CORRELATIONS BETWEEN MIXED MODEL ESTIMATES OF MILK YIELD FOR SUCKLING, MILKING ONLY AND WHOLE LACTATION PERIODS IN PLEVEN BLACKHEAD DAIRY SHEEP

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INTRODUCTION

Basic selection trait in dairy sheep in Bulgaria for the last 30 years was the milk yield (LY) for the whole lactation period. ICAR recommendations (Barillet *et al*., 1992) suggested to implement recording after the weaning of lambs, e.g. the control during the milking only period (CY). Corresponding to these proposals a study was performed to compare the estimates of all factors, fixed and random, for each of the three yield traits, recorded during the suckling period, after the weaning of lambs, and for the entire period of lactation.

MATERIAL AND METHODS

Study was carried out on 598 Pleven Blackhead ewes of a ram producing flock in Pleven area, born in six consecutive years, and being progeny of 31 rams. Lambing was strictly seasonal – mainly in January and February. The milk yield was determined using test day records according to A4 design as described in ICAR recommendations. The yield during suckling period (SY) was measured by milking control, the first one being implemented after lambing of 30 % of the flock, and the followings on the 15-th, 21-st and 28-th (and all later) day intervals. Test day was carried out in the middle of a test period. The dates of lambing and weaning were the actual ones, and that of drying off was assumed to be on the 14-th day after the last recording.

Test day number varied from 1 to 3 in the suckling period (SP) and from 2 to 6 in the milking only period (CP), and the sum of them conformed to the whole lactation period (LP). Main environmental effects that influence milk yield in sheep – flock-year-lambing season, parity, length of suckling and milking only period (Astruc *et al*., 1994) were considered in the models. Statistical analyses for each one of the three traits, SY, CY, LY, were performed using first an ANOVA model including flock-year-parity (FYP), months of lambing (ML) and weaning (MW), and a set of linear regressions corresponding to the trait of interest. Estimates of variance components were completed with a single trait repeatability animal model (ST AM) accounting for additive genetic effect of the animal and environmental permanent (PE) effect, plus the fixed effects described in the previous analysis, using MTDFREML (Boldman *et al.,* 1993) set of programs.

RESULTS AND DISCUSSION

The average lactation yield (LY) was 189 l in 192 days (LP), suckling yield (SY) 78 l in 68 days (SP), and yield during milking only period (CY) 110.8 l in 125 days (MP) (table 1). The first test day occurred on average at 53 days in milk. The lowest variation coefficient was found for LY (24 %) and the highest one for SY (33.8 %). Length of the three periods had

lower variation compared to that of yields. The averages and their variation were close to that found in the previous studies of the breed (Georgiev, 1989).
The main environmental factor for the three traits was FYP, while ML was not significant, and MW affected only CY. Linear regression of the length of each period was significant on the corresponding yield trait. Results suggested similarity of the effects compared to other dairy sheep breeds (Serrano *et al.,* 1994 ; Ugarte *et al.,* 1994). Formulation of the basic environmental factors was similar to that in the genetic evaluations of the other Mediterranean countries (Astruc *et al.,* 1994). Comparison of the models showed highest coefficient of determination, R^2, for CY (64-65 %), compared to LY (45 %) and SY (37 %). These results suggested that EBVs for CY would be more accurate than EBVs for LY.

Table 1. Milk production averages for Pleven Blackhead dairy ewes

Traits		Average	SD	CV
Lactation yield (l)	LY	189.3	44.5	24.0
Milk production during suckling period (l)	SY	78.5	26.5	33.8
Yield for milking only period (l)	CY	110.8	33.8	30.5
Length of lactation period (days)	LP	192.5	25.4	13.2
Length of suckling period (days)	SP	67.7	12.0	17.7
Length of milking only period (days)	MP	124.7	21.4	17.2
First control period (days)		53.0	14.2	26.8

Variance components for the traits in this study were relatively low. The proportion of additive genetic variance accounted for less than 10 % of total variation. Permanent environment proportion corresponded more to the difference between repeatability and heritability coefficients (0.07 – 0.14), that were used in assessment of breeding values in dairy sheep (Barillet *et al.,* 1992 ; Barillet and Boichard, 1994 ; Baro *et al.,* 1994 ; Ugarte *et al.,* 1996).
Correlation coefficients for the estimates of FYP fixed effects (table 2) were high between LY and CY (0.81)and somewhat lower between LY and SY (0.58). Results show that dynamics of milk yield explained by the environmental variation for the whole period of lactation was mostly related to the nutritional and other differences that appear during milking only period. Close to zero correlations for FYP between SY and LY estimates indicated that the environmental influences in the first and second part of lactation period were independent. Better conditions for milk production at the beginning of the year do not necessarily determine similar effect at the end of lactation. Such results support an extension of similar studies for the yield in separate test days (test day models) in order to account better for the environmental conditions at the moments of traits' measurement.
Correlations between lambing month effects were high and opposite in sign. In fact the early lambing corresponded to high SY, and relatively low values for LY, the latter having its maximum in March. Among the reasons for those differences could be some longer suckling length of early delivered ewes, until the start of flock milking. It is possible that after the accounting for its duration some effect of suckling period continues to exist. Another reason might be some difference in the shape of lactation curve of the ewes. Empirical observations suggested that first lambs in the flock grow faster, with sufficient milk of their dams, which

however decrease rapidly after weaning, the lactation period of these ewes was shorter and they come in heat first. In contrast, for good milkers conception comes later and lactation curve is more persistent. Same understanding would correspond also to the negative correlations (-0.86) of estimates between the yield in the suckling (SY) and milking only period (CY). Considerable but not significant effect of lambing month did not allow for more categorical conclusions.

Table 2. Correlation coefficients between estimates of different effects for milk yield traits in Pleven Blackhead dairy ewes

Correlations between	Effects			
Milk yield traits	FYP	Month of lambing	Ram EBV[A]	PE
LY-SY	0.58	-0.72	0.75	0.81
LY-CY	0.81	0.97	0.77	0.80
SY-CY	0.01	-0.86	0.29	0.30

[A] EBV- expected breeding value.

Correlations between ram EBV estimates for LY and SY and for LY and CY were high and positive (0.75 to 0.77). Correlation between ram EBV for SY and CY was positive and low (0.29) illustrating again the for weak link between the considered traits (SY and CY). The results suggested that in the population of Pleven Blackhead dairy sheep exists a possibility for increasing milk yield after weaning while keeping milk yield during suckling period at a level sufficient for satisfying the lamb requirements. An extended study in that direction might give more information for the importance of suckling and lactation yields as selection criteria.
Estimate of permanent environmental effects for lactation yield (LY) was highly related to those of SY (0.81) and CY (0.80) (table 2). Similar to the ram EBVs, the correlation between PE estimates of SY and CY was positive and low (0.30). The estimates show that some variation exists in the individual effect and some ewes affect positively the yield during suckling and not in the milking period. Direct speculation about that reason would be difficult but it might result partially in behavior differences and stress sensitivity of ewes to separation of their lambs and to control milking during the suckling period.
As a whole, results suggested that the milk yield of the sheep during suckling and milking only periods appeared as two distinguished traits.

CONCLUSION

The highest part of milk yield variation was explained by the modeling of the production of the milking only period.
Estimates of environmental flock-year-parity effect, of sires EBVs and permanent environment effects were in low positive correlation between the milk yield during suckling and milking only periods.

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