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EVALUATING THE USE OF NUTRITIONAL SUPPLEMENTS IN THE DIET OF CONFINED BEEF CATTLE IN PRESIDENTE OLEGÁRIO - MG[1]

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1. Trabalho de Conclusão de Curso II apresentado como pré-requisito para obtenção do título de bacharel em Medicina Veterinária do Centro Universitário de Patos de Minas.

Abstract: This study evaluated weight gain and animal performance of beef cattle when adding *Saccharomyces cerevisiae* yeast and vanillin to the diet. The experiment was conducted with two groups of cattle, a test group with the additives and a control group without the additives, both with 20 male animals of Nellore breed, weighing an average of 350 Kg. The results showed a statistically significant difference in weight gain between the two groups, with the test group showing a higher average daily weight gain. Additionally, the sieve test indicated an improvement in nutrient digestibility in the test group. The supplementation of yeast and vanillin in the cattle's diet proved to be an effective strategy to enhance animal performance and weight gain.
Keywords: Yeast**,** Performance**,** Vanilin, Weight Gain

INTRODUCTION

In 2021, Brazil was the largest beef meat exporter, with a market share of over 15%, or 2.5 million tons of beef meat. In 2023, Brazilian beef meat exports are expected to rise. The USDA (United States Department of Agriculture) estimates a 3.5% increase of Brazilian exports from the previous year volume of 3.345 million tons of beef meat, whilst the world exports are expected to rise by 0.5%. Cristiano Botelho, chief executive of the Brazilian Association of Artificial insemination (Asbia) comments: "USDA projections shows the potential the Brazilian meat has on the mission of feeding the world. It reflects the drive our producers have to invest in technology, which in turn makes greater productivity and efficiency possible".

The modernization of the Brazilian livestock industry has been supported by technology advancements in many areas of the production process, including animal nutrition. Changes in technology have been reflected in meat quality, and beef livestock nutrition does not rely solely on grazing, as it is not enough to support production trends. Therefore, nutritional supplements have been used to complement beef cattle's diet, offering a range of minerals and proteins.

There are many supplementation types, and the use of yeast as a microbial additive to ruminant's diets is an option to benefit animal performance and make rumen fermentation more efficient. It can also promote digestibility of dry matter, especially fibers, enhancing feeding efficiency, weight gain, and milk production. There are advantages of using yeasts over other microbial additives, yeasts have high rates of growth and are not considered unexpected residues in food products (MACHADO et al., 2014).

Using additives in ruminant's diets is a strategy to raise production, and many studies have explored modifying rumen fermentation through diet adjustments to improve animal performance. Yeasts is a group comprised of several unicellular fungi species. *Saccharomyces* is a genre of yeast well studied and are traditionally used in manufacturing processes. Within this genre, *Saccharomyces cerevisiae* is of special interest since it has been used since the primordia of human civilizations. *S. cerevisiae* has strains found in plants, animals, soils, and aquatic environments. (BELDA et al., 2019). *Saccharomyces cerevisiae* (SC) is found in sugar cane and is widely used for beer brewing. (GOES et al., 2017). When added to cattle diet, the rumen becomes the growth media.

According to Gillioli (2017), the yeast affect the rumen fermentation via oxygen sequestration from the rumen environment, which in turns activates the anaerobic bacteria that are also present in the rumen. Anaerobic bacteria when active, regulate rumen pH by degrading fibers and further activating other bacteria strains entering the rumen.

Another strategy to adjust cattle diet is to explore the complexity of this species, that has

a good taste perception, with approximately 25,000 taste buds. A diet additive that has shown good results is vanillin. Its sweet taste is attractive the cattle, that in turn ingest more feed. According to Silva (2021) a main reason for the addition of aromatic compounds to feed is to minimize rejection of the feed by the animals and increase feed ingestion. Vanillin is popularly known as vanilla, and is one of the most appreciated extracts worldwide, and an important flavoring in foods and beverages (FANI, 2020).

As stated by Fani (2020) vanilin is the main compound present in vanilla, and is obtained as glucovanilin, which corresponds to 2% of vanilla on a weight basis. Its functional groups are one aldehyde, one methyl ether, and one phenol. In its pure form, is a White crystalline powder of sweet taste and smell.

Although nutrition and the use of nutritional additives are known as an important factor in livestock production, there is still resistance to adoption from producers, who fear introducing new methods and costs to their operations. It is important to have measured results of using such practices. The goal of this study is to evaluate the impact of a fine adjustment to an already tailored diet that optimizes the animals' rumen environment by adding the yeast *Saccharomyces cerevisiae* and vanillin to beef cattle diets and measuring the impact in the gain weight of beef herds.

MATERIALS AND METHODS

This experiment was submitted to the Comitê de Ética Em Uso/CEUA, and received approval on July 10th, 2023, which was the start date of the experiment.

The experiment was conducted at Fazenda Nova Era, in the township of Presidente Olegário, state of Minas Gerais, Brazil. The geographic coordinates for the site are: 18º 24'56" S, 46º25 17" W.

Treatments were applied to two groups of 20 animals, referred here as Test Group (TG) and Control Group (CG). Mean starting weight at day zero (D0) was 350 Kg, with a maximum deviation of 15 Kg. Individual animal weight was taken at the start of the experiment (D0), 30 days after the start (D30), and 60 days after the start (D60).

Both groups were kept at same environmental conditions: temperature, distance from water source and feeding area, pasture size of 400 square meters. Ration consisted of the standard diet provided at that farm: 88% cornmeal, 9.5% soybean meal, 0.4% common salt, 1.6% protein supplement, 0.5% urea. Percentages are in a dry ,atter basis for every 100 Kg of alive animal weight. Final feed quantity is 2.5% of the animal's alive weight divided by the number of feedings in a day. In the Test Group (TG), *Saccharomyces cerevisiae* e vanilin were added to the standard ration. The product containing both additives was VASNIM, and 20g per each animal were added to the diet and given at the trough. At the start of the experiment, an adaptation of the herd to the additives was done by gradually increasing the rate per animal by 5g every 2 days, until the 20g rate was reached.

A sieve test of the cattle manure was performed at D0 and D60 in both groups to evaluate nutrient absorption. 320g of manure were collected from the pasture of each group and used for analyzes. Mean daily weight gain, and mean weight gain were calculated. Data was recorded in Excel, and statistical analyses was performed using a t-test.

RESULTS AND DISCUSSION

At D0, D30 e D60 all animals in the experiment were weighted. Mean weights at each sampling date, and the p-value associated with the statistical analyzes are reported in Table 1.

	D0	D30	D60
CG	348.595 kg	390.56 kg	432.515 kg
TG	347.595 kg	395.525 kg	443.63 kg
*p- value	0.10	< 0.01	< 0.01

Table 1. Mean weight of CG and TG at D0, D30 and D60.

*Statistically significant difference at an alpha level of 0.05

At D0, at the start of the experiment, the p-value indicates that there is not statistically difference in mean weigh between CG and TG. At D30, the p-value is <0.01, and it shows a statistically difference between mean weight on CG and TG that can be traced back to the diet additives. At D60, p-value is <0.01, and again it indicates a statistically difference between mean weight on CG and TG that cab explained the nutritional additives in the diet of TG.

Mean weight gain (MWG) and daily mean weight gain (DMWG) were calculated over the duration of the experiment as another way to explore the results mentioned above. TG had higher MWG and DMWG When compared to CG as summarized in Table 2.,

	MWG	DMWG
CG	83.920 kg	1.39 kg
TG	96.035 kg	1.60 kg

Table 2. Mean weight gain and daily mean weight gain results

A chi-square statistical analyzes of the sieve test results did not show any statistically significant difference in manure attributes between the two groups.

The results of the sieve test performed on D0 and D60 did not demonstrate a significant statistical effect of the use of additives when comparing the difference in the fecal score of both batches using the Chi-square statistical test to evaluate the significance of the difference between the test batch and control batch in D0 and D60 on sieves 1, 2 and 3, as shown below in Table 3.

Sieve test results show a decrease in the number of particles eliminated without being absorbed by the organism. In the CG, it decreased from 66g on D0 to 59g on D60. While in the TG, it decreased from 64g in D0 to 47g in D60. Although this trend was observed, no statistically significant difference was found using a chi-square test at an alpha level of 0.05, as shown in table 3.

Differences in feed leftover at the through indicated that the feed ingestion by the TG increased. At D0, there was a 10% leftover, that decreased to 7.7% at D60. Table 4 reports total daily feed amount, daily feed leftover, and percent change.

The decrease in feed leftovers at the trough suggests a greater feed ingestion by the animals in the TG and can explain the greater weight gain observed in that group. Feed leftover at the trough decreased in both groups from D0 to D60, but TG had a 1.7% better feed consumption than CG.

The results of this study agree with Neumann et al. (2013), who found that confined beef cattle on a similar corn silage and energy concentrated feed diet, when supplemented with 8g of live *Saccharomyces cerevisiae* yeast per day per animal had a higher daily mean weight gain (1.23 Kg/day) compared to the control (1.10 Kg/day). Dann et al. (2000) also reports weight gain in first calf heifer and cows on 75% and 43.3% forage in pre- and post-partum diet respectively. Live *Saccharomyces cerevisiae* was added to the diet at a rate of 60g per animal per day. Divergent results were found by Vyas et al. (2014), results from his study reported a non-statistically difference in weight gain of beef heifers on a grain-based diet (33.8% amid). In that study, the test group was supplemented with 4g of live *Saccharomyces cerevisiae* yeast per day per animal

A meta-analysis by Erasmus et al. (2009), with data from 15 studies, evaluates the effect

	SIEVE 1		SIEVE 2		SIEVE 3	
	D0	D60	D0	D60	D0	D60
CG	16g (23%)	11g (19%)	14g (20%)	11g (19%)	37g (43%)	37g (62%)
TG	14g (20%)	7g (14%)	14g (21%)	9g (19%)	36g (59%)	31g (67%)
*p-valor	0.59		0.73		0.65	

Table 3. Sieve test results

*No statistically significant difference at an alpha level of 0.05

	Total Feed Amount (Kg/day)			Feed Leftover (Kg/day)			(%)		
	D0	D30	D60	D0	D30	D60	D0	D30	D60
CG	174.30	195.28	216.20	17.93	19.41	20.965	10.2%	9.9%	9.6%
TG	173.75	197.75	221.8	17.68	17.32	17.044	10%	9%	7.7%

Table 4. Feed amount and leftover at D0, D30, and D60

of adding sodium monensin, *Saccharomyces cerevisiae* yeast, and the combination of both in beef cattle weight gain. The population was 1875 animals, with measurements of daily weight gain (DWG) and feed conversion rate (FCR). Daily weight gain was lower in the animals not receiving any additives to their diet (1.45Kg/day) when compared to the animals that received *Saccharomyces cerevisiae* as an additive to their diets (1.57Kg/day), and to the animals that received sodium monesin as an additive to their diets (1.54Kg/day), and to the animals that received both *Saccharomyces cerevisiae* and sodium monesin as an additive to their diets (1.57Kg/day). Feed conversion rate was also higher in animals that received *Saccharomyces cerevisiae* yeast as an additive to their diets (6.40Kg of dry matter/Kg of weight gained) compared to animals on diets with no additives (6.61Kg of dry matter/Kg of weight gained). Animals that received sodium monesin as an additive to their diets did not have an FCR different from the controls.

Swyers al. (2014) did not observe a difference in average fat layer thickness between the controls and beef cattle on diets that had addition of live yeast or addition of sodium monesin. Fat layer thickness was found to be a trait not affected by additives, regardless of yeast strain and dose.

Mikael Neumann at al. (1016) did not report a statistically significant difference ($p>0.05$) in daily mean carcass meat yield. Nonetheless, a non-statistically difference of 8% was observed in daily mean carcass meat yield, animals receiving yeast at a dose of 8g of yeast per day per animal in their diets had an average of 8Kg more meat carcass yield at the end of the confinement period compared to the control.

Although Krehbiel et al. (2003) reports no difference in carcass meat yield when animals are on a diet containing yeasts compared to the controls, it is important to note that literature supports that marginal weight gains can still positively affect productivity, and animal health. Inconsistent results in the literature can be due to a lack of consensus in the yeast dosage, type of yeast supplemented, and method used to provide the yeast supplement to the animals (GATASS et al., 2008).

Meyer et al. (2009) studied the use of essential oils (vanilla, cinnamon, and clove leaves) compared to a diet containing sodium monesin and tylosin. Results from this study report that there was significant increase in feed dry matter ingestion when essential oils were added to the diet. Contrary to this finding, Tassou et. Al. (20011) reported a decrease of 7% in feed dry matter ingestion in the first 15 days after essential oils (vanilla, cinnamon,

and clove leaves) were added to the diet. Coutinho et al. (2014) reports that addition of 7g of cashew peel extract per animal per day had no effect on feed dry matter ingestion by cows in lactation period. Tager et al. (2014) explored the same compound at a higher dose of 10g of per animal per day and reported no effect on feed dry matter ingestion.

Literature has a wide range of results, that both support the findings of this study and that diverge from it. The statistically significant difference in mean weight gain and daily mean weight gain between the Cg and the TG found in this study supports the hypothesis that fine tunning beef cattle diets is a strategy to increase meat productivity. The economic impact of such practice was also explored in this study, with the goal of determining if it is economically feasible to invest in nutritional additives without harming producers' profitability.

Table 5 summarizes the mean confinement period (days for confined animal to reach 588Kg and be considered finished), and daily cost for both CG and TG. Total cost is a function of how many days the animal was confined and the daily cost per animal. It is important to note that the study was carried out over the course of 60 days, at a daily cost difference of R$0.70 between CG and TG, the total cost difference between the groups for the duration of the experiment was of R$42.00.

	Mean confinement period	Cost (R$/day)	Total cost during confinement period (R$)
CG	171	7.70	1316.7
TG	148	8.40	1243.2

Table 5. Cost benefit of CG and TG

The monetary values summarized in table 5 show a saving of R$73.50 per animal when using the diet additives in the TG, compared to the CG. Although there is a cost associated with adding such supplements in the diet, lower total confinement period and faster weight gain in the TG make it an economic sound practice that could be implemented by producers without harming their operations, while still maintaining meat production levels at the farm.

CONCLUSION

Results suggest that adding the yeast *Saccharomyces cerevisiae* and vanillin to beef cattle's diet can be beneficial to the animals' weight gain. The gain weight observed in the test lot if a positive indicator of the effectiveness of these additives, which can lead to greater profitability in beef livestock production. Sieve test indicates an improvement in digestibility efficiency, which can lead to better absorption of the nutrients available in the diet.

These results can be relevant to the Brazilian beef livestock industry and highlight the importance of nutrition and the use of nutritional additives in weight gain efficiency and overall better performance of beef cattle.

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