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Ingestive behaviour and Growth Performance of Boer Crossbred and Indigenous Goat Kids Under Different Feeding Levels in Semiarid Region in Brazil

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ABSTRACT

This study aimed to evaluate intake, digestibility, ingestive behaviour, and growth performance of Boer × non-descript breed (NDG) F1, Canindé, and Moxotó kids subjected to three levels of feeding (*ad libitum* intake and restricted intake by 25 and 50%). The study used 45 non-castrated males, 15 animals from each genetic group, assigned to a 3 × 3 factorial arrangement, with five replicates of each genotypic group at each feeding level. There was an interaction (P<0.05) between genotype and feeding levels for intake, digestibility, and average daily gain (ADG). Boer × NDG F1 kids fed *ad libitum* had higher dry matter intake (g/day), average daily gain, and lower dry matter digestibility than the Canindé and Moxotó kids. Kids at the 50% restriction level had a longer rumination time per gram of dry matter ingested (0.76 min/g) compared to that fed *ad libitum* (0.29 min/g) and with 25% restriction (0.41 min/g, P<0.05). Boer × NDG F1 animals, when fed *ad libitum*, have high growth performance compared to Canindé and Moxotó. Thus, it can be inferred that in feedlot systems with unrestricted feeding and a higher proportion of concentrate than forage (above 50%) in the diet, the use of the Boer × NDG F1 kids is an alternative to increase meat production in the Brazilian semiarid region. When subjected to feed restriction, the growth performance of Boer crossbred kids is similar to that of indigenous breeds. Kids subjected to feed restriction have longer rumination time and higher digestibility coefficients than their counterparts.

INTRODUCTION

Goat farming has developed rapidly in recent years. However, research has been directed almost strictly to the areas of nutrition, breeding, and reproduction. Although the relevant contribution of these approaches, brings countless benefits to the meat and milk production sectors, it is necessary to understand the ingestive behaviour of these animals to adjust the feed management and obtain better performance (Miller and Lu, 2019).

Goats are known for their adaptive advantages in relation to survival in arid and semiarid environments, where feed resources are heterogeneous and restricted in quantity and quality. This is explained by the physiological and behavioural mechanisms that allow goats to assess feed resources through visual, tactile, and chemosensory stimuli, accounting for their anatomical and physiological adaptations (digestion and detoxification processes), generating feed preferences and aversions (Egea *et al*., 2019).

In the semiarid region of Northeast Brazil, goat farming is one of the main economic activities carried out by the rural population, highlighting the use of animals of native breeds, such as Canindé and Moxotó (Araújo *et al*., 2017a; Ribeiro *et al*., 2017). With the introduction of exotic breeds, such as the Saanen, Anglo-Nubian, and Alpine, followed by the disorderly crossing of these exotic breeds with the native breeds, the non-descript breed goat (NDG) was originated, which represents most of the herd of goats from the Brazilian semiarid region (Cartaxo *et al*., 2013). However, due to the low production performance of NDG, exotic breeds specialized in meat production have been used in crossbreeding systems in order to increase the productivity of local herds (Sousa *et al*., 2015). Among the breeds used for crossbreeding, the Boer breed stands out as it has a fast growth rate and good carcass conformation.

In semiarid regions, animals can naturally undergo periods of feed restriction, due to variations in feed supply, being considered one of the nutritional management strategies used to reduce animal production costs (Araújo *et al*., 2017b), corresponding to 70% of operating costs in the production of feedlot ruminants (Makkar, 2016). According to Pereira Filho *et al*. (2005), goats fed with feed restrictions of up to 30% did not decrease the feed efficiency, proving their ability to adapt or adjust to feeding scarcity conditions. Thus, it is necessary to establish the relationship between behaviour and feed intake to provide subsidies for production improvement programs for animals.

Feed restriction is a strategy whose effects have been investigated in studies with goats on meat production (Bezerra *et al*., 2017), fatty acid profile in milk (Palma *et al*., 2017), immune response (Abdalla *et al*., 2014), mineral metabolism (Härter *et al*., 2017), biochemical and endocrine parameters (Lérias *et al*., 2015), water balance (Teixeira *et al*., 2006) and intake and productive performance of goats (Ribeiro *et al*., 2018). However, studies comparing the performance of Boer × NDG F1 with Canindé and Moxotó kids subjected to different levels of feed restriction are not available in the literature. In addition, assessments of the effect of feed restriction on digestibility and ingestive behaviour of indigenous goats in the Brazilian semiarid region are scarce (Alves *et al*., 2008). This study evaluated the digestibility, ingestive behaviour, and growth performance of Boer × NDG F1, Canindé, and Moxotó goats subjected to different feed restriction levels.

METHODOLOGY

Experimental site

The experiment was carried out at the Universidade Federal do Vale do São Francisco/ Agricultural Sciences Campus/ Department of Animal Science (UNIVASF/CCA/DZ), Petrolina, Pernambuco, Brazil (Latitude 09°23’55” S and Longitude 40º30’03” W, 376 m altitude). The predominant climate in the region is a hot semiarid climate (BSh), with summer rains. The mean annual precipitation is 433 mm, relative humidity of 36.73%, and average annual temperatures, maximum and minimum, of 32.0 °C and 26.9 °C, respectively.

Animals, experimental design diet and feeding levels

Forty-five male noncastrated kids at four months of age from three genotypes; Boer × NDG F1 (n=15) Canindé (n=15) and 15 Moxotó (n=15), with the body weight at the beginning of the confinement of 15 ± 0.3 kg, 14.3 ± 1.5 kg and 15.5 kg ± 0.6 kg, respectively were used in the experiment.

The experimental period lasted for 90 days, with 30 days for adaptation to the experimental diet. During adaptation, goats were identified, weighed, and treated against ecto- and endoparasites through the application of an oral solution (200 µg/kg body weight; Ivomec, Merial, Campinas, Brazil). Then, animals were housed in individual covered pens (0.8 m × 0.8 m) with concrete floors equipped with drinking and feeding troughs.

The experimental design used was randomized blocks, in a 3 × 3 factorial arrangement, with three genotypic groups and three levels of feeding, with five replications.

The animals were submitted to three feeding levels: *ad libitum*, R25 (25% feed restriction of *ad libitum* intake), and R50 (50% feed restriction of *ad libitum* intake). The amount of feed provided to animals that received feed restriction was adjusted every 15 days to provide 25 or 50% of the average dietary intake (g dry matter/kg of body weight) of animals that received *ad libitum* feed. At each adjustment in feed restriction, the animals were submitted to a 16-h fast and weighed.

The diet consisted of elephant grass (*Pennisetum purpureum*) chopped to 4 cm, ground corn (*Zea mays*) and soybean (*Glycine max*) meal concentrates, and commercial premix (Caprinofós, Tortuga, São Paulo, Brazil; Table 01). The diet was formulated according to the NRC (2007) guidelines, in a roughage: concentrate ratio of 40:60 for body weight gains of 100 g/day.

Table 01: Ingredients and chemical composition of the experimental diet.

Ingredient	In g/kg Dry matter
Elephant grass	400
Ground corn grain	330
Soybean meal	252
Common salt	6
Commercial premix[a]	12
Chemical composition	
Dry matter[b]	631
Crude protein	190
Ether extract	22
Ash	69
Neutral detergent fibre	266
Non-fibre carbohydrates	435

[a]Guaranteed levels provided by the manufacturer (per kg in active elements): 240 g/kg calcium; 71 g/kg phosphorus; 28.2 g/kg potassium; 20 g/kg sodium; 20 g/kg Magnesium; 30 mg/kg cobalt; 400 mg/kg copper; 250 mg/kg iron; 1350 mg/kg manganese; 15 mg/kg selenium; 1700 mg/kg zinc; 40 mg/kg Iodine; 10 mg/kg chromium; 710 mg/kg fluorine; 135000 IU/kg Vitamin A; 68000 IU/kg Vitamin D3; 450 IU/kg Vitamin E. [b]in g/kg natural matter

Intake and nutrient digestibility

The diet was provided twice a day, at 08.00 hr and 15.00 hr. A complete mix of diet and water was provided *ad libitum*. The amount of feed offered was calculated according to the intake of the previous day. For goats fed *ad libitum,* a feed refusal rate of 10% was allowed. Samples of feed supplied, and leftovers were taken weekly and stored at – 20 ^{0}C for later laboratory analysis. The dry matter intake (DMI) was obtained by the difference between values of dry matter offered and dry matter in leftovers. Nutrient intake was determined by taking the difference between nutrients offered and nutrients present in the leftovers.

The digestibility assay was carried out during the last 30 days of confinement. Animal faeces were collected directly from the final portion of the rectum, on three (3) consecutive days, at 52 h intervals, following the recommendations described by Chizzotti *et al.* (2007). The samples of each animal were identified, weighed, and stored at -20 °C, for further laboratory analysis. Before analysis, samples from the three collections of each animal were homogenized and a subsample of 10% of the total was taken.

Fecal output was estimated using indigestible neutral detergent fibre (iNDF) as an internal indicator. Samples of faeces, feed, and leftovers were incubated in the rumen of fistulated cattle for 240 h in non-woven bags (100 g/m2) (Casali *et al.*, 2008). The production of fecal dry matter was calculated from the relationship between iNDF intake and the concentration of fibre in faeces (Cochran *et al.*, 1986).

Ingestive behaviour

Ingestive behaviour was evaluated from day 45th of the experiment. For this evaluation, all animals were observed for 24h on three non-consecutive days established at intervals of one week, with observations recorded at intervals of 10 min. The time spent for feeding, ruminating, and idling was recorded by the evaluator during the observation time and extrapolated. Artificial lighting was used to assist in nighttime assessments. The dry matter intake efficiency (DMIE) was calculated using the DMI: time spent in feeding ratio. The rumination time per gram of ingested dry matter (RTDM) and the rumination time per gram of ingested neutral detergent fibre (RTNDF) were calculated considering the DMI and the neutral detergent fibre intake (NDFI) on the respective days of assessment of ingestive behaviour (Bürger *et al.*, 2000).

Growth performance

The animals were weighed at the beginning (at 4 months of age) and at the end of the experimental period to obtain the initial body weight and slaughter body weight (SBW), respectively. A 12 h feed fast was performed before weighing the animals. Average daily gain (ADG, g/day) and feed efficiency (FE) were obtained by using Eq 1 and Eq 2, respectively.

ADG = total weight gain/days in confinement -------------------------- Eq 1

FE = ADG/DMI. --------------- Eq 2

Laboratory analysis

Samples of feed offered, leftovers and faeces were pre-dried in a forced air oven at 55 ^{0}C for 72 h. After pre-drying, the samples were ground in a knife mill (Wiley Mill, MA-580, Marconi, Piracicaba, Brazil) using a 1 mm sieve. Laboratory analyses were performed using the methods described by the Association of Analytical Chemists (AOAC, 2016) for dry matter (DM), ash, crude protein (CP), and ether extract (EE), using protocols 967.03; 942.05; 981.10, and 920.29, respectively. Organic matter (OM) was determined by subtracting ash content from 100. The neutral detergent fibre (NDF) content was determined according to Van Soest *et al.* (1991). The non-fibre carbohydrates (NFC) content was obtained according to Weiss (1999) as given in Eq 3.

NFC = 100 - (%NDF + %CP + %EE + %ash)-------------------Eq 3

The apparent digestibility coefficient of the nutrients was calculated using the Eq 4.

Digestibility (%) = 100 × [100 - (% ingested iNDF / % fecal iNDF) × (% nutrients in the faeces / % nutrients ingested)]. -------Eq 4

The total digestible nutrients (TDN) were estimated on the basis of the data of apparent digestibility, and calculated according to Sniffen *et al.* (1992) as shown in Eq 5 and Eq 6.

TDN = (ingested CP - fecal CP) + 2.25 × (ingested EE - fecal EE) + (ingested NDF - fecal NDF) + (ingested NFC - fecal NFC) -------------------Eq 5

% TDN = (TDN Intake / DMI) × 100 ------------------Eq 6

Statistical analysis

The analysis of variance (ANOVA) was performed using PROC GLM of the Statistical Analysis System program, version 9.1. The means were compared by Tukey's test and significant differences were considered when the P value was less than 5% ($P<0.05$). The statistical model employed was as follow,

$$Y = \mu + \alpha + \beta + \alpha\beta + E,$$

where: μ = overall mean; α = effect of the feeding level; β = effect of the genetic group; αβ = interaction of feeding level and genetic group and E = random error.

RESULTS AND DISCUSSION

Intake and growth performance

There was an interaction effect ($P<0.05$) between the genotypic group and feeding level for DMI (g/kg day and %BW) and nutrient intake (Table 02). The Boer × NDG F1 kids showed a high intake of DM, OM, CP, NDF, and NFC compared to Moxotó and Canindé goats fed *ad libitum*. However, there was no significant difference ($P>0.05$) between genotypic groups for the DMI and nutrient intake when the animals were in 25 and 50% restricted feeding levels (Table 02). The DMI (% BW), EE, and TDN intake did not differ between Boer × NDG F1 and Canindé kids at *ad libitum* feeding. Among the Canindé and Moxotó kids, similar results were observed for EE and TDN intake when fed *ad libitum* (Table 02).

The DMI observed in the present study for Boer × NDG F1 (907 g/day) and Canindé (707 g/day) kids fed *ad libitum* were high compared to the recommendation of 700 g DMI/animal/day for growing goats by NRC (2007). The highest DMI by Boer × NDG F1 kids, when fed *ad libitum*, may be related to its inherently high potential for production which leads to a high nutritional requirement in those kids (Tadesse *et al*., 2016) compared to the kids from indigenous breeds.

Kids fed *ad libitum* showed a significantly ($P<0.05$) high SBW (Table 02). There was an interaction effect ($P<0.05$) between genotype and feeding level on ADG. Boer × NDG F1 kids fed *ad libitum* had a higher ADG than that of kids from other genotypes. However, the ADG of Boer × NDG F1 kids did not differ ($P>0.05$) from those presented by Canindé and Moxotó kids when subjected to feed restriction (Table 02). There was no significant effect ($P> 0.05$) of genotype and no interaction of genotype and feeding level for FE (Table 02). FE was low ($P<0.05$) at 50% feed restriction compared to *ad libitum* feeding (Table 02).

The DMI of Boer × NDG F1 and Canindé kids at *ad libitum* feeding level was higher than the estimated value given by the NRC (2007). However, there was a low and negative ADG in kids fed at 25% and 50% restriction levels, respectively. The FE was negative when the animals were subjected to 50% feed restriction. This effect is a response to the low DMI coupling with low nutrient intake, as goats have high energy and protein requirements for growth (Araújo *et al*., 2017a). This argument is further supported by the observation of Ribeiro et al. (2018), who observed a reduction in the ADG of Canindé kids at 60% of feed restriction, decreasing from 92.2 g/day (*ad libitum*) to 22.5 g/day (60% of feed restriction).

Nutrient digestibility

There was an interaction between genotype and feeding levels on digestibility of DM and OM and TDN ($P<0.01$) (Table 03). Boer × NDG F1 kids showed a low DM digestibility coefficient when compared to Canindé and Moxotó animals when fed *ad libitum*. Moxotó goats showed higher digestibility of OM and TDN than those in Boer × NDG F1 kids at *ad libitum* feeding level (Table 03).

Table 02: Intake of nutritional components and performance of goats of different genetic groups fed *ad libitum* or restricted at 25% or 50% of *ad libitum* intake.

	F1 Boer × NDG			Canindé			Moxotó			SEM	*P* value		
Intake	AL	25%	50%	AL	25%	50%	AL	25%	50%		G	F	I
DM, g/kg day	907.0^{a}	306.0^{d}	194.0^{d}	707.0^{b}	304.0^{d}	200.0^{d}	549.0^{c}	301.0^{d}	217.0^{d}	35.4	**	**	**
DM, % BW	3.6^{a}	2.0^{c}	1.3^{d}	3.6^{a}	2.0^{c}	1.3^{d}	3.0^{b}	2.1^{c}	1.7^{cd}	0.18	0.90	**	**
OM, g/day	836.0^{a}	281.0^{d}	178.0^{d}	653.0^{b}	279.0^{d}	184.0^{d}	508.0^{c}	277.0^{d}	200.0^{d}	32.5	**	**	**
CP, g/day	184.0^{a}	58.0^{c}	37.0^{c}	138.0^{b}	58.0^{c}	38.0^{c}	115.0^{b}	57.0^{c}	43.0^{c}	8.10	**	**	**
EE, g/day	20.0^{a}	7.0^{c}	5.0^{c}	15.0^{ab}	7.0^{c}	5.0^{c}	13.0^{b}	7.0^{c}	5.0^{c}	1.3	*	**	*
NDF, g/day	349.0^{a}	129.0^{cd}	81.0^{d}	264.0^{b}	128.0^{cd}	84.0^{d}	195.0^{c}	127.0^{cd}	87.0^{d}	16.0	**	**	**
NFC, g/day	281.0^{a}	87.0^{d}	55.0^{d}	235.0^{b}	86.0^{d}	57.0^{d}	184.0^{c}	85.0^{d}	64.0^{d}	9.2	**	**	**
TDN, g/day	650.0^{a}	240.0^{c}	162.0^{c}	542.0^{ab}	232.0^{c}	168.0^{c}	435.0^{b}	234.0^{c}	174.0^{c}	27.8	*	**	**
SBW, kg	33.6^{A}	16.2^{B}	13.9^{B}	26.5^{A}	16.5^{B}	14.4^{B}	23.6^{A}	17.8^{B}	13.8^{B}	2.31	0.09	**	0.06
ADG, g/day	161.0^{a}	19.0^{c}	-25.0^{d}	121.0^{b}	12.0^{c}	-15.0^{d}	94.0^{b}	21.0^{c}	-2.0^{cd}	11	0.12	**	**
FE, g/g	0.18^{A}	0.06^{A}	-0.14^{B}	0.17^{A}	0.02^{B}	-0.08^{B}	0.18^{A}	0.06^{AB}	-0.01^{B}	0.03	0.14	**	0.11

AL = *ad libitum*; 25 % = Feed restriction of 25 % of average intake *ad libitum*; 50 % = Feed restriction of 50 % of average intake *ad libitum*; DM = Dry matter; OM = Organic matter; CP = Crude protein; EE = Ether extract; NDF = Neutral detergent fibre; NFC = Non-fibre carbohydrates; TDN = Total digestible nutrients; SBW = Slaughter body weight; ADG = Average daily gain; FE = Feed efficiency; NDG = non-descript breed; SEM = Standard error of the means; G = Genetic group effect; F = Feeding level effect; I = Interaction effect between genetic group and feeding level;

$^{a, b, c}$ Means on the same line followed by distinct superscript lowercase letters differ for the effect of genotype and feeding level interaction by Tukey's Test; $^{A, B, C}$ Means in the same row followed by different superscript capital letters differ for the feeding level effect within the genetic group by Tukey's Test;

* = P<0.05; ** = P<0.01.

The low NDF digestibility coefficient and TDN content of Boer × NDG F1 kids at *ad libitum* feeding can be attributed to the high DMI of those animals in comparison to other genotypic groups. This may have caused a high passage rate of the digesta through the gastrointestinal tract and a shorter retention time of the bolus resulting in the highest intake (Conte *et al.*, 2018). NDF has a slow digestibility rate compared to soluble nutrients, such as CP and NFC, because it is not readily available to ruminal microorganisms and needs to be colonized by them to be degraded in the rumen (Moyo *et al.*, 2018). The increase in the rate of passage is caused by the increased flow pressure caused by the ingestion of more feed on the digesta present in the gastrointestinal tract (Van Soest 1994).

There were no differences among genotypes for the digestibility values of DM and OM, and TDN when the goats were under restricted feeding (25 and 50%) (Table 03). Boer × NDG F1 kids under 50% feed restriction had higher CP digestibility compared to that fed ad libitum (Table 03). The NDF digestibility value of Boer × NDG F1 kids was low (P<0.05) at the *ad libitum* feeding level compared to the 25% and 50% restriction levels (Table 03).

Table 03: Apparent digestibility of goats of different genetic groups receiving diets *ad libitum* or restricted at 25% or 50% of *ad libitum* intake.

	F1 Boer × NDG			Canindé			Moxotó			SEM	*P* value		
Digestibili-ty	AL	25%	50%	AL	25%	50%	AL	25%	50%		G	F	I
DM, g/kg	760^{b}	820^{a}	820^{a}	800^{a}	800^{a}	820^{a}	830^{a}	810^{a}	840^{a}	0.01	0.10	*	*
OM, g/kg	770^{b}	830^{a}	840^{a}	820^{ab}	820^{ab}	840^{a}	840^{a}	830^{a}	860^{a}	0.01	0.08	*	*
CP, g/kg	800^{B}	870^{AB}	880^{A}	840^{A}	840^{A}	860^{A}	850^{A}	840^{A}	880^{A}	0.02	0.70	*	0.06
NDF, g/kg	630^{B}	740^{A}	750^{A}	700^{A}	730^{A}	760^{A}	740^{A}	750^{A}	760^{A}	0.03	0.12	**	0.22
NFC, g/kg	940	940	960	940	940	950	950	930	960	0.01	0.82	0.09	0.19
TDN, g/kg	720^{b}	780^{ab}	790^{ab}	770^{ab}	760^{ab}	790^{a}	800^{a}	780^{ab}	800^{a}	0.02	0.06	*	*

AL = *ad libitum*; 25 % = Feed restriction of 25 % of average intake *ad libitum*; 50 % = Feed restriction of 50 % of average intake *ad libitum*; DM = Dry matter; OM = Organic matter; CP = Crude protein; NDF = Neutral detergent fibre; NFC = Non-fibre carbohydrates; TDN = Total digestible nutrients; NDG = non-descript breed; SEM = Standard error of the means; G = Genetic group effect; F = Feeding level effect; I = Interaction effect between genetic group and feeding level;

[a, b, c] Means on the same line followed by distinct superscript lowercase letters differ for the effect of genotype and feeding level interaction by Tukey's Test; [A, B, C] Means in the same row followed by different superscript capital letters differ for the feeding level effect within the genetic group by Tukey's Test;

* = *P*<0.05; ** = *P*<0.01

Ingestive behaviour

There was no effect of genotype or interaction between genotype and feeding level (*P*>0.05) for the ingestive behaviour parameters (Table 04). Barreto *et al*. (2011) also reported the same about the ingestive behaviour of Moxotó and Canindé kids. It was observed that the 50% feed restriction lead shortening of feeding time significantly (*P*<0.05).

Similar ingestive behaviour was observed by Ribeiro *et al*. (2007) when evaluating the feeding time of Moxotó and Canindé kids subjected to two feeding levels. It has also been observed by the same authors, that a 30% level of feed restriction reduced the feeding time of kids from 229.66 min/day to 176.81 min/day.

The inverse was found for the parameters RTDM and RTNDF, which were high (*P*<0.05) at the level of 50% feed restriction compared to the *ad libitum* feeding and 25% restriction level (Table 04).

The time spent by the animals feeding was shorter in 50% restriction than that in the *ad libitum* and 25% restriction level. Moreover, animals at the 50% restriction level had high RTDM and RTNDF compared to that fed ad libitum and with a 25% restriction level.

These observations may be related to the long retention time of digesta in the gastrointestinal tract, an adaptation mechanism of ruminants to increase the use of nutrients when subjected to feed shortages (Leite *et al*., 2015).

Rodrigues *et al*. (2014) also reported that lambs subjected to feed restriction increased RTDM and RTNDF and had high values of dry matter and nutrient digestibility compared to animals fed *ad libitum.*

Table 04: Ingestive behaviour of goat of different genetic groups fed *ad libitum* or restricted at 25% or 50% of *ad libitum* intake.

	Genetic group			Feeding levels			SEM	P value		
Parameters	F1 Boer × NDG	Canindé	Moxotó	AL	25%	50%		G	F	I
Feeding, h	2.0	1.8	2.1	2.7[a]	2.1[a]	1.0[b]	0.23	0.53	**	0.91
Idling, h	19.5	19.8	18.8	17.8[b]	19.8[a]	20.4[a]	0.47	0.40	**	0.35
Ruminating, h	2.5	2.4	3.1	3.5	2.1	2.6	0.39	0.56	0.06	0.19
Dry matter intake efficiency, g/h	245	262	207	291	232	192	64.2	0.45	0.08	0.23
RTDM, min/g	0.42	0.41	0.62	0.29[b]	0.41[b]	0.76[a]	0.08	0.21	**	0.42
RTNDF, min/g	0.98	1.03	1.53	0.75[b]	0.98[b]	1.80[a]	0.20	0.15	**	0.45

AL = *ad libitum*; 25 % = Feed restriction of 25 % of average intake *ad libitum*; 50 % = Feed restriction of 50 % of average intake *ad libitum*; NDG = non-descript breed; RTDM = rumination time per gram of ingested dry matter; RTNDF = rumination time per gram of ingested neutral detergent fibre SEM = Standard error of the means; G = Genetic group effect; F = Feeding level effect; I = Interaction effect between genetic group and feeding level;

[a, b, c] Means in the same row followed by different superscript letters differ for the feeding level effect by Tukey's Test;

** = P<0.01

CONCLUSIONS

In feedlot systems with unrestricted feeding and with more than 50% concentrate feed incorporation in the diet, the use of the Boer x NDG crossbred animals is an alternative to increase meat production in the Brazilian semiarid region. Boer kids showed similar DMI to Canindé kids when fed *ad libitum*. However, when subjected to restricted feeding, the performance of crossbred Boer kids is similar to that of indigenous breeds. However, restricted feeding resulted in longer rumination time and higher digestibility coefficients in goat kids.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest

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