Biotechnology in Animal Husbandry 34 (2), p 199-206 , 2018 ISSN 1450-9156
Publisher: Institute for Animal Husbandry, Belgrade-Zemun UDC 636.085.8
https://doi.org/10.2298/BAH1802199R

ECO-FISH MEAL AS AN ALTERNATIVE TO FISH MEAL IN DIETS FOR LAMBS

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Original scientific paper

Abstract: The effect of Eco-fish meal, as an alternative to fish meal, on the production performance of the lambs of the Mis population in the intensive fattening, was investigated. The experiment was carried out on 40 lambs, the average age of 30 days, divided in 2 groups. In addition to mother's milk, the lambs were given a concentrated mixture and a lucerne hay, at will. Isoprotein forage mixtures (16% of total proteins) differed in terms of the protein component. The protein source for treatment I had fish meal, while the animals on treatment II consumed EcoFish, a herbal substitute for fish meal, which consisted of domestic foods of known origin such as genetically unmodified and thermally treated meal of decorticated soybean grains, soybean protein isolates, gluten, livestock yeast with the addition of minerals, amino acids, vitamins, enzymes and other additives. Statistical processing of the obtained data was done using the SPSS STATISTICA, Version 20.

On treatments I and II, the average daily lamb gain was 320 and 283 g, respectively, without statistical significance. The consumption of dry matter and proteins in analogue treatments was 0.819 and 0.823 kg, and 152.62 and 157.04 g, respectively. The dry matter consumption per kilogram of gain (kg/kg of gain) was 2.56 and 2.91; of energy (MJ NEM/kg): 17.65 and 20.25; of total proteins: 476.9 and 554.9 g, respectively. The protein efficiency ratio - PER (g of gain/g of consumed protein) in analogue treatments was: 2.09 and 1.80. There were no statistically significant differences between examined treatments ($P > 0.05$).

Considering that the source of protein did not significantly affect the intensity of growth and the use of food by lambs of Mis population in intensive fattening ($P>0.05$), fish meal can be replaced by Eco-fish meal - plant protein, since according to Commission Decision 9/2001 on BCE protection (OJEC, 2001), there is a distance to the use of fish meal, as a source of protein.

Keywords: fish meal, Eco fish meal, lambs, daily gain, conversion

Introduction

In ruminant nutrition, protein requirements are provided microbial and non-degradable protein at the level of the rumen, which is absorbed directly into the small intestine (*Can et al., 2005*). The microbial protein is not sufficient for the expression of the genetic potential of lambs that have an intensive gain, which implies the use of protein nutrients with a high share of non-degradable proteins.

Fish meal is an excellent source of high-quality protein that slowly degrades in the rumen (*Amos et al., 1975, ARC 1980, Adam et al., 1982, Zebrini and Polan, 1985*) and has an excellent amino acid profile. In the research of *Orskov et al. (1971),* in fattening male lambs of 15-50 kg, the increase in fish meal in rations from 1 to 6 and 12% caused an increase in daily gain: 0.191, 0.270, 0.330 kg, respectively. Also, studies of *Beermann et al. (1986)* show that the replacement of soy meal with 3% of fish meal in the diet of lambs crosses of Suffolk x Dorset breeds resulted in increased daily gain and improved feed conversion ratio: 0.441 kg and 3.52 kg relative to 0.350 kg and 3.90 kg, realized by animals on the treatment without fish meal. In contrast, in the studies of *Ponda (1984), Hussein and Jordan (1991)* and *Cana (2004),* the intensity of lamb growth was not improved by incorporating fish meal as a protein component into a diet.

According to Commission Decision 9/2001 on the protection of BCE (OJEC, 2001), food containing fish meal can not be produced in manufacturing plants that produce food for ruminants, which in some ways leads to the distance to fish meal, as a high-quality protein source.

Considering the above facts, the aim of this study was to examine the possibility of using Eco Fish Meal (high protein plant feed), as a substitute for fish meal, in rations for fattening lambs.

Material and methods

The experiment included 40 lambs of MIS population, distributed in 2 groups of 20 heads, gender-balanced (10 male and 10 female). Lambs were about 30 days old and on average 14 kg of body weight. In addition to mother's milk, lambs were given a forage mixture and an alfalfa hay, at will. The feedingstuffs contained 16% of the total protein, but differed in terms of the protein component. The lambs in treatment I received fish meal as a source of protein, while the animals in treatment II received Eco fish meal, a replacement for fish meal. This product contains domestic nutrients of known origin such as genetically unmodified and thermally processed meal of decorticated soybean grain, soybean protein isolate, gluten, livestock yeast with the addition of minerals, amino acids,

vitamins, enzymes and other additives. The comparative chemical composition of the mentioned protein components is shown in Table 1. The structure of the used feedingstuffs is shown in Table 2, while the nutritional value of the feedstuffs is shown in the Table 3. The trial lasted for 60 days. Changes in body weight, total gain, average daily gain, feed consumption and conversion were controlled at 15 day intervals, while initial and final weight were determined by measurements in three consecutive days. Statistical data processing was performed using SPSS STATISTICA, Version 20.

Table 1. Comparative chemical composition of fish meal and Eco fish meal,%

Indicator	**Fish meal**	**Eco fish meal**
Chemical composition, %		
Dry matter	92	92
Protein	62	60
Ash	20	7
Fat	7	5
Fibres	1	4
Macroelements, %		
Calcium	5.65	0.6
Phosphorus, total	3.16	0.4
Sodium	0.56	0.16
Aminoacids,%		
Lysine	4.74	4.70
Methionine	1.75	1.77
Threonine	2.51	2.39
Tryptophan	0.65	0.65

Table 2. Structure of the concentrate mixture for fattening of lambs up to 90 days of age, %

Feedstuff	I	II
Maize	70	70
Sunflower meal	20	20
Fish meal	6	-
Eko fish meal	-	8
Livestock limestone	2	2
Salt	1	1
Premix	1	1

*Calculated according to Obračević (1990)

Table 3. Nutritional value of feedstuffs used in the experiment

Feedstuffs	DM,%	Total protein,%	MJ, NEM
Forage mixture I	88.35	16.10	6.94
Forage mixture II	88.13	16.00	6.90
Hay	88.33	15.36	4.10
Milk	16.14	5.68	2.32

Results and discussion

Tables 4 and 5 show the performance of experimental lambs that were included in the treatment fish meal (I) and Eco fish meal (II). The protein source did not significantly affect the body weight, total and average daily lamb gain (P>0.05). Our results are in agreement with *Ponda (1984), Hussein and Jordan (1991)* and *Cana et. al. (2004*), who state that the lamb growth rate is not improved by the inclusion of fish meal in diets for lambs. Also, *Banskalieva et al. (2005)* has found that supplementing the fish oil in diets for goats, aged 14 days, did not induce significant changes in the average daily gain (90.33g versus 82.42g). Comparing the effect of replacing soybean meal with fish meal in rations for fattening lambs, *Dabiry and Thonney (2001)* have found that feeding treatment did not affect the intensity of lamb growth, which is consistent with our results. Thus, fish meal can be successfully replaced with plant protein sources in fattening lamb, provided they are balanced in terms of net energy and amino acid content. The explanation for this phenomenon lies in the fact that the level of total proteins of 16%, in iso-energetic diets, provides optimum conditions for the development of the microflora of rumen and the expression of the production potential, or the genetic capacity of the growth of the experimental lambs.

Table 4. Performances of the experimental lamb

Indicators	I	II	Level of significance
Initial body weight (kg)	14.55±2.61	14.57±2.93	NS
Final body weight (kg)	31.95±3.28	30.75±3.59	NS
Total gain (kg)	17.40±2.34	16.18±1.96	NS
Average daily gain, g	320±39.09	283±32.73	NS

I Fish meal (FM)
II Eko fish meal (EFM)

Table 5. Consumption and conversion of food and nutrients of experimental lamb

Indicators	I	II
DM consumption, (kg/day)	0.819	0.823
Total protein consumption, (g/day)	152.62	157.04
Energy consumption, (MJ/day)	5.65	5.73
DM conversion, (kg DM /kg of gain)	2.56	2.91
Total protein conversion, (g/kg of gain)	476.9	554.9
Energy conversion, (MJ/kg of gain)	17.65	20.25
PER, (g of gain /g cons.protein)	2.09	1.80

*PER, protein efficiency ratio
NS = not significant (P>0.05)

Contrary to this, our results do not agree with the results of some authors' examinations. By examining the effect of replacing the urea with fish meal on the production performances of Awassi lamb, *Can et al. (2005)* has found that the animals fed fish meal had an average daily gain of 0.268 kg and with urea 0.236 kg. The average consumption of dry matter was 1.148 and 1.064, while the efficiency of protein utilization (PER) was 1.67 and 1.58 (g of gain/g of consumed protein), respectively. Also, *Ponnampalam et al. (2005),* by examining the influence of different sources of protein (canola, soybean meal, fish meal) on the production performance of lambs in fattening, have found the highest average daily gain at the level of P<0.01 (163 g) in animals on the treatment with fish meal, also the most favourable food conversion, P<0.001, (6.0 kg / kg of gain) as well as the thickness of the fat tissue (10.1 mm). Given that fish meal is an excellent source of high-quality proteins, of excellent amino acid profile, part of this response can be attributed to improved fibre digestion in rumen as a result of the availability of amino acids and ammonia used for microflora growth. This results in agreement with research by *Chalupa (1975),* who has concluded that the level of non-degradable protein, fish meal being an important source of it, is the most significant in young animals with intense muscle growth especially in the first 40 days of age, in which the microbial protein is not sufficient to express the genetic potential of the lamb.

Different responses to the effects of replacing fish meal with plant protein sources are explained by variations in the degradation of animal and plant proteins. In addition, the degree of degradability depends on the nature of the nutrient itself and on the associative effect of the ingredients of the diet as well as the method of treatment. Nutrition of ruminents with a high level of grain feeds causes a decrease in the pH of the rumen, which may result in a decreased cellulolytic activity of the microflora. Higher levels of total protein meals can compensate for poor distribution of amino acids and be more economical than procuring expensive sources of non-degradable protein.

Conclusion

On the basis of the obtained results of the examination of the effects of replacing fish meal with plant proteins in diet for lambs in fattening, the following conclusions can be made:

- The average daily lamb gain on treatments I and II was 320 and 283 g, without statistical significance (P> 0.05);
- Average consumption of dry matter and total proteins in analogue treatments was 0.819 and 0.823 kg/day and 152.62 and 157.04 g/day, respectively;
- The dry matter consumption (kg/kg of gain) was 2.56 and 2.91, while the protein conversion (g/kg of gain) was 476.9 and 554.9, respectively.
- The protein efficiency ratio (PER) was: 2.09 and 1.80 (g gain/ g of protein consumed).
- The source of protein did not significantly affect the growth rate and the efficiency of food utilization in the lambs of the MIS population in fattening (P>0.05), suggesting that fish meal can be successfully replaced by Eco fish meal, considering that, based on Commission Decision 9/2001 on protection of BCE (OJEC, 2001), there is a distance to use fishmeal as a source of protein.

Eko-fiš meal kao alternativa ribljem brašnu u obrocima za jagnjad

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Rezime

Ispitivan je uticaj eko fiš meal kao alternative ribljem brašnu, na proizvodne performanse jagnjadi Mis populacije, u intenzivnom tovu. Eksperiment je izveden na 40 jagnjadi, prosečnog uzrasta 30 dana, raspoređenih u

2 grupe. Pored majčinog mleka, jagnjad su dobijala koncentrovanu smešu i lucerkino seno po volji. Izoproteinske krmne smeše (16% ukupnih proteina) su se razlikovale u pogledu proteinske komponente.Izvor proteina na tretmanu I je bilo riblje brašno, dok su grla na tretmanu II konzumirala Eko fiš meal-biljnu zamenu za riblje brašno, koja se se sastojala od domaćih hraniva poznatog porekla kao što su genetski nemodifikovano i termički obrađeno brašno oljuštenog zrna soje, izolat proteina soje, glutena, stočnog kvasca uz dodatak minerala, aminokiselina, vitamina, enzima i drugih dodataka.
Statistička obrada dobijenih podataka je izvršena korišćenjem SPSS STATISTICA, Version 20.
Na tretmanima I i II, prosečan dnevni prirast jagnjadi je iznosio: 320 i 283 g, bez statističke značajnosti. Konzumiranje suve materije i proteina na analognim tretmanima, je iznosilo: 0.819 : 0.823 kg, odnosno 152,62 : 157,04g. Utrošak suve materije po kilogramu prirasta je(kg/kg prirasta) je iznosio: 2,56 : 2,91; energije (MJ NEM/kg): 17,65 : 20,25; ukupnih proteina: 476,9 : 554,9 g. Efikasnost iskorišćavanja proteina - PER (g prirasta/g konzumiranog proteina) na analognim tretmanima je iznosila: 2,09 i 1,80. Nisu ustanovljene statistički značajne razlike između ispitivanih tretmana (P>0,05).
Obzirom da izvor proteina nije značajno uticao na intenzitet rasta i iskorišćavanje hrane kod jagnjadi Mis populacije u intenzivnom tovu (P>0,05), riblje brašno se može zameniti Eko fiš-meal- biljnim izvorom proteina, budući da prema odluci Komisije 9/2001 o zaštiti BCE (OJEC, 2001),postoji distanca prema korišćenju ribljeg brašna, kao izvoru proteina.

Ključne reči: riblje brašno, eko fish meal, jagnjad, dnevni prirast, konverzija

Acknowledgment

This research was funded by the Ministry of Education, Science and Technological Development, Republic of Serbia within project TR-31053.

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Received 3 May 2018; accepted for publication 21 June 2018