Saccharomyces cerevisiae for Control and Prevention of Diarrhea in Grazing Calves

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ABSTRACT

Two homogenous Cuban Siboney groups (20 grazing animals each), approximately 180 days old were made up to assess the probiotic effect of *Saccharomyces cerevisiae* on diarrhea prevention and control. The experimental group received sugar cane meal *ad libitum*, and 100 ml of liquid culture of *Saccharomyces cerevisiae*, variety C-40 (1.3×10^8 ufc/g), mixed/kg of Norgold/animal. No yeast was supplied to this group. During the four months of assessment the diarrhea episodes were produced from two to three days on average (18 days total). Twenty-five episodes were observed in the control group, from three to five days (88 days total). *S. cerevisiae* has a probiotic effect on grazing calves, helps reduce the incidence of diarrhea, and lasts less when it occurs.

Key words: *probiotic, prevention, control, diarrhea, calves*

INTRODUCTION

Often enteric disorders can be observed in present-day calf raising systems, caused by morbidity and mortality, and also due to growth retardation. Diarrhea is the major health problem in neonates, which is associated with dehydration and weight loss (Windeyer *et al.,* 2014); it can be overcome if stable and protective intestinal microbiota is stimulated in these animals with the use of probiotics, which is not very popular in Cuba (Aquilina *et al.,* 2014).

In spite increased occurrence of enterotoxigenic *Escherichia coli* and *Salmonella* (Meganck *et al.,* 2014), diarrhea often comes up as a combined infection of different enteropathogens, instead of infection from a single agent. In that sense, *Lactobacillus* sp containing probiotics has a remarkable effect in reducing the number of coliforms in calf intestines (Arzuaga, 2005). The protective effect of *Saccharomyces cerevisiae* against *Salmonella enterica*, serovar Typhimurium and *Shiguella flexneri* in mice, has been demonstrated (Arribas, 2009).

The purpose was to assess the probiotic effect of *Saccharomyces cerevisiae* in the control and prevention of diarrhea in grazing Cuban Siboney calves.

MATERIALS AND METHODS

To assess the probiotic effect of *Saccharomyces cerevisiae* on prevention and control of diarrhea, two homogeneous groups of Cuban Siboney calves were chosen (5/8 H x 3/8 C), each made up of 20 animals, approximately 180 days old, and 80 kg mean weight, according to grazing calf classification for industry (ACOPIO, 2007). A completely random experimental design was used: A) experimental group: *ad libitum* crushed sugar cane and 100 ml of liquid culture of *Saccharomyces cerevisiae* var C-40 (1.3×10^8 ufc/g) mixed/kg of Norgold/per animal; B) control group: the same procedure as for group A, excluding the yeast. Both groups grazed in six enclosures, 1 h each. Animals had access to water and mineral salts through a strip of land. Grassland management was the same during all the experimental stage: the grazing times were between 7:00 a. m. and 6:00 p. m. Then the animals remained in stables, indoors, with free access to the above mentioned feeds. Along the experiment (four months), diarrhea episodes and duration were quantified, regardless of the etiology.

The normality test was made to the data and results; the non-parametric Mann–Whitney U test was made to compare the means, with a $P < 0.05$ significance (Machado Sampaio, 2002). SSPS 15.0, 2006, for Windows® was used.

RESULTS AND DISCUSSION

S. cerevisiae used as nutritional additive contributed to reduce the incidence of diarrhea, or shortened diarrhea duration in the cases it occurred (see Table).

In the four months of the study, the experimental group had eight episodes of diarrhea, with a

mean duration between two or three days, which totaled 18 days. The control group underwent 25 episodes, lasting longer (three to five days), which totaled 88 days.

On assessing the probiotic effect of *Saccharomyces cerevisiae* on weight gain and health of grazing calves, Delgado (2014) noted that the cost of a conventional five-day treatment of diarrheal calves is about $91.48 CUP, and added that fewer animals suffering this enteric disorder accounted for $ 1 555.16 CUP less. On the international level, Jatkauskas and Vrotniakiene (2014) agreed with the previous conclusion.

For over more than 20 years scientists from different countries have demonstrated the benefits of yeast administration to ruminant health and productivity. The most frequent therapeutical doses are 10^9-10^{12} UFC per animal a day, or 10^6-10^7 UFC per feed kilogram. Providing enough microorganisms in the dose in relation to the native flora, or reaching this level by growing in the digestive tract to cause a beneficial response in the host (Corcionivoschi *et al.*, 2010) is essential.

Jatkauskas and Vrotniakiene (2010) reported that probiotics mixed in the feed can improve production and inhibit the growth of *Salmonella*, and due to that fact they prevent diarrhea in calves. According to Hooper *et al.*, (2012), these results owe to an immunomodulating effect of these products, which confer greater efficiency to gastrointestinal defense mechanisms. The protective effect may not be related to a reduction in the bacterial population of pathogen germs in the intestine (Arribas, 2009), but rather to the reduction of toxins secreted by those pathogens. Usually, enterotoxins bind to specific epithelial receptors of the intestine, and induce changes that lead to water and electrolyte losses, causing diarrhea.

The probiotic effects to control and prevent diarrhea are varied, but their role in blocking enteropathogen adhesion must be highlighted. It is a vital step so further colonization and production of enterotoxins responsible for those syndromes take place (Shiba *et al*., 2003; Corcionivoschi *et al.*, 2010). Morrison *et al.* (2006) assumed that a pH change in the intestinal lumen (pH < 4) is a key element that cannot be tolerated by certain enteropathogens, mainly because of the production of organic acids, especially lactate and short chain fatty acids (acetate, propionate and butyrate), as a consequence of their fermentative capacity in the diet fiber. These beneficial microorganisms are able to produce antimicrobials or antimetabolites. Liévin *et al.* (2000) also included nisin, lactalin, and toxin destroyers. Some authors (Corr, 2007), referred to the participation of other mechanisms, like the release of bacteriocins, or the production of hydrogen peroxide.

CONCLUSIONS

The application of *S. cerevisiae* as a nutritional additive has a probiotic effect that contributes to reduce the incidence of diarrhea, and shorten their duration when they occur.

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Table. U-Mann-Whitney test results for diarrheal episodes, and duration in days

Indicators	Group	Number of animals	Mean range	Asymptomatic signs (bilateral)
Diarrheal episodes	experimental	20	72.90	.002
	control	20	88.10	
Days in which diarrhea ceased	experimental	20	71.94	.001
	control	20	89.06	