Influence of mechanical maceration on wheat straw on characteristics of digestion in growing–finishing diets for feedlot cattle


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ABSTRACT

Four Holstein steers [142 ± 3 kg] with cannulas in the rumen and proximal duodenum were used in a 4 × 4 Latin square design to evaluate the influence of mechanical maceration of wheat straw on the characteristics of digestion. Treatments consisted of a steam-flaked corn-based growing-finishing diet supplemented with 21% forage (DM basis) as: 1) sudangrass hay (SG), 2) wheat straw (STRW), 3) macerated wheat straw (MAC) at intensity of 600 psi (MAC600) and 4) macerated wheat straw at intensity of 900 psi (MAC900). All forage treatments were ground to pass through a 3.81 cm screen before incorporation into complete mixed diets. Chromic oxide was used as an indigestible marker to estimate nutrient flows and digestibility. Ruminal NDF kinetics were determined from measures by total evacuation of ruminal content and by NDF duodenal flow. There were no treatment effects (P>0.11) on ruminal digestion of OM, NDF, starch, microbial efficiency (MN, g/kg of OM fermented), or protein efficiency (NAN, g/kg of N intake). Apparent total tract digestion of OM, NDF and DE diet were greater (P<0.01) for SG than for STRW. Maceration of wheat straw increased (P<0.04) apparent postrumininal and total tract digestion of OM, NDF, N, and dietary DE. Ruminal NDF passage rate was greater (P<0.05), and ruminal OM (P<0.01) and NDF fill (P<0.02) were lesser for SG and MAC than for STRW. Intensity of maceration (MAC500 vs. MAC900) did not affect (P>0.11) characteristics of site and extent of digestion. Maceration increased (28%) the DE value of wheat straw. The DE value of MAC tended to be greater (7.5%; P=0.08) for MAC than for SG.

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1. Introduction

Maceration applications have been developed to enhance site and extent of digestion of low-moisture, low-quality forages such as rice straw (Plascencia et al., 2007; Torreterra et al., 2000). The process consists of passing forage through sets of opposing corrugated rolls maintained within set tolerances of each other using hydraulic pressure. Opposing corrugated rolls turn at differential speeds so that as the forage is drawn through it is stretched and crushed, but remains otherwise, intact. Indentations produced during maceration by roll corrugations greatly alter the structural integrity and density of the fiber, promoting microbial attachment, digestion, and rate of passage (Plascencia et al., 2007). Although the influence of mechanical maceration on characteristics of digestion of rice