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TECHNICAL NOTE

Bagamés as Feeding Alternative for Suckling and Weaned Calves

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INTRODUCTION

Calves are the main link to proper zootechnical flow in the herd. Feeding systems are critical to achieve the best growth with adequate somatic and genital development, so they can incorporate the earlier to reproduction.

Economically, it is impossible to use high volumes of concentrates in Cuban breeding and feeding systems. An alternative to the system is the use of whole diets. They allow for the inclusion of local resources available, like pastures and forages, from grass, trees and shrubs (Ybalmea *et al.*, 2008).

Anderson *et al.* (1987) noted that the stimulation of anatomical and physiological development through VFA production, suggests the existence of a close relationship between ruminal and antibacterial activity, and that the origin of these bacterial ruminant populations seem, firstly of all, dependent on calf diet. Correspondingly, finding dry feeds for calves that provide adequate morphological, physiological and bacterial development might be one of the key aspects to consider within breeding systems under the Cuban conditions, using the maximum amounts of feeds available in the country.

Accordingly, the implementation of whole sugar cane meal diets has been recommended in recent years, though studies on the effects of diets in the stomach of calves, the behavior assumed depending on the diet supplied, and their effect on calf growth are insufficient in early weaned calves, receiving limited amounts of milk or other milk substitute (Garzón, 2007).

In Cuba, industrial sugar cane residues have been commonly used, naturally or processed, for animal nutrition. In addition to it, several researches have been developed, leading to nutritionally enriched products by Solid-state fermentation, as for Saccharine (Elías *et al.*, 1990) and Bagarip (Pedraza *et al.*, 1996). However, the technology used for production has hindered industrial production (Ramos, 2000), causing imports of raw material to maintain basic animal nutrition (Guevara *et al.*, 2007).

Bagamés (animal feed from nutritionally enriched sugar cane bagasse) is another effort in search for solutions to problems arisen in animal nutrition; it is produced with the sugar industry residues by Solid-state Fermentation (SSF) (Julián *et al.*, 2015). New expectations are created for Bagamés as animal feed supplement, or as replacement of costly imported raw materials for animal feeds.

Bagamés´s potential use for nutrition of dairy cows has been successfully upheld using simulation techniques, through economic efficiency assessments, and possible nutritional values for suckling cows (Julián, 2009). New possibilities are being explored to extend its use as whole feeds for young calves in the form of enhanced fiber supplement, or as partial replacement of grains in industrial feeds.

Simulation or modeling for biological processes allows reproducing various digestive and metabolic transformations that occur inside the animal, apart from studying them on dynamic and quantitative basis, at lower costs than common practice in conventional livestock raising (Ku-Vera, 2000).

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In this work, simulation is made of possible use of whole diets including Bagamés, and its effect on productive behavior of suckling and weaned calves.

DEVELOPMENT

Whole milk, or milk replacement distributed at the cattle enterprises, plus other feeds whose bromatological values are shown in Table 1, were used for ration design.

The required intake of milk replacement and concentrate for 40 kg live weight suckling calves to achieve 450g gains, must be 0.2and 0.37 kg, respectively, besides including 3kg whole milk.

To achieve 450g gains in 120 kg live weight weaned calves, good quality hay and industrial concentrates are required at a rate of 2 kg/animal/day.

It has been said that the ration must provide functional development and rumen capacity for weaning, so including fiber in the diet of suckling calves, especially high quality fiber with slow theoretical ruminal degradability, will favor ruminal papillae development (Bacha, 1999). It might be accomplished with the use of treated Bagamés fiber.

The same results are observed with the supply of 1 kg Bagamés, 0.2 kg milk replacement, and 1.3 liters of milk in the diet, without the concentrate.

The results achieved in the simulation process are shown in Tables 2 and 3.

Tables 4 and 5 show the balance results through SACBA software (2011), for 120 kg weaned animals with gains of 450 g daily.

Concerning economic feasibility, having combinations that contribute to replace calf diets with the same effects are appealing. The calves are also given feed rations in order to improve ruminal conditions and rumen absorption capacity.

In all the cases Bagamés helped reduce consumption of commercial concentrates, whose production demands hard-to-access raw materials due to high international prices.

Table 6 shows prices of some of the products used to make commercial concentrates in the world market.

The results for Bagamés production in optimum conditions; the cost for the semi-continuous variant was 95.66 $/t PS; and for the semi-continuous variant, 89.69 $/t, which is very economical (Ricardo, 2009).

Bagamés production can improve PB and EM contents, which might also improve diet composition, with lower use of milk replacements and the technological inconveniences.

CONCLUSIONS

Bagamés is a potential source of nutrients in suckling and post weaned calves at lower costs and less use of milk and concentrated nutrients.

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Table 1.Bromatological composition of feeds used in diets

Product	% DM	BP g/kg MS	Ca g/kg MS	P g/kg DM	MEMcal/kg MS	PDIN g/kg MS	PDIE g/kg MS	ICB
*Bagamés	85	150	10	5	2.36	84.4	87.8	1
Feed	87	219	12	12	2.91	148	143	1
Hay	85	90	5	2	1.9	54.8	64.10	0.86

* Julián *et al.* (2015)

Table 2.Balance results using SACBA software for 40 kg suckling calves and mean daily gain of 450 g

	Requirements	Contribution	Difference
ME (Mcal)	315	3.15	0
BP (g)	201	216	15
Ca(g)	4	24.7	20.7
P(g)	3.5	21.97	18.47
DM (kg)	1.2	0.85	- 0.35

(Diet 0.2 kg SL; 3 kg Whole milk, and 0.35 kg feed for calves)

Table 3.Balance results using SACBA for 40 g suckling calves, and mean daily gain of 450 g

	Requirements	Contribution	Difference
ME (Mcal)	315	316	0.01
BP (g)	201	215.9	14.1
Ca(g)	4	23.04	19.4
P(g)	3.5	18.73	15.23
DM (kg)	1.2	1.12	- 0.08

(Diet 0.2 kg SL; 1.35 kg Whole milk, and 1 kg Bagames)

Table 4. 120 kg live weight calves, mean daily gain of 450 g, receiving industrial feeds for calvess (2 kg/a/d) and good quality hay (2 kg/a/d)

	Cons kg/MF	Cons.kg/MS	EM Mcal.	BP g.	Ca g.	P g.
Feed	1.85	1.61	4.7	353	19.3	19.3
Hay	2.0	1.58	3.0	147	8.8	3.5
Total	3.85	3.19	7.7	442	28.2	22.9
Requirements			7.7	442	16.6	9.2
Difference			0	58	11.6	13.6

Table 5. 120 kg live weight calves, with mean daily gain of 450 g, receiving industrial feeds for calves (0,5kg a/d), good quality hay (2.0 kg/a/d) and Bagames (2kg/a/d)

	Cons kg/MF	Cons.kg/MS	MEMcal.	BP (g)	Ca (g)	P (g)
Feed	0.27	0.23	0.7	51	2.8	2.8
Hay	2.0	1.58	3.0	147	8.8	3.5
Bagames	2	1.7	4.0	255	17.0	8.5
Total	4.27	3.51	7.7	453	28.6	14.8
Requirement			7.7	442	16.6	9.2
Difference			0.0	11	12.0	5.6

Table 6.International prices of feed components

No	Component	Price (S/t)	Increase (%)
1	Soy	346	87
2	Rice	854	74
3	Corn	250	31
4	Wheat	401	130