DOI: 10.5433/1679-0359.2017v38n4p2065

Water with different salinity levels for lactating goats

Águas com diferentes salinidades para cabras em lactação

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Abstract

The aim of this study was to evaluate the influence of supplying water with varying salinity levels to dairy goats on nutrient intake, apparent nutrient digestibility, and milk yield. The experiment lasted 65 days and involved 24 crossbred goats with mean body weight of 38±4 kg, which were randomly allotted. It was set in a completely randomized design with four treatments consisting of 640, 3188, 5740 and 8326 mg L^{-1} total dissolved solids (TDS) in the drinking water. The results showed that water salinity levels had no effect on the intake of dry matter, neutral detergent fiber, crude protein, ether extract, total carbohydrates, non-fibrous carbohydrates, total digestible nutrients, metabolizable energy, digestible energy, or apparent nutrient digestibility. Water intake was influenced by the salinity, increasing as the salt level was increased. Moreover, the varying salinity had no significant effect on milk yield. Drinking water containing up to 8326 mg L^{-1} TDS provided no interference with the intake and nutrient digestibility of lactating goats in the feedlot. However, increasing the water salinity affects animal intake without any changes in milk yield. Therefore, this type of water can be used for crossbred goats at 30 days in milk, for up to 65 days in the feedlot.

Key words: Saline water. Intake. Digestibility.

Resumo

Objetivou-se avaliar a influência do fornecimento de água com diferentes salinidades sobre o consumo e digestibilidade aparente dos nutrientes e produção de leite de cabras leiteiras. O experimento teve duração de 65 dias, sendo utilizadas 24 cabras mestiças, com 38±4 kg de peso corporal, sorteadas e distribuídas em um delineamento experimental inteiramente casualizado, em quatro tratamentos contendo 640, 3.188, 5.740 e 8.326 mg l^{-1} de sólidos dissolvidos totais na água de beber. Os diferentes níveis de salinidade da água não influenciaram o consumo de matéria seca, fibra em detergente neutro,

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Received: Aug. 18, 2016 - Approved: Mar. 22, 2017

proteína bruta, extrato etéreo, carboidratos totais, carboidratos não fibrosos, nutrientes digestíveis totais, energia metabolizável, energia digestível e digestibilidade aparente dos nutrientes. O consumo de água ofertado sofreu influência dos teores de salinidade, elevando o consumo à medida que aumentava o nível salino. Os diferentes níveis de salinidade da água utilizadas no experimento não afetaram significativamente a produção de leite dos animais. Águas com até 8.326 mg l^{-1} de SDT não interferiram no consumo e na digestibilidade dos nutrientes de cabras em lactação em confinamentos. Entretanto, o incremento da salinidade da água afeta o seu consumo, sem afetar a produção de leite, portanto, esse tipo de água pode ser utilizado para cabras mestiças com 30 dias de lactação durante um período em até 65 dias de confinamento.

Palavras-chave: Água salina. Consumo. Digestibilidade.

Introduction

Water availability is often a limiting factor for herds in the arid and semi-arid regions worldwide. Particularly during the dry season, animals consume forages with low moisture contents and low nutritional levels, besides having irregular and restricted access to water sources, in general, once daily. On many occasions, water has to be brought to animals. According to NRC (2007), nutritional success depends on a proper supply of water to animals so that water requirements are met through ingestion.

Holding nearly 3.8% of the national water availability, Brazilian semi-arid regions face scarcity of drinking water for human and animal consumption. This has been a major problem compromising the development of rural populations in this area, which has the largest concentration of small ruminant herds of the country. This issue is intrinsically related, on the one hand, to the low precipitation and irregular rainfall in the region and, on the other hand, to its geological structure (crystalline shield), jeopardizing water accumulation in the subsoil, which is the largest water source for the region.

Salinity is the total amount of mineral salts (in grams) dissolved in a kilogram of water. The animal tolerance to salinity varies according to its water requirements, species, age, and physiological condition, besides of time of the year, and salt content in the total diet. The main salts are carbonates, bicarbonates, sulfates, nitrates, chlorides, phosphates, and fluorides. There is no difference whether the total dissolved salts consist of a simple salt or a complex (BOYLES, 2009).

Saline water consumption by animals varies largely, among which small ruminants have a broader range of tolerance (BOYLES, 2009). The Brazilian literature database on the degree of tolerance of dairy goats to water salinity levels is incipient. Studies of this nature are of critical importance, especially for the Brazilian semi-arid region, which concentrates the largest herd of goats of the country, and where surface water amount is insufficient to meet animal requirements over the year (ARAÚJO et al., 2011). Therefore, the use of water from wells, which is usually saline, may be an alternative to supplying small ruminants.

Given the above-described scenario, this study was conducted to evaluate the performance of lactating goats, in the semi-arid region of Paraíba State – Brazil, based on their nutrient intake, apparent nutrient digestibility, and milk yield.

Material and Methods

The experiment was conducted at the Laboratory of Goat Rearing, Research Center for Human, Social, and Agricultural Sciences, Federal University of Paraíba, at Campus III, located in Bananeiras – PB, Brazil. The study was analyzed and approved by the Committee on Ethics in Study and Research of Deontology of the Federal University of Vale do São Francisco (case no. 0007/131014).

Twenty-four multiparous crossbred goats, with an average body weight of 38 ± 4 kg and at 30 days in milk, were distributed into individual 1.26 m^2 stalls provided with feeders and drinkers for total diet and water. A completely randomized design was adopted, including four treatments that consisted of four salt levels and four blocks considering animal body weight and respective yields. Six replicates were used per treatment.

The experiment lasted 65 days, including a 12-day adaptation to the experimental diets and saline treatments, and two 5-day digestibility periods. At the beginning of adaptation stage, animals were identified, weighed, treated against endo- and ectoparasites, and randomly distributed into the stalls, which were identified according to each treatment. During this period, feed intake was adjusted by weighing the amount of feed supplied and leftovers, adding 20% of the total provided the previous day.

The treatments corresponded to increasing levels of total dissolved solids in the water provided to the animals, which was reconstituted using sodium chloride (NaCl), distributed into four electrical conductivity levels: 1.0, 5.0, 9.0, and 13.0 dSm^{-1}. The conductivity and temperature of each treatment were read daily using a conductivity meter (Digimed, Brazil), allowing for a difference of 5% of the limit of each treatment. For conversion of the water electrical conductivity into parts per million (ppm), or milligrams per liter of total dissolved solids (mg/L TDS), we multiplied 1 dS m^{-1} by 640 mg L^{-1}, following Marwick (2007). The treatments were converted to milligrams per liter, in the following proportions: T1 – 640; T2 – 3188; T3 – 5740; and T4 – 8326 mg L^{-1} TSS. Water troughs were washed once weekly to prevent NaCl from accumulating on the borders, which might affect the salt concentration of each treatment.

Before being supplied to the animals, the treatments were homogenized and provided *ad libitum* in 10-kg buckets, being refilled whenever necessary. Water intake was measured in kilograms, by calculating the difference between the water supplied and leftover, also discounting the water lost by evaporation, which was calculated by using buckets with the same amount of water for each treatment, distributed randomly across the experimental shed. Average evaporation losses were quantified as the difference in weight, over 24 h.

Samples of water from each treatment were collected weekly and bottled in labeled plastic packaging and sent to the Agro-environmental Laboratory at Embrapa Semi-arid, where the chemical analyses were performed and the water electrical conductivity was measured (Table 1).

Table 1. Mean values of the variables analyzed in the water supplied to lactating goats during the experimental period.

	Total dissolved solids in the water (mg L^{-1})			
Variable	640	3.188	5.740	8.326
Electrical conductivity (dS m^{-1})	1.00	4.98	8.97	13.01
Sodium (mg L^{-1})	253	1.035	1.840	3.680
Chlorides (mg L^{-1})	632,78	1.355	2.802	4.158
Calcium (mg L^{-1})	11,6	13,2	14,8	18,8
Magnesium (mg L^{-1})	26,40	17,16	11,04	10,32
Potassium (mg L^{-1})	5,86	5,47	3,13	5,87
Alkalinity (mg L^{-1})	13,80	14,2	14,6	24,50

The diet was composed of buffel grass (*Cenchrus ciliares spp.*) and a concentrate based on soybean meal, corn bran, and a mineral mixture, at a 50:50 roughage: concentrate ratio, being formulated according to the NRC (2007) to meet the requirements of lactating goats producing daily 2 kg milk/goat and 4% milk fat (Table 2). Feed was provided immediately after milking, at 07h00 and at 15h00, allowing for 20% leftovers, as a complete mixture. These leftovers were weighed every morning, and a 10% aliquot was collected to form a composite sample of the material, which was stored in a freezer for later chemical analyses.

Table 2. Chemical composition of ingredients offered in the experimental diets.

	Ingredient (%)			
	Buffel-grass hay	Ground corn	Soybean meal	Total diet
Dry matter (DM)	92,40	89,08	88,99	90,95
Organic matter (OM)	94,43	98,60	98,41	94,51
Mineral matter (MM)	5,57	1,40	1,59	5,47
Crude protein (CP)	6,47	10,31	49,04	13,98
Ether extract (EE)	1,94	6,17	2,21	3,34
NDFap	76,69	17,81	22,72	47,63
ADFap	49,69	4,66	10,76	27,99
Lignin	9,98	1,97	4,49	6,31
Cellulose	25,03	3,39	4,44	14,30
Hemicellulose	23,79	12,45	11,90	17,78
Total carbohydrates	86,02	82,12	47,16	77,18
NFCap	9,38	64,31	24,44	29,55
ADIP	0,96	0,94	1,36	0,99
Total digestible nutrients (TDN)	32,25*	85,00**	82,00**	56,70

NDFap: neutral detergent fiber corrected for ash and protein; ADFap: acid detergent fiber corrected for ash and protein; NFCap: non-fibrous carbohydrates corrected for ash and protein; ADIP: acid detergent indigestible protein; *Valadares Filho et al. (2006); ** Moreira et al. (2006).

Analyses were performed at the Laboratory of Animal Nutrition, Federal University of Paraíba, Campus II, located in Areia – PB, Brazil. Samples of diet ingredients and leftovers were analyzed for the percentages of dry matter (DM), organic matter (OM), mineral matter (MM), crude protein (CP), ether extract (EE), acid detergent fiber (ADF), and lignin according to method described by the AOAC (1990). Neutral detergent fiber corrected for ash and protein (NDFap) was determined following the method described by Van Soest et al. (1991), with modifications proposed in the ANKON device manual (ANKON Technology Corp.), and corrected for MM and CP contents. NDF and ADF corrections for nitrogen compounds and the estimation of neutral (NDIP) and acid (ADIP) insoluble nitrogen compounds were performed as described by Licitra et al. (1996).

The equation proposed by Sniffen et al. (1992) was used for the estimate of total carbohydrates, while non-fibrous carbohydrates (NFCap) were calculated using the equation recommended by Hall et al. (1999) and Hall et al. (2000), with NDF corrected for ash (a) and protein (p) (NDFap), as follows: TC = 100 – (%CP + %EE + %ash); NFCap = %TC – %NDFap.

Daily DM intake was calculated as the difference between the total DM content of the diet supplied and that of leftovers. Nutrient intake was determined as the difference between the total amounts of a given nutrient in the feed supplied and in the leftovers, on a total-DM basis. Animal performance was measured by estimating total weight gain (TWG), daily weight gain (DWG), milk yield (MY), 4% fat-corrected milk yield (CMY), and milk fat (MF).

Goats were milked twice daily, at 05h00 and 14h00, and milk yield was monitored by individual measurements (kg day^{-1}), being then pasteurized and frozen at –10 ºC. The individual samples were stored for later determination of total solids, fat, and protein contents by the AOAC method (1990). Milk composition analyses were performed at the Laboratory of Nutrition belonging to the Center for Health Sciences of the Federal University of Paraíba.

The digestibility coefficients of DM, OM, CP, EE, NDF, and NFC were determined by direct collection of feces from the final portion of the rectum, on the 1st, 2nd, 3rd, 4th, and 5th days of the experimental period, at 6h00, 9h00, 12h00, 15h00, and 18h00, respectively. Feces samples were stored at –15 ºC and later, as adopted for feeds and leftovers, they were processed at the end of each experimental period.

Fecal production was estimated using the indigestible neutral detergent fiber (iNDF) as an internal marker. The samples of feces, feeds, and leftovers were incubated *in situ* for 240 h, according to the method of Casali et al. (2008). The material remaining from incubation was extracted with neutral detergent, and the residue was considered iNDF. The following equation was used to estimate fecal production: Feces (g day^{-1}) = iNDF intake/iNDF concentration in feces.

Apparent digestibility coefficient (ADC) was calculated as described by Silva and Leão (1979), as follows: ADC = {[Nutrient intake (kg) – Nutrient excreted in the feces (kg)]/Nutrient intake (kg)} × 100.

Total digestive nutrition (TDN), i.e. available energy of diets, was calculated based on apparent digestibility data observed in the experiment, according to Sniffen et al. (1992), as follows: TDNI = (CP intake – CP feces) + 2.25 × (EE intake – EE feces) + (NDF intake – NDF feces) + (NFC intake – NFC feces); %TDN = (TDN intake/DM intake) × 100. The TDN values of the diets were converted to digestible energy (DE) and metabolizable energy (ME) using the following equations described by the NRC (2001): DE (Mcal kg^{-1}) = 0.04409 × TDN (%), ME (Mcal kg^{-1}) = 1.01 × DE (Mcal kg^{-1}) – 0.45.

Data were subjected to variance and regression analyses using the PROC GLM procedure of Statistical Analysis System (SAS, 2011).

Results and Discussion

The average intake of dietary nutritional components had no significant effect (P>0.05) of the water salinity levels (Table 3). As recommended by the NRC (2007), the DM and CP intakes were met for the dairy goats with the same production profile. Therefore, the water salinity levels had no interference with the intake of dietary nutritional fractions, suggesting that goats are tolerant to consumption of saline water.

Animal intake is one of the factors responsible for production efficiency. The average intakes of dry matter and protein found in this study were 1.891 and 0.280 kg day^{-1}, respectively. These values were higher than the 1.600 kg DM day^{-1} and 0.200 kg CP day^{-1} per animal recommended by the AFRC (1998) for an animal producing 2 L milk, at a live weight of 40 kg.

Table 3. Daily intake of nutritional components, in kilograms (kg) and in grams per kilogram of metabolic weight (g kg^{-1} LW$^{0.75}$), by dairy goats receiving water with different concentrations of total dissolved solids (TDS).

	Salinity (TDS mg L^{-1})				Significance		
Item	640	3.188	5.740	8.326	SEM[1]	Lin[2]	Quad[3]
	Intake, kg/day						
Dry matter	1,929	1,905	1,809	1,921	0,668	0,368	0,400
Organic matter	1,782	1,801	1,699	1,793	0,625	0,611	0,635
Crude protein	0,281	0,283	0,274	0,284	0,099	0,785	0,781
[4]NDF	0,817	0,827	0,759	0,823	0,285	0,479	0,509
Ether extract	0,060	0,062	0,060	0,059	0,021	0,891	0,769
Total carbohydrates	1,696	1,699	1,608	1,739	0,596	0,387	0,358
[5]NFC	0,879	0,873	0,849	0,916	0,311	0,300	0,222
[6]TDN	1,306	1,394	1,204	1,290	0,459	0,772	0,987
	Intake, Mcal day^{-1}						
Digestible energy	5,800	5,900	5,000	5,600	0,020	0,435	0,548
Metabolizable energy	4,700	4,800	4,100	4,600	0,016	0,281	0,317
	Intake, g kg^{-1} LW$^{0.75}$						
Dry matter	110,6	106,1	102,3	108,0	37,74	0,255	0,299
Organic matter	102,2	100,4	96,10	101,3	35,35	0,416	0,449
Crude protein	16,11	15,77	15,50	16,11	5,613	0,523	0,524
[4]NDF	46,87	46,05	42,97	46,53	16,12	0,322	0,355
Ether extract	3,49	3,46	3,37	3,35	1,207	0,846	0,988
Total carbohydrates	97,29	94,63	90,99	97,76	33,64	0,271	0,269
NFC	50,42	48,58	48,02	51,22	17,52	0,246	0,212

[1]Standard error of the mean; [2]Significance for linear effect; [3]Significance for quadratic effect
[4]NDF: neutral detergent fiber; [5]NFC: non-fibrous carbohydrates; [6]TDN: total digestible nutrients.

The average NDF intake found in the present study was 0.814 kg/animal/day. According to Van Soest (1994), a range of NDF intake between 0.8 and 1.2% body weight maximizes DM intake and, above this value, rumen fill would limit intake. The NDF intakes of animals receiving saline water were all near 1.2% LW. Therefore, animal intake was enhanced with all diets, which were physically unlimited due to excess fiber or high-energy concentrations.

The NRC (2007) recommends a daily TDN intake of 1.363 kg day^{-1} and 4.90 Mcal day^{-1} DE for 40-kg live weight animals producing 2 L milk with 4% fat daily; such values are close to those found in the present study. Despite the low quality of the used hay, the adoption of 50% concentrate based on corn grain and soybean meal met the production requirements of animals. Note that the water salinity levels had no influence on this result since the intake of these nutrients was unchanged for all treatments.

Digestibility of the evaluated nutrients (Table 4) showed no significant effect of the tested salinity levels, suggesting that this parameter might be inconsiderable. According to Potter (1972), these outcomes are associated with rumen-microflora adaptation to high concentrations of sodium chloride, which may be correlated with ruminal conditions without a direct effect on the functions of microorganisms.

The intake of water directly from the bucket increased linearly ($P<0.001$), from 6.08 to 9.11 kg day^{-1}, with the water salinity levels (Table 5). Araújo et al. (2011) reported that elevated concentrations of solids in the drinking water might affect its acceptance by animals; this includes the concentration of salt. Lardy et al. (2008) stated that increasing the amount of salt in a diet stimulates an increase in water intake by all animal species because of a larger volume of urine required for salt excretion. The intake of water via feed had no significant difference with the water salinity levels (Table 5). However, total water intake increased linearly (P<0.001) as the salinity content was elevated, which, in turn, increased the water intake across the treatments from 6.28 to 9.29 kg day^{-1}, respectively, from the lowest to the highest level of total dissolved solids. This heightened water intake can be explained by the higher quantity of total dissolved solids, which increases without affecting animal performance, despite the ingestion and excretion of this nutrient.

Table 4. Apparent nutrient digestibility in dairy goats receiving water with different concentrations of total dissolved solids (TDS).

	Salinity (TDS mg L^{-1})					Significance	
	640	3.188	5.740	8.326	SEM[1]	Lin[2]	Quad[3]
Dry matter	64,09	64,88	64,64	65,22	22,88	0,741	0,899
Organic matter	66,08	65,68	65,57	65,58	23,24	0,801	0,857
Crude protein	72,29	72,04	70,69	70,58	25,26	0,599	0,859
Neutral detergent fiber	69,75	69,54	69,76	70,58	24,71	0,694	0,565
Ether extract	70,12	70,76	69,41	69,27	24,71	0,847	0,647
Total carbohydrates	84,44	83,71	82,46	85,44	29,60	0,452	0,471

[1]Standard error of the mean; [2]Significance for linear effect; [3]Significance for quadratic effect.

Table 5. Water intake from buckets (WIB), water intake from the feed (WIF), total water intake (TWI), total fecal excretion (TFE), and water excretion via feces (WEF) of dairy goats receiving water with different concentrations of total dissolved solids (TDS).

Variable	Total dissolved solids (mg L^{-1})					Significance	
	640	3188	5740	8326	SEM[1]	Lin[2]	Quad[3]
Water intake from bucket (kg day^{-1})	6,08	6,98	7,82	9,11	1,329	0,001	0,725
Water intake from feed (kg day^{-1})	0,20	0,22	0,21	0,18	0,027	0,536	0,213
Total water intake (kg day^{-1})	6,28	7,20	8,03	9,29	1,290	0,012	0,738
Total fecal excretion (kg day^{-1})	1,06	1,17	1,06	0,93	0,153	0,490	0,067
Water excretion via feces (kg day^{-1})	0,69	0,77	0,68	0,60	0,101	0,370	0,058

[1]Standard error of the mean; [2]Significance for linear effect; [3]Significance for quadratic effect.
$\hat{Y} = 0.0025*X + 5.7619$ $r^2 = 99\%$.

The NRC (2007) reported that the total water intake for small ruminants could be estimated by the following equation: TWI = DMI × 3.86 – 0.99. Nevertheless, this formula disregards the different water salinity levels, which usually increase water intake by ruminants, or the physiological status of lactating animals, which may also influence nutrient intake, elevating water intake by up to 50%. Conversely, the total water intake of goats was different when applied to the equation. The animals displayed an average total intake of 6.309 kg day^{-1}, with a large variation across treatments, whereas the intake recommended by the NRC (1985) are 6.45, 6.36, 5.99, and 6.42 kg.animal.day for the treatments with 640, 3188, 5740, and 8326 mg L^{-1} TDS, respectively.

Considering the total water intake of 6.309 kg/animal/day proposed by the NRC (2007), the water intake of goats consuming water with 640 mg L^{-1} TDS led to a TWI decline of 0.17 kg day^{-1}. In the treatments containing 3188, 5740, and 8326 mg L^{-1} TDS, however, the animals had their water intake increased by 0.84, 2.04, and 2.87 kg/day, respectively. This indicates that an increase in the

TDS concentration in these treatments stimulated water consumption by animals, as suggested by BOYLES (2009).

Pereira et al. (2010) observed a significant decreasing linear effect ($P<0.01$) as they increased the proportion of silk flower in the diets, providing *ad libitum* fresh water, for lactating goats producing 1.32 kg day^{-1} of milk, averaging 7.06 kg/animal/day. These values are relatively close to the 7.7 kg/animal/day observed in the present study, considering the water salinity and the significant effect detected.

After ingestion, the salt concentrations of treatments inhibit the production of antidiuretic hormone (ADH), which is released by the hypophysis, regulating the input and output of water from the extracellular fluid. This role of urine volume regulation is adjusted by a precise regulation of water intake through thirst to maintain the body's water level compatible with life (MERCADANTE; ARCURI, 2004). Another hormone involved in this process is aldosterone, which is responsible for sodium absorption; in this way, when aldosterone levels are low, there is a larger sodium elimination via urine. There are also other body-water excretion pathways responsible for releasing the excess of sodium chloride consumed by animals, such as profuse sweating, feces, respiration, and milk production (DUKES, 2006).

Total fecal excretion and water excretion via feces remained significantly steady for all water salinity levels (Table 5), indicating that animals excreted water through alternative pathways, e.g. through the urine, once milk yield remained unchanged (Table 6). These two variables averaged 1.05 and 0.68 kg day^{-1}, respectively.

Table 6. Initial weight (IW), total weight gain (TWG), daily weight gain (DWG), milk yield (MY), 4% fat corrected milk yield (CMY), and milk fat (MF) of dairy goats receiving water with different concentrations of total dissolved solids (TDS).

Variable	Total dissolved solids (mg L^{-1})					Significance	
	640	3.188	5.740	8.326	SEM[1]	Lin[2]	Quad[3]
Initial weight (kg)	37,93	37,00	39,75	39,93	1,462	0,196	0,707
Total weight gain (kg)	7,01	12,80	6,50	8,61	1,704	0,844	0,301
Daily weight gain (kg day^{-1})	0,10	0,19	0,19	0,13	26,22	0,844	0,302
Milk yield (kg day^{-1})	1,79	1,85	1,76	1,86	0,185	0,582	0,902
4% corrected milk fat (kg day^{-1})	1,74	1,80	1,72	1,81	0,148	0,935	0,929
Milk fat (kg day^{-1})	2,72	2,65	2,51	2,53	0,101	0,147	0,651

[1]Standard error of the mean; [2]Significance for linear effect; [3]Significance for quadratic effect.

The water salinity levels had no effect on animal performance, whereby the animals had an average daily weight gain of 0.15 kg (Table 6). This may be more related to diet type and quality than to the salinity in the supplied water. It should be stressed that the hay used here was low quality, which might have been the main factor leading to the gains discussed earlier.

Furthermore, milk yield, fat-corrected milk yield, and milk fat had no effect of the water salinity levels ($P>0.05$). As described previously, both DM and CP intakes in the present experiment (Table 3) were higher than those values stated by the NRC (2007). This finding demonstrates the acceptability and adaptability of animals to water with TDS levels of up to 8326 mg L^{-1}, suggesting that milk production was maintained regardless of the concentration of total dissolved solids in the water provided to the lactating goats in our experiment. Despite the importance of water quality and its effects on food and water intakes, production performance, and animal health, the available information on this subject is still too scarce, especially for goats and sheep. However, obtaining this information is a matter of paramount importance for the development of goat and sheep farming in the Brazilian semi-arid region.

According to the NRC (2007), the formulated diet might have met the requirements for a daily milk yield of 2 kg. Nonetheless, the average milk yield observed in our experiment was lower, averaging 1.82 kg day^{-1} (Table 6).

Supplying water with up to 8326 mg L^{-1} TDS to crossbred goats at up to 30 days in milk, in the feedlot, for a period of 65 days, has no effect animal nutrient intake and digestibility or even milk yield. However, increasing the water salinity leads to higher water intakes.

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