

Effect of Level of Spent Corn from the Ethanol Industry and Lamb Sex on Performance

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Abstract: Lamb production depends on energy ingredients, mainly starch suppliers to stimulate the body weight gain. The ethanol uses grains like corn to produce as biofuel and generate by-product called spent Dry Distiller Grain with Soluble (DDGS), commercially available in Mexico. The by-product has been used in cattle, poultry and pig industry successfully with promising results. However, in the sheep producing no research was found comparing sex of the animal and level of DDGS inclusion. Twenty four (12 male and 12 female) recently weaned (average weight 25 kg) Suffolk lambs were randomly assigned to 3 levels of DDGS (0, 15, or 30% dry matter basis). Intake was similar among DDGS levels ($p>0.05$), but the male consumed more ($p<0.05$; 1.375 vs 1.743 kg day⁻¹), no interaction DDGS by sex was observed ($p>0.05$). On the other hand, body weight gain was affected by the DDGS level ($p<0.05$; 0.284, 0.285 and 0.221 kg, for 0, 15 and 30%, respectively). Base on the results the 15% DDGS inclusion level can be recommended in the feed for lambs.

Key words: Spent dried corn level, lamb, performance, digestibility

INTRODUCTION

The spent grains (mainly corn and sorghum) from the ethanol industry, due to the price, amount and nutrient content, have become an attractive source of nutrients for poultry (Lumpkins *et al.*, 2003; Martinez-Amezcuca *et al.*, 2007; Roberson, 2003; Roberson *et al.*, 2005) and pig (Whitney and Shurson, 2004) feeding. In Los Altos de Jalisco, Mexico, the number of lamb producing farms continues to increase to respond the protein demand for human consumption. However, the grain production in the region does not match the demand of such enterprises, hence depending on the importation of grain and meals to provide energy, protein and minerals to the animals in order to achieve their production goals. The cost of feed has an important impact on the profitability of the animal production; therefore, new sources of low cost highly nutritious feeds are constantly being search and assessed. With the increasing number of ethanol (as environmentally friendly source of energy) plants in the United States, there is an increasing available amount of grains, such as spent corn (Held, 2006; Robinson, 2005; Schingoethe, 2006; Spiels *et al.*, 2002). Distillers' grains have been used as an economical source of nutrients for feedlot and dairy cattle for years (Al-Suwaiegh *et al.*, 2002; Anderson *et al.*, 2006; Da Cruz *et al.*, 2005; Kalscheur *et al.*, 2004; Kleinschmit *et al.*, 2007; Leonardo *et al.*, 2005;

Sasikala-Appukuttan *et al.*, 2008); however, little evidence (Huls *et al.*, 2006; Schauer *et al.*, 2006) was found on the use of spent corn from the ethanol industry in intensive lamb production.

MATERIALS AND METHODS

Twenty four recently weaned (12 females and 12 males; average weight 24 kg) Suffolk lambs. Animals were randomly assigned to treatments in order to have 4 males and 4 females in each. Body weight was recorded at the beginning of the trial and used as co-variable of the gain. The lambs were individually lodged in a cement floor stalls (1.40×2.00 m), located in a totally closed barn. Water and feed was always available for *ad libitum* consumption, the metal feeder was located at 30 cm above the floor. Feed was served once a day. The feed offered and the refusals were weighted daily to determine the intake. Lambs were weight twice a week in a portable cage. All the handling and treatment of the lambs was always supervised by a Certified Veterinarian.

The treatments were 3 levels (0, 15 and 30%; dry matter basis) of dried spent corn from ethanol distillery. The diets were isonitrogenous and had equal amount of energy to fulfill the daily requirements of the lambs at fattening. Ground sorghum, canola and soybean meal were the major ingredients, also a vitamin-mineral mixture was used. Diets were mixed automatically. The experimental period had 4 weeks (28 days). The

parameters evaluated were; intake, daily gain of weight, feed to gain ratio and apparent digestibility. Data were submitted to statistical analysis using the GLM procedure of the SAS (1985) program, establishing an α of 0.05 to declare differences among treatments. When they existed the PDIFF method was used to separate the means. The model used was the following:

$$Y_{jkl} = \mu + C + T + e$$

where:

- Y = Measured parameter
- μ = General mean
- C = Sex effect
- T = Spent dried corn level
- e = Error

RESULTS AND DISCUSSION

In the present, no effect of the level of dried spent corn (issue from the ethanol industry) was observed on the feed intake ($p > 0.05$), but it tended to behave quadratically. Huls *et al.* (2006) using 22.6% of dried spent corn (compared to whole grain) in the lamb feed reported an daily average of 1.650 kg of intake, values that are higher than those observed in the actual study. On the other hand, males consumed more than females ($p < 0.05$; 1.375 vs 1.743 kg day⁻¹, respectively), probably, due to the hormonal effect on the body growth that demanded more energy.

Furthermore, the average weight gain (ADG; g day⁻¹) was altered by the spent corn level in the lamb feed ($p < 0.05$; 0.284, 0.285 and 0.221 kg day⁻¹, for 0, 15 and 30%, respectively), the global average observed in the present experiment was 0.259 kg day⁻¹. But, Huls *et al.* (2006) found 0.290 kg, values slightly higher than those found with Suffolk lambs of the present study. The interaction between spent corn and animal sex was positively affected ($p < 0.05$). Hence, the feed to ADG ratio averaged 6.41, meaning that more spent corn in the feed is required to produce the same amount of the control diet (5.583a, 5.164a and 8.259b; for 0, 15 and 30%, respectively; $p < 0.05$).

Table 1 is reported effect of the interaction of the spent corn level and the sex of the sheep. Males had higher gain independently of the spent corn level ($p < 0.05$) however, as the ingredient increases in the feed the gain was reduced ($p < 0.05$), but the intake was increased ($p < 0.05$). The finding can be a physiological response of the genre as suggested by Huls *et al.* (2006).

On the other hand, as observed in the Table 1, digestibility of the nutrients was unchanged by the spent corn level in the feed ($p > 0.05$) and presented a quadratical behaviour as the ingredient was increased.

Table 1: Effect of animal sex and level of spent corn on lamb productivity and digestibility

Parameters	Dry spent corn level (dry matter (%) basis)					
	0		15		30	
	Female	Male	Female	Male	Female	Male
Production						
Weight gain (ADG kg day ⁻¹)	0.196	0.372	0.222	0.347	0.184	0.258
Intake (kg day ⁻¹)	1.493	1.651	1.148	1.773	1.484	1.806
Feed to gain ratio (intake/ADG)	7.691	3.484	5.212	5.110	9.054	7.470
Back fat, mm	4.500	7.000	7.500	3.500	4.500	2.500
Apparent digestibility						
Dry matter	71.840	72.110	54.290	70.930	77.790	60.010
Organic matter	76.590	74.990	59.210	74.460	80.550	62.570
Protein	58.090	60.540	59.470	59.530	63.610	66.720
Neutral detergent						
Fiber (NDF)	60.820	59.250	58.210	53.990	63.600	67.930

CONCLUSION

The results of this study suggested that no >5% of spent corn should be used in the fattening of lambs.

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