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Levels of supplementation in the performance for beef heifers, in grazing, during the dry season

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ABSTRACT: Productive performance of crossbreds Nelore beef heifers, in the growing stage receiving different supplement levels for three months grazing *Brachiaria decumbens* pasture were evaluated. The area was divided in five paddocks of 2.5 ha, with dry matter availability and potentially of dry matter digestible of 3.85 and 2.12 t/ha, respectively. Forty beef heifers of 191 ± 3.99 kg initial weight and 8.5 ± 0.15 months of age were assigned in a completely randomized experimental design with five treatments, and four supplementation levels. Mineral mixture (MM) (60 g/day) and multiple supplements, formulated to supply different supplementation levels in the amounts of 0.5, 1.0, 1.5 and 2.0 kg/animal more MM (60 g/day) were evaluated. The supplement had 300 g of crude protein/kg. Animals not responded significantly ($P > 0.05$) to the use of multiples supplements to final body weight. However, the heifers than received supplement won more weight ($P \leq 0.01$) (372 g vs. 92g of average daily gain), in addition to higher ($P \leq 0.01$) serum N-urea levels (20.14 vs. 12.09 mg/dL), when compared with heifers fed diets supplied only with mineral mixture. In conclusion, increasing the amount of protein supplement during the dry season, increased of performance of beef heifers. However, despite increase productive performance and intake of energy during dry season, additional higher levels of supplementation resulted in lower increment in growth.

Key words: beef cattle, daily gain, pasture, protein, supplements

INTRODUCTION

In the dry season of years, due to unfavorable climatic conditions, occurs reduction of forage quality on the content of crude protein and high concentrations of neutral detergent fiber with large lignified portion. This way have been used in an increasing scale by producers of beef cattle, mineral salt with urea and supplements protein low consumption, especially for animals in the growing phase, in order to meet the nutritional deficiencies of pasture. However, the weight gains obtained are still negative or very low and may compromise the productive system, since replacement heifers or killing staying at the property in the growing phase, for a long period.

In this context, the use of larger amounts of energy as food supplements could bring benefits to the production system, increasing the weight of the heifers, conception rate and decreasing the time in the growing phase.

This study aimed to evaluate the performance in beef heifers, in growing phase, receiving different offers multiple supplements, in pasture *Brachiaria decumbens*, Stapf, during dry season.

MATERIALS E METHODS

The experiment was conducted in the Cattle Sector - Universidade Federal de Viçosa, located in Viçosa – MG - Brazil, during dry season, between the months of July to September 2006, 84 days of works. An experimental area comprised of five paddocks of 2.5-ha each was used, formed by *Brachiaria decumbens*, each batch allocated in a paddock. Change of the animals was carried out between the paddocks every 14 days.

Experimental Design and Treatments

Forty heifers crossbred were used, $\frac{3}{4}$ Nelore $\frac{1}{4}$ Holstein, with age and average weight of 8.5 ± 0.15 months and 191.0 ± 3.99 kg, respectively. Heifers were randomly allotted to five treatments with eight replications, which were evaluated in four different supplements offers and mineral mix. The supplements were: mineral mixture (MM), control group, and supplements composed of the following ingredients: soybean meal, ground corn grain, mixture of urea more ammonium sulfate (9:1), MM was supplied in the amount of 60 g/animal, regardless of the treatment it was in, being the amounts of supplements offered in 0.5, 1.0, 1.5 e 2.0 kg/animal. The supplements attended 13, 26, 39 e 52% the requirements for total digestible nutrients, respectively (NRC, 1996), for a heifers of 190 kg and average daily gain of 0.4/kg, satisfying 25, 50, 75 e 100% of the requirements of CP, respectively. The chemical composition of supplements and pasture can be found in Table 1.

The heifers were weighed without fasting at beginning of study and every 28 days, always in the morning, without allowing water intake before weighing. On the 14th day of the trial period, pasture samples were taken by cutting a 5 cm soil, of four areas of 0.25 m², randomly, within each paddock to assess the total available dry matter e potentially digestible dry matter (PDDM)/ha.

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Table 1. Perceptual composition the of supplements, with based on natural matter and chemical composition of pasture and supplement

Items	Level of supplement (kg)					Pasture ⁴
	MM	0.5	1.0	1.5	2.0	
	Proportion (%)					
Mineral mixture ¹	100.0					
Urea/sulfate de ammonium (9:1)	-		2.50			
Soybean meal	-		40.00			
Ground corn grain	-		57.50			
Total	100.0		100.00			
Chemical composition						
Dry matter (DM)	98.20					35.84 ±0.37
Crude protein (CP) ²			31.73			7.38 ±0.74
Neutral detergent fiber (NDF) ²			8.94			62.79 ±2.56
Etheric extract (EE) ²			1.80			1.37 ±0.24
Organic matter (OM) ²			94.21			90.80 ±0.26
Non Fibrous carbohydrates (NFC) ^{2,3}			58.23			19.29 ±2.77
Neutral detergent fiber indigestible (NDFi) ²			2.73			28.39 ±2.33

¹Perceptual composition: phosphate bicalcium, 50.00; sodium chloride, 47.15; zinc sulphate, 1.50; copper sulphate, 0.75, cobalt sulphate, 0.05; potassium iodate, 0.05 and magnesium sulphate 0.5%; ²% in DM; ³NFC = 100 - [(%CP - %CPurea + %urea) + %NDFashep + %EE + % ashes] in supplements; ⁴ means and standard-error of the means the of samples of simulated grazing obtained during the experiment.

Evaluate the chemical composition of the forage intake, also on the 14th day of each trial period collecting the pasture by grazing simulation manual.

Laboratorial Analysis

Proceeded to analyses the content of PDDM the total mass of the pasture seconds Paulino et al. (2006), by the following equation: PDDM = 0.98 (100 - NDF) + (NDF - NDFi) where, NDF = neutral detergent fiber and NDFi = neutral detergent fiber indigestible. The samples were dried in a stove of forced ventilation at 60° C for 72 hours, and ground to pass through a 1.0 mm screen. The simulated grazing na supplements were analyzed for dry matter (DM), crude protein (CP), etheric extract (EE), neutral detergent fiber (NDF), ashes e neutral detergent fiber indigestible (NDFi), obtained in situ by incubation for 264 hours.

Statistical Analysis

This study was carried on using a completely randomized design, and comparisons between the supplements levels performed by orthogonal polynomial contrasts: control (MM vs. supplements), linear and quadratic, and adjustments of regression equations; being P-values £ 0.05 were considered different.

RESULTS AND DISCUSSION

Characteristics of Pasture

Availabilities of total dry matter (TDM) and potentially digestible dry matter (PDDM) were the first to the second

period increased, already in the third period occurred reduced availability of forage due to unfavorable climatic conditions. The average availability of TDM and PDDM were of 3.85 and 2.12 ton/ha, with a potential digestibility of forage available from 55.06%, most of this is likely to be used when providing supplements to animals (Paulino et al., 2006); mainly in the dry season where the average content of CP of the pasture was 7.38%. The offer was 8.39 and 4.63 kg of TDM and PDDM/100 kg of body weight/day, respectively, with a PDDM within recommended by Paulino et al. (2004), values 4.0 to 5.0 kg of PDDM/100 kg of body weight/day, to support Cattle Precision which entails the exploration of the genetic limits of animals created on pasture.

Productive Performance

Due to the qualitative characteristics (Table 1) and quantitative presented by pasture, heifers responded to the use of multiple supplements ($P \leq 0.01$) gaining more weight (281 g/day) compared to heifers receiving only MM (373 vs. 92 g/day, respectively).

The final body weight of heifers showed no significant difference ($P > 0.05$). However, the final body weight of the supplemented animals was higher in 18.67 kg, when compared with the control group (MM), which can accelerate return on total capital invested, due to the short time that the animals will be in the rearing in growing phase (Table 2).

Supplemented heifers had higher final height ($P \leq 0.05$), which confirms the benefits of supplementation on performance when compared to animals receiving MM (129.1 vs. 124.4 cm, respectively).

Table 2 – Minimum squares means and coefficient of variation (CV, %) to means biometric, levels of serum N-urea (SNU, mg/dL), intake; in according with the levels of supplementation

Variable	Level of supplementation					Contrast			CV (%)
	MM	0.5	1.0	1.5	2.0	C ¹	L ¹	Q ¹	
IBW ²	195.4	194.0	186.0	185.2	196.8	ns	ns	ns	-
FBW ²	203.1	221.9	211.6	218.9	234.7	ns	ns	ns	14.60
IH ²	119.9	119.2	120.2	119.7	119.7	ns	ns	ns	-
FH ^{1,2}	124.4	129.0	130.1	128.2	129.1	**	ns	ns	3.53
WHRI ²	1.63	1.62	1.54	1.54	1.64	ns	ns	ns	-
WHRF ²	1.63	1.71	1.62	1.70	1.81	ns	ns	ns	12.11
ADG ^{1,2}	92	332	305	402	452	*	ns	ns	28.33
Isupp ⁴	0.06	0.50	1.00	1.27	1.67	-	-	-	-
SNU ^{1,3}	12.09	17.30	20.88	21.77	20.62	*	**	ns	18.66

¹ C = control, L = linear and Q = quadratic, significant the 1% (*) and 5% (**) of probability and ns = no significant; ² IBW = initial body weight, kg; FBW = final body weight, kg; IH = initial height, cm; AF = final height, cm; WHRI and WHRF = weight and height ratio initial and final, respectively, ADG = average daily gain, g/animal; ³ SNU = $17.436 + 2.165SL$ ($r^2 = 89.23$), where SL = supplementation level; ⁴ Isupp = intake of supplement, with based on natural matter (kg/animal/day).

The average daily gain (ADG) of the animals showed increasing linear responses to increasing levels of supplements ($P \leq 0.01$). The lowest level of supplementation was able to promote a ADG of 332 g, being three times larger than the gain observed for the control group, which demonstrates the benefits of supplementation, during dry season of year, even when the forage has a crude protein content 7%, enough to maintain rumen activity. Similar results were observed for Porto et al. (2011), supplementing young bulls with different offers on work done in parallel to this study.

Lazzarini et al. (2013) supplemented with both starch and nitrogenous compounds to cattle grazing on low-quality tropical forage is characterized by an interactive effect that increases nitrogen retention by the animals. This interactions can explain the increasing in ADG even at low levels of supplementation.

IMPLICATIONS

The supply of supplements in increasing levels during dry season, results in increasing the productive performance of the heifers.

Increasing supplements increased energy intake during the dry season, may reduce the growing phase, due to the increased performance of heifers; and can result in more than acceptable conception rates and slaughter weight of heifers. However, the extent of this performance is reduced as the supply of supplement increases.

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