Influence of Nutritive Supplement on the Stimulation of Ruminal Microorganism's Activity in Fattening Lambs Reared in a Semi-Intensive System

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Abstract
The aim of our experiment was to evaluate the effect of a nutritive supplement (named by authors RFNS) composed of minerals, vitamins, enzymes and *Sacharomyces cerevisiae,* on the requirement satisfaction and the ruminal microorganism activity in fattening lambs reared in a semi-intensive system. Experiments were carried out on two experimental groups (n=11) of fattening Turcana lambs, from 120 to 160 days of age and an average weight of 20 kg at the beginning of the experimental period. Forage rations were structured on the same components both for group L1 and group L2, lolium hay 52 % and a concentrates mixture 42%. RFNS representing 2% from concentrates components was added in L2 group. The RFNS supplementation significantly improved ($p<0.02$) the average daily gain by 11.92%, while the consumption rate for proteins and energy was with 6.3% lower. Following RFSN administration, the number of ruminal bacteria (cfu/ml ruminal fluid) increased by 46.9% and the protozoa (number/ml ruminal fluid) with 55.7% compared to the control diet. Among protozoa genus, *Entodinium* could be registered as the most predominant (98.2% in L1 and 96.32% in L2), in smaller proportion were identified *Diplodinium* (0.48% in L1, respectively 1.34% in L2) and *Dasytricha* (1.32% in L1, respectively 2.64% in L2).

Keywords: nutritive supplement, ruminal fermentation, fattening lambs

1. Introduction

Worldwide there are in use different feed products containing ingredients (vitamins, trace elements, acids, sugars) that act directly and / or indirect on microorganisms or throughout populating with useful microorganisms the digestive tract, probiotics [1, 2].
The aim of our experiment was to evaluate the results of a preparation made up of micronutrients that would satisfy the requirements and to stimulate the young ovine ruminal microsymbionts activity on the first period of fattening in a semi-intensive system.

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2. Materials and methods

Researches were carried out at the Didactic farm Timisoara, on 120 days old Turcana weaned lambs, born as singletons.
At the beginning of the experimental period, the lambs was randomly divided into two groups, each group was made of 11 lambs, according to the experiment organization program presented in table 1. The lambs groups were maintained in total confinement, under the same environmental conditions [3].
Feed rations were composed of the same components for Group 1 and Group 2 respectively Lolium hay and concentrate mixture in a ratio of 58:42% AC1 (concentrates mixture 1) plus SNFR

(Ruminal Fermentation Nutrious Supplement) for L2.

Product feed (SNFR) consisting of micronutrients, vitamins, enzymes and live yeast culture provides an additional level of micronutrients is as shown in Table 2.

Table 1. Organization schedule of the experiment

Item	Group 1 (control)	Group 2 (experimental)
n	11	11
Period	Fattening lambs during 120-160 days old	
Feeding system	Lolium hay (58 %) Concentrate mixture (42 %) R_1	Lolium hay (58 %) Concentrate mixture (42 %) R_1 + SNFR
Established indices	Nutritive and bio-productive indices: feed intake, body weight, weight gain, intake rate.	
	Rumen parameters: total germ count (UFC/ml), number and genus of protozoa's.	

Note: SNFR – Ruminal Fermentation Nutrious Supplement

Table 2. Level of additional nutrients by SNFR (nutritive supplement of ruminal fermentation) 1 kg DM ration

Compoziție SNFR		Additional level
Nutrients	Measuring unit	
Zn	[mg]	40
Se	[mg]	0.4
Co	[mg]	0.6
Vitamine E	[mg]	35
Vitamine B_3	[mg]	25
Forazime	[g]	4.5
Sacharomyces cerevisiae strain Yea-Sacc^{1026}	[g]	1.2

This preparation was incorporated into 2% concentrated mixture distributed in the experimental group.

With 10 days before the beginning of the experiments, the lambs we're used to consume the forages used during experiments, the chemical composition and the nutritive value of the forages were established, and the animals, according to they categoryes were calculated the rations.

Quantity of lolium hay and concentrates distributed to the lambs was scaled with the precision of 0.05 kg

Lambs were weighed at the beginning and end of the experiment. Ruminal fluid was collected with an esophageal probe to 3 hours after the morning portion was offered to lambs, for three days.

After the statistical interpretation of the registered results, these were compared between themselves using Mann Whitney test, in order to determine if differences exists statistically among the experimental groups.

3. Results and discussion

Nutritive and bio-productive indices

With semi-intensyve feeding system, hay and concentrates intake in lambs from L1 are 0.824 kg hay/lamb/day and 0.608 kg concentrates/lamb/day and in L2 lambs in these quantities were higher by 3.52 % to 6.25% in hay and concentrates.

At the beginning of the experimental period, careful choice of lambs and their distribution in the two feeding groups, the average body weight registered was made the results to be very similar in our work, the differences registered had no statistical significance (Table 3).

At the end of the experiment average body weight of lambs in the control group was 28.16 ± 0.60 kg, while those in the experimental group of 29.05 ± 0.61 kg, less than 3.16%.

Based on body weight, was established by calculating the total gain and average daily gain for each lamb in two groups. Assessments of the values obtained at these indicators shows that the feeding system applied semi-intensive, the growth during the 40 experimental days, the average total gain of lambs in L1 is 7.71 ± 0.26 kg, which

corresponds a value of average daily gain of 193 ± 6.4 g .Differentiation factor that further administration of the preparation SNFR in L2 lambs resulted in an average total gain / period of 8.63 ± 0.28 kg, respectively average daily gain 216 ± 6.91 g daily, which is 11.9% higher compared with L1.

The specific consumption expressed in UNC / kg gain, respectively PDIN (g) and PDIE (g) / kg weight gain is presented in Table 4.

In the system of semi-intensive fattening, the proportion from the hay of total energy amount ai arround 50% of the total intake and the specific consumption of 7.20 lambs L1 is UNC / kg gain. Stimulation of ruminal microsimbionts which ensured the achievement of a significantly higher increase of weight gain in L2 lambs caused a reduction in specific consumption at this group up to 6.75 UNC / kg gain 6.25% respectively. If specific protein consumption was found that food supplementation with SNFR, this indicator is PDIN 589.42 g / kg gain, respectively PDIE 593.02 g / kg increase in L2 lambs, values are 6.32% higher PDIN small and PDIE 10.65% lower for the lambs compared to those recorded in L1.

Table 3. Productive indices achieved by the lambs subjected to fattening in L_1 and L_2 during the experimental period (the semiintensive system)

Ithem	GROUP 1 R1				GROUP 2 R1 +SNFR				Differences L_2-L_1	Mann-Whitney test
	n	$X \pm S\bar{x}$	s	Cv %	n	$X \pm S\bar{x}$	s	Cv %		
Initial body weight (kg)	11	20.45±0.5	1.65	8.06	11	20.42±0.49	1.61	7.9	-0.03	0.86 ns
Final body weight (kg)	11	28.16±0.6	2.0	7.31	11	29.05±0.61	2.03	6.98	0.89	0.20 ns
Total gain (kg)	11	7.71±0.26	0.85	11.03	11	8.63±0.28	0.92	10.64	0.92	0.02*
Average daily gain (g)	11	193±6.4	21.26	11.03	11	216±6.91	22.94	10.64	23	0.02*

Table 4. Specific consumption achieved by fattening lambs during the experimental period in semi-intensive system

Intake rate	GROUP 1 R1		GROUP 2 R1	
	Lolium hay	AC	Lolium hay	AC +SNFR
UNC	3.54	3.66	3.28	3.47
UNC %	49.23	50.77	48.59	51.41
UNC/ kg weight gain	7.20		6.75	
PDIN g	316.49	312.69	292.69	296.73
PDIN %	50.30	49.70	49.66	50.34
PDIN g/kg weight gain	629.18		589.42	
PDIE g	318.20	345.50	284.31	308.71
PDIE %	47.94	52.06	47.94	52.06
PDIE g/kg weight gain	663.69		593.02	

Microbiological ruminal indicators

Better conditions for the multiplication of rumen bacteria by providing specific nutrients may allow the nutritionist intervention in the formation of a larger quantity of microbial digestible protein in the gut (PDIN).

To evaluate the effect SNFR conditions were ensured uniformity of experimental groups of comparison and remained a constant feeding. In the laboratory, throughout the usual technique were established total number of germs (CFU / ml) from the ruminal fluid, the results are presented in Table 5.

Averages registered leed to the conclusion that SNFR obviously influence the number of ruminal bacteria count, and that are more numerous compared to controls UFC set, with 46.9%.

From the rumen fluid collected was determined the number and species of protozoa, and the ones that were identified and the results are presented in Table 6.

Table 5. Number of germs from the ruminal fluid

Semi-intensive feeding system	
Group 1 (control)	Group 2 - experimental (SNFR)
11.3×10^9	16.6×10^9

Table 6. Number and type of the protozoa isolated from the ruminal liquid in lambs fed semi-intensively

Group 1 (control)				Group 2 Experimental (SNFR)			
No/ml	Species %			No/ml	Species %		
	Entodinium	Diplodinium	Dasytricha		Entodinium	Diplodinium	Dasytricha
752462	98.20	0.48	1.32	1171875	96.32	1.04	2.64

According to the data presented in the table, one can appreciate that the number of protozoa/ml from the ruminal fluid increased from 752.462 to 1.171,875 with 55.7%, but in the species identified, the predominance of Entodinium could be recorded, with 98.20 to 96.32% and tend to increase share from 0.48% to 1.04% and the specie Diplodinium 1.32% to 2.64% Dasytricha species.

4. Conclusions

Nutritive and bio-productive indices:

- Feed intake was higher by 3.52% for Lolium hay and with 6.25% for concentrates in the experimental group, compared to the control group.
- Body weight at the end of the experiment was with 3.16% higher in L2 lambs that have ingested SNFR;
- SNFR supplementary feeding increased the average daily gain with 23 g/lamb, value witch is significantly higher ($p < 0.02$), compared with the control group.
- Intake rate is reduced by 6.25% for UNC/kg weight gain, and with 6.32% for PDIN/kg weight gain and with 10.65% for PDIE/kg weight gain in the lambs that have ingested SNFR, compared with the averages recorded in group control.

Microbiological ruminal indicators:

- CFU/ml – averages resulted could lead to the ideea that SNFR influences the ruminal bacteria count, witch are more numerous by 46.9% compared with the control group;
- Number and type of protozoa – under SNFR influence the number of protozoa/ml increased by 55.7%. Protozoa of the genus Entodinium predominate, accounting for 96-98% and shows a tendency to increase under the influence of gender Dasytricha Diplodinium and feed sort.

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