

Homeopathy for performance and finishing of Nellore steers in tropical pasture

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PALABRAS CHAVE ADICIONAIS

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INFORMATION

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SUMMARY

The objective was to evaluate the effect of the homeopathic product for finishing on the productive performance and carcass characteristics of Nellore steers, finished on tropical pastures of Marandu-grass. Forty castrated Nellore steers, aged 30 months and average live weight of 419.25 kg, were divided into two nutritional treatments (with or without homeopathy) in a completely randomized design into four groups (2 groups/treatment with 10 animals each, totaling 40 animals). Performance parameters and carcass characteristics of loin eye area (LEA), subcutaneous fat thickness (SFT), and marbling (MAR) were evaluated using ultrasound at start and end of experimental period. There was no effect of homeopathic treatment for supplement intake, average daily gain (ADG), LEA, and SFT. The mean for intake was 0.11 kg/day, ADG was 0.47 kg/day, LEA was 76.63 cm², and LEA gain in the experimental period was 18.2 cm². The mean final SFT was 4.8 mm and the SFT gain was 2.08 mm. For marbling gain (MARg) there was a difference ($P < 0.05$) between treatments, with animals supplemented with homeopathy having higher MARg. It is concluded that the use of homeopathy for finishing Nellore steers kept on pasture positively influenced the marbling gain but without effect on performance or subcutaneous fat thickness.

Homeopatia para desempenho e terminação de novilhos Nelore em pastagem tropical

RESUMO

Objetivou-se avaliar o efeito do produto homeopático para terminação sobre o desempenho produtivo e as características de carcaça de novilhos Nelore, terminados em pastagens tropicais de capim-Marandu. Quarenta novilhos Nelore castrados, com 30 meses de idade e peso vivo médio de 419,25 kg, foram divididos em dois tratamentos nutricionais (com ou sem homeopatia) em um delineamento inteiramente casualizado em quatro grupos (2 grupos/tratamento, com 10 animais cada, totalizando 40 animais). Parâmetros de desempenho e características de carcaça como área de olho de lombo (AOL), espessura de gordura subcutânea (EGS) e marmoreio (EM) foram avaliados por ultrassom no início e no final do período experimental. Não houve efeito do tratamento homeopático para a ingestão de suplementos, ganho médio diário (GMD), AOL e EGS. A média de ingestão foi de 0,11 kg/dia, o GMD foi de 0,47 kg/dia, a AOL foi de 76,63 cm² e o ganho de AOL no período experimental foi de 18,2 cm². A EGS final médio foi de 4,8 mm e o ganho de EGS foi de 2,08 mm. Para o ganho de marmoreio (MARg) houve diferença ($P < 0,05$) entre os tratamentos, sendo que os animais suplementados com homeopatia apresentaram maior MARg. Conclui-se que o uso da homeopatia na terminação de novilhos Nelore mantidos a pasto influenciou positivamente o ganho de marmoreio, mas sem efeito sobre o desempenho ou espessura de gordura subcutânea.

INTRODUCTION

Improving the productivity and efficiency of production systems has animal feed as its main component, and the use of alternative feeding combined with management and animal genotype can result in increased productivity and economic viability of the production system (Euclides Filho et al. 2001; Bonin et

al. 2014). The finishing stage for Nellore beef cattle on tropical pasture often produce high-yielding carcasses with minimal fat cover (Viscardi da Silva et al. 2022)

A biotechnological alternative to make the cattle production system more efficient and economically sustainable is the use of homeopathic additives to improve the finishing of cattle carcasses (Ferreira, 2005;

Freitas et al., 2015). The basic principle of Homeopathy is the use of dynamized medicines, that is, medicines prepared from animal, vegetable, or mineral substances (Santos et al., 2015). Homeopathic products are prepared with raw materials which impregnate the alcohol or sugar molecules determining their energetic impressions in them, without altering their chemical form. Consequently, there will be animal and vegetable products with innocuous substances in chemical terms (Ítavo et al. 2010). According to Pinheiro et al. (2021) in homeopathic treatment, there is no presence of chemical residue in animal products, which brings financial advantages relative to the health of breeders and consumers, that is, it contributes to the reduction of environmental contaminants.

In a study with confined sheep using homeopathic medicine, Miazzi, et al, (2010) observed that there was efficacy for body weight gain and mobilization of animal fat. However, Ítavo et al. (2010) did not observe improvement in the performance of feedlot steers with the use of homeopathy for performance. When used in Nile tilapia, there was a decrease in body fat without interference with body performance (Andretto et al, 2014; Fuzinato et al, 2019). Homeopathic veterinary medicine has yielded promising results in terms of solutions to control swine herd problems and to improve productivity, especially in relation to zootechnic outcomes. The addition of sucrose saline and homeopathic medication for weaned piglets reduced losses in the weaning period, as an alternative to the use of antibiotics as animal food additives (Soto et al. 2008).

In this context, the hypothesis was formulated that the supplementation with a homeopathic product destined for the increment of finishing would be able to improve the performance and carcass characteristics of steers finished in tropical pastures. Thus, the objective was to evaluate the effects of the homeopathic product added to the mineral supplement on weight gain and carcass characteristics of Nellore steers finished in tropical pastures of Marandu-grass.

MATERIAL AND METHODS

The experiment was carried out at the Farm at Fazenda Seriema, located in the municipality of Camaquã, state of Mato Grosso do Sul, Brazil. This research was authorized by the Committee on Ethics in the Use of Animals of the Dom Bosco Catholic University, Campo Grande-MS.

Forty castrated Nellore animals were used, with an average age of 30 months and average initial weight of 419.25 ± 12.96 kg, identified and submitted to the control of endo and ectoparasites, kept in Marandu-grass pastures (*Brachiaria brizantha* cv. Marandu), per 101 days, from January to May, under continuous grazing, with water and mineral supplement provided ad libitum, with an initial stocking rate of 0.93 AU/ha.

The design was completely randomized, with two treatments, each treatment consisting of two groups of 10 animals in paddocks of 10 hectares, accounting for 40 animals in all, respecting the basic principles of experimentation: repetition, randomization, and local

control. The treatments were carried out as follows: Treatment 1 - mineral supplement with homeopathic product and Treatment 2 - mineral supplement without homeopathy product.

During the period, the humidity, rainfall, and temperature indicators were monitored (Table 1). The mineral supplement was balanced according to the guidelines of the National Research Council (NRC, 2001) for cattle nutrition in the field, with an expected intake of 0.025% kg of live weight (Table 2). The homeopathic product is composed of *Calcarea carbonica* 30 CH and *Calcarea phosphorica* 30 CH in the proportion of 1:1, carried in calcium carbonate that was inserted in the mineral supplement in the proportion of 40 g/kg of the supplement. This homeopathic product was formulated with the purpose of increasing the deposition of body fat in cattle.

Marandu-grass samples were taken from the experimental paddocks before the animals entered and then every 28 days to determine forage availability. In each paddock, samples with a square of 1.0 m² were collected, five centimeters from the ground to quantify the availability of forage per paddock, and to separate the sample into leaves, stems, and dead material. After separation, the samples were identified and then taken to an oven at 65°C for 72 hours. After pre-drying, the samples were weighed and ground so that laboratory analyses could be carried out according to the methodologies described by Detmann et al. (2012). For the determination of *in vitro* digestibility (IVD), the technique described by Tilley and Terry (1963) adapted to the Artificial Rumen, developed by ANKOM®, as described by Holden (1999), using the methodology of the ruminal fermenter (incubator anaerobic, model MA443, Marconi) (Table 3).

The animals were weighed at the beginning of the experiment and every 21 days of the experiment, after a 12-hour solid fast, in which the animals were kept closed in separate lots in the farm's corral with water available. After the weighing, the animals were changed the paddock, to avoid possible differences in the nutritional characteristics of the pastures.

Measurements of carcass characteristics were carried out at the beginning and end of the experimental period, during which the images were collected by ultrasonography using an Aloka500D® ultrasound equipment, with a 17 cm transducer and 3.5 MHz, to determine the loin eye area (LEA), subcutaneous fat thickness (SFT), and marbling (MAR), in the Longissimus muscle, between the 12th and 13th rib, on the left side of each animal. During image reading, the LEA was measured and, instantly obtaining the SFT and MAR measurement in the proximal third of the muscle image. At the end of the experimental period, average daily weight gain (ADG), total average weight gain (TWG) and LEA gain (cm²), total SFT gain (SFTg, mm), and marbling gain (points) (MARg) were calculated.

Data were interpreted using the Statistical Analysis System program (SAS, 2009). To verify the effects of the treatments on the carcass characteristics and performance, the analysis procedures Proc GLM (General Linear Model) and the Mann Whitney test, at

Table I. Nutritional guarantee levels present in the mineral supplement offered to steers kept in Marandu-grass (Níveis de garantia nutricional presentes no suplemento mineral oferecido a novilhos mantidos em capim-Marandu)

Macro-elements (g/kg)	
Calcium (Ca)	190.54
Sulfur (S)	19.4
Phosphorus (P)	35.3
Magnesium (Mg)	6.48
Sodium (Na)	5.387
Microelementos (mg/kg)	
Cobalt (Co)	89.9
Copper (Cu)	249.38
Fluoride (F)	198.03
Iodine (I)	117.71
Manganese (Mn)	35.1
Selenium (Se)	78.74

Table II. Characteristics, chemical composition and in vitro digestibility of Marandu-grass pasture (Características, composição química e digestibilidade in vitro do pasto de capim-Marandu)

	Treatment	
	With homeopathy	Without homeopathy
Total Availability (ton/hectare)	42.35	43.47
Total Leaf Availability (ton/hectare)	14.61	13.43
Total Stem Availability (ton/hectare)	21.64	24.31
Total Dry Matter of Leaf Availability (kg DM/hectare)	5,420	5,295
Total Dry Matter of Stem Availability (kg DM/hectare)	8,500	8,495
Leaf (g/kg)	345.0	309.0
Stem (g/kg)	411.0	559.3
Senescent Material (g/kg)	144.0	131.7
Chemical composition of the leaf		
DM (g/kg)	371.0	367.5
OM (g/kg)	930.6	932.5
CP (g/kg)	60.8	60.7
EE (g/kg)	25.8	23.6
NDF (g/kg)	677.3	698.3
ADF (g/kg)	345.3	366.8
IVDDM (g/kg)	527.9	506.2
IVDADF (g/kg)	648.9	666.3
Chemical composition of the stem		
DM (g/kg)	407.3	406.9
OM (g/kg)	946.5	947.3
CP (g/kg)	33.0	28.8
EE (g/kg)	17.3	15.6
NDF (g/kg)	782.7	788.1
ADF (g/kg)	476.8	498.6
IVDDM (g/kg)	354.7	349.1
IVDADF (g/kg)	469.2	455.1

DM = dry matter; OM = organic matter; CP = crude protein; EE = ether extract; NDF = neutral detergent fiber; ADF = acid detergent fiber; IVDDM = in vitro digestibility of DM; IVDADF = in vitro digestibility of NDF.

Table III. Performance of steers finished on Marandu-grass pasture receiving a mineral supplement with or without homeopathy treatment (Desempenho de novilhos terminados em pastagem de capim-Marandu recebendo um suplemento mineral com ou sem tratamento homeopático).

	Treatment		CV	P
	With homeopathy	Without homeopathy		
Initial body weight (Kg)	418.7	419.2	3.19	0.904
Final body weight (Kg)	463.8	466.2	4.61	0.736
Total weight gain (Kg)	43.2	46.7	25.52	0.784
Average daily gain (kg/day)	0.46	0.47	25.52	0.784
Supplement daily intake (g/day)	0.11	0.12	5.45	0.824

CV = coefficient of variation

5% probability, were used to compare means, with the aid of the SAS statistical program version 9.2 (2009). The Pearson's correlations were performed using the SAS PROC GLM statistical protocol (SAS University Edition, SAS Institute Inc. Cary, CA, USA) and the null hypothesis (lack of correlation) was tested at 5% probability.

RESULTS

There was no effect of homeopathic treatment ($P > 0.05$) on the animals' performance variables during the experimental period. The averages of total gain and daily gain of steers kept in tropical pastures of Marandu-grass were, respectively, 44.9 kg and 0.46 kg/day. (Table 4).

There was no effect of homeopathic treatment ($P > 0.05$) on carcass traits (LEA, SFT, and MAR) of steers finished on Marandu-grass pasture (Table 5). Likewise, there was no treatment effect on LEA and SFT gains. However, a significant effect ($P = 0.034$) was detected on marbling gain, with superiority for the marbling of animals that received supplements with homeopathic products,

For both treatments, initial weight was highly correlated with final weight and ADG ($P < 0.01$). However, for the animals supplemented with homeopathic products, the Person correlation analysis showed that the marbling gain (MARg) was significantly ($P < 0.05$) and positively correlated with the SFT gain (SFTg) in steers with homeopathic treatment (Table V).

DISCUSSION

According to the performance results (Table 4), the mineral supplement with a homeopathic product did not have a positive effect on the performance of the animals during the experimental period. Likewise, Ítavo, et al., (2010) and Soares Filho and Caetano (2002), using homeopathic products for bovine fattening, did not observe significant effects on the performance of the animals.

Regarding the carcass characteristics of the steers, there was no difference ($P > 0.05$) between the LEA, SFT, and MAR results (Table 5). The similarity in the carcass characteristics of the animals is due to the fact that the final body weight uniformity of the steers, possibly by

similar nutrient consumption also obtaining the development of the Longissimus muscle (LEA) and similar SFT, provided by the same finishing system (Vaz et al., 2014). The homeopathic treatment has no effect on the LEA of steers finished on the Marandu-grass pasture (Table 5). The LEA average (75.57 Kg cm²) observed was higher than those observed in the literature 62 to 73.39 Kg cm² in Nellore steers (Ribeiro, 2008; Bonin et al., 2014; Vaz et al., 2014).

Likewise, SFT final and SFTg were not affected by homeopathy products, and showed averages of 4.8 mm and 2.1 mm, respectively. According to Domingues et al. (2014), the SFT is related to the amount of adipose tissue in the animal, being the ideal parameter for the meatpacking industry from 3 to 6 mm, in the present study the steers met the levels required in the market. When we compare mean SFT values with studies by Ferraz et al. (2015) carcass evaluation of several lineages of *Bos primigenius indicus*, it can be stated that the SFT of the steers at the end of the experimental period is in accordance with the average of the breed.

On the other hand, positive SFT results were reported by Ferreira (2005) who attributed the use of homeopathic supplements based on *Calcarea carbonica* 30 CH and *Calcarea phosphorica* 30 CH, in non-castrated male bovines (F1 Simmental-Nellore and F1 Holstein-Nellore), greater deposition of subcutaneous fat for treatment with homeopathy in finishing.

Contrary, Ítavo et al. (2010) evaluated the performance of feedlot Brangus steers receiving a homeopathic product focusing on growth promotion in the finishing phase for 90 days and concluded that the use of homeopathy did not provide better performance for animals finished in feedlot. There are few results found in the literature on the use of homeopathic products in the diet and productive performance of cattle, despite their high commercialization, and there is a need for further studies with homeopathic products in different cattle production systems.

A homeopathic product with the objective of increasing fat deposition will be very interesting due to its benefits on meat quality. According to Nassu et al. (2016), SFT is essential in the carcass cooling process, preventing water loss and maintaining the organoleptic characteristics of the meat, in addition to reducing the shortening of muscle fibers during the cooling process the carcass. When assessing the average marbling

Table IV. Biometric measurements and carcass traits of steers finished on Marandu-grass pasture receiving a mineral supplement with or without homeopathy treatment (Medidas biométricas e características de carcaça de novilhos terminados em pastagem de capim-Marandu recebendo um suplemento mineral com ou sem tratamento homeopático).

	Treatment		CV	P
	With homeopathy	Without homeopathy		
LEA initial (cm ²)	57.84	59.02	10.14	0.538
LEA final (cm ²)	75.57	77.69	6.87	0.157
LEA gain (cm ²)	17.73	18.67	23.63	0.351
SFT initial (mm)	2.67	2.79	24.85	0.761
SFT final (mm)	4.58	5.05	23.37	0.411
SFT gain (mm)	1.91	2.26	21.49	0.481
Marbling initial (points)	2.41	2.69	28.17	0.102
Marbling final (points)	3.43	3.32	22.16	0.741
Marbling gain (points)	1.02a	0.63b	26.35	0.034

LEA = loin eye area; SFT = subcutaneous fat thickness; CV = coefficient of variation

Means in the same line with different lowercase letters were significant by the Mann Whitney test ($P < 0.05$).

points (3.37), these were higher than those reported by Domingues et al. (2014) and Ferraz et al. (2015), revealing the existence of variability among Nellore animals for intramuscular fat deposition.

However, it is noteworthy that the levels of intramuscular and subcutaneous fat deposition are also correlated with energy availability in the animals diet (Lage et al., 2012). Ítavo et al. (2021) evaluated meat composition, and fatty acids profile on the meat of heifers finished in tropical pastures and observed carcasses with high finishing and high intramuscular fat marbling, and they cited fat is deposited with greater intensity during the cattle fattening stage after the growth phase, and this marbling depends on the breed and the energy level of the diet. Likewise, Leal et al. (2021) studied protein sources in supplement to finishing heifers on deferred pastures and observed positive effects related to animal performance and carcass characteristics, mostly in meat quality.

A positive effect was observed for the total gain in the marbling of steers that received treatment with homeopathic supplementation (1.02) and without homeopathic supplementation (0.63). Marbling is affected by age, breed, type of food, and sexual condition (Restle et al., 2000). In our study, the total gain in marbling can be attributed to the reduction in sexual behavior since the evaluated product is also indicated for the control of sodomy. Our results had a direct response to the homeopathic product used to promote marbling in the studied animals, evidenced by the increase in intramuscular fat deposition when compared to untreated animals that obtained 38.23% less intramuscular fat deposition during the experimental period. Thus, it can be suggested that the treatment with homeopathy contributed to the improvement of the sensory quality of the carcass, depositing fat between the muscle fibers, increasing the tenderness, palatability, and juiciness of the meat (Bonin et al., 2014), however without effect on the deposition of subcutaneous fat.

The accumulation of fat in the muscles increases with the maturity of the animals. Fat deposition beg-

ins with subcutaneous fat and its increase invariably and positively affects the accumulation of intramuscular fat or marbling (Bruns et al., 2004). The person's correlation analysis showed that the increase in the marbling gain index (MARg) is positively correlated with the gain in total subcutaneous fat thickness (SFTg) in steers with homeopathic treatment (Table 5). These results are in agreement with the findings of Lima et al. (2008), who observed that the homeopathic use of *Calcarea carbonica* in supplements, raised the pH and changed the molar percentages of volatile fatty acids in the ruminal fluid, contributing to increases in metabolizable energy and proteolytic activities of the ruminal microbiota. Possibly part of this energy is mobilized to increase the marbling gain index (MARg) of the animals that received the homeopathic supplement in the present work. It is noteworthy that in the establishment of the physiological balance of animals treated with homeopathy, there is also a positive response in relation to stress, due to the gradual reduction of cortisol in the bloodstream (Samulski et al., 1996). Thus, favoring the maintenance of metabolizable energy for gain.

CONCLUSION

The use of homeopathy products for finishing Nellore steers kept on pasture positively influenced the marbling gain but without effect on performance or subcutaneous fat thickness.

Further studies related to the effect of the use of homeopathy on the performance and finishing of beef cattle on pastures are suggested.

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Table V. Pearson correlation of initial body weight, final body weight, average daily gain (ADG) and gains in carcass biometric characteristics, gain in the loin eye area (LEAg), marbling gain (MARg), and gain in subcutaneous fat thickness (SFTg) of steers finished on Marandu-grass pastures receiving mineral with or without homeopathy treatments (Correlação de Pearson entre o peso corporal inicial, peso corporal final, ganho médio diário (GMD) e ganhos nas características biométricas da carcaça, ganho na área de olho de lombo (AOLg), ganho de marmoreio (AGMg) e ganho na espessura de gordura subcutânea (EGSg) de novilhos terminados em pastagens de capim-marandu recebendo tratamentos minerais com ou sem homeopatia).

	Initial BW	Final BW	ADG	LEAg	MARg
With homeopathy treatment					
Final BW	0.623**				
ADG	0.202	0.886**			
LEAg	0.296	0.292	0.175		
MARg	-0.245	0.219	0.419	0.097	
SFTg	-0.060	0.155	0.286	0.133	0.524*
Without homeopathy treatment					
Final BW	0.662**				
ADG	0.183	0.842**			
LEAg	-0.002	-0.017	-0.135		
MARg	-0.387	-0.310	-0.157	-0.321	
SFTg	-0.451	0.132	0.422	0.048	0.398

** P<0.01; *P<0.05

BW = body weight; ADG = average daily gain; LEAg = loin eye area gain, SFTg = subcutaneous fat thickness gain; MARg = marbling gain.

AUTHOR CONTRIBUTIONS

LCVI, GJQM, CCBFI, conceived and designed research; wrote the manuscript. GJQM, ESL, LCP, AMD, MNBG, CSC, RGM, ALCG and MGPS data analysis and discussion of results, reviewed the manuscript. GJQM, ESL, and LCP conducted experiment, laboratory analysis and collection of samples. All authors read and approved the manuscript.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AVAILABILITY OF DATA AND MATERIAL

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

ETHICAL APPROVAL

This study was conducted in strict accordance with the recommendations of the Guide for the National Council for the Control of Animal Experiments. The experimental protocol of research was approved by

the Ethics Committee on Animal Use of Dom Bosco Catholic University.

CODE AVAILABILITY

Not applicable

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