Inclusion of dried distillers grains with solubles in Lepesdeza or Alfalfa-based diets for meat goats is associated with a unique ruminal microbiome

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Introduction

- The use of Distillers Dried Grains with solubles (**DDGS**) represents an alternative to decreased the cost of feeding in animal production systems.
- Previous studies reported that replacing corn and soybean meal with DDGS did not impact animal performance and carcass yield in lambs and goats.
- There is limited data on the effects of DDGS on microbiome and bacterial communities of ruminants

General Objective

- To evaluate the effect of replacement of corn and soybean meal with distillers dried grains with solubles (DDGS) in Lespedeza and Alfalfa-based diets on performance and microbial diversity in the rumen of growing meat goats.

Materials and Methods

- A total of 36 intact-male Spanish growing goats with a BW of 24 ± 1.8 kg randomly blocked in fours groups (N = 9). 1) SL Control, 2) SL DDGS, 3) ALF control and, 4) ALF DDGS
- The animals received four different isonitrogenous (CP =18.0 ± 0.1 %) and isocaloric (3.2 Mcal/ kg DM) diets in a completely randomized design for 60 days
- After the experimental period animals were slaughtered and rumen contents were immediately taken and store for 16s RNA sequencing
- Analysis of Similarity (ANOSIM) and linear discriminant analysis (LDA) effect size (LEfSe) were used to detect microbial community shift and differentially abundant taxa among treatments.

Results

Table 1. Ingredient composition of the experimental diets for meat goats (N= 9)

Ingredients % DM	SL control	SL DDGS	ALF control	ALF DDGS
Lespedeza	47.25	54.75	0	0
Alfalfa	0	0	40.5	51.7
Corn meal	20	0	26	0
Soybean meal	13	0	13	0
DDGS	0	20.5	0	18
Soybean hulls	8	12.5	8	14
Molasses	4	5	5	8.5
TM salt	2	2	2	2.5
Vitamin premix	2	2	2	2.25
Poultry fat	3	2.5	3	2.3
Biofos-MonoCaP	0.75	0.75	0.5	0.75

Table 2. Effect of the addition of DDGS on Lespedeza and alfalfa-based diets on intake and performance of meat goats (N=9)

	SL Control	SL DDGS	ALF Control	ALF DDGS	SEM	*P*-value
DMI (kg/day)	1.29	1.12	1.08	1.08	0.102	0.42
Carcass (kg)	17.1[a]	12.4[b]	16.2[a]	15.2[ab]	0.79	<0.01
Liver W (g)	444[ab]	370[b]	470[a]	449[ab]	25.6	0.05

Figure 1. Principal component analysis plot of the effects of the addition of DDGS to Lespedeza and alfalfa-based diets on rumen microbial communities of meat goats (N = 9)

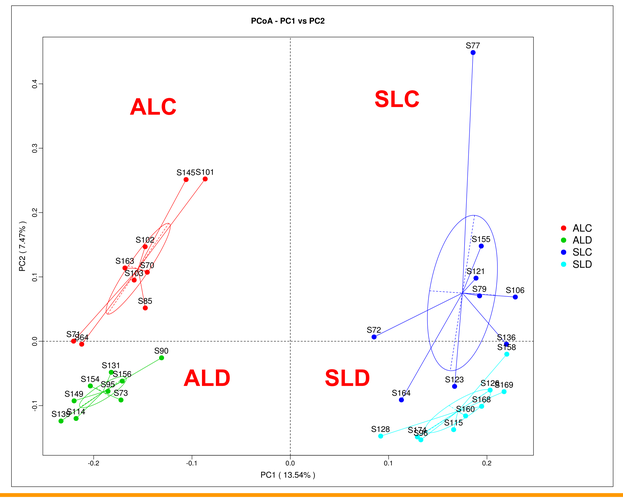


Figure 2. Linear discriminatory analysis of the effect of adding DDGS to Lespedeza and alfalfa-based diets on rumen microbial communities of meat goats (N = 9)

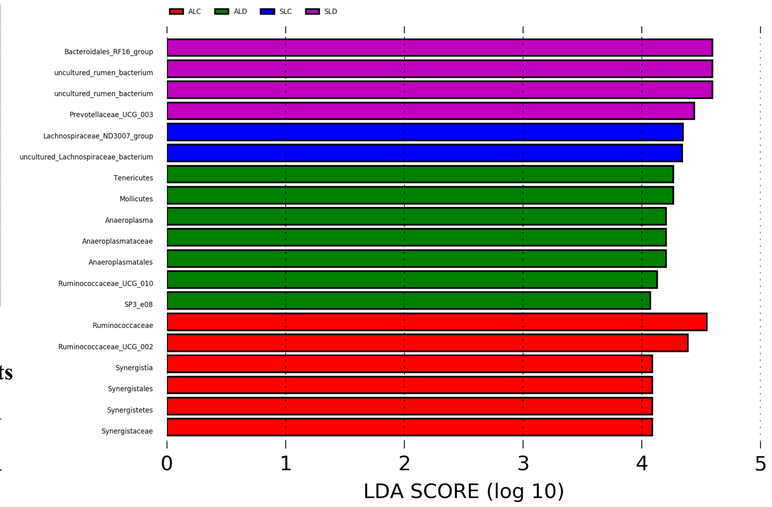


Figure 3. Effect of adding DDGS to Lespedeza and alfalfa-based diets on rumen bacterial taxa of meat goats (N= 9)

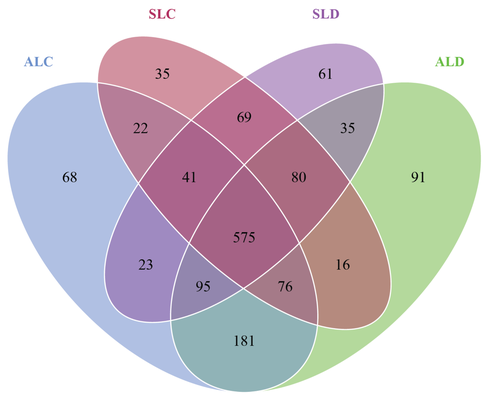
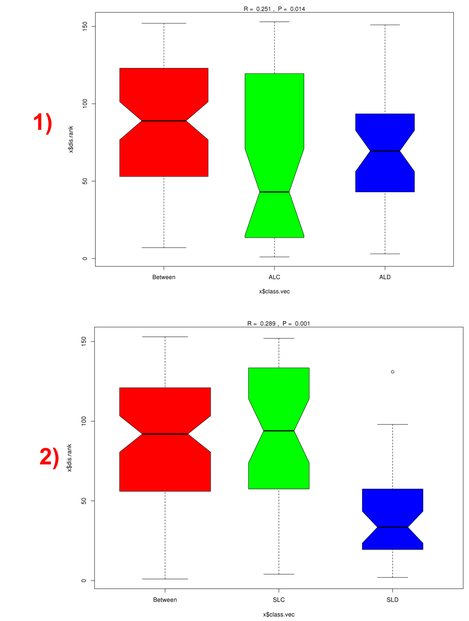


Figure 4. Analysis of similarity of rumen microbiome of meat goats fed with 1) alfalfa and 2) lespedeza-based diets with and without DDGS (N = 9)



Summary

Dietary inclusion of DDGS on lespedeza-based diet and alfalfa-based diet did not affect DMI in growing goats. However, dietary inclusion of DDGS in the SL-based diet decreased carcass and liver weight in meat goats. The ANOSIM revealed that *Ruminococcaceae* and *Prevotellaceae* groups were reduced by DDGS in the *AL-based diet,* whereas *Lachnospiraceae* and *Succinivibrionaceae* decreased in SL-based diet with DDGS. Furthermore, AL control, SL control, SL DDGS, and AL DDGS treatments shown a total of 68, 35, 61, and 91 unique rumen bacterial taxa of meat goats

Conclusion

Results from this study showed that dietary inclusion of DDGS in lespedeza or alfalfa-based diets causes a shift in the ruminal microbial community and its associated with a unique ruminal microbial community. Moreover, results from this study suggest that DDGS should not be added to lespedeza-diets to avoid reducing carcass weight in meat goats