank	Cow cods	Actual values of DMP	MPPA	Rank
1237	18.5	16.97	01	1259	11.0	11.23	25
1256	18.0	15.97	02	221	11.0	11.20	26
772	17.0	15.82	03	665	11.0	11.17	27
773	16.0	15.17	04	331	11.0	11.14	28
332	16.0	15.17	05	881	10.5	10.81	29
112	16.0	14.88	06	334	10.0	10.61	30
120	15.5	14.84	07	666	10.0	10.43	31
BB	15.0	14.43	08	886	10.0	10.33	32
113	15.0	14.15	09	110	10.0	10.30	33
FF	14.5	14.02	10	335	10.0	10.13	34
771	14.5	14.02	10	1258	9.5	10.02	35
1255	14.0	13.51	11	892	9.5	9.97	36
1257	14.0	13.51	11	DD	9.5	9.92	37
898	14.0	13.42	12	EE	9.5	9.88	38
986	14.0	13.29	13	CC	9.0	9.77	39
770	13.5	12.95	14	887	9.0	9.66	40
663	13.0	12.71	15	1231	9.0	9.61	41
885	13.0	12.69	16	890	8.5	9.42	42
664	12.5	12.38	17	AA	8.5	9.27	43
114	12.5	12.32	18	115	8.5	9.10	44
328	12.0	11.98	19	230	8.0	9.04	45
1230	12.0	11.97	20	223	8.0	9.04	45
333	12.0	11.96	21	GG	8.0	8.89	46
667	12.0	11.94	22	220	8.0	8.77	47
222	12.0	11.93	23	108	7.5	8.25	48
894	11.5	11.58	24				

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