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NOTA CORTA [SHORT NOTE]

REPLACEMENT OF GOAT MILK BY CHEESE WHEY IN THE FEED OF ALPINE KIDS

[REEMPLAZAMIENTO DE LECHE POR SUERO DE LECHE EN EL ALIMENTO DE CABRITOS ALPINOS]

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SUMMARY

This study was conducted to evaluate the replacement of goat milk by different levels of bovine cheese whey in the feed of Alpine kids. The animals were distributed in a completely randomized design, with 4 x 2 factorial arrangement (four levels of goat milk / cheese whey replacements: 0, 15, 30 and 45% and two sexes). The inclusion of cheese whey did not affect (P> 0.05) the weight gain of kids from 7 to 42 days of life. Kids fed with whole goat milk presented higher final weights, around 13.0 kg; consumed 490 liters of whole goat milk and obtained average gain of 137.5 g / day. In treatments with 15, 30 and 45% of cheese whey, the final weights were 11.1, 9.88 and 10.27 kg, the goat milk consumption was 416.5, 343.0 and 269, 0 liters; the cheese whey consumption was 70.35, 147.0 and 220.5 liters, and weight gains of 122.2, 100.8 and 99.5 g / day, respectively. The effect of sex (P <0.05) occurred from the 21 days of life on, without the occurrence of treatment vs sex interaction. Males were always heavier than females, with a range from 5.48 to 12.4 kilograms, while females from 4.38 to 10.6 kg. The feeding of kids with up to 45% of cheese whey is technically feasible and provides better economic returns.

Key words: artificial feeding, economic evaluation, growth, milk replacer

INTRODUCTION

The economic and social importance of the dairy goat breeding in northeastern Brazil, which holds about 93% of the national herd (IBGE, 2007), is evident. For this region, where soil and climatic conditions make the farming activity difficult, the goat breeding activity has already consolidated its importance and viability, attracting the interest of farmers to exploit milk, meat and skin. The breeding of dairy goats aimed at meat production may become a costly practice according to the source of milk available to animals during lactation. Ribeiro et al. (1997) report that the cost to feed the animals in the dairy goat breeding accounts for about 50 to 60% of the production costs and may reach up to 80%. The search for alternatives aimed at minimizing costs with the provision of food to kids with the objective of providing greater economic returns for producers is an important factor for the sustainability of the dairy activity. Several substitutes, such as bovine or goat cheese whey, due to their nutritional value and low cost, have been used for the feeding of lactating kids. Beserra et al. (2003) have reported that goat cheese whey can be used from 20 to 60% replacing bovine milk, without prejudice in the development of kids, thus minimizing costs for the production of these animals. Moreover, the use of cheese whey in animal feeding has contributed for the reduction on the amount of liquid effluents disposed into the environment by the dairy industry, as reported by Machado et al. (2001). This study was aimed to evaluate the effect of replacing goat milk by bovine cheese whey on the productive and economic performance of Saanen and Alpine kids.

MATERIAL AND METHODS

The experiment was conducted at the Paraiba Federal University, Bananeiras-PB, microregion of *Brejo da Paraiba*, Brazil. Twenty-eight kids selected soon after birth, showing an average weight at birth of 3.01 ± 0.75 kg, were used. The feed management was composed of tifton grass hay (*Cynodon sp*) and commercial concentrated in the pelleted form for calves followed by the supply of 1.0 liter/animal/day of goat milk and bovine cheese whey divided into two meals. Diets were: Diet 1 – whole goat milk; Diet 2 - 85% of goat milk and 15% of cheese whey; Diet 3 - 70% of goat milk and 30% of cheese whey and Diet 4 - 55% of goat milk and 45% of cheese whey. Twenty-

eight alpine goats immediately selected after birth were used, housed in covered sheds measuring 25 x 10 m in collective stalls, four females and three males per treatment. The stalls had wooden and suspended floor, provided with food trough, water and individual bottle.

The solid diet was provided *ad libitum* from the day 15 on, being daily quantified from the 21st to the 70th day, allowing up surpluses of 20%. The kids were weighed every seven days, with prior food fasting (concentrate, hay, milk and whey) of 16 hours. There was no restriction for water during the fasting period.

The pelleted concentrate consisted of wheat bran, corn germ, calcitic limestone, molasses, sodium chloride, soybean meal, ground corn, and vitamin, mineral and probiotic premix. Table 1 shows the bromatological compositions of the experimental diet ingredients.

Table 1. Ingredient and chemical compositions (%) of the experimental diets, % of DM

Ingredient	DM	CP	EE	NDF	Ca	P
Tifton hay	90,72	9,7	2,1	77,6	0,36	0,20
Commercial concentrate	88,0	18,0	2,5	-	1,2	0,5
Whole goat milk[1,2]	11,67	3,66	4,05	-	-	-
Cattle cheese whey[1]	7,0	0,99	0,05	-	0,05	0,045

[1] Valadares Filho et al. (2006) [2] Nunes (1998)

The bovine cheese whey used was obtained in the Dairy Sector of the UFPB and frozen at -18 ° C for conservation, being daily thawed to supply the kids. The milk and whey mixture was held in proportions consistent with treatments and heated to a temperature of 38 º C for supply by using individual bottles, being offered a volume of 500 mL at 7:30 am and 500 mL at 3:00 pm.

The experiment was completely randomized in a 4 x 2 factorial arrangement (four levels of goat milk / cheese whey replacements and two sexes) with seven repetitions. Analyses of variance were performed and the means were compared through the Duncan test at 5% of probability, with the aid of the computer software SAS (1997).

RESULTS

It was found that from 7 to 42 days of life, the inclusion of bovine cheese whey did not affect (P> 0.05) the weight development of kids. During this period, the animals presented normal growth and no occurrence of mortality (Table 2). From the 49 to the 70 days of life, kids fed with whole goat milk showed higher body weights (P <0.05) when compared to kids that received cheese whey, with values ranging from 9.37 to 13.0; 7.52 to 11.1; 7.7 to 9.88 and 8.34 to 10.27 kilograms, for treatments with 0, 15, 30 and 45% of cheese whey, respectively.

Table 2. Growth performance (kg) of kids fed cheese whey

Age	Cheese whey levels (%)				ANOVA	
(days)	0	15	30	45	Treatments	CV (%)
7days	3.77	3.05	2.87	3.67	ns	21.86
14 days	4.38	3.72	3.85	4.54	ns	19.95
21 days	5.25	4.65	4.61	4.88	ns	20.05
28 days	6.24 a	4.62 b	5.08 ab	5.72 ab	*	19.23
35 days	7.00	5.92	5.98	6.50	ns	15.50
42 days	7.88	6.95	7.28	7.35	ns	15.95
49 days	9.37 a	7.52 b	7.70 b	8.34 ab	*	12.81
56 days	9.87	8.97	8.61	9.47	ns	13.44
63 days	12.15 a	10.20 b	8.85 b	9.95 b	*	13.20
70 days	13.00 a	11.10 b	9.88 b	10.27 b	*	13.23
Daily weight gain (g/day)						
Birt - 70 days	137.5 a	122.2 a	99.5 b	100.8 b	*	15.64
28 - 70 days	161.0 a	154.2 a	114.2 b	108.3 b	*	19.93

Means with different letters in the lines are significant (P<0,05) by Duncan test.

Table 3 shows the similarity (P> 0.05) of weights at birth in function of sex of kids, which ranged from 2.54 to 3.37 kilograms. The effect of sex (P <0.05) occurred from the day 21 on, without the occurrence of treatment *versus* sex interaction. Males were always heavier than females, with a range from 5.48 to 12.4 kilograms, while the females from 4.38 to 10.6 kg. There was an effect of sex (P <0.05) on the weight gains from birth to day 70 and from day 28 to day 70, with averages for males and females of 150.0, 117.1,

132.0 and 102.4 g / day, respectively. However, the consumption of dry matter (143.0 g / day) and hay (38.0 g / day) were not different (P> 0.05).

Table 3. Performance of the kids in function of sex

Weights	Sex		ANOVA	
(kg)	Male	Female	Sex	Treat*Sex
Birth	3.16 ± 0.32	2.89 ± 0.46	ns	ns
7 days	3.70 ± 0.46	3.07 ± 0.55	ns	ns
14 days	4.41 ± 0.30	3.92 ± 0.49	ns	ns
21 days	5.48 ± 0.37 a	4.38 ± 0.41 b	*	ns
28 days	6.12 ± 0.92 a	5.14 ± 0.62 b	*	ns
35 days	7.14 ± 0.95 a	5.76 ± 0.55 b	*	ns
42 days	8.53 ± 0.96 a	6.50 ± 0.58 b	*	ns
49 days	9.32 ± 1.12 a	7.42 ± 0.84 b	*	ns
56 days	10.16 ± 0.88 a	8.53 ± 0.57 b	*	ns
63 days	11.42 ± 1.41 a	9.44 ± 1.41 b	*	ns
70 days	12.40 ± 1.70 a	10.06 ± 1.20 b	*	ns
Daily weight gain (g/day)				
Birth - 70 days	132.0 ± 23,71 a	102.4 ± 15.0 b	*	ns
28 - 70 days	150.0 ± 39,23 a	117.1 ± 20.0 b	*	ns

Means with different letters in the lines are significant (P<0,05) by Duncan test.

DISCUSION

It is consensus in literature that genetic factors and those related to age and nutritional status of the mother, type and order of birth and time of birth influence the birth weight and survival rate of kids (Mellado et al., 2000; Marai et al ., 2002). Factors such as satisfactory average weight at birth (average of 3.01 ± 0.75 kg) and the nutritional management adopted contributed to the survival rate of these animals in the first 45 days of life, considered as a critical phase with higher mortality rate, which in general, is high at the pre-weaning stage, considering kids with low weight at birth (Awemu et al., 1999; Turkson et al., 2004). The weight superiority of males in relation females is due to the influence of androgenic hormones on the greater muscle development, according to Lawrie (2005). However, the body weight and weight gain values obtained for both sexes can be considered satisfactory, regardless the nutritional plan that they have been submitted to. It is worth noting that at 42 and 49 days of life, males and females had already reached the index of approximately 2.5 times the weight value at birth, which is a reference value to begin the early weaning process of kids in dairy herds. The effec of sex on the weight gains reflect the capacity of earlier development of males in relation to females. However, it should be emphasized that in a dairy goats production system, the creation of males may increase the costs, especially if they are not fed with a substitute of low commercial value.

It should be emphasized that for using cheese whey of as substitute for kids, despite being a low-cost byproduct, it should be taken into account the transportation costs from the dairy industry to the rural productive unit, as well as those with conservation and storage.

CONCLUSIONS

The replacement of goat milk by up to 45% of cheese whey to feed lactating kids is feasible under the technical aspect, provides more milk for market and provides better economic returns. The use of whole goat milk for the breeding of kids in dairy herds is not recommended, under the economic point of view.

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