

ANALYSIS OF THE MORPHO-PRODUCTIVE PARAMETERS OF R1 SHEEP RESULTING FROM THE CROSSING OF LOCAL SHEEP FROM THE NORTH-EASTERN AREA OF ROMANIA WITH AWASSI BREED

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Abstract

The aim of the present work was to analyse the morpho-productive parameters of the R1 sheep resulting from the crossing of the local sheep from the north-eastern area of the country with the Awassi breed. The results showed that compared to the milk production of Tsurcana breed during the milking period (120 days), the milked milk production of R1 sheep in the first lactation is higher by 17.30 kg, the differences being very significant ($P < 0.001$). Following the analysis of the external morphological characteristics of the R1 sheep, it emerged that the only character specific to the Awassi breed that was transmitted in a higher percentage is the long and drooping ears (36.7%), the other characters being transmitted in a reduced percentage (3.3-16.7%). The reproductive indices showed the highest values in the case of R1 sheep (compared to the Tsurcana breed, the prolificacy is 28.6% higher, and the numerical productivity index is 41.4% higher). All these results recommend the improvement of local sheep from the north-eastern area of our country through crossbreeding with the Awassi breed up to the second generation of absorption.

Key words: Awassi breed, crossing, local sheep, milk production, morpho-productive parameters, reproductive indices.

INTRODUCTION

In the Nord-East region of Romania, most sheep breeders raise sheep from non-improved local breeds, the prevalent system of sheep maintenance is the extensive system and there is no improvement program for production (Popescu, 2020). As a result, the productive and economic performances achieved by these sheep holdings are lower compared to those with intensive and semi-intensive systems of sheep maintenance (Pădeanu & Voia, 2010; Pascal, 2015; NIS, 2024).

Considering those previously mentioned, as well as the interest shown by sheep breeders in the recent period for improving production and implicitly increasing the profitability of these holdings, we proposed to improve milk production by crossing sheep from the north-eastern area of the country with rams from the Awassi breed.

This breed is one of the sheep dairy breeds that was imported to our country in the 80s and proved to have a good adaptability to the

extensive exploitation system practiced in the north-eastern area of Romania (Taftă and Răducuță, 1995; Taftă et al., 1997).

The work aims to increase the milk production of native sheep from the north-eastern area of the country, where the reproductive activity was carried out uncontrolled, without a pre-established improvement program, by absorbing crosses of sheep from local breeds with purebred rams Awassi to increase productivity in sheep farms.

MATERIALS AND METHODS

Absorption crosses of local ewes with Awassi rams began in autumn 2018, and during 2023 the R1 crossbred females were in first calving.

In this work, the following determinations were made: evaluation of reproductive parameters and productive performance in the first lactation of R1 females, evaluation of body development of R2 lambs and evaluation of the degree of similarity between R1 products and the Awassi breeding breed.

The working methods used were appropriate for objectives of this kind.

To determine the reproductive parameters of the R1 products, the classic formulas for calculating the reproductive indices existing in the specialized literature (Taftă et al., 1997) were used, the following reproductive indices were calculated: fertility, fecundity, prolificacy, birth rate, lamb mortality, the numerical productivity index, the percentage of abortions and the percentage of lambs weaned.

To determine the total milk production, the control of milk production included the nursing period of the lambs and the milking period of the ewes. The amount of milk during the lactation period was estimated by the method of valorisation of the suckled milk of the lamb, respectively by the weight gain achieved, using the transformation coefficient method.

The amount of milk milked was evaluated by applying successive productive controls (n = 4 controls), at intervals of 30 days. At each control interval, the standard method was used, namely AT4 respecting the technical specifications recommended by the International Committee for Animal Recording (ICAR, 2018).

In order to evaluate the degree of similarity between the R1 products and the Awassi breeding breed, a productive and phenotypic

analysis of the R1 products was carried out, a comparison was made based on milked milk production, as well as an analysis on a number of 30 adult individuals of female sex of the mode of transmission to R1 crossbred of the main external characteristics specific to the Awassi breed.

Statistical analysis. For the statistical processing of the data, we utilized Microsoft Office Excel 2016. The statistical parameters computed included mean, standard deviation, standard error of the mean, and coefficient of variation. The Student's t-test was employed to assess differences between means, with a significance level set at 0.05.

RESULTS AND DISCUSSIONS

The evaluation of reproductive indices in R1 females represented a first objective of our research. The information necessary to calculate the following reproduction indices was extracted from the data entered in the lambing and calving register. Reproduction indices were calculated separately for all existing genotypes within the analysed farm (Tsurcana breed, Awassi breed, F1 crossbred and R1 crossbred) and an average of them for the total farm (Table 1).

Table 1. Reproductive indices at all existing genotypes within the analysed farm (%)

Specification	F1	R1	Tsurcana	Awassi	Farm average
Number of individuals (heads)	45	52	134	170	401
Fertility	95.6	100.0	97.0	98.8	98
Fecundity	97.7	100.0	98.5	99.4	98.9
Prolificacy	134.9	140.4	109.2	110.1	116.5
Birth rate	128.9	140.4	105.9	108.8	114.2
Lamb mortality	0	0	6.3	6.5	4.6
Numerical productivity	128.9	140.4	99.3	101.8	108.9
Percentage of abortions	2.3	0	1.5	0.6	1.0
Percentage of lambs weaned	111.6	140.4	102.3	102.9	111.2

From the analysis of the reproductive indices data, it can be seen that the average percentage of fertility per holding was 98%, and within the genotypes the highest value was recorded by the R1 crossbred, which reached the maximum value of 100%. The same finding is valid for the fertility index. As for the prolificacy index, it had an average value per holding of 116.5%, the highest value being registered by the R1 crossbred sheep (140.4%), and the lowest value

being registered by the breed sheep Tsurcana (109.2%). The same finding, noted for prolificacy, is also true for the birth rate. Regarding the percentage of lamb mortality, it can be noted that at the level of the entire farm it had a value of 4.6%. It should be noted that in the R1 and F1 crossbred no deaths were recorded in the birth-weaning interval, while for the Tsurcana breed and the Awassi breed it had a value of 6.3% and 6.5%, respectively.

The percentage of numerical productivity, which represents the percentage ratio between the number of lambs and the mother herd, is on average per farm 108.9%, the highest values being recorded by the F1 (128.9%) and R1 (140.4 %), and the lowest value being recorded by sheep from the Tsurcana breed (99.3%).

Referring to the percentage of abortions, it can be noted that at the level of the entire holding it had a value of 1.0%. It should be noted that no abortions were recorded in the R1 crossbred ewes, while the F1 crossbred ewes had an abortion percentage of 2.3%. Finally, the highest percentage of weaned lambs is recorded in the R1 crossbred group (140.4%), and the lowest in the Tsurcana breed sheep group (102.3%).

Evaluation of quantitative milk production

The total amount of milk consumed by the lambs during the lactation period was determined after statistical processing of the values obtained from

the control weighing of the lambs (25 lambs/batch) at the end of the weaning period and during lactation (Table 2).

From the obtained data it follows that Awassi sheep have a 5.7% higher lactation capacity compared to R1 crossbred sheep (60.60±1.143 kg versus 57.33±0.171 kg), but the difference is insignificant (P>0.05) (Table 3).

Although the R2 lambs had at the time of weaning an average body weight close to that of the Awassi lambs, however, the Awassi ewes have a 5.7% higher lactogenic potential than the ewes in the first lactation R1 crossbred during the nursing period of the lambs (P>0.05).

In conclusion, Awassi lambs benefited from a higher amount of mother's milk and thus recorded a more intense rate in terms of the total gain accumulated over the birth-weaning interval (Pascal et al., 2023).

Table 2. Evolution of body weight in lambs during the suckling period (n = 25 heads/lot) (kg)

Specification	Batch of crossbred lambs R2				Batch of Awassi lambs			
	MEAN±SEM	CV%	Min.	Max.	MEAN±SEM	CV%	Min.	Max.
Weight at birth	4.12±0.081	13.89	2.90	5.00	4.34±0.074	11.99	3.60	5.30
Weight at 28 days	10.11±0.125	8.70	8.47	12.36	10.76±0.150	9.78	8.30	12.80
ADG* 0- 28 days	0.200±0.005	17.17	0.120	0.250	0.214±0.005	16.23	0.137	0.280
Weight at 60 days	15.53±0.228	10.38	12.30	18.90	17.00±0.237	9.84	15.20	20.80
ADG 28- 60 days	0.181±0.009	37.12	0.071	0.315	0.187±0.008	30.26	0.099	0.375

Table 3. Milk production obtained during suckling period (60 days) (n = 50 females and 25 de lambs/batch) (kg)

Genotype	The milk quantity during suckling period					
	0-28 days		28-60 days		Total suckling period	
	MEAN±SEM	CV%	MEAN±SEM	CV%	MEAN±SEM	CV%
Batch of R1 ewes	32.95±0.800	17.17	24.37±1.280	37.12	57.33±1.171	14.45
Batch of Awassi ewes	35.33±0.811	16.23	25.28±1.082	30.27	60.60±1.143	13.33

To determine milk production during the milking period, the AT4 estimation method was used, performing 4 controls, carried out at 30-day intervals. The average daily milk production on the 4 controls for the R1 crossbred group was 649.38±37.03 g with limits between 378.88 and 934.68 g of milk, and for the Awassi breed group of 656.20±23.36 g with limits between 285.00 and 1,197.05 g of milk. The average level of daily milk production for Awassi breed ewes was about 1.05% higher than that of crossbred R1 ewes (Table 4). Differences between

controls, including average daily milk production during the milking period, were not significant. The average daily milk production of the ewes from the Awassi group on the 4 controls was 1.05% higher than that of the ewes from the crossbred R1 group, but the differences were insignificant (P>0.05).

The average level of milk production during the milking period for Awassi ewes was 0.57 kg lower than R1 crossbred ewes. It can thus be said that the manifestation of the heterosis effect led to an increase in the milk production of

crossbred R1 sheep, the productive level being similar to that of the Awassi breed. During the entire lactation period (180 days) R1 crossbred ewes recorded a total milk production

of 128.87 kg, which is 2.09% lower than that of Awassi sheep (131.57 kg) (Table 5).

Table 4. Average daily milk production during the milking period (4 checks) (n = 100 ewes/batch) (g)

Specification	Batch of R1 ewes			Batch of Awassi ewes	
	n	MEAN±SEM	CV%	MEAN±SEM	CV%
Check I	50	934.68±37.44	28.32	979.00±27.04	27.04
Check II	50	739.28±37.55	35.92	792.00±31.34	27.98
Check III	50	544.68±37.53	48.72	523.00±24.80	33.53
Check IV	50	378.88±36.40	67.93	330.80±22.53	48.17
Average daily milk production	50	649.38±37.03	40.33	656.20±23.36	25.17

Table 5. Milk production during the milking period (120 days) and during the lactation period (180 days) (n = 50 heads/batch) (kg)

Specification	Batch of R1 ewes			Batch of Awassi ewes	
	n	MEAN±SEM	CV%	MEAN±SEM	CV%
Check I	50	22.43±0.900	28.32	23.50±0.650	19.53
Check II	50	16.26±0.830	35.92	17.42±0.690	27.98
Check III	50	15.80±1.090	48.72	15.17±0.720	33.53
Check IV	50	17.05±1.640	67.93	14.89±1.010	48.17
Total milking milk	50	71.54±4.420	43.73	70.97±2.670	26.56
Total milk (suckling milk + milking milk)	50	128.87		131.57	

In order to evaluate the degree of similarity between the R1 products and the Awassi breeding breed, a productive and morphological analysis of the R1 products was carried out, a comparison was made based on the ratio of milked milk production, as well as an analysis on a number of 30 adult individuals of female sex of the mode of transmission to R1 crossbred of the main external characteristics specific to the Awassi breed. Compared to the milk production of Tsurcana breed during the milking

period, the milk production of R1 crossbred females during the first lactation during the milking period (120 days) is higher by 17.30 kg, even in the drought conditions manifested during the period of grazed during the year 2023 (Table 6). The differences are significant (P<0.05), a fact that shows the beneficial influence of the backcrossing of F1 crossbred females with Awassi rams on the milk production of R1 crossbred.

Table 6. The significance of the differences between genotypes in milked milk production

Batches	Batch of Tsurcana 54.24 kg	Batch of Awassi 70.98 kg
Batch of R1 71.54 kg	17.30*	0.56 ^{NS}
Batch of Awassi 70.98 kg	16.74*	-
Batch of Tsurcana 54.24 kg	-	-

NS - non-significant differences (P>0.05); *significant differences (P<0.05); **distinctly significant differences (P<0.01); ***highly significant differences (P<0.001).

Table 7 presents the analysis of the way of transmission to R1 crossbred of the main external characteristics specific to the Awassi breed. Thus, 8 external characteristics specific to the Awassi breed were considered and 30 female R1 crossbreds were evaluated to see their degree

of morphological similarity with the Awassi breed. Following the analysis of the external characteristics of the R1 crossbred, it emerged that 13.3% have a body narrow and long format, 13.3% have a ram-shaped head profile, 36.7% have long and drooping ears, 10% have an

ascending spine line towards rump, 6.7% have a bevelled rump, 3.3% have a fat deposit on the

tail and 16.7% have a brown colour of hair on face.

Table 7. Morphological similarity analysis of R1 crossbred with the Awassi breed (on-farm analysis)

Specification	R1 crossbred	
	Number of individuals	%
Body format (narrow and long)	4	13.3
Ram-shaped head profile	4	13.3
Long and drooping ears	11	36.7
Ascending spine line towards rump	3	10.0
Bevelled rump	2	6.7
Fat deposit on the tail	1	3.3
Brown colour of hair on face	5	16.7
Total	30	100

CONCLUSIONS

The reproductive indices show the highest values in the case of R1 crossbred sheep (compared to the Tsurcana breed, the prolificacy is 28.6% higher, and the numerical productivity index is 41.4% higher), a fact that recommends improving the sheep by crossing of the Tsurcana breed with Awassi rams up to the second generation of absorption.

Compared to the milk production of Tsurcana sheep during the milking period, the milk production of R1 crossbred females during the first lactation of the milking period (120 days) is higher by 17.30 kg, the differences being significant ($P < 0.05$), fact that show the beneficial influence of backcrossing F1 females with Awassi rams. In terms of milk production, the obtained R1 crossbred represents a different population than the Tsurcana breed, being significantly more productive.

Following the analysis of the external characteristics of the R1 crossbred, it emerged that the only character specific to the Awassi breed that was transmitted in a higher percentage is the long and hanging ears (36.7%), the other characters being transmitted in a much lower percentage (3.3-16.7%), from which the conclusion emerges that R1 crossbred have external morphological characteristics closer to the Tsurcana breed.

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