The Professional Animal Scientist 31 (2015):577–587; http://dx.doi.org/10.15232/pas.2015-01437

Pre- and postweaning performance by cows and calves that grazed toxic or nontoxic endophyte-infected tall fescue pastures[1]

K. P. Coffey,*[2] PAS, W. K. Coblentz,† J. D. Caldwell,‡ R. K. Ogden,† T. Hess,§ D. S. Hubbell III,§ C. P. West,# C. R. Krehbiel,‖ PAS, T. G. Montgomery, J. A. Jennings,†† and C. F. Rosenkrans Jr.,* PAS**

*Division of Agriculture, University of Arkansas, Fayetteville 72701; †USDA-ARS, US Dairy Forage Research Center, Marshfield, WI 54449; ‡Purina Animal Nutrition Center, Gray Summit, MO 63039; §Division of Agriculture, University of Arkansas, Batesville 72501; #Department of Plant and Soil Science, Texas Tech University, Lubbock 79409; ‖Department of Animal Science, Oklahoma State University, Stillwater 74074; **Division of Agriculture, University of Arkansas, Monticello 71655; and ††Division of Agriculture, University of Arkansas, Little Rock 72204

ABSTRACT

Negative effects on cattle grazing tall fescue [Schedonorus arundinaceus (Schreb.) Dumort.] infected with the wild-type endophyte Neotyphodium coenophialum (E+) are well documented, but information about the carryover effects on weaned calves is limited. Our objective was to compare pre- and postweaning performance by spring-calving cows and calves grazing E+ with that by cows grazing a nontoxic endophyte–tall fescue association (NE+). Pregnant Gelbvieh × Angus crossbred cows (n = 136; 492 ± 19.2 kg of initial BW) were stratified by BW and age and allocated randomly to one of four 10-ha pastures in yr 1 (October 15) and one of eight 10-ha pastures in yr 2 (November 30). Pastures were allocated randomly before establishment to E+ or NE+. Cows remained on their assigned pastures until weaning in yr 2 but were removed from NE+ in the summer of yr 1 because of low forage mass. After weaning, calves grazed bermudagrass [Cynodon dactylon (L.) Pers.] followed by cool-season annual grasses. Cow BW and pregnancy rate, and calf weaning weight and preweaning gain were greater ($P < 0.05$) from NE+ versus E+. Weaning weight differentials were maintained throughout postweaning production phases, resulting in heavier HCW ($P < 0.05$) by steers and a tendency for greater ($P < 0.10$) subsequent calving rates by heifers. Therefore, replacing E+ with NE+ may improve preweaning cow and calf performance and heifer reproductive rates, but postweaning gains may not be affected by previous exposure to E+.

Key words: tall fescue, novel endophyte, beef calf

INTRODUCTION

Cattle consuming tall fescue infected with the wild-type, toxic endophyte *Neotyphodium coenophialum* (**E+**) have exhibited a myriad of adverse conditions including reduced DMI (Forcherio et al., 1995; Humphry et al., 2002), poorer cow and calf BW gains (Gay et al., 1988; Peters et al., 1992; Caldwell et al., 2013), and poorer reproductive performance (Gay et al., 1988; Sanson and Coombs,

[1] Mention of trade names or commercial products in this article is solely for the purpose of providing specific information and does not imply either recommendation or endorsement by the USDA.

[2] Corresponding author: kcoffey@uark.edu

2003; Caldwell et al., 2013) compared with those consuming nontoxic forages. Simply replacing E+ with noninfected tall fescue (**E−**) seems to be the most logical option, but E− is less persistent than E+, resulting in significant stand losses (Bouton et al., 2002; Vibart et al., 2008). Legumes also have been used successfully, resulting in improved animal gains and reproductive rates (Gay et al., 1988; Waller et al., 1989; Chestnut et al., 1991). However, gain and reproductive rates from cattle grazing E+ pastures with clover were not as great as those from E− pastures, and clover establishment and persistence may be problematic in sites with poorer quality soils (Coffey et al., 2005). In recent years, tall fescue plants were infected artificially with nontoxic novel endophytes. These tall fescue–nontoxic endophyte associations (**NE+**) maintained their vigor (Bouton et al., 2002; Gunter and Beck, 2004) but did not have detrimental effects on cattle (Parish et al., 2003b; Nihsen et al., 2004; Franzluebbers and Stuedemann, 2006) or sheep (Parish et al., 2003a). To date, limited studies have reported the benefits of grazing NE+ with cow–calf pairs (Watson et al., 2004; Caldwell et al., 2013), and only limited information is available pertaining to postweaning performance by calves weaned from E+ pastures (Brown et al., 1999). The objective of this study was to determine the effects of grazing NE+ compared with grazing E+ on cow performance and pre- and postweaning calf production measurements.

MATERIALS AND METHODS

Pasture and Forage Management

This study was conducted at the Livestock and Forestry Branch Station located near Batesville, Arkansas (35°49′N, 91°48′W), and the University of Arkansas Institutional Animal Care and Use Committee approved the procedures used (#03017). Gelbvieh × Angus crossbred cows (n = 136; 492 ± 19.2 kg of initial BW) were stratified by BW and age and allocated randomly to one of four 10-ha pastures in yr 1 and one of eight 10-ha pastures in yr 2 at a stocking density of 1.3 cows per hectare. The pastures were allocated randomly such that half were seeded to E+ and half were seeded to a NE+ association developed at the University of Arkansas by infecting the HiMag tall fescue cultivar with endophyte strain Ark4. Two pastures each of E+ and NE+ were established in October 2003, and 2 additional pastures of each forage were established in October 2004, resulting in 2 experimental units per treatment in yr 1 and 4 experimental units per treatment in yr 2. All pastures received 56 kg of N/ha in the spring as urea and 45 kg of N/ha in the autumn as ammonium nitrate. Cows confirmed as pregnant via rectal palpation began grazing the experimental pastures on October 15 and November 30 in yr 1 and 2, respectfully. These cows would have been approximately 4 (yr 1) or 5 (yr 2) months in gestation at the time they were added to the experimental pastures.

Hay was harvested during the spring from approximately one-third of each pasture for subsequent feeding. During the summer of yr 1, extremely dry conditions resulted in reduced forage mass (<1,000 kg/ha) and forced offering of the winter hay supply during the summer. Once the hay from a particular NE+ pasture was depleted (July 29 on one pasture and September 29 on another pasture), cows were moved to a bermudagrass pasture and offered bermudagrass hay. The bermudagrass pasture was predominantly dormant because of the drought. Cows grazing E+ pastures were fed E+ hay from another location on the research farm and were not removed from their experimental pastures. In all cases, hay was offered for ad libitum consumption. The amount of hay offered to cows above that produced on the particular replicate was quantified by weighing 6 bales from each hay type and multiplying the number of bales offered by the average weight of the 6 bales.

Early autumn rainfall stimulated forage growth and all cows were returned to their respective pastures on October 6, 7 d before weaning. This resulted in cows from NE+ pastures being removed from their respective pastures for either 69 or 7 d, depending on the particular replication. During yr 2, forage mass was adequate, and cows remained on their assigned pastures until their calves were weaned.

Cattle Management and Measurements

Cow weight and BCS were evaluated at the beginning of the trial, immediately before the start of the calving season, and at weaning without prior removal from pasture or water. Calving rates were determined as the proportion of cows actually giving birth to a calf the following spring, and calving interval was determined as the difference between the actual calving dates. Cows that did not calve were not included in the calving-interval data set. Hair scores of the cows also were estimated at weaning using a 5-point scale where 1 represents no rough, discolored hair; 3 represents rough, discolored hair on 50% of the cow body; and 5 represents rough, discolored hair on >90% of the cow body.

Cows were vaccinated against 7 clostridial strains (Alpha-7; Boehringer Ingelheim Animal Health Inc., St. Joseph, MO) approximately 2 wk before the onset of calving. Cows also were vaccinated against infectious bovine rhinotracheitis, bovine virus diarrhea, parainfluenza, bovine respiratory syncytial virus, and 5 strains of *Leptospira* (Elite 9; Boehringer Ingelheim Animal Health Inc.) and were treated for internal parasites with moxidectin (Cydectin; Fort Dodge Animal Health, Fort Dodge, IA) approximately 28 d before the start of the breeding season.

An Angus × Gelbvieh bull that passed a breeding soundness examination according to the guidelines of the Society of Theriogenology (Hopkins and Spitzer, 1997) approximately 4