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GENETIC ANALYSES OF PRODUCTIVE, REPRODUCTIVE AND PRODUCTIVE-EFFICIENCY TRAITS IN DIFFERENT LACTATIONS OF FLECKVIEH CATTLE IN AUSTRIA. 1- HERITABILITY AND REPEATABILITY

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SUMMARY

A Total of 58050 productive and reproductive performance records covering the first four lactations of Austrian Fleckvieh cows raised in Austria were used to analyze the performance of each individual lactation, while a total of28316 records representing 10007 cows sired by 643 bulls extracted from 58050 records were used for the analysis across all lactations. Estimates of genetic and phenotypic variations were obtained for the first four lactations and across all lactations. Traits studied were: total milk yield (MY), total fat yield (FY), total protein yield (PY) and days in milk (DIM) as total milk yield traits (MYT); age at calving (AC), and calving interval (CI) as reproductive traits (RT); milk yield per day of days in milk (MYDIM), milk yield per day of calving interval (MYCI), milk yield per day of age at first and second calving (MY AFC and MY ASC), respectively as productive efficiency traits (PET).

Heritability (h^2s) estimates through the first four and across all lactations, respectively ranged from 0.06 to 0.19 for MYT and 0.20 to 0.22 and decreased with advance of parity. For RT, estimates of h^2s ranged from 0.40 to 0.55 for AC; from 0.03 to 0.06 and 0.03 for CI. For PET, the ranges and estimates were from 0.02 to 0.24 and 0.23 for MYDIM; from 0.05 to 0.14 and 0.27 for MYCI; from 0.10 to 0.39 and 0.18 for MY AFC and from 0.11 to 0.36 and 0.21 for MYASC. Coefficients of additive genetic and phenotypic variation (CAV% and CPV%) through the first four and across all lactations respectively ranged from 4.0 to 8.4% and 15.6 to 18.3% for MYT, from 2.8 to 8.7% and 8.6 to 16.6% for RT; from 0.9 to 34.1% and 1.9 to 54.3% for PET. In general, it is desirable to take some PET (MY AFC in the first lactation and MY ASC in the second lactation) as selection criteria, because they recorded the highest estimates of h^2s and CAV%.

Repeatability estimates for MYT were moderate or slightly high ranging from 0.41 to 0.45. The estimates were 0.17 for both DIM and CI, and form 0.43 to 0.49 for PET.

***Keywords:** Fleckvieh cattle, productive efficiency, heritability, repeatability, coefficients of additive genetic and phenotypic variation*

INTRODUCTION

Economic returns of dairy farms are dependent upon milk production and reproductive efficiency. Yield traits (milk, fat and protein yields) are quantitative traits and reflect the combined effects of large number of genes. These traits are also significantly affected by environmental factors. Reproductive efficiency has an effect on profit derived from milk and must be considered if the goal is to improve total performance of the cow and maximize economic performance of a herd. Studies on dairy cow disposals indicate that from 16 to 30% of the cows are removed from the herd due to reproductive failure (Jansen 1980), ranking second to production as a reason for disposal. Freeman (1986) reviewed heritabilities for reproductive traits and indicated that they are low, generally less than 0.05. However, Philipsson (1981) suggested that there is sufficient additive genetic variation for reproductive traits to warrant their consideration in breeding programs.

The milk production efficiency parameters are the comprehensive measures of both milk production and reproduction parameters of dairy cattle. Selection in dairy cattle is commonly based on milk yield of *1st* lactation. But a better approach would be if selection is based on production efficiency rather than simply on milk yield. Information on the genetic parameters of productive efficiency traits of dairy cattle is scarce. Therefore, the main objectives of this study were to estimate the genetic parameters (heritability, repeatability, coefficients of additive genetic and phenotypic variations) for productive efficiency traits as well as productive and reproductive traits of Fleckvieh cattle raised in Austria.

MATERIALS AND METHODS

Data

Data on productive and reproductive performance of Austrian Fleckvieh cows were recorded by the Official Federation of Austrian Cattle Breeders (ZAR) and raised in lower Austria. The records used were those of primiparous and multiparous cows calved in six consecutive years from 1976 to 1982. The data consisted of productive and reproductive performance of 58050 records. Data were available on 19117, 19046, 12138 and 7749 daughters representing 1409, 1596, 1331 and 1072 sires in the first four parities, respectively. A total of 28316 records representing 10007 cows sired by 643 bulls extracted from 58050 records were used in the combined analysis across all lactations.

Heifers were inseminated when they reached an average of 320 Kg body weight, while cows were. inseminated starting from the first heat period after the *6th* day post-partum. Artificial insemination was used avoiding half-sib, full-sib and sire-daughter matings. All daughters were obtained from AI bulls and chosen randomly as one daughter per sire per herd. To avoid bias due to differences among sires in the average values of herd, each record was expressed as a deviation from the average of the herd which belong to it, (i.e. herd effect was eliminated). Consequently, any herd that contained only one record did not contribute in the present study. Also, if the cow was changed from a herd to another, her records were eliminated. Only sire with at least two daughters were included in the analysis. Other details of the breeding policy and management followed were described by Hartmann *et al.* (1992).

Traits studied were: total milk yield (MY), total fat yield (FY), total protein yield (PY) and days in milk (DIM) as total milk yield traits (MYT); age at calving (AC) and calving interval (CI) as reproductive traits (RT); milk yield per day of days in milk (MYDIM), milk yield per day of calving interval (MYCI), milk yield per day of age at first and second calving (MYAFC and MYASC) respectively, i.e MYAFC = MY divided by AFC and MYASC = MY divided by ASC, in the first four lactations, separately and across all lactations as productive efficiency traits (PET).

Statistical analysis

Table (1) lists random and fixed effects included in the different models used to analyze different sets of traits of each of the first four and across all lactations of Austrian Fleckvieh cattle using the least-squares maximum likelihood means weighted (LSMLMW) computer program of Harvey (1990). However, it was not possible to examine simultaneously all factors and their all possible interactions which caused a matrix too large to invert. Estimation of Sire ($\sigma^2 s$), COW (σ^2c) and remainder ($\sigma^2 e$) variance components were calculated using LSMLMW (Harvey, 1990) according to Henderson's method 3. Paternal half-sib analysis of variance was utilized to obtain the estimates h^2s for each lactation as: $h^2s = 4\ \sigma^2 s/(\sigma^2 s + \sigma^2 e)$. Heritability across all lactations were calculated as: $h^2s = 4\ \sigma^2 s\ /(\sigma^2 s + \sigma^2 c + \sigma^2 e)$. Repeatability (t) estimates for all traits studied were calculated across all parities as: $t = (\sigma^2 s + \sigma^2 c\ )/(\sigma^2 s+\sigma^2 c+\sigma^2 e)$. Standard errors of h2s and t estimates were calculated according to Harvey (1990). The coefficients of additive genetic (CAV) and phenotypic variation (CPV) were calculated as a percentage of the genetic ($SDG=\sqrt{\sigma^2 s}$) and phenotypic ($SDp= \sqrt{\sigma^2 s+\sigma^2 e}$) standard deviation divided by the phenotypic means, i.e. CAV= (SDG/phenotypic mean)*100 and CPV= (SDp/phenotypic mean)*100, according to Moore *et al.* (1990) and Oltenacu *et al.* (1991).

RESULTS AND DISCUSSION

Sire variance components and heritaibility estimates (h^2s)

Effects of sire of the cow on all total milk yield (MYT) and reproductive (RT) traits studied in the different parities and across all parities were shown to be significant ($P\leq 0.05$ or $P\leq 0.01$ or $P\leq 0.001$) except for DIM in the *1st* and *4th* parities (Tables 2 and 3). Estimates of V% due to $\sigma^2 s$ like heritability estimates decreased as parity increased, while the V% due to $\sigma^2 e$ took an opposite trend for MYT (Table 2).

In analysis of the first four lactations, the estimates of h^2s for all MYT ranged from 0.06 to 0.19 (Table 2). The estimates of h^2s for MYT are lower than those commonly reported in the Austrian and other central Europe studies (e.g. Soliman and Khalil, 1993 and Afifi *et al.* 1995). Estimates of h2s for DIM ranged from 0.00 to 0.04 in the first four parities (Table 2), which are in close agreement to those obtained by Genena (1998) on Fleckvieh cattle and lower than the estimates reported by Soliman and Khalil (1991) on Fleckvieh. Among reproductive traits in the first four lactations, estimates of h^2s for AC recorded the highest estimates (0.40 to 0.55), while the lowest estimates (0.03 to 0.06) were observed for CI (Table 2). These results are in agreement with those estimated by Genena (1998). Estimates of h2s for AFC (0.50) suggesting that rate of sexual development and/or reproductive management practices were associated with bull progeny groups (Gill and Allaire, 1976). Therefore, AC seems to be more efficient as a selection criterion than the other RT. The ranges of h^2s estimates for PET in the first four parities were from 0.02 to 0.24 for MYDIM; from 0.05 to 0.14 for MYCI; from 0.10 to 0.39 for MYAFC and from 0.11 to 0.36 for MY ASC (Table 2). The highest estimates of h^2s for MYDIM

Table 1. Models and model components used for the analysis of data

Traits	Model No.	Parity	Random effects: Sire	Random effects: Cow	Random effects: Remainder	Fixed effects: Herd book	Fixed effects: Year season	Fixed effects: Age at Calving AC(L)	Fixed effects: Age at Calving AC(Q)	Fixed effects: Days open DO (L)	Fixed effects: Days open DO (Q)	Fixed effects: Parity
Total milk yield												
MY, FY, PY,DIM	1	1-4	X		X	X	X	X	X	X	X	
	2	All	X	X	X		X	X	X	X	X	X
Reproductive												
AC, CI	3	1-4	X		X	X	X					
CI	4	All	X	X	X		X					
Reproductive efficiency												
MYDIM	5	1-4	X		X	X	X	X	X	X	X	
	6	All	X	X	X		X	X	X	X	X	X
MYCI, MYAFC	7	1-4	X		X	X	X					
MYASC	8	All	x	x	x		x					X

Table 2. Estimates of sire mean squares (M.S), and percentages of variance component (V %) due to sire (σ^2_s) and remainder (σ^2_e) and heritability estimates (h^2) for total milk yield, reproductive and productive efficiency traits in the first four lactations

Traits	1st lactation					2nd lactation				
		Sire		Remainder			Sire		Remainder	
	M.S.	σ^2_s	V%	σ^2_e	V%	M.S.	σ^2_s	V%	σ^2_e	V%
Total milk Yield										
MY	1.60***	23248.9	4.4	504999.4	95.6	1.63***	19360.1	3.0	624555.1	96.9
FY	1.66***	46.5	4.8	928.3	95.2	1.44***	46.0	3.7	1207.9	96.3
PY	1.57***	27.8	4.2	568.5	95.8	1.42***	25.6	3.5	703.8	96.5
DIM	1.04^{ns}	4.3	0.3	1360.3	99.7	1.11***	13.5	0.1	1373.7	99.9
Reproductive										
AC	2.69***	1.6	11.4	12.6	98.6	2.86***	2.7	13.8	17.1	86.2
CI	1.21***	63.5	1.6	3950.7	98.4	1.08***	28.5	0.7	3997.9	99.3
Productive efficiency										
MYDIM	1.85***	0.2	5.8	3.1	94.2	1.42***	0.1	3.4	4.0	96.6
MYCI	1.48***	0.1	3.4	3.7	96.6	1.37***	0.2	3.0	5.1	97.0
MYAFC	1.83***	0.1	5.9	1.6	49.1	1.74***	0.6	8.4	6.6	91.6
MYASC	1.60***	0.01	2.6	0.4	97.4	1.35***	0.2	8.9	2.1	91.1
Total milk Yield										
MY	1.20***	13689.4	2.2	616054.3	97.8	1.12***	10258.4	1.6	627185.1	98.3
FY	1.26***	37.3	2.9	1255.4	97.1	1.18***	32.0	2.5	1273.5	97.6
PY	1.23***	17.9	2.5	698.3	97.5	1.18***	17.8	2.5	698.5	97.5
DIM	1.07*	9.4	0.8	1163.0	99.2	0.975^{ns}	0.0	0.0	1120.8	100.0
Reproductive										
AC	2.19***	3.2	11.8	23.6	88.2	1.78***	3.4	10.0	30.6	90.0
CI	1.15***	64.4	1.7	3716.5	98.3	1.11***	57.6	1.5	3783.8	98.5
Productive efficiency										
MYDIM	1.22***	0.1	2.3	4.2	97.7	10.05^{ns}	0.02	0.5	4.3	99.5
MYCI	1.25***	0.1	2.6	4.8	97.4	1.09*	0.1	1.2	5.0	98.8
MYAFC	3.58***	1.0	9.9	8.9	90.1	1.23**	0.1	2.4	4.0	97.6
MYASC	1.39***	0.2	6.6	2.3	93.4	1.20*	0.1	4.7	1.6	95.3

*** = $P < 0.001$, ** = $P < 0.01$, * = $P < 0.05$, ns = non significant. + Traits defined in Table 1.
++ standard error for h^2 ranged from 0.01 to 0.03

Table 3. Estimates of sire and cow mean squares (M.S) and percentages of variance Component (V%) due to sire (σ^2_s), cow within sire ($\sigma^2_{c:s}$) and remainder (σ^2_e), and heritability (h^2) and repeatability (t) estimates for total milk yield, reproductive and productive efficiency traits across all lactations

Traits	Sire			Sire			Remainder	
	M.S.	σ^2_s	V_s%	M.S.	$\sigma^2_{c:s}$	$V_{c:s}$%	σ^2_e	V_c%
Total milk Yield								
MY	2.35***	30974.8	5.0	2.93***	246186.6	40.0	337776.6	55.0
FY	2.51***	64.8	5.4	2.71***	443.9	37.1	685.9	57.5
PY	2.40***	34.4	5.0	2.62***	249.6	36.1	408.2	58.9
DIM	1.20***	0.1	0.5	1.54***	192.2	16.9	942.3	82.6
Reproductive								
CI	1.31***	30.6	0.9	1.52***	576.8	16.2	2957.7	82.9
Productive efficiency								
MYDIM	2.57***	0.3	5.8	2.96***	1.7	40.0	2.3	54.2
MYCI	2.93***	0.3	6.7	2.69***	1.8	36.3	2.8	57.0
MYAFC	2.17***	0.1	4.5	3.28***	0.7	44.1	0.8	51.4
MYASC	2.45***	0.03	5.3	2.85***	0.24	38.9	0.34	55.8

*** = $P < 0.001$

+ Traits defined in Table 1.

++ standard error for h2 and t estimates ranged from 0.01 to 0.02.

were obtained at the first lactation, while, the lowest estimates of h2s were recorded for MYDIM and MYCI at the fourth lactation.

In analysis of data of all lactations, the heritability estimates for MYT were moderate and nearly had similar magnitudes ranging from 0.20 to 0.22 (Table 3). This range agrees with the findings of Afifi *et al.* (1995) and Genena (1998) with Fleckvieh cattle. Estimates of h^2s for DIM was low (0.02). This estimate is in agreement with Genena (1998), however, it is lower than those estimated by O'Ferrall (1990). The h^2s estimate for CI was samll and around 0.03 which is close to. the estimate given by Kaygisiz and Vanli (1995). Estimates of h^2s for PET ranged from 0.18 to 0.27 (Table 3). It was 0.23 for MYDIM which is nearly similar to the estimates of Murali Dhar and Deshpande (1995) and Genena (1998), higher than those obtained by Deshmukh *et al.* (1995) and it is lower than the estimates reported by Katkade *et al.* (1995). For MYCI, the h2s estimate was 0.27, which is similar to those given by Deshmukh *et al.*, (1995) and Genena (1998).

Estimates of h^2s for MY ASC was 0.21, which is nearly similar to 0.24 recorded by Deshmukh *et al.* (1995) and higher than that estimate of 0.16 obtained by Deshpande *et al.* (1992).

Cow variance components and repeatability estimates (t): Results in Table 3 indicate that MYT, RT and PET were affected significantly ($P \leq 0.001$) by the cow within sire. The estimates of V% due to cow within sire ($\sigma^2 c{:}s$) for MYT were moderate and ranged from 36.1 - 40.0% (Table 3).

Repeatability estimates (t) for MYT were moderate or slightly high (Table 3). These estimates ranged from 0.41 -0.45, which are nearly similar to those obtained by Soliman and Khalil (1993); Afifi *et al.* (1995); Zahed *et al.* (1997); Genena (1998) for Fleckvieh cattle. Repeatability estimate for DIM was 0.17 (Table 3), which is generally in agreement with values obtained by Milagres *et al.* (1988a) and Genena (1998), while it is lower than those of Camoens *et al.* (1976). Estimate of (t) for CI was 0.17 (Table 3), which is in full agreement with estimate obtained by Genena (1998). The t estimate of CI was generally higher than 0.14 estimated by Kaygisiz and Vanli (1995), but lower than 0.28 estimated by Milagres *et al.* (1988b).

Estimates of t for PET are generally moderate or slightly high which ranged from 0.43 to 0.49 (Table 3). This indicated that culling on the basis of 1*st* record will be effective in improving the overall performance of the cows. The t estimate for MYCI 0.43 was higher than 0.25 and 0.36 obtained by Deshpande *et al.* (1992) and Genena (1998), respectively. However, it is lower than 0.53 obtained by Singh (1992). Moreover, the t estimate for MYDIM was 0.46, which is nearly similar to those 0.52 obtained by Singh *et al.* (1989). In addition, this estimate is lower than 0.56 recorded by Singh (1992). However, it was higher than 0.27 given by Deshpande *et al.* (1992). The t estimates for MYAFC and MYASC were 0.49 and 0.44, respectively, and lower than 0.64 and 0.47 estimated by Genena (1998), respectively.

The estimates of t for PET and MYT except DIM were higher and approximately nearly twice as large as the corresponding h^2s estimates across all lactations and (Table 3). This is because the relationship between the successive parities generally increases as the cow gets older i.e. t estimates obtained from subsequent records of the same cow tends to increase, while the h^2s estimates tend to decrease with advance of parity (e.g. Soliman and Khalil, 1993; Afifi *et al.*, 1995 and Genena, 1998).

Coefficients of additive genetic (CAV%) and phenotypic variation (CPV%). The estimates of CAV% and CPV% for all traits studied in the first four and across all lactations are given in Table 4. Estimates of CAV% and CPV% for MYT ranged from 4.0 to 8.4% and 15.6 to 18.3%, respectively. However, the estimate of CAV% decreased with advance of parity, while CPV% remained constant across the four parities. Estimates of CAV% in the present study, are nearly similar to those obtained by Hermas *et al.* (1987), Raheja *et al.* (1989) and Mostafa (1991) on dairy cattle. Estimation of CAV% and CPV% for DIM trait in different and across all lactations ranged from 0.0 to 2.3% and 10.0 to 11.3%, respectively (Table 4), while the estimates of CAV% and CPV% for RT ranged from 2.8 to 8.7% and 8.6 to 16.6%, respectively. The CAV% and CPV% for AC decreased with advance of age. Estimates of CAV% for CI were lower than those corresponding estimates for AC in different lactations. However, the reverse trend was true for CPV% estimates (Table 4). In our study, the range of estimates for CAV% for RT is nearly similar to that obtained by Raheja (1989) and it is higher than that provided by Moore *et al.* (1990) on Ayrshire and Holstein cattle. Estimation of CAV% and CPV% for PET in different and across all lactations ranged from 0.9 to 34.1% and 1.9 to 54.3%, respectively. The estimation of CAV% for MYDIM and MYCI traits decreased with advance of parity and recorded the highest value at 19 parity, while the reverse trend was true for MYAFC. Estimates of CPV% for MYDIM and MYCI remained almost constant at different parities, while estimates of MYASC and MYAFC increased from 1*st* to 3*rd* parity and decreased thereafter.

In general, it is desirable to take some PET (e.g. MYAFC in the first lactation and MYASC in the second lactation) as selection criteria, because they recorded the highest estimates of h2s and CAV%. MYASC trait, recorded the highest h^2s and CAV% (0.36 and 28.7%), respectively at second lactation, can be used as an index trait (composite trait) in selection programme, because it is a combination of AFC, first CI and MY traits of the first lactation. Thus, this trait qualifies to be a comprehensive and ideal trait for selection under field conditions for comparing the economic merit of the dairy cattle.

CONCLUSION

1. Age at calving seems to be more efficient (i.e. , h^2s estimates for AC were generally high) as selection criterion to improve fertility of dairy cows more than any other RT, and it may be considered at least in part as measure of maturity as well as measure of fertility.
2. It is desirable to take some PET (e.g. MYAFC in the first lactation and MYASC in the second lactation) as selection criteria, because they recorded the highest estimates of h^2s and CAV%. MYASC, can be used as an index trait composite trait) in selection programme, because it is MY of the first lactation and a combination of AFC and first CI. Thus, this trait is qualified to be a comprehensive and ideal trait for selection under field conditions for comparing the economic merit of the dairy cattle.
3. Moderate to high repeatability estimates of PE, obtained here, may suggest that a great improvement will occur for this breed through early selection for these traits (especially for MYAFC, MYDIM and MYASC), and the information obtained from the records beyond the first one will add little influence to the

Table 4. Estimates of additive genetic and phenotypic variation (CAV% and CPV%) for total milk yield, reproductive and productive efficiency traits in the first four lactations and across all lactations

Traits	1st lactation				2nd lactation				3rd lactation				4th lactation			
	h^2	SE	CAV %	CPV %	h^2	SE	CAV %	CPV %	h^2	SE	CAV %	CPV %	h^2	SE	CAV %	CPV %
Total milk Yield																
MY	0.18	0.02	7.1	17.8	0.12	0.02	5.9	17.2	0.08	0.02	4.7	15.9	0.06	0.02	4.0	15.6
FY	0.19	0.02	7.7	17.7	0.15	0.02	7.0	18.3	0.11	0.02	5.8	17.4	0.09	0.02	5.4	17.1
PY	0.17	0.02	7.0	17.1	0.14	0.02	6.5	17.4	0.10	0.02	5.2	16.3	0.09	0.02	5.0	15.9
DIM	0.01	0.01	1.2	10.9	0.04	0.01	2.3	11.3	0.03	0.01	1.9	10.3	0.0	0.0	0.0	10.0
Reproductive																
AC	0.46	0.03	8.7	12.9	0.55	0.03	7.9	10.6	0.47	0.03	6.4	9.4	0.40	0.03	5.4	8.6
CI	0.06	0.01	4.1	16.2	0.03	0.01	2.8	16.6	0.06	0.02	4.2	15.9	0.06	0.02	3.9	16.0
Productive efficiency																
MYDIM	0.24	0.02	6.9	14.4	0.14	0.02	5.3	14.5	0.09	0.02	4.2	13.8	0.02	0.02	1.9	13.6
MYCI	0.14	0.02	6.6	17.7	0.12	0.02	6.5	18.7	0.11	0.02	5.6	17.1	0.05	0.02	3.7	17.1
MYAFC	0.24	0.02	12.9	26.6	0.34	0.02	30.4	52.4	0.39	0.02	34.1	54.3	0.10	0.03	10.7	34.3
MYASC	0.11	0.02	6.6	20.5	0.36	0.02	28.7	47.9	0.26	0.02	20.5	40.1	0.19	0.03	14.2	32.6

+ Traits defined in Table 1.

Table 5. Estimates of heritabilities, standard errors (h2±S.E.), coefficients of additive genetic and phenotypic variation (CAV% and CPV%), repeatabilities, standard errors (t±S.E.), genetic and phenotypic standard deviations (GSD and PSD) for total milk yield, reproductive, and productive efficiency traits across all lactations of Fleckvieh cattle in Austria

Traits	h^2	SE	CAV%	CPV%	t	SE	GSD	PSD
Total milk yield:								
MY	0.20	0.02	7.6	17.0	0.45	0.01	352.0	784.2
FY	0.22	0.02	8.4	18.1	0.43	0.01	16.1	34.6
PY	0.20	0.02	7.6	17.1	0.41	0.01	11.7	26.3
DIM	0.02	0.01	1.5	10.2	0.17	0.01	4.9	33.8
Reproductive:								
CI	0.03	0.01	2.9	15.6	0.17	0.01	11.1	59.7
Productive efficiency:								
MYDIM	0.23	0.02	7.2	15.1	0.46	0.01	1.0	2.1
MYCI	0.27	0.02	10.4	19.0	0.43	0.01	1.2	2.2
MYAFC	0.18	0.02	1.8	4.6	0.49	0.01	0.53	1.3
MYASC	0.21	0.02	0.9	1.9	0.44	0.01	0.36	0.78

+ Traits defined in Table 1.

prediction of cow's producing ability. Consequently, sire's progeny test and cow's culling policies for such traits based on early record (i.e. single record) would be from the genetic point of view efficient and later records would not be needed.

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التحليل الوراثي لصفات الكفاءة الإنتاجية والتناسلية في المواسم المختلفة فـــي ماشـــية الفلاك في. ١- العمق الوراثي والمعامل التكراري

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استخدمت بيانات الأداء الإنتاجي والتناسلي لعدد ٥٨٠٥٠ سجل إدرار لأبقار الفليكفيه فى النمسا. وذلـــك للأربعة مواسم إدرار الأولى ، بينما استخدام لكل المواسم مجتمعة ٢٨٣١٦ سجل إدرار تمثل ١٠٠٠٧ بقـــره لعدد ٦٤٣ طلوقة ، تم تقدير التباينات والتغايرات الوراثية والمظهرية لجميع الصفـــات المدروســـة وذلـــك للأربعة مواسم الأولى بالإضافة إلى كل المواسم مجتمعة .

كانت الصفات المدروسة هى : صفات إنتاج اللبن الكلى : محصول كل من اللبـــن والدهـــن والـــبروتين ، الصفات التناسلية: العمر عند الولادة ، طول فترة الأيام المفتوحة ، طول الفترة بيـــن الولادتيـــن، الصفـــات البينية: طول فترة أيام الحليب، صفات الكفاءة الإنتاجية: محصول اللبن منسوبا لطول فترة أيـــام الحليـــب ، محصول اللبن منسوبا لطول الفترة بين الولادتين- محصول اللبن منسوبا للعمر عند أول ولاده محصـــول اللبن منسوبا للعمر عند ثاني ولاده .

ويمكن تلخيص أهم النتائج المتحصل عليها فيمايلى :-

كان لأب البقرة تأثير عالي المعنوية على جميع الصفات المدروسة للأربعة مواسم الأولى فيمـــا عـــدا صفتي طول فترة أيام الحليب وكذلك محصول اللبن منسوبا لطول فترة أيام الحليب.

تراوحت قيم نسبة التباين الأبوي لجميع صفات اللبن من ١,٦ ٤,٨ % للأربعة مواسم هذا وقد انخفضـــت هذه النسبة بتقديم موسم الإدرار من الأول (٤,٢ ٤,٨%) إلى الرابع ١,٦ ٢,٥ %) تراوحت قيم نســبة التباين الأبوي للصفات التناسلية من ٠,٧-١٣,٨% ، وكما هو متوقع كانت هذه النسبة صغيره لصفة طـــول الفترة بين الولادتين (٠,٧-١,٧%) بينما كانت بالنسبة لصفة العمر عند الولادة (١٠,٠ ١٣,٨%) أعلـــى من مثيلاتها لصفات اللبن (١,٦-٤,٨%) تراوحت قيمة نسبة التباين الأبوي لصفة طول فترة الحليـــب مـــن صفر ٠,٨ % ، تراوحت قيمة نسبة التباين الأبوي لصفات الكفاءة الإنتاجية من ٠,٥-٩.٩%.

تم تقدير العمق الوراثي لجميع الصفات المدروسة للمواسم الأربعة الأولى وكذلك للمواسم مجتمعـــة حيـــث تراوحت قيمة العمق الوراثي لجميع صفات اللبن من ٠,٠٦- ٠,١٩، ٠,٢٠-٠,٢٢ علـــى التوالـــي إلا أنـــها تناقصت بتقدم الإدرار وكانت قيم العمق الوراثي لمحصول البروتين لمواسم الإدرار الأربعة الأولى أقل مـــن مثيلاتها لمحصول الدهن ، بالنسبة للصفات التناسلية تراوحت قيمة العمق الوراثي لصفة العمر عند الـــولادة من ٠,٤٠-٠,٥٥ ، ولصفة طول فترة الأيام المفتوحة والفترة بين الولادتيـــن مـــن ٠,٠٣-٠,٠٦ للمواســـم الأربعة ، ٠,٠٣ للمواسم مجتمعة ، بالنسبة لصفة طول فترة الحليب تراوحت قيمة العمق الوراثي من صفـــر

٠,٠٤ للمواسم الأربعة الأولى ، ٠,٠٢ للمواسم مجتمعة .

بالنسبة لصفات الكفاءة الإنتاجية تراوحت قيمة العمق الوراثي للأربعة مواسم الأولى ومجتمعه من ٠,٠٢– ٠,٢٤، ٠,٢٣ لصفة محصول اللبن منسوبا لطول فترة الحليب ، ومن ٠,٠٥ ٠,١٤ ، ٠,٢٧ لصفة محصول اللبن منسوبا لطول الفترة بين ولادتين ، ومن ٠,١٠ ٠,٣٩ ، ٠,١٨ لصفة محصول اللبن منسوبا للعمر عند أول ولاده ، ومن ٠,١١ ٠,٣٦ ، ٠,٢١ لصفة البن منسوبا للعمر عند ثاني ولاده على التوالي .

تم تقدير نسبة التباين الوراثي التجميعي والمظهري لجميع الصفات المدروسة للمواسم الأربعة وكذلك للمواسم مجتمعه ، وتراوحت قيمها بالنسبة لصفات محصول اللبن من ٤,٠ ٨,٤% ، ١٥,٦- ١٨,٣% على التوالي ، وتراوحت هذه القيم بالنسبة للصفات التناسلية من ٢,٨- ١٥,٩% ، ٨,٦- ٦٤,٩% على التوالي ، بينما كانت لصفة طول فترة الحليب من صفر ٢,٣% ، ١٠,٠-١١,٣% على التوالي ، تراوحت هذه القيم بالنسبة لصفات الكفاءة الإنتاجية من ١,٩-٣٤.١% ، ١٣,٦- ٥٤,٣% .

وبصفة عامة فمن المرغوب تضمين صفات الكفاءة الإنتاجية (محصول اللبن منسوبا لطول فترة الحليب ، محصول اللبن منسوبا لطول الفترة بين الولادتين) في دله الانتخاب حيث أنها سجلت أعلى قيمة لكل من العمق الوراثي ونسبة التباين الوراثي التجميعي فى الموسم الأول بينما صفتي محصول اللبن منسوبا للعمر عند أول ولادة وثاني ولادة سجلت أعلى قيم فى الموسم الثاني والثالث على التوالي .

كان لتأثير البقرة داخل الأب تأثيرا معنويا عاليا على جميع الصفات المدروسه وكانت نسبة التباين الوراثي الراجع للبقره مرتفعة لصفات محصول البن حيث تراوحت بين ٣٦,١- ٤٠,٠% وكانت القيمة لصفة طول الفترة بين الولادتين ١٦,٢% ولصفة طول فترة الحليب ١٦,٩% بينما تراوحت هذه القيم لصفات الكفاءة الإنتاجية بين ٣٦,٣- ٤٤,١% .

كانت قيم المعاملات التكرارية لجميع صفات اللبن متوسطة إلى عاليه حيث تراوحت بين ٠,٤١- ٠,٤٥ بينما لطول فترة الأيام المفتوحة ولطول الفترة بين الولادتين ، ولطول فترة الحليب ٠,١٧ بينما تراوحت بين ٠,٤٣-٠,٤٩ لصفات الكفاءة الإنتاجية .