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Efeito do peso corporal de vacas de corte na eficiência da produção de bezerros

Effect of live weight of beef cows on calf production efficiency

Efecto del peso corporal de vacas de carne sobre la eficiencia de la producción de terneiros

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Resumo

Objetivou-se avaliar o desenvolvimento e o desempenho reprodutivo de vacas de corte com diferentes pesos corporais ao parto. A produção de leite e a eficiência de produção de bezerros foram avaliadas em vacas secundíparas Braford classificadas ao parto de acordo com o peso como leves (325,2 kg), moderadas (347,7 kg) e Pesadas (384,2 kg). Vacas pesadas tiveram maior produção total de leite do que vacas leves, mas não diferiram das Moderadas, refletindo em bezerros com peso ao desmame de 82,1, 76,6 e 76,9 kg, respectivamente. Não foram encontradas diferenças nas taxas de prenhez para vacas leves (90,0%, 18 vacas prenhes / 2 vacas elegíveis), moderadas (70,2%, 12 vacas prenhes / 5 vacas elegíveis) e Pesadas (62,5%, 10 vacas prenhes / 6 vacas elegíveis). Quando o desempenho da produção foi ajustado para as taxas de prenhez, as vacas leves foram mais produtivas e eficientes do que as moderadas e pesadas. A produção de quilogramas de bezerros ajustados para a prenhez foi de 20,5, 16,2 e 14,0 kg para as vacas Leves, Moderadas e Pesadas, respectivamente. Vacas Pesadas e Moderadas foram menos eficientes em comparação às Leves para a produção de bezerros ajustados ao intervalo de partos. Vacas leves produzem mais quilos de bezerro / vaca, exigindo a mesma quantidade de leite para produzir um quilo de bezerro. Vacas leves também têm maior eficiência na conversão de leite em peso de bezerro do que vacas Moderadas e Pesadas. A produtividade e eficiência dos rebanhos reprodutores devem ser avaliadas pela combinação da taxa de prenhez e quilogramas de bezerros desmamados por vaca exposta à reprodução.

Palavras-chave: Braford; Desmame; Ganho de peso; Prenhez; Produção de leite.

Abstract

The objective was to evaluate the development and reproductive performance of beef cows of different body weights at calving were evaluated. Milk yield and calf production efficiency were assessed in secundiparous Braford cows classified at calving according to weight as Light (325.2±3.7 kg), Moderate (347.7±4.0 kg), and Heavy (384.2±4.1 kg). Heavy cows had higher total milk yield than Light cows, but did not differ from Moderate, reflecting in calves weighing at weaning 82.1, 76.6, and 76.9 kg, respectively. Differences on pregnancy rates for Light (90.0%, 18 pregnant cows/2 of eligible cows), Moderate (70.2%, 12 pregnant cows/5 of eligible cows), and Heavy (62.5%, 10 pregnant cows/6 of eligible cows) were not detected. Light cows were more productive and efficient when production performance was adjusted for the pregnancy rates than Moderate and Heavy cows. Production of kilograms of calves adjusted for pregnancy was 20.5, 16.2±0.5, and 14.0±0.5 kg for the Light, Moderate, and Heavy cows, respectively. Heavy and Moderate cows were less efficient as compared with the Light ones for production of calves adjusted for their calving interval. Light cows produce more kilograms of calf/cow, requiring the same amount of milk to produce one kilogram of calf. Light cows also have higher efficiency converting milk into calf weight than Moderate and Heavy cows. The productivity and efficiency of breeding herds should be evaluated by the combination of pregnancy rate and kilograms of weaned calves per cow exposed to breeding.

Keywords: Braford; Milk production; Pregnancy; Weaning; Weight gains.

Resumen

El objetivo fue evaluar el desarrollo y el desempeño reproductivo de vacas de carne con diferentes pesos corporales al parto. La producción de leche y la eficiencia de producción de becerros se evaluaron en vacas secundíparas Braford clasificadas al parto según su peso en leves (325,2 kg), moderadas (347,7 kg) y pesadas (384,2 kg). Las vacas pesadas tuvieron mayor producción total de leche que las vacas leves, pero no se diferenciaron de las vacas moderadas, reflejándose en terneros con peso al destete de 82,1, 76,6 y 76,9 kg, respectivamente. No hubo diferencias en las tasas de preñez para vacas leves (90.0%, 18 vacas preñadas / 2 vacas elegibles), moderadas (70.2%, 12 vacas preñadas / 5 vacas elegibles) y pesadas (62.5%, 10 vacas preñadas / 6 vacas elegibles). Cuando el rendimiento de la producción se ajustó para las tasas de preñez, las vacas leves fueron más productivas y eficientes que las vacas moderadas y pesadas. La producción de kilogramos de terneros ajustados para la preñez fue de 20.5, 16.2 y 14.0 kg para vacas Leves, Moderadas y Pesadas,

respectivamente. Las vacas pesadas y moderadas fueron menos eficientes en comparación con las leves para la producción de terneros ajustados al intervalo de partos. Las vacas leves producen más kilos de ternero / vaca, requiriendo la misma cantidad de leche para producir una libra de ternero. Las vacas leves tienen mayor eficiencia en la conversión de la leche en peso de ternero que las vacas moderadas y pesadas. La productividad y la eficiencia de los rebaños reproductores deben evaluarse combinando la tasa de preñez y los kilogramos de terneros destetados por vaca expuesta a la reproducción.

Palabras clave: Braford; Producción de leche; Preñez; destete; Aumento de peso.

1. Introduction

Over the last few years, Brazilian producers have adopted genetic breeding programs as a means to increase the production efficiency of beef cattle herds. These selection procedures allow them to identify superior animals in terms of body weight gain and possibly size increase. These advances in animal selection are aimed at greater gains, and, recently, earlier finishing, in order to reduce the cycle of production systems, enabling a rapid economic return (Pacheco, et al., 2014).

Nonetheless, the search for animals with great growth potential is not the only need of the Brazilian livestock industry. The livestock activity in Brazil is still under development and has large variations between production systems due to the diversity of soils, climate, herds, and also management-related factors. Thus, research studies can identify animals or the size of animals that are more adapted and efficient in certain systems (Castilho, et al., 2018; Farias, et al., 2018ab), resulting in better productivity indicators (Vaz, et al., 2016a).

Breeding herds in Brazil have their feed primarily based on the natural pastures or those introduced, all of which depend on climatic conditions (Rosa, et al., 2012). These pastures due to their quality limit the animals to express their genetic potential for weight gain and reproduction. This situation is aggravated when selection programs pursue the production of larger size and heavier animals (Beck, et al., 2017) which elevates the maintenance requirements and, in case of difficulty meeting them when in feed-restriction systems (Burns et al. 2010), animals will have decreased reproductive performance and production efficiency (Vaz, et al., 2014).

The aim of the present study was to evaluate the development and production performance from calving to weaning of Braford cows from herds with three different body weights at calving.

2. Material and Methods

2.1. Method of research and compliance with ethical standards

In the present study we used the quantitative method (Pereira et al., 2018), carried out by means of field research to assess the development and reproductive performance of beef cows with different body weights at calving.

The study was approved by the Ethics Committee of Animal Use of Federal University of Pelotas (Approval number CEEA nº. 8250-2015) and was developed considering the national guidelines for care and use of animals.

2.2. Location, relief and soil

The experiment was conducted at the Itú ranch, located in the county of Itaqui, RS, Brazil (29°12' S latitude and 55°36' W longitude). The topography of the region is wavy, with hills with deep, naturally acid soils of medium texture. The soil is classified as a Dystrophic Red Latosol (Haplortox) (Embrapa 1999), and the climate of the region is subtropical, according to the Köppen classification (Moreno 1961).

2.3. Definition of experiment groups, production system and investigated characteristics

Fifty-three secundiparous Braford cows with average age of 48 months were divided into three groups of body weight at calving. The groups were based on the weight difference of cows as a function of the standard deviation (22.5 kg) of the average herd. Three groups were formed: Light cows – cows weighing less than average 0.8 standard deviations, Moderate cows weighing more than 0.8 standard deviations below and less than 0.8 above average, Heavy more than 0.8 standard deviations above average. The Light group weight was 325.2±3.7 kg (20 cows - 310 to 330 kg); the Moderate - 347.7±4.0 kg (17 cows - 340 to 355 kg); and the Heavy - 384.2±4.1 kg (16 cows - 365 to 436 kg).

Body condition score (BCS) assessment (Rasby, et al., 2014 adapted), with assigned scores of 1 to 5 (1 = very lean; and 5 = very fat) was held on the occasion of the calving and together with the date they were used as co-variables in the model.

Cows of different weights were managed in a single herd, kept until calving on natural pastures with an average stocking rate of 320 kg/ha of BW. From calving to the end of the

breeding season, they were kept on Brachiaria (*Brachiaria brizantha* cv. Marandu) pasture at a stocking rate of 450 kg/ha and availability forage of 2,305 kg DM/ha. Early weaning occurred December to January, when calves reached 60 to 70 days of age, averaging 67 days.

Cows and their calves were weighed in the first 24 h after calving, and at weaning. Cows were also weighed at the beginning (November 20) and end (February 05) of the breeding period and every 28 days for stocking control on the pasture. Body weight changes were determined as the difference in weight between weighings.

Milk yield of the cows was estimated at 21, 42 and 67 days (weaning) after calving, as the difference in weight of the calf before and after a feeding session. Calves were separated from their dams from 12h00 until 18h00. After this period, they were put together with their mothers again to suckle, aiming udder depletion, and then they were once again separated until the morning of the next day, (12 h of fasting), when they were weighed, allowed to suckle until they stopped, and then weighed again. Milk production in the period and over 24 h was estimated as the difference between these two weighings (Restle, et al., 2007).

During the experimental period, cows had free access to a mineral mix containing 0.08 g/kg phosphorus. Vaccinations for the control of foot and mouth disease, clostridioses, endoparasites, and ectoparasites were applied in accordance with health standards and whenever necessary.

Natural service was adopted, with bulls previously approved in libido tests and andrological examination, at a bull-to-cow ratio of 1:25. The pregnancy rate (PR) was evaluated as a measure of reproductive efficiency; this variable was determined by rectal ultrasonography, performed 60 days after the end of the reproductive period, by relating the number of females diagnosed as pregnant and the total number of females set to mate at the beginning of the breeding season.

For the productivity of the herd and efficiency of cows in reproduction, the total weight gains of cows and calves (kg) from birth to weaning were considered. Calf production efficiency was determined as the calf production rate adjusted according to the pregnancy rate in kilograms of calves weaned per cow maintained (calf weight at weaning * PR/100). For the other variables of efficiency and productivity, the calf production efficiency was used as the base value for the calculations, as it involves the calf weight associated with the reproductive performance of the cows.

For the cow production efficiency at weaning, the ratios between calf production efficiency and cow weight (BW) and metabolic weight ($BW^{0.75}$) were calculated and the

following formula was applied: (Calf production efficiency/Cow body weight, or Metabolic weight at weaning) × 100.

Milk production efficiency was determined as a function of the amount of milk necessary to produce one kilogram of calf (Total milk yield/Total calf weight gain) and as a function of the milk production utilization (%) by the calf (Total calf weight increase/Total milk yield) × 100.

The real fertility, which simultaneously included fertility and production of kilograms of weaned calves per effective year simultaneously, was also calculated in two forms by the equation proposed by Viu et al. 2008: [(Calf weight at weaning × 365)/Calving interval] and [(Calf weight at weaning × Pregnancy rate/100) × 365)/Calving interval].

2.4. Statistical analysis

The experimental design was completely randomized, and results were subjected to analysis of variance and to the F test. The mathematical model employed for the analysis used effect of animals' weight groups and co-variables calving order, body condition score, calf sex and residual error.

Analyses were performed by the GLM procedure. Data were analyzed using SAS statistical software (Statistical Analysis System, version 6.08; SAS, 2001), adopting 5% as the maximum significance level. Means were compared by the “t” test. The pregnancy-rate variable in the different weight groups was analyzed by the Chi-squared test at a 5% significance level.

3. Results

Body condition score showed distributions of 2.7 to 3.5 average 3.12±0.04, 2.8 to 3.5 average 3.15±0.04 and 2.8 to 3.5 average 3.22±0.05 for Light, Moderate and Heavy cows ($P>0.05$), respectively.

The mean values of the cow groups differed ($P<0.05$) according to their previous classification of the average body weights at calving of 325.2±3.7, 347.7±4.0 and 384.2±4.1 kg as Light, Moderate, and Heavy cows, respectively (Table 1). The differences in weights remained ($P<0.05$) until the calves were weaned, on average 67 days post-calving.

Table 1 - Means and standard errors for development traits and milk yield from calving to weaning of cows of different weight classes at calving and of their calves.

Characteristic	Light	Moderate	Heavy
Cows			
Weight at calving, kg	325.2±3.7[c]	347.7±4.0[b]	384.2±4.1[a]
Weight at early weaning, kg	360.1±4.9[c]	378.5±5.3[b]	408.1±5.5[a]
Calving-weaning weight change, kg	34.9±4.5	30.8±4.9	23.9±5.0
Weight at start of breeding season, kg	322.0±4.2[c]	333.8±4.5[b]	352.8±4.7[a]
Weight at end of breeding season, kg	378.3±5.0[c]	393.4±5.6[b]	424.2±6.2[a]
Total milk yield, L	247±16.4[b]	278±17.8[ab]	323±18.3[a]
Calves			
Weight at birth, kg	29.5±0.5	29.7±0.5	29.9±0.5
Weight at weaning, kg	76.6±1.7[b]	76.9±1.9[b]	82.1±1.9[a]
Weight gain during lactation period, kg	47.1±1.6[b]	47.2±1.8[b]	52.3±1.8[a]

[a,b,c] Means in the same row followed by different letters differ (P<0.05) according the t test. Source: Authors.

During lactation, the cows from the three groups had positive variations in body weight (P>0.05), averaging 29.9 kg, despite their supply of nutrients from the diet being prioritized for milk production. The differences in weight at the beginning and end of the reproduction period remained at the same initial levels observed at calving (P<0.05). During the reproductive period, all cow groups gained weight, and the Heavy group had the greatest daily gains (P<0.05). Cows from the Heavy group (323±18.3 L) had a greater milk yield as compared with the Light cows (247±16.4 L), which did not differ from the Moderate group (278±17.8 L). On average, the Heavy, Moderate, and Light cows produced 4.96, 4.27, and 3.80 L of milk/day, respectively.

Calf birth weights did not differ (P>0.05) among the different cow weight groups, averaging 29.7±0.5 kg. Calves from the Heavy cows, with higher milk yields, had higher

weaning weights as compared with those born from Moderate and Light cows (P<0.05), which reinforces the dependence of calves on the milk of cows for their development. Pregnancy rates did not differ (Table 2; P>0.05), with values 90.0, 70,2 and 62.5% for Light, Moderate and Heavy cows. The cows from the present study, Light, Moderate and Heavy, according to their average daily gain and milk yield performances, required, on average, 4.3, 4.6 and 5.4 kg of total digestible nutrients (TDN) and 0.700, 0.814 and 0.916 kg crude protein (CP) per day, respectively (NRC, 2016). From Light to Moderate cows, there was an increase in daily requirements of TDN and CP of 25.6 and 30.8%, respectively (NRC,2016).

Table 2 - Reproductive performance, productivity, and efficiency of cows of different weights classes at calving.

Trait	Light	Moderate	Heavy
Pregnancy rate, %	90.0	70.2	62.5
Herd productivity, kg calf/cow[1]	73.5±1.6[a]	60.6±1.7[b]	57.6±1.8[b]
Production efficiency at weaning, kg[2]	20.5±0.5[a]	16.0±0.5[b]	14.2±0.5[c]
Cow metabolic weight, kg	82.6±0.8[c]	85.8±0.9[b]	90.8±0.9[a]
Cow efficiency at weaning/Cow weight$^{0.75}$, kg[3]	89.1±2.0[a]	70.7±2.2[b]	63.7±2.2[c]
Real calf production efficiency, kg[4]	73.5±3.7[a]	65.0±4.1[a]	71.2±4.2[a]
Real calf production efficiency, kg[5]	70.6±3.2[a]	52.1±3.4[b]	50.0±3.5[b]
Milk production efficiency, L/kg calf	5.3±0.4[a]	5.9±0.4[a]	6.4±0.4[a]
Milk production efficiency, %	21.7±1.7[a]	18.5±1.8[ab]	16.6±1.9[b]

[a, b, c] Means followed by different letters in the row differ (P<0.05) according to the t test; [1] Herd productivity = Calf weight at weaning × Pregnancy rate/100 = kg of weaned calf/Cow maintained; [2] Production efficiency at weaning = Herd productivity (kg calf/cow)/Cow weight at weaning; [3] Cow efficiency at weaning /Cow weight$^{0.75}$ = Herd productivity (kg calf/cow)/Metabolic cow weight at weaning; [4] Real calf production efficiency, kg = Calf weight at weaning * 365/Calving interval; [5] Real calf production efficiency, kg = (Calf weight at weaning * Pregnancy rate/100) *365/Calving intervals. Source: (Viu et al., 2008; Vaz & Lobato, 2010; Vaz et al., 2014; Vaz et al.,2016b).

In the evaluation of productivity of the three weight groups, associating calf weight at weaning and cow pregnancy, we observed that the lighter cows were more efficient as compared with the Moderate and Heavy groups, which did not differ from each other

(P>0.05; Table 2). Light cows weaned at 67 days post-calving, on average, 21.3 and 27.6% more kilograms of calves (P<0.05) than Moderate and Heavy cows, respectively.

By dividing the herd productivity by the weight of the cows at weaning, we obtained the herd efficiency. When adjusted for cow pregnancy, once again the Light cows produced more (P<0.05) kilograms of calves relative to their weight: 20.5±0.5, 16.0±0.5, and 14.2±0.5 kg of calves for each 100 kg of Light, Moderate, and Heavy cows, respectively. These results show that it takes 44.4 and 28.1% more Heavy and Moderate cows, respectively, in the breeding herd, to produce the same number of kilograms of calves in the following year.

When the metabolic weight of the cows was evaluated, the differences in body weight of the groups remained. The efficiency calculated in kilograms of calf adjusted for the pregnancy of the groups had the opposite behavior to that of metabolic weight: Heavy cows produced less, 63.7±2.2 kg; Moderate cows produced 70.7±2.2 kg; and Light cows were the most productive, with 89.1±2.0 kg of calf for each 100 kg of cow metabolic weight. When the weaning weight was adjusted with the pregnancy rates of the cows, the Light group was superior by 35.5 and 41.2% in relation to Moderate and Heavy cows, respectively.

The amount of milk necessary to produce one kilogram of calf did not differ (P>0.05) among the cow weight groups, with 5.3±0.4, 5.9±0.4, and 6.4±0.4 kg for Light, Moderate, and Heavy cows, respectively. Although with a similar response, the offspring of Heavy cows, even with larger milk production, have a lower transformation efficiency when associating the amount of milk with calf weight at weaning (Table 1). They were less efficient (16.6%) as compared with the Light cows, which have a transformation efficiency of 21.7% and did not differ from the Moderate cows (18.5%). The mean value of 18.9% observed in the present study can be explained by the evaluation period, which was on average at 67 days of age of the calves.

4. Discussion

Weights gains during the reproductive period are important for reproductive success. In the present study, the highest weight gains were consequence of the reproductive period being after the calves were weaned, which reduced the nutritional requirements of the cows (Vaz & Lobato, 2010), besides the fact that the Heavy cows were probably having a compensatory gain due to the less gain obtained during lactation (Bohnert, at al., 2013). Positive weight changes during the reproductive period are associated with nutrient intake in the right amount to regulate the ovarian activity, correlating with higher pregnancy rates

(Burns, et al., 2010; Johnston et al., 2013).

In cows of the same size, body weights can indicate their physiological conditions and are reflected in their production and reproduction performances. Heavier weights at calving and at weaning (Vaz, et al., 2016a) as well as at the beginning and end of the breeding season (Torres, et al., 2015) are associated with better pregnancy rates.

The greatest weight at calf weaning from Heavy cows is due to higher milk production. Light cows at calving tend to have lower milk yields. In the study of Vaz, et al. (2016b) between the milk-yield groups, the low-producing cows were 11.7% smaller at calving and produced on average 61.3% less milk. Lemaster, et al., (2017) also reported positive correlations between milk yield and calf development. The heavier weight of calves from the Heavy cows, even at 67 days, has an importance within the production system, because weaning weight is associated with the slaughter age of future steers (Pötter & Lobato, 2003) and with the first service of heifers at 13/15 months of age (Silva, et al., 2018).

Reproductive indices of cow herds can be influenced by age (Bitencourt, et al., 2020; Fordyce et al. 2103), the breed or genetic group of cows (Vaz, et al., 2016a), and especially by the nutritional level to which the herds are subjected to (Restle, et al., 2007, Rosa, et al., 2012). In the present study, none of the variables could affect reproductive performance influenced it, including the cow weight, whose major importance is in non ideal nutritional situations (Burns, et al., 2010; Scasta, et al., 2015).

Another factor influencing the reproductive performance of cows, with considerable increases in the interval between calvings, is milk production, which is positively correlated with this variable because milk production cause greater exhaustion to cows (Torres, et al., 2015).

Cow weight gain is a determinant of higher nutritional requirements. Thus, the results for pregnancy are explained also in part by not all the nutritional requirements of the animals being met. Moderate and Heavy cows have higher requirements as compared with Light cows, where normally do not have enough conditions to obtain all the nutrients necessary in the available forage mass to meet their maintenance, milk production, growth, and weight-recovery needs, which compromises the reproductive part (Doye & Lalman, 2011; Beck, et al,. 2016).

These facts show how much exhausting it is for the cows the process of gestation and lactation in conditions of limited food. The use of weaning at 67 days, potentiated the reproduction of all cows (Vaz & Lobato, 2010), with large cows, even with greater demand they obtained reproductive results similar to small ones (Scasta, et al., 2015).

To measure the efficiency of the breeding herds, not only the weights and body-weight changes of cows and of their calves from calving to weaning should be considered. High weight gains and consequently high weights are important in measuring the herd productivity (Doye & Lalman, 2011; Beck, et al., 2016), however, its efficiency must also be associated with the subsequent reproductive result (Mulliniks, et al., 2012).

The calf production index associates the cow maternal ability with its subsequent reproduction. This index is important, as it determines the number of kilograms of weaned calf per cow in the subsequent year (Vaz & Lobato, 2010; Silveira, et al., 2014). Light cows weaned at 67 days post-calving, on average, 21.3 and 27.6% more kilograms of calves ($P<0.05$) than Moderate and Heavy cows, respectively. The herd productivity adjusted for the subsequent pregnancy of the cows can be changed by factors such as genetic group (Vaz, et al., 2014), use of pastures by the breeding herd pre- and post-calving (Vaz, et al., 2016a), calf weaning age (Vaz & Lobato, 2010), or even by the use of supplementation with calcium salts of fatty acids pre- and post-calving (Silveira, et al., 2014).

The production of kg of calf in relation to the kg of cows of the herds increases with the larger size of the cow, requiring more cows for the same production of kg of calves per kg of cow kept. However, this higher number of cows may compromise the feeding of younger categories (Doye & Lalman, 2011; Vaz & Lobato, 2010), because the efficiency of herds on farms with systems of calf-production, back-grounding and cattle finishing depends on relationships among body size, physiological maturity, fertility and milk yield (Beck, et al., 2016).

Despite weaning heavier calves, heavier cows were not superior in real fertility, because this variable also takes into account their calving interval. This parameter is of great importance, since the maternal ability allows some cows to better raise their calves, better expressing their production potential (Viu, et al., 2008) and demonstrating, even in unfavorable situations, higher adaptability conditions (Fordyce, et al,. 2013; Scasta, et al., 2015).

The real fertility rate associates the calving interval and the weaning weight of the calves, and when adjusted for the percentage of pregnancy, it shows the total production potential of breeding herds. Because the calf weight is influenced by the nutritional level to which it is subjected, the birth month may affect the supply and quality of the forage, and consequently the weaning weight of the calves (Rodrigues, et al., 2014).

Overall, production values were superior for the heavier cows in kilograms of cow and weaned calf, but opposite results were found when production efficiency was measured

associated with the reproductive results of the herds in all variables (Lobato, et al., 2000). This confirms that the evaluation of production results depends on several factors that should be assessed systemically, and results may change according to their interpretation. These facts demonstrate that Brazilian herds are part of a developing livestock sector, in which there is still a very large variation between animals within herds (Lobato, et al., 2010). Thus, less or more demanding categories or animals require different feeding and/or management strategies. Further, animals better adapted to production systems should be selected, and these are also very distinct (Fordyce, et al., 2013).

Production efficiency values in liters of milk per kilogram of calf produced are above the average described in the literature (Rovira, 1996). This author stated that the milk production process is inefficient because the transformation of pasture into milk (30%) and of milk into kilograms of calf (30%) generates a result of 9 to 10%. In this stage, the calf is highly dependent on the cow's milk, displaying great growth potential and satisfactory use of the feed (Lemaster, et al., 2017). The most efficient cow is the one with the highest milk potential that can, without reducing the percentage of calves successfully weaned, repeatedly produce a calf with the growth and carcass characteristics most valued in the marketplace.

5. Conclusions

Heavy cows produce more milk and more kilograms and greater weight of calves at weaning at 67 days than Light cows.

Light cows have greater productivity and production efficiency.

Although body weight alone is not accurate in determining the animal's *frame*, it does give breeders a good idea of the animal's nutritional requirements. The body size extensively researched in other countries still in Brazil is little worked, and it can be better explored for the choice of animals more adapted to the productive system.

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