Relationships Among First Lactation, Longevity, and Lifetime Performance Traits of Holsteins

By

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ABSTRACT

Data on 9286 German Friesian cows, daughters of 666 sires and with first calvings from 1979 to 1994 in 23 herds from one region in Northern Germany, were analysed for relationships of first lactation traits with lifetime performance using multitrait REML mixed model. Effects of herd-year-season, and age at first calving were considered to be fixed, and effects of sires and residuals were considered to be random. Individual lactation records were precorrected for the fixed effect of year and month of calving before lifetime totals were calculated. Each cow was given at least a 3 years opportunity for production. All genetic and phenotypic correlations were positive except correlation of first lactation percentage traits. Genetically, first lactation milk yield was highly correlated with most measures of lifetime performance, 0.54 to 0.96; correlations with measures of longevity were relatively smaller, 0.41 to 0.78. Given high positive genetic correlations, selection singly on first lactation milk yield will improve all measures of lifetime performance; however, some measure of longevity should be considered in selection programs of dairy cattle.

Key words: *Lifetime performance, longevity, German Friesian cows, genetic, phenotypic and first lactation.*

INTRODUCTION

Lifetime performance of the cow is critical for determination of the profitability of dairy enterprise. Opinions expressed at scientific meetings, in the dairy industry, and by dairy producers in recent years indicate the need for present selection methods to be better oriented toward improving lifetime performance of cows (Miller and Pearson, 1979; Pearson and Miller, 1981; Cassell and McDaniel, 1983; Tigges et al., 1984 and Beaudry et al., 1988). The basic purpose of selection for any trait or combination of traits is to use bulls and cows with the highest possible genetic values to obtain progeny that will maximize the desired change from the parental generation. More than 90% of the genetic change of the progeny resulting from selection of bulls (Van Vleck, 1977, and Van Tassel and Van Vleck, 1990) because, with AI, bulls can be selected much more intensive and with greater accuracy than cows. Selection of bulls in many countries and for most breeding programs has been based only on first lactation performance of their daughters. Late records are widely used in assessment of the genetic merit of cow (Hill an Swanson, 1983), although very little opportunity for selection exists among cow for traits related to lifetime performance and thus the profitability of cow (Jairath et al., 1994). However dairy farmers, in particular, have argued th selection only on first lactation performance decrease longevity and lifetime yiel of cows. Conversely, season diary have almost invariably found positiv relationship between first lactation yield and lifetime production and longevit (Hoque and Hodges 1981; Miller and Pearson, 1979 and Norman et al., 1981).

The objective of this study was to (1) estimated genetic and phenotypi parameters of traits associated with first lactation; longevity and lifetim performance and (2) investigate the relationships between first lactation an lifetime performance and asses the implications of present selection metho on lifetime performance of cow.

MATERIALS AND METHODS

A total of 32132 lactation records collected from January, 1979 t December 1994 on 12858 cows, were obtained from VIT(Vereinig Informations systeme Tierhaltung), Verden, Germany. Editing data befo analysis consisted of the following (1) age at first calving from 21 to 40 m (2) calving interval from 300 to 550 d; (3) requiring all cows to ha consecutive lactation, starting with first lactation; (4) observations on yiel of milk, fat and protein from all the lactations. Cows were removed with (no measurements on yields of milk, fat and protein or with records fro <240, d and 400, d length of lactation; (2) duplicate termination codes ar (3) duplicate records.

Eight traits for first lactation were investigated for their relationshi with longevity and lifetime performance. First lactation traits were yie (milk, fat and protein), fat and protein percentages, and per day traits for individual cow were defined as cumulative yield. Traits associated wi lifetime performance were lifetime yield (milk, fat and protein), yield per d of productive life and longevity (Lifetime days in milk, LTDIM, Producti life, P. life and number of lactations completed, NLC). Productive life w defined as the total number of days from date of first calving to date disposal or the last dry date if the cow was still in the herd. Yield per day productive traits was defined as total lifetime yield and divided by total da of productive life. Relationships of first lactation traits with lifetin performance and longevity traits were obtained using multivariate REML f a mixed model; Effects of herd-year-season, age at first calving considered be fixed, and effects of sires and residuals were considered to be random.

All know additive genetic relationships among sires were accounted f in construction of the relationship matrix. Each sire was required to have least 10 daughters; the restriction imposed was to ensure connectedness the data and to reduce the bias caused by preferential treatment of particular sires daughters in a particular herd or group of herds. Finally, aft these restrictions, lifetime records remained on 9286 cows. The multivariate mixed model used for the analysis was:

$$Y_{ijkl} = S_i + HYS_j + AFC_k + e_{ijkl}$$

Where Y_{ijkl} is the vector of observations on traits for cow ijkl; S_i is the vector of random effect of sires on traits for sire i; HYS_j is the vector of fixed effects on traits for herd-year-season j of first calving (663 level in 23 herds); AFC_k is the victor of fixed effects of age at first calving k in month (20 levels); and e_{ijkl} is the random residuals associated with the cow ijkl. Sires and residuals were assumed to be distributed with 0 means and covariances G*A and R*I, respectively, where G is the matrix of genetic covariances, A is the relationship matrix among sires, R is the residual covariances matrix, and I is the identity matrix and the asterisk refers to the direct product of two matrices (Searls, 1982). Estimates of h^2 and genetic and phenotypic correlations were computed from the converged estimates of sire and residual covariances.

RESULTS AND DISCUSSIONS

Phenotypic means, standard deviations and coefficients of variation of first lactation and lifetime performance traits are presented in table (1). Means of first lactation and lifetime performance traits were higher than for other published investigations (Hargrove et al., 1969; Jairath et al., 1994 and Jaiarth et al., 1995). The average of productive life and number of lactations complete were 39.21 mo and 3.00, respectively. Coefficients of variation for first lactation and lifetime performance traits were lower than for another reported by Van Vleck (1964) and Jairath et al., (1994) with more restricted definitions of lifetime traits. Most lifetime performance traits tended to be skewed to the right. The fixed effect of age at first calving accounted for a very small (0.2 to 0.4 %) but significant amount of variation ($P<0.01$) for all lifetime performance traits.

Heritabilities of first lactation and lifetime performance traits:

Estimates of heritabilities of first lactation traits are presented in table (2). For yield traits, heritabilities ranged from 0.29 to 0.37. Our estimates were moderate, but to be considering slightly lower particularly for fat and protein yields. The lower heritabilities were expected because length of yield among cows varied considerably, respectively in the introduction of more nongenetic variation for non-standarized lactation yields. Gill and Allaire (1976), reported somewhat lower heritabilities for first lactation yields of milk and fat, 0.12 and 0.14, respectively, from a similar study of relationships between first lactation and lifetime performance traits.

Hargrove et al., (1969), estimated heritability of 0.39 and 0.37 for 305-d yields during first lactation of milk and fat, respectively, they suggested that part of increase in their estimates could be due to the removal of environmental variation through the adjustment for days open. The estimates in the present study agreed with most of literature estimates (DeJager and Kenndy, 1987, Campos et al., 1994, Jairath et al., 1995 and El-Awady et al., 2000).

Table 1. Phenotypic means, standard deviations and coefficient of variation of first lactation and lifetime performance traits.

First lactation				Lifetime performance traits			
Trait[1]	$\bar{X}$	SD	CV	Trait[2]	$\bar{X}$	SD	CV
MY1, kg	6047.5	993.29	16.42	LTMY,kg	19934.2	3090.3	15.50
FY1, kg	252.13	42.81	16.98	LTFY,kg	837.18	134.22	16.03
PY1, kg	199.88	33.59	16.81	LTPY,kg	665.32	103.32	15.53
F%	4.19	0.41	9.79	MYDPL,kg	22.05	3.33	15.10
P%	3.32	0.19	5.72	FYDPL,kg	0.92	0.15	16.30
MYD1, kg	19.99	3.20	16.01	PYDPL,kg	0.73	0.11	15.07
FYD1, kg	0.83	0.14	16.87	LTDIM,d	903.17	18.39	2.04
PYD1, kg	0.66	0.11	16.67	P. Life, o	39.21	3.71	9.46
				NLC	3.00	0.30	10.00

[1]MY1= First lactation milk yield, FY1= first lactation fat yield, PY1= first lactation protein yield, F%= fat percentage in first lactation, P%= protein percentage in first lactation, MYD1= milk yield per day of first lactation, FYD1= fat yield per day of first lactation, and PYD1= protein yield per day of first lactation.
[2]LTMY= Lifetime milk yield, LTFY= lifetime fat yield, LTPY= lifetime protein yield, MYDPL= milk yield per day of productive life, FYDPL= fat yield per day of productive life, PYDPL= protein yield per day of productive life, LTDIM= lifetime day in milk, P. Life = days of productive life, and NLC= number of lactation completed.

Table 2. Estimates of heritabilities of first lactation and lifetime performance traits[1].

First lactation		Lifetime performance	
Traits[2]	h^2	Traits[3]	h^2
MY1	0.34	LTMY	0.31
FY1	0.29	LTFY	0.32
PY1	0.30	LTPY	0.28
F%	0.45	MYDPL	0.32
P%	0.46	FYDPL	0.32
MYD1	0.37	PYDPL	0.30
FYD1	0.29	LTDIM	0.11
PYD1	0.29	P. Life	0.16
		NLC	0.06

[1]standard error ≤ 0.03
[2]MY1= First lactation milk yield, FY1= first lactation fat yield, PY1= first lactation protein yield, F%= fat percentage in first lactation, P%= protein percentage in first lactation, MYD1= milk yield per day of first lactation, FYD1= fat yield per day of first lactation, and PYD1= protein yield per day of first lactation.
[3]LTMY= Lifetime milk yield, LTFY= lifetime fat yield, LTPY= lifetime protein yield, MYDPL= milk yield per day of productive life, FYDPL= fat yield per day of productive life, PYDPL= protein yield per day of productive life, LTDIM= lifetime day in milk, P. Life = days of productive life, and NLC= number of lactation completed.

Estimates of heritabilities of lifetime performance traits ranged from 0.28 to 0.32 (Table 2). Heritability of lifetime yield and per day of productive life were moderate, while h^2 of longevity (LTDIM, P. life and NLC) were low, being 0.11, 0.16 and 0.06, respectively. The higher estimates of h^2 of lifetime performance traits, as expected, because residual variation accumulates and variation increases as the length of herd life increases. Our estimates were higher than those estimated by Gill and Allaire (1975), Hoque and Hodges (1980), Ponce and Gomez (1988) and Jairath et al.,(1995). Heritability estimates of yield per day of productive life in the present study ranged from 0.30 to 0.32, table (2) and were higher than the corresponding estimates from record of performance data for Canadian Holsteins (Hoque and Hodges, 1980), but lower than the estimates of 0.49 and 0.40 obtained using paternal half-sib analysis by Evans et al., (1964), and Gill and Allaire (1976), using daughter-dam comparisons. However, the present estimates are enclose agreement estimated by Jairath et al., (1994) with Canadian Holsteins.

Heritability estimates of longevity traits of LTDIM, P. life and NLC were low, ranged from 0.06 to 0.16. Literature estimates of heritability for longevity measured variously ranged from zero (Evans et al., 1965 and Parker et al., 1960) to 0.39 (Wilcox et al., 1957); values near 0.15 were most frequent (Miller et al., 1967, Pearson and Miller, 1981 and Jairath et al., 1994). Estimates of h^2 for length of P. life were low, 0.04 for definitions (Ducrocq et al., 1988), (1) true stayability and (2) functional or "milk-connected" stayability.

Relationships of traits for first lactation with lifetime performance

Table (3) contain genetic correlations between traits for first lactation and lifetime performance. Genetic correlations of first lactation yield and lifetime yield ranged from 0.69 to 0.96. Correlations were relatively higher between similar traits and between those involving per day traits, e.g. between first lactation milk yield and milk per day of productive life milk and between first lactation fat and protein yield and fat per day of productive life. These high correlations were because of part to whole relationship and the fact that per day of productive life traits were standardized for herd life. However, correlations of yields during first lactation with longevity were slightly smaller from 0.71 to 0.83. Our results were comparable with those reported by Hargrove et al., (1969) and Jairath et al., (1995).

Gill and Allaire, (1976) and Norman and Van Vleck (1971), reported unit genetic correlation between first lactation milk yield and lifetime milk yield. In contrast, Hoque and Hodges (1981), reported much smaller genetic correlation between 305-d milk and fat from first lactation with lifetime milk, lifetime fat, herd life and number of lactations. Also, Lin and Allaire (1978), found relatively smaller correlations of first lactation milk yield with lifetime milk, and herd life. Genetic correlation of per day yield during first lactation with lifetime yield, longevity and yield per day of productive life were, 0.55 to 0.96, 0.29 to 0.75 and 0.53 to 0.98, respectively. Selection on milk yield per day of first lactation may select sires with very high yields but short lives and therefor may not be most profitable because longer herd life is a determining factor of the profitability of the dairy enterprise. High positive genetic correlations of first lactation yields and lifetime performance traits in the present study imply that selection on first lactation yield traits improves all measure of lifetime performance. Among first lactation traits, the genetic correlation with most lifetime performance traits were highest for milk yield, greater response in lifetime performance trait could be achieved by indirect selection on milk yield per day of first lactation rather than on milk yield from first lactation. This result was mostly dependent on the relatively higher heritability of standardized milk yield per day of first lactation than have unstandardized milk yield during first lactation.

Table 3. Genetic correlations between traits for first lactation and lifetime performance[1]

Trait[2]	LTMY	LTFY	LTPY	MYDPL	FYDPL	PYDPL	LTDIM	P. Life	NLC
MY1	0.96	0.76	0.86	0.96	0.54	0.80	0.81	0.76	0.78
FY1	0.73	0.96	0.69	0.62	0.95	0.68	0.76	0.83	0.81
PY1	0.87	0.67	0.96	0.87	0.66	0.96	0.84	0.83	0.71
F%	-0.38	0.42	-0.19	-0.38	0.43	-0.19	-0.05	-0.08	-0.13
P%	-0.46	-0.10	0.11	-0.47	0.11	0.12	-0.16	-0.15	-0.27
MYD1	0.96	0.55	0.81	0.98	0.53	0.81	0.75	0.53	0.68
FYD1	0.61	0.88	0.69	0.61	0.96	0.68	0.29	0.50	0.51
PYD1	0.86	0.68	0.95	0.85	0.67	0.96	0.57	0.49	0.57

[1]standard error ≤0.06

[2]MY1= First lactation milk yield, FY1= first lactation fat yield, PY1= first lactation protein yield, F%= fat percentage in first lactation, P%= protein percentage in first lactation, MYD1= milk yield per day of first lactation, FYD1= fat yield per day of first lactation, and PYD1= protein yield per day of first lactation, LTMY= lifetime milk yield, LTFY= lifetime fat yield, LTPY= lifetime protein yield, MYDPL= milk yield per day of productive life, FYDPL= fat yield per day of productive life, PYDPL= protein yield per day of productive life, LTDIM= lifetime day in milk, P. Life = days of productive life, and NLC= number of lactation completed.

Table 4. Phenotypic correlations between traits for first lactation and lifetime performance[1]

Trait[2]	LTMY	LTFY	LTPY	MYDPL	FYDPL	PYDPL	LTDIM	P. Life	NLC
MY1	0.78	0.55	0.72	0.77	0.53	071	0.24	0.24	0.06
FY1	0.55	0.72	0.62	0.53	0.74	0.61	0.22	0.22	0.07
PY1	0.72	0.62	0.79	0.71	0.60	0.75	0.22	0.23	0.05
F%	-0.11	0.01	-0.03	-0.23	0.34	-0.13	-0.03	-0.04	0.01
P%	-0.13	0.08	0.10	-0.34	0.13	0.10	-0.08	-0.06	-0.03
MYD1	0.58	0.42	0.52	0.79	0.54	0.72	0.35	0.21	0.15
FYD1	0.54	0.48	0.52	0.54	0.79	0.62	0.24	0.19	0.14
PYD1	0.61	0.61	0.59	0.72	0.61	0.80	0.30	0.21	0.24

[1]standard error ≤0.06

[2]MY1= First lactation milk yield, FY1= first lactation fat yield, PY1= first lactation protein yield, F%= fat percentage in first lactation, P%= protein percentage in first lactation, MYD1= milk yield per day of first lactation, FYD1= fat yield per day of first lactation, and PYD1= protein yield per day of first lactation, LTMY= lifetime milk yield, LTFY= lifetime fat yield, LTPY= lifetime protein yield, MYDPL= milk yield per day of productive life, FYDPL= fat yield per day of productive life, PYDPL= protein yield per day of productive life, LTDIM= lifetime day in milk, P. Life = days of productive life, and NLC= number of lactation completed.

The present results showed that, among first lactation yield traits, the genetic correlation with lifetime performance traits were highest for milk yield traits, on a cumulative and on a per day basis, closely followed by protein yield and fat yield. This high correlations and relatively higher heritability of milk yield traits indicate that selection on milk yield traits for first lactation results in a greater response in lifetime performance traits than selection on other first lactation traits. In contrast to results of the present study, Hargove et al., (1969) reported higher genetic correlations of 305-d milk yields of fat during first lactation with longevity traits, 0.72 and 0.84 than for 305-d milk yield during first lactation, 0.62 to 0.76.

Genetic correlations of fat and protein percentage during first lactation with most lifetime performance traits were negative, table (3); negative correlation were larger for protein percentage, -0.10 to -0.47, than for fat percentage, -0.05 to –0.38. These results agreed with those estimated by Jairath et al., (1995), with Canadian Holsteins, reported negative genetic correlation for protein percentage (-0.14 to –0.44) and fat percentage (-0.03 to 0.42) during first lactation with lifetime performance. In addition, Norman and Van Vleck (1971) reported similar genetic correlations, -0.39 and –0.20, between fat percentage during first lactation with lifetime milk yield and number of lactation, respectively. Because the protein content of milk depends strongly on the energy balance of the cow, milk yield and protein content compete more or less directly for food energy; fat content also depends on a share of roughage in the ration, which seems to be the reason for the larger negative genetic correlations of protein percentage than for fat percentage (Gravert, 1985).

High negative estimates in the present study and is available in the literature on correlation of protein percentage with lifetime performance traits, indicate that these results could be used to caution dairy producers that they should not select highly for protein percentage because, genetically, it is related negatively with most/ or all measures of lifetime performance. Other studies (Kennedy, 1982 and Van Vleck, 1977), also concluded that selection should not before fat and protein contents if the desired results is more yield of fat and protein. The nutritional goal should also be to increase the total yield of these constituents, and standardization of these components could be used to attain the most desirable composition of the final product.

Phenotypic correlations of first lactation yield with lifetime yield, and productive life was moderate, from 0.55 to 0.79 and 0.53 to 0.77, respectively, but with longevity traits were very small, from 0.05 to 0.24. Likewise, phenotypic correlations (Table 4) between milk, fat and protein yield per day during first lactation with lifetime performance and productive life were smaller, from 0.42 to 0.61, 0.54 to 0.80 and from 0.14 to 0.35, respectively, Table (4). Correlations between per day of first lactation and per day of productive life traits were slightly higher because both per day traits are standardized for length of production during first lactation and herd life, respectively.

Fat and protein percentage traits during first lactation were nearly unrelated phenotypically with most lifetime performance traits (Table 4) and close to null. Correlations between fat and protein percentages during first lactation and lifetime performance were, -0.23 to 0.34 and –0.34 to 0.13, respectively, table (4). Phenotypic correlations that were relatively higher between first lactation yield and lifetime performance traits than between per day yield of first lactation and lifetime performance traits, possibly indicate that selection was practised on traits during first lactation than on traits per day of first lactation.

Correlations among first lactation traits

Genetic correlations among yield traits and between yield traits and yield per day during first lactation were, 0.65 to 0.88 and 0.54 to 0.98, table (5). Also, as expected, genetic correlations between fat and protein percentages and milk yield during first lactation were negative, as well as genetic correlation between protein percentage and milk yield during the first lactation was more negative than the correlation between fat percentage and first lactation milk yield, table (5). The present results are in agree with those obtained by Jairath et al., (1995). Genetic correlations between yield per day during first lactation ranged from 0.54 to 0.82. Correlations between fat and protein percentages and yield per day during first lactation were, -0.41 to 0.37 and -0.44 to 0.05, respectively.

Table 5. Genetic (above diagonal) and phenotypic (below) correlations among first lactation traits[1].

Trait[2]	MY1	FY1	PY1	F%	P%	MYD1	FYD1	PYD1
MY1		0.65	0.88	-0.43	-0.48	0.99	0.63	0.87
FY1	0.76		0.74	0.35	-0.12	0.64	0.98	0.54
PY1	0.92	0.81		-0.23	0.03	0.88	0.73	0.98
F%	-0.28	0.33	-0.16		0.59	-0.41	0.37	-0.23
P%	-0.35	0.05	0.10	0.50		-0.44	0.05	0.05
MYD1	0.98	0.74	0.90	-0.35	-0.28		0.63	0.87
FYD1	0.74	0.99	0.79	0.35	0.06	0.74		0.72
PYD1	0.90	0.79	0.98	-0.16	0.11	0.91	0.79	

[1]standard error ≤ 0.05

[2]MY1= First lactation milk yield, FY1= first lactation fat yield, PY1= first lactation protein yield, F%= fat percentage in first lactation, P%= protein percentage in first lactation, MYD1= milk yield per day of first lactation, FYD1= fat yield per day of first lactation, and PYD1= protein yield per day of first lactation.

Phenotypic correlations between yield traits during first lactation were high, from 0.76 to 0.92. Likewise, correlations between yield traits and yields per day during first lactation were close to 1, which was higher than those reported by Jairath et al., (1995), from, 0.44 to 0.55. Phenotypic correlations between fat and protein percentages and milk yield during first lactation were negative, -0.28 and –0.35, respectively, and between fat and protein percentages and yields per day during first lactation were negative, except for fat yield per day were positive, table (5). However, genetic and phenotypic correlations between yields and percentages of fat and protein for first lactation were originally reported and discussed, (El-Awady et al., 2000).

Correlations among lifetime performance traits

Genetic and phenotypic correlations among lifetime performance traits are presented in table (6), and all close to 1, which agreed with other investigations, (Hargrove et al., 1969; Hoque and Hodges, 1980; Norman et al., 1981 and Jairath et al., 1994), and indicated that many of same factors are involved in controlling these traits. Genetic correlations of lifetime performance traits with longevity traits were smaller, from 0.34 to 0.61, but were high with yields of productive life, close to unit.

Genetic correlations of longevity traits with yield per day of productive life traits (Table 6), from 0.54 to 0.80, and were highest for milk per day of productive life, (0.74 to 0.80), followed by protein per day of productive life (0.62 to 0.71), and fat per day of productive life (0.54 to 0.60). These corresponding phenotypic correlations ranged from 0.53 to 0.66. Gill and Allaire (1975), reported estimates of genetic correlations of length of productive life and number of lactations completed with milk per day (0.40 and 0.42) that were slightly lower than the estimates of corresponding phenotypic correlations (0.48 and 0.48). These correlations were in contrast to the correlations reported in the present study. Two explanations are plausible. First, the range of standard errors reported in the study of Gill and Allaire, (1975) was very large (0.01 to 0.40), although estimates of genetic correlations are usually subject to rather large sampling errors (Reeve, 1955), the estimates obtained in the present study were more precise. Second, the data in Gill and Allaire were limited to only eight herds and included only records for those cows that had at least two calvings and at least one completed lactation; terminal lactation records were excluded from the data.

Table 6. Genetic (above diagonal) and phenotypic (below) correlations among lifetime traits[1].

Trait[2]	LTMY	LTFY	LTPY	MYDPL	FYDPL	PYDPL	LTDIM	P. Life	NLC
LTMY		0.86	0.96	1.00	0.69	0.86	0.36	0.61	0.59
LTFY	0.73		0.71	0.59	0.99	0.70	0.35	0.56	0.59
LTPY	0.91	0.81		0.86	0.69	0.99	0.34	0.56	0.38
MYDPL	0.99	0.71	0.90		0.68	0.86	0.80	0.79	0.74
FYDPL	0.71	0.99	0.79	0.71		0.69	0.60	0.54	0.55
PYDPL	0.90	0.79	0.99	0.91	0.80		0.71	0.70	0.62
LTDIM	0.98	0.98	0.97	0.66	0.60	0.57		0.98	0.94
P. Life	0.98	0.96	0.98	0.61	0.59	0.57	1.00		0.97
NLC	0.95	0.96	0.95	0.62	0.56	0.53	0.95	0.97	

[1]standard error ≤0.06

[2]LTMY= lifetime milk yield, LTFY= lifetime fat yield, LTPY= lifetime protein yield, MYDPL= milk yield per day of productive life, FYDPL= fat yield per day of productive life, PYDPL= protein yield per day of productive life, LTDIM= lifetime day in milk, P. Life = days of productive life, and NLC= number of lactation completed.

Phenotypic correlations between lifetime yield traits and longevity was highest, from 0.95 to 0.98. High genetic and phenotypic correlations of lifetime yield traits and measures of longevity indicate that cows with long heard life were also high for genetic merit of lifetime performance traits. This correlations is mostly due to number of lactations and, in part, is a result of management and culling for yield. The importance of increasing the number of lactations to increase total yield and therefore profit from cow in the farm, this was indicated by large phenotypic correlations (0.95) table (6).

Genetic and phenotypic correlations of all first lactation traits with longevity traits of LTDIM and days of P. life were nearly the same, which clearly indicated that LTDIM and days of P. life are essentially the same traits and management of one should be adequate to determine longevity (Table 3 and 4). However, the correlations with number of lactations were always slightly lower. Number of lactations is a crude measure of longevity. The correlations with measures of longevity should also be interpreted with caution. Because most of the culling of dairy cattle is for yield, these correlations measured selection intensities for milk yield and longevity. The estimates of genetic and phenotypic parameters of lifetime traits in the present study were mostly free from the effects of selection on milk yield.

CONCLUSIONS

Lifetime performance of the cow is the determining factor of her profitability in a dairy operation. Most studies of lifetime performance have established that selection for yield of first lactation will improve most measures of lifetime performance. The low estimates of heritability for total lifetime performance traits suggest that direct selection holds little promise for enhancing lifetime performance of cows because response to selection will be very slow. Selection on lifetime performance is not practical because delaying of selection until information is available on lifetime traits greatly increases the generation interval (with resulting decrease in genetic gain) and the cost of maintaining potential replacement stock. Alternatively, selection on first lactation milk yield seems to be most desirable because of its high positive genetic correlations with all lifetime performance traits, although, imply that selection on first lactation yield traits will improve all measures of lifetime performance traits, as information becomes available on lifetime performance of half-sisters and close ancestors, it should be incorporated in choosing young sires for enhancing lifetime performance of dairy cows and thus the profitability of dairy enterprise. In this sense, most of the selection pressure that can be applied among cows is automatic, those cows remaining longest in the herd leave the largest number of progeny.

Acknowledgement

We thank the VIT (Vereinigte Informationssysteme Tierhaltung), Verden, Germany for making the data available for analysis.

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الملخص العربى

العلاقة بين صفات موسم الحليب الأول و مدة الحياة وطول الحياة الإنتاجية فى أبقار الهولشتين

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حللت بيانات ٩٢٦٨ بقرة هولشتين – بنات ٦٦٦ أب والتى بدأت أول ولادات لها من ١٩٧٩ حتى ١٩٩٤ فى ٢٣ قطيع بشمال ألمانيا وذلك لتقدير العلاقة بين صفات الموسم الأول للحليب مع صفات طول الحياة الإنتاجية باستخدام الموديل الخطى الخليط بواسطة الـ REML. تم أخذ القطيع داخل السنة داخل الموسم وكذلك العمر عند أول ولادة كتأثير ثابت بينما أخذ تأثير الأباء كتأثير عشوائى. تم تصحيح سجلات الحليب لتأثير العوامل الثابتة (سنة وشهر الولادة) قبل حساب طول الحياة الإنتاجية الكلية وأعطت كل بقرة ٣ سنوات إنتاجية على الأقل.
كانت جميع الارتباطات الوراثية والمظهرية موجبة باستثناء الارتباطات بين النسب للدهن والبروتين. وقد أظهرت النتائج أنه من الناحية الوراثية فإن معامل الارتباط كان عالياً بين محصول اللبن فى الموسم الأول مع معظم مقاييس صفات طول الحياة الإنتاجية (٠,٥٤ إلى ٠,٩٦) بينما كان قليلاً نسبياً مع مقاييس مدة الحياة (٠,٤١ إلى ٠,٧٨). وقد أظهرت النتائج أنة من خلال الارتباطات الوراثية الموجبة المرتفعة هذه فإن الانتخاب الفردى على أساس محصول اللبن فى الموسم الأول سوف يؤدى إلى تحسين جميع مقاييس طول الحياة الإنتاجية. إضافة إلى أن بعض مقاييس مدة الحياة سوف يكون ذو شأن أيضاً فى برامج الانتخاب فى ماشية اللبن.