Evaluation of cattle tallow and hen’s excreta in rations for the raising of semi-confined Brahman pre-weaning, Lara State, Venezuela

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Abstract. Two levels of incorporating cattle tallow (CT) and agricultural or agro-industrial byproducts of regional abundance were tested in the supplement to be compared with the usual practice of supplementation of the farm (near Sarare Locality, Simón Planas Municipality, Lara State, Venezuela), using to cover the limitations of base ration in calves at the end of the lactation. Using a completely randomized design with three treatments, to determine their effect on weight gain (WG), food intake, animal behavior and cost of supplementation; with 78, 77 and 76 animals, respectively per treatment, there are: T1: farm ration (without tallow, with hen excreta’s.-HE.-49.22%, wheat bran 39.6% and sesame cake 11.72%). T2: ration with 3.5 % of CT, from the industrial slaughters from Barquisimeto, (50% H, corn byproduct meal-30.9%, sugar cane molasses.-SCM.- 15%, salt-sulfur flower 4:1.-SSF.- 0.6%). T3: ration with 7% CT (T1, with 30.9% CBM). All animals receive distilleries vinasse ad libitum. The experiment was 7 d for adaptation for rations and 98 d to make measurements. The animals were confined in corrals 20 m by 20 m, live weight of 265 ± 4.96 kg (age 10 to 11 months). To aggregate 3.5% CT in the ration with 50% HE and substituting CBM with 15% of SCM, permitted increase the food intake and WG, with reduction of supplementation cost and the time to sell the animals. Whereas the use 7% CT was disadvantageous in all variables evaluated and lower that farm ration.

Key words: Corn byproducts meal, hen excreta’s, post-weaning cattle, sugar cane molasses, tallow, weight daily gain

Evaluation de sebo bovino y excretas de gallina en raciones para la crianza de predestete Brahman semiconfinados, Estado Lara, Venezuela

Resumen. Se probaron dos niveles de cebo en el suplemento comparado con la práctica habitual de suplementación de la Finca (cerca de la localidad de Sarare, Municipio Simón Planas, estado Lara, Venezuela), utilizando subproductos agrícolas o agroindustriales de abundancia regional, para cubrir limitaciones de ración base en becerros al final de la lactación. Usando un diseño completamente al azar con tres tratamientos, para determinar efecto de los mismos sobre la ganancia de peso (GDP), consumo de alimentos, comportamiento animal y costo de suplementación; con 78 animales por tratamiento, a saber, T0: suplemento empleado en finca (Sin grasa, con gallinaza.-G.-49,22 %, afrecho de trigo 39,6 % y harina de ajonjoli 11,72 %). T1: suplemento con adición de 3,5 % de cebo de res.-CR.-, proveniente del matadero industrial de Barquisimeto, (50 % de G, harina de subproductos de maíz.-HSM.- 30,9%, melaza.-M.- 15 %, sal-azufre 4:1.-SA.- 0,6 %). T2: suplemento con adición de 7% de CR (como T1, pero con 27,4 % de HSM). Todos recibieron vinaza de licorera a libertad. El experimento con 7 d de acostumbramiento y 98 d de mediciones. Los animales fueron confinados en corrales de 20 x 20 m, un peso vivo de 265 ± 4,96 kg (edad 10 a 11 meses). Agregar 3,5 % de CR en raciones con 50 % de gallinaza y sustituir la harina de subproductos de cereales en un 15 % por melaza, permitió incrementar consumo de alimentos y ganancia de peso, con reducción del costo de suplementación y tiempo para llevar al mercado los animales en levante. Mientras que el uso del 7 % CR presentó desventajas en todas las variables consideradas e inferior al testigo empleado

Palabras Clave: Gallinaza, melaza, grasa animal, impurezas de maíz, mautes brahmán, ganancia diaria de peso, consumo, comportamiento.

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Avaliação de sebo bovino e excrementos de galinha em rações para criação de Brahman semicôfesado pré-desmame, Estado de Lara, Venezuela

Resumo. Dois níveis de incorporação de sebo bovino (CT) e subprodutos agrícolas ou agroindustriais de abundância regional foram testados no suplemento para ser comparado com a prática usual de suplementação da fazenda (próximo à localidade de Sarare, município de Simón Plazas, estado de Lara, Venezuela), utilizando para cobrir as limitações de ração base em bezerras no final da lactação. Usando um delineamento inteiramente casualizado com três tratamentos, para determinar seu efeito no ganho de peso (GP), ingestão alimentar, comportamento animal e custo da suplementação; com 78, 77 e 76 animais, respectivamente por tratamento, temos: ração T0 (sem sebo, com excreta de galinha.-HE.-49,22%, farelo de trigo 39,6% e torta de gergelim 11,72%). T1: ração com 3,5% de CT, proveniente dos abates industriais de Barquisimeto, (50% H, farelo de milho-CTM-30%, melão de cana-de-açúcar.-SCM.-15%, flor de sal enxofre 41.- SSF.- 0,6%). T2: ração com 7% CT (T1, com 30,9% CBM). Todos os animais recebem vinhaça destilaria ad líbitum. O experimento foi de 7 d para adaptação às rações e 98 d para fazer medições. Os animais foram confinados em currais de 20 m por 20 m, peso vivo de 265 ± 4,96 kg (idade de 10 a 11 meses). Agregar 3,5% CT na ração com 50% HE e substituir CBM por 15% SCM, permitiu aumentar o consumo de ração e ganho de peso, com redução do custo de suplementação e do tempo de venda dos animais. Considerando que o uso de 7% CT foi desvantajoso em todas as variáveis avaliadas e menor que a ração da fazenda.

Palavras-chave: Farelo de subprodutos de milho, excrementos de galinha, gado pós-desmame, melão de cana-de-açúcar, sebo, ganho de peso diário

Introduction

The breeding of cattle consists of producing as many calves as possible, from a group of mother cows, whose milk production is entirely destined to the feeding of the young; ideally, each cow should produce one young each year. These cows suckle their young for a long period of time (6 to 8 months after the birth of the calves, Pérez-Gutiérrez 2017). The bovine animals for meat (Bos indicus), in the second third of the growth stage, recently weaned calves, have a high demand for nutrients, especially energy and high-quality protein, since their rumen is not in full development (NRC 2000), it is only until they reach between 250 and 325 kg of live weight, when the ruminal fermentation can reach a level with which to satisfy the needs of protein through quality microbial protein (VanSoest, 1994). When their mothers graze on grasslands with forages of medium to low quality the level of milk production reached reduces the possibility of meeting the requirements of a lactating animal with high genetic value and this is reflected in a low growth rate (Contreras and Montoni, 1996; Lascano and Euclides. 1998, Martínez et al. 1998). To improve the growth rate of these animals it is possible to supplement deficient nutrients in the ration to achieve this, but when managing herds in large production units it is convenient to use high-energy-protein supplements to avoid mobilizing high volumes of feed material to achieve economic benefits in the practice of food supply (Preston and Leng, 1987). Neto et al., (2015) determined that the intake of forages from tropical pastures alone is usually insufficient to avoid nutritional imbalances and reduces the weight gain of the animal, they could conclude that the use of oil supplements can be effective to reduce the emission of enteric methane of the post-weaning calves Nellore (live weight, PV, initial of 250.69 ± 27 kg) rear in grazing of Urochloa brizantha. Carvalho et al., (2016) determined that using supplements with 8% saturated fats, such as palm oil, offered at a level of 1% of live animal weight in dry matter (DM) daily reduces the digestion of the cell wall, when compared with sources with greater insaturation, reducing in all cases methane emissions when grazing Urochloa brizantha. Ghaly and Mac Donald (2012) determined that dry poultry manure contained sufficient levels of digestible energy, crude fiber, crude protein, crude fat, cobalt and iodine for ruminant rations. Bórquez et al., (2010) determined that silage mixtures of animal excreta were more digestible when molasses was added, than when only cattle bale was added, when offered to stabled sheep. This paper proposed the possibility of using agricultural or agro-industrial byproducts of regional abundance that can cover the limitations of the base ration of grazing and lactation, in calves at the end of lactation and reduce post-weaning stress, incorporating cattle tallow, molasses, corn meal and poultry by-products to cover part of the nutritional requirements at this critical stage of growth. Two levels of tallow were tested (3.5 and 7% of the DM) in the complement compared with the usual practice of supplementation of the Production Unit.
Cattle tallow and hen excreta in rations for semi-confined Brahman

Materials y Methods

Location.
The trial was carried out at the "Cujicito" farm, Las Aroitas sector, via Sarare, Simón Planas Municipality, Lara State (Venezuela). The farm is located in the tropical dry forest life area, altitude of 278 msol., Precipitation period is 6-7 months, average rainfall of 1300 to 1400 mm per year and temperatures vary between 22 and 29 ºC; bounded by the geographic coordinates 09°47'40 "of North latitude and 69°09'09" of west longitude (MRNRN, 1986).

Experimental design. A completely randomized design was used with three treatments, with 76 to 78 Brahman crossbred animals (> 3/4, crossed with other races Bos indicus.-Nellore, Indu Brasil, Guzerá.-) by treatment, namely T 
ration used on the farm (Without adding fat, with hen excreta’s -HE-49.22%, wheat bran 39.6% and sesame meal 11.72%). T:
ration with an addition of 3.5% of cattle tallow.-CT-, coming from the industrial slaughterhouse of Barquisimeto, (50% of HE, meal of corn by-products-HSM.- 30.9%, molasses.- M.- 15%, salt-sulfur 4:1.-SA.- 0.6%). T:
ration with an addition of 7% CT (as T, with 27.4% HSM). All treatments received liquor store vinasse from the rum industry, to freedom.

Feeding and management. The fresh poultry manure came from a commercial layer farm of the Simón Planas Municipality of the Lara State, with a production cycle of 52 weeks, before the bed was used, it was stored in piles of fresh excreta with a height of 2.5 meters and a diameter of 4 to 5 meters to ensure the elimination of the greatest possible number of pathogenic microorganisms that could be in it as described by Odhuba (1989), Shocken et al, (1996), Chaudhry et al. (1998) and Ortolani et al, (1997), where a process of self-fermentation occurs with moisture that brings the product from the poultry farm (between 15 and 20%). To determine the effects of treatments on weight gain (ADG), intake of supplements, animal behavior and cost of feeding practices. The experiment lasted 105 d, 7 of

Results and Discussion

acclimating and 98 of measurements. The animals were confined in pens with dimensions of 20 m x 20 m, these animals had an average live weight of 265 ± 4.96 kg (age between 10 and 11 months).

Data collection, measurements, and Statistical analysis.
The ADG per animal was determined by the weekly weight (using a mechanical balance of one kg of appreciation) and by simple linear regression with the statistical program Statistix 7 (2001). The observations of animal behavior were made in the pen 2 d a week, with 3 repetitions per treatment, for this evaluation the following activities were taken into account: Animals in the feeder consuming ration (ACCR). Animals in the tank consuming vinasse (ATCG). Animals lying, sleeping or not, without eating or drinking, usually ruminating (AE). Animals standing, without eating or drinking, moving or not (AP). The intake of food in the pen was estimated to take three sections of feeder of 10 linear meters each and observing the number of animals that consumed food during the d and of the difference between the offered and the rejected, making two measurements (Monday and Friday) every two weeks to each treatment, the results obtained were expressed as a percentage of live weight in dry matter intake (LW in DM), the animals received the food between 0800 and 1600, then grazed with their mothers in three grazing pastures Urechola brizantha between 1600 and 0800.

Chemical analysis.
The raw materials and prepared foods were analyzed to determine dry matter (DM, at 60 and 110 ºC), crude protein (CP, total nitrogen x 6.25), ether extract (EE) and ash by the AOAC (1984) methods and the insoluble fiber in neutral detergent (NDF) by the method of VanSoest et al, (1991). The costs of the prepared foods were estimated using the opportunity prices of the Barquisimeto (Lara state) local market.
As shown in Table 2, the T₁ animals spent more time-consuming food than the others, which coincides with the highest level of intake equal to the T₀, although the intermediate level of T₂ does not coincide with the level of intake, since that was the least consumed, perhaps the highest level of fats makes the complementary ration less acceptable and therefore of slower intake. The time used in rumination is normal for all treatments, although higher in T₀, probably in order to neutralize, via saliva, the acidity coming from a greater intake of vinasse (very acidic).

Table 1. Chemical analysis of the foods used and of the complementary mixtures prepared by treatment.

<table>
<thead>
<tr>
<th>Raw Material</th>
<th>DM</th>
<th>Crude Protein (CP)</th>
<th>NDF (%)</th>
<th>Ethereal Extract (EE)</th>
<th>Ash (%)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar cane Molasses</td>
<td>50.23</td>
<td>2.35</td>
<td>-</td>
<td>-</td>
<td>6.09</td>
<td>-</td>
</tr>
<tr>
<td>Wheat Bran</td>
<td>87.25</td>
<td>18.75</td>
<td>46.61</td>
<td>9.81</td>
<td>6.30</td>
<td>-</td>
</tr>
<tr>
<td>Corn byproducts meal</td>
<td>84.75</td>
<td>12.34</td>
<td>65.64</td>
<td>3.52</td>
<td>4.40</td>
<td>-</td>
</tr>
<tr>
<td>Sesame Meal</td>
<td>90.25</td>
<td>35.23</td>
<td>28.99</td>
<td>38.38</td>
<td>40.41</td>
<td>-</td>
</tr>
<tr>
<td>Cattle tallow</td>
<td>96.95</td>
<td>0.00</td>
<td>-</td>
<td>98.51</td>
<td>1.98</td>
<td>-</td>
</tr>
<tr>
<td>Hen excreta’s</td>
<td>85.20</td>
<td>26.05</td>
<td>28.80</td>
<td>0.50</td>
<td>17.35</td>
<td>-</td>
</tr>
<tr>
<td>Liquor vinasse</td>
<td>4.36</td>
<td>32.20</td>
<td>60.80</td>
<td>9.82</td>
<td>6.53</td>
<td>3.3</td>
</tr>
<tr>
<td>T₀</td>
<td>74.75</td>
<td>21.30</td>
<td>36.20</td>
<td>6.32</td>
<td>15.97</td>
<td>-</td>
</tr>
<tr>
<td>T₁</td>
<td>83.75</td>
<td>16.80</td>
<td>59.94</td>
<td>6.52</td>
<td>14.92</td>
<td>-</td>
</tr>
<tr>
<td>T₂</td>
<td>81.50</td>
<td>16.35</td>
<td>56.06</td>
<td>9.41</td>
<td>11.34</td>
<td>-</td>
</tr>
</tbody>
</table>

Values of PC, EE, NDF, ashes are reported in dry basis.

Table 2. Activities performed (%) by pre-weaning calves confined by treatment.

<table>
<thead>
<tr>
<th>Activity</th>
<th>%</th>
<th>T₀</th>
<th>T₁</th>
<th>T₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCR (Animals in the feeder consuming ration)</td>
<td></td>
<td>12.73c</td>
<td>20.14a</td>
<td>17.98b</td>
</tr>
<tr>
<td>ATCG (Animals in the tank consuming vinasse)</td>
<td></td>
<td>11.23a</td>
<td>10.10b</td>
<td>10.37b</td>
</tr>
<tr>
<td>AE (Animals lying. asleep or not. without eating or drinking. usually ruminating)</td>
<td></td>
<td>34.23a</td>
<td>27.37b</td>
<td>27.32b</td>
</tr>
<tr>
<td>AP (Animals standing. without eating or drinking. moving or not)</td>
<td></td>
<td>41.80b</td>
<td>42.39b</td>
<td>44.39a</td>
</tr>
</tbody>
</table>

Different letters in a column show different means (by Tukey HSD. p <0.05)

Table 3. Productive variables determined by treatment.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No animals</th>
<th>Weight gain (kg/animal·d)</th>
<th>Intake %PV in DM</th>
<th>Initial weight</th>
<th>Final weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₀</td>
<td>78</td>
<td>0.506b</td>
<td>2.01a</td>
<td>265.0a</td>
<td>314.6b</td>
</tr>
<tr>
<td>T₁</td>
<td>77</td>
<td>0.759a</td>
<td>1.91a</td>
<td>266.5a</td>
<td>340.8a</td>
</tr>
<tr>
<td>T₂</td>
<td>76</td>
<td>0.419b</td>
<td>1.76b</td>
<td>267.2a</td>
<td>308.3b</td>
</tr>
</tbody>
</table>

Different letters in a column show different means (by Tukey HSD. p <0.05).

The T₁ presented the same level of intake as T₀, but with a weight gain 50% higher than the management of the farm; Indicating that at the same level of chicken manure the combination of added fat, molasses and cereal makes the supplement better balanced despite having less nitrogen than T₀, which instead of being an advantage can result in the additional energy expenditure by eliminating the excess of it. The results, in terms of weight gain, are very similar to those reported by Nouel et al. (2003) in the same production unit, with such miscegenation, but with the use of 11% less poultry manure, 1.5% less molasses and no added fat, which allowed a ration with greater inclusion of chicken manure in the ration and lower cost in this experiment. This feeding practice favors the use of low-cost by-products in the local market in relatively high quantities, favoring the profitability of the complementation practice.

In this experiment, almost 1% of the live weight in the chicken ration was incorporated into the ration, which is
very similar to that evaluated by Nouel and Combellas (1999), but with a chicken litter, where the animal response was of 590 g/animal/d, with a similar miscegenation, which indicates that including fats when using bird droppings can represent an additional advantage by improving the energy density of the ration, representing an increase in the GDP of 28.64% for weaned animals managed in partial confinement.

Vijehulata et al. (1980), using a diet with 25% more chicken manure: 56.5% corn, 10% cotton seeds, 5% cane molasses, 3% alfalfa hay and 0.5% mineralized salts offered ad libitum as a single diet, in mongrel steers of 257 ± 15.0 kg and an intake of 2.86% of MS of by live weight achieved weight gains of 0.9 ± 0.09 kg/d, this diet was 18.58% higher in weight gain than our experience (0.759 kg/d in T1) but with half the incorporation of chicken manure in the complement, which indicates a significant reduction in the use of other materials with greater nutritional value and more expensive, being able to speculate that both energy and nitrogen were used more efficiently as they came from lower quality raw materials.

Neto et al. (2015), with crossbred steers of initial live weight of 246.7 to 257.6 kg grazing Urochloa brizantha receiving as a supplement of 1.51 to 1.45 kg DM/animal/d of a concentrated mixture (26.2 to 26% of PC and 13.4% to 2.57% of EE) achieved weight gains of 920 and 970 g/animal/d respectively, where the predominant supplement was grain (59%) or soybean cake (49%) and glycerin (28%), represents a greater weight gain than the T1 of this experiment, with the great difference that all of this soy and glycerin are better used by birds, fish and / or pigs than by ruminants.

Carvalho et al. (2016) in Nellore steers (Bos indicus) pasturing Urochloa brizantha with a complement/forage ratio of 39:860.2 where there was 8% palm oil, 65.6% ground corn grain, 22% Soy cake and 1.5% urea, with 21.9% PC and 10.4% EE achieved weight gains of 570 g/animal/d, closer to T0 and lower than T1, of this experiment despite having a high energy-protein value that did not translate into efficiency or greater gain. Meaning that a 3.5% incorporation of fat and availability of fermentable nitrogen and easily degradable energy (molasses) is more advantageous in grazing animals than using corn grain or soybean cake.

When it comes to verifying the difference between single grazing of Urochloa brizantha compared to the effect of supplementation; it is necessary that Rincón (2005) in grazing of this pasture with 12.8% of CP and 57.8% of FND with Cebu commercial animals (Bos indicus) determined weight gains of weaning at slaughter of 552 g/animal/d. On the other hand, Flores et al. (2008) with only mineral supplementation and grazing heights of 15 to 45 cm (9.6 to 10.6% of PC and 75 to 74.5% of FND, respectively) and achieved weight gains of 388 to 671 g/animal/d in animals with an initial weight of 250 kg. With the lower values they are compared with the results of the T1, while the higher values do not reach to surpass T1 which increases the weight gain between 13.1 and 37.5% due to the effect of supplementation. It is still necessary to determine a possible positive effect in the mitigation of greenhouse gases such as methane by improvements in the digestion of forage. Using lactating Sahiwal calves with a similar level of supplementation to the top fat in this experiment, Sharma et al. (2020) achieved similar dry matter intakes and very similar weight gains.

Table 4. Cost-benefit relationship of the feeding complementation practices evaluated

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of animals</th>
<th>Complement intake Kg/98d/lot</th>
<th>Bs/kg</th>
<th>USD/kg</th>
<th>BsInvested by lot</th>
<th>kg LW/period</th>
<th>Bs/kg LW</th>
<th>USD/kg LW</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>78</td>
<td>42,036.6</td>
<td>154.7</td>
<td>0.072</td>
<td>6,503,062</td>
<td>3,867.9</td>
<td>1,681.3b</td>
<td>0.782b</td>
</tr>
<tr>
<td>T1</td>
<td>77</td>
<td>39,449.5</td>
<td>198.5</td>
<td>0.092</td>
<td>7,830,726</td>
<td>5,727.4</td>
<td>1,367.2c</td>
<td>0.636c</td>
</tr>
<tr>
<td>T2</td>
<td>76</td>
<td>35,847.2</td>
<td>217.7</td>
<td>0.101</td>
<td>7,803,935</td>
<td>3,120.7</td>
<td>2,500.7a</td>
<td>1.163a</td>
</tr>
</tbody>
</table>

Different letters in a column show different means (by Tukey HSD. p <0.05).

One (1) US dollar was equivalent at that time 2150 Bolivars (Bs).

In Table 4 the management proposal of T1 with respect to T0 produced a reduction in the production cost of live weight kg in supplementation of 18.68%, despite having a 28.31% more expensive ration (for the use of fat) the advantage of a 50% increase in weight gain allowed to significantly reduce the cost of production per kg live weight and the time to reach the sales weight.

The use of 7% added fat reduced weight gain and food intake increased the cost of supplementation and favored the presence of diarrhea in T2 animals. Perippoli et al. (2016) evaluating an all-in-all system outside breeding, raising and fattening of Nellore and Bos indicus x Bos taurus grazing Urochloa brizantha with supplementation for completion determined that the weight gain in life was 450
and 460 g/animal/d respectively, and the feeding cost of 1.118 and 1.140 USD/kg of LW gained respectively indicating that the best treatment of this experiment (Tj) represents 55. d 56.89% of the total food cost 79 an understanding that the forage is cheaper than the complements it can be concluded that the proposal is an economically competitive practice which can accelerate the exit to the market of the animals and increase the carrying capacity of the production unit with a possible improvement of the business income.

Conclusions

The proposal to add 3.5% of cattle tallow in rations with 50% hens’ manure and substitute cereal meal by 15% for molasses allowed increasing food intake and weight gain with the reduction of the cost of supplying and the time to bring the animals to the market in thelevant. While the use of 7% of tallow represented a disadvantage in all variables considered and inferior to the witness used.

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Literature Cited


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