

# Feeding female lambs with peas and soybeans as protein sources

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## SUMMARY

There is insufficient data on the direct use of grain legumes as protein sources in the feeding of ruminants and, in particular, of sheep and lambs. The purpose of this study is to track the growth and consumption of feed for breeding female lambs of 19.4 kg weight when replacing sunflower meal "Sunpro 46" with a high protein content, with peas and thermally treated soybean grains. 30 female lambs of Pleven Black Head breed were used for 3 groups corresponding to three types of rations, respectively with the participation of "Sunpro-46" and grains of soybean and peas as protein sources. Lambs from all three groups received an equal amount of compound feed of 18% protein content. It was found that the thermally treated soybean and pea grains as protein sources in compound feed has the same impact as "Sunpro-46" on the weight development of female lambs for breeding with weight from 19 kg to 28 kg. An average daily weight gain of 0,205-0,209 kg for female lambs was obtained for all types of rations. Feed intake per 1 kg weight gain was 4.9 kg DM, regardless of the protein source in the ration.

Keywords: feeding, female lambs, peas, soybeans

## INTRODUCTION

Protein sources for animal nutrition - in Europe are limited. Over the last decades, research programs have focused on refining the animal's needs for protein and its digestibility. The use of genetically modified soybean varieties and, accordingly, the use of soybean meal from GMO varieties has forced Europe to search ways to increase the share of own sources of legume plant protein. The inclusion of legumes in crop rotation schemes largely reduces nitrogen fertilization, enriches the soil with nitrogen and is an important element in organic farming. To date, the European Commission has allocated funds to help producers who grow protein crops for green manure or for feed by paying additional subsidies. This policy encourages producers to increase the area of cultivated various forage legumes and increase the share of their use in animal rations (Volek,

2009). Studies in our country (Shyndarska *et al.*, 2002) for different levels and sources of protein in the compound feed (sunflower meal, urea and combination of them) showed that the productivity of lambs for fattening is not substantially influenced by the origin of the protein. There are insufficient data on the use of legume beans such as soybeans and peas as protein sources in ruminant feeds and in particular, sheep and lambs (Kirilov, 2005; Kirilov, 2011; Kirilov, 2012).

The purpose of this study is to track the growth and consumption of feed for breeding female lambs of 19.4 kg weight when replacing sunflower meal "Sunpro 46" with high protein content, with peas and thermally treated soybean grain. The price of "Sunpro 46" is about 15% lower than that of soybean meal but the quality parameters are the same.

## MATERIAL AND METHODS

The experience was conducted between May and June 2017 in the experimental platform at the Institute of Forage Crops - Pleven. 30 female lambs of Pleven Black Head breed were used. The lambs entered in experiment after reaching a live weight of 19.4 kg. Before that they were weighed individually in two consecutive days. The average weight of the two measurements was assumed to be the initial live weight of the animals entering the experiment. Animals were divided into three groups of 10 animals each.

In the first group, the lambs received compound feed consisting of sunflower meal "Sunpro-46" (23.27%) as a protein source, corn (74.73%) and vitamin-mineral supplement and salt (2%).

In the second group of lambs, half of the protein in the compound feed was replaced with soybeans - 8,25% and peas - 12,95% and the other half consisted of sunflower meal "Sunpro 4" - 12,95%. Corn - 63.82%, vitamin-mineral supplement and salt - 2% were included in ration. In third group, only soybeans - 18.00% and peas - 24.65% were used as protein sources. And respectively, corn - 55.35% and vitamin-mineral supplements and salt - 2% were used in the compound feed.

Lambs from all three groups received an equal amount of compound feed of 18% protein content. Grain feeds were pre-milled through a sieve of 8 mm size for a better intake of lambs. The rations were balanced by energy, protein and mineral substances for a daily gain of 225 g, according to the feeding standards for lambs with live weight of 20 kg (Todorov *et al.*, 2010; Todorov *et al.*, 2011). In order to better measure the effect of the protein source used, medium quality alfalfa hay (15% refusals) was used in all three groups. The daily ration of feed was given twice - at 8 a.m. and 4 p.m. Daily the remainder of the previous ration was collected and weighed

in the morning before the new ration for the day. The animals had free access to drinking water and salt for licking. Duration of the trial period was 42 days. During the trial the lambs were measured every 14 days.

Samples from the used feeds were taken weekly for determination of dry matter at 105 ° C, as well as chemical analysis for samples dried at 65 ° C. The *Weede* chemical analysis was performed on the samples (roughage and compound feed). Samples before to analysis were ground through a 1 mm sieve by *Retsch SM100 mill*. Dry matter (DM) at 105 ° C to constant weight was determined according to BDS-ISO 6498. Crude Protein (CP) was determined by *Kjeldahl* method according to BDS-ISO 5983 and also, Crude Fiber (CF) was determined (AOAC, 2007).

## RESULTS AND DISCUSSION

The data of the chemical composition of the feed used in the lamb experiment are shown in Table 1.

**Table 1.** Chemical composition of feed used, % of DM

Feed	DM	CP	CF
Corn	93.87	8.85	3.36
Sunflower meal "Sunpro-46"	92.00	48.91	7.06
Soybean (grain)	95.40	36.68	13.05
Peas (grain)	93.09	23.98	6.05
alfalfa hay	92.13	13.36	34.04

The differences in the CP content in sunflower meal "Sunpro-46" (48.91%) are large compared to the other two protein sources - peas (23.98%) and soybean (36.68%), which is due to the high quality of the product " Sunpro-46 ", a high-protein and low-cellulose fraction of sunflower meal. High protein content provides a basis for satisfying the nutritional and energy needs of the growing organism, as well as achieving high productivity of lambs. CF in soybeans is higher (13.05%), compared to peas (6.05%) and sunflower meal "Sunpro-46" (7.06%). The results from laboratory analysis of alfalfa hay correspond to reference literature for medium-quality hay.

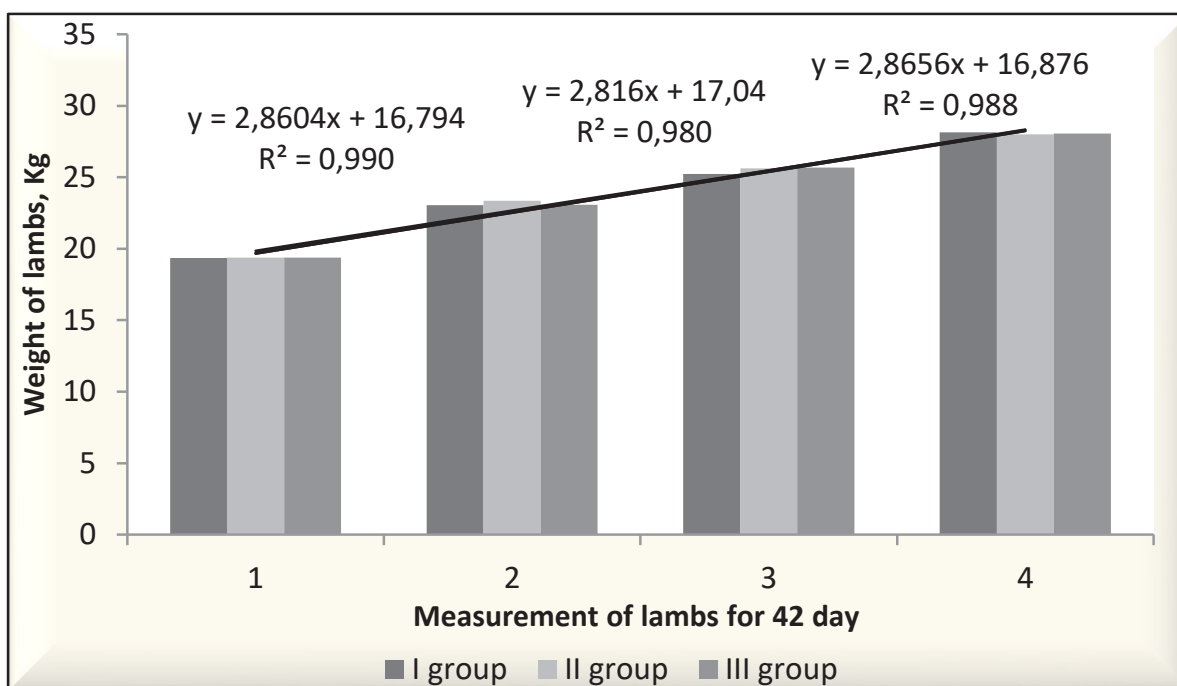
Weight at start of experiment and the end of the trial is approximately the same in all three groups of experimental lambs (Table 2). The total growth gain of lambs fed with the three different rations is approximately equal, regardless of the share and participation of protein sources. The average daily gain from measurements made over 14 days varies in narrow range, from 0.205 kg to 0.209 kg for all three groups of lambs. The growth and development of lambs in all three groups showed resistance and persistence in the mean increase, with no significant differences in the

experimental groups. The results obtained correlate with those of other authors. Krachunov *et al.* (2007) obtained a gain of 0.207 kg for fattening lambs with sunflower meal, close to our results. A lower average daily gain of lambs fed on base of sunflower meal -0.180 kg / day was obtained by Yossifov (2013) and when its fed on base of rapeseed meal, the results - 0.231 kg / day are higher than ours.

**Table 2.** Growth gain for experimental groups of lambs, kg

Parameters	First group	Second group	Third group
	100% Sunflower meal Sunpro	½ Sunflower meal Sunpro	100% soybean and peas
Weight - start of experiment	19.35	19.37	19.37
Weight - end of experiment	28.15	28.00	28.05
Total growth gain	8.80	8.63	8.68
<b>Average daily gain</b>	<b>0.209</b>	<b>0.205</b>	<b>0.206</b>

Figure 1 shows the growth of the lambs by weeks of the test groups. In the first week of the trial, the weight of the lambs was equalized for all three groups. It was found that weight for all three groups increased by an average of 2.8 kg per week with a very high correlation, respectively for the first, second and third groups:  $R^2 = 0.990$ ,  $R^2 = 0.980$  and  $R^2 = 0.988$ .



**Figure 1.** Growth of lambs during the trial

The daily amount of feed intake for one animal ranges from 1.014 to 1.034 kg of DM (Table 3). The amount of alfalfa hay intake varied from 0.246 kg to 0.266 kg per animal per day. The average intake feed for 1 kg

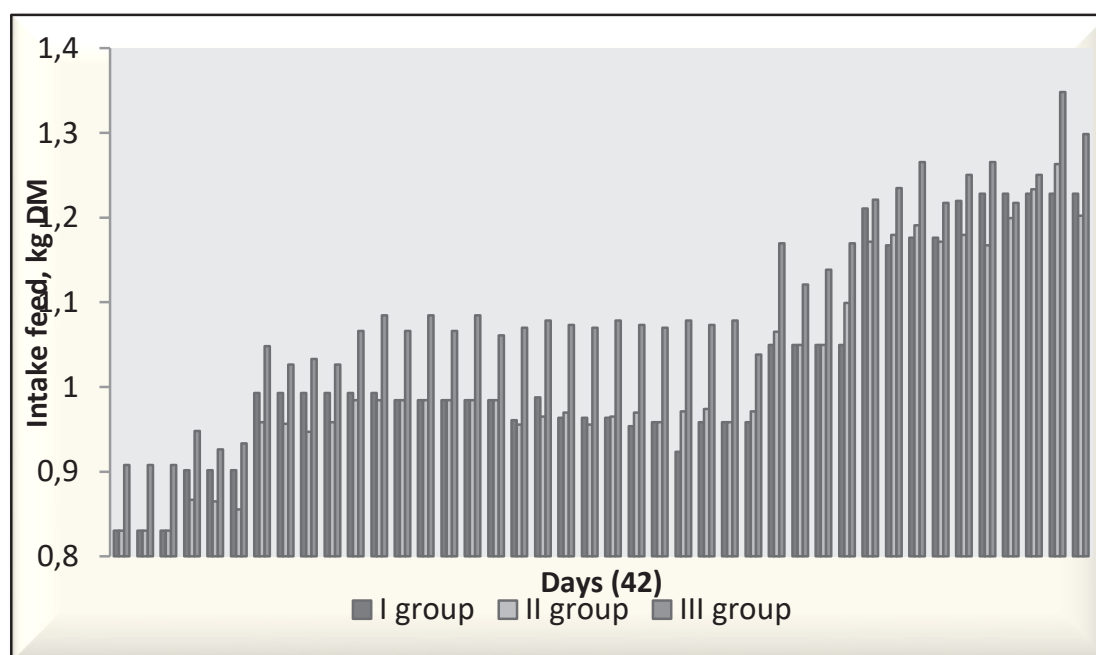
growth gain was about 4.9 kg DM for all the three groups of lambs. Lower values for intake feed per kilogram of growth gain were obtained by Krachunov et al. (2007), and it was found that in a group of lambs fed on ration of 26% sunflower meal, the intake feed was 4.47 kg of DM, as compared to our results.

**Table 3.** Intake feed for experimental groups of lambs, kg DM

Parameters	First group 100% Sunflower meal "Sunpro-46"	Second group ½ Sunflower meal "Sunpro-46"	Third group 100% soybeans and peas
<b>DMI</b>	1.034	1.014	1.025
Compound feed	0.768	0.768	0.768
Alfalfa hay	0.266	0.246	0.257
<b>FC</b>			
whole diet, kg DM	4.947	4.946	4.975
compound feed, kg DM	3.674	3.746	3.728

Note: DMI = dry mater intake, FC = feed conversion, expressed as kg DM / kg gain

Higher values for intake feed per kg were also established by Yossifov et al. (2013), respectively - 6.38kg DM, as compared to our results (Figure 2). Compound feed intake in this study was 3.6 to 3.7 kg DM. The use of different protein sources in fattening lambs after weaning to higher weight depends on their effectiveness. In studies with early weaned lambs with weight of 10 kg for fattening up to 25 kg, an average daily gain of 0.218 and 0.221 g was obtained using dry distillers grain and sunflower meal and limited amount of soybean meal (Simeonov, 2012).



**Figure 2.** Feed intake for 42 days of trial, kg DM

## CONCLUSIONS

The results obtained in determining the growth gain and consumption of feed for breeding female lambs of 19.4 kg weight when replacing sunflower meal "Sunpro 46" with a high protein content, with peas and thermally treated soybean grain allow the following conclusions to be drawn:

-It was found that the thermally treated soybean and pea grains as protein sources in compound feed for lambs has the same impact on the weight development of female lambs from 19 kg to 28 kg as Sunpro 46; An average daily weight gain of 0.205-0.209 kg for female lambs was obtained for all the three types of rations, respectively with the participation of sunflower meal "Sunpro-46" and grain of soybeans and peas.

-Feed intake per 1 kg of weight gain was 4.9 kg DM, regardless of the protein source in the ration (sunflower meal, soybeans and peas).

-It can be concluded that soybean and pea grains can successfully replace the "Sunpro 46" as the protein source in lamb rations.

## REFERENCES

- AOAC, 2007. Official Methods of Analyses of AOAC International (18 Edition, revision 2). Association of Official Analytical Chemist International, Gaithersburg, MD, USA.
- BDS ISO 5983, 2006. Feed. Determination of nitrogen content and calculation of crude protein content - Kjeldahl method. State Agency for Standardization and Metrology, Sofia.
- BDS ISO 6498, 2007. Feed. Preparation of the test samples. State Agency for Standardization and Metrology, Sofia.
- Kirilov A., 2005. Opportunities for use of grains of legumes as a source of feeding protein of ruminants. Scientific reports, UNC 80 years old Pavlikeni. "Selective and technological aspects of the production and processing of soybeans and other legumes" 08 September 2005, Pavlikeni, 175-180
- Kirilov A., I. Krachunov, G. Mihailova, 2011. Influence of soybean meal, sunflower meal and peas on milk production in sheep. Journal of Mountain Agriculture in the Balkans, 14 (3): 418-430.
- Kirilov A., M. Simeonov, 2012. Influence of soybean and beer pulp on the milk production of sheep. Journal of Mountain Agriculture in the Balkans, 15 (3): 599-608.
- Krachunov I., A. Kirilov, K. Ivanov, 2007. Influence of the source of plant protein on the productivity of lambs for fattening. Journal of Mountain Agriculture in the Balkans, 10 (1): 22-29.

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- Shyndarska Z., Ganchev, G., Krasteva, M., 2002. Effect feeding with different levels and sources of protein in fattening lambs. *Animal Breeding Sciences*, 4-5: 37-41.
- Simeonov M., 2012. Methods for early weaning of lambs from milk breeds and feeding systems. Abstract of thesis for obtaining scientific degree "Doctor", Pleven, Bulgaria.
- Todorov N., V. Atanasov, A. Ilchev, G. Ganchev, G. Mihaylova, D. Girginov, A. Penkov, Z. Shindarska, Y. Naydenova, K. Nedelkov, S. Chobanova, 2010. Practice on Animal nutrition, Ed. East-West, Sofia, ISBN 978-954-321-733-5.
- Todorov N., 2011. Granulated protein concentrate instead of starter mixture for lambs. *Feed and Nutrition*, 6: 32-35.
- Volek Z. and M. Marounek, 2009. Whole white lupin (*Lupinus albus* cv. Amiga) seeds as a source of protein for growing-fattening rabbits, *Animal Feed Science and Technology*, 152 (3-4): 322-329.
- Yosifov M., 2013. Utilization of by-products from the production of biofuels in sheep feeding. Abstract of thesis for obtaining scientific degree "Doctor", Kostinbrod, Bulgaria.