Effects of Saccaromyces Cerevisiae on In Vitro Fermentation of a High Concentrate or High Fiber Diet in Horses

J.M. Lattimer, S.R. Cooper, D.W. Freeman and D.A. Lalman

Story in Brief

A 4x4 Latin Square designed experiment was used to determine the effects of a yeast culture (YC) preparation containing *Saccharomyces cerevisiae* on the in vitro microbial populations, fiber digestion and fermentation parameters in horses. Fecal samples were taken from mature Quarter Horses consuming either a high concentrate (HC) of high fiber (HF) diet. Feces were then diluted in the lab to form the in vitro inoculum. Filter bags containing either the HC or HF diet were added to incubation vessels along with the inoculum and buffer solutions. Vessels were incubated in the Daisy II Incubator® with samples taken at 24 and 48 h. Filter bags were used to determine DM, NDF and ADF digestibility. There was no significant effect of YC on DM, NDF or ADF digestibility. However, this trial did find that DM digestibility values from the in vitro fermentation process were similar to in vivo estimates, which suggests that this procedure is adequate for determining digestibility in the horse.

Key Words: Digestibility, In vitro fermentation, Horses

Introduction

The addition of yeast culture (YC) to ruminant diets has been popular for many years. Recently, there has been an increased interest in the use of these products as a probiotic to enhance gastrointestinal function in horses. Yeast culture has been shown to alter cecal fermentation parameters, which in turn enhances nutrient digestibility. Although pervious studies are somewhat conflicting in their data, they have shown that yeast culture can be valuable to horses on both a HC diet and a HF diet. Horses consuming a majority of their diet as forage have also seemed to benefit from the addition of YC. Glade (1991) reported that DM, NDF and ADF digestibility increased ($P<.05$) in mature mares. Providing supporting data in vivo, McDaniel et al. (1993), using cecal fluid from mature horses consuming a HF diet, observed an increase ($P<.05$) in the acetate:propionate ratio as well as in the total VFA concentrations. The previous data suggests that the addition of YC to geriatric horses with inhibited fiber digestion could be advantageous.

Materials and Methods

Four mature Quarter Horses were paired by weight and age and randomly allotted to either the high fiber (HF) or high concentrate (HC) diet (Table 1). The pelleted concentrate primarily consisted of corn, wheat, soybean meal and dehydrated alfalfa meal while the forage component was alfalfa cubes. The trial was conducted as a 4x4 Latin Square utilizing two diets with varying concentrate:roughage ratios (70:30 & 30:70) with and without the inclusion of a yeast culture (YC) preparation containing *Saccharomyces cerevisiae* (Diamond V "XP", Cedar Rapids, IA). In vitro fermentation was carried out for 48h using the Daisy II Incubator (D200-Ankom Technology, Mecedon, NY). The microbial inoculum was prepared by collecting fresh feces via a rectal grab sample using palpation sleeves and mineral oil. Once in the lab feces were diluted

with warm sterile water in a 10:1 ratio of water to feces. *Saccharomyces cerevisiae* was added directly to the incubation vessel at a level of 2.2 mg (equivilant to the recommended feeding level of 50 g/d, assuming a mature (500kg), sedentary horse consuming 2% of BW per day).

Sixteen total filter bags containing a 0.25 g sample of the total mixed ration were added to each incubation vessel and used to determine DM, NDF and ADF digestibility. Each parameter was run in quadruplicate. At 24 h and 48 h, the vessels were removed from the incubator, opened, agitated by hand and flushed with CO_2 while the samples were taken. Eight of the bags were removed at each time period by sterile tongs and placed into cold water to stop the fermentation process.

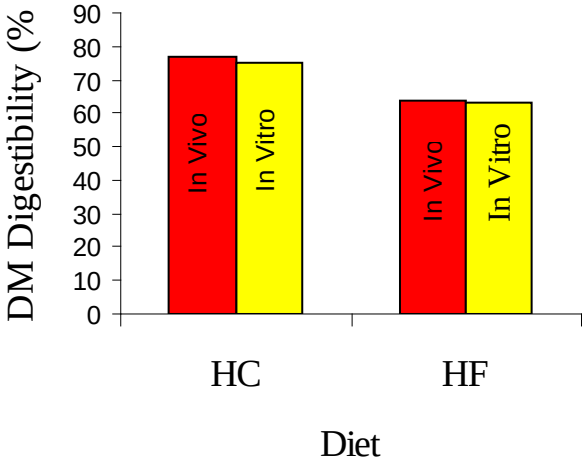
After incubation, filter bags were placed in a 50°C oven and dried for 48 h. Bags were then weighed and dry matter digestibility was determined. Following DM determination, eight bags were analyzed for ADF and NDF using a fiber analyzer (A200- Ankom Technology, Macedon, NY).

Composition of treatment diets, % as fed		
Ingredient	HF	HC
Alfalfa Hay	70.00	30.00
Ground Shelled Corn	12.60	31.57
Soybean Meal	-	4.20
Wheat Mids	7.35	21.90
Cottonseed Hulls	6.00	-
Dehy. Alfalfa Meal	3.30	10.50
Limestone	.60	1.68
Trace Min. Salt	.15	.15
Nutrient		
DE (Mcal/kg)	2.50	2.94
CP, %	15.17	16.62
NDF, %	21.03	33.14
ADF, %	13.64	24.38
Ca, %	1.22	1.21
P, %	.27	.29

Results and Discussion

The average DM digestibility between the in vitro fermentation and in vivo estimates were similar (P>.05) within the HC (75 vs 77%) and HF (64 vs 63%) diets, respectively (Figure 1). This suggests that the in vitro incubation procedure utilized in this study is an adequate estimate for in vivo digestibility.

Figure 1. In Vivo vs In Vitro dry matter digestibility



There was no significant interaction or main effect of YC on DM, NDF, or ADF digestibility (Table 2). This coincides with McDaniel et al. (1993) who observed that *A. oryzae* added to incubation vessels containing alfalfa hay and inoculated with cecal fluid from mature horses had no effect on DM or fiber digestion. In addition, Carro et al. (1992), using the rumen simulating technique Rusitec, found no change in DM, NDF, or ADF digestion of a low (30:70) or medium concentrate (50:50) diet incubated with *S. cerevisiae*.

Table 2. Effects of S. cerevisiae on in vitro DM, NDF and ADF digestibility

Item	Control	YC	SEM	Pr>F
DM	62.99	63.24	.817	.8335
NDF	22.55	22.09	1.2128	.7569
ADF	16.24	17.52	1.0236	.2927

The addition of *S. cerevisiae* produced no effect on the digestibility parameters in this trial. This is most likely do to the type of fermentation process used. The incubator was a closed system therefore not allowing for a continuous flow of microflora and nutrients. In addition, the horses used for collection of feces for the inoculum were not adapted to the yeast culture. This might suggest that yeast culture requires an adaptation period before significant effects on digestion and fermentation can be observed.

Literature Cited

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