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GENETIC PARAMETERS AND SELECTION RESPONSES FOR MILK PRODUCTION TRAITS OF THE FIRST LACTATION UNDER MONTHLY TEST DAY RECORDING SYSTEMS IN FLECKVIEH CATTLE

Genena, Shereen K.
Animal Prod. Res. Inst., Ministry of Agric. and Land Recl., Dokki, Giza, Egypt.

ABSTRACT

Data were collected in two consecutive years (1990 - 1991), it included 9652; 27158; 27886; 28017; 28049; 27842; 23902; 14517 and 9226 records of different monthly test-day recording systems (SMRS) from the 2nd up to 10th month of the first lactation in Fleckvieh cows.

Yields of monthly test -day and simulated 305-day milk ,fat ,protein and fat-plus- protein and percentage of protein yield /fat yield were studied. Effects of calving year- season, age at calving ,days open and stage of lactation were considered as fixed effects ,and sire effect as random effect.

Data were analyzed using the LSMLMW computer program of *Harvey (1990)*.Variance components, heritabilities and genetic-, phenotypic- and environmental correlations among those traits were estimated .The indirect selection of those traits were calculated under the different recording systems (SMRS). Heritability estimates for monthly test-day milk traits (TDMT) ranged from 0.19 to 0.48. Generally, the highest h^2 estimates were under $SMRS_8$ (0.27 to 0.48); the lowest were under $SMRS_2$ (0.19 to 0.23). Estimates of heritability for simulated 305-day milk traits (SMT) ranged from 0.40 to 0.61 under various SMRS. Generally, the highest h^2 estimates (0.54 to 0.61) were obtained under $SMRS_8$ up to $SMRS_{10}$; the lowest were under $SMRS_2$. Genetic- (r_G) ,phenotypic- (r_P) and environmental (r_E) correlations between simulated 305- day milk yield traits (SMYT) and monthly test-day milk yield traits (TDMYT) under different SMRS were generally positive and varied from moderate to high. Those estimates ranged from 0.59 to 1.0 for r_G ; from 0.59 to 0.86 for r_P and from 0.47 to 0.76 for r_E. Estimates of r_G, r_P and r_E between SMT and monthly test-day percentage of protein yield /fat yield (TDPOF%) varied generally in direction and in magnitude from low to moderate .While, positive and moderate estimates were observed between simulated 305- day percentage of protein yield / fat yield (SPOF%) and TDPOF% and ranged from 0.78 to 0.99; 0.46 to 0.65 and 0.33 to 0.50 for r_G, r_P and r_E, respectively.

The results lead to conclude that using single trait selection for both TDMYT (especially monthly test-day fat-plus- protein yield TDFPY) under $SMRS_8$ and TDPOF% under $SMRS_2$ could be utilized satisfactorily for genetic improvement in SMYT relative to other recording systems to obtain high genetic gain in MYT. This procedure would ,also, reduce effort ,time and costs of recording.

Keywords: Fleckvieh, monthly test day, genetic parameters, correlated response, milk traits.

INTRODUCTION

Improvement of milk production in dairy cattle is possible through using proven sires based on their daughter's milk records. Constraints on milk recording systems in Egypt are numerous. The most important of them can be classified as follows: lack of breed associations, breeding programs and a national institution responsible for sustaining recording system. The financial constraints were due to the poor income from the animals, small farmers are not willing and aren't able to pay for the recording of their animals. The technical constraints were the lack of national animal identification program and the lack of recording incentives, especially for small farmers *(Nigm, 2000)*. Also, daily milk recording is labor consuming process. Thus, monthly test-day recording systems are means for reducing the cost, effort and time of recording. Moreover, the use of test-day yield instead of 305- day lactation yields has recently become the focus of much research in dairy genetics and evaluation system (*Gengler et al. 1999 and Silvestre et al. 2005*).

The objectives of this study were to : (1) investigate the possibility of predicting 305- day first lactation milk traits from using different single monthly test-day; (2) estimate the genetic, phenotypic and environmental parameters of monthly test – day – and simulated 305- day milk traits under different monthly recording systems in Fleckvieh cattle ;(3) estimate the correlated response to selection for 305 – day milk traits based on different single monthly test-day.

MATERIALS AND METHODS

Data on milk traits of Austrian Fleckvieh cows were collected by the official Federation of Austrian Cattle Breeders (ZAR). Analysis of data was carried out at the Department of Animal production, Faculty of Agriculture, Zagazig University. Records used were those of primiparous and multiparous cows calved in two successive years (1990-1991). Data available are for paternal half sisters of the first parity.

Heifers were inseminated when they reached about 320 kg body weight and were artificially inseminated using deep – frozen semen, avoiding full – sibs and sire –daughter matings. Breeding and management policies of Austrian Fleckvieh cattle are described by *Hofinger et al.(1997)*.

Data were available on 9652; 27158; 27886; 28017; 28049; 27842; 23902 ;14517 and 9226 records of 629; 1748; 1777; 1780; 1781; 1775; 1642; 1232 and 1387 sires under different data sets of monthly test – day (TD) milk traits from 2^{nd} up to 10^{th} month of lactation ($SMRS_2$ up to $SMRS_{10}$). Only sires with at least two daughters (paternal half – sisters) in different herds were included in the analysis. Traits studied were monthly test – day milk traits (TDMT): yields of monthly test – day milk- (TDMY); fat- (TDFY); protein- (TDPY) and fat–plus– protein (TDFPY) and protein yield / fat yield as percentage (TDPOF%). Simulated 305-day milk traits (SMT) were simulated yields of 305 -day milk- (SMY) ; fat- (SFY) ; protein- (SPY); fat – plus – protein (SFPY) and protein yield / fat yield as percentage (SPOF%).

Simulated 305-day milk traits (SMT) were calculated by using the following equations:

$SMT = [(TD_i \times 30.5) \times 10]$,

Where: i = 2; .... and 10 month of lactation (ML)

TD = monthly test – day

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)* . The estimates of paternal half – sib heritability (h^2_S) were calculated as, $h^2_S = 4\sigma^2_S / (\sigma^2_S + \sigma^2_e)$, where : σ^2_S and σ^2_e are sire and remainder variance components ,respectively. Genetic- (r_G); phenotypic- (r_P) and environmental (r_E) correlations with standard errors (SE) were estimated. Approximate standard errors for h^2_S and r_G estimates were obtained according to *Swiger et al. (1964)*. The expected correlated response of simulated milk traits studied were estimated according to *Falconer (1981)* by using the following equation:

$CR_y = i.h_x\ h_y\ r_G\ .\ \sigma P_y$

Where, CR_y = the correlated response of trait y; h_x and h_y are the square roots of respective heritability estimates, r_G = the genetic correlation between x and y traits, and σp_y = the phenotypic standard deviation of trait y.

The expected genetic changes per generation were calculated on cow side. The selection intensity (i) for a trait was set to be 1.0 for the purpose of comparisons

RESULTS AND DISCUSSION

Means

Means ± SD and coefficients of variation (CV%) for simulated 305-day milk traits (SMT) and monthly test – day milk traits (TDMT) under single monthly recording system ($SMRS_2$ up to $SMRS_{10}$) are given in Table (1). The results showed that the CV% value of SMYT ranged from 16.2 to 18.8%. Estimates of CV% for SPOF% were almost the same and near (8.0%) under different SMRS. As presented in Table (1) means of TDMT were generally increased as the month of lactation (ML) advanced, however , estimates of CV% showed an opposite trend.

Components of variance and heritability

The proportion of variation (V%) due to the sire component of variance for SMT under various SMRS ranged from 10.1 to 13.8% for SMY; from 12.5 to 15.2% for SFY; from 10.9 to 13.5 % for SPY; from 11.9 to 14.6% for SFPY and from 12.7 to 14.9% for SPOF% (Table 2). Results obtained in the present study (Table 2) proved significant effects of sire on all TDMT ($P<0.01$ or $P<0.001$). The proportion of variation (V%) due to sire component for TDMT ranged from 4.8 to 11.0% for TDMY; from 5.2 to 11.5% for TDFY; from 5.2 to 10.7% for TDPY; from 5.3 to 11.9% for TDFPY and from 5.5 to 7.4% for TDPOF% .

Heritability estimates (h^2_S) for SMT under different SMRS as given in Table (2) ranged from 0.40 to 0.55 for SMY; from 0.50 to 0.61 for SFY ; from 0.44 to 0.54 for SPY ; from 0.48 to 0.59 for SFPY and from 0.51 to 0.59 for

SPOF%. Results in Table (2) indicated that, generally, the highest h^2_s estimates of SMYT under different SMRS were under the 8th, 9th and 10th SMRS, while, the lowest was under $SMRS_2$. Also, the highest h^2_s estimates of SPOF% under various SMRS were at the 4th; 5th and 8th SMRS, while, the lowest was under $SMRS_2$.

Table (1): Unadjusted means, standard deviations (SD) and coefficients of variation (CV%)+ for simulated 305 - and monthly test-day milk traits under different single monthly recording in Fleckvieh cattle

Trait		SMRS								
		2	3	4	5	6	7	8	9	10
SMY	Mean	4359	4298	4290	4288	4288	4290	4338	4422	4466
SD		809	810	813	814	814	813	804	793	790
CV%		16.9	16.9	17.1	17.1	17.1	17.1	16.8	16.4	16.2
SFY	Mean	183	179	178	178	178	178	180	183	184
SD		37	37	37	37	37	37	37	37	37
CV%		18.4	18.7	18.8	18.8	18.8	18.8	18.6	18.3	18.2
SPY	Mean	144	142	141	141	141	141	143	145	147
SD		28	28	28	28	28	28	28	27	27
CV%		17.7	17.7	17.9	17.9	17.9	17.9	17.6	17.2	17.1
SFPY	Mean	326	320	320	320	320	320	323	329	331
SD		64	64	64	64	64	64	63	63	62
CV%		17.6	17.8	17.9	18.0	18.0	18.0	17.7	17.4	17.2
SPOF%	Mean	79	80	80	80	80	80	80	80	80
SD		7	7	7	7	7	7	7	7	7
CV%		7.7	7.8	7.8	7.8	7.8	7.8	7.8	7.9	7.9
TDMY	Mean	9	11	12	13	14	16	17	17	17
SD		3	3	3	3	3	3	4	4	3.5
CV%		31.4	26.6	23.4	21.5	20.4	19.2	18.5	17.9	18.0
TDFY	Mean	0.44	0.48	0.53	0.56	0.59	0.63	0.68	0.69	0.70
SD		0.14	0.14	0.14	0.14	0.14	0.16	0.17	0.18	0.18
CV%		31.5	27.7	25.2	23.4	22.9	22.9	22.9	22.7	24.7
TDPY	Mean	0.34	0.39	0.42	0.45	0.48	0.50	0.53	0.54	0.54
SD		0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12
CV%		30.8	26.6	24.0	22.5	21.6	20.5	20.0	19.6	19.7
TDFPY	Mean	0.77	0.87	0.95	1.0	1.1	1.1	1.2	1.2	1.2
SD		0.25	0.24	0.24	0.24	0.24	0.26	0.28	0.28	0.29
CV%		30.5	26.5	23.9	22.0	21.5	20.8	20.2	20.5	20.2
TDPOF%	Mean	79	81	81	82	82	81	79	79	80
SD		10	11	11	10	10	11	11	12	12
CV%		12.7	12.9	12.4	12.0	12.0	12.9	13.6	14.2	14.9

+ Coefficients of variation computed as the square root of the residual means squares divided by the overall least squares

++ Yield traits in Kilograms means of a given trait according to *Harvey (1990)*.

SMY: Simulated 305-day milk yield ; SFY: Simulated 305-day fat yield ; SPY: Simulated 305-day protein yield ; SFPY: Simulated 305-day fat –plus – protein yield ; SPOF%: Simulated 305-day protein yield / fat yield as %; TDMY: monthly test-day milk yield ; TDFY: monthly test-day fat yield ; TDPY: monthly test-day protein yield ; TDFPY: monthly test-day fat –plus – protein yield and TDPOF%: monthly test-day protein yield / fat yield as %.

Table (2): Estimates of variance percentages (V%) due to sire+ and remainder and heritability (h^2_s)++ for traits studied under different single monthly recording systems (SMRS) in Fleckvieh cattle.

	SMRS	2	3	4	5	6	7	8	9	10
SMY	V% sire	10.1	13.1	13.1	13.0	12.8	12.8	13.5	13.6	13.8
	V% error	89.9	86.9	86.9	87.0	87.2	87.2	86.5	86.4	86.2
	h^2_s	0.40	0.52	0.52	0.52	0.51	0.51	0.54	0.54	0.55
SFY	V% sire	12.5	14.7	14.7	14.7	14.7	14.7	15.0	15.1	15.2
	V% error	87.5	85.3	85.3	85.3	85.3	85.3	85.0	84.9	84.8
	h^2_s	0.50	0.59	0.59	0.59	0.59	0.59	0.61	0.60	0.61
SPY	V% sire	10.9	13.0	13.0	13.0	12.8	12.8	13.5	13.5	13.5
	V% error	89.1	87.0	87.0	87.0	87.2	87.2	86.5	86.5	86.5
	h^2_s	0.44	0.52	0.52	0.52	0.51	0.51	0.54	0.54	0.54
SFPY	V% sire	11.9	14.0	14.1	14.0	14.0	14.0	14.0	14.6	14.6
	V% error	88.1	86.0	85.9	86.0	86.0	86.0	85.4	85.4	85.4
	h^2_s	0.48	0.56	0.56	0.56	0.56	0.56	0.58	0.58	0.59
SPOF%	V% sire	12.7	14.7	14.8	14.8	14.6	14.7	14.7	14.4	14.9
	V% error	87.3	85.3	85.2	85.2	85.4	85.3	85.3	85.6	85.1
	h^2_s	0.51	0.58	0.59	0.59	0.58	0.58	0.59	0.58	0.57
TDMY	V% sire	4.8	7.2	8.0	9.4	9.6	10.4	11.0	10.5	10.3
	V% error	95.2	92.8	92.0	90.6	90.4	89.6	89.0	89.5	89.7
	h^2_s	0.19	0.29	0.32	0.38	0.38	0.42	0.45	0.45	0.41
TDFY	V% sire	5.2	7.6	8.6	9.6	10.1	10.7	11.5	11.4	9.7
	V% error	94.8	92.4	91.4	90.4	89.9	89.3	88.5	88.6	90.3
	h^2_s	0.23	0.31	0.34	0.39	0.39	0.42	0.45	0.46	0.39
TDPY	V% sire	5.2	7.4	7.4	8.7	8.8	8.3	10.6	10.7	9.4
	V% error	94.8	92.6	92.6	91.3	91.2	91.7	89.4	89.3	90.6
	h^2_s	0.21	0.29	0.30	0.35	0.36	0.39	0.44	0.43	0.38
TDFPY	V% sire	5.3	7.6	8.4	9.4	9.7	10.7	11.9	11.8	10.1
	V% error	94.7	92.4	91.6	90.6	90.3	89.3	88.1	88.2	89.9
	h^2_s	0.22	0.31	0.33	0.38	0.39	0.43	0.48	0.47	0.40
TDPOF%	V% sire	5.5	6.0	6.5	6.5	6.5	7.4	7.0	7.4	6.0
	V% error	94.5	94.0	93.5	93.5	93.5	92.6	93.0	92.6	94.0
	h^2_s	0.21	0.24	0.27	0.28	0.27	0.27	0.27	0.30	0.24

+ Sire effect was significant ($P < 0.001$) for SMT and ($P < 0.05$ or $P < 0.01$ or $P<0.001$) on all TDMT.

++Standard errors of heritabilities ranged from 0.02 to 0.04 under other SMRS.

SMY: Simulated 305-day milk yield ; SFY: Simulated 305-day fat yield ; SPY: Simulated 305-day protein yield ; SFPY: Simulated 305-day fat –plus – protein yield ; SPOF%: Simulated 305-day protein yield / fat yield as %; TDMY: monthly test-day milk yield ; TDFY: monthly test-day fat yield ; TDPY: monthly test-day protein yield ; TDFPY: monthly test-day fat –plus – protein yield and TDPOF%: monthly test-day protein yield / fat yield as %.

The corresponding h^2_s estimates for TDMT ranged from 0.19 to 0.45 for TDMY; from 0.23 to 0.46 for TDFY; from 0.21 to 0.44 for TDPY ; from 0.22 to 0.48 for TDFPY and from 0.21 to 0.30 for TDPOF% (Table 2). Generally, the h^2_s estimates for TDMY (0.19 to 0.45) in the 1st lactation (Table 2) were higher than those (0.08 to 0.37) obtained by Van Vleck *and Henderson* ,1961a ; Keown and Van Vleck, 1971; Auran,1976; Danell,1982; Meyer et al. *1989; Swalve,1995; Vargas et al. 1998 and Silvestre et al. 2005*. Also, the h^2_s

of both TDFY and TDPY (0.23 to 0.46) and (0.21 to 0.44), respectively, under different SMRS were higher than (0.05 to 0.27 and 0.10 to 0.25) ,respectively, obtained by *Meyer et al. 1989 and Swalve, 1995.*

Results in the present study (Table 2) indicate that , the highest h^2_s estimates for all TDMT were under the 8th and 9th SMRS, while , the lowest estimate was under $SMRS_2$ Generally ,the pattern of h^2_s reviewed for TDMT shows an increase of h^2_s with advance of ML toward the end of lactation at the 9th ML and a decrease thereafter (e.g.*Gengler et al. 1999 and 2001*). However *Searle, 1961; Auran,1976; Danell,1982 ; Meyer et al. 1989; Danell, 1990; Swalve, 1995; Baffour et al. 1996; Vargas et al. 1998; Dematawewa and Berger, 1998 and Silvestre et al. 2005* reported that ,the highest h^2 estimates of TDMYT were in the mid lactation and the lowest estimates were obtained at early or late of lactation.

Correlations

Genetic- (r_G), phenotypic- (r_P) and environmental (r_E) correlations between 305-day (SMT) and TDMT under different SMRS are given in Table (3). Estimates of r_G between SMT and TDMYT ranged from 0.59 to 1.0 between SMY and TDMYT ; from 0.68 to 1.0 between SFY and TDMYT; from 0.70 to 0.99 between SPY and TDMYT; from 0.70 to 1.0 between SFPY and TDMYT and from -0.09 to -0.58 between SPOF% and TDMYT.

Estimates of r_G between SMY and TDMY under different SMRS (0.73 to 1.0) are comparable with the findings of *Keown and Van Vleck (1971) and Auran (1976*). Generally, the highest r_G estimates were found between SMYT and TDMYT under the SMRS 10th and 5th up to 7th, while, the lowest estimate was found under the $SMRS_2$. The trend of r_G estimates between SMYT and the most of TDMYT showed generally an increase with the advance of ML at the 7th ML and a decrease up to 9th ML and again increased thereafter; except for the r_G estimates between TDMY and both SFY and SFPY which increased with the advance of ML; those estimates were constant at the 7th up to 9th ML and increased thereafter.

In general , the lowest negative r_G estimates between SPOF% and TDMYT were found under $SMRS_4$. Estimates of r_G between SMYT and TDPOF% under different SMRS ranged from -0.50 in $SMRS_9$ to 0.07 in $SMRS_2$. However, r_G estimates between SPOF% and TDPOF% ranged from 0.78 under $SMRS_2$ to 0.99 under $SMRS_{10}$. In general , the closest relationship was found between SMYT and TDPOF% under $SMRS_2$, while the lowest was found under $SMRS_9$.

Moderate to high and positive r_P and r_E estimates were shown between SMYT and TDMYT under different SMRS and ranged from 0.47 to 0.86 (Table 3). Generally, the r_P estimates between recorded 305- day MY and TDMY were higher in the middle months of lactation than the first and late months of lactation. This observation is in line with many studies (*VanVleck and Henderson,1961b; Lamb and McGilliard, 1967; Kang et al. 1990; Shelke et al. 1992 and Abou-Bakr et al. 2000*). Estimates of r_P between *SMY and TDMY (0.86 and 0.83) under the 7th and 8th* ML ,respectively were generally in agreement with the results of *Abou-Bakr et al.(2000)*.

Table (3): Estimates of genetic- (r_G)+; phenotypic- (r_P) and environmental (r_E) correlations between simulated 305- and monthly test - day milk traits under different single monthly recording systems (SMRS) in Fleckvieh cattle.

Correlated traits	r_G+	ML*		r_P	ML		r_E	ML	
		Max.	Min.		Max.	Min.		Max.	Min.
SMY & TDMY	.73 to 1.0	2	10	.65 to.86	2	6,7	.64 to.76	2	6
& TDFY	.59 to .90	2	7	.59 to.74	2	5,6	.47 to.63	10	4 -6
&TDPY	.68 to .94	2	7,10	.64 to.79	2	6	.58 to.70	10	6
& TDFPY	.64 to .93	2	7,10	.63 to.79	2	6	.55 to.70	10	6
&TDPOF%	-.19 to .07	7 ,9	2	-.05 to.06	9	2	.02 to.11	8	5
SFY & TDMY	.68 to .90	2	10	.59 to.76	2	7	.58 to.69	3	6
& TDFY	.81 to 1.0	2	10	.65 to.83	2	6	.56 to.70	9	6
&TDPY	.78 to .92	2	10	.62 to.75	2	6,7	.54 to.65	10	6
& TDFPY	.81 to 1.0	2	10	.65 to.82	2	6,7	.60 to.71	10	6
&TDPOF%	-.24 to -.50	2	9	-.12 to-.25	2	10	-.04 to-.11	3,4	8,10
SPY & TDMY	.70 to .95	2	10	.62 to.81	2	6	.60 to.73	10	6
& TDFY	.70 to .92	2	7	.61 to.76	2	6	.47 to.63	9,10	6
&TDPY	.79 to .99	2	6,7,10	.67 to.84	2	6	.64 to.74	2,3	6
& TDFPY	.75 to .97	2	5-7	.65 to.82	2	6	.58 to.71	10	6
& TDPOF%	-.15 to .07	9	2	.02 to.08	10	2	.08 to.16	2	5,7
SFPY & TDMY	.70 to .94	2	10	.62 to.80	2	7	.61 to.73	3,10	6
& TDFY	.78 to .98	2	5-7	.65 to.81	2	5,6	.54 to.69	9,10	6
&TDPY	.80 to .97	2	10	.65 to.81	2	6	.61 to.71	10	6
& TDFPY	.80 to 1.0	2	10	.66 to.84	2	6	.61 to.73	10	6
& TDPOF%	-.11 to -.37	2	9	-.03 to-.14	2	8-10	-.01 to.04	8,1	4,5,7
SPOF% & TDMY	-.11 to -.20	4,5	3	-.05 to.02	9,10	5	.06 to.14	2	5,6
& TDFY	-.45 to -.58	4	10	-.17 to-.34	2	10	-.01 to-.14	2,3	8 -10
& TDPY	-.09 to -.21	4	2	.03 to.08	2,3	5,6	.15 to.25	2	5,6,8
& TDFPY	-.30 to -.42	4	10	-.09 to-.20	2	10	.02 to.09	7,8	5
& TDPOF%	.78 to .99	2	10	.46 to.65	2	7	.33 to.50	2	6

+ Standard errors of genetic correlations ranged from 0.01 to 0.08. *:Month of lactation.

SMY: Simulated 305-day milk yield ; SFY: Simulated 305-day fat yield ; SPY: Simulated 305-day protein yield ; SFPY: Simulated 305-day fat –plus – protein yield ; SPOF%: Simulated 305-day protein yield / fat yield as %; TDMY: monthly test-day milk yield ; TDFY: monthly test-day fat yield ; TDPY: monthly test-day protein yield ; TDFPY: monthly test-day fat –plus – protein yield and TDPOF%: monthly test-day protein yield / fat yield as %.

Estimates of r_P between SMY and TDMY and between SFY and TDFY (0.65 to 0.86) were generally in the range reviewed in literature : (0.59 to 0.90) as reported by *McDaniel,1969; Keown and Van Vleck,1971 and Auran, 1976* and lower than those (0.76 to 1.0) given by *Fritz et al.(1960)*. The highest r_P estimate (0.86) between SMY and TDMY was found under $SMRS_6$ and this is in agreement with the results of (*e.g. Van Vleck and Henderson, 1961b and c and Lamb and McGilliard, 1967*). The magnitude of both r_P and r_E estimates between SMYT and TDMYT, were generally increased with the advance of ML up to $SMRS_6$ and decreased thereafter (*e.g. McDaniel ,1969; Keown and Van Vleck, 1971 and Auran, 1976*). However , *Fritz et al. (1960)* stated that, the r_P estimates , generally increase linearly with the advance of ML.

Generally , TDPOF% had the lowest negative r_P and positive r_E estimates with SMY under different SMRS. SPOF% had the lowest negative

r_P's with all TDMYT(-0.17 to -0.34), except with TDPY (0.03 to 0.08). While positive r_E estimates (0.02 to 0.25) were obtained between SPOF% and TDMYT, except with TDFY(-0.01 to -0.14). Moderate and positive r_P and r_E estimates were found between SPOF% and TDPOF% and fill in the range 0.46 to 0.65 and 0.33 to 0.50, respectively (Table 3).

Prediction of Response to Selection

The expected correlated response per generation from single – trait selection on females , for SMT based on TDMT under different SMRS, are presented in Table (4). The selection intensity was set to be 1.0 , just for comparison of correlated response (CR_Y) from TDMT under different SMRS. Generally as evidenced in Table (4) and Figure (1) that, selection for the 8th TDMYT had the highest estimates of CR_Y in SMYT as compared to other TDMYT .While, selection for 2nd TDMYT had the lowest estimates of CR_Y relative to others in MYT.

Responses per generation expressed as % of the overall means following selection for the 8th TDMYT were shown in Table (4). Selection for the 8th TDMY, results in an increase of 376; 16.4; 12.2 and 28.5 kg of SMY; SFY ; SPY and SFPY, respectively, while response per generation expressed as % of the overall mean were 8.7; 9.1; 8.5 and 8.8 % , respectively. Selection for the 8th TDFY compared to selection for the 8th TDMY , resulted in less or more changes of -1.0 ; 1.3; -0.3 and 0.6% of SMY ; SFY ; SPY and SFPY ; respectively. . While , selection for the 8th TDPY led to -0.5 ; 0.3 ; 0.5 and 0.3 % for SMY; SFY; SPY and SFPY , respectively . Also, selection for the 8th TDFPY , accompanied by -0.3; 1.5; 0.6 and 1.0 % compared to selection for the 8th TDMY as calculated from Table (4).

Selection for the TDPOF% under $SMRS_2$ resulted in the highest CR_Y in SMYT (15.7; -2.8 ; 0.57 and -2.1 kg) for SMY; SFY; SPY and SFPY, respectively, while response per generation expressed as % of the overall mean were 0.36; -1.5; 0.4 and -.66 % , respectively relative to under other SMRS as listed in Table (4). Generally, using TDPOF% as a criterion of selection resulted in little genetic improvement in SMYT due to small and negative value of r_G between TDPOF% and SMYT.

Table (4): Estimates of expected correlated response (CR_Y) per generation from single trait selection for 305 – day milk traits using single monthly recording systems (SMRS) of the first lactation in Fleckvieh cattle.

lection trait		SMRS2					SMRS3					SMRS4					SMRS5					SMRS6				
		MY	FY	PY	FPY	POF %	MY	FY	PY	FPY	POF %	MY	FY	PY	FPY	POF %	MY	FY	PY	FPY	POF %	MY	FY	PY	FPY	POF %
TDMY	a	156	7.5	5.5	13.0	-.01	279	12.5	9.2	21.9	-.01	307	13.1	10.0	23.0	-.01	343	14.5	11.1	25.4	-.01	343	14.6	11.0	25.4	-.01
	b	3.6	4.1	3.8	4.0	-.75	6.5	7.0	6.5	6.9	-1.0	7.2	7.4	7.1	7.2	-.63	8.0	8.1	7.9	8.0	-.65	8.0	8.2	7.8	8.0	-.76
TDFY		138	9.9	6.0	16.0	-.02	248	14.5	9.3	23.6	-.02	279	15.6	10.2	26.0	-.02	315	17.3	11.2	28.4	-.02	312	17.3	11.0	28.4	-.02
		3.2	5.4	4.2	4.9	-2.0	5.8	8.1	6.6	7.4	-2.5	6.5	8.8	7.3	8.1	-2.5	7.4	9.7	8.0	8.9	-2.8	7.3	9.7	7.8	8.9	-2.9
TDPY		153	9.1	6.5	15.6	-.01	261	13.0	9.7	22.8	-.01	276	13.3	10.2	23.3	-.00	312	15.0	11.3	26.3	-.01	313	15.0	11.5	26.7	-.01
		3.5	5.0	4.5	4.8	-.87	6.1	7.3	6.9	7.1	-.92	6.4	7.5	7.2	7.3	-.47	7.3	8.4	8.0	8.2	-.63	7.3	8.6	8.2	8.4	-.69
TDFPY		147	9.6	6.3	15.9	-.01	261	14.5	9.7	24.0	-.02	286	15.0	10.5	25.5	-.01	322	16.7	11.7	28.3	-.02	326	17.1	11.7	28.7	-.02
		3.4	5.3	4.4	4.9	-1.6	6.1	8.1	6.9	7.5	-1.9	6.7	8.5	7.5	8.0	-1.7	7.5	9.4	8.3	8.8	-1.9	7.6	9.6	8.3	9.0	-2.0
TDPOF %		15.7	-2.8	.57	-2.1	.03	-17.0	-5.4	-.57	-5.9	.03	-35.	-6.7	-1.2	-7.7	.04	-39.	-6.4	-.93	-7.1	.04	-38.0	-6.4	-.91	-7.23	.04
		.36	-1.5	.4	-.66	3.3	-.38	-3.0	-.40	-1.8	4.1	-.82	-3.8	-.87	-2.4	4.7	-.91	-3.6	-.66	-2.2	4.7	-.88	-3.6	-.64	-2.3	4.6

lection trait		SMRS7					SMRS8					SMRS9					SMRS10				
		MY	FY	PY	FPY	POF %	MY	FY	PY	FPY	POF %	MY	FY	PY	FPY	POF %	MY	FY	PY	FPY	POF %
TDMY	a	360	15.6	11.5	27.0	-.01	376	16.4	12.2	28.5	-.01	373	16.3	12.1	28.4	-.01	370	16.3	12	28.5	-.01
	b	8.4	8.7	8.2	8.5	-.93	8.7	9.1	8.5	8.8	-1.0	8.4	8.9	8.4	8.6	-1.0	8.3	8.9	8.2	8.6	-1.1
TDFY		326	17.9	11.5	29.4	-.02	333	18.6	11.8	30.4	-.03	331	18.6	11.7	30.3	-.03	314	17.7	11.0	28.6	-.03
		7.6	10.1	8.2	9.2	-3.0	7.7	10.4	8.2	9.4	-3.4	7.5	10.2	8.1	9.2	-3.4	7.0	9.6	7.5	8.7	-3.4
TDPY		329	15.9	12.0	27.8	-.01	356	16.9	12.8	29.4	-.01	346	16.3	12.6	29.0	-.00	335	16.1	12.1	28.3	-.01
		7.7	8.9	8.5	8.7	-.65	8.2	9.4	9.0	9.1	-.76	7.8	8.9	8.7	8.8	-.56	7.5	8.7	8.2	8.5	-.82
TDFPY		342	17.9	12.3	30.1	-.02	364	19.0	13.0	31.7	-.02	354	18.8	12.8	31.3	-.02	340	18.0	12.0	30.0	-.02
		8.0	10.1	8.7	9.4	-2.1	8.4	10.6	9.1	9.8	-2.5	8.0	10.3	8.8	9.5	-2.4	7.6	9.8	8.2	9.0	-2.5
TDPOF %		-55.4	-7.1	-1.4	-8.5	.04	-42.0	-6.9	-1.2	-8.1	.04	-60.0	-7.7	-1.6	-9.5	.04	-48.	-6.8	-1.2	-8.1	.04
		-1.3	-4.0	-1.0	-2.6	4.7	-.97	-3.9	-.87	-2.5	4.7	-1.4	-4.2	-1.1	-2.9	4.8	-1.1	-3.7	-.79	-2.5	4.6

a = response in actual units of measurement (Kg), except ratios, b = response (a) per generation expressed as a percentage of the overall mean of the trait.

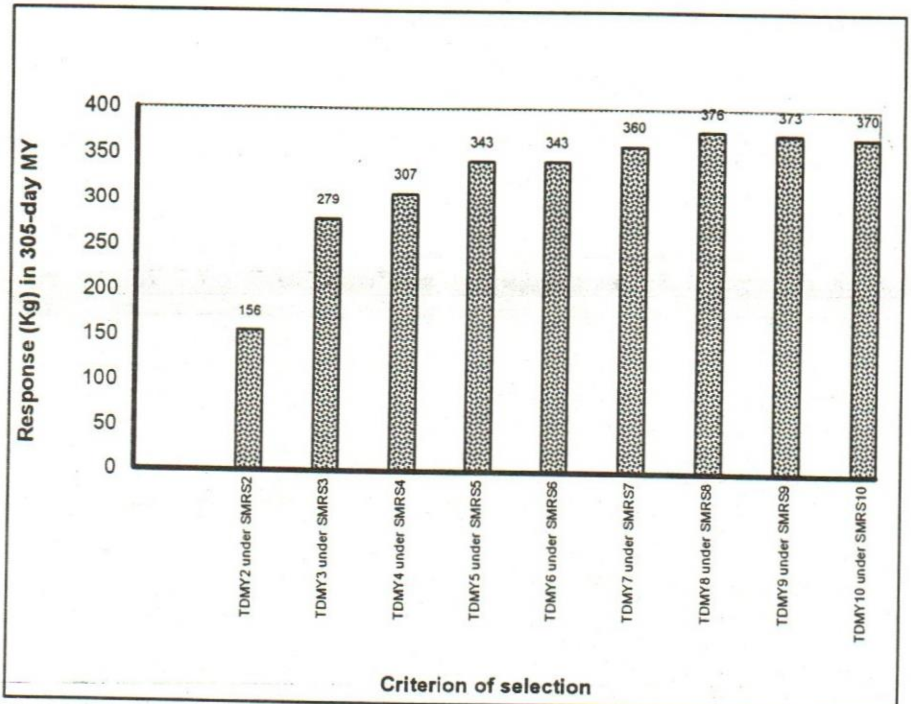

Figure (1). Expected correlated response (CR_Y, Kg) per generation from single trait selection for simulated 305-day milk yield (SMY) under different single monthly recording systems (SMRS).

Conclusions

The results obtained from the present study revealed that 305-day milk yield traits (MYT) could be simulated or predicted from the milk yield of the eight month of lactation. The single TD months from the 7^{th} up to the 10^{th} month of lactation can be used to predict 305-day milk yield.

Also, it is evident that selection on the basis of TDMYT (especially TDFPY) under $SMRS_8$ could be utilized to obtain high genetic gain in MYT relative to other recording systems. Moreover, selection for TDPOF% under $SMRS_2$ could result in the highest genetic gain in MYT relative to other SMRS.

As it was mentioned before that the best way for improving Egyptian national animals is existing breeding programs through breeding associations and the way to establishing this improvement without sustaining good recording systems. Thus, the present study indicator to the way for overleaping the problems of recording. Therefore, the performance of milk yield in one month or more could be use as fundamental prediction of whole yield.

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المعالم الو راثية والاستجابات للانتخاب لصفات إنتاج اللبن خلال الموسم الأول باستخدام أنظمة التسجيل ليوم الاختبار الشهري الفردي في ماشية الفليكفية

شيرين كمال جنينة

معهد بحوث الإنتاج الحيواني – وزارة الزراعة واستصلاح الاراضى، الدقي، الجيزة ، مصر.

استخدمت الدراسة سجلات الموسم الأول لإنتاج اللبن في عامين متتالين (١٩٩٠-١٩٩١) للأبقار الفليكفية النمساوية والتي اشتملت على ٩٦٥٢، ٢٧١٥٨ ، ٢٧٨٨٦ ، ٢٨٠١٧، ٢٨٠٤٩، ٢٧٨٤٢،٢٣٩٠٢، ١٤٥١٧، ٩٢٢٦ سجلا تحت نظام ا لتسجيل الشهرى الفردي من الشهر الثاني حتى العاشر .شملت الصفات المدروسة كل من إنتاج اللبن والدهن والبروتين وإنتاج الدهن والبروتين معا وكذلك نسبة إنتاج البروتين/ إنتاج الدهن ليوم الاختبار الشهري وكذلك ل ٣٠٥ يوم المقدر من الإدرار تحت هذة الأنظمة المختلفة . وأشتمل نموذج التحليل الاحصائى على تأثير كل من توليفة السنة وموسم الوضع(تأثير ثابت) وتأثير كل من العمر عند الولادة والأيام المفتوحة وتأثير مرحلة الحليب (انحدار خطى) بالإضافة لتأثير الأب (تأثير عشوائي) على كل الصفات المدروسة

و تم حساب مكونات التباين والمعاملات الوراثية لهذة الصفات وحسبت معاملات الارتباط المختلفة بين هذة الصفات المدروسة تحت أنظمة التسجيل المختلفة . وفى النهاية تم حساب كمية التحسين الوراثى المتوقعة باستخدام الانتخاب الفردي غير المباشر لصفات إنتاج اللبن ليوم الاختبار الشهري الفردي تحت أنظمة التسجيل المختلفة

١. تراوحت قيم المكافئ الوراثى لصفات إنتاج اللبن ليوم الاختبار من ٠,١٩ – ٠,٤٨ وكانت الأعلى والأقل قيمة تحت نظام التسجيل في الشهر الثامن والثاني (على الترتيب) . ولإنتاج ٣٠٥ يوم من ٠,٤٠ –٠,٦١ وكانت الأعلى والأقل تحت النظام من الثامن حتى العاشر والثاني (على الترتيب).

٢. قيم معاملات الارتباط الوراثى والمظهري والبيئي بين صفات محصول إنتاج اللبن ليوم الاختبار الشهري الفردي وكذلك لل٣٠٥ يوم المقدر تحت هذة الأنظمة كانت بصفة عامة موجبة وتراوحت بين ٠,٥٩ – ١,٠ ، ٠,٥٩ – ٠,٨٦ ، ٠,٤٧ – ٠,٧٦ (على التوالي).

٣. كانت تقديرات جميع الارتباطات بين صفات محصول إنتاج اللبن لل٣٠٥ يوم المقدرة والنسبة المئوية لإنتاج البروتين / إنتاج الدهن ليوم الاختبار الشهري متباينة في الاتجاة والقيمة (منخفضة – متوسطة) . بينما كانت جميع الارتباطات بين صفتي إنتاج البروتين / إنتاج الدهن لكل من ٣٠٥ يوم المقدر وليوم الاختبار الشهري الفردي تحت أنظمة التسجيل المختلفة (موجبة ومتوسطة) وتراوحت من ٠,٧٨ – ٠,٩٩ ، ٠,٤٦ – ٠,٦٥ ، ٠,٣٣ – ٠,٥٠ للارتباطات الو راثية و المظهرية و البيئية (على الترتيب).

٤. قيم التحسين الوراثى المتوقع باستخدام الانتخاب الفردي لمحصول صفات إنتاج اللبن باستخدام يوم الاختبار الشهري الفردي تحت نظام التسجيل في الشهر الثامن(و بخاصة محصول إنتاج البروتين والدهن معا ليوم الاختبار الشهري الفردي) ، وكذلك لصفة إنتاج البروتين/ إنتاج الدهن كنسبة مئوية ليوم الاختبار الشهري الفردي تحت نظام التسجيل في الشهر الثاني من الإدرار حققت أعلى قيمة وأعلى عائد وراثي مقارنة بالأنظمة الأخرى للتسجيل .

٥. أوضحت النتائج أنة يمكن إجراء التحسين الوراثى في صفات إنتاج اللبن(و بخاصة صفة إنتاج الدهن والبروتين معا لإنتاج ٣٠٥ يوم) على أساس الانتخاب باستخدام يوم الاختبار للشهر الثامن من الإدرار، وكذلك لصفة إنتاج البروتين/ إنتاج الدهن كنسبة مئوية ليوم الاختبار للشهر الثاني من الإدرار خلال الموسم الأول وسيؤدى ذلك لتقليل المجهود والوقت المبذول وتكلفة التسجيل اليومي في مصر.