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***In vitro* gas production from pearl millet cultivars under nitrogen levels**

Produção de gases “in vitro” de cultivares de milho sob doses de nitrogênio

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ABSTRACT

This study aimed to evaluate the *in vitro* gas production from three pearl millet cultivars submitted to four nitrogen levels. The treatments consisted of three pearl millet cultivars (ADR 500, ADR 7020, and LABH 70732) and four nitrogen levels (0, 50, 100, and 200 kg/ha), using urea as the nitrogen source. A 3 x 4 factorial experimental design, employing a randomized block setup, was used to assess both gas production and digestibility. No interaction was observed between nitrogen doses and fermentative parameters on *in vitro* gas production from the dry matter of pearl millet cultivars. Nitrogen had no impact on the dry matter content or chemical composition of the cultivars. Consistency prevailed in the chemical composition across the various cultivars, a trend that extended to the gas production rates for both soluble and insoluble contents. Notably, nitrogen fertilizer exerted an influence on the fermentation pattern of organic matter, gas production, and lag time for the cultivars. Nitrogen fertilization is advised solely for enhancing fermentative attributes in the case of the cultivar ADR 7020.

KEYWORDS: Fermentation; Nitrogen fertilization; *Pennisetum glaucum*.

RESUMO

Objetivou-se avaliar a produção “in vitro” de gás de três cultivares de milho forrageiro sob adubação nitrogenada. Os tratamentos foram constituídos por três cultivares de milho: (ADR 500, ADR 7020 e LABH 70732) e quatro doses de N(ureia) (0; 50; 100 e 200 kg/ha). Para as avaliações da produção de gases e digestibilidade o delineamento experimental foi blocos casualizados em esquema fatorial 3 x 4, com quatro repetições. Não houve interação entre as doses de adubação nitrogenada e os parâmetros fermentativos da produção de gases “in vitro” da matéria seca das cultivares de milho. A adubação nitrogenada não influenciou os teores de matéria seca ou a composição bromatológica das cultivares. Não houve diferenças na composição bromatológica entre as cultivares. O mesmo foi observado para as taxas de produção de gás a partir do conteúdo solúvel e insolúvel. A adubação nitrogenada influenciou o padrão de fermentação, a produção de gases e o tempo de colonização por bactérias da matéria orgânica das três cultivares. A adubação nitrogenada é recomendada para incrementar as características fermentativas apenas da cultivar ADR 7020.

PALAVRAS-CHAVE: Adubação Nitrogenada; Fermentação; *Pennisetum glaucum*.

INTRODUCTION

Pearl millet is a forage originally from Africa with a short cycle, tolerant to water deficit, fast-growing, good regrowth capacity, forage potential, high nutritional value, appreciated by ruminants, and absence of anti-nutritional factors such as hydrocyanic acid (Pereira et al., 1993).

The Brazilian ruminant production system is mainly based on the use of annual or perennial native or cultivated pastures and pearl millet (*Pennisetum glaucum* (L.) R. Br) is considered one of the forages that can be used for this purpose (Brum et al., 2008).

The chemical-bromatological composition of pearl millet depends on variables such as soil and climate conditions, sowing time, cultivar, and maturation stage (Silva et al., 1999). Furthermore, its nutritional value is directly related to its chemical composition.

The nutritional value and aspects related to the extent of digestion and fermentation rate are of great relevance in animal nutrition, as these parameters are directly involved in the control of

voluntary intake (Dijkstra et al., 2005). In turn, it is closely related to animal performance, and one of the techniques used to characterize the fermentative pattern of forages is the in vitro production of gases.

The use of the gas production technique to evaluate feed for ruminants is based on fermentation by ruminal microorganisms, producing mainly CO₂ gas.

In this context, this study aimed to evaluate the in vitro gas production of three pearl millet cultivars under four nitrogen levels.

MATERIAL AND METHODS

The research was carried out on the facilities of the Department of Animal Science of the Schools of Veterinary and Animal Science of the Federal University of Goiás, Campus II, in the city of Goiânia – GO, Brazil, from January to April 2020, located at latitude 16°35'52" S and longitude 49°17'11" W, with an altitude of 723 m. The regional climate is classified as semi-humid tropical (Aw), according to the classification of Köppen (1948), with a

well-defined dry season from May to October. The mean annual temperature was 23.2 °C, with a minimum mean of 17.9 °C, a maximum mean of 28.9 °C, and annual precipitation of 1578 mm (Pereira et al., 2010).

The experimental area was prepared for sowing using a tractor equipped with a harrow, totaling two harrowing operations. Phosphate and potassium fertilization was performed with the application of 60 kg of P₂O₅ per ha (SS) and 30 kg of K₂O per ha (KCl), in addition to micronutrients – 50 kg of K₂O per ha of FTE BR 16, according to recommendations by Martha Júnior et al. (2007). Nitrogen and potassium fertilization was divided into two applications: half the dose at 10 days after germination and the other half at 20 days after germination.

The treatments consisted of three pearl millet cultivars (ADR 500, ADR 7020, and LABH 70732) and four N levels (0, 50, 100, and 200 kg/ha), using urea as the nitrogen source.

The experimental plots consisted of five rows of five linear meters, with a spacing of 0.30 m between rows, with an area of 6.0 m² for each plot, totaling 288 m² of experimental area. The three central rows of each experimental unit, disregarding 0.50 m from the ends, were used for evaluation purposes. Sowing was conducted manually on January 6, 2020, using a density of 20 pure live seeds per linear meter.

The manual cut for evaluation was conducted on April 8, 2020, 87 days after germination, at 0.15 m from the soil level and using steel scissors when the plants presented an average of 27% dry matter (DM), that is, the grains were at the dough stage. Monitoring of the plant's dry matter content was conducted from 75 days, after germination, using the microwave technique (Lacerda et al., 2009).

After cutting and identification, the forage was crushed and a sample weighing approximately 500 g was taken and dried in a forced-air ventilation oven at 55 °C, aiming to determine the pre-dried matter. Then, the samples were ground in a Willey mill, using a 1-mm opening sieve, for laboratory analysis.

Dry matter (DM), crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), cellulose (CEL), lignin (LIG), ether extract (EE), and ash (ASH) contents were determined according to the methodology described by Silva & Queiroz (2002). Neutral detergent fiber (NDF) and acid detergent fiber (ADF) were determined according to the methodology described by INCT-CA F-002/1 and acid INCT-CA F-004/1, respectively (Detmann et al., 2012). Hemicellulose (Hem) contents were estimated using the formula $Hem (\%DM) = NDF (\%DM) - ADF (\%DM)$. Organic matter contents were obtained from ash contents using the formula: $OM (\%DM) = 100 - Ash (\%DM)$. Non-fibrous carbohydrate (NFC) contents were obtained using the methodology described by Sniffen et al. (1992), where $NFC = 100 - (NDF + CP + EE + Ash)$. Laboratory analyses were performed according to methodologies described by Silva & Queiroz (2002).

The in vitro production of gases was obtained using the methodology by Theodorou et al. (1994), modified by Maurício et al. (1999), using a Delta DHM HD 21241 pressure gauge.

Eight bottles were incubated per treatment to measure gas production and organic matter digestibility. Each 110-mL glass bottle contained 0.2 g of sample with 30 mL of inoculum plus McDougal's buffer solution (McDougal, 1949).

The bottles were sealed and kept at 39 °C in a water bath and the gas pressure was measured at times 0, 2, 4, 8, 10, 12, 24,

26, 28, 30, 32, 36, 48, 52, 56, 60, and 72 hours post-incubation. Bottles containing the incubation solutions without substrate and one containing a standard (Tifton 85 grass hay) with a known gas production profile were incubated for variation adjustments.

The rumen inoculum was obtained from three Nellore cattle with a mean weight of 280 kg and a mean age of 26 months, fitted with a ruminal cannula. The animals were fed twice a day with a diet based on corn silage. During the period, the animals were housed in individual stalls and the rumen contents were collected manually from the dorsoventral sac, stored in thermos bottles preheated to 39 °C, and immediately taken to the laboratory. The inoculum was filtered through two layers of mesh fabric and kept in a water bath at 39 °C with CO₂ saturation until inoculation.

The data were adjusted to France ($V(t) = Vf\{1 - e^{[-b(t-g)-c(t-g)^2]}\}$), modified logistic ($V(t) = Vf/(1 + e^{[2-4k(t-g)])}$), two-compartmental logistic ($V(t) = Vf[1 - e^{(-k^1(T-g))}] + Vf2[1 - e^{(-k^2(T-g))}]$),

Gompertz ($V(t) = Vf e^{(-be^{-kt})}$), Brody ($V(t) = Vf[1 - be^{(-kt)}]$), and Von Bertalanffy ($V(t) = Vf[1 - be^{-kt}]^3$) models as parameters for choosing the mathematical model to be used to estimate gas production patterns.

The two-compartmental logistic model (Schofield et al., 1994) presented the best fitting to the data to estimate the patterns of microbial fermentation, adopting as a basis the AIC and BIC values, with the following parameters: $V(t)$ = accumulated gas volume produced over

time (T), Vf1 = gas volume produced by the fermented soluble fraction, K1 = gas production rate produced by the fermented soluble fraction, g = lag time, Vf2 = gas volume produced by the fermented insoluble fraction, and K2 = gas production rate produced by the fermented insoluble fraction.

The in vitro digestibility of organic matter and the percentage of total digestible nutrients were estimated using the equations proposed by Chenost et al. (2001), setting a time of 24 hours to obtain these estimates.

The experimental design for the evaluations of gas production and digestibility consisted of a randomized block design in a 3 x 4 factorial scheme (three cultivars and four nitrogen levels), with four replications per sample. The results of gas production were adjusted to the model and the models were compared using the test to verify the equality of parameters and identity of non-linear regression models (REGAZZI, 2003), using the statistical program R (R Core Team, 2013) at a 5% significance.

The results of chemical composition and estimates of in vitro digestibility and total digestible nutrients (TDN) were subjected to analysis of variance and the means were compared using the Tukey test at a 5% probability.

RESULTS

No interaction was observed between N levels and the fermentative parameters of dry matter of the in vitro gas production of pearl millet cultivars (Table 1).

Table 1. Mean values of gas production from dry matter (DM), determined in pearl millet cultivars under N levels.

Parameter**	Cultivar	N level			
		0	50	100	200
	ADR500	125.4 ^{Aa*}	139.5 ^{Aa}	142.3 ^{Aa}	126.1 ^{Aa}

VF1 (mL/g DM)	ADR7020	129.6 ^{Aa}	124.3 ^{Aa}	102.7 ^{Aa}	128.8 ^{Aa}
	LABH70732	119.8 ^{Aa}	118.4 ^{Aa}	114.8 ^{Aa}	124.0 ^{Aa}
	ADR500	11.4 ^{Aa}	12.1 ^{Aa}	11.6 ^{Aa}	10.8 ^{Aa}
K1 (%/h)	ADR7020	11.3 ^{Aa}	11.8 ^{Aa}	11.0 ^{Aa}	12.5 ^{Aa}
	LABH70732	9.8 ^{Aa}	13.2 ^{Aa}	12.7 ^{Aa}	10.1 ^{Aa}
	ADR500	7.1 ^{Aa}	6.3 ^{Aa}	6.7 ^{Ab}	6.0 ^{Aa}
g (h)	ADR7020	6.1 ^{Aa}	6.7 ^{Aa}	9.9 ^{Aa}	8.7 ^{Aa}
	LABH70732	7.3 ^{Aa}	7.1 ^{Aa}	6.9 ^{Aab}	6.8 ^{Aa}
	ADR500	427.8 ^{Aab}	436.3 ^{Aa}	444.5 ^{Aab}	402.3 ^{Aa}
VF2 (mL/g DM)	ADR7020	412.4 ^{Ab}	415.1 ^{Aa}	494.8 ^{Aa}	418.7 ^{Aa}
	LABH70732	490.2 ^{Aa}	419.0 ^{Aa}	400.1 ^{Ab}	401.6 ^{Aa}
	ADR500	1.69 ^{Aa}	1.70 ^{Aa}	1.67 ^{Aa}	1.66 ^{Aa}
K2 (%/h)	ADR7020	1.63 ^{Aa}	1.70 ^{Aa}	1.51 ^{Aa}	1.54 ^{Aa}
	LABH70732	1.70 ^{Aa}	1.76 ^{Aa}	1.78 ^{Aa}	1.61 ^{Aa}

*Means followed by the same uppercase letter in the rows and lowercase letters in the columns do not differ from each other according to the parameter equality and identity test of nonlinear regression models at a 5% probability.

**Gas volume produced by the soluble content (VF1), gas production rate produced by the soluble content (K1), lag time (g), gas volume produced by the insoluble content (VF2), and gas production rate produced by the insoluble content (K2).

A significant interaction was observed between nitrogen fertilization and dry matter (DM) between cultivars ($P < 0.05$) (Table 2).

Table 2. Mean values of dry matter (DM), determined in pearl millet cultivars under N levels.

Cultivar	Nitrogen level				P	CV (%)
	0	50	100	200		
ADR500	24.02 ^{Aa*}	24.51 ^{Ab}	25.95 ^{Aa}	23.56 ^{Aa}	0.48	9.31
ADR7020	26.70 ^{Aa}	29.23 ^{Aa}	25.28 ^{Aa}	25.43 ^{Aa}	0.11	
LABH70732	28.26 ^{Aa}	24.82 ^{Ab}	23.83 ^{Aa}	25.30 ^{Aa}	0.46	
P	0.25	0.02	0.42	0.51		

*Means followed by the same uppercase letters in the rows and lowercase letters in the columns are statistically equal by the Tukey test at a 5% probability level.

The values of the chemical composition of the cultivars were not influenced by nitrogen fertilization and showed no differences between cultivars (Table 3).

Table 3. Mean values of chemical composition, determined in pearl millet cultivars under N levels.

Variable (%)**	Nitrogen level				CV (%)	P
	0	50	100	200		
CP	9.74 ^a	9.93 ^a	9.42 ^a	9.07 ^a	16.59	0.57
NDFap	62.82 ^a	61.95 ^a	62.73 ^a	62.80 ^a	3.07	0.64
ADFap	33.41 ^a	34.36 ^a	34.66 ^a	34.12 ^a	4.65	0.27

HEMI	29.40 ^a	27.44 ^a	27.89 ^a	28.67 ^a	9.34	0.29
CEL	28.64 ^a	29.47 ^a	29.95 ^a	29.08 ^a	4.4	0.10
NFC	6.96 ^a	6.65 ^a	6.28 ^a	6.84 ^a	15.77	0.72
MM	9.14 ^a	9.53 ^a	9.08 ^a	9.17 ^a	6.54	0.80

*Means statistically equal by the Tukey test at a 5% probability level.

**Crude protein (CP), neutral detergent fiber corrected for ash and protein (NDFap), acid detergent fiber corrected for ash and protein (ADFap), hemicellulose (HEMI), cellulose (CEL), non-fibrous carbohydrates (CNF), mineral matter (MM), and lignin (LIG).

Nitrogen fertilization influenced the fermentation pattern and gas production of the cultivars (Table 4). Gas production from the soluble content of organic matter (OM) was not affected by nitrogen fertilization, but the cultivar ADR 7020 showed higher gas production from the soluble content compared to the cultivar LABH 70732 at levels of 100 and 200 kg N/ha.

Gas production rates from soluble and insoluble contents were similar between cultivars and were not affected by nitrogen fertilization ($P < 0.05$). An

increase in gas volume production due to the insoluble content was observed in the cultivar ADR 500 at the level equivalent to 200 kg N/ha relative to levels of 50 and 100 kg N/ha. The level of 100 kg N/ha for the cultivar ADR 7020 showed higher gas production due to the insoluble content at levels compared to the control treatment. The cultivar LABH 70732 had higher gas production due to the insoluble content in the control treatment and at the level of 100 kg N/ha compared to the others.

Table 4. Mean values of gas production parameters from organic matter (OM), determined in pearl millet cultivars under N levels.

Parameter**	Cultivar	N level			
		0	50	100	200
VF1 (mL/g DM)	ADR500	163.5 ^{Aa*}	117.4 ^{Aa}	144.6 ^{Ab}	139.7 ^{Ab}
	ADR7020	131.6 ^{Aa}	130.6 ^{Aa}	157.1 ^{Aa}	172.5 ^{Aa}
	LABH70732	140.2 ^{Aa}	121.5 ^{Aa}	95.0 ^{Ab}	106.2 ^{Ab}
K1 (%/h)	ADR500	10.5 ^{Aa}	11.0 ^{Aa}	10.0 ^{Aa}	15.2 ^{Aa}
	ADR7020	17.5 ^{Aa}	10.8 ^{Aa}	17.0 ^{Aa}	12.9 ^{Aa}
	LABH70732	19.7 ^{Aa}	12.2 ^{Aa}	19.3 ^{Aa}	12.7 ^{Aa}
g (h)	ADR500	3.6 ^{Bb}	3.3 ^{Bb}	4.4 ^{ABb}	8.9 ^{Aa}
	ADR7020	9.6 ^{Aa}	10.7 ^{Aa}	8.9 ^{Aa}	10.4 ^{Aa}
	LABH70732	9.5 ^{Aa}	5.9 ^{Ba}	8.2 ^{ABa}	5.6 ^{Ba}
VF2 (mL/g DM)	ADR500	448.7 ^{ABb}	410.1 ^{Bab}	434.6 ^{Bb}	501.1 ^{Aa}
	ADR7020	445.0 ^{Bb}	472.5 ^{ABa}	542.3 ^{Aa}	513.6 ^{ABa}
	LABH70732	553.6 ^{Aa}	393.6 ^{Bb}	547.2 ^{Aa}	427.8 ^{Bb}
K2 (%/h)	ADR500	1.82 ^{Aa}	1.82 ^{Aa}	1.83 ^{Aa}	1.69 ^{Aa}
	ADR7020	1.76 ^{Aa}	1.83 ^{Aa}	1.61 ^{Aab}	1.52 ^{Aa}
	LABH70732	1.54 ^{Aa}	1.75 ^{Aa}	1.46 ^{Ab}	1.84 ^{Aa}

*Means followed by the same lowercase letter in the column and uppercase letter in the row are statistically similar by the Tukey test at a 5% probability.

**Gas volume produced by the soluble content (VF1), gas production rate produced by the soluble content (K1), lag time (g), gas volume produced by the insoluble content (VF2), and gas production rate produced by the insoluble content (K2).

A significant effect ($P < 0.05$) was observed between the estimated in vitro digestibility of organic matter and the percentage of TDN only between the

cultivars ADR 500 and ADR 7020 at a level equivalent to 100 kg N/ha, with no influence of nitrogen fertilization (Table 5).

Table 5. Mean values of in vitro digestibility of organic matter (IVDOM) and the total digestible nutrients (TDN), determined in pearl millet cultivars under N levels.

Variable	Cultivar	N level (kg/ha)				P	CV%
		0	50	100	200		
DIVMO	ADR500	69.0 ^{Aa}	73.6 ^{Aa}	74.0 ^{Aa}	69.5 ^{Aa}	0.50	7.23
	ADR7020	70.0 ^{Aa}	68.6 ^{Aa}	63.3 ^{Ab}	65.7 ^{Aa}	0.25	
	LABH70732	70.2 ^{Aa}	68.9 ^{Aa}	68.1 ^{Aab}	67.7 ^{Aa}	0.90	
	P	0.94	0.33	0.01	0.53		
NDT	ADR500	62.6 ^{Aa}	67.3 ^{Aa}	67.5 ^{Aa}	62.9 ^{Aa}	0.51	6.88
	ADR7020	63.9 ^{Aa}	62.2 ^{Aa}	56.5 ^{Ab}	59.3 ^{Aa}	0.18	
	LABH70732	63.6 ^{Aa}	62.2 ^{Aa}	61.2 ^{Aab}	61.4 ^{Aa}	0.90	
	P	0.93	0.28	0.01	0.58		

*Means followed by the same uppercase letters in the row and lowercase letters in the columns are statistically equal by the Tukey test at a 5% probability level.

Figure 1 shows the gas production, determined in pearl millet cultivars, as a function of N levels. The lag time by

bacteria (g) relative to fermented organic matter (OM) was influenced by nitrogen fertilization.

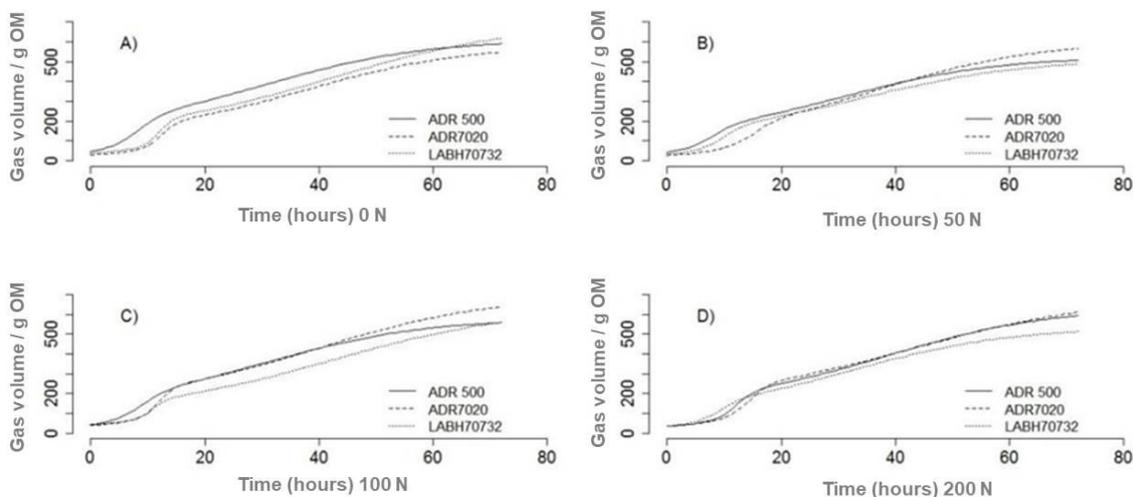


Figure 1. Gas production (ml/g DM) as a function of N levels: A) 0, B) 50, C) 100, and D) 200 kg N/ha.

DISCUSSION

The pearl millet cultivars have similar dry matter fermentation characteristics,

regardless of the N level. The cultivar ADR 7020 showed higher lag time values than the cultivar ADR 500 at the level of 100 kg N/ha, and possibly did not affect the gas production rate of the soluble and insoluble fractions, as this variable is a measure estimated by mathematical models. Guimarães Jr et al. (2008) reported mean lag time values of 2.25 h for millet cultivars, values lower than those of the present study, probably because they are estimated by different statistical models based on different prerogatives (Mello et al., 2008).

The cultivar LABH 70732 with no nitrogen fertilization produced a higher gas volume through the fermentation of insoluble material than the cultivar ADR 7020. However, the cultivar LABH 70732 produced a higher gas volume through the fermentation of insoluble material under fertilization of 100 kg N/ha than the cultivar ADR 7020 ($P < 0.05$).

Guimarães Jr et al. (2008) observed no significant effect on gas production from silages of millet cultivars, with a mean of 148.7 mL of gases g/DM.

Nitrogen fertilization at the level of 50 kg N/ha accelerated the drop of moisture in the cultivar ADR 7020, thus presenting a higher dry matter content, but not influencing the fermentative characteristics of gas production of the pearl millet cultivars.

According to Amaral et al. (2008), the DM content of millet varies according to its phenological stage. The authors observed DM values in millet plants of 21.34, 27.70, and 36.83% at 70, 90, and 110 days after planting, respectively, showing that senescence increases the dry matter content, mainly due to grain production and physiological stage.

The mean values of crude protein for pearl millet are similar to those found by Guimarães Jr et al. (2008), remaining above the minimum 7% recommended

for minimum rumen fermentation (Mehrez & Orskov, 1978).

The NDFap contents found in this study corroborate the mean content found by Pinho et al. (2013) in a study conducted with millet cultivars 42 days after sowing. The forage NDFap is inversely related to the voluntary intake of dry matter by the animal, the digestion rate, and the passage rate of rumen contents (Siqueira Campos et al., 2010).

Guimarães Júnior et al. (2005) evaluated three millet genotypes harvested and ensiled 100 days after planting and found mean ADFap values of 42.5%. The ADFap and lignin contents are inversely related to the degradation potential of the forage, influencing the availability of energy and nutrients for the ruminant (Orskov et al., 1980).

Hemicellulose is an important carbohydrate used by ruminal microorganisms for the fermentative process in gas production and corresponds to the majority of the gaseous fraction produced by the fermentation of insoluble carbohydrates (Kozlosky, 2009). The mean value of hemicellulose of all cultivars found in this experiment was 29.05%, a value close to that found by Guimarães Junior et al. (2005) for three millet cultivars, with a mean value of 27.18%.

Non-fibrous carbohydrates showed no influence on the gas production of the soluble content of the cultivars and N levels. Carbohydrates that have high solubility are the main carbon sources for fermentation and gas production in the first hours of fermentation (Kozlosky, 2009).

The soluble content has a higher gas production rate and the higher the soluble fermentable content, the higher the gas production from this substrate. The most appropriate fitting model for interpreting the parameters for substrates that have soluble and insoluble

fermentable fractions, such as millet and corn in the grain production phase, is the dual substrate model (Mello et al., 2008). The point that defines gas production by the soluble and insoluble fractions is the inflection point of the nonlinear regression curve (Figure 1), defined by the principles and assumptions of each regression model. Therefore, the time in which it occurs is variable and may not be the same for all curves, with the comparison being made on the absolute values of gas production from the soluble fraction (Schofield et al., 1994). The higher the gas production rate, the shorter the time taken for fermentation of the soluble and insoluble substrates.

The highest nitrogen level for the cultivar ADR 500 provided a longer lag time by bacteria (g) compared to 0 and 50 kg N/ha ($P<0.05$), thus characterizing a difficulty in colonization by rumen bacteria with nitrogen fertilization in this cultivar. The cultivar LABH 70732 showed a longer lag time at the level of 0 kg N/ha compared to levels equivalent to 50 and 200 kg N/ha, indicating higher difficulty in colonization by rumen bacteria with the lowest N level. Among the cultivars, ADR 7020 presented the longest lag times by rumen bacteria at all N levels, which can be seen in the four quadrants of Figure 1, but this difficulty did not interfere with gas production due to the soluble content.

Assuming that gas production reflects the sample degradation by ruminal microorganisms, the volumes of gases produced and production rates are the main parameters for evaluating the quality of the tested forages (Guimarães Júnior et al., 2008).

The control treatment (0 kg N/ha) ($P<0.05$) showed a higher gas production due to the insoluble content of the cultivar LABH 70732, while the cultivar ADR 7020 produced more gas from the insoluble content at a level equivalent to

50 kg N/ha. The cultivars ADR 500 and LABH showed lower gas production due to the insoluble content at levels of 100 and 200 kg N/ha, respectively.

Guimarães Jr et al. (2008) found no differences between the in vitro digestibility of silage from three millet cultivars. Unlike the present study, Costa et al. (2011) evaluated five millet cultivars and reported lower TDN content in the cultivar ADR 500 when compared to other cultivars using bacterial inoculants.

CONCLUSIONS

The best N level aiming to increase the fermentative characteristics of the cultivar ADR 7020 was equivalent to 100 kg N/ha, with no recommendation of nitrogen fertilization to increase the fermentative characteristics of the cultivars ADR 500 and LABH 70732.

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