ENERGETIC SUPPLEMENTATION ASSOCIATED OR NOT WITH UREA AND/OR MONENSIN FOR BEEF HEIFERS

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ABSTRACT

The effect of energetic supplementation, in the form of ground oat grain (OT), associated with urea (OTU), with monensin (OTM), or with urea and monensin (OTUM), on the performance of 116 Charolais (C), Nellore (N) and crossbreds with predominance of C (CN) or N (NC) heifers was evaluated during the end of summer (ES) and beginning of autumn (BA). The 15-month-old heifers, with initial weight of 243.1 kg, were kept on native pasture and supplemented with an amount of .7% of live weight. The average daily weight gain (ADG) was higher for heifers supplemented with the combination OTUM (538 g) in relation to OT (430 g) and OUT (380 g), however it was statistically similar to the combination OTM (488 g). Treatments that included monensin showed higher efficiency of converting the supplement into weight gain. During ES, the ADG was higher than during the BA (525 vs 394 g). For C, CN, N and NC heifers, the ADG during ES was 370, 517, 560 and 691 g and during BA it was 427, 398, 317 and 397 g, respectively. Nellore heifers showed lower live weight than the other genetic groups. Body condition score at the end of ES and BA was higher for CN heifers which did not differ from NC, with C showing intermediate score and N showing the lowest score. The monensin and urea association promotes weight gain of animals kept on native pastures and supplemented with oat grain.

KEYWORDS: Charolais; ionophore; Nellore, oat.

SUPLEMENTAÇÃO ENERGÉTICA ASSOCIADA OU NÃO À URÉIA E/OU MONENSINA SÓDICA PARA NOVILHAS DE CORTE

RESUMO

Avaliou-se o efeito da suplementação energética, na forma de grão de aveia moído puro (AV), associado com uréia (AVU), com monensina sódica (AVM) ou com uréia mais monensina (AVUM), no desempenho de 116 novilhas Charolês (C), Nelore (N) e mestiças com predominância de C (CN) ou de N (NC), durante o final do verão (FV) e o início do outono (IO). As novilhas com idade de 15 meses e peso médio inicial de 243,1 kg foram mantidas em pastagem nativa. O suplemento foi fornecido em quantidade equivalente a 0,7% do peso vivo. O ganho de peso médio diário (GMD) foi superior para as novilhas recebendo o suplemento combinando AVUM (539 g) em relação à AV (430 g) e AVU (380 g), porém foi similar estatisticamente à combinação de AVM (488 g). Observou-se que os tratamentos que incluíram monensina proporcionaram melhor conversão (3,58 e 3,46, para aveia + monensina e aveia + monensina + uréia) em transformar o suplemento em ganho de peso. No FV o GMD foi maior que no IO (525 vs 394 g). Para as novilhas C, CN, N e NC, o GMD no FV foi de 370, 517, 560 e 691 g e no IO foi 427, 398, 317 e 397 g, respectivamente. Novilhas N apresentaram menor peso vivo em relação aos demais grupos genéticos. O escore da condição corporal no FV e IO foi melhor para as novilhas CN que não diferiu das NC, com as C apresentando escore intermediário e as N o pior escore. A associação da monensina com uréia

favorece o ganho de peso dos animais mantidos em campo nativo e suplementados com grão de aveia.

PALAVRAS-CHAVE: aveia; Charolês; ionóforo; Nelore.

INTRODUCTION

In the early production system in southern Brazil, males are slaughtered and females mate for the first time at two years of age, and the growing phase usually occurs on native pasture. There is a wide variation in quality and productivity of native pasture during the year (RESTLE et al. 2004; CRANCIO et al. 2006; FONTOURA JUNIOR et al., 2007), which is reflected on animal´s performance. SOARES et al. (2005) reported gains ranging from 0.477 to 0.780 kg/day in spring/summer, while during autumn/winter these gains ranged from -0.154 to 0.283 kg/day. Therefore, the practice of supplementation represents a way to correct completely or partially this nutritional deficiency of native pasture in order to allow greater input of nutrients in the total diet of the animals. According to REZENDE (2010), besides providing higher weight gains to the animals, supplementation guarantees constant gains.

It is estimated that, in Rio Grande do Sul, about 1.2 million hectares of oat are cultivated annually in order to form a cover for summer crops (soybean and corn), which produces spare seeds in some years. The seed excess may lower the prices compared to traditional energetic sources such as corn, sorghum, rice bran and wheat bran, representing an option for animal feed (FATURI et al. 2003; RESTLE et al., 2009). In addition, FATURI et al. (2003) and RESTLE et al. (2009) observed that oat grain showed 13.08 and 13.68% crude protein, 29.30% NDF and 71.42% of *in vitro* organic matter digestibility.

The action of ionophores on ruminants consists of altering growth and metabolism of microorganisms in the rumen, causing gram negative bacteria to predominate over gram positive ones. Thus, an increase in the proportion of propionic acid and a decrease of acetic and butyric acids occur (THONNEY et al., 1981), leading to an improvement in feed efficiency (DINIUS et al., 1976). ZEOULA et al. (2008) observed positive effect with the addition of monensin to the diet of heifers fed high concentrate fraction (50% based on dry matter - DM), with an increase of the digestibility of the total DM consumed. The authors explain these results by the increase of amylolytic bacteria population, thus a greater degradation of nonfibrous carbohydrates.

Besides the drop in production during the winter period, native pasture loses quality, regarding especially protein. When the roughage offered to ruminants has low nutritional quality, usually there is a reduction in the production of microbial protein in the rumen, resulting in lower animal production. Urea is included in ruminant feed in order to replace true protein, which is more expensive, or to add nitrogen to food systems with low-protein roughage, thus keeping ruminal ammonia concentration at appropriate levels (OWENS & BERGEN, 1983).

The objective of this experiment was to evaluate the use of black oat grain as an energy supplement, associated or not with monensin and/or urea, on the performance of beef heifers from different genetic groups in the growing phase, maintained exclusively on native pastures.

MATERIAL AND METHODS

The experiment was conducted at the Beef Cattle Laboratory, at the Department of Animal Science, Federal University of Santa Maria - Rio Grande do Sul, located in the central lowlands physiographic region, from January to April, 2001. The soil belongs to São Pedro mapping unit, classified as dystrophic red-yellow ultisol, which is characterized by presenting deep soil, reddish sandy surface texture, besides being friable and well drained (EMBRAPA, 2006).

The performance of 116 contemporary beef heifers classified in four genetic groups - Charolais (C), Nellore (N), crossbreds with predominance of Charolais (3/4C 1/4N, 3/8N 5/8C, 11/16C 5/16N) and crossbreds with a predominance of Nellore (3/4N 1/4C, 3/8C 5/8N and 11/16N 5/16C) - was studied. The heifers were supplemented with ground black oat grain, ground black oat grain + urea; ground black oat grain + monensin and ground black oat grain + urea + monensin. The amount of supplement was equivalent to 0.7% of body weight on the dry basis of the beginning of each experimental period. The amount of urea was calculated to meet one-third of the equivalent of crude protein required for average daily gain of 600 g/day, according to NRC (1996), being corrected in each period according to the evolution of animal weight.

The supplementation lasted 84 days, divided into two periods, from January 28th to March 11th (end of summer) and from March 12th to April 22th (beginning of autumn). The animals were acclimated to the supplement 14 days before the beginning of the experiment. The ones that included urea were offered at 30 g/animal/day, with an increase of 15 g every three days until the total amount calculated according to the animal´s need for crude protein. Supplements that included monensin were offered at a level of 50 mg of monensin/animal/day, with an increase of 50 mg every three days, until the total amount of 150 mg/animal/day.

The animals were kept on the same native pasture area, totaling 50 hectares, provided with water and natural shade. For supplement supply, four paddocks with individual area of 120 m², with wooden troughs and 50 cm access per animal were used.

The animals were taken to the management center, located next to the supplement paddocks, every morning at 7:30, then they were separated according to their treatment, and were taken to the paddocks where they received the supplementation. The animals remained in the paddocks until the total consumption of the respective supplements and were finally driven back to the pastures, where they remained until the next day.

The oat grain was ground in a sieve with a 3 mm mesh. For correction of the macrominerals Ca, P and Na, nutritional composition tables for the mineral content of oat (NRC, 1996) were used. Sodium chloride and dicalcium phosphate were used for correction.

The animals were weighed when the adaptation started at the beginning of the experiment period, at 42 days and at 84 days (end of experiment). Before each weighing, the animals were fasted for solids for 12 hours. At the weighing, individual body condition was also evaluated, as follows: 1 – very thin; 2 – thin; 3 – average; 4 – fat; 5 – very fat (RESTLE, 1972).

Continuous grazing with variable stocking rate was used as the method in this experiment. The daily accumulation estimate of native pasture DM was evaluated in each period, using five grazing exclusion cages, adopting the method of triple pairing in which each sample contained an area of 0.25 m². The rate of dry matter accumulation of the period was estimated by the difference between what was observed inside the cage and what was cut off from the cage, divided by the difference in days between cuts. The availability of forage mass was assessed in each period, taking twelve samples (0.25 m²/sample) (WILMA et al., 1944).

Two grazing simulations were carried out, one in each trial. Immediately after collection, samples were weighed, identified and packaged in paper bags, then pre-dried in a forced-air hothouse at 65°C for 72 hours to determine partial dry matter content. Afterwards, the samples were ground in a Willey grinder with 1 mm mesh. Total nitrogen was assessed by micro Kjeldahl method, to obtain crude protein (CP) rate, according to AOAC (1984), and *in vitro* dry matter (IVDMD) and organic matter digestibility (IVOMD) by Tilley & Terry (1963) technique. The levels of neutral detergent fiber (NDF) were assessed by the method described by VAN SOEST & WINE (1967).

It was observed (Table 1) that there was an increase of 66.7 mm in average monthly precipitation, demonstrating that it has been an unusual period, causing a decrease in insolation of 30.4 hours. The values for mean maximum temperature remained similar to normal rates; however, there was a sharp decline in mean maximum temperature from 30.3°C (March) to 25.7°C (April) during summer/autumn transition. Regarding the mean minimum temperature, there was a slight increase of 2.7°C compared to normal.

Table 1 - Precipitation, sunshine, normal and occurred mean temperatures during experimental period

Month	Precipitation (mm)		Insolation (h)		Maximum temperature (°C)		Minimum temperature (°C)	
	Normal	Occurred	Normal	Occurred	Normal	Occurred	Normal	Occurred
January	145.1	309.9	225.2	164.6	30.4	30.0	19.1	22.0
February	130.2	124.8	196.7	171.6	30.0	31.3	19.5	22.0
March	151.7	144.1	197.5	191.3	28.2	30.3	17.9	20.7
April	134.7	249.6	168.7	138.9	25.0	25.7	14.5	17.1
Mean	140.4	207.1	197.0	166.6	28.4	29.3	17.8	20.5

Source: Meteorological Station - UFSM.

The experimental design was completely randomized, and data was submitted to analysis of variance, F test and means were compared by Tukey test at 5% significance level.

The data was analyzed according to the following mathematical model:

$Y_{ijklm} = \mu + T_i + GG_j + R(T*GG)_{ij} + P_k + (T*P)_{ik} + (GG*P)_{jk} + I_l + E_{ijklm}$, where**:**

Y_{ijklm} = dependent variable; μ = overall mean of all observations; T_i = effect of type of supplement of order "i", where 1 = oat; 2 = oat + urea; 3 = oat + monensin; 4 = oat + monensin + urea; GG_j = effect of genetic group of order "j", where 1 = Charolais; 2 = Nellore; 3 = crossbred Charolais and 4 = crossbred Nellore; $R(T*GG)_{ij}$ = random effect based on repetition within the combination $(T*GG)_{ij}$ (Error a); P_k = effect of the supplementation period of order "k," where 1 = end of summer and 2 = early autumn; $(T*P)_{ik}$ = interaction effect between the i-th type of supplement to the k-th period of supplementation; $(GG*P)_{jk}$ = effect of interaction between the j-th genetic group with the k-th period of supplementation; I_l = effect of the initial age of animal as a covariant and E_{ijklm} = residual random effect (Error b).

Initial weight and initial body condition were analyzed in the statistical model including the effects of genetic group and age. For statistical analysis, we used the SAS statistical software (2000).

RESULTS AND DISCUSSION

The native pasture presented average forage mass of 2370.81 kg DM ha^{-1} (Table 2). As regards the quality of pasture, 6.39% CP, 47.15% IVDMD, 43.62% IVOMD and 77.41% NDF were verified. By analyzing the results per period, a decrease in CP, IVDMD and IVOMD was observed, which, associated with the increase of NDF content, resulted in reduced weight gain, as it can be seen in Table 5. The daily accumulation of dry matter showed an average of 11.61 $kg.ha^{-1}.day^{-1,}$ and there was a decrease as the trial period advanced, due to seasonality of native forage production that is mainly composed of summer growth species (SOARES et al., 2005).

As the average of forage mass was high, allowing the selection of the grazed material, the quality of forage consumed by animals, evaluated by simulating grazing, presented higher values of CP and IVOMD, however, NDF content remained similar.

There was a predominance of grasses (82.47%) among the species observed during the botanical composition evaluation (Table 3). Values of 47.15 and 43.62% were observed for IVDMD and IVOMD contents, respectively. High content of NDF (77.41%), which represents the amount of cellular wall of the plant, was observed.

Table 2 - Production and chemical quality of total native pasture and of pasture harvested in grazing simulation according to the period

	Period		Mean
	01/28 to 03/11/	03/12 to 04/22	
Forrage mass, kg DM/ha	2237.77	2503.84	2370.81
Accumulation rate, kg DM/ha/day	19.07	4.14	11.61
Dry matter,%	41.25	43.20	42.23
Pasture height, cm	14.1	15.1	14.6
Crude protein,%	6.46	6.32	6,39
IVDMD,% *	50.64	43.65	47.15
IVOMD,% *	46.76	40.47	43.62
NDF,% *	75.12	79.70	77.41
Grazing simulation			
Dry matter,%	41.26	43.36	42.31
Crude protein,%	9.00	8.37	8.69
IVDMD,% *	51.25	47.93	49.59
IVOMD,% *	53.69	50.45	52.07
NDF,% *	74.62	78.41	76.52

* IVDMD - *in vitro* dry matter digestibility; IVOMD - *in vitro* organic matter digestibility; NDF - neutral detergent fiber.

Table 3 - Botanical composition (dry basis) and dry matter of native pasture components per evaluated period

Components	Period		Mean
	01/28 to 03/11	03/12 to 04/22	
	.... Botanical composition,%		
Grass	82.19	82.74	82.47
Dead material	11.63	10,13	10.88
Other species	6.19	{0}7.13{/0} {1} {/1}	6.66
	....Dry matter,%		
Grass	39.82	39.14	39.48
Dead material	79.87	76.36	78.12
Other species	46.76	37.35	42.10

There was no interaction between time and dietary treatments for average daily weight gain (Table 4). This was expected because of the low difference in chemical and production parameters in both evaluated periods (Tables 2 and 3). The animals fed oat + urea + monensin and oat + monensin had higher (P <0.05) average daily weight gain (DWG) compared to animals supplemented with oat + urea. The inclusion of monensin in the diet improved DWG of the animals.

GOODRICH et al. (1984) verified in a research that animals kept on pasture and supplemented with monensin gained 13.5% more weight than control animals. ROSO & RESTLE (2000), working on winter pasture, found a 7% increase in average animal stocking, 6.9% in live weight gain/ha, and 6% in feed efficiency of beef heifers supplemented with lasalocid sodium via sodium chloride, compared to animals supplemented only with sodium chloride. RESTLE et al. (1999) found no effect of including lasalocid sodium in the supplement for steers finished on oat and ryegrass pasture. OSMARI et al. (2008) found no effect of monensin sodium on the performance of cull cows finished on natural pastures and receiving supplementation.

Table 4 - Adjusted means and standard errors for average daily weight gain (g) according to treatment and period

Treatment	Period		Mean
	01/28 to 03/11/	03/12 to 04/22	
Oat	471 ± 36	390 ± 39	430 [BC] ± 28
Oat + urea	458 ± 35	302 ± 35	380 [C] ± 26
Oat + monensin	563 ± 62	413 ± 62	[AB] 488 ± 57
Oat + urea + monensin	608 ± 45	471 ± 45	[A] 539 ± 38
Mean	525 [a] ± 19	394 [b] ± 19	

[a, b] Means followed by different lowercase letters in the line differ (P <0.05) by F test
[A, B, C] Means followed by different capital letters in the column differ (P <0.05) by Tukey test.

Researches have shown the benefits of the addition of ionophores to beef cattle´s diet by the increase in the proportion of propionic acid and the decrease of acetic and butyric acids (GOODRICH et al., 1984), improving feed efficiency because propionic acid is energetically more efficient (DINIUS et al., 1976). As propionic acid is an efficient glucose precursor, greater use of amino acids for protein synthesis is obtained due to its reduced use for gluconeogenesis (SALLES et al., 2001).

The average daily weight gain for the treatment oat + urea (380 g) was similar to the treatment oat (430 g) and lower than the other evaluated treatments (Table 4). This can be explained by ruminal patterns, because it is likely that the inclusion of urea to the supplement increased the levels of $N\text{-}NH_3$ to limit the development of rumen microbiota. According to SATTER & SLYTER (1974), $N\text{-}NH_3$ concentrations around 5 mg/100 ml of fluid are suggested as appropriate to maximize rumen microbial growth, and higher concentrations represent an excess that is not used for microbial synthesis. Therefore, it causes excessive ammonia production and absorption, which increases the N excretion and the energy cost for urea production (RUSSEL et al., 1992).

By verifying the weight gain of animals fed urea + monensin, a beneficial associative effect was found. This can be explained by the monensin effect of reducing ammonia producton, as observed by OLIVEIRA et al. (2007) and LANA & FOX (2001). Similar results were reported by SALLES et al. (2001), who observed a large amount of ammonia accumulated in the rumen of animals submitted to diets with excess of urea. In this situation, monensin decreases ammonia by 30%, and amino acids, spared from deamination, are used by other bacteria, increasing the concentration of bacterial protein in rumen fluid. This has probably occurred because the treatment oat + urea + monensin was similar (P> 0.05) to oat + monensin and both treatments were superior to oat + urea treatment.

The presence of urea in the diet with monensin did not favor animal´s performance compared to the diet that was supplemented only with monensin. GELINSKI et al. (2000) and RODRIGUES et al. (2007) also found no interaction between monensin x urea. LANA et al. (1997) explains that monensin tends to improve the efficiency of nitrogen utilization in diets based on true protein (soybean meal) instead of non-protein nitrogen (urea), which is different from the circumstances used in this experiment, where the diet whether provided lower levels of CP (Table 2) or was supplemented with a non-protein nitrogen source.

BARBOSA et al. (2001), evaluating the fermentation of three protein sources and three energy sources associated with two types of ionophores, found results that are consistent with the performance values attained in this experiment. According to these authors, in the analysis of ruminal fermentation, microbial protein concentration in the culture medium decreased with the use of urea and soybean meal and increased with corn gluten, probably due to greater availability of energy and lack of gluten peptides in the case of urea. They also found that ammonia and microbial protein concentrations were highly correlated with the final pH, crude protein percentage and type of food, with lower correlation with the presence of the ionophore. In the case of ammonia, and as reported for the soluble protein, these effects were attributed to the presence of urea, which raised the pH of the medium, and to a larger amount of incubated nitrogen. They concluded that monensin had a greater effect in reducing ammonia production from the protein sources which show the highest degradability (71.4 for urea and 24.8 mM for soybean meal).

LANA & FOX (2001) found no changes in the efficiency of diets containing urea, by associating monensin to a true protein source or NPN in the diet for beef cattle in feedlot. On the other hand, HANSON & KLOPFENSTEIN (1979), supplementing steers with monensin added to natural protein or urea, observed better performance for animals supplemented with natural protein, indicating that the limiting factor for weight gain and feed efficiency for the supplement with urea was due to the reduced amount of protein that reached the intestine.

The means for the periods show a decrease ($P < 0.05$) in average daily weight gain from 525 ± 19 to 394 ± 19 g, from the first to the second period, due to lower qualitaty of the consumed forage (Tables 2, 3 and 4), which is consistent with data from SOARES et al. (2005). These authors, studying different kinds of forage on native pasture, observed a decrease the ADG of the steers of approximately 400 grams in all treatments, from summer to autumn. In the present study, the decrease in ADG was not so marked, demonstrating the benefit of energy supplementation at strategic times.

There was a significant interaction between the genetic group and period (Table 5). Analyzing the first period (01/28 to 03/11), which corresponds to the end of summer, there was significant difference in favor of crossbred Nellore compared to Charolais (691 against 370 g). In the second period, this difference disappeared. The greater weight gain of crossbred Nellore in the first period is due to the incorporation of Charolais genes, which express a greater potential for weight gain (MENEZES & RESTLE, 2005), associated with Nellore genes, which have greater adaptability to hot weather (PEREIRA et al., 2000). In addition, heterozygosity also affects positively weight gain (MENEZES & RESTLE, 2005).

Table 5 - Adjusted means and standard errors for average daily weight gain (g) according to the genetic group and period

Genetic group	n (%)	Period		Mean
		01/28 to 03/11	03/12 to 04/22	
Charolais	23	370 [bc] ± 52	427 [bc] ± 55	411 ± 34
Charolais crossbred	37	517 [abc] ± 43	398 [bc] ± 43	471 ± 26
Nellore	(13)	560 [ab] ± 73	317 [c] ± 73	390 ± 64
Nellore crossbred	43	691 [a] ± 40	397 [bc] ± 40	566 ± 28
Mean		525 ± 19	394 ± 19	

[a, b, c] Means followed by different letters differ ($P < 0.05$) by Tukey test.

PEREIRA et al. (2000) found greater weight gain in Charolais animals at the stage of growth under grazing, than in Nellore animals under the same conditions during the winter, but greater weight gain in Nellore animals during the summer. We verified that the average daily weight gain of Charolais and crossbred Charolais heifers did not change significantly (P> 0.05) from late summer to early autumn. However, in Nellore and crossbred Nellore heifers, the reduction was significant (P <0.05), probably influenced by the temperature drop (Table 1).

Nellore heifers always presented the lowest weight for both the beginning and the end of each period in relation to the other genetic groups (Table 6).

Table 6 - Adjusted means and standard errors for body weight according to the genetic group and period

Genetic group	Live weight (kg)		
	Beginning (01/28)	End of Period 1 (03/11)	End of Period 2 (04/22)
Charolais	262.5 ± 6.7ab	277.1 [a] ± 7.5	292.2 [a] ± 7.8
Crossbred Charolais	276.9 [a] ± 5.5	298.6 [a] ± 6.1	318.3 [a] ± 6.1
Nellore	188.6 [c] ± 9.0	213.3 [b] 10.1 ±	226.7 [b] ± 10.1
Crossbred Nellore	244.4 [b] ± 5.2	273.2 [a] ± 6.1	290.2 [a] ± 5.8
	Body condition score (points)		
Charolais	3.02 [a] ± 0.04	3.10 [b] ± 0.04	3.20 [b] ± 0.04
Crossbred Charolais	3.16 [a] ± 0.03	3.31 [a] ± 0.03	3.38 [a] ± 0.03
Nellore	2.83 [b] ± 0.05	2.97 [c] ± 0.05	3.04 [c] ± 0.05
Crossbred Nellore	3.06 [a] ± 0.03	3.23 [ab] ± 0.03	3.31 [ab] ± 0.03

[a, b, c] Means followed by different letters in the column differ (P <0.05) by Tukey test.

The higher growth rate of Charolais heifers enables this breed to reach their adult weight faster. MENEZES & RESTLE (2005), finishing steers in feedlot, found greater genetic effects for the weight of Charolais animals, which are always heavier than Nellore animals. The greatest genetic potential for weight gain indicates that Charolais breed presents a higher additive effect of the gene for the weight gain trait than Nellore breed. This is also evident when the weight of the crossbred heifers is compared to the weight of Nellore animals.

Nellore genetic group presented lower values for body condition score in all studied periods compared to the other genetic groups. It is known that the body condition reflects energy reserves, thus, the use of numerical scales to classify females according to their body condition has proven to be an important tool to improve their nutritional management.

In animals for slaughter, body condition is one way to estimate their degree of completion. In breeding cows, the amount of body fat in specific stages of their production cycle is important to determine their reproductive performance. Decisions about the nutritional management are more accurate when body condition evaluation is routinely used. Qualitative variations occurred in the offered pasture are a common cause of low body condition and, hence, reproductive failure. Such facts are evident in the results of the study by VAZ & RESTLE (2000), who submitted heifers kept on natural pastures to three supplementation levels (0; 0.35 and 0.70% of body weight), and found that weight gain and body condition at the end of the supplementation period increased in a linear way, following the supplementation level.

In Table 7, it is observed that the treatments that included monensin had higher efficiency in converting the supplement in weight gain, although the statistical analysis cannot be done. This statement agrees with the findings by ZEOULA et al. (2008) on diets with 50:50 forage/concentrate ratio, in which the addition of monensin to the diet had a beneficial effect on ruminal fermentation and nutrient utilization in cattle and buffaloes. PRADO et al. (2010), by feeding buffaloes with 80% roughage in the diet, concluded that monensin increases intestinal and total digestibility of the nutritional components.

Table 7 **-** Mean daily intake and total supplement, average daily weight gain, supplementation efficiency and relative difference according to the treatment

	Treatment			
	Oat	Oat + urea	Oat + monensin	Oat + + monensin urea
Daily intake, kg/animal/day	1.84	1.86	1.90	1.90
Total intake (A), kg/animal	154.81	155.98	159.44	159.66
Weight gain (B), kg	35.59	33.83	44.55	46.10
Conversion (A / B)	4.35	4.61	3.58	3.46
Relative difference,% *	100.0	105.9	82.3	79.5

* Related to efficiency.

** Data not analyzed statistically

CONCLUSION

The association of urea with monensin favors weight gain of animals on pasture and supplemented with oat grain.

Genotypes with a higher Nellore prevalence presented higher weight gain and better body condition than Charolais animals at the end of summer. However, Nellore heifers suffered a sharp drop in performance at the beginning of autumn.

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