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

J.K. Farney, T. M. Jones

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 = 48) averaging 140 ± 0.5 days of gestation at turnout, were randomly allocated and stratified to pasture treatment by parity. Each pasture contained three 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: TOXIC or non-toxin producing fescue: NONTOXIC) and two levels of supplemental feeding (non-supplemented: NON or supplemented at 1% of body weight on a dry matter basis of corn silage: SUPP). Toxic fescue pastures consisted of K-31 endophyte infected tall fescue (n = 8) tested at 1709 ppm ± 0.36 for ergot alkaloids with an 89.1% infection rate. Non-toxic pastures consisted of novel (MaxQ) and endophyte free varieties (n = 8). Cows were fed silage (32-42% dry matter and 7.83% crude protein) 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), beginning of the third trimester, ~2 weeks prior to the estimated calving date for herd, and at peak lactation (~60 days after calving). Body weight (BW), body condition score (BCS), hair score (based on a 1-5 scale; HS), hair length measured over the 3rd rib (HL), and rump fat (RF) measurements were taken at each weigh date during gestation. Calves were weighed at birth and used in weigh-suckle-weigh to estimate milk output. Forage accumulation (FA) and forage mass (FM) were estimated every 28 days using the paired-cage method. There were no grass type x supplementation interactions ($P > 0.19$) for any measurement, other than HS and HL. Prior to calving, there was a tendency for cows grazing NONTOXIC to have heavier weights ($P = 0.10$); this continued through peak lactation ($P = 0.10$). Supplementation did not affect BW ($P > 0.32$), BCS ($P > 0.22$), or RF ($P > 0.21$) during gestation; but during lactation SUPP increased BCS ($P = 0.007$) over NON. Hair length and HS were greater for cows grazing TOXIC pastures at the beginning of third trimester ($P = 0.06$) and immediately prior to calving ($P = 0.04$). NONTOXIC-NON cows had a greater reduction in HL than those grazing TOXIC-NON with supplementation on both grass types being intermediate ($P = 0.05$). Calf birth weight and estimates of milk output were not different for grass type or supplementation ($P > 0.23$). Forage mass tended to be 11% greater in TOXIC pastures than NONTOXIC ($P = 0.06$) and SUPP pastures tended to have 6% greater FM than NON ($P = 0.09$). Non-toxic pastures, overall, result in greater cattle

performance. Supplementation did not offset toxicity but did result in greater available forage.

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 disadvantage 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 eight non-toxin producing fescue and eight toxin producing fescue pastures.

The experiment was a 2 by 2 factorial design. The two fescue types were toxin producing (**TOXIC**) and non-toxin producing (**NONTOXIC**), with the two levels of supplemental feeding being either non-supplemented (**NON**) or supplemented at 1% of BW corn silage on a DM basis in fence-line bunks (**SUPP**). 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 21, 2024, gathered for a single day of midpoint measurements on June 18, 2024, and a weigh period on August 28, 2024. The initial weight measurement corresponded to cows in mid-gestation, the mid-point measurement was at the beginning of the third trimester, and August measurement was

about 2 weeks prior to estimated start of calving. Following the calving period, pairs were gathered and sorted for calf weigh-suckle-weigh on December 2, 2024.

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, Manitoba, Canada), 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 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, Kansas). 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).

Pasture Measurements

Forage mass: Forage mass per square foot was collected every 28 days by sampling a 1 by 1 ft area that was being grazed by the cows in four locations through each pasture. This measurement was used to determine the amount of available forage for the cows. These samples were clipped with about one inch of stem remaining.

Forage accumulation: This was used to determine the amount of forage that was growing and was measured using the paired-cage method. Within each pasture there were four exclusion cages that were sampled via clipping a sample every 28 days. Then the cages were moved to another location within the pasture. To calculate forage accumulation the amount of forage measured within the exclusion cage was used and then the amount of forage measured from outside the cage during the previous 28 days was subtracted.

Results and Discussion

Weight Measures

Body weight gains measured during second trimester and third trimester measurements were not statistically significant between treatments. However, prior to calving there was a tendency ($P = 0.10$) for cows on NONTOXIC fescue pastures to have heavier weight than those on TOXIC fescue pastures and this continued through early lactation ($P = 0.10$; Table 1). Over the entire time grazing these pastures (mid-second trimester through early lactation) there was a tendency for the cows that were on NONTOXIC fescue pastures to have a greater weight gain ($P = 0.09$) than those grazing TOXIC fescue pastures (129 lb vs. 83 lb, respectively). Supplemental

feeding did not impact cow weight gains at any measured point ($P > 30$). There was no difference in calf birth weight based on whether the dams were supplemented with silage; however, calves that were born to cows grazing TOXIC fescue pastures had a lighter birth weight than those grazing NONTOXIC pastures (68 lb vs. 77 lb, respectively).

Body Condition Score and Rump Fat

Cattle did not show a significant change in BCS during gestation, but during early lactation cows that were supplemented after calving had a greater body condition score and body condition score change ($P < 0.01$, Table 1). The total BCS change was positive for the supplemented cows and was negative for those that were not supplemented. Fescue type had no impact on BCS scores ($P > 0.20$). Rump fat changes were not able to be detected as different for any treatments.

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 (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 affected by fescue cultivar (Table 2).

Forage measurements

Forage mass tended to be 11% greater for TOXIC pastures as compared to NONTOXIC ($P = 0.06$). Forage accumulation was not different, thus indicating that there may have been less intake of TOXIC fescue, which has been reported in other studies. Additionally, in pastures where cows were SUPP, there was a tendency ($P = 0.09$) for there to be 9.8% more available forage than the pastures where cows were non-supplemented

Conclusions

Cow weights and calf birth weights were impacted by type of fescue that the cows were grazing more than by supplementally feeding corn silage. Fescue cultivars that were non-toxin producing increased cow gains and resulted in greater calf birth weights than toxin producing pastures. Possibly this could occur because the cows voluntarily consume more non-toxic pasture than toxic. Supplemental feeding of cows had the greatest impact while they were in early lactation, resulting in less condition loss. Additionally, supplementally feeding corn silage on fescue during the summer resulted in ~10% more available forage.

References

Aiken, G. E., and J. R. Strickland. 2013. Forages and Pastures Symposium: Managing the tall fescue–fungal endophyte symbiosis for optimum forage-animal production. Journal of Animal Science. 91:2369–2378. doi:10.2527/jas.2012-5948.

Beck, P. A., S. A. Gunter, K. S. Lusby, C. P. West, K. B. Watkins, and D. S. Hubbell.2008. Animal performance and economic comparison of novel and toxic endophyte tall fescues to cool-season annuals. Journal of Animal Science. 86:2043–2055. doi:10.2527/jas.2007-0522.

Elizalde, J. C., J. D. Cremin, D. B. Faulkner, and N. R. Merchen. 1998. Performance and digestion by steers grazing tall fescue and supplemented with energy and protein. Journal of Animal Science. 76:1691. doi:10.2527/1998.7661691x.

Evans, T. J., D. J. Blodgett, and G. E. Rottinghaus. 2012. Fescue toxicosis. In: Veterinary Toxicology. Elsevier. p. 1166–1177. Available from: *https://linkinghub.elsevier.com/retrieve/pii/B9780123859266001150*

Hemken, R. W., J. A. Jackson, and J. A. Boling. 1984. Toxic Factors in Tall Fescue. Journal of Animal Science. 58:1011–1016. doi:10.2527/jas1984.5841011x.

Paterson, J., C. Forcherio, B. Larson, M. Samford, and M. Kerley. 1995. The effects of fescue toxicosis on beef cattle productivity. Journal of Animal Science. 73:889–898. doi:10.2527/1995.733889x.

Roberts, C., and J. Andrae. 2004. Tall Fescue Toxicosis and Management. Crop Management. 3:1–18. doi:10.1094/CM-2004-0427-01-MG.

Rottinghaus, G. E., G. B. Garner, C. N. Cornell, and J. L. Ellis. 1991. HPLC method for quantitating ergovaline in endophyte-infested tall fescue: seasonal variation of ergovaline levels in stems with leaf sheaths, leaf blades, and seed heads. J. Agric. Food Chem. 39:112–115. doi:10.1021/jf00001a022.

Schmidt, S. P., and T. G. Osborn. 1993. Effects of endophyte-infected tall fescue on animal performance. Agriculture, Ecosystems & Environment. 44:233–262. doi:10.1016/0167-8809(93)90049-U.

Strickland, J. R., M. L. Looper, J. C. Matthews, C. F. Rosenkrans, M. D. Flythe, and K. R. Brown. 2011. Board-Invited Review: St. Anthony's Fire in livestock: Causes, mechanisms, and potential solutions. Journal of Animal Science. 89:1603–1626. doi:10.2527/jas.2010-3478.

Stuedemann, J. A., and C. S. Hoveland. 1988. Fescue Endophyte: History and Impact on Animal Agriculture. J. Prod. Agric. 1:39–44. doi:10.2134/jpa1988.0039.

Table 1. Cow and calf performance results

	Non-Toxic[1]		Toxic[2]			*P*-value		
Item	NON[3]	SUPP[4]	NON[3]	SUPP[4]	SEM[5]	Fescue[6]	Supp[7]	Fes × Supp[8]
Second trimester weight, lb	1206	1314	1189	1216	70	0.41	0.34	0.57
Third trimester weight, lb	1391	1492	1343	1380	70	0.26	0.33	0.64
Prior to calving weight, lb	1481	1544	1371	1440	66	0.10	0.32	0.97
Early lactation weight, lb	1349	1431	1259	1312	62	0.10	0.30	0.82
Gestation weight change, lb	274	230	182	224	34	0.17	0.97	0.62
Lactation weight change, lb	-132	-113	-111	-128	34	0.93	0.97	0.62
Weight change second trimester through early lactation, lb	143	117	70	96	27	0.09	0.99	0.33
Second trimester BCS	5.74	5.89	5.76	5.76	0.18	0.78	0.66	0.66
Third trimester BCS	6.19	6.36	5.94	6.78	0.25	0.42	0.22	0.68
Prior to calving BCS	6.92	7.14	6.65	6.86	0.29	0.20	0.30	0.97
Early lactation BCS	6.00	7.58	5.88	7.33	0.25	0.45	<0.001	0.80
Gestation BCS change	1.18	1.29	0.89	1.10	0.36	0.30	0.49	0.82
Lactation BCS change	-0.67	0.92	0.38	1.00	0.29	0.53	<0.001	0.72
BCS change second trimester through early lactation	0.08	1.75	-0.29	1.42	0.37	0.35	<0.001	0.96
Calf birth weight, lb	78	77	68	69	3.3	0.01	0.89	0.85
Milk output estimate, lb	18	35	19	22	8.2	0.48	0.27	0.44

[1] Non-toxic: treatment consists of fescue cultivars that are non-toxin producing and included MaxQ and endophyte-free varieties.
[2] Toxic: treatment that consists of toxic fescue variety of Kentucky 31 (K31) fescue.
[3] NON: treatment applied to pastures where cows were not supplemented.
[4] SUPP: supplement treatment where cows in pastures were supplemented daily with 1% of body weight as corn silage on DM basis.
[5] SEM: standard error of means.
[6] Fescue: treatment comparisons between NONTOXIC and TOXIC pastures.
[7] Supp: treatment comparisons between NON-supplemented and SUPP (supplemented).
[8] Fes × Supp: interaction comparison between fescue type and supplementation method.

Table 2. Hair length and hair score measurements

	Non-Toxic[1]		Toxic[2]			*P*-value		
Item	NON[3]	SUPP[4]	NON[3]	SUPP[4]	SEM[5]	Fescue[6]	Supp[7]	Fes × Supp[8]
Second trimester hair length, mm	17	14	16	17	1.6	0.67	0.47	0.31
Third trimester hair length, mm	10	10	15	13	1.7	0.06	0.53	0.63
Prior to calving hair length, lb	7	9	13	10	1.4	0.04	0.51	0.10
Gestation hair length change, mm	-10[b]	-4[ab]	-1[a]	-4[ab]	2.2	0.21	0.92	0.05
Second trimester hair score[9]	4.3	4.3	4.4	4.7	0.2	0.21	0.67	0.40
Third trimester hair score	1.8	1.1	3.3	2.3	1.7	0.07	0.25	0.76
Prior to calving hair score	1.2	1.4	2.5	1.7	0.4	0.08	0.49	0.21
Gestation hair score change	-3.2	-2.8	-1.9	-3	0.5	0.26	0.43	0.15

[1] Non-toxic: treatment consists of fescue cultivars that are non-toxin producing and included MaxQ and endophyte-free varieties.
[2] Toxic: treatment that consists of toxic fescue variety of Kentucky 31 (K31) fescue.
[3] NON: treatment applied to pastures where cows were not supplemented.
[4] SUPP: supplement treatment where cows in pastures were supplemented daily with 1% of body weight as corn silage on DM-basis.
[5] SEM: standard error of means.
[6] Fescue: treatment comparisons between NONTOXIC and TOXIC pastures.
[7] Supp: treatment comparisons between NON-supplemented and SUPP (supplemented).
[8] Fes × Supp: interaction comparison between fescue type and supplementation method.
[9] Hair score is based on scale of 1-5 with 1 being slick hair and 5 having 100% of hair not shed.