Effect of rumen-protected carbohydrate (RUPCA)supplementation on performance, blood and plasma metabolites in growing heifers.

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INTRODUCTION

The source of energy that is fed to non ruminant animals not only affects the efficiency in which amino acids are used metabolically for growth but also influences the partitioning of nutrients, generating different carcass characteristics (Girard et al., 1997). In ruminants, several infusion trials bypassing the rumen have been put together and proved that the source of energy used to feed the animal, glucose, fat or VFA affects not only the efficiency in which amino acids are used (Schroeder et al., 2006), but also the way energy is partitioned in the animal (Baldwin et al., 2007; McLeod et al., 2007). RUPCA has shown to be an effective source of protected soluble carbohydrate that has been tried in transition cows, causing to elevate plasma glucose concentration and milk lactose concentration. (Russi et al., 2011). However, RUPCA has not been tested in growing cattle.

OBJECTIVE

The objective of this study was to evaluate the inclusion of a ruminally protected carbohydrate (RUPCA) (US Patent # 8,507,025) on performance and blood metabolites in growing heifers.

MMATERIALS AND METHODS

One hundred and thirty five crossbred heifers (136 ± 14 kg) were used in an 84-d experiment. Heifers were blocked according to initial BW and placed (9 per pen) into 15 dirt floor pens (12 X 50 m). Heifers within blocks were randomly assigned to one of 3 treatments: T0) Control (100% basal supplement), T1) 50% RUPCA and 50% basal supplement, and T2) 100% RUPCA in the basal supplement. Diets were (DM basis): 38.8% corn silage, 41.5% dry corn (finely ground), 2% minerals and vitamins mix, and 17.7% supplement (58.1% soybean meal, 39.9% carbohydrates, 2% urea and 1% minerals). RUPCA and the basal supplement consisted of the same ingredients, differing on the processing of the carbohydrate (i.e., protected or not from ruminal degradation). Heifers had ad libitum access to feed and water during the study. Body weights were measured on d 0, 21, 42, 63, and 84. Dry matter intakes were measured every 7 days from d 21, when the adaptation to the diets finished. Blood samples were taken every 21 d and analyzed for glucose concentration, insulin, NEFA and UREA . Back-fat on the 12th rib was measured on d 1 and 84. Data was analyzed as a randomized complete block design with repeated measures using a mixed model in SAS.

RESULTS

There were no differences (*P* > 0.10) amongst treatments on initial BW, final BW, or ADG; however, cattle fed T1 had the lowest DMI (*P* < 0.01) and the greatest G:F ratio (*P* < 0.001). No differences were found in the concentrations of blood glucose (*P* > 0.91), plasma insulin (*P* = 0.82), plasma NEFA (*P*= 0.802), plasma urea (*P* = 0.336) or BF on d 84 (*P* > 0.72).

Table 1. Effect of rumen-protected carbohydrate (RUPCA) supplement on performance and blood metabolites of growing heifers

					P –value		
	T0	**T1**	**T2**	**SEM**	**T**	**day**	**T*day**
DMI, kg/d	6.9^{a}	5.9^{b}	6.8^{a}	0.06	<0.001	<0.0001	0.02
ADG, kg	1.18	1.13	1.19	0.027	0.21	<0.0001	<0.001
G:F	0.161^{b}	0.202^{a}	0.177^{ab}	0.010	0.0003	<0.001	<0.001
Glucose, mg/dL	90.2	91.6	91.2	3.52	0.91	<0.0001	0.92
Insulin, µg/ml	0.26	0.26	0.24	0.053	0.82	0.016	0.72
NEFA, m*M*	200.8	187.9	181.3	18.74	0.54	0.0025	0.42
Urea, mg/dL	14.9	13.4	14.8	1.03	0.36	<0.0001	0.39

[a, b] Means without common superscript differ (*P* < 0.05).

[1] All treatments, had the same level of inclusion of carbohydrate (17.74% of the diet DM). The difference was whether it was rumen-protected (RUPCA) or not. The balance of carbohydrate for 0 and 8.87 was in the unprotected form.

CONCLUSION

Including RUPCA at a rate of 8.87% of the diet DM improved G:F ratio by reducing DMI, without affecting ADG or blood metabolites

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