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TECHNICAL NOTE

Fly Densities on Cattle Grazing 'WW-B.Dahl' Old World Bluestem Pasture Systems

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ABSTRACT

The decline in water supply for irrigation in the Texas High Plains is encouraging transition to drought-tolerant forages such as 'WW-B.Dahl' old world bluestem [OWB, *Bothriochloa bladhii* (Retz) S.T. Blake]. Cattle (*Bos taurus* L.) grazing this grass have been casually observed to host fewer horn flies (*Haematobia irritans* L.) but definitive data are lacking. Visual ratings (1-5 scale) were contrasted for fly densities on steers grazing two forage systems: grass-only (predominantly OWB) vs. grass-legume (OWB and alfalfa, *Medicago sativa* L.) in 2015 and 2016. Mean fly densities were not different between the systems in either year, but a date × system interaction in 2016 ($P = 0.052$) suggested a lower fly density for grass-only on 23 June. Horn fly densities were not consistently reduced on cattle grazing the OWB-dominant grass-only system, therefore our observations do not support anecdotal reports of significant deterrence of horn flies by WW-B.Dahl OWB.

KEY WORDS: alfalfa, cattle, horn flies, old world bluestem

INTRODUCTION

The Texas High Plains has a limited water supply for irrigation to produce agricultural crops and livestock. 'WW-B.Dahl' old world bluestem [*Bothriochloa bladhii* (Retz) S.T. Blake] is a productive, drought-tolerant grass in the Rolling Plains and High Plains of west Texas (Dahl et al. 1988). It is a warm-season, perennial bunchgrass that matures 3 to 5 weeks later than other OWB varieties (*Bothriochloa* spp.) (Dewald et al. 1995), and supports steer weight gain of 0.79 kg head^{-1} day^{-1} (Baxter et al. 2017). Some types of OWB contain aromatic oils that confer a pleasant odor (Gupta and Daniel 1982) and may impart resistance to or deterrence of some insects (Pinder and Kerr 1980; Villalobos et al. 2003). Sternberg et al. (2006) reported that pastures of WW-B.Dahl contained about one-third the number of red imported fire ant (*Solenopsis invicta* Buren) mounds than adjacent pastures of native grass or 'Coastal' bermudagrass [*Cynodon dactylon* (L.) Pers.] throughout 25 sites in Texas. This indicates a possible role for WW-B.Dahl in deterring insect pests in Texas pastures.

Of the various flies (Diptera: Muscidae) that are economically detrimental to cattle (*Bos taurus* L.), horn flies (*Haematobia irritans* L.) are the most important obligate, blood-feeding ectoparasites (Palmer and Bay 1981). It is not known whether the aromatic compounds from WW-B.Dahl can deter insects. Female flies lay eggs on fresh cattle

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manure, which hatch in 1 to 2 days. Larvae feed on manure from 4 to 8 days, and pupation occurs in 6 to 8 days. Horn flies complete their life cycle between 10 to 20 days, depending on ambient temperate and time of year. Reduction or control of horn flies can be economically beneficial to cow-calf and stocker/yearling operations because of improved animal comfort and productivity (Steelman et al. 1991). Beef calf weaning weights were reduced by 8.1 kg for every 100 flies on beef cows (Steelman et al. 1991). Chemical control is essentially the only method available to control these pests, and some fly populations have developed resistance to common insecticides (Pruett et al. 2003). Lower numbers of horn flies have occasionally been observed on stocker steers grazing WW-B.Dahl in the Texas High Plains compared to cattle grazing other grasses in adjacent areas (pers. commun. V.G. Allen 2012); however, data are lacking for this comparison. If WW-B.Dahl can reliably repel livestock pests, then this grass offers an economically attractive method of reducing flies while also utilizing a grass with efficient water use in semiarid environments. In an initial evaluation in 2014, we observed lower horn fly densities on cattle grazing WW-B.Dahl than on those grazing alfalfa, which justified more frequent observations in subsequent years. The objective of this study was to assess the impact of forage systems differing in predominance of WW-B.Dahl OWB on fly densities on cattle compared to an OWB system that included alfalfa.

MATERIALS AND METHODS

Research was conducted at the New Deal Research Farm near Lubbock, TX, in northeast Lubbock County (33°45’ N, 101°47’ W; 993 m elevation) with almost level soil (0 to 1% slope) on a Pullman clay loam (fine, mixed, thermic Torrertic Paleustolls). This study was superimposed on a grazing trial to test animal productivity and water use of two pasture systems considered as treatments, grass-only and grass-legume, with three replicates (or blocks) per system (Baxter et al. 2017). Each system comprised three paddocks containing different forage species or mixes among which cattle were rotated according to forage availability. The grass-only system consisted of WW-B.Dahl OWB, (68% of the grazing days [averaged over 3 yr]), native-grass mix (18% of grazing days), and teff [*Eragrostis tef* (Zuccagni) Trotter] (14% of grazing days). The grass-legume system consisted of OWB-‘RSI 707’ alfalfa-yellow sweet clover [*Melilotus officinalis* (L.) Lam.] mix (average of around 25% legume content; 58% of grazing days), a mix of alfalfa-‘José’ tall wheatgrass [*Thinopyrum ponticum* (Podp.) Z.-W. Liu & R.-C. Wang] mix (usually >90% alfalfa; 18% of grazing days, referred to henceforth as alfalfa), and teff (3% of grazing days). Each grass-only replicate was stocked with 12 British-crossed (primarily Angus) beef steers (overall mean liveweight 320 kg), whereas each grass-legume replicate was assigned eight steers in each year from June to September during 2 yr.

Cattle were treated with Revalor-G (trenbolone acetate and estradiol, Merck Animal Health, Madison, NJ, USA) growth promotant implants at the beginning of each grazing seasons. Python Magnum insecticidal ear tags (10% zetacypermethrin + 20% piperonyl butoxide, Y-Tex Corp., Cody, WY) were applied by the cattle supplier in 2014 and 2015 before receiving the cattle, but were removed on 20 July 2015 because of lack of flies. Fly control was not implemented at the beginning of the 2016 grazing season, but was implemented on 5 July and 8 September as a pour-on treatment with CyLence (cyfluthrin, Bayer Health Care LLC, Shawnee Mission, KS, USA) to provide the cattle relief.

Visual ratings were made for horn fly densities independently by the same two observers on one side of each steer using binoculars (16 x 32 power). Fly numbers were

scored on each animal using a 1 to 5 scale with 1 = zero to < 10; 2 = 10 to < 30; 3 = 30 to < 50; 4 = 50 to 100; and 5 = >100 flies. Fly ratings data of the two forage systems were compared as means of two observers, and means of all eight or 12 cattle within each system (grass-legume or grass-only, respectively) per replicate for a total of six experimental units. Ratings were performed on six dates in each of 2015 and 2016. The preliminary rating in 2014 occurred on 26 August when grass-alone rated 1.7 and grass-legume rated 3.2 ($P < 0.01$). There ratings were made by only one observer, and therefore were not included in the subsequent years' analysis.

No differences ($P > 0.20$) were found between observers when compared in paired t-tests within each date and for combined dates within year. Data were then analyzed as means of the observers in a randomized complete block design within years, with the six sampling dates as a repeated measure. System means and system × date interactions were tested using Proc Mixed in SAS 9.4 (Littell et al. 2006). Forage system was set as a fixed effect, and date and system × date were set as random effects. Differences were considered significant at $P \leq 0.05$.

RESULTS

Fly ratings for the first two observation dates in 2015 (22 June and 20 July; Table 1) indicated absence of flies; likely owing to the insecticidal ear tags. Therefore the 2015 data were reanalyzed with only the last four dates in the repeated-measures design. Insecticidal ear tags were removed from all cattle after 20 July. Fly ratings were very high from 7 September to 29 September, illustrating the apparent dissipation of insecticidal control. There was no main effect of forage system nor system × date interaction on the last four dates in 2015, indicating an inability of OWB to prevent the build-up of flies.

The difference in mean fly rating between the systems in 2016 was not significant ($P = 0.076$) (Table 1). The system × date interaction in 2016 ($P = 0.052$) reflected inconsistency in the system effect across dates. The $LSD_{0.05}$ for comparing system means within dates was 0.8, which provided evidence that OWB reduced fly density relative to grass-legume on 23 June. On that date, cattle in the latter system were grazing the alfalfa paddock, which may have presented a stronger contrast of forage types than when the grass-legume cattle were on OWB-alfalfa. The contrast with cattle grazing alfalfa agreed with the preliminary assessment in 2014. Nevertheless, the high fly ratings (> 4.0) late in both grazing seasons indicate that OWB had little, if any, deterrence effect on the build-up of horn fly populations.

Table 1. Fly density ratings by year, date, for cattle on grass-only and grass-legume forage systems, and actual paddocks occupied on the sampling dates for each system. Within-date data are means of all cattle within a pasture and three replicate systems.

Year	Date	Grass-only	Grass-legume	Paddock occupied by grass-only cattle	Paddock occupied by grass-legume cattle
2015	22 June[1]	1.0	1.0	Native mix	Native mix
	20 July[1]	1.0	1.0	OWB[2]	OWB-alfalfa
	27 Aug.	1.4	1.8	OWB	OWB-alfalfa
	7 Sept.	4.1	4.4	Native mix	Native mix
	15 Sept.	4.2	4.7	OWB	Alfalfa
	29 Sept.	4.7	4.9	OWB	Alfalfa
	Mean[1]	3.6	3.9		
	System effect $P = 0.103$				
	System × Date $P = 0.945$				
2016	9 June	1.6	1.7	Native mix	Native mix
	23 June	2.2	3.6	OWB	Alfalfa
	4 July	3.3	3.5	OWB	OWB-alfalfa
	25 July	1.0	1.3	OWB	OWB-alfalfa
	28 Aug.	4.7	5.0	OWB	OWB-alfalfa
	26 Sept.	4.6	4.2	Native mix	OWB-alfalfa
	Mean	2.9	3.2		
	System effect $P = 0.076$				
	System × Date $P = 0.052$				
	$LSD_{0.05}$ within dates = 0.8				

[1] Data of 22 June and 20 July are not included in the means
[2] OWB = WW-B.Dahl old world bluestem

CONCLUSION AND DISCUSSION

This study was the first attempt to test anecdotal observations that WW-B.Dahl OWB pastures may reduce horn fly infestations of cattle. Results did not support the hypothesis of a strong or consistent deterrence effect. There was a numerical tendency for a deterrence effect on many dates, but a significant deterrence apparently occurred on only one date when cattle on the grass-legume treatment were grazing alfalfa. Toward the end of the two grazing seasons, fly populations built up to levels that may have overwhelmed any possible deterrence effects. This study was challenged by the fact that the cattle grazing schemes were not designed specifically to test the OWB effect on horn flies, in that cattle on the grass-legume treatment had large exposure to OWB in the OWB-alfalfa mixture, which constituted 58% of their grazing time. Also, the low number of replications limited statistical precision. In any case, cattle in the grass-only system on a diet high in WW-B.Dahl OWB were infested with horn flies to a degree that required insecticidal intervention. Concurrent studies on the same pastures demonstrated that OWB pastures were nearly completely devoid of red imported fire ants (consistent with Sternberg et al.

2006) and harvester ants (*Pogonomyrmex* spp.) (Bhandari et al. 2018), but the deterrence of ants by OWB did not extend to a similar effect on horn flies in this trial.

Fly rating data did not indicate a clear deterrence effect of WW-B.Dahl OWB on horn flies on cattle relative to cattle on the grass-legume pasture system, which were less exposed to OWB. Horn fly numbers on the grass-only cattle were not depressed to an extent that obviated the need for insecticidal treatment. Future research should focus on comparing cattle that are limited to only OWB to those with no access to OWB to provide a more distinctly different grass environment.

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