PREDICTION OF TEST DAY MILK YIELD BY AC METHOD IN INDIGENOUS BALKAN GOATS IN MACEDONIA

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
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PREDICTION OF TEST DAY MILK YIELD BY AC METHOD IN INDIGENOUS BALKAN GOATS IN MACEDONIA

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INTRODUCTION

Goat breeding in Republic of Macedonia, for the last two decades (2000-2017), although with small oscillations, is stable, especially if we take into consideration the number of goats (70.000-80.000 goats). As an indigenous goat breed, Domestic Balkan goat has been protected in order to preserve the breed, having in mind the growing pressure for its crossbreeding with more productive breeds such as Alpine and Saanen breeds of goats. This is the reason why some of the Balkan goats are tested in milk production, hence it is logical to search for the most accurate and cheapest methods.

The aim of the study was to determine the accuracy of prediction of the actual daily milk yield in the Balkan goats, measured twice a day (method A4), in the morning and evening and predicted based on only one milking on the day of testing (method AC).

Such test are being conducted mostly in sheep, almost never in goat. Therefore the comparison of results was performed with data and analysis of milk tests conducted in sheep.

MATERIAL AND METHODS

We used a flock of Balkan goats as basic experimental material located on south-east Macedonia. The number of goats included in these tests was around 242 goats per year, in the period of three years (2014-2016). A total number of 726 goats (lactations) were monitored for three years of testing. According to the age range, goats were from first to ninth lactation. During the first three years of production, total number of 4598 individual lactation tests were conducted or according to the age: 588 tests in the first, 882 tests in second, 1318 in third, 919 in fourth, 598 in fifth, 195 in sixth, 56 in seventh, 30 in eighth and 12 in ninth lactation. The production of milk in goats was monitored according to the standard A4 method *(ICAR, 2009, ICAR, 2012)*, which means measuring of daily production of milk per goat, in the interval of 28 to 34 days. The recording of milk commenced after the weaning of kids (60 days) and lasted until the moment of drying in milk (end of October or mid-November). The total number of conducted milk recordings of milk was 7 tests in 2014, 6 tests in 2015 and 6 tests in 2016.

The data used were monthly test day yields of the goats in three consecutive years, 2014, 2015 and 2016. The actual yield per day is the sum of the morning and evening milk yield of each goat. The predicted milk yield per day is based either on the morning measurement or evening measurement. These measurements were weighted by the relative total amount of the milk in the flock, for the corresponding milking: morning or evening to the total milk yield for the day of test in the separate year-test days:

Predicted daily yield on morning milking = morning milk yield * K1,
Where K1 is the ratio of total daily milk yield for the flock to total milk yield in the morning.
Predicted daily yield on evening milking = evening milk yield * K2,
Where K2 is the ratio of total daily milk yield for the flock to total milk yield in the evening.
Regarding the statistic analyses, the characteristics of daily milk production (morning, evening and total amount of milk) were analyzed using the following model:

$$Y_{jklm} = \mu + Y_j + L_k + TD_l + e_{jklm}$$

where:
Y - is an individual observation of each trait during a test (daily) test (morning, evening and total amount of milk) of the m-th individual-test day measurement;
μ - is general mutual average for tested characteristics;
Y_j - effect of j-th year with (j=2014, 2015 and 2016);
L_k - effect of k-th lactation with (k=1,2,3,4,5,6,7,8,9);
TD_l - effect of l-th test day with (l=1,2,3,4,5,6,7);
e_{jklm} - residual influence

The influence of certain effects (year, lactation and number of test) was studied using the F-test, whereas the analyses were performed using the package programs SPSS *(SPSS, 1994)*.
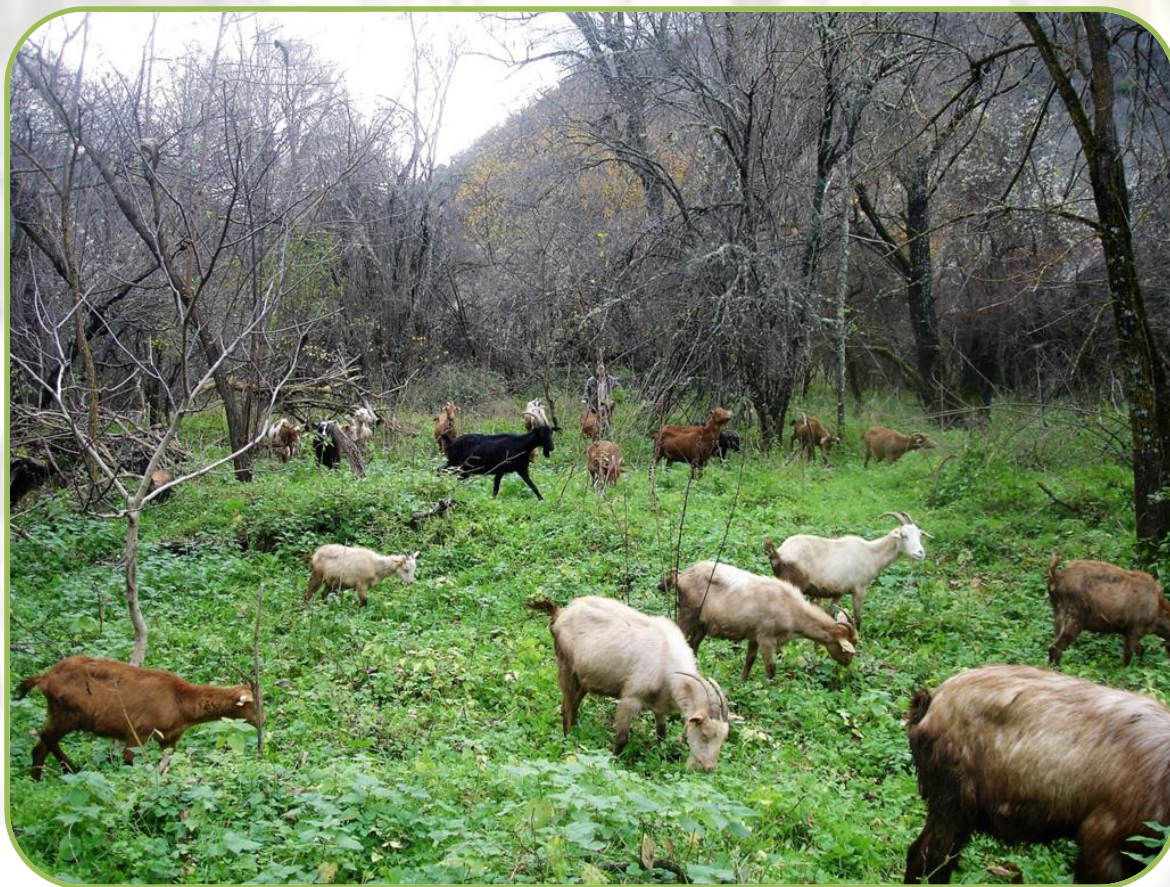
RESULTS AND DISCUSSION

In order to minimize the error of predicting of daily milk yield, the influence on variations of certain factors was analyzed in predicting the morning and evening milking (Table 1). During the analyses, it was determined that all three analyzed factors (year, lactation and number of milk test), had highly significant influence (P<0.001) on morning, evening and total amount of milk. The same factors also had highly significant influence (P<0.001) on the expected total amount milk, using morning and evening milk.

During the analyses of the data for the three years of testing (2014-2016), it was determined that the average milk yield during morning, evening and total milk yield was 0.314, 0.391 and 0.705 liters, consequently (Table 2).

The influence of each year on the analyzed characteristics of daily milk production separately is presented in Table 3.

The influence of age i.e. lactation on tested characteristics of daily production of milk are presented in Table 4 separately.

The influence of the milk test on analyzed characteristics of daily production of milk is presented in Table 5, separately.

Table 1. Influence of the certain factors on the measured and predicted daily milk yield

Factor	df	Morning	Evening	Total	Expected (morning)	Expected (evening)	Difference (morning)	Difference (evening)
Year	2	46.33***	18.24***	29.30***	23.23***	33.24***	0.78	0.71
Lactation	8	7.31***	9.12***	8.50***	7.43***	9.10***	2.50*	2.47*
Number of test	6	427.76***	535.29***	500.21***	406.28***	558.17***	0.00	0.00
R², %		37.3	41.9	40.5	35.7	43.2	0.4	0.4

Table 2. Average milk yield L/day

Trait	Mean (L)	±SE
Morning	0.314	0.010
Evening	0.391	0.010
Total	0.705	0.019
Predicted morning	0.698	0.021
Predicted evening	0.710	0.018
Difference-morning	-0.007	0.005
Difference-evening	0.005	0.004

Table 3. Effect of the year on the measured and predicted milk yield, L

Year	N	Morning	Evening	Total	Predicted - morning	Predicted-evening	Difference -morning	Difference -evening
2014	1694	0.338	0.421	0.760	0.750	0.768	-0.0103	0.0076
2015	1452	0.342	0.392	0.735	0.730	0.738	-0.0047	0.0034
2016	1452	0.260	0.358	0.618	0.611	0.622	-0.0061	0.0047
SE		0.011	0.011	0.022	0.025	0.020	0.005	0.004

Table 4. Effect of the lactation on the measured and predicted milk yield, L

Lactation	N	Morning	Evening	Total	Predicted -morning	Predicted -evening	Difference -morning	Difference-evening
1	588	0.30	0.35	0.65	0.66	0.64	0.01	-0.01
2	882	0.35	0.43	0.79	0.79	0.79	0.00	0.00
3	1318	0.35	0.43	0.78	0.79	0.78	0.00	0.00
4	919	0.34	0.42	0.76	0.75	0.77	-0.01	0.01
5	598	0.37	0.46	0.83	0.83	0.83	0.00	0.00
6	195	0.37	0.44	0.81	0.82	0.80	0.01	-0.01
7	56	0.23	0.32	0.55	0.52	0.57	-0.03	0.02
8	30	0.25	0.32	0.56	0.54	0.58	-0.02	0.02
9	12	0.27	0.35	0.61	0.59	0.63	-0.03	0.02
SE		0.006-0.06	0.006-0.06	0.01-0.13	0.01-0.14	0.01-0.12	0.003-0.03	0.002-0.02

Table 5. Effect of the test day on the measured and predicted milk yield, L

Test day	N	Morning	Evening	Total	Predicted-morning	Predicted-evening	Difference-morning	Difference-evening
1	726	0.60	0.72	1.32	1.31	1.32	-0.0071	0.0053
2	726	0.49	0.58	1.07	1.06	1.08	-0.0071	0.0053
3	726	0.39	0.50	0.89	0.89	0.90	-0.0071	0.0053
4	726	0.28	0.35	0.63	0.62	0.64	-0.0071	0.0053
5	726	0.19	0.25	0.45	0.44	0.45	-0.0071	0.0053
6	726	0.14	0.18	0.31	0.31	0.32	-0.0071	0.0053
7	242	0.10	0.15	0.26	0.25	0.26	-0.0071	0.0053
SE		0.01	0.01	0.02-0.04	0.03-0.04	0.02-0.03	0.006-0.008	0.005-0.007

CONCLUSIONS

- Evening milking predicted TD milk yield slightly more accurate, but for the breeding purposes both measurements are reliable enough in the breeding programs,

- The difference of predicted and measured TD milk yield is less than 10 ml for different lactations and test days,

- Such results indicate the fact that the quite cheap AC method as well as the referent A4 method can be used, with significant precision of prediction.