



Impact of replacing soybean meal in beef cattle diets with inactive dry yeast, a sugarcane by-product of ethanol distilleries and sugar mills

Andressa Fernanda Campos, Odilon Gomes Pereira*,
Karina Guimarães Ribeiro, Stefanie Alvarenga Santos,
Sebastião de Campos Valadares Filho

Universidade Federal de Viçosa, Departamento de Zootecnia, Viçosa 36571-000, Minas Gerais, Brazil

ARTICLE INFO

Article history:

Received 25 June 2013

Received in revised form 4 January 2014

Accepted 6 January 2014

Keywords:

Digestibility

Nutrient

Rumen-degradable protein

ABSTRACT

This study assessed the intake, total and partial apparent digestibility of nutrients, pH, ruminal ammonia concentration, nitrogen efficiency usage, and productive performance of beef cattle fed with different soybean meal replacement levels with inactive dry yeast (IDY 0, 250, 500, 750, and 1000 g/kg). The forage:concentrate ratio was 60:40 and the forage source was corn silage. Concentrates were formulated to comprise 220.0 g/kg CP independent of treatments. In the first experiment (EXP 1), 35 Nelore bulls with an initial average weight of 370 ± 42 kg were distributed across a completely randomized design, with five treatments and seven replicates to assess nutrient intake and performance. EXP 1 lasted 98 days and was divided into a 14-day adaptation period and three experimental periods of 28 days each. In the second experiment (EXP 2), five castrated Nelore steers with an initial average weight of 320 ± 39 kg were fistulated in the rumen and abomasum and distributed in a 5×5 Latin square design, balanced for residual effect. The purpose of this experiment was to assess the total and partial digestibility of nutrients, pH, ruminal ammonia nitrogen, and nitrogen efficiency of usage. EXP 2 lasted 90 days, divided into five experimental periods. Each period lasted 18 days and was divided into 10 days for adaptation to the diets and 8 days to collect samples. The intake of dry matter (DMI) decreased linearly ($P = 0.03$) with increased dietary IDY levels. Conversely, the intake of neutral detergent fiber assayed with a heat-stable amylase and corrected for ash and nitrogenous compounds [aNDFom(n)] in g/day ($P = 0.043$), and the g/kg body weight ($P = 0.011$) increased linearly as IDY was added to the concentrate. The experimental diets showed no effect ($P > 0.05$) on the total and partial apparent nutrient digestibility. IDY had no effect ($P > 0.05$) on ruminal pH, ruminal ammonia nitrogen, or dietary nitrogen efficiency. Additionally, IDY had no effect on productive performance variables, with the exception of average daily gain (ADG), which decreased linearly ($P = 0.028$) as IDY was added to the concentrate. IDY addition resulted in decreases

Abbreviations: RDP, rumen degradable protein; IDY, Inactive dry yeast; ADG, average daily gain; HCW, hot carcass weight; FLW, final live weight; CADG, carcass average daily gain; DM, dry matter; OM, organic matter; CP, crude protein; EE, ether extract; aNDFom(n), neutral detergent fiber assayed with a heat-stable amylase and corrected for ash and nitrogenous compounds; NDIN, neutral detergent insoluble nitrogen; ADIN, acid detergent insoluble nitrogen; NFC, non-fibrous carbohydrates; FDM, flow of fecal dry matter; ADM, abomasal dry matter; TDN, total digestible nutrients; NB, nitrogen balance; UUN, urinary urea nitrogen; NPN, non-protein nitrogen; PUN, plasma urea nitrogen; Emic, microbial efficiency; PD, purine derivatives; BW, body weight; ILW, the initial live weight; DRS, dressing percentage after slaughter; RCY, carcass yield; N_{mic} , microbial nitrogen compounds; NID, normal independent distribution.

* Corresponding author. Tel.: +55 31 3899 3323; fax: +55 31 3899 2275.

E-mail address: odilon@ufv.br (O.G. Pereira).

in DMI and ADG for beef cattle in feedlots (EXP 2). However, the apparent digestibility of nutrients and microbial efficiency were not affected. In addition, IDY did not reduce feed conversion or carcass gain. The high market price of soybean meal might make feasible its total replacement by IDY, even considering the possibility of a small reduction in ADG.

© 2014 Elsevier B.V. All rights reserved.

1. Introduction

As a consequence of the high cost of protein supplements in feed concentrates, new non-conventional alternatives have been exploited in recent years. Both ethanol distilleries and beer breweries have surplus yeast co-products for use in animal feed. In feedlot diets for beef cattle, soybean meal is the most frequently used protein concentrate and is also one of the most expensive products. The search for alternative products that can replace soybean meal without altering body weight gain and carcass yield is important for achieving higher profits by reducing the costs of concentrate ingredients. Yeasts are unicellular microorganisms that grow during ethanol fermentation (Yara et al., 2006). Because of their protein composition (300 to 450 g/kg), yeasts are rich in limiting amino acids such as lysine, threonine, and methionine, in addition to vitamin B complex (Ezequiel et al., 2000).

Yeast protein is classified as having high rumen degradable protein (RDP), which may result in increased use of readily available energy sources such as starch for the synthesis of microbial proteins, improving protein and energy synchronization. Yeast protein has a high ruminal degradability compared with soybean meal (990 g/kg vs. 790 g/kg of RDP) (Marcondes et al., 2009). As a consequence, Rufino et al. (2012) observed that the greatest amount of inactive dry yeast (IDY, *Saccharomyces cerevisiae*) used to substitute soybean meal resulted in the greatest ruminal ammonia production in lambs. IDY is marketed by the ethanol and sugar producing industries because the surplus from yeast mash can be used as an alternative ingredient in ruminant diets. Evaluations of nutrient use by livestock and the resulting rumen-microorganism interactions are needed to better understand the role of this potential ingredient. These data can be obtained through digestion studies, which analyze the possibility of replacing a high-cost conventional feed with a by-product that would otherwise be considered an environmental contaminant.

Thus, the present study aimed to evaluate the potential nutritive value of IDY as a protein ingredient in ruminant diets by assessing the intake, total and partial digestibility, pH, ruminal ammonia nitrogen, microbial efficiency (Emic), nitrogen balance (NB), average daily gain (ADG), carcass average daily gain (CADG), carcass yield, and feed conversion when using different soybean meal replacement levels in the diet of Nelore cattle.

2. Material and methods

2.1. Experimental area and climatic conditions

This experiment was conducted in the Experimentation, Research and Extension Center of Triângulo Mineiro (Central de Experimentação, Pesquisa e Extensão do Triângulo Mineiro, CEPET) of the Federal University of Viçosa (Universidade Federal de Viçosa, UFV), Brazil, from June to September of 2009. The CEPET is located at an average altitude of 620.2 m, 18.41°S latitude and 49.34°W longitude. The climate is classified by Köppen standards as Aw, i.e., hot and humid, with the temperature of the coldest month above 18 °C, a rainy season in the summer and a dry season in the winter, with an annual average precipitation of between 1,400 and 1,600 mm.

2.2. Experimental diets

The diets were formulated to meet beef cattle requirements of 1 kg of daily gain according to the National Research Council (NRC, 1996). The forage:concentrate ratio was 60:40 on a dry matter (DM) basis with corn silage as the forage. The diets consisted of five concentrate replacement levels of soybean meal by IDY, 0, 250, 500, 750, and 1000 g/kg on DM basis. The proportions of concentrate ingredients are shown in Table 1, and the chemical composition of the concentrates and corn silage is shown in Table 2.

2.3. Animals, management, and sample collection

The management and care of animals were performed in accordance with the guidelines and recommendations of the Committee of Ethics on Animal Studies at the Federal University of Vicosa (UFV), MG, Brazil. To determine nutrient intake and productive performance, 35 Nelore bulls with an average initial body weight (BW) of 370 ± 42 kg were distributed throughout a completely randomized experimental design, with five treatments and seven replicates (EXP 1). The trial lasted 98 days and was divided into a 14-day adaptation period and three experimental periods of 28 days each. Five animals were slaughtered at the end of the adaptation to estimate the initial carcass weights of all steers at the beginning of the experiment. They represented the mean of the total group.

Download English Version:

<https://daneshyari.com/en/article/8491707>

Download Persian Version:

<https://daneshyari.com/article/8491707>

[Daneshyari.com](https://daneshyari.com)