



Effects of silage crop and dietary crude protein levels on digestibility, ruminal fermentation, nitrogen use efficiency, and performance of finishing beef cattle

L.D. da Silva, O.G. Pereira*, T.C. da Silva, S.C. Valadares Filho, K.G. Ribeiro

Universidade Federal de Viçosa, Departamento de Zootecnia, Av. P.H. Rolfs, Campus, Viçosa, MG, 36570-000, Brazil

ARTICLE INFO

Article history:

Received 6 November 2015

Received in revised form 11 July 2016

Accepted 13 July 2016

Keywords:

Feedlot

Corn silage

Legume silage

Stylosanthes

ABSTRACT

Two trials were conducted to evaluate the effects of silage crop and levels of dietary crude protein (CP) in Nelore beef cattle. The experimental diets consisted of *Stylosanthes* (StS) or corn silage (CS) with two levels of dietary CP, 110 and 130 g CP/kg diet on a dry matter (DM) basis. The forage to concentrate ratio was 50:50 on a DM basis. In Experiment 1, the four bulls that were used had an average initial body weight (BW) of 450 ± 37.9 kg, and were surgically cannulated in the rumen and abomasum. The bulls were assigned to a 4×4 Latin square with a 2×2 factorial design of treatments, and four 16-d periods. During this experiment, we collected ruminal fluid, abomasal digesta, feces, urine, and blood. In addition, the kinetic parameters of DM, CP, and neutral detergent fiber (NDF) degradation were estimated. In Experiment 2, 40 bulls with an average initial BW of 374 ± 16.5 kg were distributed into a 2×2 factorial in a randomized design with ten replicates. The trial lasted for 99 d and was divided into a 15-d period for adaptation and an 84-d period for data collection. The intake and digestibility of nutrients as well as animal performance were evaluated in Experiment 2. The potentially degradable fractions of DM, CP, and NDF of StS were lower than CS ($P < 0.004$). The diets containing StS showed lower ruminal digestibility of organic matter (OM) and lower total tract digestibility of OM, CP, and NDF than diets containing CS ($P < 0.050$). The StS-based diets showed higher values for ruminal pH in comparison with CS-based diets ($P = 0.010$). The ruminal $\text{NH}_3\text{-N}$ concentration was higher for the level of 130 g CP/kg diet in comparison with the 110 g CP/kg diet ($P < 0.001$). The dietary CP level affected urea nitrogen in blood ($P < 0.001$) and urine ($P = 0.017$), which were higher in the diets containing StS and CS at the level of 130 g CP/kg diet. The diets containing StS showed a higher intake of DM, OM, CP, NDF, and indigestible neutral detergent fiber (iNDF) than diets containing CS ($P < 0.008$). However, the amount of digested nutrients (kg/d) was similar between treatments ($P > 0.050$). The silage crop and dietary CP levels had no effect on productive performance ($P > 0.050$), but the StS-based diet tended to decrease feed efficiency ($P = 0.085$). Thus, StS, as well as the level of 110 g CP/kg diet, can be used to feed finishing beef cattle.

© 2016 Elsevier B.V. All rights reserved.

Abbreviations: StS, *Stylosanthes* silage; CS, corn silage; DM, dry matter; OM, organic matter; CP, crude protein; NDF, neutral detergent fiber; iNDF, indigestible neutral detergent fiber; BW, body weight; N, nitrogen; $\text{NH}_3\text{-N}$, ammonia nitrogen.

* Corresponding author.

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

1. Introduction

In tropical regions, silage making is a suitable source of high quality forage during the dry season because of the seasonal variation in forage production throughout the year. In addition, silage is the main method of forage conservation in tropical regions because it is difficult to produce a good-quality hay under high relative humidity and frequent rainfall during the harvest period. Furthermore, corn and sorghum silage are the main crops that are used for feedlot cattle (Adesogan, 2009; Millen et al., 2009).

Recently, interest in using legume crops for silage making in livestock systems has increased because it is an important source of protein in livestock production systems, especially *Stylosanthes* because it has adequate characteristics for ensiling and provides satisfactory results regarding animal performance (Heinritz et al., 2012; Souza et al., 2014; Bureenok et al., 2016).

The genus *Stylosanthes* is native to America, and most of the species occur naturally in South America. *Stylosanthes* cv. Campo Grande is a mix of two species, *Stylosanthes macrocephala* and *S. capitata*, and has the potential to be adopted in tropical regions because it does not require nitrogen fertilization, it can be utilized to recover degraded pastures, and it can improve animal performance (Valle et al., 2001; Paciullo et al., 2003). In addition, this legume can adapt well to infertile soils, including sandy soils, with an annual dry matter (DM) yield of 8–15 t/ha (Fernandes et al., 2005; Moreira et al., 2015).

However, more studies are needed to evaluate *Stylosanthes* cv. Campo Grande, its interaction with dietary crude protein (CP), and how it affects animal performance. In addition, the quantity and quality of dietary CP are some of the main factors associated with animal performance under tropical conditions due to the positive relationship between dietary CP and forage intake (Leng, 1990; Detmann et al., 2014). However, improvement in the nutritional status in the form of protein inclusion, mostly with soybean meal in the diet, can increase the production cost, which can then reduce the profitability (Valadares Filho et al., 2006).

Based on that, it was hypothesized that StS can replace corn silage (CS) in diets with a forage to concentrate ratio of 50:50 for feedlot beef cattle in tropical conditions. The objective of this study was to evaluate the effects of the silage crop (*S*; *Stylosanthes* spp. and corn) and two levels of dietary crude protein (CP), i.e. 110 and 130 g CP/kg DM, on the intake, ruminal and total tract digestibility of nutrients, ruminal fermentation, efficiency of nitrogen usage, and performance in beef cattle.

2. Materials and methods

2.1. Experimental area and climatic conditions

The experiments were conducted and the crops were grown at the Experimentation, Research, and Extension Center of Triângulo Mineiro (“Central de Experimentação, Pesquisa e Extensão do Triângulo Mineiro, CEPET”) of the Federal University of Vicosa (“Universidade Federal de Viçosa, UFV”), MG, Brazil. This research station 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 a rainy season in the summer and a dry season in the winter, and an annual average precipitation of 1500 mm.

2.2. Ensiling of *Stylosanthes* and corn

The *Stylosanthes* cv. Campo Grande crop was seeded in November 2012 in a 6-ha area by broadcasting seeds at an application rate of 3 kg/ha. At the time of sowing, 100 kg/ha of simple superphosphate [phosphorus pentoxide (P₂O₅) 180 g/kg, calcium (Ca) 160 g/kg, and sulfur (S) 80 g/kg] was applied. Harvesting was performed at the flowering stage, approximately 150 d after sowing. The harvested material was chopped into a theoretical particle length of 2 cm by using a JF-92 Z10 forage harvester (JF Agricultural Machinery, SP, Brazil), and was ensiled in three pile silos (35 tons each, approximately) which were opened after 120 d of storage.

Corn hybrid (SHS 4070; Santa Helena, MG, Brazil) was seeded in December 2012 in a 5-ha area by using an SHM 11/13 seeder (Semeato, RS, Brazil) at an application rate of 60,000 seeds/ha (80-cm row spacing). At the time of sowing, 300 kg/ha of fertilizer, 8-28-16 (N-P-K), was applied, and a top-dressing of 300 kg/ha of ammonium sulfate was applied 30 d later. Corn plants were harvested approximately 120 d after sowing, when kernels reached the hard dough stage, and were stored in three pile silos (45 t each, approximately) which were opened after 150 d of storage.

2.3. Experimental diets

The experimental diets consisted of StS or CS in combination with two levels of dietary CP, i.e. 110 and 130 g CP/kg DM. The forage to concentrate ratio was 50:50 on a DM basis. The diets were formulated to meet the requirements for a daily gain of 1.00 and 1.50 kg/d, for the diets with 110 and 130 g CP/kg DM, respectively, according to BR-Corte, the Brazilian system of nutrient requirements for Nellore and crossbred cattle (Valadares Filho et al., 2010). Three concentrates were prepared with 110, 150, and 190 g CP/kg DM. The CS-based diets were formulated with the concentrates containing 150 and 190 g CP/kg DM, and the StS-based diets were made with the concentrates containing 110 and 150 g CP/kg DM, to reach the dietary CP levels of 110 and 130 g CP/kg diet, respectively. The chemical composition, protein fractions and organic acids of the forages

Download English Version:

<https://daneshyari.com/en/article/2419234>

Download Persian Version:

<https://daneshyari.com/article/2419234>

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