Ingestive behavior of beef cattle fed diets containing different levels of extruded urea

Victor Luan da Silva de Abreu[1], Gabriella Jorgetti de Moraes[2], Luís Carlos Vinhas ítavo[3], Marcus Vinícius Garcia Niwa[4], Alexandre Menezes Dias[5], Noemila Débora Kozerski[6], Marlova Cristina Mioto da Costa[7], Lara Aires Leite[8]

1. *Graduating in Zootechnics - FAMEZ/UFMS*
2. *Master's Degree in Animal Science - FAMEZ/UFMS*
3. *Professor at Faculdade of Veterinary Medicine and Zootechnics of the Federal University of Mato Grosso do Sul*
4. *PhD Student in Animal Science - FAMEZ/UFMS*
5. *Professor at Faculdade of Veterinary Medicine and Zootechnics of the Federal University of Mato Grosso do Sul*
6. *PhD Student in Animal Science - FAMEZ/UFMS*
7. *PhD Student in Animal Science - FAMEZ/UFMS*
8. *Graduating in Zootechnics - FAMEZ/UFMS*

ABSTRACT - The objective of this study was to analyze the best level of inclusion of extruded urea for cattle, evaluating the ingestive behavior. Four crossbred cannulated steers were used in the rumen, consuming four diets containing: 50, 60,70 and 80 g of extruded urea per 100 kg of body weight. Control treatment of 50 g / 100 kg PC was considered, because based on the urea content of the product used, it corresponds to 40 g of urea /100 kg PC, which is the indicated dose for use. There was no significant effect of extruded urea levels on nutrient intake and ingestive behavior. The time spent with feeding, rumination and idleness were 3.54, 7.04 and 13.42 hours per day, respectively. It is recommended to supply extruded urea in up to 80 g/ 100 kg PC for beef cattle receiving balanced diets for 13% CP.

Keywords: amirea, intake, steers, ruminating

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Introduction

An important tool in the evaluation of diets is the knowledge of ingestive behavior, since it helps to adjust animal feeding management to achieve a better productive performance (Cardoso et al., 2006). Although urea is widely used in ruminant feed, it has restrictions caused by its low acceptability to animals, as well as segregation when mixed with other ingredients and mainly due to its toxicity (Chalupa, 1968), aggravated by its high solubility in the rumen, since it rapidly turns into ammonia (Owens et al., 1980; Daugherty and Church, 1982). There are alternative sources of NNP where the product is the result of the extrusion of starch with urea, which have low solubility in the rumen and slow release of ammonia. According to Miranda et al., (2015) the association of foods that provide non-protein nitrogen with carbohydrate sources that provide energy with the equivalent degradation rate, will result in a better utilization of ammoniacal nitrogen by ruminal microorganisms, maximization of protein synthesis microbial, and consequently increasing the rates of digestion and passage, dry matter consumption and animal performance. In view of the aspects aforementioned, this paper aims to determine the ideal level of extruded ureia for beef cattle, evaluating the ingestive behavior, in order to explore the maximum production potential of the animals.

Literature review

The activities evaluated in the ingestive behavior are: feeding time, rumination and idleness, feeding and rumination efficiency, number of mericianism chews per food bolus, time spent chewing ruminal bolus and number of mericianism chews per day (Bürger et al. 2000). The distribution of the activities presents individual differences of the animals, which may be the duration and time spent in feeding and rumination, which may be related to appetite, anatomical differences and the supply of energy requirements or ruminal filling (Fischer et al., 2002). According to Macedo et al. (2007), the number of meals consumed per day, the average duration of meals and the speed of feeding of each meal are important parameters that when studied individually generate the complete knowledge about the daily consumption of food. According to Van Soest (1994) confined animals spend around 1 hour consuming energy-rich foods or up to 6 hours for low energy and high fiber sources. The same author also states that rumination time is influenced by the nature of the diet and appears to be proportional to the cell wall content of the bulky ones. Therefore, to evaluate the effects of feeding in amount or nutritional quality, to establish the relation between ingestive behavior and nutrient consumption and to use the potential of the knowledge about ingestive behavior aims to improve animal performance.

Materials and methods

The paper was carried out at the Experimental Farm and at the Applied Animal Nutrition Laboratory of UFMS, in Campo Grande - MS. Four castrated, rumen fistulated crossbred cattle with an average initial body weight of 336.25 ± 47.86 kg were distributed in a 4x4 Latin square design, with four treatments and four 14 day periods, 10 days for adaptation and 4 days of data collection. The experimental treatments were four diets (Table 1) with volumoso:concentration ratio of 40:60, for crossbred cattle with 350 kg PC and average gain of 1.25 kg/day. The diets contained 50, 60, 70 and 80 g of extruded ureia for each 100 kg of PC, being considered control treatment of 50 g/100 kg of PC, because based on the urea content of the product used, corresponds to 40 g of urea/100 kg PC, which is the indicated dose for use. The extruded urea used was Amireia-200® (Pajoara Ind. And Commerce Ltda. Campo Grande-MS). It was evaluated on the 14th day of each experimental period, 24 consecutive hours, recording every five minutes all the behavioral activities. The parameters: time spent feeding, rumination, leisure, feeding and rumination efficiency, number of chewing by food bolus, time spent chewing ruminal chews and number of chews per day as described by Bürger et al. (2000). The average number of mericianism chews per ruminal bolus and the average time spent on chewing per ruminal bolus were obtained in four six-hour periods, three values per period, using a digital timer. The results regarding ingestive behavior factors were obtained by the ratios of time spent feeding (h/day), rumination (h/day), leisure (h/day), feed efficiency (kg MS/h), rumination efficiency (kg MS/h and kg FDN/h) and number of total chewing time (h/day), total number of ruminal bolus (n/day) and number of mericianism chews (n/day).

Results and discussion

According to Swenson (1988), it is extremely important to know the behavior of animals in order to achieve better breeding and feeding conditions, thus being able to obtain maximum production efficiency. No significant differences were found for ingestive behavior as a function of the level of extruded urea supply in the diet. According to Van Soest (1994), the rumination time is influenced by two main factors, being fiber content and the physical form of the diet. As the aim of the research was to define the ideal consumption of extruded urea, it was expected that there would be no difference between the treatments for feeding, rumination and leisure times, since the diets supplied had practically the same FDN content, due to the fact of using only a kind of bulky and equal ratio of bulky concentrate which changed only the levels of extruded urea between them. According to Fraser (1980) and Van Soest (1994) the rumination activity can take up to 8 hours in adult animals per day with variations between 4 and 9 hours, divided into 15 to 20 periods, which corroborates with the data found in Table 2, where the average time spent with rumination was de 7.04 hours/day (P=0.5770) and with feeding was 3.54 hours/day (P=0.7262). The average values of feeding efficiency 2.92 kg MS/hour and rumination 1.40 kg MS/hour and 0.57 kg FDN/hour.

Conclusions

Increasing levels of Amireia-200 do not provide negative effects on nutrient consumption and ingestive behavior. It is recommended to supply extruded urea in up to 80 g/100 kg CP for beef cattle receiving balanced diets for 13% PB.

Graphs and Tables

Table 1 – Ingredients and chemical composition of experimental rations.

	Extruded Urea (g/100 kg PC)				EPM[2]	P
	50	60	70	80		
Corn silage (g/kg of MS)	400.0	400.0	400.0	400.0	-	-
Maize (g/kg of MS)	488.9	503.2	517.5	531.9	-	-
Soy bran (g/kg of MS)	73.6	55.4	37.2	19.0	-	-
Amireia-200S (g/kg of MS)	19.5	23.4	27.3	31.2	-	-
Mineral Core (g/kg of MS)	18.0	18.0	18.0	18.0	-	-
Chemical Composition					EPM[2]	P*
Dry Matter (g/kg of MN)	435.5	438.9	434.7	435.1	16.5	0.9821
Organic Matter (g/kg of MS)	951.1	952.1	953.2	955.8	4.3	0.4778
Raw protein (g/kg of MS)	133.7	138.3	143.1	143.0	9.8	0.3515
Fiber in neutral detergent (g/kg of MS)	380.4	369.7	377.7	374.6	33.3	0.9716
Fiber in acid detergent (g/kg of MS)	170.9	153.7	167.2	154.9	15.37	0.3267

[1]Assurance levels: Na: 100 g/kg; P: 88 g/kg; Ca: 188 g/kg; S: 22 g/kg; Mg: 8000 mg/kg: Zn: 3000 mg/kg: Cu: 1000 mg/kg: Co: 80 mg/kg: I: 60 mg/kg: Se: 20 mg/kg: F: 880 mg/kg;
[2]EPM=Standard error of average; *Averages followed by distinct lowercase letter, differ between each other by the Tukey test (P<0.05).

(http://cdn5.abz.org.br/wp-content/uploads/2017/04/Tabela-1-22.jpg)

Table 2 - Nutrient consumption and digestibility and ingestive behavior of cutting steers according to experimental treatments.

	Extruded Urea (g/100 kg PC)				EPM[1]	P*
	50	60	70	80		
Nutrient consumption (kg/day)						
Dry matter	9.3	9.7	8.5	9.1	2.16	0.4299
Organic matter	8.9	9.3	8.1	8.7	2.06	0.4551
Raw protein	1.3	1.3	1.2	1.3	0.33	0.7676
Fiber in neutral detergent	3.5	3.6	3.2	3.6	0.73	0.3770
Fiber in acid detergent	1.5	1.5	1.4	1.5	0.31	0.6290
Nutrient consumption (g/kg PC)						
Dry matter	25.2	24.6	24.2	25.4	4.28	0.8533
Organic matter	24.0	23.4	23.1	24.3	4.07	0.8447
Raw protein	3.4	3.4	3.5	3.6	0.59	0.7073
Fiber in neutral detergent	9.5	9.0	9.1	10.0	1.42	0.2187
Fiber in acid detergent	4.1	3.8	4.0	4.2	0.62	0.3159
Ingestive behavior						
Feeding (hours/day)	3.3	3.2	3.8	3.8	0.90	0.7262
Rumination (hours/day)	6.2	6.9	7.7	7.3	1.47	0.5770
Idleness (hours/day)	14.4	13.8	12.5	12.9	1.78	0.4473
Feeding efficiency (kg MS/hour)	3.1	3.3	2.5	2.8	0.91	0.6636
Rumination efficiency (kg MS/hour)	1.6	1.4	1.2	1.4	0.28	0.1926
Rumination efficiency (kg FDN/hour)	0.6	0.7	0.4	0.5	0.18	0.2802
Total chewing time (hour/day)	9.6	10.1	11.4	11.1	1.78	0.4473
Number of bolus per day	310.1	302.0	344.5	376.5	67.68	0.4199
Number of mericianism chews per day	16677	18815	20427	19858	4662.20	0.6883

[1]EPM=Standard error of average; *Averages followed by lowercase letter distinct, differ between each other by the Tukey test (P<0.05);
(http://cdn5.abz.org.br/wp-content/uploads/2017/04/Tabela-2-10.jpg)

References

Bürger, P. J.; Pereira, J. C.; Queiroz, A. C.; et al. Comportamento ingestivo em bezerros holandeses alimentados com dietas contendo diferentes níveis de concentrado. **Revista Brasileira de Zootecnia** v.29, p. 236-242. 2000. Cardoso, A. R.; Carvalho, S; Galvani, D. B.; et al. Comportamento ingestivo de cordeiros alimentados com dietas contendo diferentes níveis de fibra em detergente neutro. Ciência Rural, v. 36, n. 2, p. 604-609,2006. Chalupa, W. Problems in feed ureia to ruminants. **Journal of Animal Science**, Champaing, v.27, n.1, p.207-219, Jan. 1968. Daugherty, D.A.; Church, D.C. In vivo and in vitro evaluation of feaderand hair meals in combination with urea for ruminants. **Journal of Animal Science.** Champaing, v.54, n.2, p.345-352, Feb. 1982. Fischer, V.; Deswysen, A.G.; Dutilleul, P. et al. Padrões da distribuição nictemeral do comportamento ingestivo de vacas leiteiras, ao início e ao final da lactação, alimentadas com dieta à base de silagem de milho. **Revista Brasileira de Zootecnia**, v.31, n.5, p.2129-2138,2002. Fraser, A.F. **Comportamiento de los animales de la granja.** Zaragoza: Acribia, 291 p.12.1980. Macedo, C. A. B.; Mizubuti, I. Y.; Moreira, F. B.; et al. Comportamento ingestivo de ovinos recebendo dietas com diferentes níveis de bagaço de laranja em substituição à silagem de sorgo na ração. Revista Brasileira de Zootecnia, v. 36, n. 6, p. 1910-1916,2007. Miranda, P. A. B.; Fialho, M. P. F.; Saliba, E. O. S.; et al. Consumo, degradabilidade in situ e cinética ruminal em bovinos suplementados com diferentes proteinados. **Arquivo Brasileiro de Medicina Veterinária e Zootecnia.** Belo Horizonte, V.67, n.2, p.573-582, 2015. Owens, F.N.; Lusby, K.S.; Mizwicki, K. et al. Slowammonia release from urea: rumen and metabolism studies. **Journal of Animal Science,** Champaing, v.50, n.3, p.527-531, Mar. 1980. Swenson, M.J. Dukes - **Fisiologia dos Animais Domésticos.** Ed. Guanabara Koogan S. A. Rio de Janeiro. 799p, 1988. Van Soest, P.J. **Nutritional ecology of the ruminant.** Cornekl thaca, 476p. 1994.