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THE INFLUENCE OF ALFALFA SEMI-SILAGE ADMINISTERED TO SHEEP MOTHERS IN LACTATING PERIOD ON GROWTH PERFORMANCES OF SUCKLING LAMBS

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Abstract

This study aimed to determine the influence of fodder type administered in two consecutive years (2022 and 2023) to sheep mothers in the lactating period on the growth performances of suckling lambs, to improve growth rate up to weaning. The lambs from Țigaie breed - rusty variety (209 lambs born in 2022 and 219 lambs born in 2023) were used in the experiment from lambing up to weaning. The fodder administered to the ewes-mothers had provided a nutritional value of 198 g DP and 12.75 MJ NEM (net energy milk) in 2022, the fodder consisting of concentrates (grain corn 50%; grain barley 50%) and hill hay, while the fodder administered in 2023 is consisting of alfalfa semi-silage, hill hay and concentrates (50% grain corn; 50% grain barley) and had provided 198 g DP and 14.75 MJ NEM. The alfalfa semi-silage had significantly influenced ($p<0.001$) the growth performances of lambs in 2023 compared to those born in 2022 regarding weaning weight (19.98 kg vs. 16.82 kg), total weight gain (15.71 kg vs 12.84 kg) and average daily gain (224.44 g vs. 183.49 g).

Key words*: alfalfa semi-silage, fodder, lamb, growth rate, Țigaie.*

INTRODUCTION

The diet administered to the animals influences the final product (Milevski et al., 2014).

The influence of alfalfa hay on the productive performance of sheep and lambs is well known. In recent years, the interest in the production of alfalfa bales for the purpose of obtaining semi-hay, semi-silage, or silage has increased a lot. By ensiling the grass, on the one hand, ensures the maintenance of nutrients and the improvement of palatability (Wang et al., 2021), and it facilitates their fair storage, there where are not enough spaces for the storage of fibrous fodder, on the other hand.

More than that, in periods and areas with heavy rains, which make it impossible to produce hay, ensiling the grass immediately after mowing or after a wilting period, remains the most accessible alternative and, at the same time, helps to obtain quality fodder necessary for ruminants for the winter period. Transforming of the surplus of feed in unfavorable periods of the year in silage can increase farm profitability (Stanley, 2003).

Fraser et al. (2002) consider that legume forage assures better animal production than silages from other grass or crops.

Yang et al. (2022) have shown that ensiling alfalfa poses challenges because of its elevated buffering capacity and limited concentrations of fermentable carbohydrates. Similar results were observed by other authors (Plaizier, 2004; Wang, 2021) who considered that making alfalfa silage without using additives or mixing with other forages can be a challenge due to its low content of water-soluble carbohydrates (WSC) and high buffering capacity. The progress over the years has led to improvement of ensiling technology, many studies (Seale et al., 1986; Pahlow et al., 2002) showed a great potential to conserve legumes forage.

Chen et al. (2013) appreciate that, by ensiling alfalfa, costs for food production are reduced, while at the same time, its preservation is simplified.

Several authors (Weinberg et al., 1993) believe that leguminous silages with a lower content of dry matter and WSC are more resistant to aerobic deterioration than cereal silages.

In the specialized literature, there is a lack of information about the influence of alfalfa simi-silage on the milk production of sheep and growth performance of lambs.
The influence of the silage in two consecutive years (2007 and 2008) on ewe performance was shown by Bernes and Stengärde (2012) and on lambs performance by Bernes et al. (2012), with the mention that, the silage was from grass-dominated crops (mainly *Phleum pratense* L.).
The objective of the study is to compare the influence of the diet from two consecutive years (2022 - diet without alfalfa semi-silage and 2023 - diet including alfalfa semi-silage) on the milk production of sheep during the lactation period and on the growth performance of the lambs from birth up to weaning.

MATERIALS AND METHODS

The research works were conducted by Experimental Laboratorium Reghin of Research Institute for Sheep and Goat Palas Constanta, Mures County, 46°46' N/ 22°42'E; 395 m altitude; annual rainfall varies between 650- 700 mm; average temperatures 19/–3°C during summer/winter).
The alfalfa semi-silage was produced at these coordinates, from the fourth year and fourth cut (the middle of September). The plants were harvested after a wilted period of 48 h and the bales were formed. After two hours, the bales were wrapped with a stationary bales wrapping machine. No additives were used for the production of alfalfa semi-silage.

Animal management

The biological material on which the experiments were carried out was constituted of adult sheep and their sucking lambs from Ţigaie - rusty variety (195 sheep and 209 lambs in 2022; 201 sheep and 219 lambs in 2023). Lambs, born between January and March, underwent initial identification and weighing (±0.1 kg) within the first 24 hours, involving the application of ear tags. Data on sex, date of birth, type of birth, and the respective dam and ram groups were documented. Subsequent weighings (±0.5 kg) were conducted at the weaning phase.
Ewes and their lambs were maintained together in identical management conditions for a duration of two months post-lambing. Weaning occurred at around 73 days in 2022 and 61 days in 2023. During the suckling phase, the lamb diet was tailored to achieve a growth potential of 300 g/head/day, adhering to NRC (2007) guidelines (135 g DP and 10.89 MJ NE). Additionally, the diet for ewes was formulated to meet the nutritional demands of late pregnancy and lactation. During the experiment were provided blocks of mineral and vitamin supplements.
The structure of concentrated fodder administered to lambs up to weaning was: 30% corn flour, 30% barley flour, 25% corn grain, 11.25%, sunflower groats, 2.25% calcium, and 1.5% salt.
The sheep mothers were kept on pastures throughout the year, and in shelter in late gestation up to lambs weaning. In this period, the feeding of ewes was constituted of concentrated and hill hay in 2022, and of concentrated, hill hay and alfalfa semi-silage in 2023 (introduced in the diet three weeks before starting to lamb).
The structure of fodder is presented in Table 1.

Table 1. The structure of fodder used to feed ewes in the lactating period

Characteristics	2022	2023
Hill hay (%)	59.96	33.31
Alfalfa semi-silage (%)	-	33.31
Corn grain (%)	19.98	16.66
Barley grain (%)	19.98	16.66
Calcium (%)	0.04	0.03
Salt (%)	0.04	0.03
Dry matter intake/day (kg)	2.60	2.09
Digestible protein g/day	198	198
NEM MJ/day	12.75	14.75

The computed composition was determined using tabular values derived from the ingredient composition of the experimental diet, as outlined in the NRC (2007) guidelines.

The lambs were measured for birth weight (BW) and weaning weight (WW).
Birth weight (BW), weaning weight (WW), weaning age, initial total gain from birth up to weaning, average daily gain (ADG), and milk production of sheep in the lactating period were determined.
After determining the initial total gain at weaning, this was recalculated for 70 days.
The milk production of ewes was determined by the Nica method (this method takes into account the fact that 1 kg of gain, achieved during the lactation period, is obtained with 4.5 kg of milk).

The statistical data processing utilized the ANOVA program, and the analysis incorporated the "Tukey" tests.

RESULTS AND DISCUSSIONS

The milk production of sheep in the lactating period (Table 2) was highly ($p<0.001$) influenced by the diet administered in 2023 compared to 2022. This characteristic is spread over the body weight evolution of lambs, total gain, and average daily gain (ADG) from birth up to weaning.

The weights of lambs at birth and weaning were significantly higher ($p<0.001$) for lambs born in 2023, compared to the ones born in 2022. No significant differences ($p>0.05$) were found between the years concerning initial total gain birth-weaning, but after its recalculation for a period of 70 days, it resulted in a significant difference ($p<0.001$) of recalculated total gain and daily gains in 2023 compared to 2022. It is to be noted that the milk production of sheep was significantly influenced ($p<0.001$) by the alfalfa semi-silage.

Table 2. Mean (± SE) for body weight evolution, total gain, and ADG of lambs from birth up to weaning

Specification	2022 (n = 209)	2023 (n = 219)	Mean differences	P_{Tukey}
Birth weight (kg)	3.98 ± 0.04^{A}	4.27 ± 0.04^{B}	-0.292	< .001
Weaning weight (kg)	16.63 ± 0.22^{A}	17.85 ± 0.21^{B}	-1.229	< .001
Weaning age (days)	73.18 ± 1.09^{A}	61.11 ± 1.07^{B}	12.072	< .001
Initial total gain birth-weaning (kg)	12.65 ± 0.20	13.59 ± 0.19	-0.937	0.007
ADG birth-weaning (g)	183.49 ± 3.67^{A}	224.44 ± 3.59^{B}	-40.948	< .001
Recalculated weight at 70 days (kg)	16.82 ± 0.27^{A}	19.98 ± 0.27^{B}	-3.159	< .001
Recalculated gain (kg)	12.84 ± 0.26^{A}	15.71 ± 0.25^{B}	-2.867	< .001
Production of suckled milk birth-weaning (kg)	57.80 ± 1.16^{A}	70.70 ± 1.13^{B}	-12.899	< .001

Means with different superscripts (A, B) in each trait differ ($p< 0.001$).

The analysis of differences recorded for the same sex in different years, highlights the fact (Table 3) that there were recorded significant differences ($p<0.001$) for all traits (except initial gain birth-weaning) in favour of the year 2023 compared to 2022.

The analysis of differences recorded between the sexes in the same years showed a greater value for male lambs both in 2022 and 2023, but only in 2022 differences were significant ($p< 0.001$).

For lambs born in 2023, significant differences were recorded significant differences ($p< 0.001$) in favor of male lambs regarding ADG birth-weaning, recalculated weight at 70 days, recalculated gain, and production of suckled milk in the birth-weaning period.

In the results disseminated from a project founded by the EU (1997-2001), Low-input animal production based on forage legumes for silage (LEGSIL), none of the three working groups (Nordic-, Maritime- and Continental Region) have included sheep as being suitable to be fed with legumes silage.

However, in recent years more researchers have studied the effect of different diets including legume silage on the performances of the and lambs.

In an experiment on weaned lambs, Sobiech et al. (2015) showed that lambs fed legume silage (red clover, alfalfa) obtain better growth performance than lambs fed grass silage.

Other experiments have studied comparatively diet based silage (grass-dominated) versus concentrate.

Thus, Bernes and Stengärde (2012) observed that it is difficult to maintain a good nutritional status in ewes with more than one lamb if they are fed only forage, without concentrates. Bernes et al. (2012) showed in an experiment on weaned lambs in two consecutive years, that weight gain was highest in both years in the lamb groups fed concentrates after weaning and lowest in the group fed only silage. The authors

considered that a diet with high-nutrient-quality silage and without concentrates is difficult to meet the lamb's nutritional requirements for optimal growth.

Table 3. Mean (± SE) for body weight evolution, total gain, and ADG of lambs from birth up to weaning (depending of year and sex)

Specification	Year	Sex	n	$X \pm s_x$
Birth weight (kg)	2022	F	94	3.83 ± 0.05^{ac}
	2023		123	4.16 ± 0.06^{A}
	2022	M	115	4.10 ± 0.05^{bC}
	2023		96	4.41 ± 0.07^{B}
Weaning weight (kg)	2022	F	94	16.19 ± 0.28^{a}
	2023		123	17.42 ± 0.21^{A}
	2022	M	115	16.98 ± 0.26^{b}
	2023		96	18.42 ± 0.31^{B}
Weaning age (days)	2022	F	94	77.13 ± 4.17^{a}
	2023		123	61.73 ± 0.66^{A}
	2022	M	115	69.95 ± 1.08^{b}
	2023		96	60.30 ± 0.78^{B}
Initial total gain birth-weaning (kg)	2022	F	94	12.36 ± 0.27
	2023		123	13.26 ± 0.19
	2022	M	115	12.88 ± 0.24
	2023		96	14.01 ± 0.28
ADG birth-weaning (g)	2022	F	94	175.78 ± 5.35^{a}
	2023		123	216.32 ± 3.08^{Ab}
	2022	M	115	189.79 ± 4.46^{b}
	2023		96	234.84 ± 4.86^{B}
Recalculated weight at 70 days (kg)	2022	F	94	16.13 ± 0.40^{a}
	2023		123	19.30 ± 0.24^{Ab}
	2022	M	115	17.38 ± 0.34^{b}
	2023		96	20.85 ± 0.38^{B}
Recalculated gain (kg)	2022	F	94	12.30 ± 0.37^{a}
	2023		123	15.14 ± 0.22^{Ab}
	2022	M	115	13.29 ± 0.31^{b}
	2023		96	16.44 ± 0.34^{B}
Production of suckled milk birth-weaning (kg)	2022	F	94	55.37 ± 1.68^{a}
	2023		123	68.14 ± 0.97^{Ab}
	2022	M	115	59.78 ± 1.40^{b}
	2023		96	73.98 ± 1.53^{B}

Means with different superscripts ($^{A, B, C, a, b, c}$) in each trait differ ($p< 0.001$).

CONCLUSIONS

This study highlights the fact that the introduction of alfalfa semi-silage in the sheep's diet positively influences the milk production of the sheep during the lactation period and, implicitly, the growth rate of the lambs until weaning.

The weaning age of the lambs can be reduced, which contributes to the increase in the economic efficiency of the farms by reducing some costs during the lactation period, thus:

reducing the amount of feed required and reducing the labour for feeding animals (faster sales of the lambs and taking the ewes out to pasture).

Further, research is needed to highlight the best combinations of diets that can contribute to improving the performance of sheep and lambs during the lactation period.

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