Scientific Paper

Influence of the Sorbifauna probiotic on milk production and quality of grazing crossbred milking cows

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ABSTRACT: The objective of the research was to evaluate the inclusion of the Sorbifauna probiotic on milk production and its quality of Holstein × Zebu cows which grazed in an association of *Leucaena leucocephala* cv. Cunningham and *Megathyrsus maximus* cv. Likoni; the study was conducted in the period May-June, 2013, at the Pastures and Forages Research Station Indio Hatuey. Twelve cows (clinically healthy) were used in a Switch Back design, with three treatments: A: grazing in the association + 60 g of additive, B: grazing in the association + 90 g of additive, and C: grazing in the association + 120 g of additive. The pasture availability and milk production were measured, for which the average initial milk production, (10,0 ± 2,2 kg), in 84 ± 54 days of lactation, was taken into consideration. In addition, the fat, protein, lactose and total solid percentages were determined. The milk production was 11,9; 12,1 and 12,2 kg/cow/day, without significant differences among the treatments, just like for fat (3,8; 4,0 and 3,9 %) and protein (3,3; 3,4 and 3,4 %); in the lactose and total solids a similar performance was also obtained. It is concluded that there were no significant differences in the milk production and quality in medium-potential cows when including the Sorbifauna probiotic in a silvopastoral system, for which it is recommended to evaluate it in grass systems without fertilization.

Keywords: *Leucaena leucocephala* cv. Cunningham, *Megathyrsus maximus* cv. Likoni, silvopastoral system

INTRODUCTION

The current world situation of livestock production compels to search for management alternatives that are sustainable and that allow to make an efficient use of the available resources, in order to satisfy the feeding needs of the cattle stock.

In this sense, among the solutions are the use of silvopastoral systems and agroindustrial byproducts, and the improvement of the utilization of the diet by the ruminants through the use of probiotics, living microorganisms that influence favorably the epithelial cells of the intestine by being added as supplement in the diet (Rastall and Gibson, 2015). Besides, they exert a beneficial effect on the normalization of the microflora of the digestive tube, reduce the occurrence of diarrhea in the calf and improve the immune response (Lin, 2003; Sretenović *et al*., 2008).

In Cuba a lot of results have been obtained with the use of probiotics. In this sense, the Pastures and Forages Research Station Indio Hatuey (EEPF-IH), since 2012, develops a research program to evaluate the effect exerted by probiotics of the French firm Sorbial S.A.S., which are formed by a mixture of selected strains of *Lactobacillus acidophilus* and *Lactobacillus rhamnosus* (Bernadeau *et al*., 2002), on the nutritional value of the diets and the animal response. The influence of this additive on the nutritional indicators of orange pulp preserved with different absorbing materials (Ojeda *et al*., 2008) and on the performance of the mean daily gain of calves (Soca *et al*., 2011) has been evaluated.

The Flora and Fauna Enterprise, belonging to the Cuban Ministry of Agriculture, with the license of the Sorbial firm, elaborates a probiotic that is being evaluated for its accreditation in Cuba under the name Sorbifauna.

Different doses of this probiotic (20, 30 and 40 g) were studied in lambs, and a positive effect was found since they started to consume roughages permanently (60 days), because the digestion of low nutritional quality pastures was favored (López *et al*., 2012; 2014); however, it has not been evaluated in dairy cows. For such reason, the objective of this study was to evaluate the inclusion of different doses of the Sorbifauna probiotic on the milk

production and its quality of Holstein × Zebu cows in an association of *Megathyrsus maximus* and *Leucaena leucocephala*.

MATERIALS AND METHODS

Location. The study was conducted at the EEPF-IH –Matanzas province, Cuba– between May and June, 2013. It is geographically located at 22º 48' 7" North latitude and 81º 2' West longitude, at 19,01 m.a.s.l.

Soil. The soil in the experimental area is classified as Ferralitic Red (Hernández *et al*., 2006), with flat relief.

Description of the experimental area and the management. A grazing area of 10 ha was used, divided into nine paddocks of approximately 1,1 ha each. The occupation time was 5 days and the resting time, 40 days.

The prevailing pasture species was *M. maximus* cv. Likoni, which represented 91 % of the floristic composition, and the tree *L. leucocephala* cv. Cunningham that had been established for more than 15 years with an average distance of 6 m between rows and 3 m between plants.

Characteristics of the animals. Clinically healthy Holstein x Zebu animals were used, 7,8 ± 1,5 years old, a weight of 474,5 ± 44,4 kg and 3 ± 1,9 lactations as average. The average milk production at the beginning of the experiment was 10,0 ± 2,2 kg, with the lactation period of 84 ± 54 days.

Treatments and design. Twelve cows were used in a Switch Back design and three treatments: A: grazing of an association of Guinea grass and leucaena + 60 g of additive, B: grazing of an association of Guinea grass and leucaena + 90 g of additive and C: grazing of an association of Guinea grass and leucaena + 120 g of additive. From the seventh liter of milk a concentrate feed was used with the following formulation: plant oil (2,32 %), corn (69,20 %), soybean (24,5 %), phosphate (1,8 %), calcium carbonate (1,11 %), common salt (0,45 %), multiple pre-mixture (0,30 %), methionine (0,058 %) and choline (0,106 %). The experimental periods comprised 15 days of adaptation and 5 days of sample taking for each treatment, respectively (60 days).

Table 1 shows the feeding balance of the cows to cover their requirements.

Measurements in the pastureland

Browsing availability in *L. leucocephala*. To estimate the browsing availability in leucaena the leaves and edible fresh stems were manually collected, in ten of the trees established in the paddock, simulating the browsing made by the animals up to a height of 2 m. The technique of milking the softer parts of the plant (leaves and fresh stems up to approximately 3 mm of diameter), according to the methodology proposed by Lamela (1998) was applied.

Pasture availability. The pasture availability was estimated through the alternative method proposed by Martínez *et al*. (1990), taking into consideration the average height of the pastureland. The samplings were carried out upon the entrance and exit of the animals from each paddock, and 80 observations were made per hectare.

Measurements in the animals

Milk production. The milk production was controlled two times per day (5:00 a.m. and 3:00 p.m.), during five days of the evaluation period, through individual weighing made to 100 % of the studied cows; for such purpose, an Alfa Laval milking machine, four-position fishbone type, with volumetric flasks, was used.

Indicators of milk quality. The fat, protein, lactose and total solid (TS) percentages were

Table 1. Feeding balance of the cows.

Feedstuff	DM (kg)	ME (MJ/kg DM)	CP (g/kg DM)	Ca (g/kg DM)	P (g/kg DM)
M. maximus	10,5	91,27	1 009	63,0	25,2
Concentrate feed	2,7	33,24	564	39,7	31,3
Contribution	13,2	123,5	1 573	102,8	56,5
Requirement[1]		123,5	1 404	69,4	40,2
Difference		–	170	33,3	16,3

[1] Milk production: 12 kg/cow/day and 4 % of fat

determined through the infrared method (FIL-141: B, 1997), using the MilkoScan 104 A/S Foss Electric, in the laboratory of the National Center of Agricultural Health (CENSA) –Mayabeque, Cuba– During the evaluation days, individual samples were taken from each animal.

Statistical analysis. For the statistical analysis of the milk production a variance analysis was applied, using the statistical pack SPSS® version 15.0 for Windows XP. The difference among the means was determined through the multiple range comparison test proposed by Duncan (1955).

RESULTS AND DISCUSSION

The dry matter availability of the improved grass exceeded 6 t DM/ha/rotation (table 2), showing the importance of grasses and leucaena associations to reach stability in the total yield of edible biomass.

In general, the availability of the grass was acceptable; nevertheless, in the case of leucaena it was low, due to the height reached by the plants after 10 years of established, which limited their intake during the evaluation. However, the presence of this tree species influenced favorably the chemical composition of the grass, because the crude protein was over 9 %, although no fertilization was applied. This beneficial effect has been reported by several authors, due to the importance of the protein in milk production.

The cows received a high offer of feedstuffs in the system, and they could select a high-quality pasture. The prevailing grass was *M. maximus*, with 80 % of leaves that are longer than 20 cm and are accessible to the animals. In addition, the cows could consume a diet richer in protein, because they selected the fresh leaves of the top stratum which have a higher content of this nutrient than the rest of the pasture (Sánchez and Faría Marmol, 2013).

On the other hand, the milk production was 11,9; 12,1 and 12,2 kg/cow/day for A, B and C, respectively, without significant differences among the treatments (table 3).

These results are similar to the ones reported by Sierra (2008), when studying the effect of the addition of two levels of *Bacillus subtilis* (15 and 30 g/animal/day) on the individual milk production and quality, regarding the fat, protein and total solid percentages. The feeding consisted in grazing in paddocks with star grass (*Cynodon plectostachyus*) and supplementation with 2 kg of balanced feed in each milking, as well as 75 g of mineral salt in the afternoon milking. There were no significant differences among the treatments in the variables re-

Table 2. Availability and chemical composition of the feedstuff.

Feedstuff	Availability (t DM/ha/rotation	Offer (kg DM/animal/day)	DM (%)	CP (%)	Ca (%)	P (%)
*M. maximu*s	6,72	75	31	9,6	0,9	0,2
L. leucocephala	0,017	0,070	31	25,9	1,3	0,4
Concentrate feed	-	2,3	90	20,9	1,5	1,2

Table 3. Milk production and quality per treatment.

Indicator	Treatment				
	A	B	C	SE ±	$p \leq$
Milk production (kg)	11,9	12,1	12,2	0,213	0,851
Days of lactation (days)	119	119	116	4,028	0,970
Milk composition					
Fat (%)	3,8	4,0	3,9	0,0428	0,564
Protein (%)	3,3	3,4	3,4	0,0253	0,453
Lactose (%)	4,6	4,6	4,7	0,0271	0,329
TS (%)	12,6	12,7	12,7	0,0856	0,828

lated, although the probiotic dose was lower than the one used in this study.

In turn, the results differed from the ones found by Vibhute *et al*. (2012) in cows that received a diet with a concentrate feed:forage ratio of 60:40. These authors evaluated three doses of a probiotic (10, 15 and 20 g) composed by *Lactobacillus acidophilus*, *Saccharomyces cerevisiae*, *Saccharomyces boulardii* and *Propionibacterium frendenreichii*, and found a beneficial effect of it on milk production and a trend to increase milk quality.

On the other hand, Lara and Cardona (2013) evaluated a group of 30 Romosinuano cows (Córdoba-Colombia): 15 experimental and 15 as control, with three repetitions; where the feeding regime consisted in grazing and supply of biopreparation (concentration of yeast, 3 x 10^8cfu/mL), once per day during two months and did not find statistically significant differences in the weight gain, but there were in the milk production.

The response to the utilization of probiotics in dairy cows is variable, and the favorable effect regarding the milk production and its quality is related to those diets whose main component is the concentrate feed. It should be stated that this study was conducted with medium-potential animals and the diet offered had a high forage proportion, which covered their productive potential, maybe favoring that no significant differences were detected because the cows received a ration with adequate concentrations of crude protein.

This positive response can be the result of a direct nutritional effect, similar to the one obtained with antibiotics, or a sanitary or health effect in which the probiotic acts as a bioregulator of the intestinal microflora and reinforces the natural defenses of the host. The main objective of supplying probiotics is to establish a favorable intestinal microbiota, before the disease-causing microorganisms can colonize the intestines (Guillot, 2000).

Likewise, Chiquette (2009) stated that probiotics are recommended in cases of ruminal acidosis, produced by an unbalance in the feeding of dairy cows, and that the response in milk production and quality is variable and, in general, increases from 0,75 to 2 kg/animal/day.

Regarding the milk fat and protein, the values were 3,8; 4,0 and 3,9 % and 3,3; 3,4 and 3,4 % for treatments A, B and C, respectively, without significant differences; similar performance was found in the lactose content and in the total solids (table 3).

It should be emphasized that the fat percentage is in correspondence with the values reported for that crossing (Holstein x Zebu) and responds to a diet whose main component is pasture (Hernández and Ponce, 2006), in which the acetic fermentation at rumen level prevails.

The forage quantity in the diet of the cows is a determining factor in fat concentration in the milk, and its importance lies on the fact that it is the principal means to ensure the precursors of fat synthesis in satisfactory levels. These precursors are obtained from the diet and the adipose tissue. The short chain fatty acids are synthesized in the mammary gland from acetate and B-hydroxybutyrate (Myburgh *et al*., 2012); both compounds are derived from the ruminal fermentation, mainly from the fibrous component of the diet (Leverich *et al*., 2011).

From this study it can be concluded that the inclusion in the diet of the Sorbifauna probiotic in Holstein × Zebu cows did not improve the milk production and quality. However, values were reached in accordance with the basis feedstuffs (Guinea grass and leucaena) that were consumed by the animals.

For such reason, it is recommended to study further the use of probiotics with medium-potential cows, in non-fertilized grass systems.

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