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PROTEIN SOURCES FOR GROWING BEEF STEERS FED WITH A DIET BASED ON CORN SILAGE

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Abstract

This study was conducted to determine the effect of different protein sources in growing beef cattle (25 Aberdeen Angus steers) fed with a corn silage based diet on daily live weight gain (DLWG), dry matter intake (DMI) and feed conversion (FC). Five treatments with different supplies of crude, degradable and metabolizable protein (MP) were used. The treatments were formulated with different protein sources to provide different rate and extents of protein degradation, as follow: a negative control (T0) without protein supplements and below animal requirements, urea (T1), soybean meal (T2), whole cotton seed (T3) and a positive control (T4), which include a mixture of protein sources in excess of animal requirements. The treatments were planned to be isoenergetics (2.63 Mcal ME kg $^{-1}$ DM) and also T1, T2 and T3 were isoprotein. The data were analyzed statistically by ANOVA. The DGWG were significant different 730, 869, 1006, 946 and 979 g.day^{-1} for T0, T1, T2, T3, and T4 respectively. The main differences in DMI were obtained in the isoprotein treatments. Exceeding the animal requirements of metabolizable protein to achieve a suitable nitrogenous supply to rumen did not produce any improvement in the animal performance. The supply of nitrogenous in diets based on corn silage improves the DLWG and FC. This effect was higher with the use of true protein.

Keywords: Corn silage, supplementation, protein concentrates, beef cattle.

Introduction

Corn silage is one of the most important tools for the intensification in the procedures of growing and finishing beef cattle in Argentina. The main characteristic of corn silage is its high forage production per surface unit, with a high energetic concentration. But it presents a low level of protein, especially for young steers feeding. When it is used as the only feed of the diet, the addition of protein concentrates becomes necessary.

To achieve a productive utilization of nutrients by ruminants, a suitable energetic-protein balance is required in the diet. The amount of protein degradable at ruminal level (to microbial protein) and the amount of protein undegradable in the rumen depends on the characteristics of each protein concentrate. The different protein concentrates present differences in extent and rate of ruminal degradation and therefore the supplies to metabolizable protein (MP) vary (AFRC, 1993). The total amount of MP in a diet and its composition can affect the animal performance (Petit and Veira, 1994).

This study was conducted to determine the effect of using different protein sources in growing beef cattle fed with a corn silage diet on daily live weight gain (DLWG), dry matter intake (DMI) and feed conversion (FC).

Material and Methods

The contribution to the total supply of MP from different protein sources was simulated through the Cornell Net Carbohydrate and Protein System (CNCPS) developed by Cornell University (1994). Thus, five treatments with different supplies of crude, degradable and metabolizable protein (MP) were used. The treatments were formulated with different

protein sources to provide different rate and extents of protein degradation, as follow: a negative control (T0) without protein supplements and below animal requirements, urea (T1), soybean meal (T2), whole cotton seed (T3) and a positive control (T4), which include a mixture of protein sources in excess of animal requirements.

The treatments were planned to be isoenergetics (2.63 Mcal ME kg $^{-1}$ DM) and also T1, T2 and T3 were isoprotein. Ingredient compositions of diets for each treatment are shown in Table 1.

The chemical composition of corn silage was 335 g MS kg^{-1}, 499 g NDF kg^{-1}, 301.5 g ADF kg^{-1}, 55.6 g CP kg^{-1} and 2.36 Mcal ME kg^{-1} MS.

Twenty-five Aberdeen Angus steers with an initial weight of 222-± 0.67 kg averages were fed ad libitum once a day in a feedlot during 84 days. Each treatment had five animals that were taken as an experimental unit.

DMI was individually determined, measuring the difference between the amount of feed offered and refused daily. The period in which DMI was measured lasted 14 days, with 9 days used to balance the refusal to a 10% and the last 5 days of the period were used for the feed intake measurement.

DLWG was calculated from the difference between the final live weight and the initial live weight per the number of days of the trail. FC was calculated through the ratio between individual feed intakes and the individual live weight gains.

All data were analyzed statistically by ANOVA using GLM procedure of SAS (1988). Difference between treatments means were assessed by the LSD method.

Results and Discussion

The results obtained are shown in table 2.The addition of nitrogenous sources improved the DLWG of steers. Within the isoprotein diets there were differences in the

DLWG depending on the concentrate used, being DLWG higher with the use of true protein. Agreeing with Fernandez Mayer (1997) and Pavan (1996) in similar trials the treatments that received true protein supplements achieved better DLWG and FC.

Comparing the different levels of MP (low: T0, medium: T1, T2 and T3 and high: T4) there were differences ($p < 0.10$). in DLWG, DMI and FC among the treatments

As regards DMI the main differences were obtained in the isoprotein treatments, which indicates that the source of CP affected the total DMI. May be the high level of lipids in the diet with whole cotton seed (T3) delayed the digestion rate of the silage fiber so the DMI was lower. However this supply of lipids contributes to diet metabolizable energy and that is why in T3 there is no difference observed in DLWG and it obviously improves the FC.

The feed conversion showed correspondence with the DLWG reaching the highest levels of conversion in the negative control and in the treatment with urea.

Exceeding the animal requirements of MP to achieve a suitable nitrogenous supply to rumen did not produce any improvement in the animal performance. The supply of nitrogenous in diets based on corn silage improves the daily live weight gain and feed conversion. This effect was higher with the use of true protein.

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Table 1 - Ingredient composition of diets fed to steers

Treatments	Corn silage	Corn grain	Soybean meal	Whole cotton seed	Urea	Diet CP g kg^{-1} DM
	----------%----------					
T0 Negative control : CS[#] without protein supplement	68.1	31.9	--	--	--	72
T1 CS plus urea	69.0	30.0	--	--	1.0	97
T2 CS plus soybean meal	69.7	23.0	7.3	--	--	97
T3 CS plus whole cotton seed	66.3	13.0	--	20.7	--	97
T4 Positive control : CS plus a mixture of protein sources	67.5	14.6	--	16.5	1.4	137

[#] CS: Corn silage

Table 2 - Least square means and standard error of mean (SEM) for daily live weight gain (DLWG) (g day $^{-1}$), dry mater intake (DMI) (kg 100 kg^{-1} body weight BW) and feed conversion (FC) (kg DMI kg^{-1} DLWG).

	T0	T1	T2	T3	T4
DLWG	730 c	869 b	1006 a	946 ab	979 a
SEM	± 54	± 35	± 44	± 37	± 20
DMI	3.01 b	3.15 a	3.08 ab	2.78 c	3.02 b
SEM	± 0.03	± 0.03	± 0.02	± 0.04	± 0.04
FC	11.30 a	10.76 a	9.25 b	8.97 b	9.22 b
SEM	± 0.30	± 0.45	± 0.35	± 0.43	± 0.16

Means with different letters in the same row differ ($p < 0.10$)

T0 Negative control: Corn silage without protein supplement, T1 Corn silage plus urea, T2 Corn silage plus soybean meal, T3 Corn silage plus whole cotton seed and T4 Positive control: Corn silage plus a mixture of protein sources.