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Accuracy of estimating 305-day milk, fat and protein yields using different milk recording systems through the first three lactations in dairy cattle

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Abstract

Across the first three lactations 47163 records of Austrian Fleckvieh cows were used in this study to estimate 305-day milk , fat and protein yields by comparing bimonthly recording system (BRS_2) and trimonthly recording systems (TRS_2 and TRS_3). Traits studied were recorded milk yields of both monthly test - day and 305-day (MT) and estimated (EMT) 305-day of milk ; fat and protein yield. Three measures of accuracy (ACM) for those systems were (biases (BMT); percentages (PERMT) and percentages bias (PBMT) of estimated from actually recorded 305- day milk traits were calculated. Effects of calving year – season; age at calving; days open and stage of lactation were considered as fixed effects and sire effects as random. Genetic (r_G), phenotypic (r_P) and environmental (r_E) correlations among those estimated and actually recorded traits were estimated. The evaluation criteria for the comparisons between those schemes were relying on the accuracy measurements and the correlations. The results indicated that for the first lactation, using TRS_3 and for the second and the third lactations using BRS_2 were accurate enough to predict 305 - day milk, fat and protein yields.

Keywords: dairy cows, milk recording systems, prediction, accuracy measurements, milk traits**.**

Introduction

Since a long time ago, the benefit of recording was demonstrated. No doubt that milk recording is essential for herd management and genetic improvement in dairy cattle (**Liu et al., 2000** and **Ibrahim, 2012)**. The cost of standard monthly milk recording is high and very expensive and schemes with longer intervals presented the lowest costs due to the reduction of travel costs (**Cardoso et al 2005**). Thus simplification of milk recording systems consider as an appealing method for low to medium input production systems in the case of bias the computing total performance is not large and the estimation of accuracy of milk yield is high (**Hammami et al., 2004).**

Many researchers have investigated the effect of reducing the frequency of milk recording from different directions of view. For prediction accuracy of lactation yields, **Hammami et al. (2004)** and **Duclos et al. (2008)** revealed that with the extension length of interval between successive recordings, the prediction accuracy as well as the cost of recordings were decreased.

Berry et al. (2005) found also that the first lactation milk could be estimated based on the bimonthly recording scheme, similar to the estimation based on the standard scheme. In the same time, increasing participation in milk recording and cost reduction could be achieved by extending the interval between successive milk recordings. This leads to faster genetic gain from selection due to potentially increased intensity of selection which allowing more young bulls to be tested per year without reducing genetic gain (**Schaeffer and Rennie, 1976**), in addition to greater flexibility in organizing the work of supervisors which lead to increase number of herds served by one supervisor and less disruption of the milking routine (**Cassandro et al., 2003; Gantner et al., 2008 and 2009)**.

Also, the results of **Pander et al. (1993**) and **Schaeffer et al. (2000**) advocated the same conclusion that using less frequent methods than the standard one may reduce costs without a proportional loss in accuracy when estimating 305-day yield and the cost (in money, time, and inconvenience) of recording individual cow milk yields needs to be as low as possible to keep dairy producers enrolled on milk recording programs.

Thus**,** on the basis of this fact **Candek-Potokar et al. (2006)** revealed that, the milk recording system is a key source of information for breeding purposes (genetic improvement) and herd management (feeding decisions, health) in dairy cattle, and for that reason the accuracy of milk recording results is of great importance**.**

Duclos et al. (2008) stated that other traits, such as functional or fitness traits (longevity, fertility, mastitis resistance), are receiving increasing attention because of their impact on cost reduction and antagonism with high milk production. These traits are usually characterized by a low heritability, but at least some of them (e.g. fertility) could heavily benefit from a systematic recording for genetic evaluations.

The objective of this study were: (1) to compare the bimonthly and trimonthly recording systems as a simplified methods for estimating 305-day milk, fat and protein yields at the first three lactations and (2) to determine the optimal accuracy position of estimates for quantity and composition of milk traits relative to the normal recorded one.

Materials and methods

Data on milk traits of Austrian Fleckvieh cows belong to the Official Federation of Austrian Cattle Breeders (ZAR). Records of primiparous and multiparous cows calved in two successive years (1990-1991) were used in the present study. The used records of the first three lactations were for paternal half-sisters. The breeding and management policies of Austrian Fleckvieh cattle are described by **Hofinger et al. (1997)**. Heifers were artificially inseminated when reached about 320 kg body weight. Table (1) shows the distributions of sires and cows records according to different three recording systems. Only sires with at least two daughters (paternal half – sisters) in different herds were included in the analysis.

Traits studied were recorded 305 – day milk traits (taken normally 10 times by monthly interval): milk – (MY); fat – (FY); protein – (PY) yield. However, estimated 305 – day milk traits (EMT) were milk – (EMY); fat – (EFY) and protein – (EPY) yield were by using different recording systems **,**at each monthly test **-** day recording were done two times /day (morning and evening).

Table 1. Distribution of sires and number of records under different recording systems at the first three lactations in Fleckvieh cattle.

Recording system	**No. Sires**	**Total No. records**
1st lactation		
bimonthly system (BRS_2)	516	4847
trimonthly systems		
TRS_2	516	4850
TRS_3	771	7963
2nd lactation		
BRS_2	355	3068
TRS_2	734	6893
TRS_3	734	6892
3rd lactation		
BRS_2	275	2249
TRS_2	622	5201
TRS_3	622	5200

Under Bimonthly recording system (BRS_2): five bimonthly periods were used, beginning at the 2nd month of lactation (Table 2) thereafter the estimated 305-day milk traits (EMT) were calculated by using the following equations:

$$\textbf{EMT} = \sum_{i=1}^{5} (TD_i x62)$$

Where: i = 1; 2; 3; 4 and 5

1 = TD_2; 2 = TD_4; 3 = TD_6; 4 = TD_8 and 5 = TD_{10}

Under Trimonthly recording system (TRS)*:* two different strategies were used (Table 2) and the EMT were calculated by using the following equations:

Under TRS_2 : started at the 2nd month of lactation

$$\textbf{EMT} = \sum_{i=1}^{3} [(TD_i \text{ X } 91.5) + (TD_{10} \text{ X } 30.5)]$$

Where: i = 1; 2 and 3

1 = TD_2; 2 = TD_5 and 3 = TD_8

Under TRS_3: started at the 3rd month of lactation

$$\textbf{EMT} = \sum_{i=1}^{3} [(TD_i \text{ X } 91.5) + (TD_{10} \text{ X } 30.5)]$$

Where: i = 1; 2 and 3

1 = TD_3; 2 = TD_6 and 3 = TD_9

The criteria of comparison among testing methods at various lactations were assessed through the accuracy measurements and the correlations between recorded (MT) **-** and estimated (EMT) 305 – day milk traits.

Table 2. Start time for recording and number of recording times of the examined recording systems.

Recording systems	Start time for recording	Number of recording times
Bimonthly recording system (BRS_2)	2nd month	5
Trimonthly recording systems	(TRS_2) 2nd month	4
	(TRS_3) 3rd month	4

Accuracy measurements (ACM)

The estimated 305- day milk traits (EMT) under different examined milk recording systems were compared to the accurate 305- day milk traits (MT) on the base of the following criteria:

1- Bias of estimated – from recorded 305- day milk traits (BMT):

BMT = (EMT – MT) kg.

2- Percentage of estimated – from recorded 305- day milk traits (PERMT):

PERMT = (EMT/MT) x 100

3- Percentage bias of estimated – from recorded 305-day milk traits (PBMT):

PBMT = (EMT– MT) /MT x100

Statistical analysis

Traits studied were analyzed by using LSMLMW computer program of **Harvey (1990).** The linear mixed model included the random effect of sire, the fixed effects of calving year – season (CYS) , age at calving (AC), days open (DO) and stage of lactation (SL) as partial linear and quadratic regression coefficients. Estimates of sire and remainder components of variance and covariance were computed by method III of **Henderson (1953).** Genetic- (r_G); phenotypic- (r_P) and environmental (r_E) correlations with standard errors (SE) were estimated. Approximate standard errors for r_G estimates were obtained according to **Swiger et al. (1964**).

Results and discussions

Bias and accuracy measurements

The accuracy measurements (ACM) between recorded – and estimated 305-day milk traits which were estimated under bimonthly recording system (BRS_2) and trimonthly recording systems (TRS_2 that started at the 2nd month of lactation or started at the 3rd month of lactation (TRS_3) are shown in Table (3). At the 1st lactation the TRS_3 method gave the best ACM translated as shown by smaller values of bias - (BMT) and percentage bias (PBMT) of estimated – from recorded 305- day milk traits coupling with higher values of percentage of estimated – from recorded 305-day milk traits (PERMT) compared to the other methods as illustrated in Figures (1, 2 and 3) for estimated milk traits. These results may be related to the high performance and variability among individual cattle within sampling schemes at the 1st lactation. In contrast, **Berry et al. (2005)** at the 1st lactation reported that the predicted EMT under the BRS_2 were not significantly different ($P > 0{\cdot}05$) from the standard method .In addition, the trimonthly recording methods (TRS) predicted significantly ($P < 0{\cdot}001$) lower EMY and EFY however, it was not significantly different ($P > 0{\cdot}05$) for EPY to the standard one. Also, the accuracy of the BRS_2 and TRS schemes in estimating EMY with the standard method was 0·97 and 0·95, respectively.

With regard to the 2nd and 3rd lactations (Table 3) shows that the corresponding accuracy measurements of estimation lactation milk, fat and protein yield were increased and gave precise estimates under BRS_2 method with shorter intervals between TD as shown in (Figures 1, 2 and 3). This results confirmed with the results of (**Hamed , 1995** ; **Hammami et al. 2004 and Berry et al. 2005)** that the BRS_2 with samples taken from all stages of lactation on average predicts a 305- day yield was similar to the normal standard one. Moreover, as it was evidenced in Table (3), the behavior of the bias of values has more tendencies to be more underestimate of the recorded 305-d MT as the parity advanced .The present results were nearly similar to the results of **Hamed, (1995**).

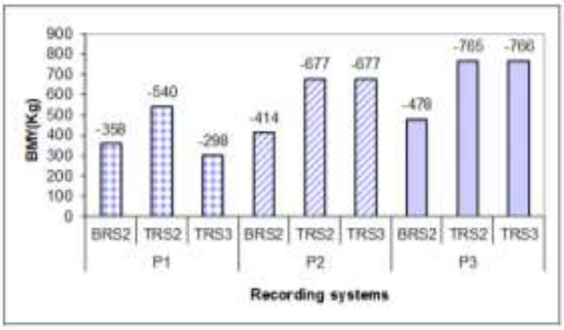

Fig. 1. Bias (Kg) of estimated – from recorded 305 – day milk yield (BMY) under different recording systems.

P: parity

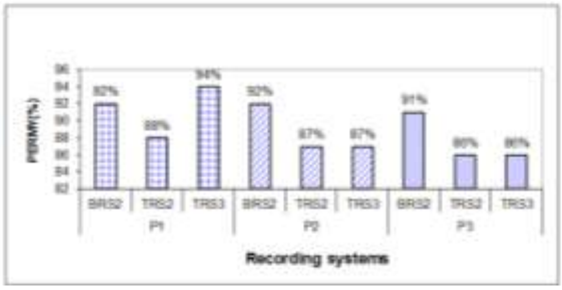

Fig. 2. Percentage of estimated – from recorded 305 – day milk yield (PERMY) under different recording systems.

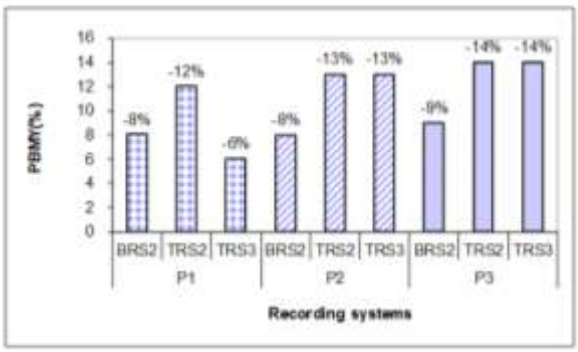

Fig. 3. Percentage bias of estimated – from recorded 305 – day milk yield (PBMY) under different recording systems

Table 3. Unadjusted means; standard deviations (SD) for recorded - and estimated 305-day milk, fat and protein yields and their accuracy measurements under bimonthly (BRS_2) - and trimonthly (TRS_2 and TRS_3) recording systems of the first three lactations in Fleckvieh cows.

Trait	1st lactation						2nd lactation						3rd lactation					
	BRS_2		TRS_2		TRS_3		BRS_2		TRS_2		TRS_3		BRS_2		TRS_2		TRS_3	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Recorded 305 – day milk traits																		
MY	4523	767	4523	767	4501	783	4994	856	4994	804	4994	804	5326	884	5318	822	5318	822
FY	186	36	186	36	186	37	206	40	206	38	206	38	221	43	221	40	221	40
PY	148	26	148	26	148	27	165	29	165	27	165	27	174	30	174	28	174	28
Estimated 305-day milk traits																		
EMY	4165	757	3983	752	4202	805	4579	830	4317	764	4317	764	4848	885	4553	810	4553	810
EFY	175	35	168	35	176	37	192	39	182	36	182	36	204	42	193	39	193	39
EPY	139	26	135	26	140	27	154	28	147	26	147	26	161	30	153	27	153	27
Biases of estimated from recorded milk traits																		
BMY	-358	432	-540	459	-298	468	-414	506	-677	495	-677	495	-478	536	-765	519	-766	518
BFY	-11	18	-17	20	-10	20	-14	22	-24	22	-24	22	-17	24	-28	24	-28	24
BPY	-8	13	-13	14	-7	14	-11	15	-18	15	-18	15	-12	16	-21	16	-21	16
Percentages of estimated from recorded milk traits																		
PERMY	.92	.09	.88	.10	.94	.10	.92	.10	.87	.09	.87	.09	.91	.16	.86	.09	.86	.09
PERFY	.94	.09	.91	.10	.95	.10	.94	.10	.89	.10	.89	.10	.93	.10	.88	.10	.88	.10
PERPY	.95	.08	.91	.09	.95	.09	.94	.09	.89	.09	.89	.09	.93	.09	.88	.09	.88	.09
Percentages bias of estimated from recorded milk traits																		
PBMY	-.08	.09	-.12	.10	-.06	.10	-.08	.10	-.13	.09	-.13	.09	-.09	.10	-.14	.09	-.14	.09
PBFY	-.06	.09	-.09	.10	-.05	.10	-.06	.10	-.11	.10	-.11	.10	-.07	.10	-.12	.10	-.12	.10
PBPY	-.05	.08	-.09	.09	-.05	.09	-.06	.09	-.11	.09	-.11	.09	-.07	.09	-.12	.09	-.12	.09

Table 4. Estimates of genetic correlations (r_G) and their standard errors (SE) between recorded – and estimated and among estimated 305 – day milk ,fat and protein yields under bimonthly and trimonthly recording systems of the first three lactations in Fleckvieh cows.

Trait	**1st lactation**						**2nd lactation**						**3rd lactation**					
	BRS_2		**TRS_2**		**TRS_3**		**BRS_2**		**TRS_2**		**TRS_3**		**BRS_2**		**TRS_2**		**TRS_3**	
	r_G	SE	**r_G**	SE	**r_G**	SE	**r_G**	SE	**r_G**	SE	**r_G**	SE	**r_G**	SE	**r_G**	SE	**r_G**	SE
Between recorded - & estimated 305 - day milk traits																		
MY&EMY	.92	.01	.94	.01	.92	.01	.85	.03	.88	.01	.90	.01	.84	.04	.88	.01	.90	.01
&EFY	.77	.03	.79	.03	.77	.02	.69	.06	.74	.02	.76	.02	.81	.05	.79	.02	.80	.02
&EPY	.88	.02	.90	.02	.88	.01	.78	.04	.83	.02	.84	.01	.81	.05	.84	.02	.85	.02
FY& EMY	.83	.03	.84	.03	.85	.02	.78	.04	.79	.02	.80	.02	.76	.06	.78	.02	.79	.02
&EFY	.96	.01	.97	.01	.95	.01	.90	.02	.90	.01	.91	.01	.93	.02	.90	.01	.91	.01
&EPY	.88	.02	.89	.02	.90	.01	.86	.03	.83	.02	.83	.02	.84	.04	.82	.02	.83	.02
PY &EMY	.87	.02	.90	.02	.88	.02	.82	.04	.84	.02	.86	.01	.75	.06	.81	.02	.82	.02
&EFY	.82	.03	.85	.03	.83	.02	.80	.04	.80	.02	.82	.02	.83	.04	.80	.02	.81	.02
&EPY	.95	.01	.98	.01	.96	.01	.89	.02	.90	.01	.91	.01	.89	.03	.90	.01	.90	.01
Among estimated 305- day milk traits																		
EMY&EFY	.86	.02	.86	.02	.87	.02	.87	.03	.87	.01	.87	.01	.89	.03	.87	.02	.87	.02
& EPY	.93	.01	.93	.01	.94	.01	.93	.02	.94	.01	.94	.01	.92	.02	.93	.01	.93	.01
EFY &EPY	.90	.02	.90	.02	.91	.01	.95	.02	.91	.01	.91	.01	.92	.03	.89	.01	.89	.01

Absolute estimates of r_G which higher than 0.062 or 0.081 are significant at $P < 0.05$ and $P < 0.01$, respectively, otherwise are not significant (n = 1000 or more).

Table 5. Estimates of phenotypic - (r_P) and environmental (r_E) correlations among recorded- and estimated 305 – day milk, fat and protein yields under bimonthly and trimonthly recording systems of the first three lactations in Fleckvieh cows.

Trait	**1st lactation**						**2nd lactation**						**3rd lactation**					
	BRS_2		TRS_2		TRS_3		BRS_2		TRS_2		TRS_3		BRS_2		TRS_2		TRS_3	
	r_p	r_E	r_p	r_E	r_p	r_E	r_p	r_E	r_p	r_E	r_p	r_E	r_p	r_E	r_p	r_E	r_p	r_E
Between recorded - & estimated 305 - day milk traits																		
MY & EMY	.93	.94	.91	.89	.92	.93	.93	.97	.90	1.0	.91	.95	.93	.97	.90	1.0	.91	.99
& EFY	.80	.83	.78	.78	.79	.82	.80	.87	.78	.93	.78	.89	.81	.81	.78	.76	.79	.75
& EPY	.87	.87	.85	.82	.87	.86	.87	.92	.85	.94	.85	.91	.87	.90	.85	.94	.86	.93
FY & EMY	.82	.82	.80	.78	.81	.80	.82	.84	.80	.85	.80	.83	.81	.84	.79	.91	.79	.89
& EFY	.92	.89	.90	.83	.91	.87	.92	.93	.89	.85	.89	.83	.92	.91	.89	.84	.89	.83
& EPY	.83	.81	.81	.77	.83	.78	.83	.81	.81	.74	.81	.73	.82	.81	.80	.77	.81	.77
PY & EMY	.86	.86	.85	.82	.86	.85	.88	.92	.86	.93	.86	.90	.88	.94	.85	1.0	.86	1.0
&EFY	.82	.82	.80	.77	.81	.79	.83	.84	.80	.81	.81	.78	.82	.82	.80	.79	.80	.78
&EPY	.93	.91	.90	.86	.92	.90	.93	.95	.91	.93	.91	.90	.93	.95	.91	.97	.91	.95
Among estimated 305- day milk traits.																		
EMY&EFY	.87	.88	.87	.88	.86	.85	.87	.87	.87	.87	.87	.87	.87	.86	.87	.86	.87	.86
& EPY	.93	.94	.94	.94	.92	.92	.94	.95	.94	.96	.94	.96	.94	.95	.94	.98	.94	.98
EFY & EPY	.89	.89	.89	.88	.88	.86	.89	.85	.89	.82	.89	.82	.88	.86	.88	.84	.88	.85

Absolute estimates of r_P and r_E which were higher than 0.062 or 0.081 are significant at $P < 0.05$ and $P < 0.01$, respectively , otherwise are not significant (n = 1000 or more).

Correlations

Table (4) showed that, the TRS_2 recorded method showed strongest r_G values between MT and EMT at the 1st lactation. On the contrary, **Hamed, (1995)** and **Berry et al. (2005)** stated that, the correlations between the standard and BRS_2 method were always greater than that with TRS_2 and TRS_3 methods.

Also, from Table (4) the 2nd lactation showed that the corresponding r_G estimates were nearly high and almost fall in the range from 0.69 to 0.91 between MT and EMT under all methods. On the other side, in the case of the 3rd lactation the corresponding r_G estimates ranged from (0.75 to 0.93) and the greatest r_G values were located under the BRS_2 method from 0.75 to .93.

The r_G values among the predicted EMT by various recording schemes (Table 4) observed that, the sizable values were found under TRS_3 method (0.87 to 0.94) at the 1st lactation and under BRS_2 method at the other lactations.

Results in Table (5) evidenced that, the BRS_2 method recorded the highest r_P correlations between MT and EMT through all lactations that is in line with the findings of **Hamed, (1995)**. At the 1st lactation, the greater estimates were shown by both BRS_2 and TRS_3 methods and by BRS_2 method at the other lactations. Estimates of r_P 0.93 between MY and EMY under BRS_2 through the 1st three lactations were generally lower than 0.97 and 0.99 computed by **Hammami et al. (2004)** and **Berry et al. (2005),** respectively. In the other view, the r_P values among EMT (0.86 to 0.94) were nearly similar in magnitude at the all lactations.

The r_E estimates between MT and EMT presented in Table (5) were generally near unity and it increased as parity advanced from 0.77 to 0.94; from 0.73 to 1.0 and from 0.75 to 1.0. Also, the r_E estimates among EMT have the same trend and ranged from 0.85 to 0.94; from 0.82 to 0.96 and from 0.84 to 0.98 at the first three lactations.

Conclusion

The results of this study revealed that using 4 times as test-days (TD) per lactation under the trimonthly recording system (TRS_3) during the first lactation could be consider accurate enough instead of 10 times TD under the standard monthly recording systems to predict 305 – day milk traits (EMT) with strongest r_G . Therefore, using the TRS_3 system could be expected for early culling of low production cows instead of removing the same cows by culling on the standard normal recording system.

From the other side, with regard to the 2nd and 3rd lactations using 5 times TD under bimonthly recording system (BRS_2) showed adequate and enable more accurate prediction of 305 – day milk traits with high accuracy (Table 3). Hence, the favorable attributes of BRS_2 milk recording system of the present study was agree with the review of **McDaniel (1969)** that the bimonthly milk recording may be sufficient for predicting herd average, group average, sire evaluations and ranking cows within herds.

On the basis of the obtained present results, it could be concluded that the perfect and positive r_G values between MT and EMT reflect that selection of AI sires on the basis of EMT using the present examined systems may be equal to selection on the basis of complete lactation yield records of their daughters rather than to the standard systems. In other meaning this lead to obtain high genetic gain in milk, fat and protein yields through selection programs with more benefit by reduce effort; time and costs of recording. So, this lead in general to increase the recorded number of dairy herds without increased costs and permit a choice of some dairy farmers which prefer this recording system in respect to the standard method with less disruption in the milking routine.

From other direction, it could be concluded that the high estimate and nearly values of r_E among EMT and between MT and EMT emphasize to the high influence of environmental factors on the three examined recording methods (BRS_2;TRS_2 and TRS_3) that must be considered in selection programs to achieve more genetic progress with ought biasness along the time.

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دقة تقدير محصول اللبن والدهن والبروتين فى 305 يوم باستخدام نظم التسجيل المختلفة خلال الثلاث مواسم الاولى من الادرار فى ماشية اللبن

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أجريت الدراسة على سجلات الادرار لابقار الفلاك –فى وذلك لفترة عامين من سنة (1990 –1991) لعدد 47163 سجلا تم التحصل عليها من الاتحاد الفيدرالى النمساوى الرسمى لمربى الماشية (ZAR). تم تقديرمحصول اللبن والدهن والبروتين فى 305 يوم بتطبيق نظامى التسجيل : مرة كل شهرين بداية من الشهر الثانى (BRS_2) ومرة كل ثلاثة اشهر ابتداء من الشهر الثانى او الثالث من بداية الموسم (TRS_2, TRS_3) خلال الثلاث مواسم الاولى من الادرار. وأشتمل نموذج التحليل الاحصائى على التأثيرات الثابتة التالية : تاثير كل من توليفة سنة وموسم الوضع وتأثير كل من العمر عند الولادة والأيام المفتوحة ومرحلة الحليب) بينما كانت التأثيرات العشوائية كالتالي: اثر الطلوقة والأثر المتبقي على الصفات السابقة. واستخدمت تأثيرات كل من العمر عند الولادة وفترة الأيام المفتوحة ومرحلة الحليب كمعاملات انحدار جزئية (خطية ومن الدرجة الثانية) للصفات المدروسة على تلك التأثيرات.

وقد اعتمدت المقارنة بين نظم التسجيل المختلفةعلى:

اولا– مقاييس الدقة التى تشتمل على: قيم تحيز صفات انتاج اللبن المقدرة كانحراف عن الانتاج المسجل (BMT) – تقدير النسبة المئوية لصفات انتاج اللبن المقدرة بالنسبة للانتاج المسجل (PERMT) وتقدير النسبة المئوية للتحيز المقدر لصفات انتاج اللبن كانحراف عن الانتاج المسجل (PBMT) لنظم التسجيل الشهرية المختلفة.

ثانيا– الارتباطات الوراثية والمظهرية بين محصول اللبن والدهن والبروتين المقدر والمسجل.

وتلخصت أهم النتائج المتحصل عليها تحت أنظمة التسجيل المختلفة فيما يلي:

1 – خلال الموسم الاول يمكن تقدير انتاج 305 يوم لمحصول صفات اللبن باستخدام اربعة اختبارات شهرية فى الموسم بدرجة عالية من الدقة باستخدام نظام التسجيل مرة كل ثلاثة اشهر ابتداء من الشهر الثالث (TRS_3) مقارنة بانظمة التسجيل الاخرى.
2 – خلال الموسمين الثانى والثالث يمكن تطبيق نظام التسجيل مرة كل شهرين ابتداء من الشهر الثانى (BRS_2) باستخدام خمسة تسجيلات شهرية فى الموسم بدرجة عالية من الدقة مقارنة بانظمة التسجيل الاخرى.
3 – كانت قيم معاملات الارتباط الوراثى والمظهرى بين صفات انتاج اللبن المسجلة والمقدرة بصفة عامة مرتفعة وموجبة تحت انظمة التسجيل مرة كل ثلاثة اشهر فى الموسم الاول وتحت نظام التسجيل مرة كل شهرين فى كلا من الموسمين الثانى والثالث من الادرار.
4 – تنصح الدراسة بامكانية تطبيق نظام التسجيل مرة كل ثلاثة أشهر ابتداء من الشهر الثالث فى الموسم الاول من الادرار وكذلك تطبيق نظام التسجيل مرة كل شهرين ابتداء من الشهر الثانى خلال الموسم الثانى والثالث من الادرار بدرجة عالية من الدقة بما يتيح امكانية التطبيق المبكر لبرامج الانتخاب والتربية والتحسين و كوسيلة لتقليل تكاليف تسجيل اللبن وتوفير الوقت والجهد المبذولين فى عملية التسجيل. ولتحفيز المربين وصغار الفلاحين على تسجيل انتاج اللبن.