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Effects of Supplementing Corn Silage to Fall-Calving Heifers and Cows Grazing Tall Fescue on Cow Performance

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Summary

The objective was to test the effect of fescue cultivars and supplemental feeding of cows grazing fescue pastures on cow performance and pasture management. Primiparous and multiparous Angus-based crossed cows ($n = 45$) averaging 151 ± 7 d of gestation at turnout, were randomly allocated and stratified to pasture treatment by parity. Each pasture contained 3 cows of different ages, consisting of a young (first-calf heifer), middle-aged (3-5 yrs.), and old (≥ 6 yrs.) cow. Treatment was a 2 by 2 factorial design with two types of pasture (toxin producing or non-toxin producing fescue) and two levels of supplemental feeding (non-supplemented or supplemented at 1% of body weight on a DM basis of corn silage). Toxic fescue pastures consisted of K-31 endophyte infected tall fescue ($n = 8$) tested at $507 \text{ ppm} \pm 0.82 \text{ SEM}$ for ergot alkaloids with a 92.5% infection rate. Non-toxic pastures consisted of novel (MaxQ) and endophyte free varieties ($n = 7$). Cows were fed silage (32-42% DM and 7.83% CP) daily in fence-line bunks, with feeding amount being adjusted at each weigh date. Cows were weighed on 2 consecutive days prior to turnout (middle of the second trimester), midpoint (beginning of the third trimester), and at about 2 weeks prior to the estimated calving date for herd. Body weight, body condition score, hair score, and rump fat measurements were taken at each weigh date. Supplementation tended ($P = 0.07$) to increase body weight gain and rump fat ($P = 0.06$) regardless of fescue type. Cattle grazing toxic fescue tended to have longer hair ($P = 0.09$) and did not “slick” off as quickly as those that were supplemented ($P = 0.08$). Cattle grazing toxic fescue exhibited classic fescue toxicosis symptoms, and supplementation improved cow performance regardless of fescue cultivar.

Introduction

Notably, fescue toxicosis is known for its signature negative impacts on livestock, with some of the most prominent visual symptoms being an inability to shed summer hair coats, fat necrosis, and fescue foot (Hemken et al., 1984; Stuedemann and Hoveland, 1988). The endophyte fungus that works cohesively with toxic fescue to ensure drought and predation resistance is also infamous for producing ergot alkaloids known to have vasoconstricting properties, which hinder proper circulatory function (Aiken and Strickland, 2013). Cattle grazing endophyte infected fescue tend to pant, excessively salivate, and spend more time in either shade, mud, or water sources (Stuedemann and Hoveland, 1988; Rottinghaus et al, 1991; Beck et al., 2008; Evans et al., 2012). As far

as feeder calves are concerned, their “unthrifty” appearance has been well documented, along with decreased feed intake and altered posture, which results in a lesser price at auction (Paterson et al., 1995). Compromised reproductive efficiency in heifers and cows has also been associated with grazing toxic fescue, accompanied by delayed puberty and increased respiration rates (Schmidt and Osborn, 1993; Paterson et al., 1995; Strickland et al., 2011).

The cattle industry has investigated mitigation strategies with hopes of eliminating the more than one-billion-dollar price tag that comes with grazing fescue pasture across the United States (Strickland et al., 2011). Supplemental feeding has been proven to assist in alleviating tall fescue toxicosis by means of substitution in the diet (Roberts and Andrae, 2004). Grain, oil seeds, milling byproducts, silage, and non-toxic hay have been deemed solutions in the fight against fescue toxicity (Roberts and Andrae, 2004). As the cattle select the alternatives previously mentioned, they decrease the intake of fescue and thus reduce the amount of toxin being ingested, resulting in improved animal performance (Elizalde et al., 1998).

The focus of this study was to examine how the inclusion of corn silage would impact function and performance of cattle grazing non-toxic fescue and if this supplemental feeding would reduce the effect of grazing toxic tall fescue during the late gestation period of fall calving cows.

Experimental Procedures

The study was conducted at the Mound Valley Branch of the Southeast Research and Extension Center in Mound Valley, Kansas. The facility consisted of 8 non-toxin producing fescue and 8 toxin producing fescue pastures. Due to drought conditions and lack of regrowth, one non-toxic pasture was unable to be utilized in this experiment. The experiment was a 2 by 2 factorial design. The two fescue types were toxin producing and non-toxin producing, with the two levels of supplemental feeding being either non-supplemented or supplemented at 1% of BW corn silage on a DM basis in fence-line bunks. Both groups were offered access to free choice mineral. Following a two-day weigh period to adjust for feed allocation, cattle were turned out on May 8, 2023, gathered for a single day of midpoint measurements on June 21, 2023, and for a final two-day weigh period on August 29-30, 2023. The initial weight measurement corresponded to cows in mid-gestation, the mid-point measurement was at the beginning of the third trimester, and the end measurement was about 2 weeks prior to calving. Following the calving period, pairs were gathered and sorted for calf weigh-suckle-weigh on December 3, 2023.

Corn silage consisted of 32-42% DM and 7.83% CP content respectively.

Weight Measures

Cattle were restrained in an Arrowquip Q-Power 107 Series hydraulic squeeze chute (Arrowquip, Woodlands, MB), with weights being recorded by a Gallagher TWR chute scale head (Gallagher Group Limited, Riverside, MO). Average weights at the beginning and middle of the experiment were used to adjust feed allocation. Initial, middle, and ending weights were used to determine total body weight change. Calf birthweight was also collected via the hanging calf scale. Weights were recorded in pounds (lbs).

Body Condition Score and Rump Fat

Three blind, independent evaluators recorded body condition scores at each measurement period using the standard 1-9 scale. Rump fat was recorded using an ALOKA 500 ultrasound machine (Hitachi, LTD., Wallingford, CT) with a 3.5-megahertz short probe capturing the image in Cattle Performance Enhancement Company (CPEC). Measurement was taken over the rump by a trained technician and recorded in millimeters (mm).

Hair Score and Hair Length

One independent tech evaluated hair scores at each measurement period using the standard 1-5 scale. Hair length was measured chute-side using a slide ruler and recorded in millimeters (mm).

Results and Discussion

Weight Measures

Body weight gains measured during second trimester and third trimester measurements were not statistically significant between treatments. However, the duration of the 209-d grazing period allowed for a tendency ($P = 0.09$, Table 1) for supplemental feeding to increase total weight gain for cows on supplemented pastures compared to their non-supplemented contemporaries, regardless of fescue cultivar. There was no difference in calf birth weight based on fescue type, supplementation, nor the interactions ($P > 0.10$; Table 1).

Body Condition Score and Rump Fat

Cattle did not show a significant change in BCS during the second trimester, but during the third trimester there was an interaction tendency ($P = 0.06$, Table 1) for supplemented cattle, regardless of fescue cultivar, to more effectively increase body condition when compared to their counterparts that grazing toxin producing fescue. Ironically, there was not a significant effect on total BCS change from the middle of the second trimester to about 2 weeks prior to calving. Total rump fat change from the middle of the second trimester to about 2 weeks prior to calving tended ($P = 0.06$, Table 1) to increase the rump fat deposition for cows that were supplementally fed. Supplementation increased external fat content in cows regardless of fescue type as evidenced by numerical improvements in both visually appraised BCS and ultrasound rump fat measurements.

Hair Score and Hair Length

Cattle grazing toxic fescue without supplementation showed classic symptoms of fescue toxicosis by having a handicapped ability to shed their winter hair coat with an interaction tendency ($P = 0.08$, Table 2). The cows on toxic pastures that were supplementally fed had “slicker” hair coats than those not consuming the silage. Supplementation did not improve hair measurements in a non-toxic pasture. Total hair length change tended to be impacted by fescue cultivar ($P = 0.09$, Table 2.).

Conclusions

Supplemental feeding, regardless of fescue cultivar, tends to increase rump fat and weight gain over time. Non-supplemented cattle on toxic fescue exhibit hallmark signs

of toxicosis, including longer hair and subsequently poorer hair scores, along with a decreased ability to gain weight. Supplemental feeding aids in cow performance, but more research is needed to provide a deeper understanding of how ergot alkaloids biologically disrupt other physiological pathways.

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Table 1. Body condition score (BCS), rump fat (RF), and body weight (BW) change

	Non-toxic		Toxic		SEM	P-value		
	No supplement	Supplement	No supplement	Supplement		Fescue	Supp.	Fescue by Supp
BCS change during second trimester	0.39	0.73	0.44	0.52	0.24	0.74	0.40	0.58
BCS Change during third trimester	1.08 ^a	0.96 ^{ab}	0.39 ^b	1.06 ^a	0.24	0.16	0.18	0.06
Total BCS change	1.47	1.67	0.83	1.57	0.34	0.27	0.17	0.41
Total rump fat change, mm	5.56	8.77	6.62	9.22	1.33	0.59	0.06	0.83
BW change during second trimester, lb	130	138	87	125	18.5	0.14	0.22	0.42
BW Change during third trimester, lb	61	91	47	78	18.0	0.46	0.12	0.99
Total BW change, lb	191	227	134	203	28.2	0.18	0.09	0.58

Table 2. Hair score (HS) and hair length (HL) change

	Non-toxic		Toxic		SEM	P-value		
	No supplement	Supplement	No supplement	Supplement		Fescue	Supp.	Fescue by Supp
Total HS change	-1.78 ^b	-0.79 ^{ab}	0.25 ^a	-0.42 ^{ab}	0.43	0.02	0.72	0.08
Total HL change	-11.11	-7.10	-1.17	-5.83	3.00	0.09	0.92	0.18