Evaluation of the Substitution Value of Barley Grain for Conventional Forage as an Energy Source for Wintering Beef Cattle

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Metabolizable energy can often be supplied more economically from grain than from forages; however, grains are traditionally not included in wintering beef cattle rations. Metabolism and a performance studies were conducted to evaluate the substitution value of barley for conventional forage for supplying a specific amount of metabolizable energy. In the metabolism study, four ruminally cannulated steers were used to evaluate diets containing alfalfa fed coarsely chopped or as pressed cubes. These diets were fed with or without substituted barley. For the barley-containing diets, dry-rolled barley was included at 40 percent of the diet DM as a separate ingredient when fed with chopped alfalfa or as an incorporated ingredient with the cubed alfalfa. Steers were fed a restricted amount of their respective diet such that all steers received the same amount of energy equal to 1.2 times calculated NE_m requirement. Substitution of barley into the diet reduced ($P < 0.05$) *in situ* DM and NDF disappearance of alfalfa for short incubation times (8, 16, and 24 h); however, DM and NDF disappearance was actually greater ($P < 0.05$) for longer incubation times (48, 72 and 96 h) when barley was included in the diet. No treatment differences were observed ($P > 0.10$) for ruminal fluid pH. *In situ* degradability and ruminal fluid pH data indicated that barley substitution did not have an enduring detrimental effect on the ruminal environment. Total tract digestibility of DM and NDF was greater ($P < 0.05$) for diets containing barley, suggesting that providing a portion of the dietary ME as barley might have actually increased ruminal microbial fibrolytic activity. In the performance study, 40 heifer calves (Angus crossbred) were used in a completely randomized design to evaluate heifer development with conventional forage or forage with substituted barley provided in the AM, in the PM, or in the AM as a pressed pellet. Heifers were fed restricted amounts of their assigned diets to limit ADG in all treatments to 0.72 kg/d. Following 105 days on these growing regimes, heifers were commingled, fed a common diet, and estrus was synchronized with two treatments of prostaglandin. Heifers were bred by AI for 25 days followed by pasture breeding for 21 days. As expected, inclusion of barley in the diet reduced ($P < .05$) the total feed intake required to achieve the prescribed rate of gain; feed conversion ratio was consequently lesser ($P < .05$) for barley-containing treatments. Following estrus synchronization, corpus lutea formation tended ($P = 0.07$) to be greater for heifers fed the conventional forage diet compared with diets containing barley. Pregnancy rates determined by ultrasound at 35 and 71 days post-breeding were not different ($P \geq 0.21$) among treatments. Results of these studies indicate that substituting barley for forage in limit-feeding regimes is a feasible means of meeting the metabolizable energy requirements of reproductive beef females.