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CARCASS CHARACTERISTICS OF FEEDLOT LAMBS FED DIETS WITH SOYBEAN WHOLE AND SUPPLEMENTED WITH VITAMIN E

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ABSTRACT

The objective of this study was to evaluate the feedlot lambs carcass characteristics fed with diets containing three levels of replacement of soybean meal by soybean grain and vitamin E supplementation (with or without it). We used 30 male Ile de France castrated lambs, with average weight of 18 kg randomly drawn between levels of inclusion of soybean (0, 7 and 14%) and supplementation with vitamin E. Evaluated the dry matter intake (DMI), average daily gain (ADG), the slaughter weight (SW), hot carcass weight (HCW), cold carcass weight (CCW), carcass yield (HCY), cold carcass yield (CCY), index chilling losses (ICL). The diet had a significant influence over the SW, HCW and CCW. The different tissues of the leg were not affected by the diet or the supplementation with vitamin E. The vitamin E supplementation does not alter the quantitative parameters of the carcass. The inclusion of soybeans up to 14% in the dry matter is recommended.

Key words: Carcass composition, carcass yield, feed management, sheep

INTRODUCTION

The Brazilian production system is directed to product cutting sheep. The demand for meat from young animals has been increasing. Moreover, the contemporary consumer appreciates the cutting presentation and especially of the ones with little fat.

Currently the market is plaintiff, i.e., everything that is produced is virtually assured outlet if the product is within the standards required by the consumer[1]. But the sheep industry still faces problems such as the supply of animals for slaughter, uniformity and consequent standardization of carcasses. Moreover, the price of meat varies depending on the amount available on the market. The consumer purchasing power cannot always achieve the purchase of lamb standard, even in traditionally consuming regions. As the price of meat can be considered limiting, the production in scale could be one of the solutions.

It is essential in this growing phase of the activity, the implementation of rational techniques during breeding, slaughter and post-mortem, focusing on improving the quality of carcasses and meat to the market interested in the product[2].

The feed management, among other factors, influences the characteristics of the meat as the distribution of covering fat, intermuscular and intramuscular, development of muscle tissue and carcass yield[3]. The energy supply by time short periods can affect growth, carcass traits, and meat quality[4]. The feed management, among other factors, influences the characteristics of the meat as the distribution of covering fat, intermuscular and intramuscular, development of muscle tissue and carcass yield[3]. The energy supply by time short periods can affect growth, carcass traits, and meat quality[4]. Sources of lipids, such as oilseeds, to provide energy and because they have a high crude protein (CP) content, can be viable for sheep farmers, especially when containment systems are adoted[5].

When the confined animals are fed with diets rich in concentrates, they show more uniform carcasses, and meat with higher fat marbling and with better color[5]. The color of the meat is the characteristic thar the consumer has at the time of purchase[6], as well as the amount of cover fat in meat of sheep.

Animals still in the growing process need vitamin E sources, as the deficiency of it may cause muscle degeneration and thus growth retardation. The association of vitamin E supplementation with fat source inclusion in the diet can contribute to the production of uniform carcasses, with a smaller period of confinement. This study aimed to evaluate the carcass characteristics of feedlot lambs fed with diets containing three levels of substitution of grain for soybean meal and with the soy supplementation with vitamin E (with or without supplementation).

MATERIAL AND METHODS

The experiment was conducted in the sheep breeding sector in the Federal Institute of Education, Science and Technology - IFRS Campus Sertão, in the municipality of Sertão, RS, from October to December 2011.

It was used a total of 30 Ile de France breed uncastrated male lambs, housed in individual pens after weaning, which occurred approximately in their 60 days old, with average live weight of ± 18 kg and raffled among the inclusion levels of soybean (0, 7 and 14%) and vitamin E supplementation (with or without supplementation), it was 5 animals / treatment.

The experimental diets were formulated according to the NRC[7] to meet the nutritional requirements of 250g of weight gain. The relationship of dietary ingredients was 30:70, ie 30% of roughage and 70% concentrate. The formulation consisted of Tifton 85 hay, ground in a hammer mill particle of 1 cm, ground corn, soybean meal, crushed soybean and commercial mineral supplement (Table 1). Food was provided ad libitum in two meals a day (at 08:00 and 16:00), and each meal was composed of 50% of the daily total offered. The remains of food were quantified to determine the daily dry matter intake per pen. The chemical analyzes were performed according to AOAC[8]. The animals had access to water profesuly.

In the morning after the collection of the remains it was carried out the cleaning of the troughs and provided vitamin E powder, in the amount of 500 mg / animal. The supplementation with vitamin E was performed with a-tocopherol. The experiment was preceded by a period of 14 days of animals adptation to the diet, and facilities management. The animals were confined until they reach slaughter weight of 38 kg, with an average of 120 days of age for the level of inclusion of soybeans and 130 days old on average to treat 14% of inclusion of soybeans. The weight measurements were performed weekly.

Table 1. Percentage breakdown of the ingredients of experimental diets and their chemical composition

Ingredients	**Diets %**		
	Control	**7% soybeans**	**14% soybeans**
Tifton	30,0	30,0	30,0
Ground corn	50,5	50,5	49,5
Soybean meal	13,0	6,0	-
Soybeans	-	7,0	14,0
Mineral core*	3,0	3,0	3,0
Limestone	3,5	3,5	3,5
DM%	Chemical composition %		
Crude protein	16,0	16,0	16,0
Total digestible nutrients	69,0	69,1	69,3
Neutral detergent fiber	40,9	38,8	37,4
Ether extract	3,9	5,5	5,9
Calcium	1,9	1,22	1,21
Phosphorus	0,55	0,57	0,60

*Composition of the mineral core: Calcium: 240 g; Phosphorus: 70 g; Magnesium: 21 g; Sulfur: 20 g; Cobalt: 30 mg; Iron: 250 mg; Iodine: 40 mg; Manganese: 1350 mg; Selenium: 15 mg; Zinc: 1700 mg; Fluorine: 710 mg; Vitamin A: 135.000 UI.

After 18 hours fasting, the animals were weighed for the weight determination at slaughter. The slaughter took place in a commercial refrigerator, according to the normal flow of the establishment. The desensitization was performed after animal stun concussion, followed by bleeding in the carotid and jugular section. Sequentially the skin was removed, the evisceration was performed and the separation of the head and the extremities.

The entire animal carcass was weighed to obtain the hot carcass weight (HCW). The carcasses were brought to the freezer with an average temperature of 2°C and relative humidity of about 90%, for a period of 24 hours. After this time the carcasses were weighed to obtain the cold carcass weight (CCW) and calculated hot carcass yield (HCY) and cold carcass yield (CCY).

The ½ carcasses in the left were sectioned into eight commercial courts, 24 hours post-mortem. The cuts were: leg, loin, loin, chest/breast, shoulder and neck. The evaluation of fat thickness (SFT) was obtained by exposing the longissimus dorsi muscle after a cross-section in the housing between the 12th and 13th rib, with the aid of a digital caliper.

The dissection of the leg sections was performed with blades number 23, for determining the tissue composition in: total fat – TF, subcutaneous fat - SF and intermuscular – IF, muscle tissue - MT, other tissues - OT and tissue bone – TB. The different tissues were individually weighed to be expressed in grams (g) and percentage (%) relative to its weight of cut.

The experimental design was completely randomized in a factorial 3 x 2 (three levels of inclusion of soybeans and with or without vitamin E supplementation). The data was submitted to the analysis of variance model with factors including soybean inclusion levels, supplementation with vitamin E (supplementation or not), and their interaction. For the analysis of variance, it was used PROC GLM of SAS[9]. The average was performed using the Tukey multiple comparison test, considering the level of 5% probability.

RESULTS AND DISCUSSION

The Table 2 shows the average value for the consumption characteristics of dry material (DMI), average daily gain, weight and yield of the carcass of Ile de France lambs breed at different levels of soy beans inclusion in the diet and supplementation or with no vitamin E.

Table 2. Cost of production, dry matter intake and carcass characteristics of Ile de France lambs fed soybeans and supplemented with vitamin E

Variable	Vitamin E		Inclusion of grains			MSE	Significance level		
	Absence	Presence	0	7	14		Vitamin	Soybean	V X S
Cost/day (R$)	0,73	0,75	0,73	0,79	0,82	0,52	0,778	0,068	0,258
DMI (kg/day)	1,19a	1,1a	1,24a	1,11b	1,05c	0,037	0,301	0,001	0,217
ADG (g/day)	0,265a	0,257a	0,286a	0,263b	0,253c	0,029	0,073	0,001	0,245
SW,Kg	38,41a	38,16a	38,60a	38,07b	37,96b	2,78	0,074	0,0132	0,0614
HCW,kg	18,87a	18,67a	19,04a	18,71b	18,54b	1,39	0,2141	0,006	0,087
CCW,Kg	18,33a	18,10a	18,55a	18,07b	17,80b	1,51	0,1108	0,001	0,1551
HCY,%	49,22	49,10	49,31	49,20	49,03	2,77	0,0832	0,0832	0,2763
CCY,%	47,52	47,54	47,70	47,56	47,33	0,68	0,946	0,9030	0,075
CBI, %	3,21	3,46	3,12	3,37	3,52	0,09	0,0946	0,9030	0,075
SFT,mm	1,71	1,72	1,74	1,73	1,69	0,13	0,1739	0,913	0,6261

DMI: dry matter intake; SW: slawghter weight; ADG: avarege daily gain; HCW: hot carcass weight; CCW: cold carcass weight; HCY: hot carcass yield; CCY: cold carcass yield; CBI: cooling by breaking index; ST: subcutaneous fat thickness. MSE: Mean standard error.
Vitamin - effect of vitamin E; Soybean - effect of dietary soybean inclusion level.
Means followed by different letters in the line differ by Tukey test at 5% probability.

There was no significant interaction between soybean inclusion levels and vitamin E supplementation on dry material consumption, average daily gain, carcass weights and yields. The confinement period required to the lambs to reach 38 kg body weight ranged from 58 to 70 days, with higher production costs in the treatments of 14% and 7% inclusion of soybean respectively. The lambs not supplemented with vitamin E and without the addition of soy beans in the diet had a lower cost power.

The DMI had an average of 1.13 kg / day, approximately the recommended by NRC[7] to the sheep of this category, ranging from 1.0 to 1.3 kg / day [4]. Yamamoto[10] when using diets with high concentrate for lambs observed DMI 0.9 and 1.0 kg / day respectively.

There was a significant effect of (P<0.05) for adding soybeans in the diet. Animals from the control treatment, ie without inclusion of soybeans had higher DMI in relation to other treatments. Probably the reduction in DMI was due to a "feedback" chemostat[11], with DMI adjusted to maintain constant power consumption, since there was an increased caloric density provided by the high content of lipid in the animal ration.

The results were significant (P<0.05) for slaughter weight (SW), hot carcass weight (HCW) and cold carcass weight (CCW), with higher values in the control treatment. But the variables hot carcass yield (HCY), cold carcass yield (CCY), index chilling losses (ICL) and subcutaneous fat thickness (SFT) suffered no significant influence of diet (P> 0.05). None of the parameters was affected by vitamin E supplementation (P>0.05).

There was no difference between the treatments for HCY, CCY, ICL and SFT whose average observed were 49.21, 47.53, 3.33% and 1.7mm respectively. The results corroborate[4], to evaluate the carcass characteristics of the breed Santa Inês lambs fed with different levels of inclusion of soy beans in the diet (0, 7,

14 and 21%) reported live weight values end lower the extent to which increased consumption by animals soybeans.

Probably it was the best performance of the control treatment of lambs (0% soybean) compared to other treatments, is due to higher DMI, which resulted in higher ADG, with consequent increase in SW, HCW and CCW.

The fat contains more energy than carbohydrates thus it is expected to increase the efficiency of utilization of feed consumed when the energy content of the feed is increased, since the DMI is not affected[12]. However, depending on the content or fat source used, animal performance may be compromised as long free chain polyunsaturated fatty acids are potentially toxic to the rumen microorganisms, particularly to the protozoal and cellulolytic bacteria[13], helping to reduce microbial activity and subsequent digestion[12].

In this work the EGS can be related to the age at slaughter. The lambs were slaughtered with an average of 130 days and 38 kg LW. Young animals tend to have lower fat deposition in the constituent tissues of the carcass, including subcutaneous fat when compared to older animals. Diets that have fat in their constitution can promote their deposition in the body of the animal but they can be influenced by the source of fat consumption by the animal, physiological state and category it is found in[13].

The Table 3 shows the average values for the weights of commercial cuts. For cuts of weights variables, there was no interaction between the factors studied. The mean shank cuts, shoulder, loin, chest and breast, loin and neck were not significant (P>0.05) in relation to the diet and vitamin supplementation.

Table 3. Yield of commercial cuts of France Ile lambs fed soybeans and supplemented with vitamin E

Variable	Vitamin E		Inclusion of grains			MSE	Significance level		
	Absence	Presence	0	7	14		Vitamin	Soybean	V X S
Leg,%	29,56	30,6	30,08	29,66	29,22	0,14	0,8665	0,3089	0,1305
Shoulder,%	16,24	16,35	17,03	16,52	16,47	0,38	0,3391	0,063	0,1579
Carré, %	16,68	17,23	17,25	16,47	16,19	0,43	0,1248	0,6089	0,3288
Chest/ diaper,%	21,6	21,21	22,93	20,26	20,13	0,28	0,2995	0,5135	0,2634
Loin,%	7,4	7,18	7,39	7,11	7,04	0,55	0,9033	0,4830	1,6798
Neck,%	7,82	7,62	7,65	7,4	7,35	0,17	0,4375	0,3556	0,6139

MSE: Mean standard error.
Vitamin - effect of vitamin E; Soybean - effect of dietary soybean inclusion level.
Means followed by different letters in the line differ by Tukey test at 5% probability.

Siqueira[14] working with F1 lambs Ile de France x Corriedade slaughtered at 28, 32, 36 and 40 kg live weight, found no difference in the leg yield, with an average of 34.08%. Yamamoto[15] evaluated the addition of fat sources (soybean oil, canola and flaxseed) in animal rations for lambs Santa Inês pure and crossbred Santa Inês x Dorset, slaughtered at 30 kg with an approximate age of 150 days, and also observed no difference in income cuts:

loin, shoulder and leg of animals fed with diets with fat sources, compared to the control diet.

The Table 4 shows the average figures for the income of the leg. There was no interaction between soybean inclusion levels and supplementation with vitamin E. The different levels of soybean inclusion and vitamin E supplementation did not significantly affect the weights of all the tissues studied (P>0.05).

The results of the composition of the leg tissues demonstrate that in these levels of inclusion of soy beans, the cut tissue composition does not change. However, according Preston and Willis[16], when animals are slaughtered at the same age, but under different diets, their carcasses tend to differ in fat content. The fat from the diet tends to promote its deposition in the animal housing, but varies widely and can be influenced by the type of fat consumption, physiological status and for animal category[17].

Table 4. Yield from lambs leg tissues Ile de France fed soybeans and supplemented with vitamin E

Variable	Vitamin E		Inclusion of grains			MSE	Significance level		
	Absence	Presence	0	7	14		Vitamin	Soybean	V X S
MT, %	68,6	67,5	67,7	66,3	68,2	0,11	0,7282	0,1164	0,5307
SF, %	8,2	9,0	8,9	8,9	9,0	0,07	0,2008	0,4312	0,4546
IF, %	5,1	5,1	5,3	5,5	5,3	0,28	0,2970	0,9743	0,8943
TB, %	14,3	14,1	14,0	13,9	14,0	0,07	0,2227	0,3011	0,1352
OT, %	4,0	4,0	3,9	4,1	4,0	0,13	0,1135	0,1178	0,2304

TM: muscle tissue; SF: subcutaneous fat; IF: intermuscular fat; TB: tissue bone; OT: other tissues.
MSE: Mean standard error.
Vitamin - effect of vitamin E; Soybean - effect of dietary soybean inclusion level.
Means followed by different letters in the line differ by Tukey test at 5% probability.

As for vitamin E supplementation, their inclusion in the diet did not cause any changes in the carcass parameter. MACIT[18] conducted a study to determine the effects of vitamin E supplementation on carcass characteristics of Morkaraman breed lambs and found no significant differences between groups.

CONCLUSION

With the conditions described in this experiment, the inclusion of soya beans up to 14% in the dry matter is recommended. Despite that the inclusion of soybeans in the diet affects CMS, GMD, PCQ and PCF the average values found are suitable for carcasses of lambs.

ETHICS COMMITTEE AND BIOSAFETY

The procedures were approved by the Ethics Committee on Animal Use of the Universidade Estadual Paulista (CEUA - FMVZ / UNESP), under protocol 160/2011.

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