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Effect of raising the cutting height in corn on performance and carcass traits of lambs

Efeito da elevação da altura de colheita do milho sobre o desempenho e as características de carcaça de cordeiros

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Abstract
This experiment was conducted to evaluate the effect of raising the cutting height of the corn plant destined to silage production, in relation to the dry biomass production and possible influence on the performance of confined lambs. The treatments tested were: SM20: Corn silage harvested at 20 cm height; SM80: Corn silage harvested at 80 cm height. Cutting at 80 cm from the ground reduced the dry biomass production by 2.375 kg DM ha-1, but did not reduce the carrying capacity and improved the digestibility of the feed by 4.59%, besides improving the carcass conversion, carcass transformation efficiency and carcass yield by 1.04%, 4.68% and 2.20%, respectively, for animals fed silage of corn cut at 20 cm from the ground. Production of silage harvested farther from the ground provides smaller volumes per area, but increases the quality of the final feed and improves the performance of the animals.
Keywords: apparent dry matter digestibility, animal performance, ingestive behavior, productivity.

Resumo
O experimento foi conduzido com o objetivo de avaliar o efeito de elevar a altura de corte da planta de milho destinada a confecção de silagem, perante a produção de biomassa seca e possíveis influencias no desempenho de cordeiros confinados. Os tratamentos utilizados foram: SM20: Silagem de milho colhida a 20 cm de altura; SM80: Silagem de milho colhida a 80 cm de altura. A realização do corte a 80 cm do solo reduziu a produção de biomassa seca em 2.375 kg MS ha-1, porém não reduziu a capacidade de suporte e melhorou a digestibilidade do alimento fornecido em 4,59%, além de melhorar a conversão de carcaça, eficiência de transformação em carcaça e o rendimento de carcaça em 1,04%, 4,68% e 2,20%, respectivamente, em relação aos animais alimentados com a silagem cortada a 20 cm do solo. A produção de silagem colhida mais distante do solo proporciona menores volumes por área, porém aumenta a qualidade do alimento final e melhora o desempenho dos animais.
Palavras-chave: comportamento ingestivo, desempenho

animal, digestibilidade aparente da matéria seca, produtividade

Introduction

The search for food with adequate nutritional value and capable of promoting good animal performance has been a drawback to be overcome[1]. The most used material for ensiling is the corn plant, due to its high productivity and the soluble carbohydrate contents above 3%, low buffering capacity and, at suitable harvest stages, dry matter (DM) between 30 and 35%[2].

The cutting height at the time of harvest can also improve these intrinsic characteristics of the corn plant, this procedure promotes improvements in the nutritional value of the silage, reducing by 1.9, 0.6 and 1.3% the levels of neutral detergent fiber (NDF), acid detergent fiber (ADF) and hemicellulose (HEM), respectively for every 10 centimeters the cutting height is raised[3].

The silage with the highest cutting height, that is, closer to the ear, guarantees a food with greater participation of grains in DM, reduces the participation of stem in the plant structure, a component that negatively influences the digestibility of the food(4), in addition to bringing benefits to the soil, increasing potassium cycling, reducing fertilizer costs[1].

On the other hand, the increase in the cutting height of the silage reduces the volume of ensiled mass[5] and, when making a decision to perform such practice, the quality vs. quantity ratio must be taken into account[6].

Therefore, this study aimed to evaluate the effect of the cutting height of corn for silage in relation to its chemical composition and the performance of lambs finished in feedlot.

Material and Methods

The experiment was conducted in the facilities of the Agrarian and Environmental Sciences sector, Universidade Estadual do Centro-Oeste (UNICENTRO), in the municipality of Guarapuava, State of Paraná, located in the subtropical zone of the state, at the geographical coordinates 25º23'02" South latitude and 51º29'43" West longitude and 1.026 m altitude. The ethics committee protocol was registered under number 040/2014.

The climate of the region, according to the Köppen classification, is Cfb (humid subtropical mesothermal), with mild summers and moderate winter, the average annual rainfall is 1.944 mm, the average minimum annual temperature is 12.7°C, the average maximum annual temperature of 23.5°C and 77.9% relative humidity.

The plots were allocated in a homogeneous area of soil, relief and plants. The experimental material was the simple hybrid P30F53HR (Pioneer®), for grain and silage production, early cycle and medium size. The sown area was 3.680 m², subsequently subdivided into 10 plots with 20 planting rows of 23 m in length each, spaced at 0.8 m (between rows), resulting in an area per plot of 368 m².

Prior to sowing, the area was desiccated with glyphosate (commercial product Roundup Original®: 3.0 L ha^{-1}); in crop management, 30 days after emergence, atrazine-based herbicide (commercial product Atrazine Atanor®: 4.0 L ha^{-1}) + Soberan®: 240 mL ha^{-1} and mineral oil (commercial product Assist®: 1.0 L ha^{-1}), and Pyrethroid-based insecticide (commercial product Karate Zeon 50CS®: 150 mL ha^{-1}) were applied.

Corn was sown on December 5, 2011, under no-till system, 4 cm deep and with 6 seeds per linear meter to obtain a final population of 70,000 plants ha^{-1}. At sowing, basal fertilization was applied with 300 kg ha^{-1} 05-25-25 formulated fertilizer (N-P_2O_5-K_2O) and topdressing with 200 kg ha^{-1} N as urea (45-00-00) when the plants had four fully expanded leaves.

Plots were harvested when the crop was at the dough to dent grain phenological stage (R5). The forage produced was harvested and processed with the aid of a forage chopper JF-Z10® set to an average particle size between 1 and 2 cm.

Plots were harvested according to their treatments and the original material was transported and placed in "semi-trench" silos built in a previously leveled and well-drained site, with masonry walls, with dimensions of 0.8 m wide, 0.8 m high and 10 m long, where the mass was compacted to eliminate oxygen, and later the silos were sealed and protected with 200 μm double-sided polyethylene tarpaulin.

To calculate the productivity of green biomass of the crop, the plants were harvested according to the height of each treatment and weighed. A 500 g-sample of each treatment (SM20 and SM80) were collected and dried in a forced air oven at 55 °C to constant weight, to determine the DM content, this method allowed to estimate the average dry matter production values in hg per ha^{-1} (DMP, kg DM ha^{-1}). In order to estimate the DMP values, kg DM ha^{-1}, we considered 15% losses related to the ensiling process.

The experiment lasted 56 days, with 14 days for adaptation of the animals to the diets and facilities and, sequentially, 3 periods of 14 days of evaluation. The facilities consisted of 8 covered pens, with an area of 4 m² each (2.0 mx 2.0 m), containing a wooden feeder, measuring 1.00 m long, 0.40 m wide and 0.30 m high, in addition to a plastic drinker and had a capacity of 3 animals per pen.

This experiment used twenty-four Ile de France lambs from the same herd, with an average age of 3 months and an initial body weight of 23.5 ± 3 kg. Before the beginning of the evaluations, the animals were properly dewormed and balanced by weight and body condition for each treatment. The animals were divided into two treatments: SM20: corn silage harvested at 20 cm from the ground + balanced concentrate food, ad libitum; and SM80: corn silage harvested at 80 cm from the ground + balanced concentrate food, *ad libitum*. The forage: concentrate ratio was set at 50:50 in DM for both treatments.

Food management was carried out twice a day, at 6:00 and 17:00 hours, with the voluntary food intake recorded daily by weighing the amount supplied and the leftovers from the previous day. The adjustment in the supply was carried out daily, considering a surplus of 5% DM offered in relation to the amount consumed. Diets were formulated to meet the requirements of daily gains of 300 g body weight[(7)].

The mixture to prepare the concentrate of the diet was prepared in the feed factory of Cooperativa Agrária Agroindustrial, located in the district of Entre Rios, in Guarapuava, State of Paraná. The following ingredients were used in the preparation of the concentrate: soybean meal, soybean hulls, wheat meal malt root, barley, ground corn grain, corn germ, calcitic limestone, dicalcium phosphate, livestock urea, vitamin and mineral premix, common salt (0.5%) and sodium monensin (30 mg kg^{-1}). The average nutrient content in feed and experimental diets are listed in Table 1.

Table 1: Average nutrient content of feed and diets for lambs finished in feedlots fed corn silages harvested at 20 cm and 80 cm height

Nutrients	Feed			Experimental diets	
	Commercial Concentrate	SM20	SM80	SM20	SM80
DM, %	89.20	33.92	35.97	61.45	62.49
CP, % DM	20.22	7.43	6.95	13.83	13.59
EE, % DM	4.04	2.92	2.61	3.48	3.33
MM, % DM	7.19	3.52	2.80	5.36	5.00
NFC, % DM	45.40	37.30	42.33	43.87	46.39
NDF, % DM	30.45	48.83	45.31	39.64	37.88
ADF, % DM	15.04	23.00	21.02	19.02	18.03
TDN, %	80.30	71.74	73.12	76.02	76.71
Ca, % DM	1.12	0.12	0.09	0.62	0.61
P, % DM	0.51	0.14	0.14	0.32	0.32
K, % DM	0.56	0.80	0.67	0.68	0.62
Mg, % DM	0.27	0.15	0.14	0.21	0.20

The animals were weighed at the beginning and at the end of the experimental period, with intermediate weighing every 14 days, after fasting solids for 12 hours. The variables related to animal performance consisted of the measurement of dry matter intake expressed in g day^{-1} (DMI), dry matter intake only of silage expressed in kg DM day^{-1} (DMIs, kg DM animal day^{-1}) and in relation to the percentage of body weight (DMIp), average daily gain in g day^{-1} (ADG) and feed conversion, given by the relationship between DMI and ADG (FC). The carrying capacity of animals fed in feedlot was also calculated according to the type of silage (CC, animals ha^{-1}).

In assessing performance in carcass gain, the variables were calculated considering the theoretical initial carcass yield of 50%, a value conventionally used when resources are not available to slaughter animals at the beginning of the evaluation. The average carcass gain in the feedlot period (CGF) was calculated, obtained by the difference between the hot carcass weight at slaughter and the theoretical initial carcass weight (BWi = initial body weight x 0.5). The average carcass gain (ACG) was calculated based on the 49-day feedlot period (ACG = CGF ÷ 56). Carcass conversion (CC) was also measured using the equation: CC = DMI/ACG and carcass yield (division of carcass weight by animal weight, multiplied by 100), and efficiency of transforming consumed DM into carcass, expressed in %.

In the intermediate feedlot period (approximately 35 days), an analysis of the animal behavior was carried out for 48 continuous hours, divided into 8 periods of 6 hours, with readings taken at regular intervals of 5 minutes. The variables analyzed were the activities of idle, rumination, drinking (water intake) and feeding, expressed in hours per day. Still, the frequency of the occurrence of the activities feeding, watering, urination and defecation, expressed in number of times per day, was observed, following the same methodology.

Along with the behavior analysis, the apparent digestibility of the experimental diets was estimated, in which the daily intake of food and leftovers from two consecutive days was measured, together with the total collection of feces produced by the animals of each pen. The total fecal output from each experimental unit was determined with the aid of screened collectors with 4 mm mesh, attached below the slatted floor of each pen. In each 6-hour shift, feces were mechanically separated from diet residues, collected and weighed. After weighing and identification in individual plastic bags, they were properly stored under refrigeration.

At the end of the 48-hour period, the feces of each experimental unit were homogenized to form a composite sample representing the evaluation days and subsequently analyzed. Samples were dried in forced air oven at 55 °C to constant weight, afterwards the fecal output per animal (FOA, kg DM animal^{-1} day^{-1}) and fecal output per unit area (FO, kg DM ha^{-1}), the apparent dry matter digestibility coefficient (DMD) was also determined by the expression: DMD (%) = (g DM consumed - g DM excreted)/(g DM consumed) X 100.

At the end of the experimental period, animals were fasted of solids for 12 hours in order to weigh the animals before loading to the slaughterhouse, obtaining the pre-slaughter body weight. The slaughter followed the normal flow of the slaughterhouse and the carcasses were weighed, identified, washed and cooled to –2ºC for 24 hours. Carcasses were measured for five development measures: carcass length, which is the distance between the medial cranial edge of the pubic bone and the medial cranial edge of the first rib; arm length, which is the distance between the tuberosity of the olecranon and the radiocarpal joint; arm perimeter, obtained in the median region of the arm surrounding it with a measuring tape; and the thigh thickness, measured with a compass, perpendicular to the carcass length, taking the greatest distance between the cut that separates the two half carcasses and the lateral thigh muscles. After taking these measurements, the thickness of the fat present was measured at the 12th rib[8].

At the time of slaughter, parts of the body that were not part of the carcass were also weighed: head, tail, leather and paws (called external components); heart, kidneys, liver, spleen and lungs (called vital organs); rumen-reticulum, full and empty abomasum and full intestines.

The experimental design was completely randomized, consisting of 2 treatments with 4 replications, where each replication consisted of a pen containing three lambs, totaling 8 experimental units. The variables were tested by analysis of variance and the comparison of means was performed using the F-test at 5% probability of error in a statistical software(9).

Results and Discussion

Table 2 lists the values of DMP, kg DM ha^{-1}, DMIs, CC, FOA, kg DM animal^{-1} day^{-1} and FO, kg DM ha^{-1}. It is noted that the DMP and DMIs were affected by the cutting height of the corn plant for ensiling ($P < 0.05$). The SM80 produced 2,375 kg DM ha^{-1} less than the SN20 ($P = 0.01$), an expected result once this practice is adopted.

Table 2: Corn silage production (DMP, kg DM ha^{-1}), daily silage intake per animal (DMIs, kg DM animal day^{-1}), carrying capacity of animals fed in feedlot according to the type of silage (CC, animals ha^{-1}), fecal output per animal (FOA, kg DM animal^{-1} day^{-1}) and fecal output per unit area (FO, kg DM ha^{-1})

Parameters	Treatments		Mean	CV[4] (%)	P-value
	SM20	SM80			
DMP[1], kg DM ha^{-1}	16.896 a	14.521 b	15.709	7.77	0.0152
DMIs[2], kg DM animal^{-1} day^{-1}	0.575 a	0.555b	0.565	11.73	0.0152
CC[3], animais ha^{-1}	530	473	501	12.29	0.2439
FOA, kg DM animal day^{-1}	0.425	0.418	0.422	10.52	0.6950
FO[3], kg DM ha^{-1}	12.461	11.000	11.730	7.43	0.0555

[1] Silage produced considering losses of 15% in fermentation.
[2] Represents the intake of DM only from silage, for sheep.
[3] 56-day feeding period, with a diet consisting of 50% silage and 50% concentrate.
[4] Coefficient of variation

The literature shows reductions from 35(10) to 39(3) kg ha^{-1} of DM for each centimeter of increase in the cutting height of the corn plant, but Rezende et al.(10) report an increase of 0.11% in participation of grain in the plant structure for each centimeter raised in the cutting height.

In addition to the increase in the participation of grains, the increase in the cutting height of the plant improves its nutritional value(11), reducing the concentrations of cellulose, lignin, NDF and ADF(6-10), promoting a positive increase in values of TDN and non-fiber carbohydrates[12-13]. Oliveira et al.[5] found an increase of 6.7% in the concentration of TDN when the cutting height was increased from 15 to 55 centimeters, providing a food with higher energy value.

There was a reduction of 20g in the DMIs of SM80 when compared to SM20 and the lower intake of DM was determinant for the absence of changes in the carrying capacity between treatments. The nutritional value of the food provided can directly interfere with its intake. Foods with higher energy levels are less consumed, since the energy requirements of animals are met with lower volumes[14].

The higher concentration of fiber constituents in the composition of SM20 was not a limiting factor for the intake of the animals, as it presented higher DMIs. This fact suggests that the animals practiced greater DMIs with SM20, in order to provide greater intake of TDN and make the use of silages equivalent. Such inference can be confirmed by the lack of significant difference for the variables FOA, kg DM animal day^{-1} and FO, kg DM ha^{-1}.

When assessing the performance of lambs, Table 3 shows the data regarding the intake of the total diet, ADG, DMD, FC, and the efficiency of their gains converted into carcass. The DMI and DMIp based on the intake of the total diet showed no difference (P> 0.05), with an average of 1.130 g day^{-1} and 3.45% body weight between treatments. Neumann et al.[12] evaluated confined steers fed silages harvested at 15 cm and 39 cm in height and Restle et al.[15], on silages harvested at 20 cm and 42 cm in height, also did not observe differences in DMI and DMIp.

Table 3: Dry matter intake (DMI) expressed in g day^{-1} and in percentage of body weight, average daily weight gain (ADG, g day^{-1}), feed conversion (FC, DMI ADG^{-1}), apparent dry matter digestibility (DMD, %), average carcass gain (ACG, g day^{-1}), conversion into carcass (CC, DMI ACG^{-1}) and efficiency of transforming weight gain into carcass gain (ETC, %) of lambs finished in feedlot on diets containing silages harvested at 20 or 80 cm height

Parameters	Treatments		Mean	CV, %	P-value
	SM20	SM80			
DMI, g day^{-1}	1.150	1.109	1.130	11.74	0.6794
DMI, % body weight	3.50	3.40	3.45	9.57	0.6836
ADG, g day^{-1}	317.86	330.87	324.36	6.37	0.3999
FC, DMI ADG^{-1}	3.61	3.35	3.48	6.75	0.1619
DMD, %	66.08 b	70.67 a	68.37	3.66	0.0411
ACG, g day^{-1}	165.76	187.38	176.57	8.31	0.0811
CC, DMI ACG^{-1}	6.95 b	5.91 a	6.43	7.12	0.0188
ETC, %	52.03 b	56.71 a	54.37	5.17	0.0568

Mean values followed by different letters in the same row are significantly different by the F-test at 5% probability of error.

According to Mertens[16], NDF is related to rumen distension and the energy density of food, thus, it is the major of consumption[17]. In addition, Pimentel et al.[18] report that diets with a higher DM content tend to promote higher intake. When analyzing Table 1, it is observed that these parameters differed little between diets and these differences did not promote changes in the intake of the total diet of the animals. Buso et al.[19] inferred that more significant changes in intake occur when the NDF content is above 60%. In addition to NDF, other aspects can influence animal intake, such as: particle size, particle fragility, chewing rate and effectiveness, indigestible NDF proportion and fermentation rates of potentially digestible NDF and, consequently, the passage rate of the food[20]. However, data from this study may indicate that the SM20 diet, in addition to not reaching the concentration of energy that could limit intake at the level of satiety, also did not reach the intake limit due to rumen filling, leading them to ingest a greater amount of silage in order to increase the intake of TDN. This fact may explain the difference in DMIs, but not for DMI and DMIp.

ADG and FC, despite having a numerical difference, did not show statistical difference (P>0.05). Thus, it is not possible to infer which was the best or the worst treatment, a result that can be explained by the similarity in the TDN of the diets. Marquardt et al.[6] emphasize that depending on the cutting height increase, changes in the fiber constituents of the silage can be minimal, making their use by the animal and its conversion into weight gain not significant. Vaz et al.[21] examined the performance of steers in the finishing phase fed corn silage harvested at 16 cm and 46 cm from the ground, and also did not find significant difference for this variable.

There were higher values of DMD and CC and ETC for treatment SM80, when compared to SM20. This can be attributed to the greater participation of grains with the increase in the cutting height as reported by Vaz et al.[10]. Marafon et al.[22] concluded that the greater participation of grains in ensiled mass allows better transformation of consumed DM into meat, in addition to improving carcass characteristics[23].

Table 4 lists the quantitative measurements of the carcass of lambs fed silages harvested at 20 cm and 80 cm in height. The treatments were not different (P> 0.05) for the parameters initial body weight, pre-slaughter body weight, hot carcass weight, weight gain in the period, carcass gain, carcass length, thigh thickness, arm length, arm circumference and fat thickness between treatments, with average values of 23.61 kg, 41.77 kg, 19.33 kg, 18.16 kg, 9.89 kg, 69.75 cm, 8.16 cm, 18.88 cm, 15.81 cm and 1.38 mm, respectively. Restle et al.[24] evaluated the carcass of super-early steers fed corn silage harvested at different heights also detected no differences in carcass measurements. Because, measures related to carcass morphology are more influenced by precocity and genetics[25]. However, the fat parameter is easily influenced by the diet. Animals fed high energy diets are likely to have greater fat deposition[26]. However, in this study, fat thickness measured at the 12th rib, also did not show differences between treatments, in addition to not meeting the values considered as ideal (2.5 mm to 3.0 mm)[27].

Osório et al.[28] infer that when carcasses have similar weight and fat deposition, similarity occurs in other regions of the carcass, regardless of breed, which was also observed by Gallo et al.[27] when slaughtering sheep with similar weight.

Table 4: Quantitative measurements of carcasses of lambs finished in feedlot on diets containing silages harvested at 20 or 80 cm height

Variables evaluated	Treatments		Mean	CV, %	P-value
	SM20	SM80			
Initial body weight, kg	23.89	23.33	23.61	5.42	0.5492
Pre-slaughter body weight, kg	41.69	41.85	41.77	4.62	0.9301
Hot carcass weight, kg	18.84	19.82	19.33	5.75	0.2568
Carcass yield, %	45.15 b	47.35 a	46.25	2.66	0.0451
Weight gain in the period, kg	17.80	18.52	18.16	6.38	0.4121
Carcass gain, kg	9.28	10.49	9.89	8.28	0.0818
Carcass length, cm	70.13	69.38	69.75	3.60	0.6876
Thigh thickness, cm	8.25	8.06	8.16	6.22	0.6202
Arm length, cm	18.63	19.13	18.88	2.02	0.1135
Arm circumference, cm	15.75	15.88	15.81	4.79	0.8231
Fat thickness, mm	1.39	1.38	1.38	17.34	0.9436

Mean values followed by different letters in the same row are significantly different by the F-test at 5% probability of error.

Cunha et al.[29] observed the same hot carcass weight, cold carcass weight and body weight at slaughter of lambs fed corn silage, which had high fiber content due to the increasing addition of cottonseed. These authors attributed the result to lot uniformity, that is, they were animals with similar weight, age, sex and breed, characteristics also observed in the animals of the present study.

However, for the carcass yield, there was a significant difference (P <0.05), in which the highest yield was found for animals fed SM80. Even if the difference in NDF values is small, it may have been crucial for the difference between treatments. Pilecco et al.[30] obtained linear reductions in carcass yield with an increase of 3 percentage points in the NDF of the diet. It is worth mentioning that the producer is paid for the carcass yield, therefore, aiming at the production of food with better nutritional value brings direct and positive impacts at the end of the production chain.

When fiber components are increased in the diet, reductions in carcass yield occur[31]. The fiber content of the diet promotes direct changes in the animal digestion and the content of the gastrointestinal tract directly influences the carcass yields[30].

The cutting height did not influence (P> 0.05) the weight of components that are not part of the carcass (Table 5). This lack of difference between treatments for the components not part of the carcass can be explained by the similarity of both diets and standardization of the animals.

When evaluating the components that are not part of the carcass of sheep from the cross of Ile de France x Texel fed in confinement, Tonetto et al.[32] presented some measures similar to those of the present study, where the heart, liver, lungs, empty rumen, empty abomasum, head and paws weighed an average of 0.16 kg, 0.44 kg, 0.43 kg, 0.60 kg, 0.15 kg, 1.15 kg and 0.78 kg, respectively.

Table 5: Weight of body components not part of the carcass of lambs finished in feedlot on diets containing silages harvested at 20 or 80 cm height

Weight of the components (kg)	Treatments		Mean	CV, %	P-value
	SM20	SM80			
Heart	0.16	0.15	0.16	8.02	0.4595
Liver	0.80	0.79	0.79	7.27	0.6918
Kidneys	0.11	0.11	0.11	16.06	0.7735
Lungs	0.55	0.52	0.54	10.50	0.4482
Spleen	0.07	0.06	0.06	17.07	0.7827
Full rumen	4.77	4.27	4.52	11.90	0.2406
Empty rumen	1.08	1.09	1.08	4.58	0.7854
Full abomasum	0.50	0.46	0.48	14.16	0.4661
Empty abomasum	0.26	0.31	0.28	10.74	0.0716
Intestines	3.06	3.01	3.04	12.21	0.8621
Head	2.05	2.06	2.06	9.57	0.9725
Tail	0.25	0.26	0.25	10.49	0.5723
Leather	4.22	4.29	4.25	10.11	0.8196
Paws	1.00	1.00	1.00	6.02	0.9103

Mean values followed by different letters in the same row are significantly different by the F-test at 5% probability of error.

The organs with intense metabolic activities are the intestines and the liver, which are highly influenced by the diet[33]. Alves et al.[34] report that changes in size are expected to occur mainly in the liver when animals are fed diets rich in energy due to its high metabolic rate. On the other hand, when the same authors evaluated different energy densities in the diet of sheep, they also found no changes in this organ[34].

Table 6 lists the ingestive behaviors, expressed in hours day^{-1} and times day^{-1} of lambs fed SM20 and SM80. For the variables rumination, idle, feeding and drinking, expressed in hours day^{-1}, there was no difference (P> 0.05) between treatments, with mean values of 7.32, 11.38, 5.09 and 0.19 hours day^{-1}. The evaluations of feeding, drinking, urination and defecation, evaluated in times day^{-1}, also did not differ between treatments.

On feedlot sheep, Vieira et al.[35] observed rumination and feeding times similar to the present study, with mean values of 7.9 and 3.57 hours day^{-1}, respectively. However, the frequencies of visits to the water trough (3.8 times day^{-1}) and frequency of defecation (7.6 times day^{-1}) were lower.

Table 6: Ingestive behavior and frequency of behavioral activities of lambs finished in feedlot on diets containing silages harvested at 20 or 80 cm height

Activity	Treatments		Mean	CV, %	P-value
	SM20	SM80			
	Duration (hours day^{-1})				
Rumination	7.28	7.35	7.32	24.98	0.9586
Idle	11.46	11.30	11.38	12.35	0.8812
Feeding	5.02	5.16	5.09	16.79	0.8307
Drinking	0.19	0.19	0.19	74.29	0.6529
	Frequency (number of times day^{-1})				
Feeding	32.75	34.25	33.50	15.46	0.4003
Drinking	11.00	13.00	12.00	37.88	0.5560
Urination	7.75	8.00	7.88	66.42	0.8952
Defecation	16.75	15.25	16.00	48.65	0.8936

Mean values followed by different letters in the same row are significantly different by the F-test at 5% probability of error.

The ingestive behavior of the animals can be modified by several factors, including the composition of the diet, and in general, the fiber content is the main influencer of the ingestive behavior[36].

Another aspect that promotes changes in the ingestive behavior and in the frequency of activities is the particle size of the food, that is, the larger the particle size of the food provided, the longer the time for ingestion and rumination, in addition to increasing the production of saliva, which is essential for regulating ruminal pH and maintaining the microbial flora[36-37]. In the present study, it is suggested that the animal behavior was not affected due to the similarity of the fiber components and the standardization of particle size between the diets tested.

Conclusion

The increase in the cutting height of the corn plant from 20 to 80 centimeters proves to be a suitable management at the time of harvesting. Even with reductions in dry matter production by area, there is a maintenance of the carrying capacity of animals per area. The increase in the cutting height improves the nutritional values of the silage, resulting in an increase in the carcass yield, without influencing the weight of components not part of the carcass and the ingestive behavior of the animals.

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