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Possibilities for prediction of the test day milk yield based on only one individual test per day in Awassi sheep

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Summary

400 test day records were used for testing the accuracy of measurement of the test day yield of three time a day milking Awassi ewes. The actual test day yield was approximated by only one individual measurement and its weighting by the ratio of total yield in the farm in that milking and of the whole day.

Coefficients for separate test days and period of the day wary from 1.9 to 3.4. The average difference for the morning, midday and evening milkings three practically zero, and the corresponding extremes were from -0.67 l to 0.81 l, from -1.05 l to 0.79 l and from -1.14 l to 1.22 l. Only about 30% of the deviations in predicted and actual yields were in the range ±5%.

Differences were not affected by the age, lactation stage, consequence and level of the test day.

It was considered that the differences from the actual yield are too big and the method is of use for herds in the initial stages of recording practice and with limited importance for the breed improvement.

Key words: test day yield, approximation, three time a day milking

Introduction

Milk recording in the extensive dairy sheep breeding schemes is one of the most time and efforts consuming tasks. This is the base for further assessment of genetic parameters (Barrilet et al., 1987, 1994, Barrilet, 1990). A trial is made for simplification of the official A4 ICAR recording scheme (ICAR, 2005) by measurement of the individual ewe milk yield only once during the test day and approximating the total individual test day yield with the relative total yield in the flock in conditions of three time milking a day, e.g. AC method. In the official guidelines (ICAR, 2005) the AC method is recommended for two milkings a day. A proper measurement of the test day yield is one of the important points in sheep improvement (Blair, 1982, Epstein, 1985, Boyazoglu et al., 1990).

Objective of the study was to test the A4 and AC methods at three time milkings of Awassi sheep during the test day.

Material and methods

Among 400 individual test records in the Awassi Mediterranean Farm (AMF) – Kumanovo, Macedonia, which were made in 2001 and 2002 on 21 and 33 ewes respectively were chosen 371, all of which with measurement in the morning, at noon and at the evening of the test day, during the milking only period. For the sake of the study, the test days with one and two measurements were omitted in this comparative study.

The total milk for the flock was calculated on the basis of the individual measurements per ewe, for each milking and test day and the proportion of these amounts to the total yield, during the day of test. Prediction coefficients (Coef.) for the flock test day yields, weighted the difference in the milk in separate milkings. These coefficients were the ratio of the total yield to the yield of a given separate milking. For the morning individual test the corresponding Coef. was:

Coef.(morning) = total yield / morning yield

Next, the individual morning yield of each ewe, was multiplied by this coefficient for approximation of the yield, for the whole test day. This predicted yield was compared to the actual yield, which was measured by summation of individual yields, for each milking. The difference of predicted and actual yield was analyzed. It is expressed in actual units, e.g. litters (l) and in percentage from the individual actual yield.

Results and discussion

1. Coefficients for separate test days

Average milk yield of recorded ewes in the study for the morning milking was 0.594±0.027 l, for the midday milking 0.406±0.017 l, for the evening milking 0.393±0.020 l and for the test day 1.359±0.053 l, which sources of variation were discussed in a previous study (Dimov et al., 2005).

The coefficients for separate test days (Table 1) were lower for the morning, compared to the noon and evening milkings, which corresponded to the highest level of the yield measured in the morning. Coefficients for the noon and evening milkings, were close in value with somewhat smaller values for the latter one. Results suggested that in prediction of the daily yield, the most considerable was the importance of the morning, followed by the evening and midday milkings.

Table 1. Weighting coefficients for morning, midday and evening milking by month-year of test day (mytest)

Mytest	No ewes	Morning	Noon	Evening
12002	10	2.402	3.953	3.024
22002	23	2.360	3.240	3.736
32002	26	2.241	3.003	4.529
42002	29	1.998	3.954	4.054
52002	32	1.973	3.987	4.127
62002	33	2.491	3.765	3.003
72002	33	2.670	3.395	3.022
92002	10	3.391	3.408	2.429
52001	21	2.636	3.354	3.101
62001	22	2.736	3.435	2.912
72001	22	2.077	4.072	3.664

82001	21	2.348	3.625	3.354
92001	21	2.621	3.522	2.989
102001	20	2.499	3.469	3.210
22001	15	2.489	3.152	3.558
32001	15	2.511	3.190	3.468
42001	18	2.658	3.410	3.026
Sum	371			

Possible deviations in the individual yields from the general tendency of morning-noon-evening level will be weighted and possibly overestimated by using the noon milking and will cause the smallest effect on the predicted daily yield, by using the morning coefficient. Latter in the study the differences of the predicted and actual yields were discussed.

2. Differences between the predicted and actual individual test day yields

The three tested methods of prediction, gave practically zero average difference of the predicted and actual yield (Table 2). The minimum and maximum of the deviations for a particular ewe/milking, were lowest for the morning milking (from –0.67 l to 0.81 l, e.g. from -31.2% to 38.6% from the actual daily yield) and highest for the evening one (from –1.14 l to 1.22 l, e.g. from –67.1% to 81.3% from the actual daily yield). The standard deviation of the difference was smaller for the morning milking - 0.20 l, and highest for the evening milking - 0.33 l.

Table 2. Average difference of predicted and actual test day milk yield when prediction is made only on the morning, midday or evening recording, l

Milking	N	Minimum	Maximum	Mean	Std. Deviation
Morning	371	-0,67	0,81	-0,0008	0,20304
Noon	371	-1,05	0,79	0,0008	0,23976
Evening	371	-1,14	1,22	0,0001	0,32556

Results showed that the extreme differences are big and could influence the test day yield considerably, when it is approximated on the base of single daily milking. The distribution of relative deviation of predicted and the actual yield (Table 3) illustrated that relatively small part of the measurements, from 26.2% at the midday milking to 33.8% at morning milking, were in the scope of ±5%. Almost equal part of the predicted individual test day yields were overestimated and underestimated. This difference could be considered as very big and control of the productivity, on that base is subject of error. This type of recording, might be used for preliminary assessment of some flocks, just entering the recording scheme.

Table 3. Distribution in % of the relative difference in separate milkings

Milking	Relative difference class, %		
	<5%	±5%	>5%
Morning	34.6	33.8	31.6
Noon	37.0	28.9	34.1
Evening	38.1	26.2	35.7

Some reasons for the deviation were presented next in the study. Possible significant sources could correct the accuracy of assessment and improve the test day yield prediction.

3. Effects of different factors on the difference between predicted and actual yield

The main effects which were examined to influence the difference of predicted and actual yield, were lactation (LAC), type of lactation curve (TYPE), number of lambs born (NOLAM), order of test day (TD) and level of actual yield (LEVLTD). The LS-analyses of variance showed that most of these did not affect the difference of prediction. The only factor with significant effect (P<0.01 was the number of lambs born at morning and midday milkings (Table 4).

Table 4. Effect of different factors on the difference of predicted and actual test day milk yield

Source	df	Morning			Noon			Evening		
		MS	F	Sig.	MS	F	Sig.	MS	F	Sig.
Corrected Model	19	0,067	1,682	0,037	0,064	1,126	0,322	0,157	1,526	0,074
Intercept	1	0,060	1,501	0,221	0,055	0,955	0,329	0,241	2,339	0,127
LAC	6	0,069	1,728	0,113	0,089	1,553	0,160	0,237	2,293	*0,035*
TYPE	2	0,014	0,345	0,709	0,138	2,420	0,090	0,111	1,080	0,341
NOLAM	1	0,318	7,989	*0,005***	0,438	7,676	*0,006***	0,093	0,900	0,343
TD	8	0,006	0,141	0,997	0,018	0,308	0,963	0,046	0,442	0,896
LEVLTD	2	0,011	0,268	0,765	0,012	0,213	0,808	0,291	2,818	0,061
Error	350	0,040			0,057			0,103		
R Squared			0,084			0,058			0,077	

ns – non significant, * - P<0.05, ** – P<0.01, ***-P<0.001

For ewes with single lambs the average error at the morning milking was -0.011±0.030 l, which is an underestimation of the daily yield, and for the ewes with twins the average overestimation of the TD yield was 0.082±0.036 l (Table 5). The difference between deviations (-0.092±0.033 l) of singles and twins was significant. Based on midday milking the TD yield of ewes with single lambs was overestimated with 0.088±0.036 l and of ewes with twins were underestimated with 0.020±0.043 l. The difference between them of 0.108±0.039 l was also significant. For the evening milking both groups were underestimated, but more heavily the ewes with twins. The difference of 0.05 l however was not significant. The deviations from actual yield in different milkings were in opposite direction and were difficult for a reasonable explanation. Either more data should be accumulated or the influence of the factor should be ignored and no corrections of these differences will be assumed as appropriate.

Table 5. Effect of number of lambs born on the difference of predicted and actual test day milk yield, l

NOLAM	N. obs.	Morning	Noon	Evening
1	308	-0,011 ± 0,030	0,088 ± 0,036	-0,046 ± 0,048
2	62	0,082 ± 0,036	-0,020 ± 0,043	-0,096 ± 0,058

Results of the analyses of the errors of prediction of the test day milk yield based only on one individual milking in awassi ewes in conditions of three times a day milking,

showed that deviations from the actual yield when the ewes were tested at all milkings individually are considerable. The main factors did not affect this difference, with the exception of the number of lambs born.

Conclusions

Approximation of the test day yield at system of milking three times a day, based only on one individual measurement is more accurate at morning milking.

Relative deviation above and under 5% was found for about 1/3 of ewe/test day measurements.

About 1/3 of predicted TD yield was in the bounds of ±5% relative deviation.

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