The Effect of some Pre and Probiotics on the Valorisation of Wheat Straws, in Young Sheep Fattening

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Abstract
The aim of this experiment was to study the effect of stimulation of ruminal symbionts on the use of wheat straw. Thus, at SCDCOC Caransebes, two groups of Turcana breed young sheep (n=20), with an average body weight of 30 kg, were established, which were maintained in the same environmental conditions. The young sheep from the LC control group and from the LE experimental group were fed with the same granulated ration consisting of a mixture of concentrates (1 kg) and wheat straw (0.45 kg). The factorial difference consisted of the supplementation of the ration, distributed to LE, with a vitamin mineral complex (Zeta complex, 1%) and yeast (*Saccharomyces cerevisiae*, 0.5%). The adaptation period with the new feed was 10 days. After 25 days from the beginning of the experimental period in young sheep from LE group, a significantly higher body weight, $p \leq 0.05$, by 1.21 kg compared to LC group was found, on average. The difference increased significantly $p \leq 0.01$ at the end of the experiment (after 50 days) by 1.82 kg in the conditions of improved the feed conversion rate by 8.51%. We recommend the use of pre and probiotics in the fattening lamb ration to increase productive performance.

Keywords: fattening, feeding, prebiotics, probiotics, young sheep.

1. Introduction

Within the European Union, lamb meat is sold at the highest price compared to all the other livestock. Through a better management, Romanian sheep breeders have real possibilities to increase meat production both by improving the breeding activity and genetic background and by optimizing the nutrition, feeding and technologies of raising of young sheep.
Lamb meat production must be conceived, as a scientific and economically efficient way, to optimize the obtaining of as many weaned lamb/sheep/year as possible, thru achieving a growth rate of lambs, according the level of the breed potential, with a feed conversion rate as low as possible, obtaining quality carcasses, objectives that have an effect on the selling price. [1,2].
An increased growth rate for lambs with a low feed conversion rate and quality carcasses can be obtained by adding prebiotics (microminerals, vitamins, sugars) in the lamb feed. These prebiotics will create a favourable development environment for the microsymbionts and ensure the daily requirements.
Probiotics such as the beer yeast *Sacharomices cerevisiae*, (dry yeast) are useful for the population of the rumen and for the optimization of the protein necessities [3,4]. The use of such products does not negatively impact the environment or the animal health. In Romania there are a large number of breweries that produce important amounts of yeast which can be dried and used for improved the feed conversion rate, to

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favouring quick development towards the ruminant stage, to improve and regulate digestion, to reduce stress, to lower mortality rates and costs. Other properties of yeast are: cellular wall rich in phosphorus, high capacity of removing oxygen, stimuli for the development of beneficial anaerobic ruminal bacteria and that of fibre digesting bacteria; stimulates the growth and activity of lactic acid utilizing bacteria; improves the use of nitrogen in the rumen, improves ruminal pH; positively influences digestion by increasing the concentration in essential digestive enzymes [5-7].

High amounts of oats, barley, and wheat straws are produced in the field regions. These are very rich in fibres and have a low protein content, being useful in the feed of lambs if they are supplemented with pre- and probiotics produced in our country and combined according to our own concept. The microsymbiont population existing in the rumen permanently synthesizes protein in order to maintain their own protein turnover and for multiplication. The efficiency of bacterial synthesis depends on two major factors: assuring the necessary energy and the necessary nitrogen. All attempts of increasing feed use in ruminants rely on the interdependence energy-nitrogen.

Our researches aim was to improve the lamb meat production by innovative, technological and biotechnological means, using feed resources from the internal market.

2. Materials and methods

The research was conducted at SCDCOC Caransebes on Turcana breed young sheep. The experimental groups were formed two weeks prior to the beginning of the study so that the lambs could get accustomed to the new housing and feeding conditions. Thus, two groups, each consisting of 20 randomly chosen lambs were formed. Several factors such as body weight, sex, age and type of birth were all considered. Table 1 presents the organization of the experiment.

The structure of the diet was conceived in order to meet all the physiological requirements of young sheep, weighing up to 30 kg [8]. The nutritional requirements and values of the feed were taken from specialty literature.

The granular feed, measuring 5 mm, consisted of 1 kg concentrated mix and 0.45 kg wheat straws. The quality requirement for granular feed was 102.73 g PDIN for every 1 UFC, according to calculi.

The feed was distributed among both groups of lambs (LC and LE) ad libitum. The necessary amount was added on a daily basis and the remaining feed was weighed in order to calculate intake. Manual scales were used for this operation with a deviation of 0.01 kg.

The factorial difference was the supplementation, of the feed distributed to the experimental group (LE), with vitamin and mineral complexes (Zeta complex, 1%) in order to stimulate the activity of the ruminal symbionts inside the rumen and with *Saccharomyces cerevisiae* (0.5 %) which interferes in increasing the concentration of cellulolytic bacteria, that of lactic-acid utilizing bacteria and that of proteolytic ruminal bacteria [5]

Following supplementation and granulation of feed, the samples collected from both groups were analysed in the Laboratory for Animal Nutrition and Feeding from the Faculty of Animal Resources Bioengineering, Timisoara. The results are shown in Table 1.

Determinations were performed using the following devices: FOSS TECATOR digester 2006, distillation unit 2100 Kjeltech, for crude protein (CP), FOSS 2055 SOXTECH manual extraction unit for crude fat (CF), Caloris L1020 calcination oven for crude ash and BINDER oven for dry matter (SU).

The lambs were housed in an enclosure with an outdoor paddock, all housing conditions being met for both groups, during the entire study period to ensure proper results. The mean temperature recorded in the hill region, where the study was conducted, was 18 ± 2 ^{0}C throughout the study period, humidity was 70-75 % and the speed of air currents was 0.3 m/s. In order to ensure good housing conditions, the animals were housed on permanent straw bedding, changed on a daily basis (0.3 kg/ m^2), making sure that every animal benefited from a surface of 0.6 m^2/young sheep.

The evaluation method used for performing the control of meat production for the two groups was the standard method stated by ICAR and accepted by ANZ (National Agency for Animal Husbandry). The fattening lasted for 60 days, of which 10 days were considered as accommodation period and 50 days were the real fattening period.

The lambs were weighed at the beginning, middle and the end of the experiment with the help of the

Platform Scale EOE 150 K 100 XL sheep weighing platform, equipped with an animal weighing software (movement software). The young sheep was weighed on every control day at 8:00 o'clock, in order to record more accurate data, by taking into account the circadian rhythm of the lamb feed consumption. Body weight determinations were performed in the outer paddock.

The Body condition scoring (BCS) was evaluated according to the fattening scale which implies scores from 1 to 5, with a maximum score given to young sheep found in a very good fattening stage.

The obtained results were compared with the help of the Mann-Whitney test in order to determine whether the differences between the two groups are statistically significant [9].

3. Results and discussion

Body weight was determined three times, in the experimental period, to assess growth rates. Based on this and the number of days in the period, the average daily gain on each lot was calculated.

The average weight of the young sheep recorded throughout the study period is given in Table 3.

By analysing data found in table 3, the difference between the groups was very small at the beginning of the experimental period, only 0.01 kg, insignificant from a statistical point of view ($p > 0.05$).

Following 25 days, the lambs from the LC showed an average body weight of 33.19 kg compared to an average body weight of 34.4 kg for those from the LE, which benefited from a diet supplemented with a vitamin-mineral complex and with yeast. The difference of 1.21 kg is statistically significant ($p \leq 0.05$).

At the end of the experimental period the difference between the two groups increased to 1.82 kg. Thus, animals from the LC reached an average body weight of 37.2 kg and those from the LE reached 39.02 kg. Statistically this difference is significant ($p \leq 0.01$).

Bugdayci et all, opined that dietary live yeast culture significantly ($p<0.05$) increased live weight gain compared with other groups at the hot (middle of summer) final weeks of the study however this result was not reflected to average live weight gain at the end of the experiment. [2].

The Body condition scoring (BCS) scores were 2 at the beginning of the experiment, due to the effect of high temperatures specific for the summer season, reaching 3 at the end of the experiment for both groups (LC and LE). The interpretation of these scores is as follows:

- Score 2: Prominent spinous apophyses. Muscles are covered by a thin layer of fat. Transversal processes are slightly rounded. Upon pressure, the finger goes under them quite easily,
- Score 3: The spinous apophyses are slightly rounded and can be felt separately, by pressing. The transversal processes are well covered, smooth and their end can be felt through firm pressing. The muscle is covered by a moderate layer of fat, measuring 3-5 mm thickness [1].

We wish to remind of the fact that the Turcana breed is a local, rustic breed and it does not specialize in meat production, however, the young sheep answers specifically to fattening techniques, accomplishing in the present case scores of 3 out of 5.

Data regarding the average daily live weight gain are presented in table 4 and figure 1.

According to data, the young sheep from the LC reached an average daily weight gain of 153 g (grams) during the first 25 days of fattening, compared to animals from the LE which gained 201 g, revealing a statistically significant difference of 48 g ($p \leq 0.001$).

The difference decreased to 25 g during the latest 25 experimental days of the fattening period. The sheep from the LC accomplished an average daily gain of 160 g while the sheep from the LE reached 185 g. It could be noticed that the weight gain increased in the LC with 7 g while in the LE it decreased by 16 g. Despite this finding, the difference remains significant ($p \leq 0.01$).

During the entire fattening period, it could be noticed that the highest average daily gain rate was recorded for the LE -reaching 193 grams, while the lowest rate was recorded for the LC-156.5 g. The difference of 36.5 g is statistically significant ($p \leq 0.001$). Voia et al reported similar results in both lambs and goat kids [2, 11].

The decrease of the average daily gain in the experimental group in the second period of fattening can be attributed to body development, namely the higher the body mass, the lower the effect of probiotics.

We will proceed in further studies with the observation of the body development at an age closer to the moment of weaning in an attempt to verify the above statement.

Table 1. Organisation of the experiment

Specification	Control group (LC)	Experimental group (LE)
n	20	20
Fattening period	60 days (10 + 50)	
Feeding	Straws and mixed concentrated feed included in granules	Straws and mixed concentrated feed included in granules With added mineral, vitamin and probiotic content

Table 2. Determined nutritional value of feed granules

Specification	CP%	CF%	Ash%	DM%
LC granulated feed	11.65	2.77	6.00	89.55
LE granulated feed (supplemented)	11.83	2.85	5.99	89.58

Table 3. Average lamb weight throughout the experimental period

Groups		Lamb weight Beginning		Middle (25 days)		End (50 days)	
		n	(kg)	n	(kg)	n	(kg)
LC		20	29.36 ± 0.25	20	33.19 ± 0.37	17	37.2 ± 0.39
LE		20	29.37 ± 0.21	20	34.4 ± 0.29	17	39.02 ± 0.31
Differences			0.01		1.21		1.82
Significance [LC versus LE]			ns		*		**
BCS	LC		2		3		3
	LE		2		3		3

Note * p≤0.05, ** p≤0.01

Table 4. The averages daily gain of the lambs from the experimental groups

Groups	Average daily gain during the experimental period 0-25 days		25-50 days		0-50 days	
	n	g	n	g	n	g
LC	20	153 ± 3.1	20	160 ± 4.3	17	156,5 ± 3.8
LE	20	201 ± 2.9	20	185 ± 3.5	17	193 ± 3.2
Differences		48		25		36.5
Significance [LC versus LE]		***		**		***

Note ** p≤0.01, *** p≤0.001

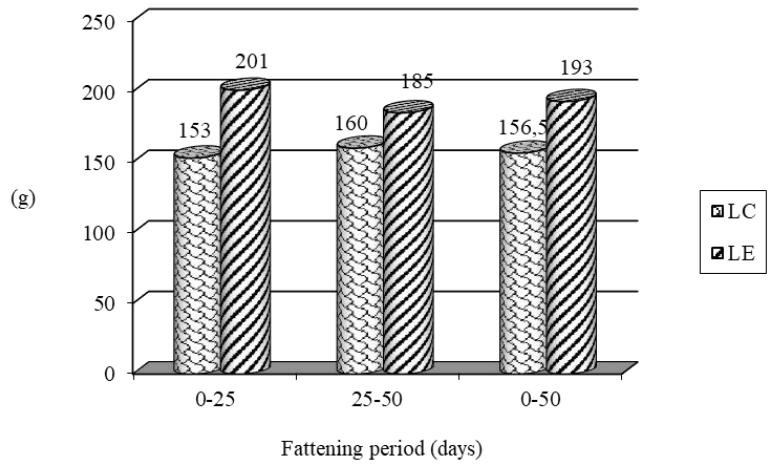

Figure 1 – Graphical representation of the average daily gain during the fattening period

The feed conversion rate, calculated according to the food intake was 6.11 kg of granules/kg gain for the LC and 5.59 kg of granules/kg gain for the LE, the 0.52 kg difference being economically justified. The production price for a kg of granules was 0,245 euro for the LC and 0,26 euro for the LE. The price of a kg weight gain was 1.5 euros for LC and 1.45 euros for LE.
We appreciate that the feed conversion rate for the experimental group was improve due to a better valorisation of the dietary components.

4. Conclusions

The diet supplementation of Turcană breed young sheep, during fattening periods, with pre and probiotics has the following effects:
- Significant increase ($p \leq 0.05$) of body weight (kg) by 3.64 % and of the average daily gain (g) ($p \leq 0.001$) by 31.37 % for the LE compared to the LC during the first 25 experimental days;
- Significant increase ($p \leq 0.01$) of the body weight (kg) by 4.89 % and that of the average daily gain (g) ($p \leq 0.001$) by 23.32 % for the LE compared to the LC within 50 experimental days;
- The feed efficiency recorded for the LE was improved with 0.52 kg compared to that recorded for the LC.
- The BCS was evaluated as score 3 for both groups.
- Increased profit based on a significant increase in body weight and average daily gain for the LE, with lower of feed conversion rate, maintaining BCS.

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