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Dairy calves fed with milk replacer in substitution to whole milk

Bezerros leiteiros alimentados com sucedâneo lácteo em substituição ao leite integral

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Abstract. The objective of this study was to evaluate milk replacer as substitute of whole milk in suckling calves, during early weaning at 60 days of life. Therefore, were used 24 Girolando breed calves, distributed in a randomized block design with six treatments and four replications. The treatments were: T1- Whole milk until weaning, T2- Milk replacer supplied from the 5thº day after birth, T3- Milk replacer supplied from the 10thº day after birth, T4- Milk replacer supplied from the 15thº day after birth, T5- Milk replacer supplied from the 20thº day after birth and T6- Milk replacer supplied from the 25thº day after birth. All animals also received concentrated ration and water *ad libitum*. Calves fed whole milk showed higher body growth (withers, croup and thorax) and daily weight gain and lower feed:gain ratio as to those fed milk replacer from 5 to 10 days old; however, there were no differences in the animals receiving milk replacer from the 15, 20 and 25 days old. The analysis of benefit/cost indicated that animals receiving whole milk are economically superior in ratio to those fed with milk replacer. It concludes that the calves receiving milk replacer from 15th day of life had a similar performance to the animals receiving whole milk.

Keywords: artificial breastfeed, dairy cattle, early weaning

Resumo. Objetivou-se neste trabalho avaliar a utilização de sucedâneo lácteo como substituto do leite em bezerros lactentes, num sistema de desaleitamento precoce aos 60 dias de vida. Foram utilizados 24 bezerros Girolando, distribuídos num delineamento em blocos casualizados com seis tratamentos e quatro repetições. Os tratamentos testados foram: T1- Leite integral até o desmame, T2- Sucedâneo lácteo fornecido a partir do 5º dia de vida, T3- Sucedâneo lácteo fornecido a partir do 10º dia de vida, T4- Sucedâneo lácteo fornecido a partir do 15º dia de vida, T5- Sucedâneo lácteo fornecido a partir do 20º dia de vida e T6- Sucedâneo lácteo fornecido a partir do 25º dia de vida. Todos os animais também receberam ração concentrada e água à vontade. Verificou-se maior crescimento corpóreo (cernelha, garupa e tórax), maior ganho de peso diário e menor conversão alimentar nos animais alimentados com leite integral em relação aos que receberam sucedâneo lácteo a partir do 5 e 10º dia de vida; não havendo, entretanto, diferenças dos animais que receberam sucedâneo lácteo a partir do 15, 20 e 25º dia de vida. A análise de benefício/custo indicou que os animais que receberam leite integral são economicamente superiores em relação aos alimentados com sucedâneo lácteo. Conclui-se que os bezerros que receberam sucedâneo lácteo a partir do 15° dia de vida tiveram um desempenho semelhante aos animais que receberam leite integral.

Palavras-chave: aleitamento artificial, bovinocultura de leite, desmama precoce

Introduction

Milk is considered one of the most complete foods (Luz et al., 2011), being the main source of energy, protein and minerals in the feeding of calves during the milking (NRC, 2001). However, as it is a noble food and one of the main contributions in producer income, it must be replaced by a diet of lower cost (Modesto et al., 2002). In this sense, the reduction in the weaning age, with decreasing amount of milk fed to calves during lactation or milk

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replacement for aproduct with lower cost, will reduce the expense on food and allow an additional quantity of milk to be intended for human consumption (Fontes et al., 2006).

Alternatives were developed to restrict the use of milk as early weaning systems providing concentrate rations to stimulate the development of the rumen-reticulum (Baldwin et al., 2004, Costa et al., 2008) as well as the substitution of whole milk for milk replacers (Timmerman et al., 2005; Güler et al., 2006; Ribeiro et al., 2009); thus reducing the cost of feeding the suckling calf and providing more milk to be traded.

Milk replacers are industrial products in powder, where milk constituents, especially lactose, casein and fatty acids are partially replaced by others of vegetable origin (Donavan et al., 2002). However, as in the first weeks of life the calf does not have enought amounts of enzymes for digestion and absorption of components of vegetable origin (Argenzio, 1996), the major problems with the use of milk replacer are excess starch and fiber, type and amount of fat, and low availability of milk protein.

In this sense, information on the best time to start providing milk replacer to calves are essential to the milk producer, in order to reconcile the physiological maturity of the digestive tract of the animal and its ability to use non-dairy components and reduce problems on cramping, chronic diarrhea and acute and lung infections, which will cause poor growth, increase in the cost of production and increase in morbidity and mortality of the herd.

According to Oliveira et al. (2009) milk replacers in addition of differentiated nutritional characteristics and compatible with the physiological needs of the animals should have lower price than whole milk, ease dilution, good uniformity and high palatability. The objective of this experiment was to evaluate the influence of the time of replacement of whole milk for milk replacer on the performance and cost of production of early weaning suckling calves kept in confinement.

Material and Methods

The experiment, with 24 new born Girolando calves was conducted at Imbaúba farm at the municipality of Agua Clara / MS and laboratory analyzes performed at the State University of Mato Grosso do Sul - Campus of Aquidauna (UEMS / UUA), located at Aquidauana / MS, the upper Pantanal region of Mato Grosso do Sul.

The experimental diets were: T1-Whole milk until weaning (control), T2- milk replacer supplied from the 5th day of life, T3- milk replacer supplied from the 10th day of life, T4-milk replacer supplied from 15th day of life, T5-milk replacer supplied from the 20th day of life and T6-milk replacer supplied from the 25th day of life. All the animals received water and concentrated feed at will.

The animals were kept with their mothers in the first 24 hours, where ingested colostrum and performed the disinfection of the navel. Then the calves were kept in individual pens and received 4 liters of whole milk, corresponding to about 10% of body weight, in plastic buckets daily, divided into two portions equitable, in the morning and another in the afternoon, immediately after milking the cows. The milk replacer was introduced in the diet gradually and according to the treatments. The adjustment period lasted for three days, using a proportion of milk and milk replacer 3:1, 2:2 and 1:3 for the first, second and third days, respectively. From the fourth day, in the treatments with replace, the calves started to receive only the milk replacer, divided into two daily servings. The temperature of milk replacer was 37°C and therefore similar to that of whole milk, recently milked.

In this assay, was used a commercial milk replacer composed of whole milk powder, whey powder, lactose, soy protein isolate, vitamin-mineral premix, coccidiostat, flavorant, growth promoter and antioxidant additives (Table 1).

Table 1. Chemical composition, expressed in dry matter of milk replacer.

Components	Percentage
Dry Matter	88.0
Crude Protein	20.0
Lactose	45.0
Ether extract	12.0
Mineral matter	15.0
Calcium	0.8
Phosphorus	0.4

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The supply of solid diet started from the 10th day of life of animals, with a concentrate diet consisting of 60.5% corn grain, 33.5% soybean meal, 5% molasses and 1% mineral and vitamin premix (Table 2), being the same balanced to meet the nutritional requirements prescribed in the NRC (2001).

Table 2. Chemical composition, expressed as dry matter, concentrated feed.

Components	Percentage
Dry Matter	88.90
Crude Protein	21.00
Neutral Detergent Fiber	15.40
Ether Extract	2.50
Calcium	1.10
Phosphorus	0.45
Total Digestible Nutrients [1]	80.00

[1] Estimated using data from NRC (2001).

The concentrate ration was provided daily, considering a leftover of 10% of the offered in natural matter. Leftovers of food of each animal have also been daily weighted and a sample was removed and frozen. Subsequently, at intervals of 14 days, period samples were thawed, placed on a countertop and mixed up until their homogenization, then a slice of this material was separated and used for analyzes of dry matter (DM) and crude protein (CP) according to the procedures described by AOAC (1990).

The performance of the animals was assessed using the average daily weight gain; body growth, via measurements of chest girth and height of the withers and croup; dry matter intake expressed as kg/day, percentage of body weight according to metabolic weight; crude protein intake and feed conversion. We also observed the incidence of diarrhea and drug spending.

The weighing of calves was performed on a mechanical scale, shortly after birth and thereafter at intervals of 14 days; always before the supply of milk / milk replacer in the morning. Immediately after being weighed, were also performed measurements of the heights of the withers and the rump, and thorax girth.

The experimental period was 60 days and the weaning of calves occurred concurrently with the end of this period. At this time all animals had stable concentrated feed intake greater than 700 grams per day.

In assessing the cost of production were considered as overhead, only the expenditure on food and medicines used in each treatment. Were not considered as expenses, facilities, service flows, machines, depreciation in general and spending on labor. The price of inputs was determined on the basis of retail values in farming stores.

The evaluation of the economic viability of tested treatments was performed using the indicator ratio Benefit / Cost (B/C) proposed by Woiler; Mathias, (1996) which represents the ratio between the benefits and costs generated by the use of the treatment. So, when the treatment presents the benefit value exceeding the value of the cost, ie, B / C greater than 1 means the treatment is viable. When the ratio B / C is equal to 1 means that both benefits and costs have the same value, indicating neither gains nor economic losses with the use of the treatment. Finally, when the ratio B / C is less than 1 means that the cost of treatment outweighs the benefits generated by it,thus showing the economical infeasibility of technology.

The experimental design was randomized blocks with six treatments and four replications, each experimental unit represented by a calf. Animals were blocked according to birth weight and sex, 2 females and 2 males per treatment. Initially, the variables were subjected to the Shapiro-Wilk test to verify the normality of the residuals and Bartlett, for homogeneity of variances. Subsequently, we tested the ages of birth and sex, however as they were not significant (P> 0.05 for the F test) were taken from the same model. Then, we performed analysis of variance, using birth weight as (co)variable, we applied the Tukey test at 5% probability of error and held regression studies.

Results and Discussion

When analyzing the results of this study, it appears that no significant differences (P> 0.05) in dry matter intake of concentrated feed, regardless of the form of measurement, ie, kg day^{-1}, body weight

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and weight metabolic. The crude protein intake was also statistically similar between treatments. Feed conversion, which explains the transformation capacity of dietary nutrients in body tissue, was lower for animals receiving whole milk compared to those receiving milk replacer at 5 and 10 days of age. It was not observed, however, no influence of the time of supply of milk replacer, being feed conversion statistically similar (P> 0.05) for calves fed milk replacer at 5, 10, 15, 20 and 25th day of life (Tables 3 and 6). Similar intakes were observed by Lizieire et al. (2002) feeding calves Holstein x Zebu crossbred with whole milk, with intakes of concentrated feed, in dry matter of 519 g day^{-1} (0.9% of body weight).

Although high, the coefficients of variation for the evaluated parameters are consistent with animal category. According to Oliveira et al. (2013) in this phase the animals have a high change in food intake and consequently the daily weight gain. Corroborating, Martuscello et al. (2004) observed for dry matter intake, 0-7 weeks, coefficients of variation of up to 61.7% in suckling calves weaned early.

Table 3. Dry matter intake (DMI) expressed as kg / day, percentage of body weight (% BW) and metabolic weight (MW), consumption of crude protein (CP), in dry matter, feed conversion (FC) and coefficient of variation (CV) of calves fed milk replacer in substitution to whole milk.

Intake[2]	Treatments[1]						CV(%)
	T1	T2	T3	T4	T5	T6	
DMI - kg day^{-1}	0.453	0.457	0.409	0.536	0.638	0.602	39.20
DMI - % BW	0.92	1.21	1.05	1.19	1.36	1.41	34.96
DMI - MW	24.40	29.90	26.22	30.84	35.62	35.95	34.99
CP – kg day^{-1}	0.109	0.102	0.100	0.118	0.143	0.133	40.91
FC	0.78 [a]	2.81[b]	2.45 [b]	1.57 [ab]	1.58 [ab]	1.59 [ab]	51.59

[1] T1: Whole milk, T2: Milk replacer 5th day, T3: Milk replacer 10th day, T4: Milk replacer 15th day, T5: Milk replacer 20th day, T6: Milk replacer 25th day.
[2] Different letters indicate significant differences in the line according to Tukey's test at the 5% probability.

The growing weight of calves is determined primarily by the hormones associated with the genetic potential of the animal and environmental conditions, particularly the nutritional and health factors, and their interrelationships. Among the hormones, the most relevant are the thyroxine, secreted in the thyroid gland, whose main function is to influence the development of the muscles and soft tissue; and somatotropin, produced in the pituitary gland and is responsible for the growth of bone and cartilage. The animal, therefore, gain weight by accumulating tissues, first grow intensely organs and viscera, followed by bone, muscle and adipose tissue.

In this essay, it appears that animals fed whole milk had better average daily gain (580 g day^{-1}) and higher final body weight than those who received milk replacer at 5 and 10 days of age (165 g day^{-1}), there was no difference, however, for calves fed milk replacer at 15, 20 and 25th day of life (373.3 g day^{-1}) (Table 4). Lizieire et al., (2002) providing crossbred calves, Holstein x zebu milk and concentrate observed daily gains of 533.0 g/day. Teixeira et al. (2007) and Vasconcelos et al. (2009) by feeding Holstein calves with milk replacer, hay and ration found gains of 325 and 297.0 g day^{-1}, respectively.

The best performance of animals fed with milk in relation to fed milk replacer from 5 and 10 th day of life, can be understood by the largest ability of young calves in digesting the milk components such as lactose, casein and fatty acids of short and medium chain; digestion of other carbohydrates such as starch and sucrose, branched chain amino acids and unsaturated fatty acids, is low, because of the small enzymatic action of digestive juices on them (Church, 1993).

Corroborating, Swenson & Reece (1996) claim that in pre-ruminant calves, milk or its substitutes pass over the rumen-reticulum-omasum through the esophageal groove and directly reaches the abomasum. In this compartment, casein, the main milk protein, stimulates the release of gastrin hormone produced in abomasal epithelium itself, which acts on the gastric cells releasing hydrochloric acid and the enzyme renin (pepsin). After contact of these substances with milk, is formed a clot which is retained in the enclosed casein with fat, whereas the whey proteins and lactose pass directly into the small intestine. Gradually the clot is breaking up and

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going slowly releasing nutrients to the duodenum, which is the action of Secretin and Colicistoquinina hormones, with subsequent secretion of pancreatic juices, bile and intestinal (produced by Brunner's glands and crypts Lieberkühu), in order to reconcile the physiological maturity of the digestive tract and thus promote the digestion and absorption of nutrients, which occurs primarily in the jejunum.

Table 4. Initial and final body weights, average daily gain (ADG), growth withers, croup and thorax, standard deviation (SD) and coefficient of variation (CV) of calves fed milk replacer in substitution to whole milk.

Variables[2]	Treatments[1]						SD	CV(%)
	T1	T2	T3	T4	T5	T6		
Body weights - kg								
Initial	31.8	33.0	34.0	34.8	34.8	31.5	23.34	16.19
Final	66.5 ^{a}	42.8 ^{b}	44.0 ^{b}	55.3 ^{ab}	59.0 ^{ab}	54.3 ^{ab}	37.79	18.39
ADG - kg day^{-1}	0.58 ^{a}	0.16 ^{b}	0.17 ^{b}	0.34 ^{ab}	0.40 ^{ab}	0.38 ^{ab}	22.12	41.23
Growth - cm								
Withers	12.3 ^{a}	5.0 ^{b}	6.8 ^{b}	7.6 ^{ab}	10.3 ^{ab}	9.3 ^{ab}	15.68	29.90
Croup	12.5 ^{a}	6.0 ^{b}	6.5 ^{b}	8.3 ^{ab}	10.8 ^{ab}	9.3 ^{ab}	15.19	28.11
Thorax	20.0 ^{a}	9.0 ^{b}	8.0 ^{b}	11.0 ^{a}	17.0 ^{a}	14.0 ^{a}	24.80	39.60

[1] T1: Whole milk, T2: Milk replacer 5th day, T3: Milk replacer 10th day, T4: Milk replacer 15th day, T5: Milk replacer 20th day, T6: Milk replacer 25th day.

[2] Different letters indicate significant differences in the line according to Tukey's test at the 5% probability.

In this sense physiologically, it is necessary that on the first weeks of life the calf receives liquid diets containing nutrients that can be easily digested by the digestive tract, that is being formed, so arrival of food is compatible with the availability of existing enzymes. Thus, as only casein forms coagulum, it is interesting that milk replacers contain high proportions of milk components, in order to promote the ability to use the nutrients. However, to reduce the cost there is a tendency to reduce the level of incorporation of these ingredients in milk replacers, increasing the proportion of sources of vegetable origin, leading to increased risks of digestive problems (Oliveira et al., 2009).

On the other hand, as from the second week of life the ability to digest plant components in the digestive tract develops early, consequence of the rapid increase in the secretion of amylolytic, proteolytic and lipolyticenzymes, secreted by gastric, pancreatic and intestinalcells (Brunner's glands and crypts Lieberkühu), there was no significant effect on average daily gain of the animals that were fed milk replacer from the 15th, 20th and 25th day of life, compared to calves who received whole milk throughout the test (Table 4).

Measurements of thoracic girth and heights of withers and rump are important because they allow you to track the animal skeletal development and deposition of body mass, it is essential that the heifer has adequate growth since weaning size is directly related to problems of dystocia and future milk production.

In this essay, these variables had a similar behavior to weight gain being observed in animals that received milk greater thoracic girth and greater height of the withers and croup, compared to calves fed milk replacer at 5th and 10th day of life. There were also no significant differences between animals receiving milk and fed milk replacer from the 15th, 20th and 25th day, however there was less thoracic girth, average of 8.5 cm, in calves fed milk replacer in 5th and 10th day of life, compared to those fed milk replacer from the 15th, 20th and 25th day, with an average of 14.0 cm (Table 4).

These results indicate that milk components existing in whole milk and consequently its high ease digestion and absorption, and larger concentration of TDN, positively affect the routing of nutrients to the deposition of structural tissues, resulting in a further development of the animal. It is further inferred that negative effects of milk replacer on body growth were minimized by increasing the time of the inclusion in theanimal diets. Schalch et al. (2001), providing milk and concentrate to Holstein calves weaned at 70 days of life observed increases in withers height and thoracic girth of 11.7 and 17.5 cm, respectively.

In suckling calves, although the cecum microorganisms can ferment certain quantity of starch, and short chain fatty acids produced can be

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absorbed into the cecal wall itself, this ability is limited, and the excess of plant components predisposes high growth of pathogenic intestinal microbial flora, with the appearance of fermentative diarrhea and damage the intestinal villi. In this essay, this effect was proven when evaluating costs on medicines used to minimize the deleterious symptoms of diarrhea, averaging R$ 1.40 for calves fed whole milk and R$ 35.61 and 31.44 for those who received milk replacer in 5 and 10th day of life. It also infers a significant decrease in drug spending with increased time for inclusion of the substitute ingredient in animal diets, averaging R$ 17.09, 9.71 and 9.14 for calves fed milk replacer from the 15th, 20th and 25th day of life (Table 5).

Table 5. Cost in Reais of the drugs used in diseases of calves fed milk replacer in substitution to whole milk.

Medicines[2]	Treatments [1]					
	T1	T2	T3	T4	T5	T6
Borgal	1.02	6.55	5.10	4.42	1.70	1.52
Buscofin	0.00	0.71	0.71	0.71	0.00	0.00
Ferrodex	0.00	0.34	0.22	0.00	0.00	0.00
Glicofort	0.00	5.23	4.11	0.00	2.50	2.86
Ivermectin	0.00	0.15	0.10	0.10	0.00	0.15
Kaobiotic	0.00	8.23	5.80	6.97	0.00	0.00
Norflagen	0.00	2.27	2.27	1.21	1.21	1.21
Serum	0.38	1.31	3.15	1.71	1.78	0.63
Stimovit	0.00	6.51	6.20	0.00	0.00	0.00
Tetrabiótico	0.00	0.48	0.80	0.00	0.00	0.00
Tormicina	0.00	1.37	2.06	1.97	1.51	1.14
Tristezinha	0.00	2.45	0.91	0.00	1.02	1.63
Total	1.40	35.61	31.44	17.09	9.71	9.14

[1] T1: Whole milk, T2: Milk replacer 5th day, T3: Milk replacer 10th day, T4: Milk replacer 15th day, T5: Milk replacer 20th day, T6: Milk replacer 25th day.
[2] Equivalence Dólar in Real: US$ 1.00 / R$2,0315

The regression studies (Table 6) showed that the extent that delayed the entry of the milk replacer on the liquid diet, the variables final body weight, daily weight gain, thoracic girth and heights of the withers and croup, show a gradual increase of its weights and measures, thus demonstrating an increasing linear behavior of the same. In the case of the variables dry matter intake, expressed in kg/day, percentage of body weight and metabolic weight, and crude protein intake, they were stable, ie, both milk and milk replacer were not enough to meet nutritionally the animals, forcing them to prematurely consume the feed in a similar manner. The similarity in concentrate intake between treatments can be given by the number of animals used and the coefficient of variation. According to Oliveira et al. (2013), the consumption of solid food in calves early weaned is highly variable, resulting in large amplitude coefficient of variation.

Early solids foods intakes are fundamental to the development of the rumen-reticulum (Costa et al., 2008) and thus transform the young calf in a functional ruminant (Coverdale et al., 2004), earlier will be the weaning (Montoro et al., 2013). According to Baldwin et al. (2004) this transition involves deep metabolic changes and the ability the calf in use short-chain fatty acids, particularly acetate, propionate and butyrate produced in the rumen, as a primary energy source replacing glucose supplied by milk.

With respect to variable food conversion, what is observed, is a reduction in ratio to the extent that the supply of milk replacer begins later, ie, the ability of processing food in body tissues improved due to the delay supply of milk replacer.

In this case is observed a linear decrease of this variable, which indicates the greater difficulty of calves to availthe existing plant components in milk replacer and the negative effects of these diets on digestive-tract of animals, notified by the high incidence of diarrhea and costs on drugs used to control this disease, restoring the intestinal villi, reducing the effects of dehydration and to restore the physical integrity of the calves, especially on treatments where the substitute was offered from 5th and 10th day of life.

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Table 6. Regression equations of the variables body weight; weight gain; growth of withers, croup and thorax; dry matter and crude protein feed and coefficients of determination (R^2) and coefficient of variation (CV) of calves fed milk replacer in substitution to whole milk.

Variables	Regression Equations [1]	R^2	CV(%)
Initial Body Weight	$\hat{Y}$ = 33.32	-	12.02
Final Body Weight	$\hat{Y}$ = 39.65 + (3.08*SMR)	30.67	16.68
Average Daily Weight Gain	$\hat{Y}$ = 0.0888 + (0.0672*SMR)	39.35	42.84
Growth Withers	$\hat{Y}$ = 4.2750 + (1.1750*SMR)	39.11	28.02
Growth Croup	$\hat{Y}$ = 4.9250 + (1.0750*SMR)	33.36	27.79
Growth Thorax	$\hat{Y}$ = 5.7750 + (1.9250*SMR)	28.67	39.19
Dry matter intake - kg day $^{-1}$	$\hat{Y}$ = 0.528	-	32.76
Dry matter intake - % of Body Weight	$\hat{Y}$ = 1.20	-	30.15
Dry matter intake - Metabolic Weight	$\hat{Y}$ = 31.71	-	30.03
Intake of Crude Protein	$\hat{Y}$ = 117.70	-	32.95
Feed Conversion	$\hat{Y}$ = 2.9929 – (0.3406*SMR)	27.10	43.62

[1] SMS: 1, 2, 3, 4 and 5 correspond to 5, 10, 15, 20 and 25 days to start the supply of milk replacer (SMR), respectively.

In this experiment, the systems of feeding with milk replacer, despite having a lower price than milk, have not proved profitable when compared to the supply of whole milk. The worst performance of the animals and spent on food and medicines, raised the cost of producing them, thus nullifying the gains from supplying the liquid diet. This is evident when analyzing the relationship Benefit / Cost, since the supply of whole milk was shown to have better profitability compared to treatments with milk replacer (Table 7).

Table 7. Economic viability of the treatments tested, in Real (R$).

Indexes[2]	Treatments [1]					
	T1	T2	T3	T4	T5	T6
Benefit						
Weightgain*Price@	200.01	56.12	57.55	117.99	139.58	130.94
Milk commercialized * Milk price	0.00	13.97	26.66	39.36	52.06	64.75
Total	200.01	70.09	84.22	157.35	191.63	195.70
Cost						
Milk and Milk replacer	152.36	117.04	120.34	123.64	126.94	127.71
Concentrated feed	41.10	41.44	37.13	48.63	57.95	54.70
Medicines	1.40	35.61	31.44	17.09	9.71	9.14
Total	194.86	194.10	188.90	189.36	194.61	191.55
Margin	5.15	-124.01	-104.69	-32.01	-2.97	4.15
Relationship Benefit / Cost	1.31	0.46	0.57	1.05	1.24	1.30

[1] T1: Whole milk, T2: Milk replacer 5th day, T3: Milk replacer 10th day, T4: Milk replacer 15th day, T5: Milk replacer 20th day, T6: Milk replacer 25th day.
[2] Equivalence Dólar in Real: US$ 1.00 / R$2,0315

The analysis of the cost of production supports performance results, demonstrating the difficulties of calves, especially those treated with milk replacer from 5th and 10th day of life, digesting plant foods, since they do not have sufficient amounts of enzymes capable of digesting carbohydrates, proteins and complex chain unsaturated fatty acids.

Another important fact is that the lowest concentration of casein in milk replacer possibly prevented adequate clot formation in the abomasum, causing an increased rate of passage of the milk replacer in the small intestine, with increased diarrhea and deterioration of the intestinal villi, as a result ofallergic reactions caused by plant food present in milk replacer, culminating consequently an increase in drug spending.

Conclusions

The replacement of whole milk to replacer does not affect the performance of calves Girolando when it is held from the 15, 20 and 25 days of life.

Although the price of the milk replacer is less than the milk, the beneficial / cost ratio indicated that the animals fed with milk are economically superior.

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